

## A STUDY ON THE FLORA AND FAUNA OF RAJAJI NATIONAL PARK

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### ABSTRACT

There are 11 states in India's Himalayan region that are home to India's 32 national parks and 92 wildlife sanctuaries. There are six national parks and six wildlife sanctuaries in the Indian state of Uttarakhand, which is located in the Himalayan region's northernmost region. These parks and sanctuaries were established by national and international organisations. These locations have been meticulously cared for and are recognised as some of the most stunning tourist destinations on a national and worldwide scale. Visitors come here to have fun, learn, and become more conscious of the need of protecting natural heritage. Latitude 29° 56' 40" to 30° 20' N and longitude 79° 00' E to 78° 01' 15" E are the coordinates for Rajaji National Park, which can be found in the districts of Pauri, Haridwar, and Dehradun. This park is one of the most well-known for the natural beauty it possesses as well as the prosperous diversity of its flora, fauna, and topographic landscape. It is located in the foothills, the Gangetic plains, and the lower Shiwalik mountain, and it has a total land area of around 820 km<sup>2</sup> spread throughout 9 forest ranges. The park features a terrain relief that spans from 271 metres to 1381 metres above mean sea level. The Shiwalik Range runs from east to west across the park, and the Ganga River flows from north to south through the park. The Ganga River cuts through the Shiwalik Range in the north-eastern section of the park, and it creates a flood plain in the park's southern region. Using geospatial tools and techniques such as Remote Sensing and GIS, this study describes various aspects of the park, including its topography, vegetative cover and Species, fauna species, Climate, accommodation facilities, transport, and tourist attractions. These aspects include: topography, vegetative cover and Species, fauna species, Climate. In addition, we have examined the conservation status of species of flora and wildlife in RTR in accordance with the status assigned to them by the IUCN.

*keywords: flora , rajaji national park*

### INTRODUCTION

The idea behind it The term "ecotourism" is an acronym for "ecological tourism," which means understanding and protecting the natural environment while travelling. To have enjoyment while also contributing to the preservation of natural and cultural resources is part of the concept of ecotourism, as outlined by the International Union for the Conservation of Nature (IUNC). This entails keeping the amount of effect caused by visitors to a minimum while yet providing economical advantages to the surrounding community. In addition, the term "ecotourism" refers to travelling in an environmentally responsible manner so as to have a smaller influence on the location that is being visited (Cetin & Sevik, 2016). Traveling to

natural regions that have not been disturbed by human activity is an example of ecotourism, which is a type of tourism. According to the definition and principles of ecotourism that were established in 1990 by The International Ecotourism Society (TIES), ecotourism is "Responsible travel to natural areas that conserves the environment and improves the well-being of local people." This definition was established by The International Ecotourism Society (TIES). (TIES, 1990) (Sayyed, Mansoori, & Jaybhaye, 2013). (Sayyed, Mansoori, & Jaybhaye, 2013). The topography and landscape features of the Himalayan area contribute significantly to the region's high level of natural biodiversity. Visitors are drawn there by the mesmerising splendour of its natural setting. This is reflective of the traditional outlook held by the people that we visit. Accessible on the internet at a href="www.lbp.world">2 towards the natural heritage/a>. The ever-changing vegetation, fauna, and animal life that inhabits it Tourists are drawn to the district features of interest, which include its terrain landscape. From west to east, the Himalayan area encompassed the following states: Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Assam, Arunachal Pradesh, Nagaland, Manipur, and Mizoram. The Indian Himalayan area is home to five national parks and six wildlife sanctuaries, all of which are located within Uttarakhand. The natural environments of the Indian Himalaya, the Bhabhar, and the Terai are the primary draws to the state of Uttarakhand. Shiwalik, the Lesser Himalaya area, the Greater Himalaya region, and the Trans Himalayan region are the four regions that make up the Himalayan region when seen from a physiological perspective. As a tourism destination, Uttarakhand has a lot to offer prospective visitors because the state is so rich in natural beauty, cultural history, and religious traditions and practises. The state of Uttarakhand offers many different kinds of tourism activities, such as ecotourism, cultural tourism, adventure tourism, and nature-wildlife tourism. The master plan (2007-2022) that was prepared by the Uttarakhand Tourism Department Board also focuses on the need and development of these tourism activities in the state. This is done so that the state can attract a much larger number of domestic and international tourists, which will help provide a significant number of job opportunities and an improved infrastructure. Chilla, Motichur, and Rajaji sanctuaries are located within Rajaji National Park, which is part of the Indus-Ganges Monsoon Forest Biogeographical Province and is located in the Shiwalik range and its Piedmont region of the Himalaya in the state of Uttarakhand. Rajaji National Park is part of the Himalaya. (Rakesh K. Singh,) RJNP is one of the most worthy sites for tourism activities in Northern India due to its diverse range of flora and fauna as well as its great biodiversity. The presence of megafauna such as the Tiger, Leopard, and Elephant, as well as the normal diversity of flora species on geographical sites, are helping to establish RJNP as a tourist site for ecotourism. Rajaji National Park was also formed as a component of the Rajaji-Corbett Elephant Reserve, which is a significant location for the preservation of elephants in Northwest India. The reserve is located within Rajaji National Park. The Rajaji-Corbett Elephant Reserve is home to almost ninety percent of the whole elephant population that resides in the northwest. The elephant population in the eastern (about 200 elephants) and western (approximately 400-500 elephants) sections of the park, which are separated by the river Ganga, is subject to a variety of dangers. RJNP was designated as a Tiger Reserve on April 20, 2015, by the National Tiger Conservation Authority/Project Tiger, a statutory body operating under the Ministry of Environment, Forest, and Climate Change (Government of India). With this designation, RJNP became the 48th Tiger Reserve in India as well as the second Tiger Reserve in the state of Uttarakhand (the first being Jim Corbett). RJNP is a well-known tourist site for nature enthusiasts who are hoping to get a glimpse of a tiger during their vacation. After being proclaimed, the total size of the Raja Ji Tiger Reserve would increase to 1,075,000 hectares. Previously, it had a total area of 820 km<sup>2</sup>. It was discovered that there were 18 tigers in the buffer zone of Rajaji National Park (RJNP).

### **Flora of the park**

There are around 8,000 distinct kinds of blooming plants that may be found in the Himalayas. Of these, 1748 plants are most commonly utilised for traditional healing and the treatment of a variety of illnesses (Akash et al., 2018; Wani et al., 2015, 2016). The forest environment of Rajaji Tiger Reserve is very varied and abundant. According to a variety of studies, the forests of the RTR are home to numerous significant plant communities. Some of these communities include the Shorea – Mallotus – Adina community, the Shorea – Terminalia – Bridelia community, the Dalbergia – Acacia community, as well as the Syzgiumcummini, Terminalia bellerica, Terminalia alata, Trewia nudiflora, Cassia fistula, and Fla (Akash et al., 2018; Joshi et al., 2009; Joshi et al., 2010). The RTR as a whole contains a huge variety of plant species over all of its ranges. The area of the Chilla forest division is protected by the network of protected areas, but it is undergoing rapid changes in its ecological status and the pattern of the flora and fauna that inhabit it as a result of large-scale anthropogenic forcing in some places. This anthropogenic forcing takes the form of cutting down trees, grazing livestock, building hydroelectric dams, scraping, trampling, and extracting non-timber products from the forest (Akash et al., 2019). On the other hand, the RTR is able to preserve its authenticity because to the enormous forest cover. According to the physiognomy, the vegetation of the park may be placed in the category of the northern tropical wet deciduous forest, and it can be subdivided into the following categories, as described by Champion et al. in 1988: (a). Sal forest (b). Mixed woods or woodland (c). Riverine forest (d). Grassland (e) and scrubland (e) (f). Pine woodland that is subtropical in latitude. A tropical moist deciduous forest and a tropical dry deciduous forest may be distinguished within the Sal forest, which makes up the majority of the park and can be subdivided into both of these types. The dominant tree species of the tropical wet deciduous forest is the Shorea robusta, which may be recognised by the clean tracts of forest that it generates. The common species related to the Sal forest include Terminalia alata, Anogeissus latifolia, Adina cordifolia, Terminalia bellerica, Lannea coromandelica, Garuga pinnata, Sterospermum suaveolens, Mallotus philipensis etc. On the other hand, the Terminalia bellerica, Cassia fistula, Mallotus philipensis, and Bombex ceiba species are included in the tropical dry deciduous category. The park's mixed woodland is often made up of species such as Anogeissus latifolia, Albiza procera, Mallotus philipensis, Bombex ceiba, Terminalia bellerica, Acacia catechu, Mitragyna parviflora, Erythrina suberosa, Embilica officinalis, Bredelia squamosa, Gmelina arborea, Listea glutinosa, Trew The community of mixed woodland also had to contend with the loss of species as a result of the many activities that residents engage in (Johnsingh et al., 1990). Riverine forests are made up of evergreen plant species that are able to endure the dampness of the inhabited sites and are found in low-lying waterlogged places, along nullahs, riverbands, and streambeds. These types of forests are known as riparian forests. The common species of this forest include Syzium cumini, Ficus racemosa, Bischofia javanica, Trewia nudiflora, Pterospermum acirifolium, Albizzia procera, Toona ciliata, Calamus tenuis etc. The park's scrub forest is a generic representation of the deterioration of dry deciduous forests, which are developed as a result of biotic stressors like as overgrazing, lopping, felling, and fires. These pressures led to the formation of the scrub forest. The most important tree species in this forest are the Aegle marmelos, Lannea coromandelica, Erythrina suberosa, Cassia fistula, Flacourtia indica, Zizypus mauritiana, and Z. xylopora trees.

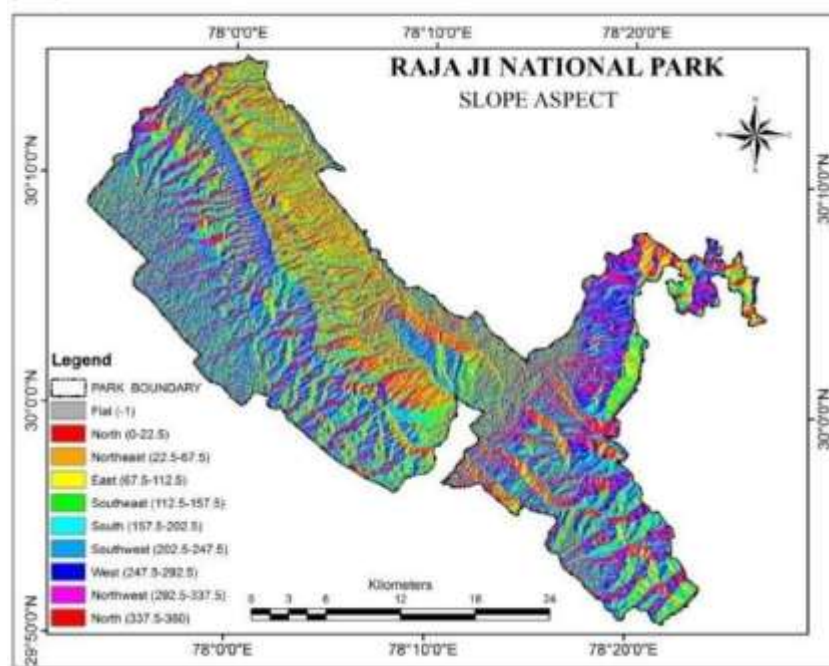
## **MATERIALS AND METHODS**

The primary foci of the study were the growth of ecotourism in RJNP, existing visitor numbers, and projections for future visitor numbers. Secondary data gathered from Rajaji national park about visitor arrivals and housing facilities (GMVN). The Location of Forest Rest Houses, also Known as FRHs, Collected from the Bhuvan Online Portal To investigate the current state of the weather Climate data

extracted from chelsa-climate. Using raster data from the biodiversity information system, Rajaji National Park was able to reach a high level of vegetation variety. The purpose of this is to demonstrate the physiographic properties of the land, such as its elevation, slope aspect, and drainage system.

## RESULTS AND INTERPRETATION

### Topography of RJNP



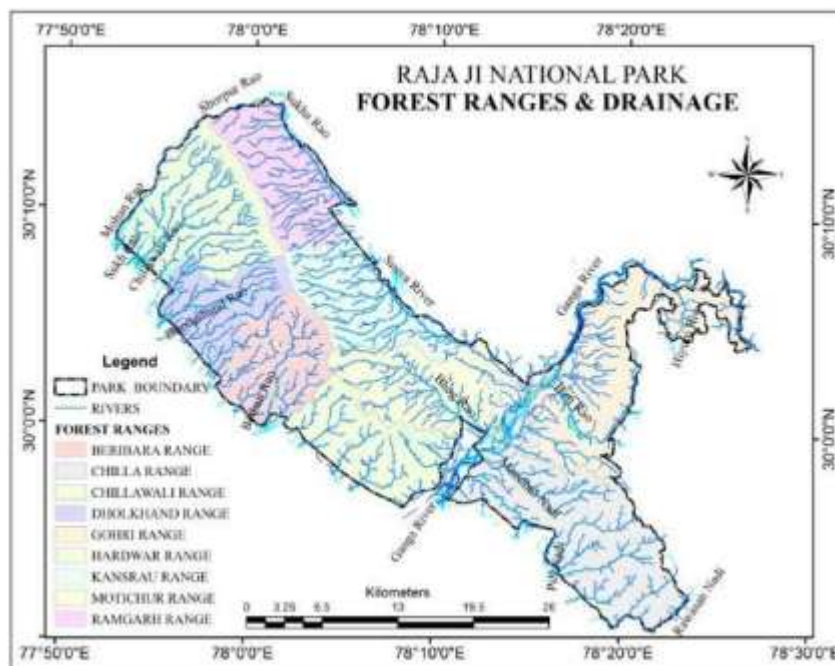
**Figure 2: Slope aspect map**

RJNP included an area of 820 km<sup>2</sup> and was situated in the southern side of the Siwalik Range and the Piedmont. The park's elevation ranged from 1381 to 271 metres above mean sea level (MSL) (Figure 1). In the northern portion of the park is covered with steep hills with the elevation of around 1381m (Figure 2). (Figure 2). Describe how the slope aspect is dispersed all along the direction in the northern half of the park. Figure indicates the shiwalik range passes from the park from east to west in the northern half of the park. Hills in the park are heavily inclined towards NNE in the northern portion and NNW in southern part.

### Drainage

River Ganga is the primary river that runs through this region from north-east to south-west in between four forest ranges named Hardwar, Motichur, Chila, and Gohri. RJNP has a thick and complicated drainage system, and River Ganga is the main river that flows through this region. This drainage system is made up of a variety of streams and tributaries, all of which contribute in their own way (figure 2). Within the Chillawa range are the rivers Mohan Rao, Sukh Rao, Chillawali Rao, and Gaj Rao. Within the Dholkhand range are the rivers Andheri Rao, Dholkhand Rao, and Malawala Rao. Within the Beribara range are the rivers Bam Rao, Betban Rao, and Dhulan Rao. Within the Hardwar range are the rivers Harnoul Rao, Chhirak Rao, Raw The rivers Rangarh Rao, Sukha Rao, Sorpur Rao, Phandowala Rao, Bulinawala Rao and Kuawala Rao in the Ramgarh Range, Bullawala Rao, Suswa River, and Kans Rao in the Kansrau Range,

and Kalakund Rao, Motichur Rao, Pirbakhsh Rao and Jamni Rao in the Motichue Range all flow from the south-east



**Figure: 3 Forest Ranges and Drainage of RJNP**

In both the Gohri Range and the Chilla Range, the river tributaries are flowing in opposite directions. The Chndrabhaga Nadi, the Badsani River, and the Bing rao all run in a direction that is north-west to south-east, whereas the Hiyuni Nadi flows in the opposite manner, from south to north. Pili Nadi, Khara Nadi, and the Rawasan River all run in the opposite way, from the north-west to the south-east, whereas Mundal Nadi flows from the south-east to the north-west in the Chilla Range.

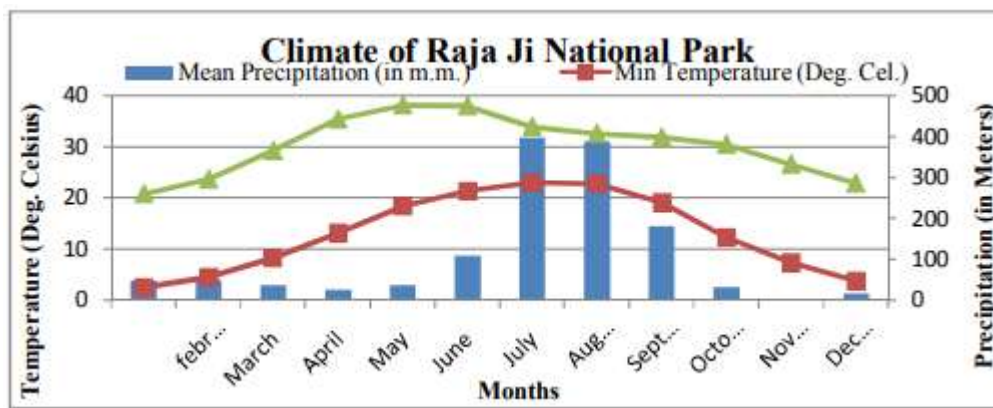
**Climatic Conditions**

**Table 2: Climate Temperature (Precipitation in mm & Temperature in ° C)**

Months	Jan	Feb	March	April	May	June
Mean Precipitation	48.57	50.42	36.36	26.19	36.63	109.03
Min Temperature	2.54	4.52	8.28	13.18	18.46	21.44
Max Temperature	20.83	23.67	29.26	35.39	38.09	38.00
Months	July	August	Sept	Oct	Nov	Dec
Mean Precipitation	397.03	388.23	180.64	31.95	4.43	16.27
Min Temperature	23.04	22.80	19.20	12.35	7.40	3.88
Max Temperature	33.91	32.61	31.87	30.49	26.63	22.90

Source: Extracted from <http://chelsa-climate.org>





**Figure 4: Climate** Extracted by author from Chelsa Climate (Details are in parenthesis)

The climate of RJNP is mainly warm and dry with a few months of rain. The months of winter, October through March, have maximum temperatures that range between 29.26 and 30.49 degrees Celsius, while the lowest temperature may be as low as 8.28 degrees Celsius and as high as 12.35 degrees Celsius (Table 2). During this time of the year, there is a good possibility that you may see migratory birds flying overhead. The months of May and June, which are considered to be summer months, have the largest number of sightings of wild animals around the water bodies. RJ National Park has monsoon weather during the months of July and September. During this time of year, the park is often closed so that the surrounding forest may be allowed to recover and so that new flora can grow. RJNP in summer (March - June) the overall climate is very mild during this period. The temperature varies from 8.28 degrees Celsius to 38 degrees Celsius. The quantity of precipitation that this region receives during the monsoon season (July–September) ranges from 180.64 to 397.03 millimetres every 24-hour period during the month of monsoon. This place gets even more gorgeous during these months. During the winter months of November through February, the average daytime temperature varies from 20.83 degrees Celsius to 26.63 degrees Celsius, while the average nighttime temperature ranges from 7.40 degrees Celsius to 2.54 degrees Celsius (Figure 4).

### Suitable Time to Visit

It is generally agreed that the greatest time to visit the park is during the springtime, which spans the months of March and April. The day begins with temperatures of 29.26 degrees Celsius and ends with temperatures of 35.39 degrees Celsius. The weather is mild. As a result of the lack of really intense heat, it is possible to see a great deal of wildlife out in the open during this period. The months of November through June are ideal for a trip to Rajaji National Park. Since RJNP is closed during the other months of the year, the ideal time to go there is between the 15th of November and the 15th of June. The months of April through June are warm, but this is the best time to see wildlife since they are more likely to come out to drink water at this time of year.

### Status of RJNP as an Eco-tourist place

The Ecotourism Society defines ecotourism as "responsible travel to natural places that conserves the environment and enhances the welfare of the local people." Ecotourism may be seen of as a form of sustainable travel. Traveling to natural regions that are free from human disturbance and pollution is an

example of ecotourism. Ecotourism is a type of tourism that involves the environment as an integral part of the experience. Both the mountains and Gangetic plain locations of RJNP have waste potential capacity with relation to Ecotourism due to the park's enriched wonderful floral and faunal history, quiet atmosphere, and waste potential capacity. The establishment of the Rajaji National Park (RJNP) as both a Tiger Reserve and a section of the Rajaji Corbett Elephant Reserve has led to a rapid increase in ecotourism in the area. Due to the natural floral and faunal history that it has, RJNP is considered to be one of the most appealing sites. It is also a suitable habitat for a variety of wild animals, including the Asian Elephant (*Elephas Maximus*), the Royal Bengal Tiger (*Panthera Tigris Tigris*), the Panther or Leopard (*Panthera Pardus*), the Yellow-Throated Marten, the Striped Hyena (*Hyaena hyaena*), the Common Jackal, the Indian Porcupine (*Hystrixindica*), the Barking Deer (Muntja Jeep Safaries are offered for three hours each time in the morning and evening from sunrise to sunset twice every day approximately in open jeeps through rugged terrain on unmetalled treks through Raus and over hills giving opportunity to see wildlife and birds in different habitats in Mundal, Mithawali, Khara, and some other ranges of peak. These safaries take place inside the park approximately in open terrain on unmetalled treks through Raus and over hills. As a result, the formal beginning of Jungle Safari was made possible by the RJNP authority, which assists the state government in generating cash each year. It is the most appealing location, not only among visitors from the host country, but also among tourists from other countries. The yearly tourist flow increase rate from 2005-06 to 2015-16 is a reflection of the growing interest in this kind of eco-tourism destination, which can be seen in the graph. In 2005–2006, it was 3.17%, but in 2015–2016, it hit an all-time high of 72.93%. It was 27.01% in 2014-15, but it got up to 72.93% into 2015-16 General growth rate of 16%. Very high flux in tourist growth rate can be witnessed during the revenue year 2015-16. The latest approach to discover the potential of ecotourism in the park is to go on an elephant safari, during which we get to observe exotic creatures up close. Within the Park for sixty to ninety minutes During the peak season for tourism, guests can go on an elephant safari either in the morning or the evening between the hours of 7:00 am and 9:00 am and 3:00 pm and 5:00 pm daily. These days, elephant safaris are a popular form of entertainment for visitors to the park. In RJNP, ecotourism is being promoted in part through the use of rafting as another component. RJNP is located on a 40-kilometer section of the National Highway 58 that runs along the Ganga river and has excellent potential for the expansion of rafting and other forms of adventure tourism. There are some well-known locations that have been established for the purpose of providing this facility. These locations include Shivpuri, Singtalli, Brahmपुरi, Bijni, Malakhunti, Paliyalgaon, Kudiyalala, Jhald Namaktok, Private land, and Neerghar. Many camp and rafting operators offer their services at these locations. In addition, RJNP is a renowned place for finding birds to observe, and observation towers that have been erected in the forest ranges allow visitors the opportunity to view the birds up close. The Chila and Gohari mountains are extremely popular destinations for ornithologists. There are over 350 different kinds of birds that can be seen at RJNP, which makes it an ideal location for bird watching and brings tourists there. Due to these factors, RJNP is a very popular tourist destination.

### **Wildlife species and fauna diversity –**

The majority of RJNP is composed of thick, verdant rainforests, and as a result, this ecosystem provides a home for a diverse collection of creatures. Asian Elephant, Bengal Tiger, Leopard, Jungle Cat, Striped Hyena, Goral, Indian Hare, Sloth Bear, Himalayan Black Bear, King Cobra, Jackal, Barking Deer, Sambhar, Wild boar, Rhesus macaque, Indian Langur, Indian Porcupine, Monitor lizard, and Python are some of the wild animal species that can be found in the Park. It is also known as a haven for bird watchers due to the fact that the Park is home to 315 different kinds of birds. The most notable avian species are peafowl,

woodpeckers, pheasants, the Hornbill, kingfishers, and barbets. During the winter months, there are also a number of migratory species present. There are a variety of fish that may be found in the rivers that flow through the park, including trout and mahseer. It is common knowledge that the RJNP is well-known for being a home to elephants and leopards as well as a source of tigers. RJNP is home to about 420 elephants, approximately 200 leopards, and approximately 18 Bengal Tigers at the present time. There are also around 3,256 Sambar living in the park.

### **Habitats in RJNP**

In this park, there is an abundance of different habitats, such as caves, crags, cliffs, overhangs, dens, burrows, and trees for cover. Many different species of flora and wildlife make use of these different environments. In the Rajaji National Park, there are two well-known caverns that can be found in the region designated as compartment no. 3b. These caves serve as the roosting grounds for bats. Caves generate their own unique microclimate, which satisfies the requirements of a diverse range of plant life. The steep cliffs of the Shiwalik ridge, which were produced by water and wind erosion, are important natural elements in the Park because they provide nesting sites for a variety of birds, including owls, eagles, bee-eaters, and mynas, as well as snakes. The unique microclimate that is created by cliffs is beneficial to the survival of endangered plant species such as *Catamixisbaccharoides* and *Ougeiniadalbergioides*. Some of the most notable overhangs in the park may be found in the areas of Gaj, Andheri, Thanda sot, Harnol, song, suswa, Motichur, Ranipur, Kansrao, and Ghasiram rau. These overhangs provide a significant portion of the park's appeal to visitors as a tourist destination. Thorough examination of burrows, which are created by a wide variety of tiny life forms and reptiles and which provide as a safe haven for a variety of indigenous species. In addition to this, it sheds light on a multitude of fascinating and educational information pertaining to more inconspicuous kinds of life. Many bird species, such as parakeets, hornbills, woodpeckers, and owls, as well as smaller mammalian species, such as bats, squirrels, and other rodents use tree hollows as a breeding and roosting location for their young. Tree hollows also provide an important habitat for other wildlife, including smaller mammals. These hollows offer a safe haven for endangered animals and raise awareness among humans about the importance of protecting and conserving them. The management should also be aware of the significance of such tree hollows, and they should take precautions to prevent them from being destroyed by forest fires and from the theft of eggs and young animals. According to the journal kept at Rajaji National Park, leopards are known to inhabit dens in the Chillawali Range and the Kansaro Range. Tigers, on the other hand, are known to inhabit dens in the Chilla Range and the Dholkhand section of the Dholkhand Range. Dens inhabited by hyenas are known to be located in the Chilla Range, adjacent to the Chilla Forest Rest House, as well as in the Haridwar Range's Chirak Khol. The park is home to various areas of marshy habitat, the majority of which are located on the southern slope of the Shiwalik Mountains and the eastern bank of the Ganges River. These areas have distinct and diverse plant communities. These regions are located along the Song and Suswa rivers, the Banbaha and Bahera beat in Kansrao, Motichur and Ramgarh ranges, and the TunChaur and Jamania Bagh areas of the Chilla-Gohri ranges. According to Champion and Seth (1968), these regions are examples of the Sub-Montane Hill Valley Swamp forest type. Some of the marshes are the source of the perennial rivers and streams. The trees that may be found in the marshes are often short, crownless, and branchy, and there is typically a dense growth of *Calamus tenuis* (Cane).

### **CONCLUSION**



These results obtained by data interpretation explained that the Rajaji National park has vast potential for ecotourism activities such as bird watching, wildlife watching, Jeep and Elephant safari, scenic beauty and Natural heritage, and rafting. Ecotourism potential in RJNP forest ranges is highly associated with drainage, transport network, physiographic, slope aspect, point of Interest and floral and faunal diversity can be used as important parameters. In the course of the research, many map layers, including Elevation, Forest range, Drainage, Slope Aspect, Vegetation Cover, Road Network, and Points of Interest, were utilised (watchtower, accommodation facility). The purpose of the present study is to provide substantial and valuable information that can be used to establish policy and strategies for the expansion of ecotourism in RJNP. It may be useful to develop job opportunities for the local community and to increase revenue, both of which contribute to the expansion of the economy of the state. Ecotourism, in its most basic form, serves as an important instrument for the economical growth of local communities as well as the ecological wellbeing of national parks. The park's continued development as a sustainable ecotourism destination is being supported by the rapid increase in the number of visitors it is receiving, which is evidence that the park possesses an allure for tourists.

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