

AN ASSESMENT ON FOREST AND WILD LIFE: CASE STUDY ON RESERVE FORESTS OF SIVASAGAR DISTRICT, ASSAM

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Abstract: *Forests are important renewable natural resources given by nature which play an important role in social, cultural, historical, economic and industrial development of any region and it maintained the ecological balance. Besides provide valuable raw materials for a number of industries, it helps natural water supply, preserve wild life, control floods and prevent soil erosion, supply medicinal plants, ornamental plants and fuel wood for domestic consumption.*

The state of Assam has a rich forest cover. The whole region is a part of global bio-diversity hot-spot and also a part of two endemic Birds area i.e. Eastern Himalayan and Assam plain. The ecosystem of the forests area becoming gradually worse day by day due to lake of awareness of people and it is become threatening to the life of plants and animals. With regards the study it is observed that there has been a continuing process of land cover changes in the forest area. Deforestation, encroachment, agricultural and other economic activities have changed the land cover in the area.

Within the geographical territory of the study area there are Six Reserve Forests and one Wild life Sanctuary. All these belong to Assam Forest Department and Sivasagar Forest Division. Under human intervention the larger part of the forest of the area has been wiped out. Growth of settlements in the forest areas and associated reclamation of land for agricultural purpose are the major factors of land and forest cover change in the study area.

In view of the above, some problems have been identified in the study area such as depletion of forests area, conversion of Reserve Forest area in to agricultural purpose, loss of biodiversity and threatened to wild life in the area and encroachment. In this background, an attempt has been made here to study the present status of the Reserve Forest of the district, to study the wild life of these Reserve Forests of the district, to identify the threatened wild life of these Reserve Forests and to suggest the possible measures.

Key Words: *Reserve Forest, Wild Life, Forest cover Change, Biodiversity Loss.*

Introduction:

Forests are important renewable natural resources which play an important role in social, cultural, historical, economic, and industrial development of any region and it maintained the ecological balance. They are the resource base for sustenance of its population and a store house of biodiversity. Having understood the importance of forest and desirability of forest conservation, our ancestors in ancient times worshipped trees and lived in harmony with the environment. Besides provide valuable raw materials for a number of industries like Paper, Plywood etc. it helps natural water supply, preserve wild life, control floods and prevent soil erosion. Moreover, the forest supply medicinal plants, ornamental plants and fuel wood for domestic consumption. Forest also supplies food to some extent to men and to all animals.

Unplanned change of land use and land cover has become a major problem in many parts of the world. Deforestation, soil erosion, desertification etc. are consequences of mismanaged planning without considering environmental impacts. North East India is now turning in to a potential danger zone because of growing environmental changes due to depletion of forests, occurrence of floods, landslide and soil erosion, improper resource utilization and loss of bio-diversity.¹

The state of Assam, North East India has a rich forest cover. Roughly half of the forest of the state is reserved. The whole region is a part of global bio-diversity hot-spot and also a part of two endemic Birds area i.e. Eastern Himalayan and Assam plain. It has widely differing habitats. In the Eastern and southern area of the state there are tropical wet evergreen forest occur, mainly the parts of Tinsukia, Dibrugarh, Sivasagar, Jorhat, N.C. Hills Cachar and Hailakandi district. In spite of this, the ecosystem of the forest area becoming gradually worse day by day due to lake of awareness of people and it is become threatening to the life of plants and animals. With regards the study it is observed that there has been a continuing process of land cover changes in the forest area.

Within the geographical territory of the study area, there are Six Reserve Forests and one Wild life Sanctuary. All these belong to Assam Forest Department and Sivasagar Forest Division. Of these Reserve Forest three are an almost continuous belt of foothills along Assam-Nagaland border. These three Reserve Forests are Galekey, Abhaypur and Dilli Reserve Forests. Sapekhati Reserve Forests and Panidihing Wild Life Sanctuary of Sivasagar of Assam is located very close to this foothills zone. Under human intervention the larger part of the forests of the area has been wiped out. Growth of settlements in the forest areas and associated reclamation of land for agricultural purpose have been identified as the major factors of land cover change in the study area. Tea cultivation has become very popular among the encroachers of the area.

In view of the above, some problems have been identified in the study area.

- 1) Depletion of forests area.
- 2) Conversion of Reserve Forest area in to agricultural purpose.

- 3) Loss of biodiversity and threatened to wild life in the area.
- 4) Encroachment

1. Chetry, N. and Borah, J. (1999): *Resource Base Development Scinario in north East India, North Eastern Geographer*, vol. 30, No. 1 & 2. pp. 15-17

In the field of Environmental Science, many prominent scholars have offered remarkable contribution in this field. Among them Edward O. Wilson² Lal J.B³ Pillai V.N.K⁴ Bustard H.R⁵ etc. may be mention. In the last 20 years remarkable progress has been made towards understanding how loss of forest and wild life affects functioning of ecosystems and thus affects society. Dr. Borang(2011) interpreted the Biodiversity samples of Arunachal villages. He strongly advocated that the stability and persistence of ecosystem of the region attributed to the age-old eco-friendly practices of use and management by the indigenous people. Prabhat, K. K.(2011) has made an attempt to quantify the depletion of common property resources and the extent of degradation of common forests in Arunachal Pradesh. Contrary to the traditional belief he found that poverty is not responsible for degradation of natural resources but commercial tree felling and development activities include privatization of resources responsible for the depletion and degradation of these resources. Rahman, H.(2011) in his paper explained the various uses of a large number of medicinal plants by the tribal people in Birbhum district of West Bengal with Botanical taxonomy.

Pursuant upon the recommendation made by the Indian 'Board of Wild Life' in its 21st meeting held on 21st January, 2002 under the chairmanship of honorable Prime minister of India resolve d the constitute a 'National Forest Commission' to review the work of the forest and wild life sector.

Significance of the study: Study on forest and wild life and their interaction with humans has become critical area of research in recent years. In recent time presents some serious dimension in interaction between them which includes issues like depletion of forest areas, loss of habitat of wild life conflict etc. In the name of development, economic and scientific, man has played simply a role in the destroying of nature. The adverse impact of human activities on nature has created an ecological imbalance causing pollutions, acid rains, depletion of ozone layer etc. This has posed a serious threat to human existence. For existence our immediate need is a better ecological understanding so as to minimize the environmental disturbance. We need to formulate the principle to co-exist with nature. We need to know the controlled use of natural resources.

The reserved forests are integral part of the **wild life** and wild life and is a very important component of environment. But such habitats decrease day by day resulting the lost of biodiversity. The problem therefore more serious from the view point of threats to biodiversity. In this background, an attempt has been made here to study the present trend of biodiversity in these R.Fs.

Objectives: The following are the main objectives of the present study:

- 1) To study the present pattern and status of the Reserve Forest of the district;
- 2) To study the wild life of these Reserve Forest of the district;
- 3) To identify the threatened wild life of these Reserve Forests and
- 4) To suggest the possible measures.

1. Edward O. Wilson² (Editor) and Frances M. Peter's, (Associate editor): *Bio-diversity, National Academy Press, Myers N.(1990) The Bio-diversity Challenges: expanded hotspot analysis,*
2. Lal J.B³ *Indias Forest,*
3. Pillai V.N.K.(1982) *Status of wild life conservation in states and union territories.*
4. Bustard H.R'(1982) *Wild life in India*

Data base and Methodology: The study is based on data collected from primary and secondary sources. Prime emphasis is given to primary data. Secondary data are obtained from different sources like District Forest Office, Economic Survey of Assam, 2004 – 05, 2009 – 10, 2010 – 11 and 2011 – 12, District at a glance, Sivasagar, 2003 and 2004 - 05 and other published and unpublished articles.

Primary data are collected through field survey. Human encroachment clearing of forests, agricultural practices and other development activities, various arrangements for illegal trade of timber and different ways of exploitation of the forest resources inside the reserve forests of the area could be experienced visually during the study period. Lot of visits had been made to the villages close to the Reserve Forests and attempted to interact with the villagers to understand the association of the villagers with the forests and to know the pattern of forests depletion and encroachment in the forests. Secondary information are collected from various published and unpublished documents and reports of government and semi government agencies as well as bulletin and journals. Collected data are processed using simple statistical techniques. It is done with the help of maps, tables, diagrams, graphs and necessary photograph etc.

Study Area:

Reserve Forests of Sivasagar district is selected for the proposed study. It is under Sivasagar Forest Division. It covers whole Sivasagar district of Assam. The total forest area of the district is 240.48 sq. kms (24092.903 hact. in 2012). The Sivasagar is lies between 94^{08'} - 95^{04'} East longitude and 26^{07'} - 27^{02'} North latitude. The whole district is comprised of 3 subdivisions, 16 Thanas 6 Revenue Circle, 9 Development block, 118 Gaon Panchayat, 01Birds sanctuary, 06 Reserve Forests and more than 30 Grazing lands.

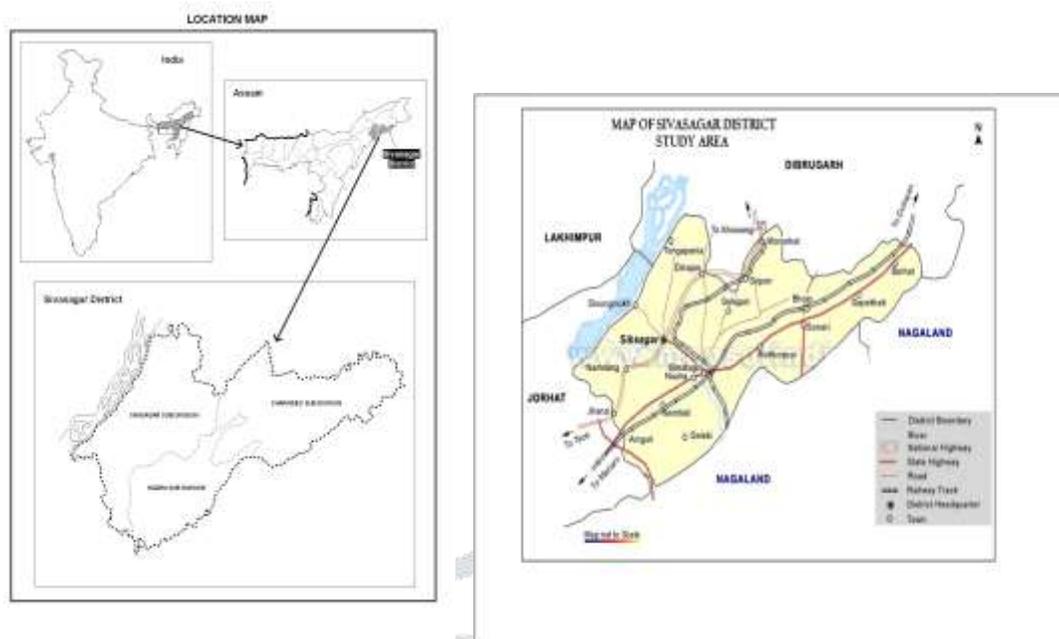


Fig: Map of Study Area

Result and Discussion:

The Assam is a constituent unit of the eastern Himalayan Biodiversity region which is one of two biodiversity “Hot Spots” in the country. The state is rich in forest resources as compared to some other states of India. The luxuriant evergreen and deciduous forests of the state abound in various valuable timber species. The climatic conditions and wide variety in physical features witnessed in Assam have resulted a diversity of ecological habitats such as forests, grasslands, wetlands, which harbor and sustain wide ranging floral and faunal species.

The forest cover of the state is 27,673 sq. km as per the India State Forest Report, 2011-12, which is 35.28% of the total geographical area of the state. But the forest cover of the state has decreased by 19 sq km as compared to the satellite data of October 2006 and January 2007 published in State Forest Report in 2009. As per Forest profile of the state, the Reserve Forest area and Proposed Forest area is 13507 sq km and 1539 sq km respectively in 2011 – 12 as against 14212 sq km and 2102 sq km reported in 2010-11 by the State Forest Department. The Reserve Forest area is 67% of the total forest area of the state. The total forest area excluding un-classed State Forest is 20031 sq km and 4198 sq km area is under protected area in 2011-12, as reported. The Reserve Forest area constitutes around 17 percent and total forest area excluding un-classed forest constitutes 26 percent of the total geographical area of the state. The scenario within the notified area depicts a gloomy state in terms of degradation during the last 20 years due to various biotic factors and encroachment. As a result, considerable rich biodiversity has been lost which need to be re-built again. Temporal change in the forest cover shows that total a nominal amount of forest decreased in the Assam from 2001 to 2011 while other forest types seemed expanding in the area. A considerable amount of Dense Forest area (2982 sq km) has decreased and Open Forest area (2941 sq km) has increased during the entire study period.

The protected area in Assam includes five National Parks and Eighteen Wild Life Sanctuaries covering an area of 3592.94 sq km. It constitutes 4.6 percent of the geographical area. The state has three Tiger Reserves, Namely Kaziranga Tiger Reserve (Nagaon, Golaghat and Sonitpur district), Manash Tiger Reserve (Kokrajhar, Chirang, Baksha and Udalguri district), and Nameri Tiger Reserve (Sonitpur district). The objective of the Tiger Project is to preserve Tiger population by providing all round protected measures. But most attentive issue is that the Tiger in these reserves has been decreasing to a large numbers, as revealed by the Tiger Census Report. The Rhino population in the state is increasing which is evident from the census report. The Elephant population is also increasing in the state according to Elephant Census, held in 2009.

The district of Sivasagar, a part of Assam has a rich forest cover while the cultural complexity of the region is extra ordinary. The whole region is a part of global bio-diversity hot-spot and also a part of two endemic Birds area i.e. Eastern Himalayan and Assam plain. It has widely differing habitats. There are tropical wet evergreen forest occur in the whole area of the district and forests of this region are unique both in terms of their structure and species composition. As per the State Forest Report, 2011, of the Forest Survey of India, the Reserve Forest area of the district is 695 sq km(24092.903 hect.) which is 26.05% of geographical area of the district. The forest cover of the district is as follows.

Table: Forest Cover of Sivasagar:

Type of Forests	Area(in sq km)
Dense Forests	08
Moderate Dense Forests	144
Open Forests	543
Total Forests	695
Total Geographical area of the district	2668
Percentage of total geographical area	26.05%

Source: India State Forest Report, 2011

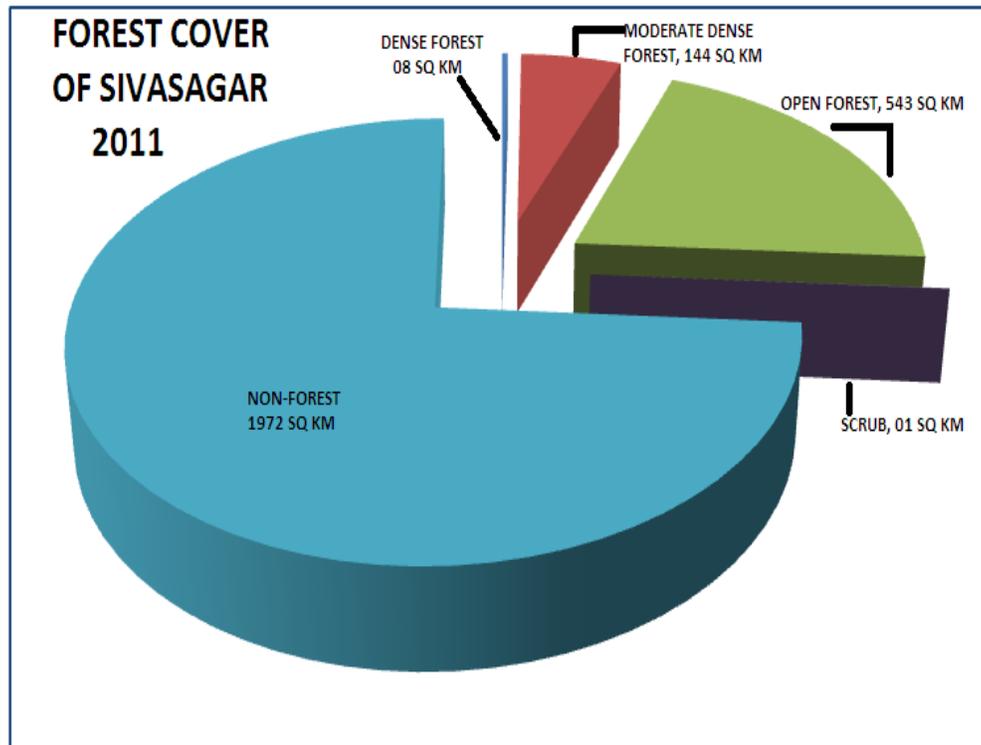


Fig: Forest Cover of Sivasagar

Owing the location in the sub-tropical zone and the prevalence of the monsoon climate, the landmass of Sivasagar possesses mainly evergreen, semi-evergreen and deciduous forests. The forests of Sivasagar are rich in plant and animal life and shows a wide variety in their structure and composition. Most of the important species plants are found here. An area of 695 sq km has been brought under Reserve Forests and Wild life Sanctuary. A Birds Sanctuary has been established in Panidihing situated near about 22 kms from Sivasagar Town. Vegetation of the area is consists of various species of herbs, Medicinal plants, and shrubs.

The Sivasagar is a region of seven Reserve Forests including one Birds Sanctuary and more than 25 grazing land.

Table: Reserve Forests and Birds Sanctuary of Sivasagar district:

Sl No	Name of Reserve Forests./ Birds Sanctuary	Area in Sq km	Area in which located	Major Vegetation Found	Major Animal found
01	Solah Reserve Forest	683.000 Hact. (169 sq km)	Nazira Sub-Division	Bhelu, Amari, Sopa, Bogipoma, Gonsoroi, Bonsum, Ajhar(lagerstroemia), Titasopa(michelia champaca),	Jungle cat, Jackal, wild boar, macaque, Assamese macaque, slow lorries, giant squirrel, Indian Python, cobra, viper, rat snake, krait etc.
02	Abhoipur Reserve Forest	6737.00 Hact. (66.446 sq km)	Abhoipur Barmajali Mauza, Charaideo Sub-Division	Nahar(messua ferrena), Ajhar(lagerstroemia), Titasopa(michelia champaca), Sam(artocarpus), Bandardima(dyoxylum bicetiferum), Hollockh etc.	Jackal, Leopard(neofelis nebolosa), Jackal, wild boar, Assamese macaque, slow lorries, giant squirrel, Indian Python, cobra, rat snake, krait etc.
03	Dilli Reserve Forest	3108.00 Hact (30.30 sqkm)	Charaideo Sub-Division	Bandardima(dyoxylum bicetiferum), Hollong(dipterocarpus), Hollockh(terminalia bicolorata), Hillikha(terminalia citrine), Bohot(artocarpus loccoba), Raidang Can(calamus	Leopard(neofelis nebolosa), Civet cat, Jungle cat, Jackal, Barking deer, wild boar, langur, rhesus macaque, Assamese macaque, slow lorries, giant squirrel, Indian Python, cobra,

				flagellum), Segun(tecton grandis), Lazai can(calamus floribundus).	viper, rat snake, krait etc.
04	Sapekhati Reserve Forest	736.000 (7.26 SQ KM)	Charaideo Sub-Division	Sam(artocarpus), Bandardima(dyoxylumbin cetariferum), Hollong(dipterocarpus bondi), Hollockh(terminalia bicolorata), Hillikha(terminalia citrine), Sassi(ageilatia agallecha) etc.	Civet cat, Jungle cat, Jackal, pangolin, Capped langur,rhesus macaque, Assamese macaque, slow lorries, giant aquirrel, Indian Python, cobra, viper, rat snake, krait etc.
05	Galekey Reserve Forest.	5927.000 (57.343 sq km)	Nazira Sub-Division	Hollong(dipterocarpus bondi), Hillikha(terminalia citrine), Sassi(ageilatia agallecha), Bohot(artocarpus loccocha), Raidang Can(calamus flagellum), Segun(tecton grandis), Lazai can(calamus floribundus).	Leopard(neofelis nebolosa), Civet cat, Jungle cat, Jackal, Barking deer, wild boar, pangolin, Capped langur,rhesus macaque, Assamese macaque, slow lorries, giant aquirrel, Indian Python, cobra, viper, rat snake, krait etc.
06	Diroi Rangali Reserve Forest	4834.000 (64.76 SQKM)	Sivasagar Sub-Division	Nahar(messua ferrena), Ajhar(lagerstroemia),Titasopa(michelia champaca), Sam(artocarpus), Bandardima(dyoxylumbin cetariferum), Hollong(dipterocarpus bondi), Hollockh(terminalia bicolorata), Hillikha(terminalia citrine) etc.	Jackal, Barking deer, wild boar, pangolin, Capped, Leopard(neofelis nebolosa), Civet cat, Jungle cat, Assamese macaque, slow lorries, giant aquirrel, Indian Python, cobra, viper, rat snake, krait etc.
07	Panidihing Birds Sanctuary	2022.000 (33.93 sq km)	Sivasagar Sub-Division	Nahar(messua ferrena), Ajhar(lagerstroemia),Titasopa(michelia champaca), Sam(artocarpus), Bandardima(dyoxylumbin cetariferum),	Bar headed Goose, Spot bill Duck, Grey leg Goose, Mallard, Wigion, Gargany, Red crested Pochard, Common Pochard, Ferruginous Duck, Open bill stork etc.

Source: Field Survey by Investigator

Solah Reserve Forest located near Mathurapur and Lakwa. It is surrounded by Suffry River in the East, Lakwa Oil Field in the West, Mathurapur area in the South and Khana Tea Estate, local village in the North. It covers an area of 169 sq km of land. It was enriched with a large number of rare species of animals, birds and trees before the coming of the operation of ONGCL. The company started its operation in the forest covering 2.15 hectares of land in 1980. Such land has increased to 120 hectares in 2007. At present there are 28 nos of Oil wells and 1(one) Gas Gathering Station (GGS) i.e. GGS no. 2 within the forest. After successful operation, an Oil well site has converted in to waste land with oil muds and waste pits along with other polluting substances, where plants cannot grow or survive. Continuous oil operation flowing of natural gas has caused threatening to the existence of many birds and animals etc. Many species have disappeared. It is observed that Sola Reserve Forest area are going to be destroyed due to drilling operation by ONGCL and heavy transportation running from through this area.

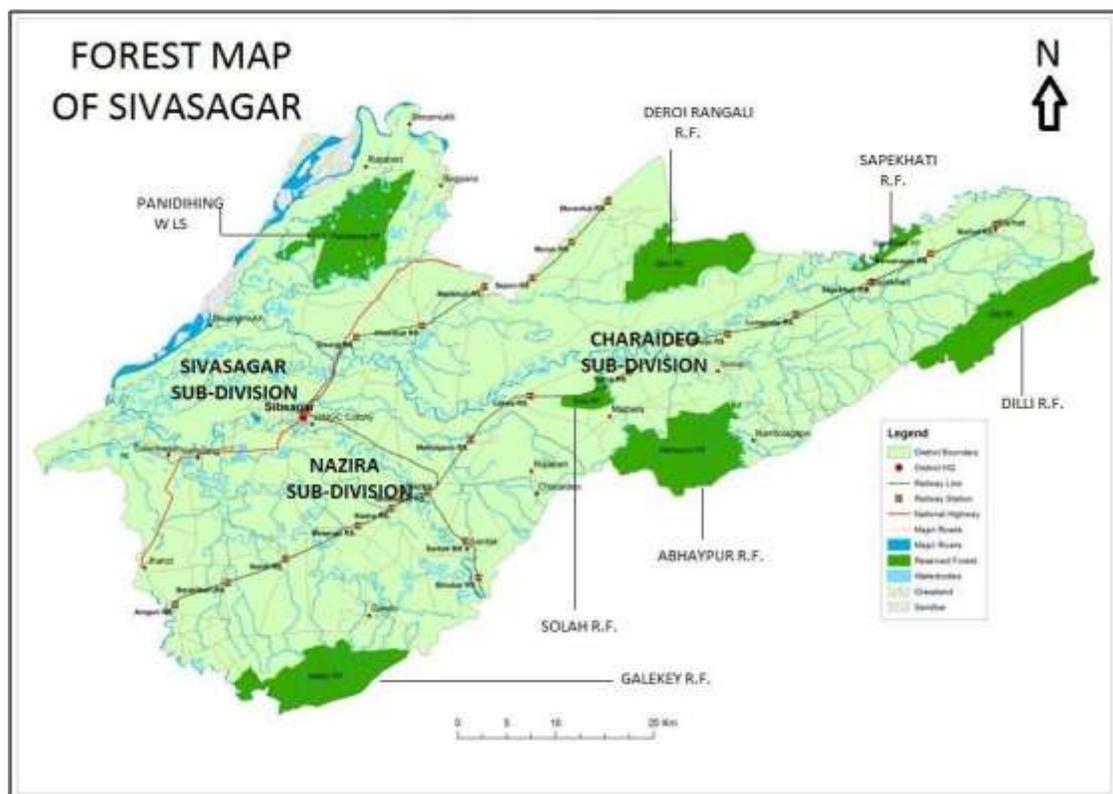


Fig: Distribution of Reserve Forests and Birds Sanctuary of Sivasagar

Abhoypur Reserve Forest has an area of about 6737.9 hectares (66.446 sq km). It is located along interstate border which is surrounded by Towkak River in the East, Dhoodar Ali in the North, Nimonagarh in the West and Nagaland boarder in the South. Regular tree felling and establishment of saw mill by the Nagas of Nagaland have been going on uninterrupted in the Abhoipur Reserve Forest.

Dilli Reserve Forest that was once upon a time packed with valued flora fauna has currently been encroached by the Arunachalies. They have been using the forest land for rehabilitation of their growing population. The Dilli reserve forest has an area of 3030 hectare (Now 16.7 sq. kms). It is located in Sivasagar district bordering two states, Assam and Arunachal Pradesh. This reserve forest is surrounded by Dilli Tea Estate and locality in the east Arunachal Pradesh Boarder in the South, Nagaland Boarder and Bimalapur T. E. in the Southwest and Barpatra T. E., Dhoodar Ali in the North. The habitat of Dilli Reserve Forest is made up with semi evergreen and deciduous forest.

The **Sapekhati Reserve Forest** is situated at the bank of the river Disang in Charaideo Sub-Division. Out of 726 hectares of forest area about 95% area has been found grappled and denuded by the encroachers.

Galekey Reserve Forest is situated eastern part of Sivasagar district. It is located along the interstate border and represents foothills and low undulating topography. It is one of the 124 villages in Nazira Block. The flora and fauna of the Galekey Reserve Forest distributed scattered with rich biodiversity. Galekey Reserve Forest is also shrinking fast. Much of the evergreen and semi evergreen forests of Galekey Reserve Forest had been wiped away. About 67% of its forest area has already been encroached and people have settled there permanently.

Diroi Rangali Reserve forest has an area of about 6476 hectares. It is surrounded by Mulagabharu and local village area in the East, Moran Oil field and Diroi River in the North, Nirmolia, Kurukani, Ramnagar village and Duribam Tea Estate in the South and in the West Himpara and Bishrampur locality are there.

Panidihing Birds Sanctuary is located in the northern part of Sivasagar district of Assam within the geographical limits of $27^{\circ}45'$ N latitude and $94^{\circ}25'E$ to $94^{\circ}40'$ E longitude. The altitude of the area varies from 100 to 110 meters above sea level. It is near about 22 kms from the Sivasagar town. It has a rich wetland ecosystem. The geographical position of the sanctuary is in between the Kaziraonga National park and Dibru-Soikhowa Biosphere Reserve. Panidihing is predominantly covered by grasslands and Bills. It represents five Biomes – Assam alluvial plains, Semi evergreen Forests, Eastern seasonal swamps forests, Eastern wet alluvial grasslands and wet lands. Panidihing Birds Sanctuary was constituted by carving out a part of Panidihing Reserve Forest and non cadastral land. Panidihing Reserve Forest was constituted during year 1894 vide government notification No. 3392 R dated 27-07-1894 with an area of 7769.856 hectares. In 1999 vide government notification NO. FRW.71/95/Pt/6 dated 10-08-1999 the area was declared as Bird Sanctuary under the Wil Life Protection Act 1972. The sanctuary is well known for many migratory birds' species and some of which very rare endangered enlisted even in the Red Data Book. The sanctuary was once the home of around 165 birds' species, of which 96 were identified as local and 69 were listed as migratory species. But in recent times the number of species has been seen in the sanctuary surprisingly gone down for many reasons. Besides, bird's species Panidihing Birds sanctuary is also rich for its local fishes. But in the recent past it has been threatened by natural and man made activities. It is observed that the Brahmaputra river bank flow and shifting of the channel of Demow River have been adversely affecting the ecology of the sanctuary. Hunting and poaching of Birds for recreation and food are common phenomena in the sanctuary. Same practices are going on in regards of fishing also. There are many buffalo rearing points (Mohkhuti) scattered aside of sanctuary. Over grazing in the lean season some time distributed the wetlands ecosystem of

the sanctuary. The frequent visit of the wild elephant mainly from Nagahills for search of food is not only tearing down the agricultural fields of the surrounding villages of Panidihing but also disturbed the ecosystem of the forest.

Wild life is a very important component of the environment. Wild life encompasses, in a broad sense, all the living plants and animals found in nature in their wild state. More and more people are now showing increased desire to acquire greater knowledge about nature and wild life. In the present context, the scope of wild life is restricted to the wild animals and birds.

Wild life played vital role in the in the development in the human culture and heritage. With the transformation of human societies from food gathering to food processing (agriculture) some species of wild life were domesticated to serve man directly, while others continued to be hunted for their flesh, hides, fur, ivory, horns, beaks and for human pleasure. In recent past human- animal conflict has emerged as the main threat for survival of some animals across their range. Human-animal conflict includes crops damage by Elephants, Property damage or injury or death to people.⁷ The incident of killing Leopards by the people is also increased in the study area in the last few years. Sources said that around 130 Leopards were killed in different parts of upper Assam in between 2001 to 2013 and among them 90% were killed by the people.⁸ Growing human population demand for cultivable land and conversion of forest habitat to human habitation and cropped land has resulted serious human elephant conflict in Assam, North East India.⁹ The forest cover of Sivasagar area represents a key landscape for wild animal habitat. That is represents by Seven Reserve Forests. But the region is extremely fragmented owing to large scale destruction of forest during the last decade. Increasing areas of tea gardens and subsequent loss of forest cover has contributed to the intense human-animal conflict.

It is already mentioned that forests are a precious resource given by nature. It is often termed as multipurpose resource. Forests provide hard wood for construction, soft wood for plywood and match manufacture, bamboo and grass for paper and pulp, fuel wood, khoir, gum, gum, bamboo, thatch, can, various medicinal and ornamental plants, vegetables, fruits, honey and many varieties of wild animals and birds and products from them.

Some of the economically very important trees found in these reserve forests. These are Agaru or Agar has become very rare plant now. In the olden days people used to prepare thin long sheets out of its wood for writing. It is locally known as Sanchi tree. Besides providing writing sheets, Agaru or Agar contain a very valuable oily essence from which a precious perfume and some drugs are prepared.



Fig: Tea Cultivation has become very popular in this area

7.Ngure, N. 1995. *People-elephant conflict management in Tsavo, Kenya*, *P achyderm*, 19: 20-25.

8. *Sentinel*, March, 17, 2013

9. Talukdar BK & Barman R (2003) *Man-elephant conflict in Assam, India: Is there any solution?* *Gajah* 22: 50-56.

Major Findings:

Although, Assam is rich in forest resources, but some factors have made it poor now in this precious resources.

The demand for wild life products has driven charismatic wildlife species like Tiger, Elephant, and Rhino to alarmingly low numbers in Assam, threatening their future survival. Poor protection, proximity to a large market (i.e. China and South East Asia) and inconsistent implementation of wild life laws have put in peril a range of wild flora and fauna in this region.

Beside the meat, indigenous people also use animal for medicine. However, hunting and poaching which used to be just for domestic consumption, is now feeding a huge international market. Rhino, Tiger, Leopard, Elephant's skin, bone and other body parts harvested here are smuggled out through the international border in North East India or through other international trade routes.

All the reserve forest under study area is rich in biological diversity, but in recent years deforestation occurred due to illegal cutting of trees, they are suffering from biological degradation. In our observation it is seen that indiscriminate illegal cutting of trees in all the reserve forest is the major threats to the biodiversity of the forest.

The Sivasagar district is sharing its southern boundary with Nagaland and Arunachal Pradesh. **Abhaypur and Gelekey** Reserve Forests are located along this part of the boundary and they together occupy 36.25 km (40%) of the boundary. One significant point is that ever green and semi-evergreen forest is surviving only in the Abhaypur Reserve Forest of the district. The trees from these forests have been cut and undergrowth including grass, bushes, bamboo and can are spreading over the area.

The marginal areas of the Reserve Forests have been encroached. Recently attempts are being made by some encroachers to up tea gardens in the marginal areas of **Galeky Reserve Forest** of the district. These people cleared up the jungle in order to reclaim land for tea and other cultivation. A section of these people started to engage themselves in the illegal trade of timber and other forest resources. Poaching and hunting of the wild animal is still continuing in the area. Deforestation, encroachment, agricultural and other economic activities as well as associated activities in the area have changed the land cover of the area.

Cutting of trees in the reserve forest has been regular affairs, which leads to shrinkage habitat of wild life. It was noticed that the timber business person encourage the local poor people to fell trees from the deep jungle where they had already given some identification mark to cutting trees. The poor people delivered the log to the business persons. Illegal encroachment by people for their own benefit is also a major threat to the study area. Illegal plantation of tea in to all the reserve forest is also a major cause of degradation. More than 10% of total area of **Dilli Reserve Forest** are encroached which is utilized for the tea cultivation and coal mining. Beside the Man-tiger conflict in Dilli Reserve

Forest and Man-monkey Conflict is prominent in all the surroundings areas of all the Reserve Forests. **Solah Reserve Forest** was enriched with a large number of rare species of animals, birds and trees before the coming of the operation of ONGCL. Drilling activities for extraction of crude oil from **Sola Reserve Forest** is causing disturbance to the environment. After successful operation, an Oil well site has converted in to waste land with oil muds and waste pits along with other polluting substances, where plants cannot grow or survive. Continuous oil operation flowing of natural gas has caused threatening to the existence of many birds and animals etc. Many species have disappeared. It is observed that Sola Reserve Forest area are going to be destroyed due to drilling operation by ONGCL and heavy transportation running from through this area. Such injudicious development activities cause environmental degradation and ecological disturbance leading to imbalance between the environment and socio-economic development of the society.

Diroi Rangoli Reserve Forest is occupied by the peoples of different area for mostly tea plantation, extension of residence and agriculture-farming etc. Only 5% reserve forest are used as plantation area by the authority mainly as Neem Plantation and Segun plantation. From the authority sources it is 5% areas that are also going encroachment. Because of the degradation of reserve forest, the animals are those areas are facing critical environmental problems for their survivals as a result of this some of the animals enlisted as endangered and some are going to be endangered. These are like Tiger, Antelope, Deer, Leopard, Bat King Cobra, King Vulture, Dhonesh etc. Out of these result of biodegradation of the study area one major outcome is the “Man-Animal Conflict”. In the surrounding areas of Abhoipur reserve forest, Man-Animal Conflict is a major problem.

It is observed that indiscriminate cutting of forest trees and encroachment by illegal encroacher for settlement and tea cultivation are posing a threat to the whole reserve forests under study area. On the other hand it affects human life and properties and causes man animal conflicts. From the field study it is clear that the environmental hazards arises due to bio-degradation, the profit oriented motive of sawmills and plywood industries.

Under human intervention the larger part of the **Sapekhati Reserve Forest** area has been wiped out. Growth of settlements in the forest area and associated reclamation of land for agricultural purpose is identified as the major factor of the forest cover change in the study area.

Area under production of food crops, tea garden and other crops are expanding day by day in **Sapekhati, Galekey, Abhaypur, Rangali Deroi, and Dilli Reserve Forest area**. Tea cultivation has become very popular among the encroachers of this area. During last 40 years more than **4,000 small tea gardens** came in to existence in Sivasagar. Tea plantations are still going on in the study area. The owners of these plantations are called ‘Small Tea Growers’. These small tea growers play a very important role in the forest cover change in the area. Studies revealed that, the forest here continue be deforested and deteriorated under the impact of rising unsustainable long harvest, poor management, small tea cultivation, shrinkage of forest area, the wild species are gradually disappearing from the district. As a result of which the biodiversity of this area also being threatened day by day. The study area has been facing various types of ecological imbalance like air, soil pollution created by the forest degradation.

Human-animal conflict is a growing problem in this area. It is essentially caused by the struggle for vital living space and resources between man and animal. Due to the serious shrinkage of animal habitat in the study area, Human animal Conflict has become a serious problem.

CONCLUSION:

It is clearer that the benefits from forest resources are nothing but the ‘ecosystem service’, which are ultimately essential for human life on the earth are the basis of a range of a industries, from agriculture and biotechnology to fisheries and ecotourism. There is an urgent need to monitor vegetation and land use in the study area on regular basis and implement protective measures.

Protective measures should be taken by the government and related authority for protection of biodegradation by implementation of forest rules and regulation strictly. NGO’s and authority should take positive steps to aware the people of surrounding areas. In this respect, the role of Media also most important. Besides providing information about utility of forest resources, sharing the local and regional policy strategy towards forest resource conservation with citizens and special interest groups also help to identify new stakeholders and reveal conflicting interest at a time when they are still easily resolved.

To reduce illegal and unsustainable exploitation of forests wild life, different measures urgently need to be applied. These includes – improved law enforcement capacity, public awareness and education campaigns and generating benefits for local communities through employment and improved economic opportunities such as providing goods and services. Full involvement of local people in managing and benefiting from the products and services delivered by forests and wild life is crucial for the sustainable conservation of these vital resources.

Wild life protection committee need to be formed at the Panchayat level so that the Panchayat members could work Jointly with the forest department to put a halt to the rampant wild animal killing in the state.

Coordination is needed among the forests officials, NGO and villagers to put a halt to the killing of wild animal in the area

The findings of this study can be used as reference data for prepare the policy, management plan, strategy related to protection of area and biodiversity conservation.

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