CHAPTER III

SITES OF STUDY
The present day land mass of Assam appears as a tiny spec in the global map on the North Eastern corner of the Indian peninsula situated in the tropical latitudes of 24.3° N and 28° N and eastern longitudes of 89.5° E and 96.1° E (Fig. III-1). The last quarter of the 20th century saw the original State of Assam having an area of 1,22,123 sq.km. reduced to its present extent of 78,438 sq. km. which represent 2.39% of Indian land mass (Bhagabati et al., 2002). Assam is surrounded by seven Indian states and two foreign countries. It is surrounded on the three sides by hills and mountains. The rivers Brahmaputra and Barak, in the north and south respectively, carve out deep valleys that represent the major part of the state. Between the two valleys there lies a strip of high land made up by hills and plateaus. Broad physiographic divisions of Assam can be delineated as i.) the Brahmaputra valley, ii.) the Barak valley, iii.) the Karbi Plateau, and iv.) the Barail and Southern Hills. The Brahmaputra valley is the major physiographic unit of Assam, which is much more extensive than the Barak valley.

Nature has endowed Assam with rich potential for the development of forest. The forest areas of the state are the meeting grounds of the Indo-Tibetan and Myanmar flora and fauna. The forest type of Assam can be divided into five major groups

1. Moist tropical evergreen forests
2. Semi evergreen forests
3. Moist deciduous forests
4. Littoral and swampy forests
Fig. III-1: Map of India showing the position of Assam
5. **Dry deciduous forests.**

Of the total geographical area of the state, the area under forest is only 30.20 percent (Source - State Forest Report 1999, Forest Survey of India, Ministry of Environment and Forests) which is below the minimum norms of 33.3 percent prescribed by the national forest policy.

In terms of bio-diversity, both flora and fauna, Assam is one of the richest state is a part of Indo-Myanmar biogeographic hot spot. Therefore, this region is an area of immense Biological interest.

The present survey was carried in the representative ecozones of the Brahmaputra Valley (Fig. III-2)

**Moist tropical evergreen forest: - Joypur Reserve Forest**

**JOYPUR RESERVE FOREST:**

The Joypur Reserve Forest (27°11' - 27°20'N and 95°26' - 95°29'E) is situated in the Dibrugarh District, adjacent to the boundary of Arunachal Pradesh with an area of 108 sq. km. The forest can be classified into two types: Assam Valley Tropical Evergreen Forest (Hollong Nahar Forest) and Mixed Deciduous forest with evergreen patches. The forest have large canopy above the general level with climbers and epiphytes. The dense undergrowth of woody shrubs like *Cochbhedeli, Kasidoria, Sarat* etc. Bamboo species like *Kako, Bajal* etc. are found in some area where densities of trees are poor. Palms and canes are common components of riparian vegetation. The terrain in the area is hilly, the soil is sandy and dry and some area still contains some coal
Fig. III-2: Map of Assam showing the study areas.
deposit. There are a few streams crisscrossing the whole area. During the
Monsoon, the low lying areas get inundated creating seasonal puddles and pools.
The climate is tropical monsoon with hot summer and a usually cool dry winter.
The annual temperature ranges from 6°c to 33°c where June, July and August are
the hottest while December and January are the coolest months. The annual
rainfall ranges from 2300mm to 3300mm.

Semi evergreen forest: -

Dibru-Saikhowa National Park,

Nameri National Park,

Podumoni Borjan Bherjan Wildlife Sanctuary,

Balipara Reserve Forest

DIBRU-SAIKHOWA NATIONAL PARK

Dibru-Saikhowa National Park (Fig. III-3) is situated on south bank of
river Brahmaputra in the extreme east of Assam The Dibru-Saikhowa National
Park is located between 27°35' - 27°50' N and 95°10' - 95°40'E, with an average
altitude of 118 m (range 110 - 125m) above MSL.

The Dibru-Saikhowa National Park enjoys a tropical summer monsoon
climate. The rain fall ranges from 2300 mm 3800mm. The months, which enjoy
heavy rainfall, are June, July, August, and September. The average maximum
temperature is 36°C while minimum is 6° C.

The Park starts, from the confluence of the Dibang and Lohit Rivers
down stream to the vicinity of city of Dibrugarh. The area is a complex of wide
river channel, sand banks, riverine marshes, Ox-bow lakes and seasonally
flooded grass land and swamps forest. In the great earthquakes of 1950, the Park area experienced a vast geological change and bulk of the Park’s area sank by few meters. The whole area is extensively flooded during monsoon. Frequent changes in the course of the rivers have created a patchwork of transitional wet land and forest type.

The vegetation of the park was tropical wet evergreen forest (Choudhury 1997). With Salix swamps and deciduous forests gradually cropping up in recent years, the vegetation became semi evergreen forest. More than half of Park is covered by tree forests while the remaining areas are grasslands, reed beds, and water bodies. The Park have about 35.84% moist mix forest, 9.50% degraded forests and 21.25% grassland (Anonymous -1999). Main tree species of the area and Salix tetrasperma, Bischofia javanica, Dillenia indica, Bombax, ceiba, Terminalia, myriocarpa, Lagersroemia parviflora, Mesua ferrea, Dalbergia sisoo, Ficus spp. etc. Rhynocystylis retusa, Aredies multiflorum, Pholidota articulata, Dendrobium spp., Eria spp, Oberonia spp., etc are some of the species of the orchid flora of Dibru-Saikhowa National Park. Arundo donax, Imperata cylindrica, Phragmaties kakra, Erianthus ravaeae, Saccharum spp. Etc. are dominant species of grasses in the Park.

Dibru-Saikhowa National Park is also very rich in faunal composition, comprising total of 36 species of mammals (12 are listed in the schedule of Wildlife (Protection) Act 1972. 18 species of reptiles, 62 different species of fish and more than 350 species of birds have also been recorded.
Fig. III-3  MAP OF DIBRU-SAIKHOWA NATIONAL PARK
NAMERI NATIONAL PARK

Nameri National Park (Fig. III-4) lies in the outer range of East Himalaya, just at the junction of the south western side of Arunachal Pradrsh and Northern side of Assam. The Nameri N.P. covers an area of 213 sq. km and is situate in between 26°55'N to 27°03'N latitude and 92°40'E to 93°06' E longitude at 100 m above MSL. The area receives a high rainfall, most of which is concentrated during the monsoon and there is a short but distinct predictable rainless season during the month of October and November. The rainfall ranges from 2000mm to 3500mm on average per year. The climate of Nameri is wet tropical, with hot humid summer and winter is somewhat dry. The average maximum temperature is 36°C and the minimum is 6°C and the average humidity level is 90%. The forest is tropical evergreen and Semi evergreen.

The vegetation of the area is a mosaic of tropical semi evergreen and evergreen largely corresponding to the Assam Valley Tropical Semi evergreen Forest interspersed with more evergreen patches in the moisture areas. The moist forests are rich in epiphytes and creepers. Cane brakes and small patches of clump forming bamboos (*Dendrocalamus sps.*) occur along streams. Some patches, where heavy logging occurred before it was declared protected area, are now open habitat, with grassy clearing and covered with bush and sparsely distributed remnant forest trees. The important feature for the Nameri National Park is that it is one of the few remaining Brahamaputra plain forest contagious with high altitude forest of Eastern Himalaya. All these various features make the site more interesting study area. The Parks numerous small and large
PODUMONI BORJAN BHERJAN WILDLIFE SANCTUARY

The Podumoni Borjan Bherjan Wildlife Sanctuary (Fig. III-9) (27° 28’ N to 27°35N and 95°29’E to 95°36’E), encompasses an area of 7.21sq. km. is situated in Tinsukia District. The forest type is composition of Hollong Nahar Forest (Assam Valley Tropical Wet Evergreen Forest) – and mixed deciduous forest. The forests have a dense canopy cover, middle story and good undergrowth. The terrain is almost flat and intersected by nallahs and swamps. The climate is tropical monsoon with annual rainfall ranges from 2300mm to 3800mm. The main rainy months are June, July, August and September. The annual temperature ranges from 7°c to 34°c. The prevailing climate condition along with the forest type and geomorphology of land is the home for a wide variety of amphibian fauna.

BALIPARA RESERVE FOREST

The Balipara Reserve Forest (26°57’ - 27°04’ N and 92°39’ - 92°55’ E) is situated on bank of the river Jia Bhorali with an area of 189.74 sq. Km. The Reserve Forest have three block Bhorali (73.24 sq. km), Sotia (30.64 sq. km) and Mansir (69.72 sq. km). The terrain is flat, and has a moderate slope from north to south. The area is intersected by numerous streams most of which are perennial in nature. The soil is of alluvial deposit of clay and sand. The climate
is tropical monsoon with three distinct season, rainy June to October, cold weather November to February and hot dry season March to May. The area receives heavy rainfall around 2900mm/year with temperature ranging from 6°C – 35°C. The vegetation of the Reserve Forest according to Champion and Seth (1968) are composition Assam Valley tropical evergreen forest, Assam alluvial plain semi evergreen forest, Sub-Himalayan light semi evergreen forest, cane brakes, Wet Bamboo Brackes, Moist Terai Sal, and Swampy. The unique habitat along with the good forest covers in the Reserve Forest, form a good habitat for amphibian fauna.

**Moist deciduous forest:**
- Chakrasila Wildlife Sanctuary
- Garbanga Reserve Forest,
- Moyong Hills Reserve Forest,
- Kholaghat Reserve Forest,
- Borduur Reserve Forest,

**CHAKRASILA WILDLIFE SANCTUARY**

Chakrasila Wildlife Sanctuary (Fig. III-5) is situated in the western most region of Brahmaputra valley in Assam and is situated in between 26° 15' to 26°26' N and 90°15' to 90°20'E in the Dhubri District. The Chakrasila Wildlife Sanctuary covers an area of 112.60 sq.km.

The climate of Chakrasila Wildlife Sanctuary is wet tropical with hot and humid summer and dry winter. The area receives high rainfall most of which is
Fig. III-5 MAP OF CHAKRASILA WILDLIFE SANCTUARY.
concentrated during the monsoon and there is short but distinct predictable rainless season during the months of October and November. The rainfall ranges from 2000 mm to 3500 mm on average per year. The average maximum temperature is 30°C and minimum being 8°C and average humidly being is 90%. The area is covered with dense forest and there are several small springs for quenching the thirst of the wild animals of the hilly forest. There are two major perennial springs in the Sanctuary and are Howhowi Jhora and Bamuni Jhora which flow over the rocks sparkling and splattering water throughout the year. There are two important wet lands in the periphery of the Chakrasila Wildlife Sanctuary namely Dhir and Deplai which play an important role in the ecosystem of the Sanctuary.

The vegetation of the Chakrasila Wildlife Sanctuary is mosaic of tropical semi evergreen and some patches of evergreen largely corresponding to the Assam Valley Tropical Semi-evergreen Forest, interspersed with more evergreen patches and moister areas. The different ecosystem present in the Sanctuary provide habitat for wide spectrum of biodiversity.

Garbhanga Reserve Forest, Moyong Hills and Borduar Reserve Forest, have similar terrain and vegetational complex and are described together here.

The Garbhanga Reserve Forest (Fig. III-6) is one of the largest reserve forest of Assam is situated in between 26°07' - 26°09' and 91°55'-90°33'E. is bounded by Guwahati on the north, Rani reserve forest on the north west and the state of Meghalaya on all other sides. Garbhanga Reserve Forest covers an area of 114.65 sq. km.
The Moyong Hills Reserve Forest and Borduar Reserve Forest are located between 25°43' - 25°55' and 90°32' - 91°21'E and cover an area of 21.39 sq. Km and 72.35 sq. km respectively. All these three reserves are located in hilly tracts are actually continuation (in the form of spurs) of the Khasi Hill.

The Reserve Forest is composed mainly of alluvium of recent and all sub recent origin and rocks of Pre-cambrian gneissic complex. The main block of forest within this Reserve Forest is situated on an out-lying portion of the Shillong plateau and separated now by alluvial tract. Geological evidence indicates that these hillock moving upward from the surrounding alluvium.

The alluvial tracks of the Brahmaputra Valley which covers a major portion of the Reserve Forest composed mainly of silt, sand and clay with occasional pebbles. Tropical climate prevails in the Reserves and distinct seasons can be recognized. June to mid October is the rainy season, when the maximum rainfall occurs. Average rainfall is 1300 mm. Except for occasional showers; there are practically no rains during winter. The period from March to May represent the hot dry season.

The Reserve Forest is drained by numerous streams crisscrossing the whole area. The few streams are quite fast flowing and play a major role in keeping the area moist. The water table is relatively high depending upon location, weather and season; it varies between 1.8m to 10m approximately.

The Reserve Forest contain following forest types,

Eastern Hill Sal Forest :- (Khasi Hill Sal),

Moist Plains Sal Forest - Kamrup sal,
Fig. III-6 MAP OF GARBHANGA RESERVE FOREST.
The Moyong Hills Reserve Forest and Borduar Reserve Forest are located between 25°43' - 25°55' and 90°32' - 91°21'E and cover an area of 21.39 sq. Km and 72.35 sq. km respectively. All these three reserves are located in hilly tracts are actually continuation (in the form of spurs) of the Khasi Hill.

The Reserve Forest is composed mainly of alluvium of recent and all sub recent origin and rocks of Pre-cambrian gneissic complex. The main block of forest within this Reserve Forest is situated on an out-lying portion of the Shillong plateau and separated now by alluvial tract. Geological evidence indicates that these hillock moving upward from the surrounding alluvium.

The alluvial tracks of the Brahmaputra Valley which covers a major portion of the Reserve Forest composed mainly of silt, sand and clay with occasional pebbles. Tropical climate prevails in the Reserves and distinct seasons can be recognized. June to mid October is the rainy season, when the maximum rainfall occurs. Average rainfall is 1300 mm. Except for occasional showers; there are practically no rains during winter. The period from March to May represent the hot dry season.

The Reserve Forest is drained by numerous streams crisscrossing the whole area. The few streams are quite fast flowing and play a major role in keeping the area moist. The water table is relatively high depending upon location, weather and season; it varies between 1.8m to 10m approximately.

The Reserve Forest contain following forest types,

Eastern Hill Sal Forest :- (Khasi Hill Sal),
Moist Plains Sal Forest-Kamrup sal,
Moist mixed Deciduous Forest,
Secondary Moist Bamboo brakes,
Wet Miscellaneous formations,

The Garbhanga Reserve Forest in deeply intruded by habitation and cultivation and due to constant disturbance and poaching larger animal have practically been wiped out but the avifauna of the Reserve Forest is rather rich and varied.

KHOLAGHAT RESERVE FOREST

The Kholaghat Reserve Forest is located in between 26°04'-26°09' N and 92°22'-90°24' E covering an area of 61.65sq km in the hilly terrain. The major portion of the RF is composed of the alluvial tracks of the Brahmaputra Valley. The alluvium is clays in stretches adjoining broad-‘julis’ and frequent patches of ‘Khorkani’. The channels intertwining these mounds become water logged during the rainy season.

Tropical monsoon climate prevails on the RF. June to mid October is the rainy season. The average rainfall was 1400 mm. The water resource of the forest are large number of small streams all converging to Akashi ganga a perennial stream which drains ultimately to plains.

The forest and vegetation type of the reserve are (Following Champion and Seth 1968), are:-

Eastern Hill Sal Forest (Khashi Hill Sal),
Moist Plains Sal Forest (Kamrup sal),
Moist mixed Deciduous Forest,
Wet Miscellaneous formations.

The Reserve Forest still have many virgin forest area which are very suitable for the amphibian fauna but few area are intruded by habitation, cultivation and logging.

Dry deciduous forest: Kulsi Reserve Forest

KULSI RESERVE FOREST

Kulsi Reserve Forest is continuation of the Moyong Hill and Borduar Reserve Forest of the Khasi Hills Range. The Reserve Forest located between 25°59'- 26°02' N and 91°23'-91°26'.E covering an area 18.55sq.km. The forest located in alluvial terraces, ( 'laris' ) and these are cut up by numerous narrow, evending low-laying tracts ('julis').

Tropical monsoon prevails and four distinct seasons can be recognized. The annual average rainfall is 1300mm; maximum rainfall occurs during June to mid October while December and January are the coldest months. The river Kusli which flow through the area is the major drainage. The Reserve Forest supports a mixed floral composition and there occurs natural forest along with plantation forest wide area. The vegetational complex of the reserve as per classification given in Champion and Seth (1968), are listed below.

Eastern Hill Sal Forest (Khasi Hill Sal),
Moist Plains Sal Forest-(Kamrup sal),
Moist mixed Deciduous Forest,
Wet Miscellaneous formations.

The Reserve forest is traversed by the river Kulsi, with numerous hilly streams which keep the region wet. The water table of the region is high.

Savanna Grassland -: Pobitora Sanctuary.

POBITORA WILDLIFE SANTUARY

Pobitora Wildlife Sanctuary (Fig. III-7) (26°12' - 26°15'N and 92°02' - 92°05'E) is situated in Morigoan district. With an area of 16 sq. km. the sanctuary harbours, world highest density of Indian One Horned Rhino in the world. Pobitora Wildlife Sanctuary is situated in the floodplain of river Brahmaputra. The area has tree land – 2%, thatch area – 68%, perennial water logged area – 5 %, Swampy area 25%. The entire area is a basin like structure in the midst of Moyong hill, Kamarpur Hill, Monoha Hill, with a gentle from east to west. The soil of the area is mostly alluvial deposit of the river. The climate of the area is subtropical moist climate; temperature range is from 8-33 °C. Rainfall occurs throughout the year though in July heaviest rainfall occurs while January is the driest and coldest month. Average Annual rainfall is 1600mm.

The Sanctuary is entirely situated in the low-lying area. The flood water of Brahmaputra and Kolong River which passes through its northern and southern boundary respectively flooded the entire area during monsoon. The floral cover of the park along with its wet monsoon provide a very conducive environment for amphibia but the seasonal burning cause some damage to the amphibian fauna.
Fig III-7  MAP OF POBITORA WILDLIFE SANCTUARY

Scale: 1 cm = 250 meters
Area: 1584.76 Hectares
Littoral and swampy forest – Deepar Beel Bird Sanctuary

DEEPAR BEEL BIRD SANCTUARY

Deepar beel (26°05' - 26°09'N, 91°36' - 91°45'E) (Fig.-III-8) is one of the largest and most important beel system in the Brahmaputra Valley of lower Assam. Deepar beel, south of the Brahmaputra river in Kamrup District with an area of 4.14 sq. km located at 53m above MSL. It is a permanent fresh water lake with abundant aquatic vegetation. During flood, it is about 4 meter deep, during the winter, the depth drops to about one meter. About half of the beels dries out during the winter months and at this time; the exposed shores are converted into paddy cultivation. The Garbhanga Reserve Forest, Rani Reserve Forest lie to the south of the beel and forests are continuous with the riparian vegetation of the beel. The sanctuary form water source for many animals of these reserves mainly elephant. The dominant aquatic species are Eichornia, Pistia, Lemna Azolla. The lake shore vegetation includes Eupatorium, Odoratum, Achyranthus aspera, Cyperus esculonis, etc. Dominant tree species of deciduous forest on neighbouring area are Tectona grandis, Shorea robusta and Bombox malabaricum (Planted). The beel have rich Piscifauna, and also support wide variety of both resident and migratory birds.

Degraded/Man modified habitat –
Govindapur Reserve Forest
Dirgheswari Reserve Forest

DIRHESWARI RESERVE FOREST
Fig. III-8  DEEPAR BEEL BIRD SANCTUARY
Fig. III-9. MAP OF PODUMONI BORJAN BHERJAN WILDLIFE SANCTUARY.
Dirheswari Reserve Forest (26° 12' - 26° 14' N and 91° 41' - 91° 43' E) is situated in the Kamrup district, north of the river Brahmaputra. The Dirheswari Reserve Forest encompasses an area of 7.62 km². The terrain of the area is particularly hilly. Tropical climate prevails and three distinct seasons can be recognized, June to October is termed as rainy, 1300mm (average) rainfall occurs during this period.

The R.F is crisscrossed by few streams and there are many perennial water streams. The forest type is Eastern Hill Sal Forest (Kashi Hill Sal), Moist Plain Sal Forest (Kamrup Sal), Moist Deciduous Forest, Secondary Moist Bamboo Breaks and Wet Miscellaneous formation. The middle story and under growth is good. The reserve is encroached from many sides, is cultivated by neighboring villagers and a little area is left as the abode of wildlife. The Hillock is also being destructed by earth cutting and in the present study is therefore considered as man modified/degraded habitat.

GOVINDAPUR RESERVE

The Govindapur Reserve (26° 10' N and 90° 55'E) with an area of 5.44 sq. km, lies on the north bank Brahmaputra. The natural habitat is restricted to a very small patch and the vegetation comprises of Sissoo, Gomari, Teak, Ajar, Bhelkan, Khoir etc. The terrain is hilly with few streams running down. The streams almost dry up during pinch (February-March). The climate is tropical summer and a dry and cool winter. The annual rainfall is approx - 3000mm / year. The main rainy months are June, July, August and September. The annual temperature ranges from 6° C to 32° C.