INVENTORY OF WETLANDS WITHIN RESERVED FOREST AREA OF ASSAM

1.0 Introduction :

Wetlands and unique ecosystems which provide water and habitat for a diverse range of plants and animals. It is increasingly realised that earth is facing grave environmental problems with fast depleting natural resources and thereby threatening the very existence of most of the ecosystems. Looking at the consequences serious concerns are voiced among societies at large to conserve and preserve the natural resources. To explore and asses authentic data is need of the hour. Often the data are sparse and rarely inform of geospatial database (maps). Hence emphasis is given to have an appropriate geospatial database using modern scientific methods.

Present day directions of Remote Sensing (RS) Application along with Geographical Information System (GIS) is found to be an effective tools for identification of objects or phenomenon for mapping, inventory, surveillance and monitoring. Hence can very will be utilitised for effective planning of natural resources. Remote sensing is defined as the science of acquiring and analysing information about objects or phenomena from a distance without any physical contact with the object or phenomena (Jensen 1986, Lillesand and Keifer 1987). When we say Remote sensing, basically we confined to satellites sensors. Satellite remote sensing can be defined as the use of satellite borne sensors to observe, measure and record the electromagnetic radiations (EMR) reflected or emitted by the earth and its environment for subsequent analysis and extraction of information. Currently more than a dozen orbiting satellites of various types provide data crucial to improving to knowledge of the earth's atmosphere, ocean, ice, snow and land. Over past few decades, Indian Remote Sensing data has been successfully used in various fields of natural resources (Navalgund et.al,2002)

Development of technologies like Geographic Information System (GIS) has enhances the use of RS data to obtain accurate geospatial database. GIS specialises in handling related, spatially referenced data, combining mapped information with other data and acts as analytical tools for research and decision making. During the past few decades, technological advances in the field of satellite remote sensing (RS) sensors, computerized mapping techniques, global positioning system (GPS) and GIS has enhanced the ability to capture more detailed and timely information about the natural resources at various scales catering to local, regional and global level study.

1.1 Wetlands

Wetlands are areas of land that are either temporarily or permanently covered by water and its is one of the crucial component of the natural resources and our ecosystems. Cowardin et.al (1979) provides the official federal definition wetlands as "Wetlands an lands transitional between terrestrial and aquatic system where the water table is usually at or near the surface or the land covered by Shallow Water". Cowardin also devised the widely used classification systems associating wetlands to its hydrological, ecological and geological aspects such as : marine (coastal wetlands including rock shores & coral reefs), estuarine (including deltas, tidal, marshes and mangrove swamps), lacustarine (lakes), riverine (along rivers and streams), palustrine ('marshy'-marshes, swamps and bogs). Given these characteristics, wetland support a large variety of plant and animal species adapted to fluctuating water levels, making the wetlands of critical ecological significance.

1.2 Objectives :

> To detect wetlands wing satellite data.

> Mapping wetlands inside reserved forest.

> Inventory of number of wetlands in each reserved forest and districts.

> Assessment of area of each wetland in GIS.

2.0. Study Area

Present study is confined to reserved from area of Assam as per request of Project Management unit of Assam Project on Forest and Biodiversity Conservation Society (APFBC Society) The state of Assam has an area of 78,438 sq,km situated in the North Eastern part of India between $24^0 3'$ N and 28^0 N latitude and $89^0 51'$ E to $96^0 1'$ E longitudes. The reported reserved forest area of Assam in 14194.82 Sq.km (Statistical handbook of Assam) ie. around 18.09 percent of state total area. It has the mighty river Brahmaputra flowing from Northeast to Southwest direction (Sadiya to Dhubri) and Barak river which in flowing through Southern part of Assam. The region receives high rainfall during Southwest monsoon (April to September). The average annual rainfall in the region is around 2200 mm. Following Map (No. 1) shows the whole study area.

3.0 Wetland inventory and Assessment :

As per assignment of the project Geospatial Database of wetlands within Reserved Forest of Assam are generated using satellite data. It is basically an inventory of wetlands within reserved forest area in Assam to identity its number and spatial extent in form of maps within limitation of resolution of satellite data used for the purpose. Natural Resources survey has already been well established by the initiative of ISRO under various national level mapping projects and same methodology and guideline has been adopted for inventory of the wetlands within Reserved Forest. As per classification of wetland is concerned it is categorised into two (2) classed river and other wetlands during this inventory. Assessment of areal extent of wetland are base on interpretation of single season satellite data.

4.0. Spatial Framework and GIS Database :

The National Spatial Framework (NSF) has been used as the spatial framework to create the database. The database design and creation standard formulated by National Natural Resources Management System (NNRMS) are followed. Feature codification scheme for every input element has been worked out keeping in view the administrative as well as natural hierarchy (State - district within feature class) 1:50,000 scale grid has been considered for mapping and inventory of wetlands. Map (No. 2) indicates the spatial Framework of Assam on 1:50,000 grid. One season data has been used for mapping the water spread of wetlands and are being integrated with Reserved Forest Boundary and District Boundary (keeping total number of district as 27 Nos.) in GIS. Spread of Reserved Forest is found basically 25 district out of 27.

5.0 Data Used

5.1. Remote Sensing Data: IRS P6 LISS III along with Resourcesat -2 LISS IV data were used to map the wetlands. The spatial resolution of the data are 23.5 m and 4.8 m respectively. Single season data has been used for the purpose.

5.2 Other Data : Survey of India topographical maps (SOI) were used for reference purpose. RF boundaries are extracted from SOI maps. District administrative boundaries are taken from SOI as well as Revenue maps. lineage data of National Wetland maps at 1:50,000 scale and SIS-DP data derived at 1:10,000 scale using LISS IV date were used.

6.0 Methodology :

The methodology to create the State level atlas of inventory of wetlands within Reserved Forest is adhered to National wetland inventory and Assessment (NWIA) technical guidelines and procedure manual developed by space Application Centre (SAC) Ahmedabad, ISRO, Govt. of India.

> Generation of spatial Framework (1:50,000 grid) in GIS environment for database creation and organisation.
> Geo referencing of satellite data.
> Generation of base layers (State-district boundary reserved forest boundary)
> Identification of Wetlands (two classes using one season satellite data) and mapping the same, base on onscreen interpretation.
> Mosaicing / edge matching to create district and state level database.
> Preparation of map composition and generation of statistics.
> Output on A$ and A) size prints.

Work was carried out using ERDAS Imagine image processing software and ARC/INFO, ARCASS software.

7.0. Results and Discussion

After mapping the wetlands of Assam within the reserved forest 7313 numbers of wetlands (excluding rivers and streams) are found within the reserved forest of Assam. It was based on interpretation high resolution satellite data and the mapping scale was 1:10,000 .   The total wetlands area found   243791.29 Ha (i.e. 2439.91 Sq. km.). Wetlands during this inventory are categorised into two classes i.e. river and other water bodies. Out of 249 numbers of Reserved Forest wetlands (i.e. other wtaerbodies excluding rivers) could not be detected only in 45 numbers of Reserved Forest based on interpretation of satellite data used for inventory. It is also observed that out of 27 districts of Assam 2 districts viz. Barpeta and Nalbari have no Reserved Forest boundary. Moreover it is found that inside the Reserved Forest areas of Assam river stream occupy maximum wetland area which is found to be 234931.83 Ha. (i.e. around 96 percent of total wetland within the Reserved Forest).
Considerable number of other water bodies detected in the Barak Valley (ie. Cachar. Karimganj and Hailakandi Districts) and Golagaht district which are basically seasonally water logged in nature due to its physiographic and surrounding landscapes needs extensive ground truthing for proper inventory. Use of multi temporal satellite data also will help to enhance the spatial extent of the wetlands database.