# Geo-spatial Database for Corbett National Park

### Background:

In March, 2003 the Uttaranchal Forest Department approached the Forest Survey of India, Dehradun with a request to assist it in preparation of a Geo-spatial database for the Corbett Tiger Reserve so that management strategies could be drawn up smoothly with a fair overview of all the resources and facilities available in and around the CTR. Development of digitized maps of all the resources and amenities in CTR was a major task of the project.

### Study Area:

Corbett Tiger Reserve (CTR), the first Tiger Reserve to be established in the country in 1973 under 'Project Tiger' includes Corbett National Park, Sonanadi Wildlife Sanctuary and a buffer zone surrounding the National Park and Sanctuary. The Corbett Tiger Reserve covering a total area of 1288.32 sq. km. is situated at the southern part of Uttaranchal comprising of Pauri Garhwal, Nainital and Almora districts. This park represents the amalgamation of culture of these hill regions, and displays amazing landscapes and diverse flora and fauna. The CTR area extends from 78° 39' 40" E to 79° 09' 23" E longitude and 29°48' N to 29°23' 32" N latitude.

The park receives about 1500 mm to 1600 mm of rainfall mainly during the monsoon though some winter rain always occurs. The temperature ranges between 4°C in winter to 42°C during the summer season.

A rain-fed River Ramganga traverses more than 100 km before entering Corbett near Marchula. A dam on the Ramganga at Kalagarh (built in the mid-1970s) forms a reservoir of about 80 sq. km. area, the backwaters of which reach Dhikala. The hydro-electric power plant located at the Kalagarh dam supplies electricity within the park. The park is the habitat for numerous animal, bird and tree species, like Black Bears, Tigers, Leopards,deer, Asian elephants, crocodiles and other aquatic species.

### Data Input

Data inputs include (i)Thematic Map of Corbett National Park on 1:25,000 based on interpretation of aerial photographs (ii) Forest Cover map on 1:50,000 scale based on satellite data of year 2000 (iii)  SOI toposheets on 1:50,000 scale covering the area (iv) IRS 1D LISS III data of March 2001 for digital classification of Forest Types. and (v) Databases provided by the authorities of the  Corbett Tiger Reserve.

### Methodology

The hard copy maps were scanned and geo-referenced in ERDAS IMAGINE 8.6. These maps were digitized and attributes were assigned using ARC/INFO 8.3. Features like the boundary of CTR, ranges, block and

compartments (from Forest Department's map) were corrected with river channels of the satellite imageries and SOI sheets. Features like roads, settlements in the fringe area etc were prepared from the toposheets and those like the range offices, rest houses, forest chaukis, firelines, sighting of animals were prepared from the maps provided by the Forest Department. The satellite imageries were geo-referenced and digital classification was performed for landuse and landcover maps. Fig 24 shows the methodology used in the project. The data sets were thus prepared so that simple queries could be generated.
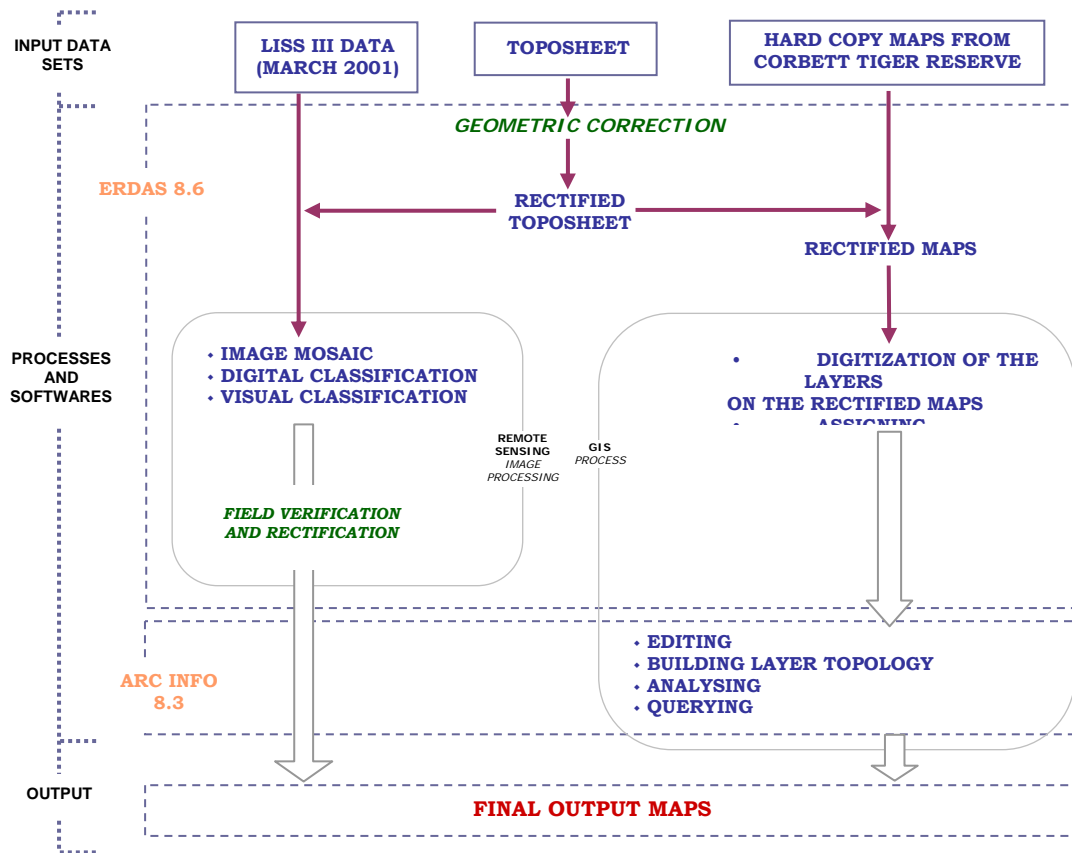


Fig. 24: Methodology of the Project.

## Outputs:

From the databases prepared query based analysis were obtained. Estimates of area for the total area of Corbett along with the ranges, shown in Table 26, blocks and the compartments were obtained. The total area as estimated by the CTR is 1288.32 km$^2$, where Corbett National Park is 520.22 km$^2$, Corbett Tiger Reserve (buffer zone including the Kalagarh Forest Division) is 466.32 km$^2$ and Sonanadi Wildlife Sanctuary is 301.18 sq km. Of the 45 blocks within the CTR, Malani has the maximum area of 66.40 km$^2$, with 19 compartments while Kartia has the minimum area of 3.12 km$^2$ with just two compartments.

**Table 26: Area of the Ranges within CTR**

| SL NO | AREA (SQ. KM) | RANGES | DIVISIONS |
|---|---|---|---|
| 1 | 128.74 | ADNALA RANGE | BUFFER ZONE & SONANADI SANCTUARY |
| 2 | 117.77 | BIJRANI RANGE | CORBETT NATIONAL PARK & BUFFER ZONE |
| 3 | 106.17 | DHELA RANGE | CORBETT NATIONAL PARK & BUFFER ZONE |
| 4 | 73.70 | DHIKALA RANGE | CORBETT NATIONAL PARK |
| 5 | 56.99 | JHIRNA RANGE | CORBETT NATIONAL PARK & BUFFER ZONE |
| 6 | 188.52 | KALAGARH RANGE | CORBETT NATIONAL PARK, BUFFER ZONE & SONANADI NATIONAL PARK |
| 7 | 99.07 | MAIDAVAN RANGE | CORBETT NATIONAL PARK, BUFFER ZONE & SONANADI NATIONAL PARK |
| 8 | 87.03 | MANDAL RANGE | CORBETT NATIONAL PARK & BUFFER ZONE |
| 9 | 114.27 | PALAIN RANGE | BUFFER ZONE & SONANADI SANCTUARY |
| 10 | 113.43 | SARPDULI RANGE | CORBETT NATIONAL PARK |
| 11 | 202.62 | SONANADI RANGE | BUFFER ZONE & SONANADI SANCTUARY |
| | **1288.32** | | |

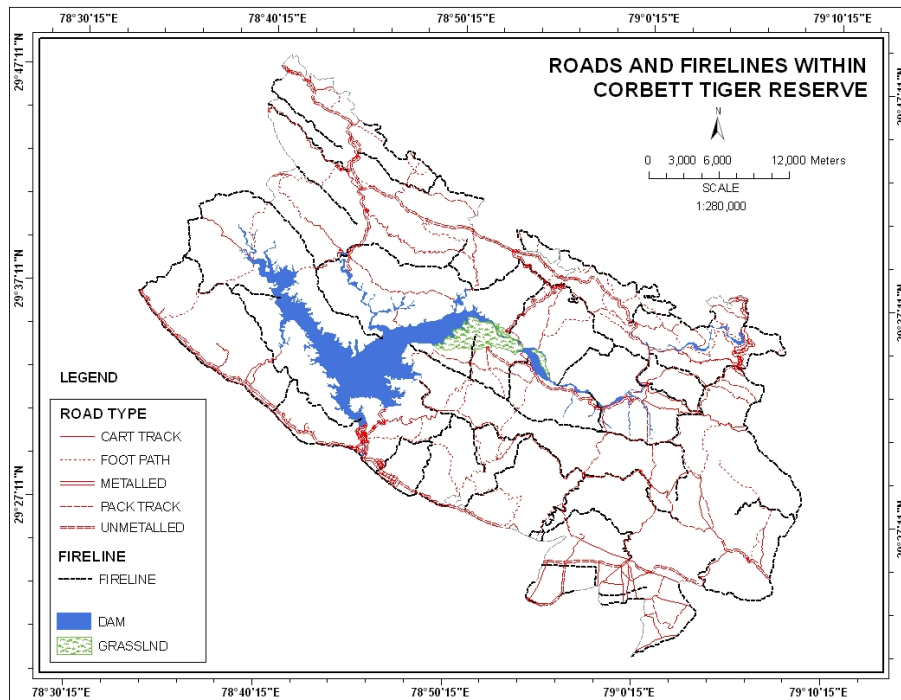From the road and the fire line maps their respective lengths were calculated (fig 25).



Fig 25:Roads and Firelines within CTR.

Similar estimates of the counts of forest chaukis, rest houses and Range offices were made for each range. There are about 58 forest chaukis, 22 rest houses and 12 Range offices within CTR. Among the Ranges, Maidavan has the highest number of 13 forest chaukis followed by Kalagarh and Mandal Ranges with 8 forest chaukis each. The park is dotted with numerous anti-poarching camps, some of which are temporary and some are permanent (Fig 26).
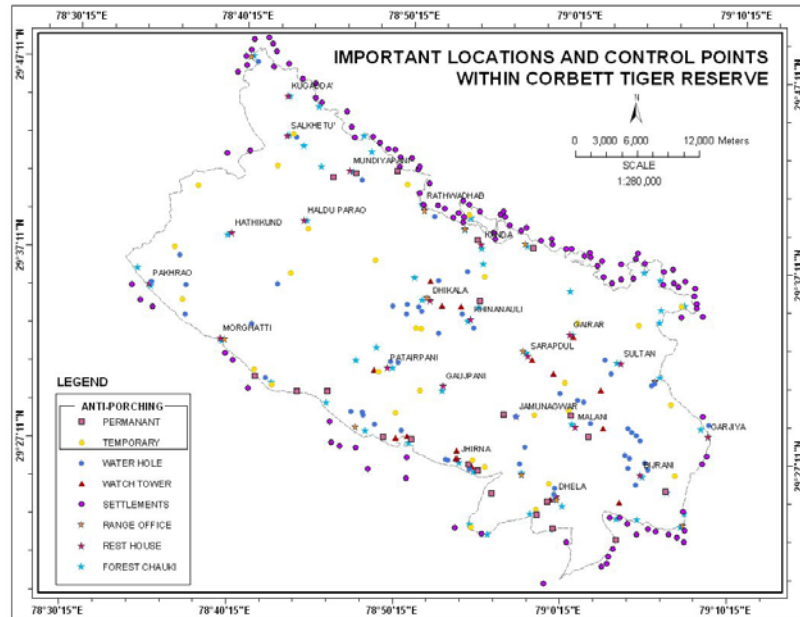


Fig.26: Location of Control points within CTR

From the contour map of 40m interval, digital elevation model was generated from which elevation slope and aspect maps were also generated. Altitude ranges vary between 300 m to 1250 m. The ridges run from north-west to south-east, with very prominent northern and southern aspects, slopes with southern aspect are more in area within Corbett Tiger Reserve. Of the slope classes, most of the slopes range between 10° to 25°. Fig 27 shows the perspective view of CTR with the false colour composite of the satellite imagery draped over the digital elevation model, which helps in the visual understanding of the geomorphology of the area.
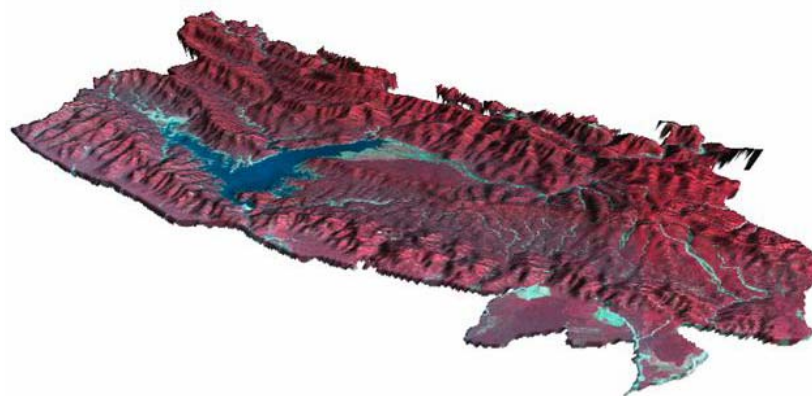


Fig.27: IRS 1D LISS III view of Corbett Tiger Reserve

The IRS 1D LISS III data of March 2001 has been used for digital classification of land use / land cover and forest density. Unsupervised, supervised and hybrid classification techniques were applied for the forest type classification. Ground verification was carried out in the southern, eastern and central parts of the CTR, where sal, teak and mixed vegetation was found. Forest types like sal, mixed sal, miscellaneous (including Shisam, Eucalyptus, Teak, Khair, Bamboo and many others), plantation, grassland, riverbeds and degraded forest were classified (Fig 28).

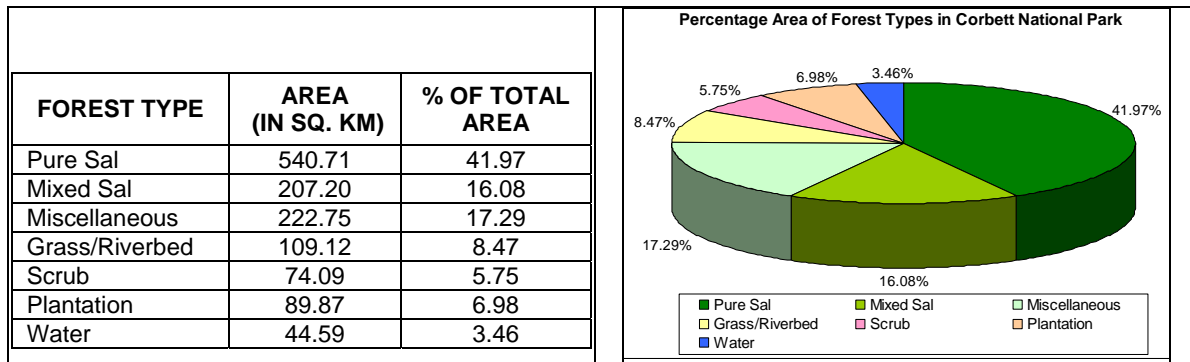| FOREST TYPE | AREA (IN SQ. KM) | % OF TOTAL AREA |
|---|---|---|
| Pure Sal | 540.71 | 41.97 |
| Mixed Sal | 207.20 | 16.08 |
| Miscellaneous | 222.75 | 17.29 |
| Grass/Riverbed | 109.12 | 8.47 |
| Scrub | 74.09 | 5.75 |
| Plantation | 89.87 | 6.98 |
| Water | 44.59 | 3.46 |



Fig 28: Area covered by each forest type

The forest cover density map has been prepared from IRS-1D LISS III data of October 2002. Unsupervised and supervised classification and NDVI (normalized difference vegetation index) was performed on the digital data, which was then rectified and finalized by ground verification. Three density classes namely, very dense (canopy density of more than 70%), moderately dense (canopy density of 40% to 70%) and open (canopy density of 10% to 40%) forests, along with scrub (canopy density of less than 10%, in and around forest areas), water bodies and non-forest areas were classified.