CHAPTER III
FOREST CLASSIFICATION
CHAPTER III

FOREST CLASSIFICATION

Forest type classification given by Champion and Seth is essentially an ecological classification and has far greater ecological significance. Any forest area, being attempted, has to be first classified on the basis of forest types.

However various classifications given by different workers have been critically studied during the course of these studies. The very purpose of this exercise is to select a classification pattern useful to the concerned forest officer. It is generally observed that many of the scientists working in the field of remote sensing have been giving legend/classification scheme based on the details they are able to extract from remotely sensed data. Unfortunately, the same is not acceptable to forest officers who are doing practical forestry in the field.

With this fact in mind, an attempt was made to review various (and most accepted) classification schemes. Some of the classification systems presented here, are based on personal communication, discussion with various forest department officers and detail literature scanning.

There are two main classes of forests in India
adopted by various state forest departments. The "Reserved" forests which cannot be used by local population in any manner other than specified and "Protected". Forests in which specified uses are prohibited for local population. Some area, however is still not put in any of these two classes and are categorised as "unclassed".

The reserved forests are comparatively free from rights and privileges of the local people in regard to obtaining their fuel requirements and grazing needs, either free or at concessional rates and consequently these can be intensively managed. The protected forests are burdened with rights and privileges which have to receive precedence over the technical considerations of scientific forest management.

In the unclassed forests, applications of concentrated inputs and principles of scientific forest management is difficult on account of factors like scattered nature of forests, rights and privileges and diffused ownership (e.g. private person, corporate bodies, Revenue Departments of the State Governments, etc.). These forests have usually been severely abused in the past and even if they are carefully nursed now will be incapable of contributing substantially (Nautiyal D.C. Choudhari R.L. 1982).
Reserved, protected or unclassed forests when considered from remote sensing angle are purely administrative boundaries and cannot be delineated using remote sensing data. Some indirect clues or converging evidence may give little indication on imagery (e.g. from degrading status due to biotic interference). Nevertheless, it is important to demarcate these areas on base map before attempting further classification discussed in the forthcoming pages because total forest management outlook changes with respect to the above mentioned classes in which the study area falls.

Total break-up of Indian Forests into these classes is already mentioned earlier.

Table 4: U.S. Geological survey land use/land cover classification system for use with remote sensor data (Anderson et al 1976)

<table>
<thead>
<tr>
<th>Level I</th>
<th>Level II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Urban or built-up land</td>
<td>11 Residential</td>
</tr>
<tr>
<td></td>
<td>12 Commercial and services</td>
</tr>
<tr>
<td></td>
<td>13 Industrial</td>
</tr>
<tr>
<td></td>
<td>14 Transportation, Communications, and Services</td>
</tr>
<tr>
<td></td>
<td>15 Industrial and commercial complex</td>
</tr>
<tr>
<td></td>
<td>16 Mixed urban/built-up land</td>
</tr>
</tbody>
</table>

39
2. Agricultural land
   17 Other urban/built-up land
   21 Crop land and pasture
   22 Orchards, groves, vineyards, nurseries, and ornamental horticultural areas
   23 Confined feeding operations
   24 Other agricultural land
3. Rangeland
   31 Herbaceous rangeland
   32 Shrub and brush rangeland
   33 Mixed rangeland
4. Forest land
   41 Deciduous forest land
   42 Evergreen forest land
   43 Mixed forest land
5. Water
   51 Streams and canals
   52 Lakes
   53 Reservoirs
   54 Bays and estuaries
6. Wetland
   61 Forested wetland
   62 Nonforested wetland
   71 Dry salt flats
   73 Sandy areas other than beaches
   74 Bare exposed rocks
   75 Strip mines, quarries and gravel pits
   76 Transitional areas
   77 Mixed barren land
8. Tundra
   81 Shrub and brush tundra
   82 Herbaceous tundra
   83 Bare ground
   84 Mixed tundra

9. Perennial snow and ice
   91 Perennial snowfields
   92 Glaciers

Land use and land cover classification system for use with remote sensor data (Anderson et al. 1976) has been mentioned here only for forest area.

<table>
<thead>
<tr>
<th>Level I</th>
<th>Level II</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOREST LAND</td>
<td>DECIDUOUS FOREST LAND,</td>
</tr>
<tr>
<td></td>
<td>EVERGREEN FOREST LAND AND</td>
</tr>
<tr>
<td></td>
<td>MIXED FOREST LAND</td>
</tr>
</tbody>
</table>

FOREST LAND: Forest lands have a tree-crown areal density (crown closure percentage) of 10 percent or more, are stocked with trees capable of producing timber or other wood products, and exert an influence on the climate or water regime.

DECIDUOUS FOREST LAND: Deciduous forest land includes all forested areas having a predominance of trees that lose their leaves at the end of the winter season or at the beginning of a dry season.
MIXED FOREST LAND: Mixed forest land includes all forested areas where both evergreen and deciduous trees are growing and neither is predominant. When more than one third intermixture of either evergreen or deciduous species occurs in a specific area, it is classified as Mixed Forest Land.

Any classification defined is based on kind of remote sensing data being used and subsequently level of details are determined on that basis. Anderson J. et. al. (USGS, 1976).

This land use classification is considered to be a very standard land use classification which gives break up of each land use class according to level of details. It is felt that a classification system which is a judicious combination of modified (In Indian Context) Anderson classification and forest information needs, would be more appropriate and suitable for our kind of set up where various remote sensing data (with large diversity in resolution, spectral bands, scales, sensors, season etc.) is to be used for giving useful forest classification.

Apart from administrative units to be marked on base map before extracting information from remote sensing data, it is also useful to decide which factors should be given weightage during designing classification. These factors are:
1) Objectives and requirements of forest survey
2) Forest type status of the area
3) Spatial and spectral resolution of the data being used
4) Multidate (temporal) data availability
5) Possibilities of identifying these classes on ground
6) Level of Mapping being attempted (e.g. National, Regional or local)

The classification system should not be too general nor too specific but should be natural one to express the area. It is equally important to give general land use classification of the study area along with forest details.

A number of classification of forests exist based on floristic composition, legal status, density or functions. Tomar and Maslekar in 1974 have given a classification based on many types of information needed for proper planning and management. Major classes identified are as under:

1) Condition classes
2) Forest type/species
3) Stand and Tree characteristics
4) Maturity
Space Applications Centre had carried out detailed survey of Panchmahals district of Gujarat in 1976. Panchmahals district is characterised by almost 25 percent forest area out of the total geographical area of the district. For classifying these forests, classification scheme was based on 1) Physiognomy, 2) Plant communities and 3) Classification based on Tomer and Maslekar (1974). All these three classifications are presented here. The very purpose of presenting this classifications is to trace gradual process of evolving an information need-based classification system.

Ecologically IVI (Importance Value Indexes) based on relative density, relative frequency and relative dominance were worked out laying quadrats on ground as well as on aerial photographs for a small study area (Jadhav et. al. 1980) Ratanmal is a Protected forest in Limkheda taluka of Panchmahals district. The study was aimed at distinguishing different forest communities on the basis of their canopy size and density pattern. Various plant communities were thus classified on the basis of their canopy size as seen on large scale aerial photographs essentially colour infrared diapositives (CIR) (Narain A.
et. al. 1980).

However for surveying total forests; Panchmahals district, 1:30,000 scale CIR diapositives were used. Concerned forest officers well conversant with remote sensing techniques were consulted and the following classification scheme was adopted based on Tomar and Maslekar (1974).

Table 5: Classification followed during Ratanmal studies in Panchmahals district

<table>
<thead>
<tr>
<th>I</th>
<th>FOREST COMMUNITY TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TYPE 1 C1</td>
</tr>
<tr>
<td></td>
<td>TYPE 2 C2</td>
</tr>
<tr>
<td></td>
<td>TYPE 3 C3</td>
</tr>
</tbody>
</table>

| II      | PURE TEAK STAND T            |

<table>
<thead>
<tr>
<th>III</th>
<th>DENSITY CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VERY GOOD Vg</td>
</tr>
<tr>
<td></td>
<td>GOOD g</td>
</tr>
<tr>
<td></td>
<td>MEDIUM m</td>
</tr>
<tr>
<td></td>
<td>POOR p</td>
</tr>
</tbody>
</table>

| IV      | FOREST BLANKS B              |

45
N.B. Community types classified on the basis of canopy

<table>
<thead>
<tr>
<th>Canopy Size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 large</td>
<td>Large canopy size</td>
</tr>
<tr>
<td>C2 medium</td>
<td>Medium canopy size</td>
</tr>
<tr>
<td>C3 small</td>
<td>Small canopy size</td>
</tr>
</tbody>
</table>

Table 6: Classification followed during Panchmahals project
(Based on Tomar and Maslekar)

**FOREST AREA**

<table>
<thead>
<tr>
<th>Forest Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Man Made</td>
<td>Natural</td>
</tr>
<tr>
<td>1. Eucalyptus plantation</td>
<td>Good Tree Cover on Hills/Plains</td>
</tr>
<tr>
<td>2. Other plantation</td>
<td>Medium Tree Cover on Hills/Plains</td>
</tr>
<tr>
<td>3. Young plantation</td>
<td>Poor Tree Cover on Hills/Plains</td>
</tr>
<tr>
<td>4. Plantation on gredonies</td>
<td>Blanks</td>
</tr>
</tbody>
</table>
Various other organisations especially National Remote Sensing Agency and Forest Survey of India have in recent times used Landsat False Colour Composites (FCC) and MSS bands 5 and 7 (600 - 700 nm and 800 - 1100 nm) respectively to classify forest on national level. Though the scale of mapping is too small (1:1000,000) to give application oriented information both these maps are hoped to serve a good data base to monitor changes occurring in Indian Forests. The classifications followed by NRSA and FSI are presented here.

Table 7: Classification followed by NRSA for mapping of Vegetation cover in India

(Source: NRSA Report, December 1983)

1) FOREST LAND

   1) Closed forest
   2) Open forest
   3) Mangrove forest

2) NON-FOREST LAND

This includes agricultural land, grassland, shrub land, non-forest plantations and barren land
3) OTHERS

These include areas under snow, fog, cloud, shadow etc.

Table 8: Classification followed by Forest Survey of India for Vegetation cover mapping in India (using Landsat MSS B/W bands 5 and 7)

I CLOSED VEGETATION COVER: Well stocked cover with crown density above 40%

II OPEN VEGETATION COVER: Vegetation cover which have been badly affected by biotic interference or natural calamities. The crown cover has been depleted to 10 to 40%.

III CLOSED COVER AFFECTED BY SHIFTING CULTIVATION/BIOTIC FACTORS

IV OPEN COVER AFFECTED BY SHIFTING CULTIVATION/BIOTIC FACTORS

V NON-VEGETATION: Includes habitation, agricultural land, cultivable and uncultivable wasteland with scattered trees and shrubs.

VI CLOUDS

VII WATER BODIES