CHAPTER - 2

STUDY AREA

2.1 The Terai

Terai region is a flat alluvial stretch of land lying between the Himalayan foothills and the Gangetic plain. It extends through Uttar Pradesh, parts of Bihar, N-W Bengal, Assam and Nepal. It is characterised by soil which is clayey, boulderless and with high moisture content. The high water table and annual precipitation from 1000 to 1800 per annum play an important role in determining the characteristic vegetation of the whole region. The vegetation is moist deciduous type dominated by extensive patches of Sal Shorea robusta forest interspersed with grasslands dominated by Saccharum, Typha, Narenga and Sclerostachya species.

Till early 1950's the whole terai region was very thinly populated except for the local tribals tharus which inhabited the area. It is believed that a virulent form of malaria prevented the colonisation of this area till DDT brought it under control and hence opened this area for colonisation. Unimaginative land reform policy on the part of the government resulted in leasing out of large tracts of highly important terai habitat, primarily grasslands for human settlements and cultivation. At that time little importance was attached to the grasslands and which were generally considered as 'blanks'.

As a result of this extensive patches of good terai grasslands were converted into arable croplands to cater to human needs.
The north Indian terai which once covered 12 districts of Uttar Pradesh is now restricted to districts of Pilibhit, Lakhimpur-Kheri, Bahraich, Gonda and Gorakhpur covering an area of about 6500 sq.km.

The uncontrolled expansion of agriculture, current land-use pattern and other biotic and abiotic factors have reduced the once extensive terai into small fragments. As a result what exist today is in protected areas such as national parks and sanctuaries amidst sea of croplands and human settlements under high biotic pressure. The whole terai is considered as a highly endangered ecosystem. There are good number of species of birds and mammals which are characteristic to this habitat and good percentage is on the threatened list. Certain threatened species are limited to small isolated fragments and are vulnerable to extinction due to demographic stochasticity (Javed & Rahmani 1991).

2.2 Dudwa National Park

2.2.1 History

The settlement of forests of the region, then under the Oudh Province was truly started in 1856 but was delayed due to the mutiny of 1857. The settlement was completed in 1858. In 1860, a tract of finest Sal forest was ceded to Nepal (Leete 1902). The present forests of Dudwa National Park were part of the Trans-Sarda Forests and are now known as North Kheri Forest division. These forests were part of the Khairigarh Pargana till 1861 when they were placed under the Superintendent of Forest.
The North Kheri forest division was constituted on 8th April, 1916 vide G.O No. 313/XIV-31. There is little information on the history of the forests prior to 1861 (Leete 1902), but apparently they were under the control of Raja of Khairigarh, which were later taken over by the Forest Department and were notified as reserved forests vide notification no. 85/XI-66 on 23rd January 1937, under the Indian Forest Act (1927). The best Sal trees of the forests were felled on a royalty of eight annas to one rupee, and the poorer trees were used for resin extraction by the local villagers and hillmen. The selective felling of 7500 best Sal trees continued for 25 years after the Government took control of the forest in 1861.

With the aim of protecting the relict population of Swamp deer Cervus duvauceli duvauceli in particular, an area of 212 sq. km was declared as Dudwa Sanctuary. In 1977 the area was declared as a National Park with a core zone of 490 sq. km. and a buffer zone of 124 sq. km. In 1987 the Park was brought under the umbrella of Project Tiger with the addition of 201 sq. km of Kishanpur Wildlife Sanctuary (Fig. 2.1). The two areas are not contiguous and river Sarda forms a natural barrier between the two areas. Buffer Zone in Dudwa National Park (DNP) is located to the north of the core zone and includes tribal (Tharus) villages resettled from the core zone. There is just one village in the core zone to be resettled. Most of the requirements of the 'tharus' are met by the buffer zone. About 30000 people continue to live in an area approximately 5 kms wide in and around the Park (Singh 1982). These are partly dependent on forest for thatch, fodder and fuel wood, and this is an important management issue.
Fig. 2.1 Map of the study area.
2.2.2 Physical Features

2.2.2.1 Location

Dudwa National Park is situated on the Indo-Nepal border in Nigahasan tehsil of Lakhimpur-Kheri district. The area falls under Terai-bhabar biogeographic subdivision of the Upper Gangetic Plain biogeographic classification of Rodgers and Panwar (1988). The Park lies between 28° 18’ and 28° 42’ north latitude and 80° 28’ and 80° 57’ east longitude. The Himalayan foothills are about 30 km north of the Park. Rivers Suheli and Mohana form the natural boundaries of the Park.

2.2.2.2 Topography

The Park is a vast alluvial plain, the doab of Suheli and Mohana rivers and scoured with channels of several small water courses. The alluvial land falls in two categories—the high alluvium under Sal and the low alluvium under grasses and miscellaneous species (Leete, 1902). Along the western and south-western edge of the Sal forest there is a clearly defined line of the rugged and scraped ground, about 30 feet from the ground and locally known as Suheli damara. These are the only irregularities of surface and are formed by the low river beds and high banks which flank them on either side. There are no prominent eminences. The result is a series of elevated plateaux separated by streams flowing from north-west to south-east.

The general slope of the area is from north-west to south-east. The altitude above mean sea-level ranges from 182 m in the extreme north to 150 m in the farthest south-east,
a drop of 32 m. The elevation is about 156 m at Fort (Qila), 163 m at Dudwa and 183 m at Gauri Phanta.

2.2.2.3 Soil

Soil of the terai region is of alluvial formation (Singh, 1965) and falls under the Gangetic alluvium (calcareous type) predominant in the Indo-gangetic plain, under the classification of Raychaudhari (1962). These soils is often low in nitrogen and phosphorous. Potash is usually adequate as also lime which is liable to form kankar pan especially over bands of clay in the older alluvium (Champion and Seth 1968). There is a noticeable kankar outcrop on the damara, near the railway line at Dudwa. At places the subsoil at a depth of 110 cm to 200 cm shows a layer of hard clay with narrow shingle beds.

The soil of the area shows a succession of beds of sand and loam. Surface soil is sandy in more elevated and better drained areas, loamy in the level upland and clayey in depression. There are no boulder formation as in the bhabar tracts.

2.2.2.4 Rivers, Waterbodies and wetlands

The two rivers, Suheli and Mohana run along the southern and northern boundary of the Park respectively. Suheli enters the area from the north-west and flows with a very irregular course, fed by several small tributary/streams, most of which flow down from higher land on the north draining the central depression of the forest tracts. It meets Kauriala river after traversing about 45 kilometers. The Mohana river enters the area near
Gauri Phanta and flows south-east to join Kauriala. At Chandanchowki the river is considerably deep, with steep banks and well defined banks (Bhatia 1953). The deep stream of the Mohana river till 1898 was the natural boundary between British India and Nepal.

Apart from the two rivers, Park has several large and small lakes. At places height, of the northern bank is low and there is formation of oxbows. Frequent change of course by rivers and streams has left behind old channels in which the water collects to form numerous taals and marshlands, some seasonal and some perennial.

Except for monsoon and winter, the water is generally confined to the deeper waterbodies or taals, the two rivers and several perennial streams like Neora, Jauraha and Chabakwa nallahs. There is a well developed system of wells, mostly near the junctions of major roads and near the forest posts.

The water table is high and is available between 3-4 meter depth. There has been no great sinking of water table between 1932 and 1952 and also there has been no serious drought, such as in 1908 and 1931 (Bhatia 1953). The low lying grasslands get inundated in monsoon and become drier in summer, while some areas remain marshy throughout.

Wetland habitats include a number of small perennial rivers, ponds, lakes (known as taals) and marshes. The most important lakes are Banketaal and Badhitaal (Fig. 2.2). Together with Royal Sukla phanta and Royal Bardia National Parks in Nepal, Dudwa is an
Fig. 2.2 Map showing major wetlands where storks were observed.
example of the often marshy, undulating alluvial lands between the Bhabar and the Gangetic plains - an area that has been largely converted to agricultural use elsewhere in the sub-continent west of Assam.

The small lakes (taals) are eutropic, with extensive submerged and emergent vegetation: stands of *Phragmites* and *Typha* fringe the lakes and *Nymphaea* is abundant on the surface of the water.

### 2.2.3 Climate

The climate of the area is tropical monsoon type. There are three distinct seasons:

(a) the cold season-from 15th October to 15th March
(b) the hot season- from 15th March to 15th June
(c) the rainy season- from 15th June to 15th October

The nights during winter are very chilly and foggy and often fog remains for greater part of the day. From April to June the days are very hot and humid.

#### 2.2.3.1 Temperature

The maximum and minimum temperature in January ranges between 19-23°C from year to year whereas minimum varies from monthly average of 7.5°C to 9.8°C respectively and during this period frost occurs in grassland. May to June are the hottest months and temperature fluctuates between 32°C to 38°C (Fig. 2.3). The weather remains pleasant between February to April.
Fig. 2.3 Meteorological data recorded at Dudwa National Park (1995-1997).

- Total rainfall
- Max. temperature
- Min. temperature
2.2.3.2 Rainfall

The rains start in June and continue till late October, with occasional winter rains between November to January. Average annual rainfall varies from 1000 mm to about 1600 mm and about 75% of it occurs between August and September. Fig. 2.3 shows the monthly and annual rainfall pattern in Dudwa National Park from 1995 to 1997. Flooding of rivers inundates large areas of grassland in monsoon. The flood water contains large amount of silt and prolonged inundation of low lying areas has now resulted in change in floristic composition of grasslands.

2.2.3.3 Humidity

The whole of terai is very humid throughout, but the air is nearly fully saturated between June.

2.2.3.4 Wind

Westerly and Northerly are the prevailing winds and they increase in velocity in March and usually blow strongly in April and May, when gales often continue for several days uprooting trees in more exposed localities (Leete 1902).

2.2.4 Vegetation

Forests of Dudwa National Park were under intensive timber exploitation, as a result of which selected commercially valuable species were favoured while naturally occurring species of little or no commercial value were slowly removed. Dudwa grasslands were planted with commercially valuable species such as Dalbergia sissoo, Tectona
grandis, Bombax ceiba and Acacia catechu. Details of the area under different vegetation types are given in Table 2.1.

Vegetation of Dudwa National Park has been classified into seven distinct types.

1. **Sal forest:**
   a. Damara Sal- With Sal as dominant tree and other codominant includes Asna *Terminalia alata*, Haldu *Adina cordifolia*, Kusum *Schleichera oleosa* and Rohini *Mallotus phillipensis*.
   b. Alluvial Plain Sal Forest - low lying areas mainly consist of Sal, Asna, Haldu, Pula, Kusum.

2. **Mixed Forests:** They are fringe forests and are dominated by *Terminalia alata*.

3. **Riparian Forest:** *Syzygium sp, Trewia nudiflora* are the dominant species. At places *Syzygium* is replaced by *Barringtonia acutangula*.

4. **Tall wet grasslands:** Formed due to inundation of the area by flood waters which stays for 4-5 months are dominated by *Phragmites karka, Arundo donax* and *Sclerostachya fusca* species.

5. **Upland Grasslands:** Major portion of the Dudwa grassland falls under this category. The grasslands are well represented in between the sal forest of the district and are locally known as “phantas”. Seventy seven species of grasses occur in this region (Singh 1982). As a result of dry season burning and grazing this area is dominated by *Saccharum munja, Imperata cylindrica* and *Desmostachya bipinnata* species.

6. **Sal savanna:** consists of 20 to 30% of Sal trees.

7. **Moist Savanna:** Dominated by *Acacia catechu* and *Bombax ceiba*. 
Table 2.1  Areas under different vegetation type in Dudwa National Park.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Vegetation type</th>
<th>Total Area *</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Sal (<em>Shorea robusta</em>) dominated forest.</td>
<td>332.35</td>
<td>54.09</td>
</tr>
<tr>
<td>2.</td>
<td>Grassland</td>
<td>113.14</td>
<td>18.41</td>
</tr>
<tr>
<td>3.</td>
<td>Shisham (<em>Dalbergia sissoo</em>) dominated forest with grasses</td>
<td>42.11</td>
<td>6.85</td>
</tr>
<tr>
<td>4.</td>
<td>Teak (<em>Tectona grandis</em>) plantation</td>
<td>40.11</td>
<td>6.52</td>
</tr>
<tr>
<td>5.</td>
<td>Jamun (<em>Syzygium cuminii</em>) dominated forest along streams</td>
<td>31.92</td>
<td>5.19</td>
</tr>
<tr>
<td>6.</td>
<td>Khair (<em>Acacia catechu</em>)</td>
<td>21.16</td>
<td>3.44</td>
</tr>
<tr>
<td>7.</td>
<td>Eucalyptus plantations</td>
<td>14.22</td>
<td>2.31</td>
</tr>
<tr>
<td>8.</td>
<td>Wetlands and waterbodies</td>
<td>18.33</td>
<td>2.98</td>
</tr>
<tr>
<td>9.</td>
<td>Rest houses, roads etc.</td>
<td>01.00</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>614.34</strong></td>
<td></td>
</tr>
</tbody>
</table>

* Computed from satellite data from Landsat-3 pass on 10th November 1981.
8. **Plantations**: *Tectona grandis, Dalbergia sissoo, Bombax ceiba* and *Eucalyptus* sp. are the major species planted. Singh and Thomar (1982) reported about the aquatic and marshland flora of Kheri district, Uttar Pradesh, which also includes flora of Dudwa National Park.

2.2.5 **Fauna**

Dudwa National Park is extremely rich in faunal composition. Nearly 323 bird species were reported from the Park (Javed & Rahmani 1991) and during the course of this study more than 230 (Appendix 1) birds species have been recorded so far, of which the Black stork (*Ciconia nigra*) is a new record.

Thirty one species of mammals that have been reported from this area. Eight species of turtles have been reported from the Park of which Indian Eyed Turtle *Morenia petersi* is the new record for Uttar Pradesh and a case of range extension by 400 Kms (Javed & Hanfee 1996). Twenty two species of reptiles and 20 species of mammals were recorded from this Park (Javed 1996) (Appendix 2).