Chapter 3

The Study Area
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This study was conducted in Kanha Tiger Reserve and the adjoining parts of the East and West Mandla Territorial Forest Divisions. The profile of the study area is as under (Gopal & Shukla, 2001):

3.1 Kanha Tiger Reserve:

The Kanha Tiger Reserve falls in the Balaghat and Mandla districts of Madhya Pradesh (Map-1). The Reserve is situated on the northern slopes of the “Maikal” ranges of the Satpuras.

Following the guidelines and objectives of Project Tiger, Kanha Tiger Reserve is constituted on a “Core-Buffer” strategy. The entire National Park area of 940 sq. km. has been is envisioned as a “Core Zone”, completely free from biotic disturbances, whereas the "Buffer Zone" is treated as a multiple use area for managing the spillover wildlife population.

3.2 Study Site-I:

The National Park, the Study Site - I, is internationally renowned for its rich habitat, floral and faunal attributes. The Park has distinguished itself in saving the endangered hard ground barasingha (Cervus duvauceli branderi) from extinction, and has the unique distinction of harbouring the last world population of this deer species.

The Park boasts a magnificent conservation history, and is the safe abode of many typical Central Indian flora and fauna. The present Park area is comprised of two important valleys, viz. the Banjar and the Halon. These valley forests
MAP-1: Location of Kanha Tiger Reserve
were declared Wildlife Sanctuaries in 1935. Subsequently, the Banjar valley alone retained that status till the upgradation as a National Park in 1955. Kanha National Park is one of the first nine Tiger Reserves constituted in our country when the ambitious "Project Tiger" was initially launched by the Govt. of India way back in 1973. Initially, the area of the National Park was 253 sq. km., which with subsequent expansions in 1964 and 1970 assumed a size of 446 sq. km. With the launch of Project Tiger in 1973, the Halon valley area was eventually integrated with the Park, thereby increasing the total area to the present size of 940 sq. km.

As Since the Core Zone of a Project Tiger area should have the least disturbance, the Management envisages exclusion of human interference in the form of human settlements, domestic livestock, agriculture and other land use practices, by the gradual relocation of existing habitations. This is required to safeguard the endangered gene pool of flora and fauna.

3.3 Study Site-II:

The Buffer Zone Division of 1009 sq. km. (including orange areas) surrounding the Core is treated as a "multiple use area" is the Study Site - II. This zone is characterised by an interspersion of revenue and forest lands, and harbours numerous villages. This zone has been notified by the Govt. as a separate division under administration of Kanha Tiger Reserve.

3.4 Details of Area:

Kanha Tiger Reserve is spread over an area of 1949 sq. km., covering parts of Mandla and Balaghat districts of Madhya Pradesh:
3.4.1 Conservation History: Kanha National Park has witnessed a magnificent conservation history of over seven decades. During this time, these wilds were introduced to the national and international community of naturalists, writers, marksmen, conservationists and scientists. As the Protected Area boasts rich floral and faunal diversity, the habitat supports a typical Central-Indian fauna, including a highly endangered and endemic deer sub-species, viz. the Branderi Barasingha (*Cervus duvauceli branderi*). Kanha Tiger Reserve, which is one of the best wildlife protected areas of national and international renown for several decades, has achieved a tremendous success in providing a sound ecological status to these wilds through concerted efforts under the Project Tiger. The flagship species, the tiger, has increased in number from a mere 48 in 1976 to 128 in 2003. The National Park also claims the unique distinction of conserving the last world population of the hard ground Barasingha. Besides, there is a remarkable recovery of the ecosystem as such, resulting in the restoration of biodiversity.

The Reserve is a part of the Gondwana tract inhabited traditionally and chiefly by the Gond and the Baiga tribes, the latter confining themselves largely to the upper valleys and dadars near the main Maikal range. Information concerning the early history of these forests prior to 1860 is very scanty. The old records indicate that the villagers had free access to cut and burn forests at will. The system of shifting cultivation, locally called
the "Bewar", prevailed almost unhindered until as late as 1870 on the hill
slopes.

Extraction of forest produce by the villagers for domestic and agricultural
use under the commutation system was introduced in 1879 to regulate the
unrestricted hacking by villagers. This system also proved quite ineffective
and was gradually curtailed, and finally stopped in 1933. Villagers were
drawing most of their domestic requirements from the "rayotwari" and the
"malguzari" forests, which are not included in the Tiger Reserve. After the
abolition of the ex-proprietary rights, some supplies of the cut material to
meet the "nistar" demands of villagers were permitted from annual coupes
under working. Later, even this was discontinued, and the nistar cut
material was made available from special depots opened in the villages.

As regards grazing, it was permitted unrestricted upto 1915, when grazing
rules were introduced. These rules regulated grazing by constituting
grazing units and closing regeneration areas to grazing. With the rise in
cattle population and slackening of control in the post-independence
period, control over grazing became weak and grazing pressure rose
tremendously in the areas close to villages.

Ever since the inception of Project Tiger in the year 1973-74, all efforts
were made by the Park Management to stop cattle grazing in the park
premises. There is absolutely no exploitation of the forest produce in the
entire park area. The National Park area is almost completely protected
from biotic interference. There are, however 18 forest villages in the Core
Zone. Only around 25% (227 sq. km.) of the park area (940 sq. km.) has
been opened for tourism.

During the year 1995, the Buffer Zone was constituted as a separate
division with an area of 1009 sq. km. under the unified control of the Park
Management. This Zone is pockmarked with villages and revenue lands, and is comprised of almost 40% forest area, and the rest is constituted by revenue land. There are 29 forest villages and 121 revenue villages in the Buffer Zone.

3.4.2 Description of the Present Status of Habitat: The habitat has been classified into 10 vegetation cover types (Gopal & Shukla, 2001): Sal, Sal-Bamboo, Sal Mixed, Sal Mixed Bamboo, Mixed-Bamboo, Grassland, Grassland on Dadar, Grassland with mixed forest tree species, and Agriculture and habitation.

The grasslands are anthropogenic in nature, formed on account of epidemics or desertion of villages. Several such grasslands have been formed on the relocated village sites also. Such areas harbour a heterogeneous grass flora, thereby attracting the wild ungulates. Sixteen grass communities have been recognised in the park area.

3.4.3 Climate: There are three distinct seasons, viz:

<table>
<thead>
<tr>
<th>Season</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>November to February (with the night temperature dropping to -2°C at times during December and January).</td>
</tr>
<tr>
<td>Summer</td>
<td>March to mid-June (the hottest period extends from late April up to the first week of June, with the day temperature sometimes soaring to 45°C).</td>
</tr>
<tr>
<td>Rains</td>
<td>Mid June to late September (July and August are the wettest months, and the average annual rainfall is around 1200 mm.).</td>
</tr>
</tbody>
</table>
(Table-1)
Meteorology of Kanha Tiger Reserve
(Average of Five Years: 1998 to 2002)

<table>
<thead>
<tr>
<th>Month</th>
<th>Temperature (°C)</th>
<th>Rainfall (mm.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>Jan.</td>
<td>-1°C</td>
<td>36.2°C</td>
</tr>
<tr>
<td>Feb.</td>
<td>-1°C</td>
<td>39.5°C</td>
</tr>
<tr>
<td>Mar.</td>
<td>5°C</td>
<td>36.9°C</td>
</tr>
<tr>
<td>Apr.</td>
<td>6°C</td>
<td>39.0°C</td>
</tr>
<tr>
<td>May</td>
<td>13.7°C</td>
<td>43.9°C</td>
</tr>
<tr>
<td>Jun.</td>
<td>18.2°C</td>
<td>38.6°C</td>
</tr>
<tr>
<td>Jul.</td>
<td>19.9°C</td>
<td>34°C</td>
</tr>
<tr>
<td>Aug.</td>
<td>20°C</td>
<td>32.7°C</td>
</tr>
<tr>
<td>Sep.</td>
<td>17.7°C</td>
<td>30.4°C</td>
</tr>
<tr>
<td>Oct.</td>
<td>10.5°C</td>
<td>28.7°C</td>
</tr>
<tr>
<td>Nov.</td>
<td>7.9°C</td>
<td>23.4°C</td>
</tr>
<tr>
<td>Dec.</td>
<td>-3°C</td>
<td>25.9°C</td>
</tr>
</tbody>
</table>

3.4.4 Drainage & Topography: The Maikal Range is the most important terrain feature, which runs along the eastern boundary of the reserve, forming the water shed between rivers Narmada and Mahanadi. This range continues to the west within the Reserve as the Bhaisanghat ridge, thereby bifurcating the Narmada catchment between the Banjar to southwest and west, and the Halon to the east and northeast. Many spurs branch off to the north from the main Maikal and the Bhaisanghat ridges and divide the head waters of the Halon into a number of tributaries, viz. the Phen, Gourdhuni, Kashmiri and Gondla. The Bhaisanghat ridge bifurcates near Bamhnidadar, with the main spur running to the north, while its branch running west sub-divides the Banjar catchment between
Banjar itself and its tributary the Sulkum (also called Surpan in the lower reaches). The elevation on the main ridge varies from 800 meters to 900 meters or more above M.S.L.

3.4.5 Dadars: The hilltops on the main ridge and the branching spurs tend to flatten out as extensive plateaus, which are known as “dadars”. Some of these dadars are quite large, ranging upto 6 km. or more, with a width of one to two km. The chief amongst these are: Katangidar, Kuseradadar, Garhidadar, Katoldih, Sukdi, Ajanpur, Dudhania, Adwar, Jholar, Deoridadar & Kahwajhardadar in Supkhar and Bhaisanghat Ranges, and Banninidadar, Bijadadar, Chhindipathar, Algidadar and Kodaidadar in Kanha and Mukki Ranges. Tree growth is thin or scanty with abundant grass growth. Some of the watercourses originating from these retain water in perennial pools.

3.4.6 Rare and endangered species found in the Tiger Reserve: The Central Indian Barasingha (Cervus duvauceli branderi) is one of the three endangered sub-species which is now endemic to Kanha National Park. Concerted efforts under Project Tiger have resurrected this species from the brink of extinction. Other endangered species are: Tiger (Panthera tigris tigris) Wild dog (Cuon alpinus), Grey wolf (Canis lupus), Jackal (Canis aureus), Otter (Lutra perspicillata), and Flying squirrel (Petaurista petaurista).

3.4.7 Geology, Rock & Soil: The Deccan trap is the principal geological formation, and it occurs along with gneiss and crystalline schists in the western part, and basaltic volcanic overflows in the eastern part of the Tiger Reserve. The flat-topped hills are capped by vesicular and clayey Laterite rock often rich in bauxite. The contents of ferric compounds lend a characteristic red colour to the rocks. In the plains and valleys, the rocks are granitic gneisses and micaceous schists, supporting sal forests.
The rock on the flat-topped hills is weathered basalt, supportive of miscellaneous forest growth.

The various soil types in Kanha Tiger Reserve depend upon the parent rock and specific terrain. The main types are as under:

- **Black Cotton Soil**: This soil type occurs due to the weathering of trap rocks and gets deposited in the low lying areas below the hill formed by the Deccan trap. Though highly clayey in nature and not conducive to tree growth, they, however, support excellent grasslands. This soil type is common in the low-lying areas of the Bhaisanghat and Supkhar ranges and also in pockets of the Mukki and Kanha ranges.

- **Alluvium**: This soil type occurs on the banks of all the major watercourses and streams, and consists chiefly of fine-silt. This is extremely favourable to sal forest, helping them attain an excellent growth in the Supkhar, Garhi, Mukki and Kanha ranges. The extensive Kanha valley, harbouring a number of watercourses, also falls under this soil type. These areas are the favoured sites for settlement of villages due to fertile soil and availability of perennial water sources. The abandoned cultivated areas in this tract have developed into excellent pasture for wild herbivores, such as the Kanha, Uranakhero and Parsatola meadows, apart from the Sonf meadow in the Kanha range. Many old forest villages, now relocated outside, were earlier situated in these areas.

- **Sahara**: Though alluvial in nature, this soil type contains a greater part of sand including coarse sand and gravel. These types occur in the upper peripheries of the valleys and lower slopes, supporting good tree growth in favourable moisture regime. These are found in most of the areas occupied by gneisses and crystalline schists in Maliadadar, the Banjar valley and south Phen blocks. This soil supports mixed forests where soil
depth is good and results in the improvement of forests and bamboo quality. Such soil type is not supportive of good waterholes; the fodder value on account of bamboo and regeneration of other tree species is very high.

- **Barra**: Large expanses of this type of soils are found on the flat and extensive dadars in the Tiger Reserve. This soil type is good and supports grass, though the tree cover in these areas is thin or scanty. Such habitats are excellent for wildlife provided the availability of nearby water sources is good.

### 3.4.8 Physiography:

The Maikal range is, geographically, the most important terrain feature, running along the eastern boundary of the Reserve, forming the watershed between rivers the Narmada and the Mahanadi. This hill-range continues to the west within the Reserve as the Bhaisanghat ridge, thereby bifurcating the Narmada catchment between the Banjar, to the southwest and west, and the Halon, to east and the northeast. Many spurs branch out to the north from the main Maikal and the Bhaisanghat ridges, and divide the headwaters of the Halon into a number of tributaries, viz. the Phen, Gourdhuni, Kashmiri and the Gondla. The Bhaisanghat ridge bifurcates near Bamhnidadar, with the main spur running to the north, while its branch running west sub-divides the Banjar catchment between the Banjar itself and its tributary, the Sulkum (also called the Surpan in the lower reaches). The elevation on the main ridge varies from 800 meters to 900 meters or more above M.S.L.

### 3.4.9 Hydrology & Water Sources:

Kanha Tiger Reserve lies in a deciduous zone, and the availability of water is a very important factor requiring serious attention of the Park Management. Though the hydrology of the area has gifted it with a number of perennial and seasonal streams, streamlets and some rivers, these waterlines are not well distributed in
time and space, sometimes posing problems in the summer. Besides the above, the hydrology of the Tiger Reserve has also facilitated some areas with high water tables which can easily be dug up as small waterholes, locally known as "jhirias".

As stated earlier, the distribution of natural water is not adequate in the Tiger Reserve, and this requires the Park Management to make special efforts for water development to ensure that the water remains more or less uniformly distributed for wildlife throughout Kanha Tiger Reserve.

3.4.10 Vegetation:

- **Biogeographic Classification:** Kanha Tiger Reserve is part of the Indo-Malayan Realm floristically and a member of the Oriental Region zoogeographically. As per the biogeographic classification of India (Rodgers & Panwar, 1988), the area lies in zone-6E – Deccan Peninsula – Central Highlands.

- **The Vegetation & Cover Types:** After Champion and Seth (1968), the following forest types have been identified in the Tiger Reserve.

(I) Moist Peninsular Sal Forests (3 C/C2)
   a) High level sal (3 C/C2 ci)
   b) Low level sal (3 C/C2 cii)
   c) Valley sal (3 C/C2 ciii)

(II) (A) Southern Tropical Moist Mixed Deciduous Forest (3 A/C 2 a)
     (B) Southern Tropical Dry Mixed Deciduous Forest (5 A/C-3)

However, a working classification in the field suggests that the forests are mainly of two types: Sal and Miscellaneous.
In the middle reaches of the slopes, bamboo is abundant as undergrowth. Kanha is very rich in flora, due largely to the combination of landforms and soil types, apart from the moist character of the region.

3.4.11 Habitats, Fauna & Trophic Niches: Physiography, geology, climate, and precipitation contribute to decide the types of vegetation and habitats of wild animals in a wildlife ecosystem. The Tiger Reserve harbours flat-hilltops, varying degree of slopes, and rolling meadows in the valleys, which offer unique settings and ecotones for creating diverse types of wildlife habitat, forming ideal niches for various species of plants and animals. Apart from over 600 species of flowering plants as discussed above, there are around 260 species of birds and 43 species of mammals. Besides, several species of reptile, arthropod and termite are also found in the Reserve.

The rich habitat diversity of Kanha Tiger Reserve supports abundant animal communities viz: mammals, birds, reptiles and the lesser life forms.

The animals generally seen in the Tiger Reserve are the Chital (Axix axis), Sambar (Cervus unicolor), Barasingha (Cervus duvauceli branderi), Barking deer (Muntiacus muntjak), Chousingha (Tetracerus quadricornis), Gaur (Bos gaurus), Langur (Presbytis entellus), Wild pig (Sus scrofa), Jackal (Canis aureus), Sloth bear (Melursus ursinus), Wild dog (Cuon alpinus), Panther (Panthera pardus), Tiger (Panthera tigris). Kanha National Park offers an ideal habitat for a variety of avifauna, reptiles and insects.

A Herd of Axis Deer

A Herd of Grazing Axis Deer in an Extensive Meadow
The heterogeneity of habitats influences the local distribution of mammals. The presence of the mosaics of meadows within the woodland, being large expanses of herbage availability, also has a bearing on the concentrations of herbivores.

The central meadows of Kanha (Kanha Range) are rich in ungulates and other fauna. This high prey density area is encompassed on three sides by the ridges of the Deccan trap, leaving a gap only in the North towards Sonf. This topographical peculiarity poses a physical barrier to animal movement from the central meadows. Likewise, the ridges extending along the eastern boundary of the reserve impede animal movement between the eastern and western portions of the park. Such topographical attributes foster pockets of high and low prey density areas within the Protected Area, resulting in unequal concentrations of tigers and co-predators in different portions of the habitat.

3.4.12 Social Structure: The majority of inhabitants are tribals - viz. Gonds and Baigas. Most of the people are illiterate, and are by and large, pastoral, though agriculture, collection of minor forest produce and wages through routine park works constitute their principal occupation.

3.5 Study Site-III:

Situated contiguously to the Buffer Zone Division along the West, North and North-Eastern boundaries, the parts of the Bamhni, Maharajpur, and the Motinala and Jagmandal Forest Ranges of the West and East Mandla Territorial Divisions respectively constitute the Study Site-III. (Map-2) The total area of this site is 274.575 sq. km. While the geological, physiographical, and hydrological features of this Study Site are almost identical with the other two Study Sites, it is not a wildlife protected area and all the necessary silvicultural operations and forestry
MAP-2: Location of the Three Study Sites

- **Study Site-I**
- **Study Site-II**
- **Study Site-III**
operations are carried out as per the respective Working Plans. Being managed forests; no special protection/managerial measures are taken for the conservation of the wildlife populations of the area. Wildlife conservation practices in this Study Site are limited largely to routine protection against various modes of poaching, and annual population estimation of tiger and panther population.