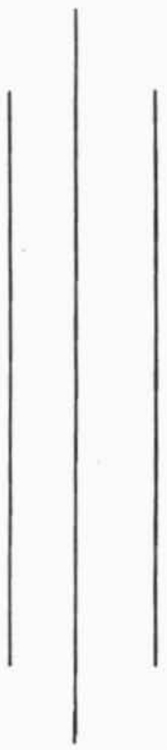
PRESENT STATUS AND DISTRIBUTION OF THE INDIAN RHINOS (RHINOCEROS UNICORNIS) IN THE WILD IN ASSAM AND ITS HABITAT.



ASSAM FOREST DEPARTMENT

COMPILED
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CURRENT STATUS AND DISTRIBUTION OF THE INDIAN RHINO (RHINOCEROS UNICORNIS) IN THE WILD IN INDIA AND ITS HABITAT.

ABSTRACT

All the five species of rhinoceros, the two African species and the three Asian species are presently under the threat of extinction. Out of the three Asian species, the Indian Rhino with a surviving population of 2,000 plus individuals appears to be somewhat safer. But with the pressure on its shrinking habitat coupled with ever increasing incidence of poaching, its future is still uncertain. The existing population is distributed in twelve isolated and scattered locations in Nepal and West Bengal and Assam in India. Out of these, Kaziranga National Park and Chitwan National Park hold the bulk of the rhinos which can be truely described as viable population units. The other areas are not only scattered and smaller in extent but the number of animals therein appears to be too few to make any significant contributions towards ensuring the continued existence of the species. The study of these populations and the habitats, in relation to current and available historical data, sources of environmental variations, information on current habitat status vis-a-vis the future plan of actions and management practices aresome of the important parameters essential for understanding the problems and prospects of conservation of the Indian Rhino. Being the most important key area in the field of conservation of the Rhinos, Kaziranga National Park is dealt with here with as much details as are presently available.

INTRODUCTION

*1.1. The Range of distribution of the Great Indian One Horned Rhinoceros (**Rhinoceros unicornis**) in the not too distant past extended from Indus Valley (Peshwar in Pakistan) in the west upto Assam in the east along the Ganges and the Brahmaputra valley covering the entire length of the North Indian Plains, Southern Nepal and also perhaps Bangladesh and North Burma. The archaeological finds in the form of sculptures and seals depicting the rhinoceros in Mohenjo Daro (Pakistan) indicate that the Indian Rhino lived in the Indus Valley about 5,000 years ago. Mongal invader Timur Lane during his conquest of Delhi*

(1398 AD) and later, Babur, the founder of the Mugal empire in India (1926) hunted rhinos in the Gangetic Plains (Uttar Pradesh) of Northern India. The occurance of the Rhino in various parts of Uttar Pradesh was also mentioned in the memoirs of Emperor Akbar (1590) and Emperor Jehangir.

1.2. This region of the sub-continent known as the northern fertile plain happend to be the area where civilization first struck roots in India, 5,000 years ago. Beginning from the Indus Valley civilization, successive waves of people poured in to occupy the fertile lands to build up settlements. As a consequence thereof, in course of time, this whole area was transformed into vast expanse of cultivated fields and conglomeration of human settlements. The forests have been destroyed and the swamps drained out until the last vestige of rhino habitats were completely obliterated. This, coupled with the pressure of hunting resulted in gradual disappearance of the Rhino from the entire range of its distribution.

1.3. The few surviving rhinos in the Terai area of Uttar Pradesh (Dudhwa) and Bihar (Samparan) in the Gangetic plains were exterminated before the advent aof the 20th Century. By the turn of the present century, the remaining surviving population of he Indian Rhino were confined to only a few pockets of scattered habitats in Nepal, North Bengal and parts of Assam in the Brahmaputra Valley. Efforts to protect the species to ensure its continued existence were initiated since the beginning of the 20th Century by constituting protected areas and by framing legislations to control hunting. But in spite of stern measures, the Indian Rhino is not out of the endangered list of mammals even to-day. Perhaps no other animal has such a long history of protection and persecution soley on grounds of man's lust generated by superstitious beliefs. The present world population of the Indian Rhino and the areas in which they still inhabit are estimated to be as under :

1.4. A. Brahmaputra Valley - Assam

i) Kaziranga National Park	1,300 Nos.
ii)Orang Wildlife Sanctuary	100 "
iii)Manas ~~Wildlife Sanctuary~~	60 "
iv)Laokhowa Wildlife Sanctuary & Burachapori-Kochmara area	10 "
v) Pabitora Wildlife Sanctuary	60 "

vi)	Kukrakata and Deosur Reserved Forests	20 Nos.
vii)	Sonai Rupai Wildlife Sanctuary	-
viii)	Desangmukh area	10 "
ix)	Kurua Reserve Forests and adjacent area	10 "
		~~1,600 Nos.~~ 1,570 Nos

B. West Bengal :

i)	Jaldapara Wildlife Sanctuary	29 "
ii)	Gorumora Wildlife Sanctuary	7 "
		36 Nos.

C. Nepal :

i)	Chitwan National Park	400 Nos.
	Grand Total	2,006 Nos.

A. Brahmaputra Valley - Assam.

2. Kaziranga National Park.

2.1. The Kaziranga National Park is the most important key area on which the future of the Indian Rhino is mainly dependent in as much as the park harbours almost 2/3rd of the surviving world population of Indian Rhinos. Kaziranga is situated between the longitudes of 93°5' E and 93°40' E and latidues 26°30' N and 26°45' N in the flood plains of the Brahmaputra river in North East India. It falls partly under the civil district of Golaghat and partly under Nagaon district of Assam, covering an area of 42,496 hectares extending from Bokakhat on the east upto Burapahar on the west almost parallel to the National Highway No. 37 (NH 37). The northern boundary extends upto the Brahmaputra river.

2.2. The Park can be approached by road from NH 37 at various points. The eastern part of the park can be approached from Bokakhat. The main approach to the park at its central point is from Kohora by a fair weather forest road branching off from NH 37. The Tourist Complex is located at Kohora by the side of the 135th mile post of the NH 37. Regular State Transport buses ply on this road connecting both Guwahati and Jorhat and the other towns of Upper Assam. Guwahati is connected by regular air services both from Delhi and Calcutta. Jorhat is connected by daily air services from Calcutta only. Visitors coming to Kaziranga may either come to Guwahati or Jorhat by air and then either avail State Transport buses or hire taxies to come to the Tourist Complex at Kohora. The distance

from Guwahati to Kohora is 230 Kms. and from Jorhat to Kohora is 90 Kms. by road. The western part of the Park can be approached through Baguri and Kanchanjuri.

2.3. Past history :

2.3.1. The entire land mass of Kaziranga is formed by the alluvial deposits of the Brahmaputra river and its tributaries which carry a great amount of silt during the rainy season. The riverian areas thus formed are colonized by saccharum and other pioneer grass species as soon as the land mass is stabilised. But before the succession of other pioneering tree species sometimes such land masses are again erroded away by the rivers. This type of land formation and vegetational succession can be observed even to-day in the 'Chapories' (river islands) formed along the course of the Brahmaputra river.

2.3.2. That there used to be constant change of the land masses formed by deposition of silts can be easily visualised from the fact that the Diflu river which flows into the Brahmaputra river through Kaziranga after originating in the Karbi Anglong Hills now divides the park into almost two equal halves, though originally this river had its course flowing along the southern boundary of Kaziranga. This abandoned course is now known as Mora Diflu (dead Diflu) river and forms the southern boundary of the Park.

2.3.3. The Dhansiri river which originates in the Naga hills once discharged into the Brahmaputra river after flowing through Kaziranga. But this course of the river has since died up and the present point of confluence of the Dhansiri river is about 5 Kms. east of the Park. The dead course now flowing through the Park is called the Mora Dhansiri (dead Dhansiri) river.

2.3.4. Perhaps mimerous other channels of the Brahmaputra river criss crossing the area were once flowing through Kaziranga at the initial stages of land formation. When these channels got disconnected by further silt depositions and changing course of the Brahmaputra river, they were transformed into water bodies of various sizes and shapes and depths, now called the 'beels' (lakes). The process of land formation and

erosion in this manner is still going on especially along the northern boundary of Kaziranga.

2.3.5. This tract between Karbi Anglong Hills on the south and the Brahmaputra river on the north covered with grass jungles and patches of tree forests was very thinly populated and permanently settled villages existed only at Bokakhat in the east and Jakhalabandha on the west. The area intervening these two places was the abode of varieties of wild animals including the Indian Rhino. The grass jungles of Kaziranga and the forests of Karbi Anglong hills formed one single eco-system ideally suited for the wild animals.

2.3.6. But after accession of the State of Assam to the British territory in India, following the treaty of Yandaboo in 1826, the area was gradually opened up for human settlement and the forests covering the gentle slopes of the hills were ruthlessly cut down for tea cultivation. Along with the destruction of the habitat, destruction of animals by human settlers and the tea planters went on at an alarming rate. The animals were forced to seek shelter and safety in the remote hills and the riverian grass jungles. The Indian Rhino which by now have disappeared from the Gangetic Plains were persecuted even in this area. Wanton killings have created osuch a situation that they became rare in this area also and it was believed that only a few of them, around a dozen, rhinos were left in Kaziranga by the turn of the present century.

2.3.7. Realising the gravity of the situation, the Government of Assam initiated the proposal to constitute Kaziranga into a Reserved Forests in the Year 1903-04 primarily for protecting the wildlife of the area, especially the Indian Rhino. A peliminary notification declaring the intention of the Government to constitute the area into a Reserved Forest was published by the Notification No. 2442 R dated Ist June, 1905. The area proposed for reservation consisted of 57,273'6 acres (22,910 hectares) of land from approximately the present southern boundary of the Park to the Diflu river on the norther falling partly under Namdoyang Kaziranga Mouza of Golaghat Sub-Division and partly under Rangalugarh Mouza of Nagaon Sub-Division. Within the limits of this boundary, there were only two temporary settlements at that time carrying on 'Pam' cultivation on annual

lease basis. One of this was Dobaduar or Borchapori Hatibandha village consisting of 20 house holds which at that time was about two years old and the other was Uperteliagaon consisting of 27 house holds which at that time was about 8 to 9 years old. In addition, there were about 16 acres of annual leased land belonging to the villagers of harmoti and Baguri within the proposed area. The two villages were ordered to be shifted after payment of compensation @ Rs. 25/- per household having land over 20 Bighas (3 hectares). The annual lease was not renewed. No rights and concessions were admitted. Finally an area of 56,544 acres (22,618 hect.) of land was declared as a Reserved Forest by Notification No. 37 F dated the 3rd January, 1908.

2.3.8. Subsequently, however, 1,441.6 acres (576.6 hect.) of land opposite to Kuthori and Baguri villages was dereserved by Notification No. 2069 F dated 18th April, 1911, to allow the villagers free access to the Mora Diflu river for water supply and to allow Hatikhuli and Kuthori Tea Estates to continued despatching of tea by boat through this river.

2.3.9. But hunting of Rhinoceros in the areas outside the Kaziranga Reserve and adjacent to it were continued as the legislation in force at that time did not prohibit such huntings in areas outside the Reserved Forests. The grass lands in these areas were subjected to burning early in the year and the fresh grasses coming up after burning attracted the wild animals including rhinos to feed on it. The hunters exploited the situation to their advantage. It was therefore proposed to extend the Kaziranga Reserved Forest by adding an area of 16,347 acres (6,539 hect.) of adjacent grass lands by Notification No. 5311 F dated the 17th October, 1911 with the main object of offering further protection to the Rhinoceros. This extension included a tract of land to the east of the existing reserve towards the Bokakhat - Dhansirimukh road.

(a) The objections from the local people to the effect that inclusion of the area inside the Reserve Forest would deprive them from grazing grounds, fishing, facilities for cutting cane, thatch and firewood, etc. were rejected on the ground that vast areas were still available for these purposes outside the proposed area. The European community of tea planters objected to the proposal mainly on the ground that the area available for big game hunting would be greatly reduced.

(b) While disposing off this objection, the then Forest Settlement Officer, Major A. Playfair, Deputy Commission-

er, Sibsagar District observed that "There are several keen sportsmen among them and it is an undoubted fact that the areas of their operations have been greatly restricted. Our object is to preserve the rhinoceros and the herd of buffaloes in these parts and were it only the real sportsmen whom we had to deal with, the newly made game laws might be sufficient. There are however, certain persons, who have few scruples against whom further restrictions have to be aimed. An alternative to constituting an addition to the Kaziranga reserve would be to prohibit entirely the shooting of rhinoceros for a certain number of years and then to issue only a limited number of years per annum. I have consulted persons who are well acquainted with the game in the part of the district and the highest estimate made of the number of rhinoceros in the Kaziranga reserve is twenty pairs".

(c) Another objection was that during the rainy season there used to be a good deal of boating down the Diflu and the Mori Dhansiri river through which tea from the neighbouring gardens were taken into the Brahmaputra river for loading on to steamers. On this consideration, an area of 2,841 acres (1,136 hect.) of low lying land had to be excluded from the proposal area of extension to facilitate the transportation of tea by these rivers. Finally an area of 13,506 acres (5,402 hect.) was added to the Kaziranga reserve by Notification No. 295 R dated 28th January, 1913.

2.3.10. The Chronological sequence and subsequent additions leading to the declaration of Kaziranga as a national Park with its present area are as under :

	Area in acres	Area in hect.
First constitution as a Reserved Forests - Notification No. 37 F, Dated 03.01.1908	56,544	22,618
Notification No. 2069 F, Dated 18.04.1911 (by dereservation)	(-) 1,441.6	(-) 576.6
Notification No. a/95 Dated 04.06.1911 (by recomputation)	890	356
Notification No. 295 R, Dtd. 28.01.1913	13,506	5,402
Notification No.3560 R, Dtd. 26.07. 1917.	37,529	15,012
Notification No.FOR/WL/512/66/17, Dated 07.04.1967	151	60.4
Total	1,07,178.4	42,871.8

Declared as a National Park under the relevant provision of the Assam National Park Act, 1968 by Notification No. FOR/WL/722/68 Dated 11th February, 1974. No rights and privileges for any forest produce or right of way exist in the National Park. Grazing of all domestic animals and entry of unauthorised persons into the park are prohibited. The following concessions are granted to the adjoining villagers in the portion of Mora Diflu river which forms the southern boundary and included within the limits of the National Park now :

(a) Using of the water course for drinking purposes both by cattle and human beings and for agricultural irrigation purposes.

(b) Fishing in the portion of the river for domestic consumption by the adjoining villagers with rod and line and such other non-commercial domestic fishing implements as approved by the Forest Department.

(c) Using of the portion of the river for religious purposes by the adjoining villagers.

2.4. Surroundings and status of boundary.

2.4.1. The eastern boundary of the Park is demarcated by an artificial line and the adjoining area consist of cultivated land and human settlements. Most of the inhabitants are tribals, belonging to the Miching community. Their main occupation is agriculture.

2.4.2. The narrow belt between the foot of the Karbi Anglong Hills and the southern boundary of the Park consists of Tea gardens, cultivated lands and human settlements. The inhabitants of the tea gardens belong to the Adibasi community and that of the remaining areas belong to different backward communities. The Mora Diflu river demarcates the southern boundary in most places intervened by two or three stretches of artificially demarcated lines.

2.4.3. The western boundary is partly demarcated by artificial lines and partly by the Mora Diflu river. There are a few settled villages along this boundary.

2.4.4. The river Brahmaputra forms the northern boundary of the Park. There are no villages or cultivation along this boundary. Professional graziers and their buffaloes occupy the 'Chapories' (river island). Though these 'chapories' remains separated from the main land of the Park during the rainy season because of the intervening channels, during winter they dry up and the 'Chapories' form contiguous land mass with the adjoining park land.

2.4.5. There exists a buffer zone around the National Park, declared by Notification No. FOR/WL/511/66/3, dated 22.12.1966, where hunting of animals and birds are prohibited. This area comprises of populated villages and cultivations extending from Bokakhat to Jakhalabandha along the foot of the Karbi Anglong Hills and upto the north bank of Brahmaputra river. The park authority have no control over the area except protection of wildlife against hunting.

2.5. Climate :

2.5.1. The climate of the area may be described as sub-tropical moist climate having four distinct periods of seasonal variations, viz. winter, premonsoon, monsoon and post monsoon. The winter season is from December to February and January is the coldest month. During this season, the cool, fair and pleasant weather is sometimes interrupted by driving showers and bring cold spells. Fogs are very common during early part of the day. December is the driest month and rainfall is lowest during this season.

2.5.2. The months of March and April represent the premonsoon period between dry winter and wet monsoon. Temperature gradually rises and casual showers occur in association with severe winds during the period. Hail storms are also not uncommon.

2.5.3. The monsoon season begins from the later part of May and lasts untill September or early October. The rising temperature during this season is comparative lowered down by continuous heavy rains. Warm, humid, cloudy weather is the characteristic of the season. This is the most trying season for wildlife and the protection staff. Floods occur in the Park during this period and many places become inaccessible.

2.5.4. By the end of September and early October, the monsoon retreats, temperature begins to fall and the morning

mist appear. The weather progressively clears up and fair sunny conditions prevail. This is the most pleasant period of the year lasting till November.

2.6. Rainfall :

2.6.1. Rainfall in the area is distributed throughout the year. Heaviest rainfall occur during the months of July and August in the monsoon season. The driest month is December. Even during the dry season in winter, the area gets a few showers which help the burnt grasses to throw up new shoots.

2.7. Drainage & water supply :

2.7.1. The streams inside the Park flow from east to west upto their point of confluence with the Brahmaputra river - which forms the northern boundary of the Park. The river Mora Diflu flows along the southern boundary while the Diflu river flows almost through the middle of the Park dividing it into two equal halves. All the other streams and rivers originating in the Karbi Anglong Hills on the south of the Park flow in a northernly direction and after draining into the Mor Diflu river run westwards. The prominent rivers and streams which originate in the Karbi Anglong Hills are Diflu, Mora Diflu, Borjuri, Diring, Kohora, Dehing, Bhalukjuri and Deopani. The branches of the Brahmaputra river which flow through the Park are Bhengra and Belkatijan. There are some smaller channels which originate in the beels and flow from one beel to another during the monsoon season and dry up durin the winter. The entire river system discharge their water into the Brahmaputra river.

2.7.2. There is no scarcity of water in the Park at any time because of the well distributed rains throughout the year. The presence of numerous 'beels' (lakes), both big and small, scattered all over the Park serves as another source of perennial water supply. These beels which were formed by the abondoned course of the Brahmaputra river due to siltation are replenished by the annual floods. The low lying areas wherefrom flood waters take longer to receed and dry up through seepage and evaporation contribute towards formation of swamps.

2.7.3. The ground water table is high all throughout the Park. The water table rises further during the monsoon.

2.8. Flood :

2.8.1. The Kaziranga National Park, is situated

in the flood plains of the mighty river Brahmaputra, fed both by snows and rains and as stated earlier the land mass of Kaziranga have been formed by alluvial deposits of the different river systems flowing into it. In a sense Kaziranga may be called the gift of Brahmaputra. This is dynamic and young river which go on changing its course through continuous process of erosion and accretion of land. It is due to this reason that the northern limits of the Park alaong the Brahmaputra rive go on changing its boundary in tune with its fury. During the monsoons the water flowing through the river system floods the Park by overtopping the banks. The beds of all the rivers, particularly that of the Brahmaputra river have been raised during the great earthquake of 1950 as well as by gradual silt deposition in such a way that the run off from the catchment areas during the monsoons cannot be contained within the existing channels of these rivers. Depending on the intensity of rains in the upper catchment areas of the Brahmaputra river and its tributaries, floods of varying intensity have become an annual feature in Kaziranga. Though the annual average rainfall in the upper catchment areas of the Brahmaputra river and its tributories may not vary very much in a year, the level of flood in its basin vary due to the intensity of rains and concentrated spells. Depending on such spells of intensive rains, flood may occur a number of times in the same year.

2.8.2. It has been observed that as long as the water level in the Brahmaputra river remains low, the run off from the river originating in the Karbi Along Hills are quickly drained out into it without flooding the Park. But with the rise of the water level in the Brahmaputra river, the water from it back flows into the Park through the rivers draining into it. The flood water of the Brahmaputra river thus enter into the Park from the wesern end through the Diflu and the Mora Diflu rivers. The southern side of the Park being a low lying area is then flooded by overtopping of the banks of the Mora Diflu river. Thus the areas under the Baguri block are the first to be submerged during the floods. The banks of the Diflu river are comparatively higher and overtopping of these banks take place only when the water level of the Brahmaputra river rises further. As such the central portion of the Park is the area which is submerged last. The northern part of the Park is submerged by the overflow of the water from the Brahmaputra river itself.

2.8.3. With the gradual receding of water level in the Brahmaputra river, the back flow stops and the tributaries start flowing and discharging into it again freeing the park from

excess flood waters. While the higher grounds dry up fast in the process the low lying areas forming sancer shaped basins, specially around the 'beels' of the southern limits of the Park on the western end remain under water for a considerable period even after the receding of flood waters from other places. The water in such areas dry up gradually through evaporation and seepage and last till December.

2.8.4. The width of the Brahmaputra river in this portion flowing along the northern boundary of Kaziranga is more than 2 Kms. and do not have a permanent well defined banks. Further, quite a few 'Chapories' (river islands) of various sizes have been formed and stabilized along the course of the river through alluvial deposits. These 'Chapories' (river islands) divide the main water course into several channels. The prominent 'chapories' in are Murkhowa, Bisbali, Hatibati, Janeki, Lumsali, Koloni and Nasle. These seven chapories have since been notified as Reserved Forests. During the recent years a few more chapories have been formed and stabilized. Some of these chapories have now become contiguous with the main land mass of Kaziranga which were earlier separated by shallow channels of the Brahmaputra through extensive sand beds during the dry season. The beds of some of the 'beels' and streams situated inside the Park are also being silted up by the annual floods.

2.8.5. Flood is one of the major factors, contributing towards creation of different site conditions and soil formation preferred by different types of vegetation. The areas wherefrom the water do not dry up completely have creates swampy grounds which support a different type of vegetation compared to the grounds that dry up quickly after flooding. Similarly, there are water logged and other marshy areas which support a different type of vegetation. In some areas, it contribute towards formation of clayey soil by alluvial deposits and in some places it arrests the progress of soil development by sand deposition, thus creating different soil types preferred by different types of vegetation.

2.8.6. The influence of flood on the wildlife population of the Park is marked by regular seasonal movement of some animals like Elephants and Gaurs to the Karbi Anglong Hills. Other animals inhabiting the low lying areas along the southern part of the Park, including the Rhinoceros move out to these hills for shelter as soon as the Park is submerged by the incoming flood waters. The animals of the central and northern portion of the Park seek shelter in the forested high lands within the Park. Some animals, specially the deer inhabiting

the river islands are washed away by the turbulent waters of the Brahmaputra river while some animals on their way to the hills through the populated villages and across the highway get killed by poachers and runover by fasting moving vehicles. Some young animals do die due to drawning.

2.8.7. During high floods, the favourite grazing grounds of the animals around the beels comprising of short grasses go under water and only the tip of the tall coarse grasses and reeds remain above the water level in the low lying areas. The tree forest areas which are comparatively in higher grounds are devoid of any grass growth. As such the grazing animals in some areas suffer from fodder shortages during floods. The rhinoceros, buffaloes and elephants can feed on the submerged grasses, who bring out mouthfull of grasses from under the water and chew tham above. When the flood is prolonged some animals do suffer from malnutrition and cases of death due to starvation and disease at such times can not be ruled out, specially in case of the weak and older animals. The forest dwellers like the Smabhar, who is a brouser is not effected as much as the grazers. The Elephants and Gaurs habituated to retreat to the hills during the rains, now a days find it difficult to find shleter due to opening up of the hill slopes through massive deforestation and blocking of the migration routes by human settlements and cultivations. As a result, the regular to and fro movements of these animals from the Park to the hills have almost stopped.

2.8.8. The Chapter on flood wil remain incomplete without a word about the vast fish fauna of the park inhabiting the numerous water bodies inside it. As soon as the Park is flooded the fishes from the water bodies come out to lay eggs in the fast flowing current of the flood water. The fishes from these areas replenish the stock of the Brahmaputra river going out to it along with the receding flood waters. In the same process the stock of fish in other water bodies both inside and outside the Park are also replenished. Thus Kaziranga serves as a breeding ground for fishes.

2.8.9. Flood also hampers in the management of the Park by disrupting the means of communication to the various antipoaching camps. Many antipoaching camps situated in strategic and low lying areas of the Park are submerged upto the roof top facing the inmates to desert their posts. The poachers take advantage of the situation and become very active during such times.

2.8.10. There is a popular misconception that

the annual floods are a source of great danger to the existence of Kaziranga since large number of animals either die or washed away at such times and also causes loss to the land mass by way of erosion. But the loss of a few individual nimals is insinificant compared to the overall effect of the floods on populations, communities and eco-systems as a whole. The annual inundation is not only beneficial but essential for supporting the sub-type of vegetation known as "eastern wet alluvial grassland" which covers almost two third of the park area. The flowing flood waters help maintain a balance in the cycle o production - consumption - decomposition of organie matter and replenish the nutrient level. The present high ratio of productivity/biomass in Kaziranga could be achieved only because of the annual flooding.

2.8.11. The loss of a few animals due to floods, in the long run, will have the beneficial effect of a process of natural selection, by removing the weak and improving the quality of the remaining stock. The damage caused by erosion in the alluvial flood plain of a geological young river like the Brahmaputra is bound to occur naturally. The examination of maps prepared at successive interrals, show that there has been no aggregate loss to the area of the park over the years. along the entire 50 Kms. northern stretch, erosion at one point have been compensated by accretions at another.

The study of landsat imagery of the Park of the year 1973 and 1977 and its comparision with the topographic maps of the Survey of India indicate that large scale accretions have taken place in the north western boundary of the Park while erosions have been noticed along the north eastern boundary.

2.8.12. Flood is an essential component of the Kaziranga eco-system and it has thrived for centuries in spite of it. This is because, the very rhythm of life and the intricate web of the life support system in Kaziranga are linked with the annual cycle of floods. We may from the human point of view construct a few flood shelters to mitigate the sufferings of the animals but any attempt to control the floods will not only be futile and shear wastage but will also seriously upset the eco-system and ruin it beyond repair.

2.9. Fire :

2.9.1. Like the annual floods, fire is the other most important component of the Kaziranga eco-system. The annual burning of the grass lands helps in arresting the progress

of the process of vegetational succession maintaining it as an edaphic sub-climax described as "eastern wet alluvial grassland". The soil condition in the higher grounds in a climate like that of Kaziranga present an ideal condition for tree growth of evergreen species. Pioneer fire hardy tree species do try to colonise the grass lands in such areas by profuse regeneration along the existing tree forests. But the process is kept in check by the annual burning followed by heavy incidence of grazing in these areas.

2.9.2. Controlled burning of the areas comprising of tall reed grasses is carried out by the Park staff from December onwards in patches. Though the driest months are from December to march the grass never dry up uniformly all over the Park due to the presence of moist localities where the grass remain green even during these months. As such burning takes place only in about 30 to 40 percent of the Park area. Moreover due to the inadequacy in the number of part staff compared to the vastness of the task of controlled burning, many areas remain unattended.In areas where burning do not take place for more than one year, the annual growth and the dead stems of old reed grasses grow into such impregnable mass of tangled vegetation that animals passing through such areas have to literally tunnel through it. No othr vegetation including grasses grow under such such thick mass of tall grasses and hence such areas not not frequented by the animals. Besides these, the areas covered by tree forests remain free from burning which also act as fire breaks. The short grass areas around the 'beels' also remain free from fire.

2.9.3. It is observed that animals tend to concentrate in freshly burnt patches and relish the partially burnt stems of the reed grasses such as Arund donax, Phragmites karka, Erianthus ravanae, etc. New and tender shoots of these grasses come up immediately after the burnt areas receive a few winter showers. The precipitation in the form of dew also help in fresh growths. These areas comprising of tall and coarse reed grasses and otherwise beyond the reach of the smaller animals and are not palatable except when they give out tender shoots. At this time of the year, the animals arefound to graze in the burnt patches rather than on the short grass areas around the 'beels'.

2.9.4. No casuality of animals due to fire has ever been noticed. Occasional casuality amongst the slow moving reptiles like the Python and Ground birds can not however be ruled out.

2.10. Terrain and Soil :

2.10.1. The entire area of the Kaziranga National Park is more or less a flat land interspersed with water channels and 'beels'. There are a few very small hillocks on the extreme western end of the park known as the Malini hills. The land has an easy slope from east to west.

2.10.2. The soil of the entire Brahmaputra basin is formed by sedimentation and silt deposition. The soil overlying the sandy deposits at places are very deep while at some places it is of very recent origin consisting mainly of sand, devoid of any humus or decomposed organic matter. As such the soil at different places vary from sandy soil, sandy loam, clayey loam to purely clayey soil.

2.11. The Flora :

2.11.1. The area of the park can be conveniently divided into three distinct categories, viz. the tree forests, the grass lands and water bodies called 'beels'. 27.98% of the total area of the park is covered by tree forests, 66.44% by grass lands and 5.58% by the water bodies. The percentage of tree forest area is more on the eastern side while the percentage of grass lands and water bodies is more on the western side.

2.11.2. The tree forests occupy the comapratively higher grounds along the central portion and the eastern portions of the park. The newly colonised areas along the bank of the Brahmaputra river consists mainly of scattered growth of Salmalia malabarica and Albizzis procera. Though profuse regeneration occur in such areas the seedlings fail to establish due to annual fire. Thus further progress of the vegetational succession is arrested. The other tree species in this type of formations are Albizzia labbek, A. stipulata, A. odorotisima, A. lucida, Careya arborea, Premna latifolia, Lagerostroemia parviflora, Dillenia pentagyna, Zizyphus jujuba, etc. The undergrowth in addition to the grasses like Erianthus ravaneae, Saccharum spontaneum , S. procerum, Imperata cylindrica, etc. consist of Clerodendron spp., Alpinia allughas, Leea spp. In moist localities and lowlying marshy areas, patches of Barringtonia acutangula and Craeteva religiousa grow with Lagerostroemia flosreginae occupying the slightly higher grounds.

2.11.3. The evergreen tree species predoninates the stable high grounds alongwith cane breaks. The undergrowth

in such forests are very thick. Grasses are completely absent from the ground flora. A typical patch of such type of forest may consist of numerous species such as Salmalia malabarica, Albizzia spp., Premna spp., Lagerostroemia spp., Trewia nudiflora, Tetrameles undiflora, Stereospermum chelonoides, Alstonia scholaris, Spondias mangifera, Vitex peduncularis, V. trifoliate, Dysoxylum procerum, Eugenia spp., Eheretia acuminata, Ficus spp., Bischofia javonica, Dillenia indica, Pterospermum acerifolium, Cedrella tuna, Anthocephalus kadamba, Bridelia refusor, Kydia calicina, Sterculia villosa, terminalia belerica, Litsea polyantha, Artocarpus chaplasa, Mallotus phillipensis, Oroxylum indicum, Salix tetrasperma, Talauma hodgsonii, Wrightia tomentosa, Holorrhena antidysentrica, Aesculus punduana, Schima wallichii, Gmelina arborea, Randia domatorum, Erythrina indica, etc. The main species forming the undergrowth are Polyalthia jenkinsii, Laportea crenulata, Phlogocanthus curriflorus, Melastoma spp. Alpinia alughas, Clinogynae dicholoma, Calamus spp., Rauwolfia serpentina, Solanum ferox, Solanum indicum, Xanthium strumarium, Ageratum conizoides, Eupatorium odoratum, Mimosa pudica, Amaranthus spinosus, Flemengia spp., Clerodendron infortunatum, Calocasia esculenta, Aeschynomene indica, Cassia tora, Polygonum spp., Adhatoda vasica, Coffia bengalensis, etc. The climbers in this type of forests are Vitis latifolia, Paederia foederia foetida, Ichnocarpus frutiscence, Cardiospermum halicalbum, Mikenia scandens, Smilex vaginata, Mucuna bracteata, Trichocanthes dioca, Tinospora cardifolia, Ficus scandens, etc.

2.11.4. Almost two third of the Kaziranga National Park is covered by grass lands consisting of both grasses and reeds. The reeds attain a height of 4 to 6 metres during the monsson and the main species are Erianthus ravanae, Arundo donax, Phragmites karka, Imperata arundinacea, Neyraudia reynaudiana, Typha elephantina, etc. The newly formed soil are mostly covered by Saccharum spp., Imperata cylindrica, Erianthus filifolius, Cymbopogon pendulus, Pollinia ciliata, etc. mixed with Tamarix dioca.

2.11.6. The most important grass lands of the Park are those that are found around the open areas and banks of the beels which remain under water during monsoon and dry up during wnter comprising of loamy soil. Such areas are covered by shorter grasses like Cynodon dactylon, Chrysopogon aciculatus, Andropogon spp., Pennisetum spp., Eragrostis spp., Themeda villosa, Apluda mutica, Arundinella bengalensis, Hemarthria spp., Digitaria setigera, Hygroryza aristata, Cenchrus ciliaris, etc.

2.11.7. The water bodies harbour a variety of aquatic flora. The important species are Andropogan spp., Ipomea raptans, Enhydra fluctuans, Pistia stragioles, Lemna pencicostata, Eichhornia crassipes, Azolla pinnata, Utricularia flexuosa, Trapa natans, Ceratophyllum demersum, Limnophila sessiliflora, Ottelia alismoides, Vallisneria spiralis, Cryptocoryne retrospiralis, Polygonum caespitosum, Typha elephantina, Monochoria hastata, Cyperus brevifolius, Lasia spinosa, etc. In addition to the aquatic vegetation, some 'beels' have small floating swamps. The water bodies are also full of various species of fresh water fishes.

2.12. The Fauna :

2.12.1. Kaziranga is rightly called the 'Home' of the Indian Rhnoceros. But in addition to rhinos many other endangered species of animals, reptiles and birds, such as the tiger, the Asiatic Elephant, the Water Buffalo, the Guar, the Swamp Deer, the Hoolock Gibbon, the Capped Langur, the Fishing Cat, the Python and the Florican are also dependent for their survival on the proper conservation and management of this Park. The number of large mammals of different species counted inside the park during successive census operations since 1966 are as under :

Species	1966	1972	1978	1984	1991	1993
Rhino	366	658	939	1080	1129	1164
Elephant	349	422	773	523	515	1094
Water Buffalo	471	555	610	677	1090	1034
Gaur	1	18	23	30	5	-
Swamp Deer	213	516	697	756	635	427
Sambhar	120	105	215	158	55	34
Hog Deer	4000/5000	6000/6500	6855	9872	2911	2048
Barking Deer	29	76	95	33	NA	24
Wild Boar	155	522	733	1645	555	140
Bear	2	6	4	2	NA	2
Tiger	20	30	40	52	50	60

2.12.2. Scientific management of wildlife calls for constant monitoring of the number and population trend of the different species of animals inhabiting an area and the evaluation of various ecological parameters interacting with

the habitat and he factors influencing them. As a part of this programme attempts to ascertain the size of the Rhino population in Kaziranga was made for the first time in 1957 followed by another in 1963. However, systematic census operation covering all the large mammals have become a regular feature of the park management only since 1966. The successive census operations have been carried out every six years in 1972, 1978 and 1984. A sample census was also carried out in 1989. The six year interval in carrying out the census operations have not been fixed by any design. But due to administrative and practical reasons, we have been somehow adhearing to the cycle.

2.12.3. From the successive figures of census operations, it is evident that there is an overall increase in the population of the different species. In case of the rhinoceros, it has been observed that though the gross number of animals have increased over the years the rate of growth is slowing down. The number of rhinos according to sex and age classification counted during the census operations are as under :

Year	Number of Rhinos				
	Non-sexed	Adult Male	Adult Female	Young	Total
1966	172	67	83	44	366
1972	119	203	188	148	658
1978	43	331	322	243	939
1984	134	316	329	301	1080
1991	184 (+60)	338	357	190	1069 (+60)
1993	222	387	379	176	1164

2.12.4. From the successive census figures it is observed that the largest number of rhinos have been recorded in the Baguri block on the western end of the park. The population density in this block works out to be 1 (One) Rhino for every 43.82 hectares in 1966, 22.26 hectares in 1972, 17.73 hectares in 1978 and 13.92 hectares in 1984 against the average density of 103.34 hectares in 1966, 57.48 hectares in 1972, 40.28 hectares in 1978 and 35.02 hectares in 1984. The following table gives the area of the block, the number of rhinos counted and the average area available per rhino :-

Name of the Block	Area in hect.	No. of Rhinos counted				Available area per Rhino in Hectare.			
		1966	1972	1978	1984	1966	1972	1978	1984
Agaguri	6,830.11	157	309	383	494	43.82	22.26	17.73	13.92
Haldhibari	3,970.01	49	106	218	263	81.02	37.45	18.21	15.09
Kaziranga	4,470.20	32	34	105	81	139.69	131.47	42.57	55.18
Panbari	4,378.44	30	64	92	64	145.95	68.41	47.59	68.41
Tamulipathar	4,012.21	9	16	24	23	445.80	250.76	167.17	174.44
Coralimora	3,423.22	8	14	17	7	427.90	244.52	201.37	488.03
Kharighoria	4,992.37	22	60	58	77	226.93	83.21	86.08	64.84
Bhawni	5,695.87	59	55	37	71	96.54	103.56	153.94	80.22
	37,822.43	366	658	939	1,080	103.34	57.48	40.28	35.02

2.12.5. The mortality figures worked out for different causes such as matured death due to old age, death caused by floods, death due to tiger predation and death due to poaching are compiled on the basis of available records as shown on the chart on mortality of rhinos in Kaziranga. From this chart, it would be evident that predation by tiger on young rhino calf is a regular feature and that the incidence of poaching have gone up by leaps and bounds during the past few years.

MORTALITY OF RHINOS IN KAZIRANGA

Year	Natural death				Death due to Flood				Predation		Poaching				Total
	Adult		Young		Adult		Young		Young		Adult		Young		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
1965	10	9	-	-	-	-	-	-	4	2	14	4	-	-	43
1966	4	5	-	-	-	-	-	-	1	1	2	3	-	-	16
1967	10	13	-	-	-	-	-	-	2	2	6	4	1	1	39
1968	5	7	-	-	-	-	-	-	8	3	7	3	-	-	33
1969	9	3	-	-	-	-	-	-	2	1	1	-	2	5	23
1970	12	8	-	-	-	-	-	-	4	2	2	-	-	-	28
1971	8	5	-	-	-	-	-	-	6	1	4	2	1	1	28
1972	7	9	-	-	-	-	-	-	2	2	-	-	-	-	20
1973	20	19	-	-	-	-	2	2	7	9	2	1	-	-	62[1]
1974	6	7	-	-	-	-	1	-	2	4	2	1	-	-	23
1975	22	7	-	-	-	-	-	-	3	2	3	2	-	-	39
1976	10	5	-	-	-	-	-	-	3	3	-	-	1	-	22
1977	13	12	-	-	-	-	-	-	7	5	-	-	-	-	37
1978	8	8	-	-	-	-	-	-	4	5	3	2	-	-	30
1979	10	5	-	-	-	-	-	-	3	1	2	-	-	-	21
1980	18	17	2	-	3	3	4	3	4	4	6	5	-	-	69*

Year	Natural death				Death due to flood				Predation		Poaching				Total
	Adult		Young		Adult		Young		Young		Adult		Young		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
1981	9	8	-	-	1	-	3	3	8	7	8	12	4	-	63
1982	16	14	-	1	2	-	-	-	8	6	11	9	5	1	73
1983	17	13	2	-	-	-	-	-	8	5	15	14	5	4	83
1984	20	13	3	2	-	-	-	-	4	5	15	12	2	2	78
1985	13	8	-	2	-	-	1	-	7	6	24	16	2	2	81
1986	16	7	-	-	-	1	-	-	9	5	24	1	3	-	83
1987	14	12	2	-	-	-	3	3	6	4	11	11	1	-	64
1988	16	21	2	-	14	8	15	11	11	8	9	13	1	-	129
1989	15	13	5	5	-	2	-	-	8	6	22	20	1	1	98
1990	21	12	5	7	-	-	-	-	7	6	16	12	3	3	92
1991	24	19	2	7	3	1	1	-	13	10	8	9	2	3	102
1992	20	13	8	10	-	-	-	-	9	6	20	17	5	6	113
1993	13	11	4	5	-	1	2	4	7	10	18	12	2	4	93

In 1973 ten rhinos died due to Haemorrhagic sceptisemia immediately after the floods. There had been no other incidence of death due to disease. 13 cases of death during 1980 and 48 cases of death during 1988 are attributed to floods. Such deaths are exceptional cases rather than the rule.

2.13. Poaching :

2.13.1. Poaching of rhinos poses to be the greatest threat against the continued survival of the species in this world. The problem of rhino poaching has global implications and it is not confined to Kaziranga or Assam alone. The operation is not the work of isolated individual or groups of individual. These are the works of well organised gangs having international links. The poaching organisation works like links in a chain. The poacher who enters the park to shoot the rhino and collect its horn in the lowest man in the chain. This poacher is financed by local traders or moneyed persons. The local trader in his turn has links with financiers in urban areas. These merchants of the urban locations are connected to international smugglers located in Calcutta or in other foreign countries, who are the ultimate link in the chain. Therefore, apprehension of the local poacher constituting the lowest link of the chain do not break the organised ring of the poachers. Whenever a link is snapped, new links are formed and poaching goes on.

2.13.2. The modus operandi for killing rhinos by poachers are mainly by two methods. One is by digging pits on regular rhino trails which are nicely camouflaged and the unsuspecting animal falling into such pit traps dies either to due breaking of its neck or due to asphusciation and injury caused to it

by piercing spears placed inside the pit. The poachers go away after sometime to collect the horn. The other method is by using sophisticated fire arms such as Self Loading Rifles, Carbines and powerful Rifles. During recent years, the killing of rhinos by using fire arms have gone up. The poachers have devised other novel ways of killing rhinos by electrocution and by laying noose traps made of steel wire ropes.

2.13.3. As a measure of anti-poaching efforts, the Park is divided into sectors. In each sector, there is an anti-poaching camp manned by armed Forest Guards and other staff. These anti-poaching staff go out on regular patrolling rounds to monitor and scan the areas under their sector, looking into each and every rhino trail and evidence of the presence of poachers left in the form of foot prints. They cover the known favourite grounds of the rhinos around water bodies and the tracks leading to them. Whenever, any pit trap is detected, the patrolling staff neutralise such pits by filling and exposing them. With armed gangs, it is a do or die situation. the poachers would not hesitate to fire at our guards without any provocation to make good their escape as soon as they are detected. There had been many occasions for the staff to be engaged in armed encounters with gangs of poahcers. There had been casualities on both sides resulting from such encounters.

2.13.4. The presence of human habitation and cultivated fields right upto the boundary of the Park and the intensive fishing activities along the Brahmaputra river on the northern boundary are two major obstacles in preventing the entry of poachers into the park. The inadequate strength of patrolling staff and riding elephants are other inherent draw backs. Patrolling on foot and going into grass cover for checking is a highly risky job in a place like Kaziranga with high concentration of wild animals. Failure to obtain convictions for the poachers in the Courts due to inherent weakness of the Law is another handicap standing on the way of eliminating the poahcers. There are many other shortfalls in other spheres too which hinders proper protection and management of the Park.

2.14. Public awareness and co-operation :

The people of the state as a whole and specially the younger generation are aware about the need to conserve wildlife

and offer support to the cause by giving publicity through writings in newspapers and periodicals. The people living in the vicinity of the park, inspite of being subjected to depredations by wild animals, causing loss to their crops and property, are generally not hostile to the cause of conservation. However, a poor and backward state like Assam, can hardly afford to compensate even a part of their losses, as a token of good will and sympathy for their sufferings. Such situations sometimes do create misgivings which are not conducive to the cause of conservation.

2.15. Future Plans :

2.15.1. From what have been discussed so far, it is clear that poaching is 'the' most important problem confronting the survival of the Indian Rhino. Therefore, all future programmes and actions are planned centering around this problem so that poaching of rhinos can be kept under check, if not eliminated completely. Efforts are on to provide more inputs in the form of arms and ammunitions, wireless communication net work, vehicles and motor boats, improvement of road communications, provision of residential accommodations for the families of the staff posted in the anti-poaching camps in the interior areas of the park, establishment of an informer net work for intelligence gathering, procurement of elephants for patrolling, augumenting publicity efforts to generate public sympathy and co-operation and to augument the strength of the protection staff.

2.15.2. Besides antipoaching measures, the plan for the future also include proposals for extension of the Park area towards south, west and north of the existing boundary. Such extension will provide more rooms to the animals of Kaziranga and will make it ecologically viable on a long term basis.

2.15.3. On the southern side, a portion of the Karbi Anglong hills extending from Kohora to Baguri along the foot of the hills and parallel to the National Highway covering an area of 32.76 Sq. Kms. is proposed to be declared as a National Park. The area is under the jurisdiction of the District Council, who have already been paid funds for shifting of the effected villagers. This area is of vital importance for conservation of rhinos not only because during floods animals from the park seek shelter here, but

a few rhinos have become resident to the area. Poachers are active in this are and have taken the toll of a few rhinos during the past few years. Moreover, the Kaziranga eco-system would be incomplete without these hills for obvious reasons. The forests on these hills are being progressively denuded through shifting cultivation (slash and burn) and human occupation for settlement.

2.15.4. The second proposal for extension o the Park on the southern side consist of an area of 6.47 Sq. Kms. known as the Sildubi area. The Mihimukh visiting centre and the elephant riding point is situated in this area comprising of Sildubi village Grazing Reserve, Sildubi Professional Grazing Reserve, Sildubi Village No. 2, Kaziranga Non-cadestral area and a small portion of ceiling surplus land of Hatikhuli Tes Estate.

2.15.5. The third proposal for extension of the Park on the southern side comprises of an area of 0.6976 Sq. Km. near Panbari Reserve Forests and known as Panbari Corridor. This area is designed to provide a carridor for the to and fro movement of animals from the Park to the Panbari R.F. and then on to the hills. This is being used by the animals for to and fro movement even now.

2.15.6. The fourth proposal for extension of the Park on the southern side comprises of an area of 1.1536 Sq. Kms. known as Haldhibari corridor adjacent to the existing one.

2.15.7. The next proposal for extension on the southern boundary comprises of an area of 0.8975 Sq. Kms. known as Burapahar corridor on the western end of the Park. This proposal has since been finalised and the area has been declared to be an addition to the Kaziranga National Park.

2.15.8. The proposal for extension of the Park on the western side comprises of an area of 43,7875 Sq. Kms. known as the Deosur area. The addition of this area will extend the park boundary on the western side upto Kukrakata Reserve Forests. The cost of acquisition of land amounting to more than Rs. 2.3 million have already been paid and the proposal is in the final stage now.

2.15.9. The proposal for extension of the park on the northern side comprises of an area of 401.5 Sq. Kms. which includes the entire Brahmaputra river abutting the National Park from Dhansirimukh in the east upto Silghat Bridge on the West right upto the northern high bank. All the riverian islands within this stretch of the river will automatically form a part of the Park when the proposal is finalised. This will eliminate the fishing activities on the river which the poachers now use as a spring board to enter into the Park in the guise of fishermen.

2.15.10. When all these proposal are finalised, the park area will go upto 917.20 Sq. Kms. from the existing 429.93 Sq. Kms. Besides the National Park proper the area of Kukrakata Reserved Forests - 10.87 Sq. Kms. Kamakhy Hill Reserved Forests - 5.18 Sq. Kms. and Bagser Reserved Forests - 33.67 Sq. Kms. which would become contiguous to it are proposed to be managed and administered as a buffer to the Park. For this purpose, necessary infrastructures are already under construction in the area.

2.16 Research :

2.16.1. For years together Kaziranga has been jealously guarded as a sanctum sanctorum for the Indian Rhino. With the tangled mass of problems confronting the protection of Kaziranga, the management could not devote much time for research and study of the ecology of the rhinoceros in Kaziranga so far. Informations on many vital aspects concerning the Indian rhino are lacking at present. In the future plan of actions therefore, research would be given a very high priority. With this in mind a post of Research Officer has already been sanctioned for Kaziranga. More inputs are envisaged for the purpose after the formulation and finalisation of the project.

3. Orang Wildlife Sanctuary
(Renamed Rijiv Gandhi W/L Sanctuary in 1992)

3.1. After Kaziranga, the next most important area for conservation of the Indian Rhino is the Orang Wildlife Sanctuary. It is located within the limits of 92°15'E and 92°30'E Longitudes and 26°30'N and 26°40'N latitudes. It falls partly ounder Sonitpur and partly under Darrang Districts of Assam. It is situated on the north bank abutting the river Brahmaputra down stream of Kaziranga. Its area is 71.98 Sq. Kms.

3.2. Orang can be approached by road from N.H.52 from Dhenuguri and also from Sirajuli during the winter months. Visitors coming by air would have to take the flights either to Guwahati or to Tezpur and then travel by road. The Forest Range Office is located at Silbori and a Tourist Complex is also coming up in the same location. Silbori is approximately 175 Kms. from Guwahati and 90 Kms. from Tezpur. There are several kms. of fair weather forest road through which the different areas inside the Sanctuary can be approached.

3.3. Past History.

3.3.1. Orang isalso situated in the flood plains of the Brahmaputra river. It is made up of alluvium of recent and subrecent origin having two distinct alluvial terraces. The lower alluvial terrace is of recent origin and is situated on the southern part of the reserve abutting the river Brahmaputra. The older, higher alluvial terrace is located on the northern part of the reserve. There is a sharp distinction between the two terraces in the form of a high bank in the central part between the Dhansiri and Panchnoi rivers. In other regions, the higher terrace merges imperceptibly with the lower one.

3.3.2. Though no recorded history is available, it is evident from the existence of man made ponds that there were once human settlements inside Orang. Before the advent of the present century due to some reasons or the other the settlements were abandoned and secondary succession and annual flood and fires resulted in the formation of the grass lands.

3.3.3. In 1915 an area of 80.54 Sq. Kms. was notified as 'Orang Game Reserve' vide notification No. 2276/R Dated 31st May, 1915. Later on an area of 17.29 Sq. Kms. was dereserved for settlement of people who were brought from erstwhile East Bengal (now Bangladesh) under the 'Grow More Food' programme, vide notification No. 3778/R, dated 30th Nov.,1931. Subsequently, an area of 8.73 Sq. Kms. lying to the east of Panchnoi river was added as Ist addition to 'Orang Game Reserve' by notification dated 18th June, 1969. Thus the area notified as Game Reserve works out to be ;

No. 2276/R Dated 31.05.1915	-	80.54 Sq.Kms.
No. 3778/R Dated 30.11.1931 (Dereserved)(-)		17.29 "
Ist addition notified on 18.06.1969		8.73
		71.98 Sq.Kms.

3.3.4. In the mid-sixties a programme for afforestation of the grass lands with fast growing species was taken up all over the country to convert the savannah formations to wood lands. The grass lands were considered to be a waste and unproductive land. The fact that the Savannah formations have a peculiar ecology of their own which are the result of both edaphic and biotic factors was ignored. In some cases, such grass lands resulting from secondary successions formed edaphic climax. The grass land eco-systems are eminently suitable for the terrestrial mammals and even though such areas harvoured vaieties of fauna, the conservation aspect was completely neglected. This has led to disappearance of amny of the grass land fauna from their earlier range of distribution where such habitats have been destroyed.

3.3.4. Under this programme, afforestation of grass land areas was taken up in our State also in different areas. In Orang reserve also plantations of fast growing species was tried for a few years in the mid-sixties. The higher terrace was planted up with mixed degrees of success in raising plantations. Although plantations have not been a complete success, the presence of additional staff for executing the works led to better surveillance of the area and indirectly resulted in better protection of wildlife, particularly the Rhinos. As a result, there was an apparent increase in the number of animals in the area. Attempts to raise plantations were ultimately given up in 1965 and the reserve was transferred to the Western Assam Wildlife Division in 1972. Since then, the area is completely dedicated to the cause of wildlife conservation and managed as a wildlife sanctuary. No forestry operation nor any exploitation is permitted ever since.

3.4.1. Surroundings and status of boundary :

3.4.1. The northern boundary resulting from the dereservation of a portion of the reserve in 1931 is now demarcated by an artificial boundary in the form of a forest road upto the Panchnoi river. The portion of the reserve east of Panchnoi which was added later on in 1969 is demarcated by an artificial line which also forms the eastern boundary till it meets the Brahmaputra river.

3.4.2. The southern boundary runs along the Brahmaputra river abutting the reserve down stream upto the confluence of the Dhansiri river with it. The Dhansiri river flows more or

less along the western boundary in a north-south direction.

3.4.3. The reserve is surrounded by cultivated fields and human habitations on east, west and the northern side. In such a suitation, wildlife depredations such as crop raiding and occasional cattle lifting leads to conflicts detrimental to the cause of wildlife conservation. On the south the riverian areas are very much disturbed by commercial fishing activities. The river islands some of which are cultivated and some harbours professional graziers act as a constant threat to the animals of the reserve. Because of the presence of populated villages around the reserve there are pressures for grazing by domestic cattle along the periphery of the reserve.

3.5. Climate :

3.5.1. The reserve enjoys typical subtropical monsoon climate, the major precipitation being during the period from May to September. The average annual rainfall is approximately 3,000 mm. The temperature varies between 7°C to 35°C. The relative humidity is high which never falls below 66% and may go upto 90% or more.

3.6. Drainage and water supply :

3.6.1. The Dhansiri river originating in the Bhutan Himalayas flows along the western boundary of the reserve and drains into the Brahmaputra river. The Panchnoi river also originates in Bhutan Hills branching off from the Dhansiri river. These rivers have very shallow beds and branches off to many channels during the rainy season. Besides, these there are a number of streams and 'nullahs' (channels) drainin into the Brahmaputra river. More than a dozen water bodies (Ox-bow lakes of abandoned river course) dot the area.

3.7. Flood :

3.7.1. Like Kaziranga, Orang also experiences annual flooding of the area being situated in the flood basin of the Brahmaputra river. The higher terrace however remains some what free from floods caused by the overflowing of the river Brahmaputra.

The lower terrace bears the brunt of floods caused by the Brahmaputra river. The higher terrace experiences flash floods caused by the river Dhansiri and Panchnoi.

3.7.2. The effects of flood on the ecology of Orang including erosion is the same as has been described in respect of Kaziranga. But due to the existence of the higher terrace the sufferings of the animals of Orang is much less than that of Kaziranga.

3.8. Fire :

3.8.1. The same practice of controlled burning of the grass lands as in Kaziranga is practised in Orang also. The effects of burning on the ecology of Orang is also the same as that of Kaziranga. The only difference is that the areas which have been successfully planted up under the programme of afforestation of grass land areas by quick growing species are afforded meticulous protection from fire.

3.9. The Flora :

3.9.1. Grass land occupies nearly 60% of the area of the reserve. In areas nearer to the Brahmaputra river and on recently formed soil Saccharum spontaneum is the dominant grass with Tamarix dioca as coloniser. A little farther away associations of Erianthus ravacae - Saccharum arundinaeceum - Arundo donax occur. The shorter grass Imperata cylindrica predominates alaong the banks of Dhansiri and Panchnoi rivers. The higher alluvial terrace is occupied mostly by the coarser grasses. Along the edges of water bodies, there are seasonally inundated regions containing very short grasses like Cynodon dactylon, Hemarthia compressa, Chrysopogon species, Pennisetum Spp., Eragrostis spp., Cenchrus ciliaris, etc. Such grass land areas are the favourite foraging grounds for the herbivours.

3.9.2. The water bodies support a variety of aquatic vegetation some of which are predominated by the water hyacinth. Other species occuring in these areas are Andropogon spp., Ipomea spp., Enhydra fluctuans, Pistia spp., Lemna spp., Nymphea spp., etc. The man made water bodies of the higher terrace contain Nelumbo

spp.

3.9.3. The wood lands are confined to the higher terrace only. There are natural pockets of wet miscellaneous formations containing Stereospermum spp., Dillenia spp., Lannea spp., Bischofia spp., Litsea spp., Trewia spp., Albizzia spp., Terminalia spp., etc. But such formations are limited in extent and occur in north-eastern and north-western corner of the reserve. The plantation areas mainly comprise of some Salmalia, Gmelina, Accacia, Dalbergia, Anthocephelus, Albizzia, Lagerostroemia, Terminalia, Michelia spp. and a few Teak and Eucalyptus. In the plantation areas the ground cover is an admixture of Eupatorium and coarse grasses with heavy infestation of Mikenia and occasional patches of Curcuma spp. In moister locations Fern-Mikemia associations with Alpinia occur. Natural growth of Salmalia and Accacia are also met with in a few patches inside the reserve.

3.10. The Fauna :

3.10.1. The Indian Rhino is the dominant species of the park. The other species sharing the habitat are Asiatic Elephant; Hog deer, Wild Boar and the Tiger. Besides, these there are other smaller mammals like the smooth Indian Otter, Large Indian Civet, Small Indian Civet, Fishing Cat, Leopard Cat, Mongoose, Jackals, etc.

3.10.2. The first ever detail census in Orang was conducted in the year 1985. The period from 1981 to 1984 was a period of pre-occupation for strengthening the field organisation of protection staff, equipments and administration. The work of census could therefore be planned from the later half of 1984 only. The census conducted on 27.02.1985 revealed the following figures of the Indian Rhino. The area covered during the census is less than the area of the reserve due to the fact that the compartment No. II (Ramdas Tapu) had to be left out for want of riding elephant.

Area covered in Sq. Kms.	Number of Rhinos						Total	Remarks
	Adult			Juvenile				
	M	F	Un sexed	M	F	Un sexed		
61.7	23	23	-	7	2	10	65	A check count on a subsequent date during Ist week of March showed Males - 29 Females 28 Calves - 10

The second detailed census of the Orang Sanctuary was conducted in 30th March, 1991. The rhino population as per census are as below:

Area covered in sq. k.m.	Number of rhinos						Total
	Adult			Juvenile			
				Juvenile			
	M	F	U/S	M	F	U/S	
75.6	28	41	5	-	1	22	97

The number of large mammels of different species counted during the census are as under:

Type of animals	Adult			Sub Adult			Calf below 1 yr.	Total	Last Census done in 1985
	Male	Female	Un Sexed	Male	Female	Un Sexed			
1. Rhino	28	41	5	-	1	14	8	97	65
2. Hogdeer	238	322	97	21	53	59	77	897	457
3. Wild Boar	46	86	21	-	-	21	70	241	114
4. Tiger (sighting)	4	1	3	-	-	-	1	9	17 (Total Census)
5. Elephant	5	-	-	-	-	-	-	5	4
6. Porcupine	-	1	9	-	-	-	2	12	-
7. Civet Cat	-	-	2	-	-	-	-	2	-
8. Hare	-	-	5	-	-	-	-	5	-
9. Monkey (Reasus)	1	2	2	-	-	-	3	8	-
10. Python	-	-	5	-	-	-	-	5	-
11. Lizzard	-	-	3	-	-	-	-	3	-
12. Cobra	-	-	1	-	-	-	-	1	-
13. B. Florican	4	4	-	-	-	-	-	8	-

3.10.2. The mortality figures for the five years period from 1980 to 1984 are shown below:

Year	Natural death	Death due to Poaching	Total
1980	2	3	5
1981	3	2	5
1982	8	5	13
1983	9	4	13
1984	7	3	10
1985	1	8	9
1986	1	3	4
1987	3	4	7
1988	2	5	7
1989	3	3	6
1990	1	-	1
1991	2	1	3
1992	3	2	5
1993	2	-	2

From these figures, it is evident that poaching presents the greatest threat to the survival of the rhino population in this reserve. There had been reports of death of 5 Rhinos due to Anthraz in 1966.

3.11. Future Plans :

3.11.1. The main thrust of all plans in the near future are aimed at combating the menace of poaching. In this direction efforts are on to increase the number of Forest Guards, Guard Posts and to equip the staff with arms and wireless communication net work.

3.11.2. The reserve is surrounded by populated villages all around except on the river front. As such there is no scope for expanding the any further. However, steps have been taken to extend the reserve including the entire stretch of the Brahmaputra river abutting the reserve and the riverian accretions within this stretch which will cover an addition area of about 20 Sq. Kms. bringing up the total extent of the reserve to 92 Sq. Kms.

4. Manas National Park

4.1. The rhinos of Manas originally formed a part of the population occupying the higher reaches of the valley extending

westwards through Manas Reserved Forests, Chirang Reserved Forests, Ripu Reserved Forests to Buxa Reserved Forests and the Jaldapara Wildlife Sanctuary in West Bengal. These Rhinos were pushed out from the valley lands due to pressures of human settlements and extension of cultivations. The distribution later on became discontinuous due to fragmentation and disappearance of suitable habitats. The last link in this chain of distribution between Manas and Joldapara populations was snapped when the last rhino in Haziraguri area of Ripu Reserved Forests was killed by poachers in 1962.

4.2. Manas elavated to the status of National Park in Sept, 1990 is situated in a lower strip extending in the foot of the Bhutan Himalayas in a linear strip extending in the east west direction between the longitudes 90 30' E33333 and 91° 15' E a3nd latitude3s 26° 30' N and 27° 0'N, partly under the civil district of Barpeta and partly under Kokrajhar. It extends over area of 500 sq.km extending from Alabari river in the East upto Sukanjan river in the west. The northern boundary between India and Bhutan while the southern boundary is formed by a artifically demarcated line in the form of a forest road. The extended area of the National Park includes Panbari, Kahitama, Kokilabari R.Fs.

4.3. The National Park can be approached by rail and road. The main Railway line connecting Assam with the rest of the country runs almost parallel to the southern boundary and is served by a number of Railway stations. Barpeta Road Station is the gateway and also the headquarter of the Field Diretor, Manas Tiger Reserve, who heads the administration of the Manas Sanctuary. The alternative approach is by air upto Guwahati and thence by rail cum road or by road alone. The distance from Guwahati to Barpeta Road by road is 140 Kms and hence another 20 Kms to the southern boundary of the Sanctuary.

4.4. Past history:

4.4.1. The Manas Wildlife Sanctuary is comprised of North Kamrup Reserved Forests and a part of Manas Reserved Forests. The North Kamrup Reserved Forests was constituted by notification No.1091 R dated 23rd July, 1912 comprising of an area 233.59 sq.Kms. Later on another area of 37.04 Sq.Km. was added to the reserve by notification No.3296 R dated 15th December, 1925. The Manas Reserved Forests was constituted

by notification No. 1886 R dated 11th July, 1927 covering an area of 770 Sq. Kms. The Manas Wildlife Sanctuary comprising of the entire 270 Sq. Kms. area of North Kamrup Reserved Forest and 120 Sq. Kms. of a part of Manas Reserved Forests was constituted into a Sanctuary in 1928.

4.4.2. The status of Reserved Forests afforded protection to the Wildlife population since its inception against hunting under the Assam Forest Regulation, 1891. Vast areas of swamps and low lying grass lands were extend towards the south of the reserves extending upto the Brahmaputra river. The population was thinly distributed and scattered over the area. Wildlife of various species were found in abundance. But the scenerio started to change with mounting pressures of human settlements and extension of cultivation by draining out the swamps and transforming the grass lands. It was at this stage that the area was declared a sanctuary in 1928 to save the remaining vestige of varied life forms.

4.4.3. Forestry operations to exploit the timber resources of the region were carried out during the Forties and early Fifties. Operation of Accacia catechu, a tree species yielding 'Khoir' (Kutch & Catechu) continued till 1964. But since 1964 all operations were stopped. The area is fully dedicated for the cause of wildlife conservation ever-since.

4.5. Surroundings :

4.5.1. The Manas National Park is blessed with an ideal surrounding which no other protected area enjoys. The southern boundary only is occupied by populated villages. Continuous belt reserve forests extends from both the eastern and western boundaries of the Sanctuary. On the northern side across the international boundary lies the Manas Wildlife Sanctuary of Bhutan covering an area of 439 Sq. Kms.

4.5.2. The Bhutan Manas Wildlife Sanctuary and the Manas Wildlife Sanctuary of Assam together constitute ecosystem comprising of the hills and plains. The animals inhabiting the two sanctuaries are unaware about the political boundaries and freely utilise the habitat on both the countries. The salt

licks on the hill slopes and the streams originating in the Bhutan Himalayas are the added attractions for the animals of the plains. The existence of the Bhutan Manas Wildlife Sanctuary all along the northern boundary not only provides more room for the animals but also makes protection of the area somewhat easier from that direction.

4.5.3. One negative point is that on the eastern part of the N.Park close to the southern boundary, there is a forest village occupying an area of approximately 405 hectares having a population of around 2000. This is a very old village and the people are so rooted to the land that there is practically no scope of shifting it.

4.5.4. In addition to the forest village, there is an agricultural seed farm, belonging to the State Farming Corporation of India, a Government of India Undertaking, right inside the Sanctuary on the south eastern corner. The farm occupies an area of hectares of pristine wildlife habitat. Though talks of shifting the farm from inside the sanctuary started way back in 1974, immediately after launching the Project Tiger in Manas, it is still continuing there in full swing.

4.6. Climate :

4.6.1. Though Manas is situated in the Sub-tropical zone, it enjoys a moist tropical climate. The mean maximum summer temperature goes upto 37°C and the mean minimum winter temperature is about 11°C. Rainfall is evenly distributed through out the year - December and January being the driest months and June and July are the wetest. The relative humidity is high almost through out the year.

4.7. Drainage & Water supply :

4.7.1. The Manas N.Park is traversed by numerous rivers and streams, originating in the Bhutan Hills, flowing in a generally north south direction. The main rivers and streams are Alabari, Aigunmari, Doimari, Rabang, Goruchora, Giati, Jougrong, Manas, Gelung, Goberkunda and Sukanjan. Besides these, there are many other smaller 'nullahs' which provide sources of water to the animals inhabiting the area.

4.7.2. Manas is the biggest amongst all these rivers,

having its source in the snow clad mountains in the inner Himalayas and joined on its way down to Brahmaputra by a number of other smaller streams. During the rains, the river branches off to many channels often flooding the sanctuary along its banks and causing erosions and accretions at different places on its course.

4.7.3. All other streams, though carry lot of discharge during the rainy season, dry up during the winter immediately after emerging out into the plains. The water goes underground and completely disappears in the Bhabar belt. The water of these streams reappear in the Terain region on the southern boundary of the Sanctuary or beyond. This phenomenon exercise considerable influence on the distribution and seasonal movement of animals between the plains and the Bhutan hills as well as the eastern part and western part of the Sanctuary.

4.7.4. The ground water table is very low in the Bhabar areas compared to the water table in the Terai region. There is, therefore scarcity of water in many places within the Sanctuary and attempts to dig up artificial water holes in such areas have not been successful in many cases. There are however some areas having near swampy conditions within the Sanctuary, which are the favourite abodes of rhinos.

4.8. Floods :

4.8.1. Flood in the form as is generally understood in the Brahmaputra basin is absent here. But following heavy rainfalls in the hills forming the catchment of the river system draining out through Manas, floods come as a deluge over flowing the river banks, uprooting trees, causing erosion and disrupting the communication system by washing away roads and bridges.

4.9. Fire :

4.9.1. Fire plays an important role in maintaining the grass land eco-system, in its present stage of ecological succession. The authorities therefore use fire as a management tool and carry out controlled burning in well laid out segments according to a predetermined regime. The forested areas and

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the swampy localities are left out.

4.10. Geology, Rock and Soil :

4.10.1. Geologically the area belongs to the Shiwalik series. This formation belongs to Miocene to Pleistocene period and consists of mainly sedimentary rocks, bedded sand stones and grey to green clay stones with occasional modules of lime stones.

4.10.2. The soil formation is mainly from the Himalayan wash brought down by numerous streams and rivers. The soil in the northern belt comprise of Bhabar formation lying over mixed layers of boulders and gravels. The soil depth is barely few cms. Alluvial soils derived from recent deposits are met with all along the length of the areas on river banks. In the southern belt Terai formations are met with where the soil is sandy loam to clayey loam. The wate table is high and the rivers and streams from which water disappears in the Bhabar belt, reappears in this region. The soil contains good deal of humus and is very fertile. Grasses of different species intermixed with tree growths are found in all such formations which are of utmost importance from the wildlife point of view.

4.10.3. The area has a gentle south ward slope starting from the Bhutan foot hills. Some areas along the foot hills comprise of re-entran valleys and depressions with a somewhat undulating terrain.

4.11. The Flora :

4.11.1. The forest types met with in Manas are, according to the classification of Champion and Seth, Sub-Himalayan high alluvial semi-evergreen forests, East Himalayan moist mixed deciduous forests, low alluvial savannah woodland.

4.11.2. Within these forest types the habitat can be generally divided into three distinct categories, viz. the open grass land areas, the woodlands and the riverian areas. The grass land areas cover roughly about 60 percent along with the riverian

areas while woodlands cover about 40 percent.

4.11.3. The typical tree species in these types of forests are Salmalia malabarica (syn. Bombax ceiba), Albizzia spp., Eugenia spp., Lagerostroemia parviflora, Castonopsis spp., Michelia spp., Tetrameles nudiflora, Ailanthus grandis, Mansonia dipikae, Schima wallichii, Sterculia villosa, Careya arborea, Amoora spp., Terminalia myriocarpa, Duabanga sonnerotiodes, Chikrassia tabularis etc. In the riverian areas the tree species are Dalbergia sissoo, Accacia catechu, Phylanthus amblica, etc. in addition to some of the pioneer species mentioned above. Fresh alluvial deposits along the river banks are colonised by grasses of various species such as Saccharum spontaneum, Saccharum munja, Imperata cylindrica, Imperata arundinacea, Erianthus filifolins, etc. The drier soils in the Bhabar formations are occupied by tall grasses like Phragmites karka, Erianthus ravanae, Typha elephantina. The moist and swampy areas are covered by reed grasses like Arundo donax, Neyraudia reynaudiana, Andropogan spp., etc. in addition to some other plants like Alpinnia alughas, Eugenia spp., Aesculas spp. From the wildlife point o view, the fringe areas play the most important role in determining the potential of a wildlife habitat.

4.12. The Fauna :

4.12.1. The varieties of life forms come across in Manas is truely bewildering. There are more than 20 species of endangered fauna listed in the Schedule I of the Wild Life (Protection) Act, 1972. The area holds some endemic species of wildlife which are found nowhere else in the World. The Golden langur may be sited as an example alongwith the Pygmy hog.

4.12.3. In Manas more than 320 species of birds have been recorded including the Florican and three species of Hornbills. The mammalian fauna includes five species of primates, nine species of cats including the Tiger, four species of Civets, five species of Deer, besides the Indian rhino, Asiatic elephant, Indian bison (Gaur), Water Buffalo, Wild Dog, Hispid Hare and an array of other animals.

4.12.4. With the sanctuary proper as the core and the adjacent reserve forests as buffer the entire area covering 2,837 Sq. Kms. was brought under 'Protect Tiger' in 1974 which is now famous as the Manas Tiger Reserve. The Manas Wildlife Sanctuary has ever since been receiving undivided attention as one of the most prestigious conservation area of the country.

4.12.5. Though census of Tigers and Elephants have been carried out in the area, the other animals have not been covered during such census operations so far. As such the exact size of the rhino population in Manas is not known. But the authorities managing the Sanctuary estimate that there are approximately 85 - 90 rhinos in Manas. This appears to be quite a reasonable estimate and therefore acceptable. The ideal habitat for the rhino is rather limited in Manas compared to its extent, and are confined to Makhibaha, Semajhora, Rupahi, Kokilabari, Uchila, Bhatgali and Goberkunda areas only.

4.12.6. The mortality records of rhinos in Manas over the period of last 17 years are as under :

Year	Death due to natural causes	Death due to poaching	Total
1973	1	-	1
1974	1	-	1
1975	1	-	1
1976	2	4	6
1977	1	-	1
1978	-	1	1
1979	2	5	7
1980	2	-	2
1981	4	2	6
1982	2	1	3
1983	3	3	6
1984	2	4	6
1985	2	1	3
1986	-	1	1
1987	6	7	13
1988	5	1	6
1989	1	6	7
1990	2	2	4
1991	2	3	5
1992	4	11	15
1993	1	21	22
	44	73	117

4.13 Poaching:

4.13.1. From the above figures it would be seen that poaching of rhinos is gradually up in Manas also. Until recently Manas was one of the most well fotified protected asra. But the present distribution in the area arising out of an agitition demanding a separate state for the tribals, have thrown all the protection measures, meticulously built up over the years, completely out of gear. Six personnels engaged in protection duty of Manas have been killed by the extremists. Many office buildings, antipoaching camps and bridges have been burnt down forcing the protection staff to flee for life deserting the antipoaching camps and other administrative establishments located in the interior of the sanctuary.

4.13.2. Manas is facing a grave situation at the moment. Score of animals are being felled and smuggled out of the National Park taking advantage of the present situation. If the present trend continues for some more time, Manas will surely lose its status of being one of the finest conservation area of the country.

4.14. Future Plans:

4.14.1. The Manas National Park was constituted an addition of another 317 sq.kms by adding a portion of Manas Reserved Forests (west Block Part) covering the area westwards upto Kanamakra river and by including the entire Koklabari Reserved Forests within the minits of the National Park. Constitution of Manas Wildlife Sanctuary into the Manas National Park was notified vide Govt. Notification No.FRW.55/86/64, dt.7.9.90.

4.14.2. The erstwhile sanctuary along with the adjacent reserved forests, viz.Panbari, Kahitoma and Koklabari had been constituted into a National Park. After completion of all formalities in this regard the final notification declaring Manas to be a National Park was notified in 1990. Incidently it may also be mentioned here that the e3ntire area of Manas Tiger Reserve has been proposed to be a Biosphere Reserve.

4.14.3. It would be necessary to launch a massive programme of reconstruction of the damaged bridges, buildings and anti-poaching camps together with the efforts to rebuilt the morals of the staff by putting in more men, arms and equipments. Hopefully, funds should not be a constraint as Manas received from the Government of India both under tre schemes of 'Project Tiger' and 'Conservation of Rhinos in Assam'. With the repairing of the damages there would be a simultaneous effort to built up the anti-poaching machinary to the desired level of

efficiency to bring back the old glories of Manas which is a World Heritage Site.

5. Laokhowa Wildlife Sanctuary and Kochmora, Burachaporl Reserved Forests :

5.1. The Laokhowa Wildlife Sanctuary together with the two contiguous reserved forests, viz. Kochmora and Burachaporl used to be one of the important rhino habitats untill the other day. The Laokhowa Wildlife Sanctuary is situated within the civil district of Nagaon which Kochmora and Burachaporl reserved forests falls under the civil district of Sonitpur.

5.2. Laokhowa Wildlife Sanctuary can be approached from Nagaon town on National Highway No. 37 by road. The distance from Nagaon is 25 Kms. The distance from Guwahati to Laokhowa is 145 Kms. Burachaporl can be approached through Laokhowa during the dry season. But during the remaining part of the year, it can be approached only by Boat from Tezpur across the Brahmaputra river. Kochmora can be approached only by Boat across the Brahmaputra river from the north bank.

Past history :

5.4.1. The land mass of Laokhowa Wildlife Sanctuary was formed by the alluvial deposits of the Brahmaputra River in the same manner as that of Kaziranga. It was declared as a Game Reserve in 1907 by notification No. 227/71/5, Dt. 25th January. In a Game Reserve, forestry activities such as raising of plantations, exploitation of forest produce such as thatch, reed grasses, timber were permissible and had been carried out untill the late Sixties. To obtain an available source of labour for raising the plantations seven number of forest 'Taungiya' villages were established in the Game Reserve along its periphery.

5.4.2. With the increase in the population of wildlife in the area, especially that of the Indian rhino, it was considered prudent to fully dedicate the area for the cause of wildlife conservation and all forestry practices were discontinued in the early Seventies except that of fishing. In 1978, Laokhowa was constituted to be a Wildlife Sanctuary by notification No. FRS.369/78/Pt.I/17, Dt. the 6th September, covering an area of 70.14 Sq. Kms. Since then even fishing inside the Sanctuary is prohibited.

5.4.3. Kochmora Reserved Forests used to be a river island of the Brahmaputra river. After stabilisation of this river

island coupled with simultaneous growth of pioneer species of grasses and trees, the area became eminently suitable as a Wildlife habitat and a few rhinos became resident to the area. These developments prompted the authority to declare the area as a Reserved Forests by a notification No. FRS.767/78/4, Dt. 10th November, 1978. In course of time, the channel of the Brahmaputra river separating the landmass from Laokhowa Wildlife Sanctuary virtually dried up and formed into a contiguous land mass except in the flood season. Though its legal status at present is that of a Reserved Forests, it is maintained and managed as a part of the Sanctuary.

5.4.4.Burachapori Reserved Forests as the name indicates also used to be a 'Chapori' (river island) of the Brahmaputra river. When the island became stable and thereafter colonised by the pioneer species of grasses swarms of professional graziers with their cattle and buffaloes descended on the area. In due course, wild animals from Laokhowa including the rhinoceros also establish themselves in this river island. The island is contiguous to the Wildlife Sanctuary and is separated from it by a narrow channel of the Brahmaputra river which dries up during the winter months. With a view to provide more rooms to the animals of Laokhowa Sanctuary, the island was declared as a Reserved Forests by notification No. FRS.239/74/2, dtd. 10th September, 1979 covering an area of 44.06 Sq. Kms.

5.4.5. There are three hamlets of graziers on the eastern periphery of the reserve and a cattle population of around 2,000 Nos. Some plantations of Dalbergia sissoo have been also raised in the reserve. But now all forestry activities have been discontinued and the area is managed alongwith Laokhowa Sanctuary as a Wildlife habitat.

5.5. Surroundings and Status of boundary :

5.5.1. The Brahmaputra river flows along the northern boundary. The eastern, southern and western boundaries are artificially demarcated and surrounded by thickly populated villages. The area is vulnerable to intense biotic interference in the form of grazing, illegal collection of firewood, thatch and timber and also illegal fishing. This is one of the most difficult area from the point of protection and management.

5.6. Other environmental factors :

5.6.1. The climate, rainfall, topography and soil, drainage and water supply, flood and fire, etc. as well as the vegetational cover are comparable and similar to that of Kaziranga and Orang.

5.7. The Fauna :

5.7.1. The adverse influence of biotic interference and the degre of abuse perpetrated on the habitat are reflected on the animal population of the area. Apart from the rhinos the other animals found in it are a few herds feral buffaloe, wild boar, hog deer and tiger. The size of the population of these species is comparatively small.

5.7.2. A census in the area was conducted in 1966 and 41 rhinos were counted. The rhino population of the Sanctuary and its adjacent reserves showed an increasing trend as could be ascertained from the frequency of sightings. But during 1983 almost the entire rhino population was wiped out by the poachers from the area. The poachers took advantage of the disturbed situation, prevailing in the area, resulting out of an agitation on foreign national issue in Assam, when all our protection staff were disarmed and forced to flee from their posts. After restoration of normalcy in the area, when the protection staff returned to their post, they have detected as many as 43 nos. of rhino carcasses killed by the poachers.

5.7.3. Though earlier it was believed that entire rhino population was wiped out from the area, fortunately of late a few animals have been sighted in the area at Kochmara and Burachapori and in Laokhowa Sanctuary bordering the Kochmara Reserved Forests. The management estimates that there are about 6 - 10 nos. of rhinos still extant in the area. During a census in 1965 in Laokhowa proper only 2 rhinos were sighted.

5.7.4. The death figures of rhinos in this area are as follows :

Year	Death due to natural causes	Death due to poaching	Total
1979	6	6	12
1980	3	1	4
1981	2	6	8
1982	15	5	20
1983	7	43	50

Year	Death due to natural causes	Death due to poaching	Total
1984	-	-	-
1985	-	-	-
1986	-	-	-
1987	-	-	-
1988	-	1	1
1989	-	3	3

5.8. Future Plans.

5.8.1. A massive effort will have to be made to retrieve the Laokhowa area back to the rails and consolidate its status as a wildlife habitat. With this view in mind the protection measures are being augmented by putting in more man with equipments like arms and ammunitions, boats, vehicles and walkie talkie sets. The administration have also been geared up by bringing the area under the full control of the Wildlife Wing of the State.

5.8.2. It would be the endeavour of the department to shift the existing villages from within the Sanctuary and rehabitate the people elsewhere. Plans are afoot to motivate and persuade the people to agree to the shifting of the villages. Funds, more than the willingness of the people, may be the biggest constraint in achieving this aim.

5.8.3. The situation and the extent of Laokhowa area and the earlier level of rhino population (prior to 1983) which it supported signifies the role of the area as a rhino habitat of considerable importance. Plans are being formulated to add another 20 Sq. Kms. of land of the river island known as Bhojkhowa Chapori to Laokhowa.

6. Pobitora Wildlife Sanctuary :

6.1. Pobitora Wildlife Sanctuary is situated in the flood plains of the Brahmaputra river further downstream of Kaziranga, Laokhowa and Orang on the southern bank, within the newly constituted civil district of Morigaon. It is a very small sanctuary covering only Sq. Km. but is of considerable importance

from the point of view of the survival of the Indian Rhino in so far as the size of the population supported by it is concerned.

6.2. Pobitora is only 50 Kms. away from Guwahati and can be approached after driving 32 Kms. of N.H. 37 and then another 18 Kms. by a gravel road branching off from the highway.

6.3. Past history :

6.3.1. The Raja Mayang Reserved Forest and the adjacent grass land areas which were yet to be constituted into a reserved forest were known to have a resident population of few rhinos. A case of poaching was detected in 1964 and another case of death due to fighting took place in 1966. It was proposed to declare this reserve and the adjacent grass lands known as Pobitora area as a Wildlife Sanctuary in 1965.

6.3.2. Raja Mayang was already a reserved forest constituted by notification No. AFR.472/54/40, Dtd. the 21st October, 1959 covering an area of 11.98 Sq. Kms. Pobitora was declared to be reserved forest by notification No. FOR/Sett/542/65/54, Dt. 18th November, 1971 having an areas of 15.86 Sq. Kms. Subsequently, these two areas together was constituted into Pobitora Wildlife Sanctuary.

6.4. Surroundings :

6.4.1. Pobitora is surrounded on all sides by populated villages and its boundaries are demarcated by artificial lines and roads. The area is subjected to the influence of adverse biotic interference such as cattle grazing, illegal collection of thatch and fishing. These pressures are being gradually brought under control by the management.

6.5. Other environmental factors :

6.5.1. The climate, rainfall, drainage, topography and soil and effects of flood and fire are the same as that of Kaziranga and Orang. The bulk of the sanctuary is covered by grass lands and water bodies called 'Beels' with scattered patches of tree forests comprising of Bombax, Albizzia and Lagerostroemia spp. etc.

6.6. The Fauna :

6.6.1. The other species of Wildlife inhabiting the Sanctuary, besides the Indian Rhino are Hog deer, Barking deer, Wild boar, Jackals, Otters, some lesser Cats, Civets, etc. The area is occasionally visited by Leopards from the neighbouring forest areas.

6.6.2. In March 1987 the first ever census of Rhinos

The second census was carried out in April, 1993. Detail break-up of the rhino population is as under:

Adult Male	Female	Male	Female	UNSEXED	Calf	Total
18	21	1	2	3	11	56

1985	2	-	2
1986	-	-	-
1987	3	2	5
1988	5	3	8
1989	1	3	4
1990	2	2	4
1991	1	1	2
1992	2	3	5
1993	-	4	4

6.7. Future Plans:

6.7.1. Wherever there are rhinos, poaching continues to be the greatest threat endangering its survival. One of the major thrust areas in all future plannings will be the fight against poaching. The measures taken in this direction including augmenting the manpower of the protection staff with arms and equipments and establishment of wireless communication networks.

6.7.2. Some of the adjoining areas comprising of grazing reserves and Unclassed State Forests are being surveyed with the intention of expanding the existing area of the sanctuary and linking it up with the Raja Mayang area by providing a corridor.

6.7.3. One disturbing development is the proposal being taken up to introduce the 'Sanghai' (Cervus eldi eldi) commonly known as the Brow Antlered Deer of Manipur, another very highly endangered species to the area. For this project about 100 hectares of prime rhino habitat have already been fenced up and the level of the ground raised by dumping earth over it. The feasibility of such a venture not only appears doubtful but the advisebility of taking up such a project in a small sanctuary like Pobitora depriving the Rhinos from its available area of habitat is also questionable.

7. Other Rhino Habitat :

7.1. There are quite a few other habitats in Assam's Brahmaputra Valley, where the Rhinos have established itself over the years after dispersing off to such areas from the neighbouring population units. Some of these areas are existing reserved forests while some others are without having any legal status of forests.

7.2. Kukrakata and Deosur Reserved Forests are two such areas contiguous to the Kaziranga National Park towards its western boundary. These areas are included within the proposed expansion area of Kaziranga. While Kukrakata would remain as a buffer with an area aof 15.93 Sq. Kms., the Deosur area would be included within the limits of the National Park. Two other contiguous reserved forests which would also form a part of the buffer of Kaziranga are Bagser Reserved Forest having an area of 33.67 Sq. Kms. and Kamakhaya Hill Reserved Forests having an area of 5.12 Sq. Km.

7.2.1. There are at least 20 nos. of Rhinos resident in the area occupying the Swampy Valleys of the reserves. During high floods in Kaziranga, some rhinos go into the higher grounds of this reserve and the population during such periods swells upto more than 50 Rhinos.

7.2.2. Poachers are active in this area also and have taken the toll of 1 Rhino in 1984, 2 rhinos in 1985 and 1 Rhino in 1986. During 1989 poachers have killed one of our protection staff in Kukrakata area.

7.3. Sonai Rupai Wildlife Sanctuary situated in the foot of Arunachal Hills is another area where Rhinos used to be resident. The sanctuary with an area of 175 Sq. Km. is covered by extensive grasslands and evergreen forests. In the late Sixties the Rhino population in the area was estimated to be 8 - 10. But recently there had been no records of sighting of the animals there.

7.4. Desangmukh area near Sibsagar is a riverian area situated in the flood plains of Brahmaputra river having similar ecological features as that of Kaziranga with vast expanse of grasslands and water bodies. The status of the land is that of an Unclasses State Forests having an area of about 90 Sq. Kms. The estimated population for the area is 10 to 12 rhinos. The most recent poaching case of rhino was reported from the area in 1987.

7.5. The Kurua area comprising of a number of small hilly reserved forests and proposed reserved forests, viz. Kurua Hill Reserved Forests - 155 ha., Baman Hill Reserved Forests - 49 Ha., Kholihoi Proposed Reserved Forests - 600 ha., Ganesh Hill Proposed Reserved Forests - 50 ha., Teteliguri Hill Proposed Reserved Forests - 33.6 ha., Chaolkhowa Proposed Reserved Forests - 1,058 ha. with intervening swamps in the valley bottoms provide an ideal habitat for the rhino. The area is situated on the bank of the Brahmaputra river having links with the Pobitora Wildlife Sanctuary across it through riverian islands. The rhinos from Pobitora frequently come into this area and established the small population.

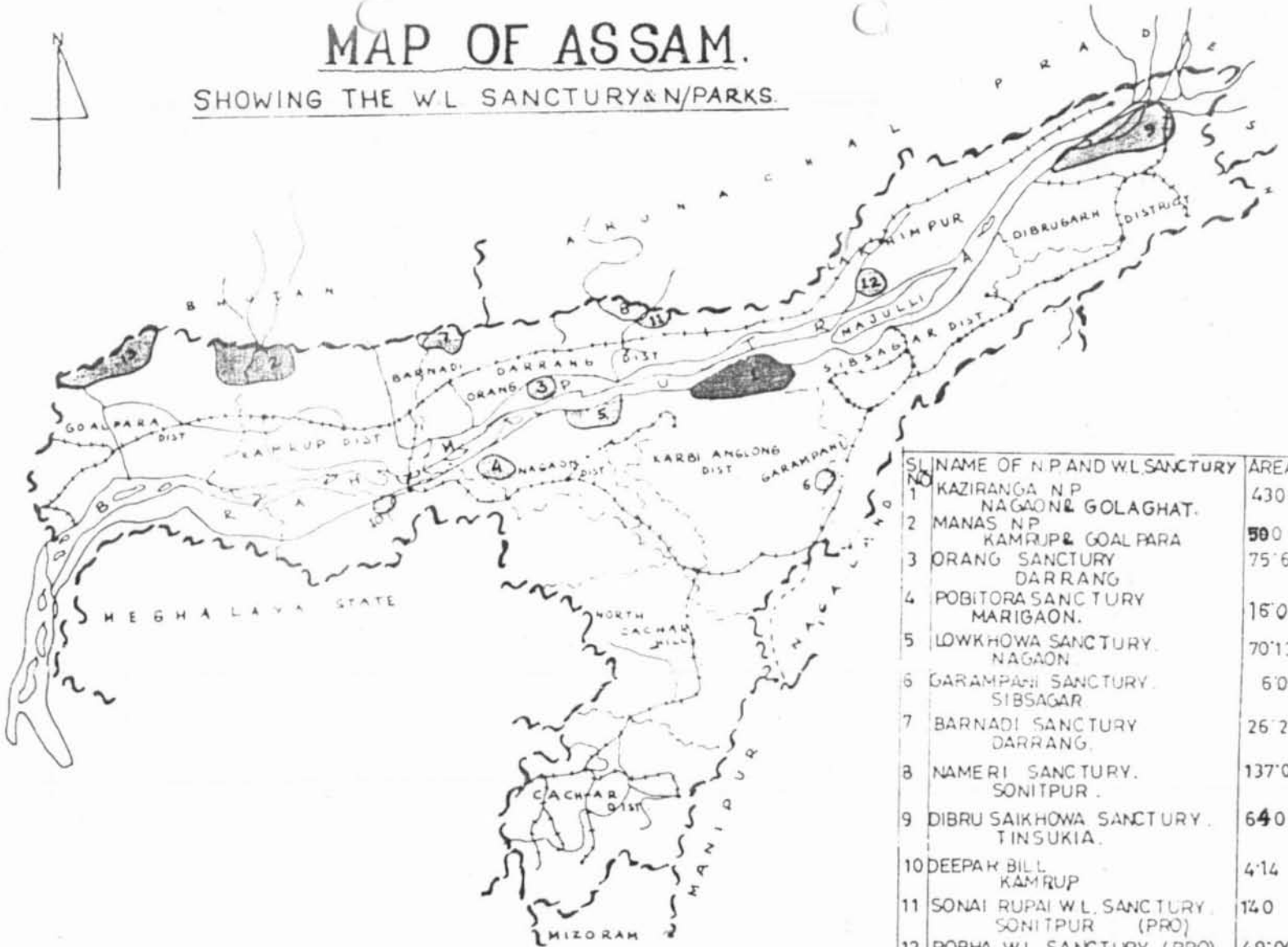
7.5.1. The population in the area is presently estimated to be around 10 Rhinos. But heavy pressure from poaching is one of the most serious decimating factor effecting the rhino population of this area. The records of poaching read as - 1980 - 1, 1981 - 1, 1982 - 1, 1983 - 2, 1984 - 3 and 1985 - 5.

7.6. Bedsides the above areas, rhinos have been known to stray into such far flung areas as Sadiya, Gohpur, Dibrugarh, Dhakuakhana, Majuli, etc. One stray rhino travelled upto Goalpara

in 1984 and would have acrossed into Bangladesh, if it would not have been caught by tranquilization in time. But inspite of best efforts, it is seen that such stray rhinos are almost invariably killed by poachers. Perhaps the endeavour should be to capture all such stray rhinos immediately after detection.

MAP OF ASSAM.

SHOWING THE W.L SANCTURY & N/PARKS.



SL NO	NAME OF N.P AND W.L SANCTURY	AREA IN SQ KM
1	KAZIRANGA N.P NAGAON & GOLAGHAT.	430 SQ KM
2	MANAS N.P KAMRUP & GOALPARA	500 " "
3	ORANG SANCTURY DARRANG	75·60 " "
4	POBITORA SANCTURY MARIGAON.	16·00 " "
5	LOWKHOWA SANCTURY. NAGAON	70·13 " "
6	GARAMPANI SANCTURY. SIBSAGAR	6·00 " "
7	BARNADI SANCTURY DARRANG.	26·21 " "
8	NAMERI SANCTURY. SONITPUR.	137·07 " "
9	DIBRU SAIKHOWA SANCTURY. TINSUKIA.	640 " "
10	DEEPAR BIL KAMRUP	4·14 " "
11	SONAI RUPAI W.L. SANCTURY. SONITPUR (PRO)	140 " "
12	POBHA W.L SANCTURY. (PRO) LAKHIMPUR.	49·00 " "
13	KACHUGAON GAME RESERVE KOKRAJHAR (PRO)	