# KAZIRANGA - MAKING WAY FOR THE TIGER RESERVE

by Pranab Pal

## Introduction

Assam's Kaziranga National Park (KNP) - the abode of the Great one-horned rhinoceros *(Rhinoceros unicornis)* - lies in the flood plains of the Brahmaputra River. It is located between latitudes 26°30'N-26°45'N and longitudes 93°00'E -93°45'E. The average annual rainfall is 1,320mm and temperatures range between a maximum 38°C and minimum 8.9°C. The terrain of this protected area is, by and large, flat with an almost imperceptible slope from east to west and also from north to south. The area in KNP primarily consists of recent composite alluvial flood plains. According to the biogeography province (Rodger, *et al.*, 2000), the northeast Brahmaputra valley cover classification is 9a. Flooding is an annual phenomenon in KNP and many animals, especially deer, lose their lives by drowning. Poaching is also a problem and in addition the wildlife are sometimes hit by vehicles on National Highway 37.

Kaziranga is also home to Wild buffalo *(Bubalus bubalis)*, Hog deer *(Axis porcinus )*, Indian elephant *(Elephas maximus)*, Royal Bengal tiger *{Panthera tigris*), Indian wild boar *(Sus scrofa)*, Swamp deer *(Cervus duvauceli)*, etc. The park supports more then 35 species of mammals, of which 15 are listed in Schedule I of the Wildlife Protection Act (1972). Its conservation values were formally recognized when it became one of the World Heritage Sites notified by the UNESCO in 1985 (Fig.l). So far, management efforts in KNP have concentrated on centric conservation. With an abundant number of wild herbivores and other endangered species, the park management should also direct focus on species like Sambar *(Cervus unicolor)*, Barking deer *(Muntiacus muntjak)*, Hoolock or White-browed gibbon *(Hylobates hoolock)*, Common langur *(Presbytis entellus)*, Assamese macaque (*Macaca assamensis*), Leopard *(Panthera pardus)*, Sloth bear *(Melursus ursinus)*, etc. KNP is famous for its breeding bird fauna and is an important resting and feeding area for migratory birds traveling between the Indian sub-continent and their summer grounds in Siberia and China.

Significantly, Kaziranga also has a high density tiger population and is one of the national tiger reserves established in India. The present study attempts to assess the significance, adequacy and appropriateness of the landscape management-based approach for tiger conservation.

## Study area

KNP encompasses an ideal wildlife habitat with a total area of 429.63 km$^2$. But with the gradual opening up of the area on the southern side towards National Highway No.37, the forest cover has been drastically reduced, resulting in loss of natural wild habitat due to human activities around the highway and also in adjoining tea estates. In view of this, the Government has added six additional areas in the park for the movement and dispersal of wild animals through an extended natural habitat (Table 1).

**Table 1: Additional park areas**

| Additional areas | Km$^2$ | Notification (R/F) |
|---|---|---|
| 1. Burapahar | 43.79 | 28/05/97 |
| 2. Sildubi | 6.47 | 10/07/97 |
| 3. Panbari | 0.69 | 31/05/85 |
| 4. Kanchanjuri | 0.89 | 03/08/88 |
| 5. Haldibari | 1.15 | 13/06/85 |
| 6. Panpur RF & Brahmapura channel | 376.80 | 07/08/99 |

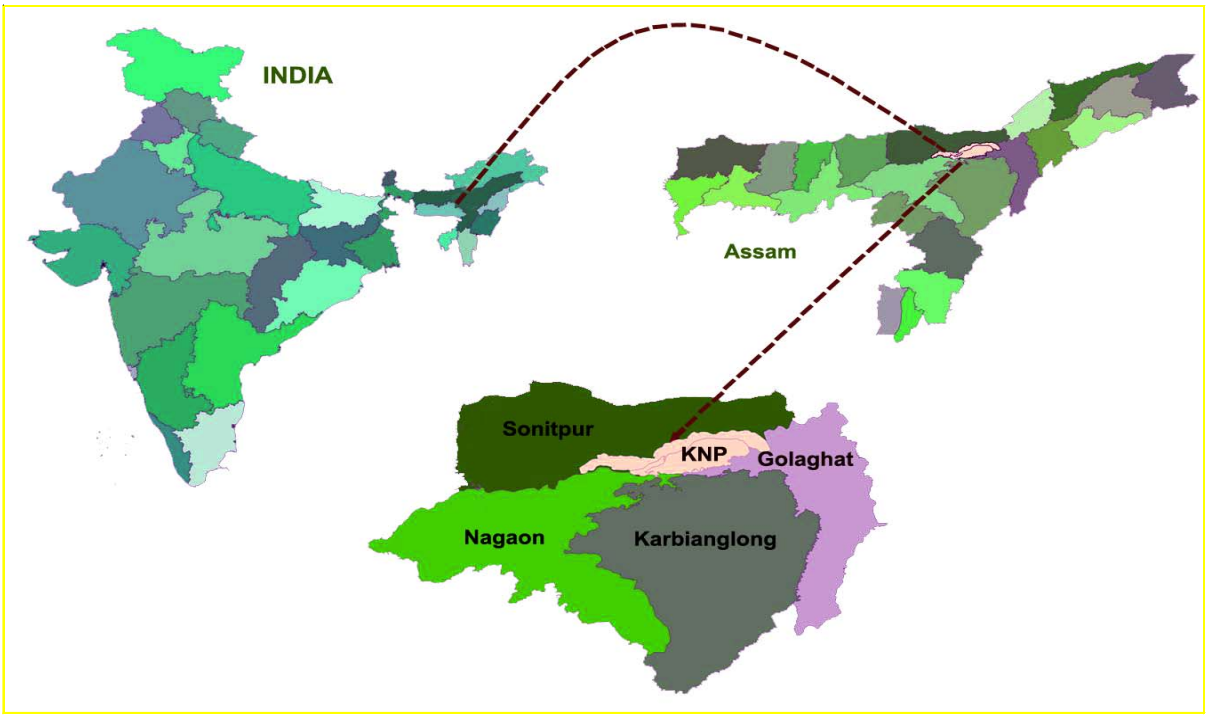



**Fig.1 Kaziranga National Park**

The six additional areas cover an area of 429.79 km$^2$, thus bringing the enlarged total area of KNP to 859.42 km$^2$. In 2007, the Government of India declared KNP as Kaziranga Tiger Reserve (KTR) and added two wildlife sanctuaries: Burachapori Wildlife Sanctuary (44.06 km$^2$) and Laokhowa Wildlife Sanctuary (70.13 km$^2$), including the 1$^{st}$ addition, 6$^{th}$ addition and KNP. KTR has now become one of the major tiger reserves among the 39 tiger reserves in India (Fig.2). The Central and State Governments and other conservation organizations have recognized the importance of Kaziranga. The present study aimed to evaluate the adequacy of the landscape approach adopted for tiger conservation in KTR.

## Methodology

During the field study, the methods followed in the study included reconnaissance of the area, review of literature, visits to representative sites of KTR for personal observations and information collected through questionnaires distributed to representatives of the villages and forest officials, Gram Pradhans, frontline staff and laborers, etc. The data was collected to gain a better understanding of habitat diversity, distribution of wild herbivores/carnivores, past and current management practices, socio-economic dependency and present management issues, conservation efforts, habitat management practices and other developmental activities in the environs of KTR.

## Results

KTR definitely lacks the desired extent of inviolate and buffer areas as per the Government of India (GoI) and National Tiger Conservation Authority (NTCA) guidelines. However, the current available area is able to support an adequate number of tigers, their prey, and co-predators. Practically speaking, the legal status of the national park and wildlife sanctuary for the ingredient areas of KTR is enough for extensive protection and conservation efforts for tigers. In addition, KNP has developed a preferred mechanism for protection of the area and its wildlife from poaching and other illegal actions. However, this type of protection effort should also extend to the two sanctuaries and the additional areas. During the study a socio-economic profile analysis was made to determine the proportion of dependency on the PA and

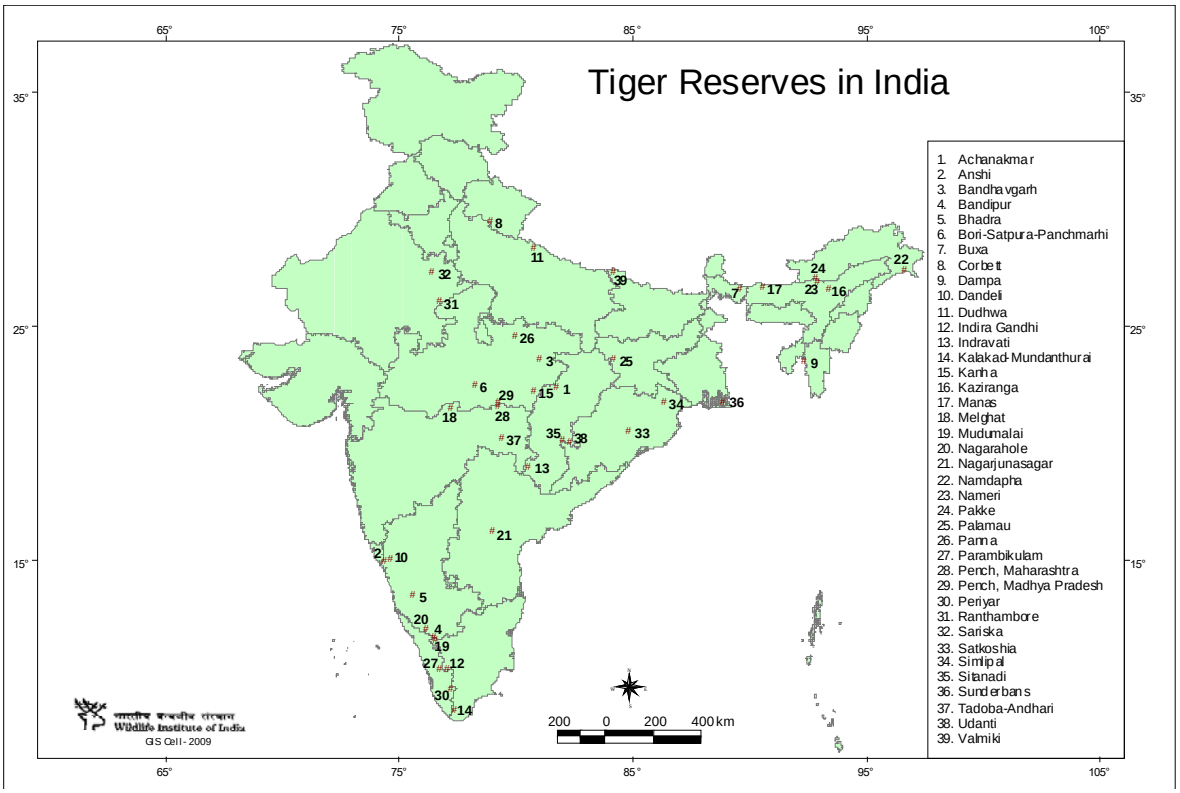



**Fig.**2

additions for fodder and encroachment in the study area.

### Land cover and habitat diversity

According to satellite imagery (Khushwa, 1997), KNP's ecological diversity comprises woodland (114.01 km$^2$ - 27.95% of the area), short grass (12.30 km$^2$ - 3.01%), tall grass (248.85 km$^2$ - 61.01%), swamps (24.32 km$^2$ - 5.96%), the Jia Diffalo River (3.96 km$^2$ covering 0.97%), Mora Diffulo (2.84 km$^2$ - 70%) and sand (1.62 km$^2$ - 0.40%). Tigers and their prey seem to be abundant in KTR. Similarly, Water buffalo has population of 1,666 (2007 census); however, gaurs number only 5 (1991 census). The sambar population is 58 (1999 census), Swamp deers - 681 (2005 census), Hog deers - 5,045 (1999 census), Wild boars - 431 (census 1999), Elephants – 1,293 (2008 census). According to the 2009 census data, One-horned rhinoceros has a healthy population of 2,048. KTR is home to 17 species of endangered mammals, 23 species of endangered birds and 10 species of endangered reptiles. Earlier, the core area of the erstwhile NP was devoid of any human habitation. However, it now hosts 150 village settlements with sufficient area for agriculture (70%), vegetable gardens (15.5%), shifting cultivation (7.7%), and several tea estates in and around KTR as per the Management Plan 2002-12. Significantly, the livelihoods of the people of these villages are mainly agriculture-based and more than 95% of people residing in the southern part within a 5 km periphery of KTR, as well as other villages, are using firewood for cooking. On the other hand, Kaziranga faces many other threats including poaching, domestic livestock grazing, proliferation of invasive species in grasslands and *beels* due to increased human activity. Presently, more than 120 beels are found around the KTR and heavy siltation, pollution and weed invasion are threats to the beel ecosystem. Other disturbances include fast development of tourism-related communications, development of highways, mining in the nearby Karbi Anglong hills, etc. Proposed developmental activities and heavy traffic on the National Highway (NH-37), encroachments around the eastern boundary of the park, resource dependence and socio-economic conditions, growing tourist pressure and the

man-animal conflict are some problems of lesser magnitude.

**Table 2: Socio-economic survey**

| Socio-economic parameters | Study area |
|---|---|
| No. of households (Population) | 4,435 (23,795) |
| Family size | 6-7 |
| Literacy % | 55% |
| Ratio male:female | 1:1.2 |
| Cattle holdings per family | 6.5 |
| Land holding (in bigha) | 32% |
| Landless | 30% |
| Land holdings (up to 2 bighas) | 38% |

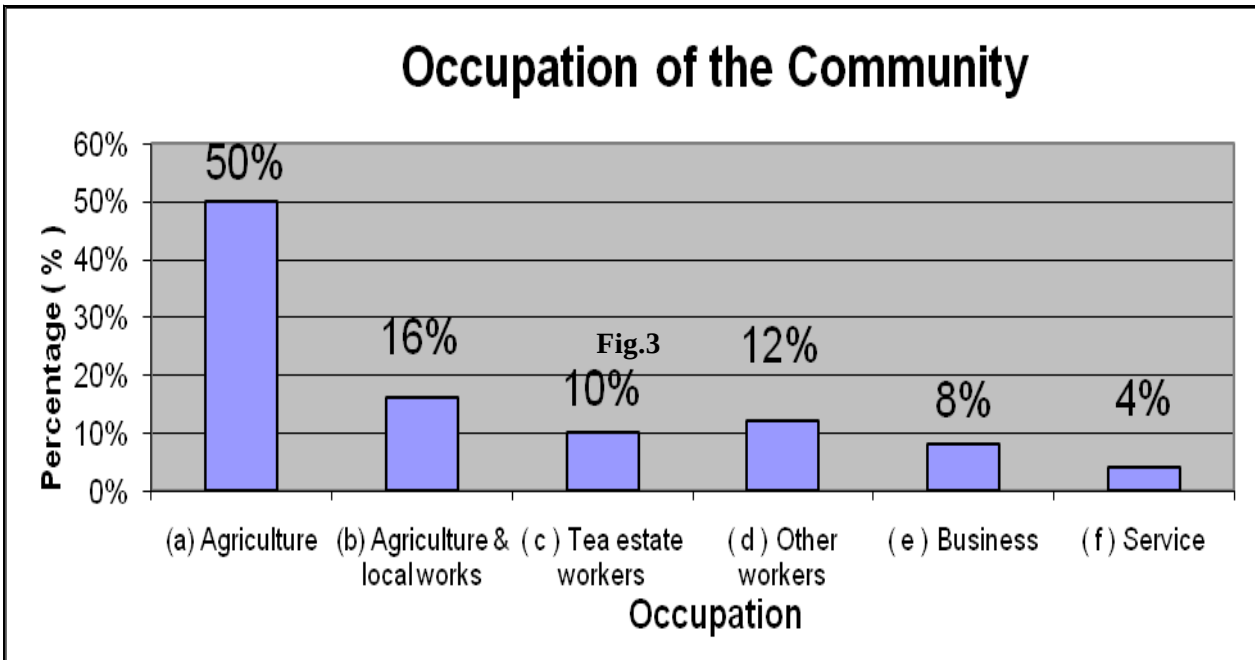
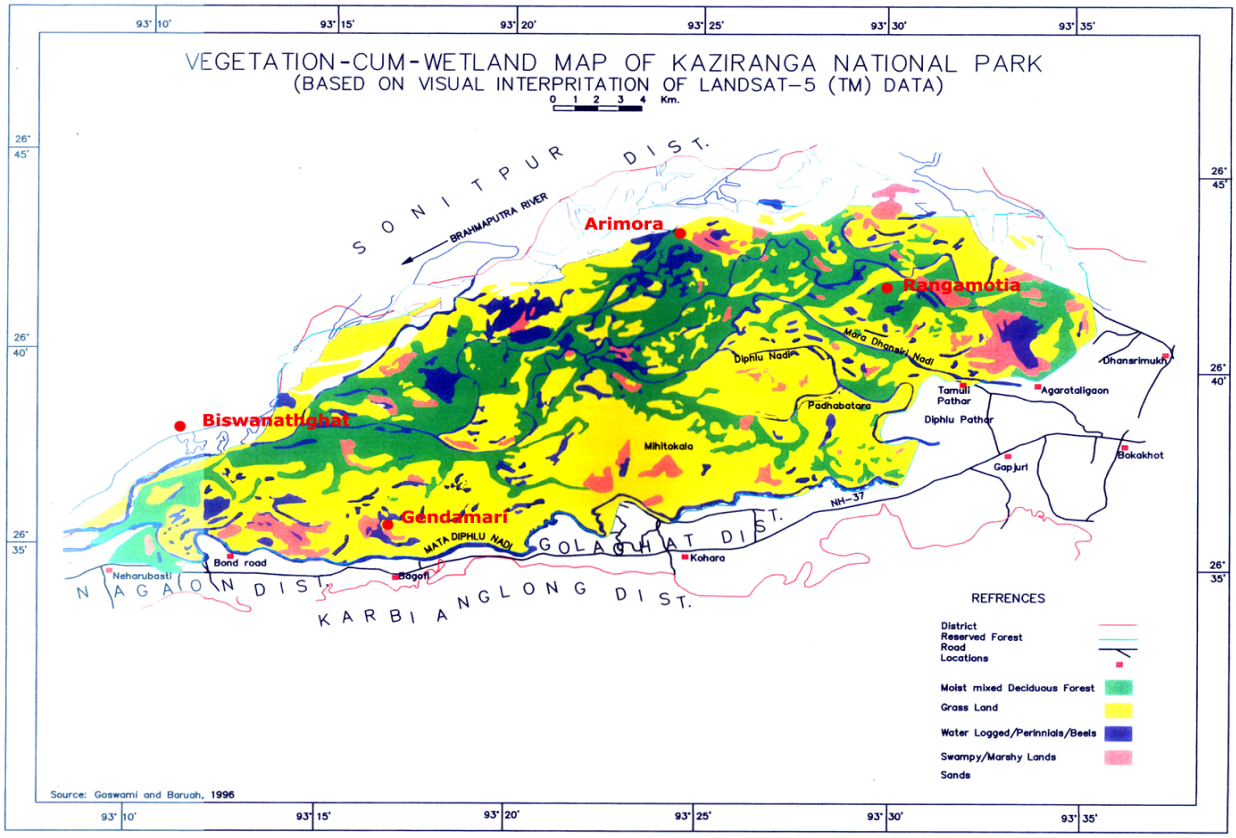



Fig.3

**Fig.4 Vegetation and wetlands of Kaziranga National Park**




## Control of natural habitat

Unfortunately, some species of weeds species like *Mimosa invisa* have infested grassland and *beel* habitats. Invasive species are an emerging problem in KTR. The proliferation of various weeds like *Mikenia*, water hyacinth *(Eichhornia crassipes)* and wild rose have spread to some areas of the park, causing ecological degradation of the habitat and are a major problem confronting the park authorities. Some efforts taken by the park management and other NGOs have been made to control such invasive species.

## Grassland management

The terrain of KTR is flat with a gentle, almost imperceptible slope from east to west. The habitat is such that water bodies and grassland form a significant part of the park's area. Wetlands in KTR cover 7% of the park area with species such as *Saccharum spontaneum*,

*Saccharum elephantinus, Imperata cylindrica, Erianthus filifolius, Narenga porphyrocome Cymbopogon pendulus,* etc. Woodland species include *Albizzia procera, Bombax ceiba, Albizzia odorotissima, Lucida, Latifolia, Lagerstroemia parviflora, Trewia nudiflora, Terminalia belerica, Alstonia scholaris, Dillenia indica, Ficus bengalensis* and *Erythrina indica* (Gokhale *et al*.,2005) etc.

Annual burning has been practiced to manage grasslands in Kaziranga for quite some time as it provides new forage to wild herbivores. Other areas of concern such as identifying the factors leading to the creation of short grasslands and evolving strategies for reduction of ungulate pressure on Baguri Range also need to be addressed urgently.

Along the river beds and water bodies and marshy areas, short succulent grasses channels to promote Lokosa *(Hemarthia compressa), Cynodon dactylon, Leersia hexandra, Pistia stafwtes, Chrysopogon aciculatus, etc.* have been recognized. Designing the shape of the high grounds (earthen mounds) should be done in such a way that they do not affect the drainage pattern and wetlands. Furthermore, recognition of some inviolate areas within the park should be done so that fires and other human interventions can be minimized. The effects of conservation efforts should be compared by periodic monitoring, restoration of water bodies and channels and maintenance of corridors.

**Monitoring of Beels**

Though it is a natural phenomenon, heavy siltation is the major threat to KTR's beel ecosystem. Additionally, with the increasing disturbances in the upstream and catchment areas of the rivers running through KTR, siltation has increased in an alarming scale. For effective management of beels, limited desilting operations and monitoring of beds in KTR is necessary for its long term protection. There should be planned and phased desiltation in beels, apart from checking it for pollution. There should also be monitoring of beels through use of remote sensing technology to check the ecological linkages and integrity of the beels in the PA with Brahmaputra for its long term sustenance. Pollution of the beels, if any, similarly needs to be monitored.

**Scientific study & monitoring**

KTR officials have already carried out censuses of prominent wild herbivores and carnivores over a period of time and they provide desired trends of distribution and abundance. In 2007, KNP also followed the All India Monitoring of tigers, their prey, co-predators and habitat as prescribed by the National Tiger Conservation Authority (NTCA) for conducting the census. Nonetheless, these efforts need to be continued on a regular basis, at least every two years. Further, the process of monitoring needs to be institutionalized. Population estimates using modern tools is needed, including carrying out monitoring programmes in additional areas and wildlife sanctuaries so as to enable the development of effective strategies for habitat management of endangered wild animals.

**Dependency of local people on the KTR**

Proper planning to reduce the current dependency on the natural resources through eco-development planning and inputs and also planning awareness programmes assume importance for the time ahead. Notably, human dependency on KTR forests can be reduced to a large extent by providing fuel efficient *chulas*, pressure cookers, kerosene stoves, and reducing grazing pressure by swapping unproductive cattle with a small number of high milk yielding local cattle breed with facilities for stall feeding and rotational grazing on community pastures. Further, growing fuelwood, fodder, bamboo plantations in community land are also among other options worth considering.

**Human resource management**

In view of the pressing necessity for long term and perpetual conservation of tiger and its associated species, it is required that all basic forest areas are brought under an integrated system, under the control of the Field Director, KTR . For this, the control of constituent areas needs to be transferred to the FD, KTR. It should be noted that over the years, the front line staff of KNP have developed the essential skills

required for shelter, census, and tourism-linked activities. On the other hand, they need to be encouraged for eco-development and group consciousness works linking local communities. Similar efforts will be needed for officers and front line staff working in parts of the jungle areas.

**Discussion**

It is remarkable that there is neither any village nor human habitation within KTR's core zone. This provides an adequate, unimpaired area for tigers to flourish. KTR is also blessed with a rich ecological bio-diversity comprising woodland, tall grassland, swamps and river stretches, which act as habitats for tiger and its prey and co-predators. Currently, the prey population (wild ungulates) seems to be adequate for the tiger population, even without including gaur and sambar, whose numbers are small here. Other prey species include water buffaloes, swamp deer and hog deer, which need to be conserved as they form the main prey base for tigers. Elephant and rhino calves are occasionally preyed on by tiger. As a result, the proportionate populations of tiger, gaur, sambar and hog deer need to be estimated to understand the prey-predator interaction. The current revision and examination of available research data on tiger ecology (by WII and NTCA-2008) points out that the minimum population of tigresses of breeding age needed to maintain a viable population of 70 – 100 tigers (in and around core areas) requires an inviolate space of 800 – 1000 km$^2$. Based on 2000 census data, Kaziranga has a population of 86 tigers, which translates into a 800 to 1000 km$^2$ area having effective habitat for this tiger population. In view of the above, Kaziranga Tiger Reserve needs more areas for the population of tigers as they not only need inviolate space, but also require viable populations of other wild animals (co-predators, prey) and habitat for other meta-populations (Jhala, 2008). Tiger populations in the intervening lands between KTR and the buffer area need to have connections and adequate forest/ grassland cover to enable dispersal and genetic exchange to take place. Therefore, buffer areas with forest connectivity are imperative for tiger dynamics, since such areas further the life spans of young adults, transients and older members of the population. The immature adults periodically replace the resident ageing males and females from the source population area. Since KTR serves as a source population of tigers, nearby sink areas need to be identified. To facilitate tourism-related activities in KTR and to minimize poaching activities by neighboring villagers, it is necessary to involve the local people of southern villages (Pal, 2005) and tea estates in tourism activities and in the management efforts for tigers to reduce socio-economic dependency on the tiger reserve. Local civil communities should be involved in Kaziranga Tiger Reserve for conservation action.

**Conclusion**

KTR has a high density tiger population. With a large quantity of prey and co- predators, Kaziranga has emerged as a significant site for tiger conservation in recent times. However, in order to maintain an effective tiger habitat, more buffer areas need to be added. The reserve has also been threatened by excessive floods, loss of beels, siltation, invasive species, poaching, etc. A perspective plan is needed to protect KTR from these primary threats. The KTR Management Authority also needs to identify corridors to connect constituent areas and the meta-population.

Reducing the main dependency on specific natural resources and encroachment on the tiger reserve by local communities through appropriate eco-development measures and awareness-raising is a priority conservation action for KTR's Management Authority. The implication of research and monitoring for such a complex and dynamic eco-system cannot be over-emphasized. In addition, it is necessary to strengthen the organization and management in new additions to the reserve and buffer areas. Incorporated landscape development and management of core, buffer, additional areas and passage alongside sightseeing activities, while adopting the new guiding principle issued by NTCA for the Tiger Protection Plan, are also of supreme importance. Likewise, the contribution of local communities and other stakeholders is vital to the success of such planning efforts.

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# *HABITAT ECOLOGY OF HIMALAYAN SEROW (Capricornis sumatraensis ssp. thar) IN ANNAPURNA CONSERVATION AREA OF NEPAL*

*by Achyut Aryal*

**Introduction**

Himalayan serow ***(****Capricornis sumatraensis* ssp. *thar)* is a threatened animal, listed by CITES in Appendix I and classed as "Vulnerable" by **IUCN's Red Data Book** (IUCN, 2004). It has been given legal protection in other countries as well (Fox & Johnsingh, 1997; Green, 1987b; Shackleton, 1997; Wollenhaupt *et al*., 1997).

Himalayan serow, locally called "thar" (in the study area), belongs to the family Bovidae and subfamily Caprinae. In appearance, the serow resembles a ghoral. The serow is a solitary animal (Nowak & Paradiso, 1983; Prater, 1993; Schaller, 1977); however, sometimes as many as seven individuals have been seen in a herd (Prater, 1993; Nowak & Paradiso, 1983). It has a large head, thick neck, short limbs, long mule-like ears and a coarse coat of dark hair. It looks like a cross between a cow, a pig, a donkey and a goat. Both sexes are similar in appearance and are of about equal size (Schaller, 1977). An adult male serow measures about 100 to 110 cm at its shoulders and weighs about 91 kg on average in its adulthood. Its head and body length measure 140-180 cm. The horns are 15-25 cm long and 13-15 cm in girth and are present in both sexes. The horns are black, conical,