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## MANAGING KAZIRANGA AS A TIGER RESERVE – A LANDSCAPE PERSPECTIVE

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### Introduction

Kaziranga National Park (KNP) in Assam, India has been a major attraction for the Great One Horned Rhinoceros (*Rhinoceros unicornis*) since its establishment. KNP is one of the prominent protected areas in India. KNP lies in the flood plains of river Brahmaputra and is located between latitude N 26.04 and 26.46 N and longitude E 93.08 and 93.36. The terrain is a large flat area with a gentle and almost imperceptible slope from east to west and also from north to south. Scientific studies have show that the area under Kaziranga National Park primarily consists of recent composite alluvial plains and flood plains. This indicates that Kaziranga has been a symbol of Brahmaputra floodplain ecosystem. Kaziranga has the World's largest population of One Horned Rhino (*Rhinoceros unicornis*), Wild Buffalo (*Bubalus bubalis*) and the Swamp Deer (*Cervus duvauceli ranjitsinghi*). Its conservation values were much recognized when it became one of the World Heritage Sites notified by the UNESCO in the year 1985. So far management efforts of KNP have been focusing on conservation. With abundant number of wild herbivores and other endangered species, management focus has also been on species like elephant, water buffalo, swamp deer and Bengal Florican. At the same time Kaziranga also has high density of the Tiger (*Panthera tigris*). The Central and State Governments and other conservation organizations have recently given due importance to Kaziranga by including it as one of the Tiger Reserves. Kaziranga Tiger Reserve (KTR) was notified in 2007. This short term study as part of the ongoing 9-month Post Graduate Diploma in Wildlife Management at the Wildlife Institute of India (WII) thus aimed to evaluate the adequacy of landscape approach adopted for tiger conservation in the region.

### Material and Methods

Methods included the reconnaissance of the area, review of literature, visits to representative sites and field verification, and interaction with forest and park officials. Reconnaissance visits and visit to representative field sites in KTR along with the accompanying faculty of the WII allowed a better understanding of habitat diversity, distribution of wild herbivores/carnivores and their abundance, past and current management practices, socio-economic dependence and present management issues. I also reviewed available literature including published research papers, research reports and management plans. I specifically made me familiar with the internal and external boundaries, protection efforts, habitat management practices and other developmental activities in the surroundings of KTR. I also spent considerable time on interaction with forest and park officials.

## **Results and Discussion**

### **Extent, Inviolate Area and Protection Measures**

KTR definitely lacks the desired extent of inviolate and buffer areas as per the Government of India, 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. The legal status of national park and wildlife sanctuary for the constituent areas of KTR is adequate for long term protection and conservation efforts. In addition, KNP has developed desired mechanisms for the protection of the area and its wildlife from poaching and other illegal activities. Nevertheless, this type of protection efforts needs to be extended to two sanctuaries and addition areas.

### **Habitat diversity and wild animal abundance**

Kaziranga NP harbours woodland (27.95%), grassland (64.02%), swamps –*beels* (5.96%) besides the Jia Divallo River covering 0.97% area. Tigers and their prey seem to be abundant in KTR. The reported number of tiger is 86 individuals based on the year 2000 census data. The water buffalo has a population of 1666 individuals based on 2007 census data. The number of population of Gaur is 5 individuals based on 1991 census data. Sambar has a population of 58 individuals based on 1999 census data. Swamp Deer has population of 681 individuals based on 2005 census data. The population number of Hog Deer is 5045 individuals based on 1999 census data. Wild boar has a population of 431 individuals (1999 census data). Elephant has a population of 1293 individuals (2008 census data). The One horned rhinoceros has a population of 1855 individuals based on 2007 census data.

The core area of the erstwhile NP is devoid of any human habitation. However, there are 150 village settlements and several tea growing estates in and around Kaziranga Tiger Reserve. Villagers depend on the natural resource of KTR for their livelihood.

Kaziranga faces many threats including poaching, domestic livestock grazing, proliferation of invasive species in grasslands and *beels*, and problems related to rapid development of tourism related infrastructure and other developments such as the expansion of highways and mining in the adjacent Karbi Anglong hills. Proposed developmental activities (e.g. NH 37), 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 of the problems of lesser magnitude now, nevertheless with greater implications for the future.

### **Control of invasive species**

Few species of weeds or invasive species (*Mimosa invisa*) have infested grassland and beel habitats. The park management and other NGOs have made some efforts to control such invasive species. However, constant monitoring and practices to control them are needed.

### **Grassland management**

Annual burning is being practiced for grassland management in Kaziranga for quite some time considering that it provides new forage to wild herbivores. However, a detailed study on tall and short grasslands and the impact of fire (annual burning) on grassland habitats is required as a priority. Identifying the factors leading to the creation of short grasslands and evolving strategies to reduce the ungulate pressure on Baguri Range are also needed urgently. Conducting management experimental trials along river channels to promote Lokosa (*Haemarthria compressa*) grass has been recognized. Designing the shape of the high grounds (mounds) should be done in such a way that they do not affect the drainage pattern and wetlands. Identifying some inviolate areas within the park where fire and other

human interventions can be minimized and the effect of protection can be compared by periodic monitoring, restoration of water bodies and channels and restoration and the maintenance of corridors.

### **Management of Beels**

For the *beels* management regular monitoring of *beels* in Kaziranga Tiger Reserve (KTR) is necessary. There should be planned and phased desiltation. Monitoring of beels against pollution should be carried out. There should also be a monitoring to check the ecological linkages and integrity of the beels in the protected area with Brahmaputra and keep them sustained.

### **Research and Monitoring**

Kaziranga National Park (KNP) has carried out a census of prominent wild herbivores and carnivores for a very long time and they provide desired trends of distribution and abundance. In 2007, KNP also followed the All India Monitoring of Tiger, Prey, Co-Predator and its habitat as prescribed by the NTCA. However, this efforts need to be continued on a regular basis, at least on a 2-year cycle. Further, the process of monitoring needs to be institutionalized. Population estimation using modern tools needs to be practiced. Monitoring programs should be carried out in other additional areas and WLSs so as to enable the development of effective strategies for habitat management and endangered wild animals.

### **Socio-economic dependency on the tiger reserve**

Planning to reduce current dependency on the natural resources through eco -development planning and inputs and also the planning of awareness programs are being considered as important for the time to come. Dependency to KTR forests can be reduced by providing fuel efficient *chulas*, pressure cookers, kerosene stoves, a reduction in the grazing pressure though replacing the unproductive cattle with small numbers of high milk yielding local breed cattle and stall feeding with rotational grazing on community pastures. Further, raising fuel wood, fodder, bamboo plantations in community land is also an option.

### **Effective organizational set up and human resource development**

Considering the urgency of long term conservation of the tiger and its associated species, it is necessary that all constituent areas are part of a unified system controlled by the Field Director, KTR. The control of constituent areas needs to be transferred to the FD, KTR. Over the years, the frontline staff of Kaziranga NP has developed the desired skills mainly required for protection, census, and tourism related activities. However, they need to be encouraged for eco-development and mass awareness works involving local communities. Similar efforts will be needed for officers and front line staff working in addition and constituent areas.

### **Discussion**

There is no village and human habitation inside the core zone and KTR provides adequate inviolate area for the tiger. Kaziranga TR harbors a desired diversity of complex and dynamic ecosystem represented by woodland, tall grassland, swamps (beels), and river stretch. Studies indicate an availability of these habitats for the tiger and its prey and co-predators. Currently, prey (wild ungulates) seems to be adequate for the present tiger population. Water buffalo, swamp deer and hog deer are forming the main prey base of tiger. Gaur and Sambar are present only in small populations and need to be restored. Elephant and rhino calf are sometime preyed by tiger (*per. comm.* forest officials). The status of tiger, gaur, Sambar and hog deer is required to be estimated to understand the prey-predator relationships

The ongoing study and analysis of available research data on tiger ecology by WII and NTCA indicate that the minimum population of tigresses in breeding age, which are needed to maintain a viable population of 80-100 tigers (in and around core areas) require an inviolate space of 800 -1000 km<sup>2</sup>. Based on 2000 census data of Tiger,

Kaziranga has a population of 86 tigers. That requires 800 to 1000 km<sup>2</sup> effective habitat for this tiger population. That means Kaziranga needs more areas to provide available habitat for this population of the tiger. Tigers not only need inviolate space of 800 – 1000 km<sup>2</sup> but also need viable populations of other wild animals (co-predators, prey) and habitat for other metapopulations. The intervening lands between these populations need to have desired connectivity and an adequate cover of forest/grassland for dispersal and genetic exchange. Therefore, buffer areas with forest connectivity are imperative for tiger dynamics, since such areas foster sub adults, young adults, transients and old members of the population. The young adults periodically replace the resident ageing males and females from the source population area. Kaziranga Tiger Reserve serves as a source population of the tiger. Nearby sink areas need to be identified and managed efficiently for maintaining viable tiger population in the long run. Tourism related activities in KTR are expected to seek support from local people for the Tiger Reserve and their involvement. It is necessary to involve 150 villages and tea estates in the conservation efforts of the tiger in the region.

### **Conclusions and Outlook**

At present, Kaziranga Tiger Reserve has high tiger density. With abundance of its prey and co- predators, Kaziranga became an important landscape for Tiger Conservation in recent time. Kaziranga needs to receive more buffer areas to form effective tiger habitats. Kaziranga is threatened by excessive floods, loss of *beels* and siltation, invasive species, poaching etc. A perspective plan is needed to protect KTR from these main threats. The management is also required to identify corridors for connectivity with constituent areas and among meta populations. Reduced socio-economic dependency on the tiger reserve through appropriate eco-development measures and awareness is a priority conservation action for management authority of KTR. The significance of research and monitoring for such a complex and dynamic ecosystem can not be overemphasized. Besides this, necessary activities to strengthen the organization and HR management in new additions and buffer areas can not be overlooked. Integrated landscape planning and management of core, buffer, addition areas and corridor along side tourism activities in the tourism zone while adopting the new guidelines issued by NTCA for Tiger Conservation Plan is the need of the hour. Participation of local communities and other stakeholders is critical to the success of such planning efforts.

### **References**

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