

**UNESCO – IUCN Enhancing Our Heritage Project :  
Monitoring and Managing for Success in Natural World Heritage Sites**

**Initial Management Effectiveness Evaluation Report :  
*Kaziranga National Park, Assam, India, August 2003***



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## **PROJECT BACKGROUND**

**Enhancing Our Heritage: Managing and Monitoring for Success in Natural World Heritage Sites** is an UNESCO – IUCN project funded by the United Nations Foundation. The four-year project (2001-2004) is being implemented in ten world heritage sites from Africa, South Asia and Latin America. Kaziranga National Park, Assam and the Keoladeo National Park, Bharatpur, are two sites from India. The Wildlife Institute of India, Dehradun is acting as a Regional Partner Institution to provide technical support for project implementation in South Asia.

The main objectives of the project are **to promote the development of monitoring and evaluation systems** and **to facilitate adaptive management**. The project aims to enhance the periodic reporting process for the World Heritage Sites.

An initial management effectiveness evaluation as per the project methodology has been carried out in Kaziranga National Park in the year 2002 – 03 and the findings and recommendations are presented in this report. Along with this, a video capsule on the park profile and management effectiveness evaluation has also been prepared as part of the project activities in the Kaziranga National Park, Assam.

## **1.0 INTRODUCTION**

Kaziranga National Park (KNP) got inscription on the World Heritage list in the 9<sup>th</sup> Session of the World Heritage Committee on 6/12/1985 under the Article 2 of the convention concerning the Protection of the World Cultural and Natural Heritage. Kaziranga National Park, a name known worldwide for its success in the conservation history of one horned Indian Rhinoceros, provides habitat for a number of threatened species and migratory birds. A symbol of dedication for the conservation of wildlife and their habitat, Kaziranga, with a National Park status represents single largest established protected area within the North-east Brahmaputra Valley (9A) Biogeographical Province (Rodgers, Panwar *et al* 2002) to provide long term conservation of a genetically viable population of rhinos.

Fluctuations of mighty Brahmaputra River results in examples of riverine and fluvial processes representing the spectacular ongoing ecological and biological processes in the evolution and development of the riverine flood plain ecosystems in the world. In this regard, Kaziranga in the Brahmaputra valley floodplains offers an important refuge to a rich biological heritage.

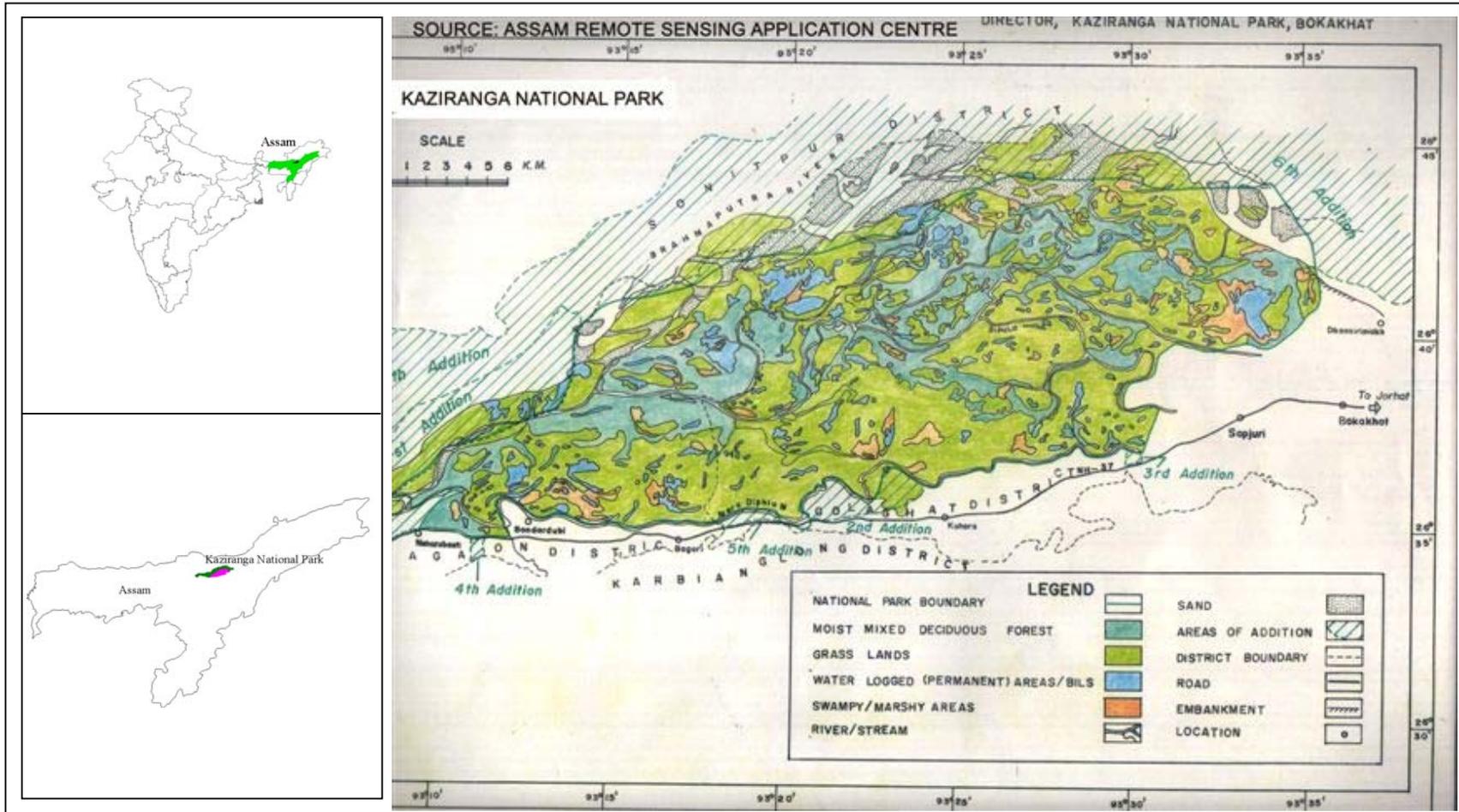
The landscape formed by complex of sprawling grasslands, numerous water bodies and woodlands provide an ideal mix of habitats for a variety of flora and fauna. It is one of the largest legally protected areas under the Burma Monsoon Biogeographical province in India that supports the wide range of flora from microscopic aquatic plants to lofty moist deciduous trees and fauna ranging from the soil invertebrates to mega fauna such as the Rhino and the elephant. With adequate protection and *in-situ* conservation efforts that date back to almost a century, the grasslands and the mega fauna have been able to sustain in such a manner that one of the largest assemblages of these can be seen today in the wild. Prominent among them are the charismatic ‘**BIG FIVE**’-The Great Indian One horned Rhinoceros (*Rhinoceros unicornis*) The Asiatic Wild Buffalo (*Bubalus bubalis*) The Asiatic Elephant (*Elephas maximus*), The Swamp deer, (*Cervus duvauceli ranjitsinghi*), The Tiger (*Panthera tigris*).

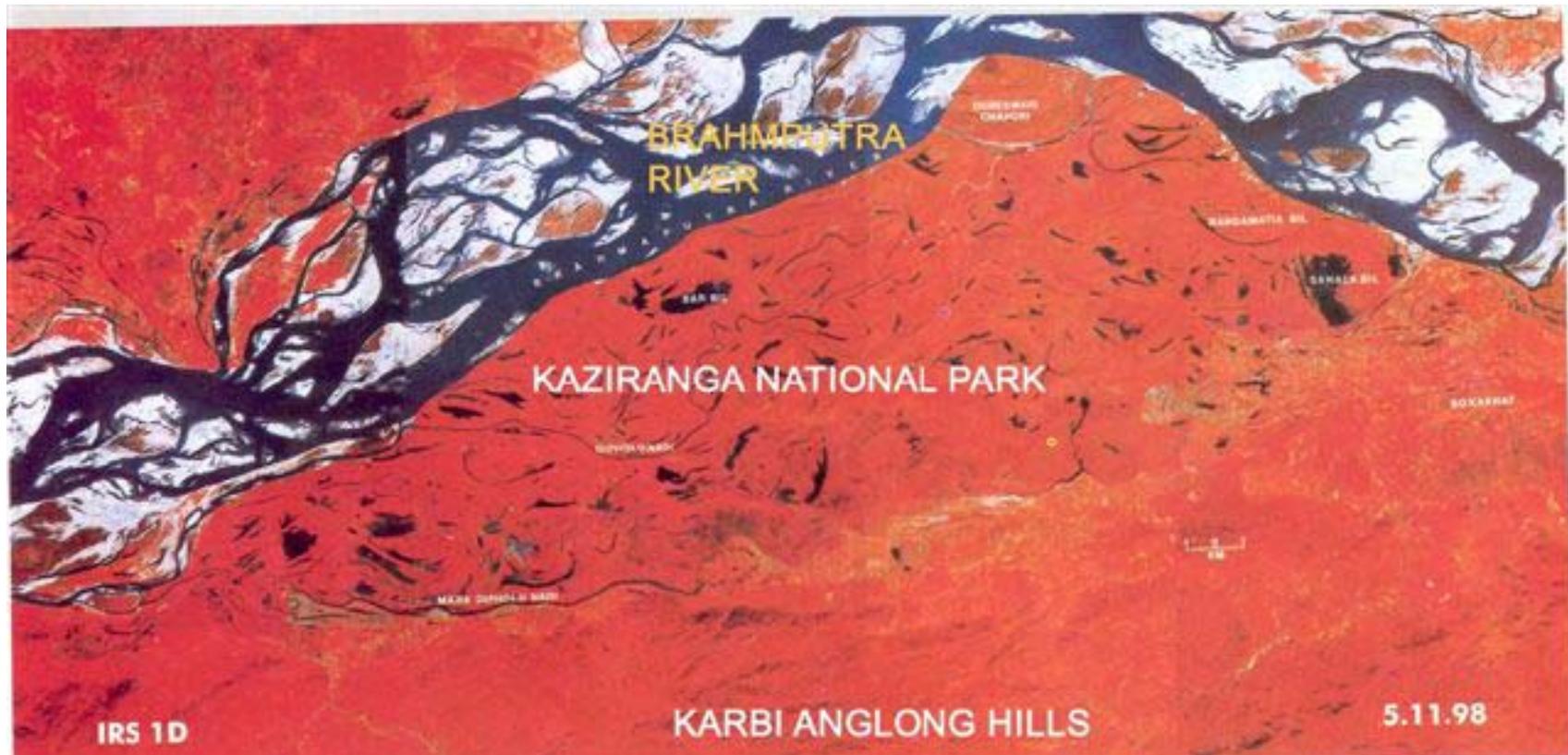
The area also falls at the junction of the Australasia and Indo-Asian flyway thus providing an important migrating, breeding and nesting site for over 480 species of Avifauna. Significant diversity in Herpetofauna and other lesser-known life forms thus provide considerable Conservation, Research, Education and Recreation values.

**LOCATION**

Kaziranga National Park located in Assam, a northeastern state of India. The site is situated in the civil districts of Golaghat and Nagaon.

Geographic Coordinates to the nearest second Centre point	:	N 26 <sup>0</sup> 40.246' ; E 93 <sup>0</sup> 21.605'
North-west corner	:	N 26 <sup>0</sup> 35.026' ; E 93 <sup>0</sup> 08.784'
South-east corner	:	N 26 <sup>0</sup> 41.518' ; E 93 <sup>0</sup> 35.251'





**Satellite image of Kaziranga National Park and adjoining areas**

### **1.1 How the Evaluation was Carried Out**

A project planning and inception workshop was organized in November, 2001 for the two project sites in India viz. Keoladeo National Park and Kaziranga National Park in which present and past site managers, frontline staff, community representatives, civil society members and scientists participated along with Dr. Marc Hockings, Project Manager and Equilibrium Consultants Nigel Dudley and Sue Stolton. A site implementation team was also constituted.

Several smaller meetings and consultations were held during the course of evaluation besides a major stakeholder consultation.

The core initial assessment team comprised of the following:

Site Officers	:	Mr. N.K Vasu, Director Mr. A.C Das, Divisional Forest Officer Mr. R. Sharma , Wild Life Research Officer
WII Scientist and Coordinators	:	Dr. V.B. Mathur Mr. B.C. Choudhury
Civil Society Representative	:	Anwaruddin Choudhari Mr. Gautam Narayan
WII UNESCO Project Leaders	:	Mr. S.K. Mukherjee Mr. V.B. Sawarkar Mr. S. Singsit

## 2.0 CONTEXT REVIEW

### 2.1 Focal Management Targets (FMT)

Kaziranga National Park was inscribed as World Heritage Site based on criteria N(ii) and N(iv). These two criteria state that proposed site should (ii) be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals. (iv) contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation. At the time of inscription as World Heritage Site, Technical committee of IUCN evaluated KNP as follows - **Although Kaziranga has a range of natural values and provides habitat for a number of threatened species and migratory birds, these are secondary to its major importance as the world's major stronghold of the Indian rhino. For these main reasons, it meets criteria (iv) of the convention. The Brahmaputra River's fluctuations result in spectacular examples of riverine and fluvial processes and the site thus also qualifies under criteria (ii).**

Some of the significant conservation values of Kaziranga National Park are enumerated below: -

- The largest undisturbed and representative area of Brahmaputra Valley flood plain grassland and forest with associated large herbivores, avifauna and wetland values (including Turtles, Dolphins etc.).
- The world 's largest population of
  - Indian one horned Rhinoceros (*Rhinoceros unicornis*) [1552 in (1999)]
  - Asiatic Wild Buffalo (*Bubalus bubalis*) [1431 in (2001)]
  - Eastern race of Swamp Deer (*Cervus duvauceli ranjitsinghi*) [468 in (2000)]
- High Ecological Density of Tigers (*Panthera tigris*) [86 (2000)]

- Significant population of Asiatic Elephant (*Elephas maximus*) [1048 (2002)]
- The junction of the East Asia /Australia flyway and Indo-Asian flyway exhibits considerable diversity in avifaunal species (480 species recorded).
- Transitional and successional example of grassland to forest and floodplain to hill evergreen forest communities.
- Considerable Research, Education and Recreation values.

Presence of four major charismatic species like Rhinoceros, Tiger, Elephant and Wild buffalo in the site make KNP is unique for wildlife conservation with worldwide appeal.

### **Biodiversity Values**

The KNP is situated in one of the “Biodiversity Hot-spots” of the world. Though KNP is famous for Great Indian One Horned Rhinoceros, it is home to variety of flora and fauna of global, national and regional values. Management in early part was focused on protection of rhinos, which was under severe threat of extinction and remains to be the main focal management target. Now, management is also focused towards conservation of other important values including endangered eastern swamp deer, raptors, rodents, turtles, migratory and resident avifauna and their habitats.

### **Other Natural Values**

Mosaic of tall and short grasslands with interspersing “beels” (water bodies) and woodland form such a complex, which is diminishing outside the protected areas. Preservation of this complex needs management intervention and attention.

### **Cultural/Social Values**

The site is a major tourist attraction in this part of the country. Thousands of national and international tourists visit the site every year. So, KNP has considerable tourism with educational and recreational values.

The site has rich diversity of medicinal and culinary plants, which become rare outside the park. The management aims to focus its attention to preserve these values for posterity.

### **GAPS**

- The complex of wetland, grassland and woodland is in dynamic state and largely influenced by annual flood and changing river course. Understanding of various processes and their result is required.
- Central to any conservation effort is to understand the ecology, behavior of the species in question and their relation with biotic and abiotic components of the habitats. More information based on long term studies is required.
- Regular monitoring of habitat with special reference to flooding pattern and wetlands is not in place.
- Increasing population of mega herbivores like elephant and buffalo and its management implication needs to be investigated
- Information on smaller species like rodents, turtles, raptors is required.
- The present management interventions in the form of controlled burning of grasslands require major impact studies for long-term management of habitat for its suitability for rhinos.

### **RECOMMENDATIONS**

- Undertake scientific studies to fill the gaps within a three-year period.
- Start implementing monitoring protocols in collaboration with scientific community within a one-year period.

**Table 1**  
**Focal Management Targets Data Sheet**

	<b>Focal Management Targets</b>	<b>World Heritage Values</b>	<b>Additional Attributes</b>	<b>Information on status</b>
<b>Biodiversity Values</b>	One-horned Indian Rhinoceros	World's largest population	A 'keystone' species of the wet grassland habitat in mainly the Brahmaputra river flood plains.	Very Good
	Wild Buffalo, Eastern Swamp Deer	World's largest population	Two obligate species mainly confined to the site.	Very Good
	Asian Elephant,	Large population	Approximately 30% of north east Indian population confined to the site	Very Good
	Tiger	Highest density in any protected area	The site is under consideration to be given a project tiger site	
	Raptors, Turtles,	High diversity	Significant breeding habitat of 13 species of turtle and several species of Raptors	Good
	Resident and migratory waterfowl	High density	Already identified as IBA site	Good
	River floodplains and wetlands	Large diversity of aquatic fauna, Important Bird Area (IBA), important waterfowl flyway and wintering ground	Breeding habitat for a large number of fish species and Gangetic river Dolphins (30% of the Indian river dolphin population)	Good

	<b>Focal Management Targets</b>	<b>World Heritage Values</b>	<b>Additional Attributes</b>	<b>Information on status</b>
<b>Other natural values</b>	Mosaic of tall and short grassland habitat	Unique diversity of wetlands (beels), grasslands and forests	Highly dynamic river system	Good
<b>Cultural / Social values</b>	Tourism	A natural heritage site of immense diversity and close to a proposed cultural heritage site – Majuli	Famous and popular wildlife tourism site not only for the region but nationally and globally.	Good
	Ethno botanical values	Rich diversity of medicinal and culinary plants with continued traditional use by local community from the surrounding landscape	Genetic reservoir for economically important plants	Fair

## **2.2 Identifying Stresses and Threats**

### **Current Threats**

1. **Poaching:** Poaching of wild animals, mainly Great One horned rhinoceros.
2. **High flood:** KNP being floodplain ecosystem, annual flooding is a regular phenomenon which helps in maintaining a variety of habitats suitable for many threatened species. Excess water of river Brahmaputra drains through KNP back to the river and recharge all important water bodies annually. However, river-bed of the Brahmaputra has been raised by the high intensity 1950 earth-quake and also by gradual silt deposition in such a way that the run off from this catchment areas during the monsoon sometimes results into high intensity flood inside KNP. Also, flash flood due to breach in the dykes on the eastern side of KNP sometimes result into sudden rise of water, unusual to the normal drainage pattern of floodwater in KNP.

Depending on the intensity of the rain in the catchments areas of the Brahmaputra River and its tributaries in the upper reaches, floods of varying intensity are experienced in Kaziranga.

During the flood season communication between the various camps and with the Range Headquarters becomes very difficult. Some camps can be reached by boat by long detours and some camps can be reached with the help of both boat and elephants or only on foot, swimming across the nullahs and other low-lying areas. During such time patrolling is done mainly by boat. Many camps situated in strategic and low-lying areas of the park are submerged by floodwater during high floods forcing the inmates to vacate their posts.

3. **Erosion:** Erosion is one of the major factors playing a vital role on the future of the park. Every year large chunks of land from the Northern boundary are washed away by the Brahmaputra river. The points of erosion go on changing according to the change of course of

the river. Sometimes the areas eroded earlier are restored by heavy silt depositions. The gravity of the situation can be judged from the fact that the estimated area of the park in 1998 by computation from a study based on multirate satellite remote sensing has been calculated to be only 40,790 ha as against the notified area of 42,993 ha in 1974.

Flood of mild nature is required for maintaining the habitat of the Park; however floods of high intensity, which is in fact a regular phenomenon, causes severe losses to the Park in terms of death of wild animal in large numbers, damage to protection infrastructure etc.

4. **Sedimentation and weeds:** Continuous sedimentation and invasion of *Eichornia*, *Mikania*, *Mimosa* etc. in the existing water bodies and on the land have posed a big problem for the existence of the wet lands of the Park. Since the wetlands of the Park is an integral part for survival of the many important Fauna such as Rhinos, Wild Buffalo, myriad bird species etc. the Park management is facing tremendous problem for containing sedimentation and weed invasion.
5. **Illegal fishing.** The villagers from the fringe areas of the National Park sometimes go for illegal fishing in the numerous 'beels' at the Park.
6. **Heavy traffic** on the National High way No. 37 makes the movement of animals to high grounds along hills unsafe during high floods.
7. **Live stock grazing** particularly in patches of southern boundary.
8. **Breach in embankments** on eastern boundary of the Park This results in unusual sudden increase of water level along the south boundary leading to large scale mortality of wild animals.

**Potential Threat**

- Pollution and contamination from effluents from the oil industry.
- Intensified organized poaching- Though at present, management has been able to contain this main threat in recent years, still it remains a major threat. Poaching has been limited to rhinoceros but in future this may spread to other wildlife values like elephant and tigers.

**GAPS**

- Inadequate trained anti-poaching staff and infrastructure.
- A huge gap between financial requirement to address planned activities and allocation of funds.
- Inadequate and untimely release of funds.
- Inadequate information on sedimentation rate in different parts.
- Inadequate available resources and methodology for effective control of weeds.
- Irregular monitoring of bankline and habitat to assess erosion and habitat degradation.

**RECOMMENDATIONS**

- Take measures to train the staff for anti-poaching aspects.
- Mobilise resources to obtain funds to address all planned activities from union/state Governments, NGOs, International agencies.
- Take measures to fill the gap in infrastructure.
- Gather information on sedimentation.
- Take intensified measure for effective control of weeds.
- Carry our regular monitoring of change in bankline of river Brahmaputra and habitat suitability.
- Properly coordinate with other departments/NGOs/Local communities to avoid flash floods and mortality of animals on National Highway.

**Identifying Stresses and Threats Worksheet**

Threats to World Heritage Values	Key threat-related factor to be assessed	Focal Management Target affected	Attributes for consideration in status measurement
<b>Current Threats</b>	STRESS: Poaching SOURCE: (i) High demand in international market. (ii) Poor economic condition of local communities	One horned Indian Rhinoceros	Protection measures, population trends and rate of mortality
	STRESS: Habitat degradation SOURCE: (i) Siltation caused by deforestation in catchments areas (ii) Unmonitored practice of grassland management using fire as a tool. (iii) Exotic weed invasion (iv) Livestock grazing in fringe areas	Grassland and wetland flora and fauna	Loss of resources (e.g. food, shelter) as well as decimation of slow moving non target species due to intense fire requires monitoring
	STRESS: Habitat fragmentation SOURCES: National Highway, surrounding land use pattern	Terrestrial vertebrates-particularly migratory fauna	Interferes in animal movement particularly during floods
	STRESS: Habitat loss SOURCE: Erosion due to change in river courses and breach in embankments	All species and habitats	Possible change in riverfront ecosystem and decline in Park area.
	STRESS: pollution and contamination SOURCE: (i) Use of pesticides and chemical fertilizers in the tea gardens near the Park	Aquatic and grassland & wetland species and habitat	Harmful effects on fishes, birds, plants and others as well as enhanced eutrophication of wetlands.

<b>Threats to World Heritage Values</b>	<b>Key threat-related factor to be assessed</b>	<b>Focal Management Target affected</b>	<b>Attributes for consideration in status measurement</b>
	STRESS: Commercial fishing SOURCE: High demand and low production in the neighbouring areas; poor socio-economic condition	Turtles, Fishes, Raptors and other birds	Loss of diversity of both fish fauna as well as dependent predators
<b>Potential Threats</b>	STRESS: Habitat degradations SOURCE: (i) Mega hydroelectric projects (ii) Invasion by alien species of weed (iii) Effluents from Numaligarh refinery released in Brahmaputra tributary upstream from Kaziranga	All species and ecosystems  Aquatic and grassland & wetland species and habitat	Loss of carrying capacity of the habitats and deterioration of habitat quality due to degradation and downstream effects of large dams  Harmful effects on fishes, birds, plants and others as well as enhanced eutrophication of wetlands.
	STRESS: Intensified and organized poaching SOURCE: Poor protection infrastructure	Rhinoceros, tiger, elephant etc	Local extinction of iconic species

### **2.3 Engagement of Stake-Holders/Partners in Management**

#### **Local people**

Kaziranga National Park is a famous destination in northeastern India. People from Assam have emotional attachment with one horned rhinoceros and Kaziranga.

#### **NGOs & International Organisations**

UNESCO, US Fish and wildlife Services, EIA-London, Rhino Foundation, David Shepherd Wildlife Foundation-UK, Wildlife Area Development and Welfare Trust-Guwahati, Aaranyak Nature Club, Kaziranga Wildlife Society, Kaziranga Staff Welfare Society and many other local NGOs and organizations have helped the site from time to time.

#### **Government Organizations**

Government organization like Police, Tourism and Indian Army helps the site management and take general interest in welfare of wildlife values of the site.

All the above-mentioned organizations are organized at their individual level. Co-ordination among them and with the site management will have better impact for wildlife conservation.

There is further opportunity for these organizations to be involved in protection and conservation of all the wildlife values.

**Engagement of “Stakeholders” and “Partners in Management” Worksheet 1**  
*Target/Management Objective: All biodiversity targets and other natural values*

	<b>Factor</b>	<b>Surrounding Villagers</b>	<b>International Institutions</b>	<b>Govt. Departments</b>	<b>NGOs</b>	<b>Tourist and tourism industry</b>
<b>Understanding Stakeholders</b>	<b>Economic dependency</b>	Low (but marginal dependency on fish, fuel-wood, fodder and other non-timber forest produce)	None	Low	None	None
	<b>Negative Impacts</b>	Moderate in fringe areas	None	Low	None	Low (some tourists do tease animals and litter)
	<b>Positive Impacts</b>	Low (some provide intelligence against poachers etc. and help during floods)	Moderate (sporadic funding for better protection and management)	Moderate (Civil Administration, Army and Police help in management objectives)	Moderate	Moderate (visitors to the park indirectly influence policy for better management)
	<b>Willingness to engage</b>	Low (its potentially high provided they are involved)	Low- with immense prospect	Moderate	High	Low to moderate
	<b>Political / Social Influence</b>	Low to moderate (some influence exists through the local politicians)	High (institutions such as IUCN and UNESCO are highly regarded by policy makers)	High	Low to moderate.	Low to moderate
	<b>Organization of stakeholders</b>	Constitution of eco-development committees and Forest Development Agency will help in organizing the surrounding villagers	Organized at individual institution levels but not as a group	Low (fairly good interdepartmental cooperation exists but not properly organized)	Organized at individual levels	Low with no proper networking

	<b>Factor</b>	<b>Surrounding Villagers</b>	<b>International Institutions</b>	<b>Govt. Departments</b>	<b>NGOs</b>	<b>Tourist and tourism industry</b>
<b>Assessment of Stakeholder Engagement</b>	<b>What opportunities do stakeholders have to contribute to management?</b>	Limiting use of bio-resources of the park and co-operating with the management.	Financial and technical assistance to the management	All round support	Research, monitoring, assistance to the park management; awareness, publicity etc.	Tourism management and infrastructure; spread awareness of the importance and value of the site
	<b>What is the level of engagement of the stakeholder?</b>	Low	Low to moderate	Moderate	Moderate	Low
<b>Summary</b>	<b>Overall adequacy of stakeholder engagement</b> (Very good, Good, Fair, Poor)	Poor	Poor	Fair	Fair	Poor

**Engagement of “Stakeholders” and “Partners in Management” Worksheet 2**  
*Target/Management Objective: Tourism*

	<b>Factor</b>	<b>Surrounding Villager</b>	<b>Tourism Industry</b>	<b>Govt. Departments (Excluding Tourism Department)</b>	<b>Media</b>
<b>Understanding Stakeholders</b>	<b>Economic dependency</b>	Moderate	<u>High</u>	Low	Low
	<b>Negative Impacts</b>	Moderate	Low	Low	Low
	<b>Positive Impacts</b>	Moderate	<u>High</u>	Low	Moderate
	<b>Willingness to engage</b>	<u>High</u>	<u>High</u>	Moderate	Moderate
	<b>Political / Social Influence</b>	Low	Moderate	<u>High</u>	Moderate
	<b>Organization of stakeholders</b>	Not organized	Partly organized	Not organized	Partly organized at individual levels
<b>Assessment of Stakeholder Engagement</b>	<b>What opportunities do stakeholders have to contribute to management?</b>	Tourist guides, small shops and ancillary to tourism industry such as home stay provisions and transport	Promotion of tourism, publicity, generation of revenue	Infrastructure development	Education and awareness, publicity
	<b>What is the level of engagement of the stakeholder?</b>	Low	Moderate	Moderate	Moderate
<b>Summary</b>	<b>Overall adequacy of stakeholder engagement (Very good, Good, Fair, Poor)</b>	Low	Good	Fair	Fair

#### **2.4 Review of National Context**

At present, India has 89 National Parks and 492 Wildlife Sanctuaries covering 4.71% of the geographical area of the country. India has also developed a “Bio-geographical Classification of India” which provides a framework for establishment of Protected Areas on a biogeographically representative basis.

There are several legislations enacted in India to deal with the conservation of biodiversity and management of wildlife. The Indian Wildlife (Protection) Act was enacted in 1972 and has been amended from time to time in response to the changing scenario of conservation at the PA and country level. Indian Parliament passed recently the Biodiversity Act in 2002 and has also formulated the National Wildlife Action Plan (2002-2016). India now has four categories of Protected Areas viz., National Park, Wildlife Sanctuary, Conservation Reserve and Community Reserve. At the apex level, there is an Indian Board of Wildlife (IBWL), which is chaired by the Prime Minister of India and has adequate representation from Government Agencies and Civil Society representatives. Similarly, at the state level there are State Wildlife Advisory Boards, which provide the necessary policy guidance in wildlife matters. The Government is committed to conserve the rich biological heritage of the country.

**GAPS**

- The present legislation regarding national parks does not facilitate the “sharing of natural resources/ usufructs” with the local communities.
- There is a lack of harmony between policies and programmes of Tourism Department with those of Forest/ Wildlife Departments

**RECOMMENDATIONS**

- A concept paper on “Sharing of natural resources/ usufructs” from the wildlife protected areas with the local communities needs to be prepared keeping in mind the conservation imperatives and the needs and aspirations of the local communities.
- There is a need to initiate dialogue/ consultation with various government agencies particularly the Tourism Department to harmonize and reduce conflict between their respective policies and programmes.

### 3.0 PLANNING ASSESSMENT

#### 3.1 Management Planning Assessment

List of planning documents for World Heritage Site :

Name of the plan	Year of preparation or most recent review	Level of approval of the plan (L, G, A, S/A, D)*	Year specified for the next review of the plan
Management Plan Kaziranga National Park, 2003- 2013	-	G	2004 and every two years subsequently

L= plan has force of law (usually has been approved by the Parliament or legal instrument)

G= **plan has been approved at the government level but is not a legal instrument**

A= plan has been approved at Head of Agency level

S/A= plan has been approved at a senior level within the Agency

D= plan is a draft and has not been formally approved.

#### **Adequacy of Management Plan:**

- Although the management objectives and strategies are clear, there is very little on “Desired Future Conditions” for the site. However, the PA managers have a reasonably good understanding of it.
- Wetland dynamics is not clearly understood and therefore management interventions are largely reactive in nature.

- Plan lists research priorities and states the areas that require regular monitoring, monitoring methodologies are not explicit and the monitoring protocols have not been stated.
- Budget is very clear but availability and timely allocation of funds cannot be always ensured.

NB: In India, policy issues are generally not addressed in the management plan. Policies are developed at the union & state level and within the ambit of these policies the management plan is prepared. Coordination with other line agencies/Dept is a major issue. At the district level there is a coordinating mechanism but forestry / wildlife issues do not find the desired importance. However, efforts are being made to improve and integrate the management plans in the regional planning process.

#### **GAPS**

- Certain additional information on ecological parameters is needed to improve understanding and planning better management interventions.
- Appropriate system for mid course evaluation and monitoring is required.
- Stronger commitment for funds along with their timely release is needed. However, new strategies for accruing and streamlining the funding process have been proposed in the Management plan (2003-2013).

#### **RECOMMENDATIONS**

- A section on “Desired Future Conditions” should be added during the management plan review process.
- Inputs from the on-going research studies in the park should be taken into consideration during the management plan review process.

**“Adequacy of General Management Plan” Data Sheet**

Principle	Criteria	Assessment	Rating guidance (Very Good, Good, Fair, Poor)	Comments
Decision making framework	1. Plan establishes clear understanding of the desired future actions for the site (ie. describes the desired outcomes of management in terms that provides a guide to management and decision making by site managers)	Fair	VG – desired future is clearly and explicitly articulated as a decision making reference point G – desired future is clearly articulated <b>F – desired future is not clearly articulated but is implied or can be inferred from plan objectives</b> P – plan focuses more on present issues and actions and doesn’t indicate a desired future for the site	The management planning process in India is based on PA management guidelines, which do not upfront include, the concept on “desired future conditions”. No formal SWOT analysis has been done although PA managers do have general understanding of conditions.
	2. Plan provides sufficient guidance on the desired future for the site for it to act as a decision framework for addressing new issues and opportunities that arise during the life of the plan	Not applicable	VG – desired future is expressed in a way that provides clear guidance for addressing new issues and opportunities G – desired future is expressed in a way that focuses more on addressing current issues and opportunities F – desired future lacks clarity and does not provide an effective decision framework for the future P – plan focuses more on present issues and actions and doesn’t indicate a desired future for the site	The management planning process in India is based on PA management guidelines, which do not upfront include, the concept on “Desired Future Conditions”.
	3. Plan provides for a process of monitoring, review and adjustment during the life of the plan.	Fair	VG – plan provides a clear, explicit and appropriate process for monitoring, review and adjustment G – provisions for monitoring, review and adjustment of the plan are present but are incomplete, unclear or inappropriate in some minor respects <b>F – need for monitoring, review and adjustment is recognized but is not dealt with in any detail</b> P – plan does not address the need for monitoring, review and adjustment	Monitoring protocols and framework needs to be developed.

Principle	Criteria	Assessment	Rating guidance (Very Good, Good, Fair, Poor)	Comments
Planning context	1. Plan provides an adequate and appropriate policy environment for management of the World Heritage Area	Not applicable	VG – Policy requirements for the site are identified and adequate and appropriate policies are established with clear linkages to the desired future for the site G – Policy requirements for the site are identified and policies are largely adequate and appropriate F – Policies in the plan are inadequate or incomplete in major respects P – Plan either doesn't establish policies for the area or the policies are inadequate or inappropriate in major respects	The policies are developed at the Federal & State Levels and the management plans are developed within the framework of these policies.
	2. Plan is integrated /linked to other significant national/ regional/ sectoral plans that influence management of the World Heritage Area	Fair	VG – Relevant national, regional and sectoral plans that affect the site are identified and specific provisions or mechanisms are included to provide for integration or linkage now and in the future G – Relevant national, regional and sectoral plans that affect the site are identified, their influence on the site is taken into account but there is little attempt at integration F – <b>Some relevant national, regional and sectoral plans are identified but there is no attempt at integration</b> P – No account is taken of other plans affecting the site	Sectoral integration is a very challenging task. Efforts are being made to ensure better co-ordination with other line agencies/departments.
Plan content	1. Plan is based on an adequate and relevant information base	Fair	VG – The information base for the plan is adequate in scope and depth and is matched to the key decisions, policies and issues addressed in the plan G – The information base is adequate in scope and depth but may contain some irrelevant information (i.e. a broad compilation of data rather than matching information to the decisions, policies and issues addressed in the plan) F – <b>The information base has inadequacies in scope or depth so that some issues, decisions or policies cannot be placed into context</b> P – Very little information relevant to plan decisions is presented	Research efforts needs to be strengthened to generate information on species, habitat & their interaction. Further available information to synthesized in order to make it more useful to PA managers.

Principle	Criteria	Assessment	Rating guidance (Very Good, Good, Fair, Poor)	Comments
<b>Plan content</b>	2. Plan addresses the primary issues facing management of the World Heritage Area within the context of the desired future of the site	Good	<p>VG – Plan identifies primary issues for the site and deals with them within the context of the desired future for the site (i.e. plan is outcome rather than issues driven)</p> <p><b>G – Plan identifies primary issues for the site but tends to deal with them in isolation or out of context of the desired future for the site</b></p> <p>F – Some significant issues for the site are not addressed in the plan or the issues are not adequately addressed</p> <p>P – Many significant issues are not addressed or are inadequately dealt with in the plan</p>	
	3. Objectives and actions specified in the plan represent an adequate and appropriate response to the issues	Good	<p>VG – Objectives and actions are adequate and appropriate for all issues</p> <p><b>G – Objectives and actions are adequate and appropriate for most issues</b></p> <p>F – Objectives and actions are frequently inadequate or inappropriate</p> <p>P – Objectives and actions in the plan do not represent an adequate or appropriate response to the primary issues</p>	
	4. Plan takes account of the needs and interests of surrounding community.	Fair	<p>VG – Plan identifies the needs and interests of surrounding community and has taken these into account in decision making</p> <p>G – Plan identifies the needs and interests of Surrounding community but it is not apparent that these have been into account in decision making</p> <p><b>F – There is limited attention given to the needs and interests of Surrounding community and little account taken of these in decision making</b></p> <p>P – No apparent attention has been given to the needs and interests of surrounding community</p>	Micro-plan has been made for few selected villages around. The park periphery. More inputs are needed to meet the needs & interests of the local comments.

Principle	Criteria	Assessment	Rating guidance (Very Good, Good, Fair, Poor)	Comments
	5. Plan takes account of the needs and interests of <u>stakeholders other than Government</u> involved in the World Heritage Area	Fair	<p>VG – Plan identifies the needs and interests of other stakeholders and has taken these into account in decision making</p> <p>G – Plan identifies the needs and interests of other stakeholders but it is not apparent that these have been into account in decision making</p> <p><b>F – There is limited attention given to the needs and interests of other stakeholders and little account taken of these in decision making</b></p> <p>P – No apparent attention has been given to the needs and interests of other stakeholders</p>	There is some scope of involvement of stakeholders in the tourism, research component of the plan.
<b>Plan implementation</b>	1. Plan provides adequate direction on management actions that should be undertaken in the World Heritage Area	Good	<p>VG – Management actions specified in the plan can be clearly understood and provide a useful basis for developing works programs, budgets and other operational plans and programs</p> <p><b>G - Management actions specified in the plan can generally be clearly understood and provide an adequate basis for developing works programs, budgets and other operational plans and programs</b></p> <p>F – Management actions are sometimes unclear or lacking in specificity making it difficult to use the plan as a basis for developing works programs, budgets and other operational plans and programs</p> <p>P – Management actions are often unclear or lacking in specificity making it very difficult to use the plan as a basis for developing works programs, budgets and other operational plans and programs</p>	Annual plans of operation are made to provide further details of activities and to seek funds from various agencies.

Principle	Criteria	Assessment	Rating guidance (Very Good, Good, Fair, Poor)	Comments
	2. Plan identifies the priorities amongst strategies and actions in a way that facilitates work programming and allocation of resources	Very good	<p><b>VG – Clear priorities are indicated within the plan in a way that supports work programming and allocation of resources</b></p> <p>G – Priorities are indicated but are sometimes unclear making their use for work programming and resource allocation more difficult</p> <p>F – Priorities are not clearly indicated but may be inferred</p> <p>P – There is no indication of priorities within the plan.</p>	

### **3.2 Design Assessment**

The KNP is medium sized park with 430 km<sup>2</sup> area. The park has a large periphery on account of its elongated shape. Northern boundary is not entirely stable, hence the effective boundary of the park change by few hectares in certain places.

Ecological boundary of the wide-ranging animal is far greater than administrative boundary. Tiger, Elephant are not restricted to park boundary. Addition areas have been able to partly address range requires of animals like elephant and tiger. But these areas are at present subjected to high biotic pressure and have low protection infrastructure. Animal move to higher areas especially during floods by crossing highway situated along the southern boundary where they are subjected to varying threats due to accidents by speeding vehicles. These higher grounds have been traditional shelter place for wild animal during flooded monsoon period. Further additions are needed to provide habitat during flood season and to make the boundary configuration ideal from the present north-south narrow configuration.

For effective and convenience, area has been divided into core zone and tourism zones. Besides, the park has been divided into four administrative ranges.

#### **GAPS**

- There is no mechanism to measure the effectiveness of the existing zonation system.

#### **RECOMMENDATIONS**

- Undertake a review of the existing zonation system and implement appropriate zonation strategy to increase management effectiveness.
- Take measures to enhance protection level at higher grounds beyond southern boundary at high political and administrative level.

**Design Assessment: Data Sheet**

<b>Design aspect</b>	<b>Strengths of reserve design in relation to this aspect</b>	<b>Weaknesses of reserve design in relation to this aspect</b>
<b>A. Ecological integrity</b>		
<b>Key areas</b>	Most of the target species etc. are largely confined to – the park. Contiguity of the floodplain habitats, level of protection efforts and terrain structure favours integrity.	Tiger, Elephant are not restricted to park boundary. During floods animals move to higher ground beyond the southern boundary of the Park. Protection level in these outside areas is not as high as in the Park.
<b>Size</b>	Considering that ecological boundaries extend beyond the current administrative boundary and more than 450 km <sup>2</sup> area in the form of National Park, Proposed National Park and reserved forests, contiguous to the site has been brought under park administration. The increase in size has been able to partly address range requires of animals like elephant & tiger.	The additional areas are presently subjected to high biotic pressure and have low protection infrastructure. Further additions are needed to provide habitat during flood season and to make the boundary configuration ideal from the present north-south narrow configuration.
<b>External interactions</b>	The Brahmaputra river forms northern boundary and there are patches of Reserve Forests on the western side of the Park. These natural features inhibit the external interaction and contribute to site integrity.	The southern and eastern boundary of the Park abuts villages & tea gardens increasing human-animal conflicts. Use of pesticides, herbicides and fertilizer in the agriculture fields and tea plantation has been perceived as a problem for longtime conservation of the ecosystem. Establishment of oil refinery in the vicinity of the Park is a weakness for the biodiversity conservation as it has been established in the migratory path of elephants, and releases effluents in the Brahmaputra tributary upstream. Existence of National Highway 37 along the southern boundary of the Park also causes further pollution and disturbance, and interferes in local movement of the wild animals.
<b>Connectivity</b>	Migratory corridors and flood season high grounds have been identified and steps are being initiated to maintain and manage them for facilitating the movement of the wild animals.	While the corridors have been identified, the existing deterrents such as the highway, refinery, tea estates etc. exist, and requires ameliorative measures.
<b>B. Community well-being</b>		
<b>Key areas</b>	The key areas of the World Heritage Site are inviolate and prohibit consumptive use or removal of any resources.	Some amount of exploitation of certain resources such as fish, fodder and firewood etc. are done in the fringe areas of the Park and causes habitat degradation. There is no buffer between human habitations and the Park along its southern boundary, which also leads to human-animal conflict.
<b>Size</b>	The large size and numbers of wetlands helps in breeding of variety of fishes and since these wetlands are connected to water bodies outside the Park, these are crucial to fish diversity and abundance in areas where	Due to inadequate control and management of the recently included ‘Additional’ areas to the Kaziranga National Park, the effectiveness and purpose of expansion remains unachievable, their potentials

<b>Design aspect</b>	<b>Strengths of reserve design in relation to this aspect</b>	<b>Weaknesses of reserve design in relation to this aspect</b>
	fishing is allowed. The Park floodplain wetlands also reduce the impacts of flood on the local populace by acting as reservoirs.	have not been fully realized.
<b>External interactions</b>	Existence of the Park has strengthened the cultural identity of the local communities as well as people of the state.	Addition of new areas to the Park has displaced livelihood options of some people engaged in livestock rearing.
<b>Legal status</b>	Legal status of the original area of Park (before ‘Additions’) is established and is generally respected by local communities.	Some ‘Additional’ areas are under legal conflict as people have been displaced, although the land ownership has always been with the government.
<b><i>C. Management factors</i></b>		
<b>Legal status</b>	The legal status and laws to protect and manage the site is clear under the Wildlife( Protection) Act,1972 as amended up to date and the rules made thereunder.	People deriving sustenance from the government owned land that have been included in the Addition Areas perceive they have a right to use such areas and have gone to court against displacement.
<b>Access points</b>	The access points to the Park are limited only to its southern boundary. Road access points are few and are well guarded.	The long interface with human habitation along the southern boundary, and presence of the National Highway are major negative factors in this respect.
<b>Neighbours</b>	Presence of contiguous forests on the Karbi Anglong hills on the southern side and the Reserved Forests on the western side of the Park.	Inadequate enforcement of wildlife protection laws and the traditional hunting practices of the tribal hill communities are problems, particularly for animals moving out of the Park. Also, spread of weeds from neighboring tea estates and disease from livestock to wild herbivores (particularly the wild buffalo).

## **4.0 INPUT ASSESSMENT**

### **4.1 Assessment of Management Needs**

#### **Manpower**

The Director, KNP is the administrative and managerial head and executes all related activities through Divisional Forest Officer, Eastern Assam Wildlife Division.

The present sanctioned strength of staff was meant for managing 430 km<sup>2</sup> of Kaziranga National Park. The area under the administrative control of the park management has now more than doubled by way of new additions to the Kaziranga National Park.

#### **Funds**

To manage a high profile as well as problem-ridden national park, regular fund flow is absolute necessary. However, due to various reasons, which are beyond control of the management, fund flow is not adequate and regular. Majority of the planned works remain reactive for this reason.

#### **Strengths**

- Management issues identified and needs prioritised.
- Some of the national and international organizations have good understanding of needs and sometimes help the management by partly filling the gaps.

**GAPS**

- Opportunities for staff are inadequate.
- Maintenance budgets for park infrastructure are inadequate.
- Mechanism for “plough back” of revenues generated from tourism is absent.
- There is always an uncertainty regarding the actual quantum of funds received by the park.

**RECOMMENDATIONS**

- Ensure that a comprehensive capacity building plan for the front line staff is put in place within a two-year period.
- Prepare a concept paper on “sharing of revenues” within a one year period.
- Organize study tours for the PA staff to other prominent wetlands in the country to enhance their skills and understanding.

**Management Needs-Financial (Non-Recurring)**

Recurring	1st. year (Rupees in lakhs)	2 <sup>nd</sup> year	3 <sup>rd</sup> year	4 <sup>th</sup> year	5 <sup>th</sup> year
<b>Boundary survey &amp; Demarcation</b>	1.5	1.5	1.5	1.5	1.5
<b>Control of Poaching:</b>					
<i>A. Anti-poaching Camps:</i>	10	10	10	10	10
<i>B. Equipment</i>	9.5	9.5	9.5	9.5	9.5
<i>C. Staffing</i>					
* Incremental Staff (Wages)	25	25	25	25	25
<i>D. Mobility</i>	28	28	28	28	28
<i>E. Patrolling:</i>	27.3	27.3	27.3	27.3	27.3
<i>F. Intelligence gathering</i>	3	3	3	3	3

Recurring	1st. year (Rupees in lakhs)	2 <sup>nd</sup> year	3 <sup>rd</sup> year	4 <sup>th</sup> year	5 <sup>th</sup> year
<b>Flood season measures</b>	18	18	18	18	18
<b>Control of grazing and other biotic disturbances</b>	3	3	3	3	3
<b>Grass land management</b>	21.5	21.5	21.5	21.5	21.5
<b>Control of ranging pattern of wild animals outside managed habitat</b>	2	2	2	2	2
<b>Infrastructure &amp; Communication:</b>	55.5	55.5	55.5	55.5	55.5
<b>Weed control</b>	11.5	11.5	11.5	11.5	11.5
<b>Wetland Management:</b>					
<i>A. De-siltation (2 lakhs Cu.Mt/p a)</i>	60	60	60	60	60
<i>B. Construction of bund during winter</i>	2	2	2	2	2
<i>C. Removal of water hyacinth</i>	5	5	5	5	5
<i>D. Creation of ponds</i>	5	5	5	5	5
<i>E. Monitoring of water quality</i>	1	1	1	1	1
<b>Erosion control</b>	1.5	1.5	1.5	1.5	1.5
<b>Animal health</b>	30	30	30	30	30
<b>Man-Animal coexistence</b>	19	19	19	19	19
<b>Tourism, Interpretation and conservation Education</b>	30.5	30.5	30.5	30.5	30.5
<b>Eco-development</b>	64	64	64	64	64
<b>Research and monitoring</b>	18	18	18	18	18
<b>Management Information System</b>	6	6	6	6	6
<b>Training:</b>	7	7	7	7	7
<i>A. Local</i>	3	3	3	3	3
<i>B. Institution</i>	2	2	2	2	2
<i>C. Educational Tour &amp; visit to other Protected Areas</i>	2	2	2	2	2
<b>Organisation and administration</b>	47	47	47	47	47
<b>Total</b>	<b>518.8</b>	<b>518.8</b>	<b>518.8</b>	<b>518.8</b>	<b>518.8</b>

NB : Indian Rupees one lakh = US \$ 2200

ITEMS/ACTIVITIES	RECURRING				
	Ist Yr.	2nd. Yr.	3rd. Yr.	4th. Yr.	5th. Yr.
Boundary survey & Demarcation	1.5	1.5	1.5	1.5	1.5
<i>Zone Plans</i>	16	16	15.5	15.5	15.5
<b>Control of Poaching:</b>					
<i>A. Anti-poaching Camps:</i>	10	10	10	10	10
<i>B. Equipment</i>	9.5	9.5	9.5	9.5	9.5
* Incremental Staff (Wages)	25	25	25	25	25
<i>D. Mobility</i>	28	28	28	28	28
<b>E. Patrolling:</b>					
Patrolling path	27.5	27.3	27.5	27.5	27.5
<i>F. Intelligence gathering</i>	3	3	3	3	3
Flood season measures	13.5	13.5	13.5	13.5	13.5
Control of grazing and other biotic disturbances	3	3	3	3	3
Grass land management	21.5	21.5	21.5	21.5	21.5
<i>A. Annual Survey of fire lines</i>	0.5	0.5	0.5	0.5	0.5
<i>B. Uprooting of unwanted tree seedlings</i>	2	2	2	2	2
<i>C. Vegetation mapping</i>	1		1		1
<i>D. Wages for creating/ Maintenance of fire line (1km x 1 km Grids)- Approx. 900 Km. @Rs.2000/-Km. during 1st Year &amp; then 1000/-Km.</i>	18	9	9	9	9
Control of ranging pattern of wild animals outside managed habitat	2	2	2	2	2
<b>Infrastructure &amp; Communication:</b>					
<i>A. Building</i>	26	26	26	26	26
<i>B. Roads</i>	25	24.5	24.5	24.5	24.5
<i>C. Annual repairing of existing -18 Wooden Bridges and culverts.</i>	5	5	5	5	6

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<b>Weed control</b>	11.5	11.5	11.5	11.5	11.5
<b>Wetland Management</b>	73	73	73	73	73
<b>Erosion control</b>	1.5	1.5	1.5	1.5	1.5
<b>Animal health surveillance</b>	30	30	30	30	30
<b>Man-Animal coexistence</b>	19	19	19	19	19
<b>Tourism, Interpretation and conservation Education</b>					
<b>Tourism</b>	14	14	15	15	15
<b>Interpretation</b>	16.5	17	17	17	17
<b>Eco-development</b>	64	64	62	62	62
<b>Research and monitoring</b>	18	18	18	18	18
<b>Management Information System</b>	3	3	3	3	3
<b>Population dynamics- Census</b>	3	3	3	3	3
<b>Training</b>	7	7	7	7	7
<b>Organisation and administration</b>	47	47	47	47	47
<b>TOTAL</b>	<b>527.8</b>	<b>535.3</b>	<b>535</b>	<b>534</b>	<b>536</b>

NB : Indian Rupees one lakh = US \$ 2200

**4.2 Rating System for Process Indicators**

Management process is largely adequate for the management of the WH site. The issues relating to law enforcement, resource management, management interventions are being managed at satisfactory level.

**Rating System for Process Indicators Worksheet**

Issue	Criteria	Rating	Actual score	Comments
<b>General</b>				
<b>1. Legislation</b>	a. Problems with legislation or regulations represent a major barrier to achieving management objectives. b. Problems with legislation or regulations are a significant but not major barrier to achieving management objectives. c. Problems with legislation or regulations are not a barrier to achieving management objectives. <b>d. Legislation or regulations are particularly effective in achieving management objectives.</b>	0 1 2 3	<b>3</b>	
<b>2. Law enforcement</b>	a. There is no effective capacity to enforce protected area legislation and regulations. b. There are major deficiencies in law enforcement capacity <b>c. Law enforcement capacity is acceptable but some deficiencies are evident.</b> d. Law enforcement capacity is excellent.	0 1 2 3	<b>2</b>	Most of the staff are not well conversant with legal processes and are not adequately trained. The infrastructure is inadequate and its staff strength is weak.
<b>3. Planning</b>	a. There is no management plan for the protected area. b. A management plan is being prepared or has been prepared but is not being implemented. c. An approved management plan exists but it is only being partially implemented because of funding constraints or other problems. <b>d. An approved management plan exists and is being implemented.</b>	0 1 2 3	<b>3</b>	
<b>Additional Points</b>	e. The planning process allows adequate opportunity for adjacent landholders and other stakeholders to influence the	1		

Issue	Criteria	Rating	Actual score	Comments
	<p>plan</p> <p><b>f. There is an established schedule and process for periodic review of the management plan</b></p> <p><b>g. Annual work programs and budgets are based on the provisions of the management plan</b></p>	<p>2</p> <p>3</p>	3	
<b>4. Resource inventory</b>	<p>a. There is little or no information available on the natural/cultural resources of the area.</p> <p><b>b. Information on the natural/cultural resources is not sufficient to support planning and decision making.</b></p> <p>c. Information on natural/cultural resources is sufficient for key areas of planning / decision making or this information is being rapidly acquired.</p> <p>d. Information concerning natural /cultural resources is sufficient to support most or all areas of planning and decision making.</p>	<p>0</p> <p>1</p> <p>2</p> <p>3</p>	3	
<b>5. Resource management</b>	<p>a. Requirements for active management of natural and cultural resources (e.g. fire mgt, feral animal control, cultural sites) have not been assessed.</p> <p>b. Requirements for active management of natural and cultural resources are known but are not being addressed.</p> <p><b>c. Requirements for active management of natural and cultural resources are only being partially addressed.</b></p> <p>d. Requirements for active management of natural and cultural resources are being fully or substantially addressed.</p>	<p>0</p> <p>1</p> <p>2</p> <p>3</p>	2	Research program need restructuring and monitoring programmes need re-evaluation
<b>6. Maintenance</b>	<p>a. Little or no maintenance of equipment / facilities is undertaken.</p> <p><b>b. Maintenance is only undertaken when equipment/facilities are in need of repair.</b></p> <p>c. Most equipment/facilities are regularly maintained.</p> <p>d. All equipment/facilities are regularly maintained.</p>	<p>0</p> <p>1</p> <p>2</p> <p>3</p>	1	Funding constraints often prevent regular maintenance
<b>7. Neighbours</b>	<p>a. There is no contact between managers and individuals or groups who own or manage neighbouring lands and seas.</p>	0		Although the contacts are regular, the outputs and response are often

Issue	Criteria	Rating	Actual score	Comments
	<p>b. <b>There is limited contact between managers and individuals or groups who own or manage neighbouring lands and seas.</b></p> <p>c. <b>There is regular contact between managers and neighbours but limited cooperation on issues of mutual concern.</b></p> <p>d. There is regular contact between managers and neighbours and issues of mutual concern are cooperatively addressed.</p>	<p>1</p> <p>2</p> <p>3</p>	2	inadequate.
Additional points	e. There is open communication and trust between managers and neighbours and issues of mutual concern are co-operatively addressed	1	1	Some ecodevelopment schemes targeted at the welfare of local communities are being implemented but are inadequate.
8. Economic benefits to local communities	<p>a. There is little or no flow of economic benefits to local communities from the existence of the protected area.</p> <p>b. <b>There is some flow of economic benefits to local communities from the existence of the protected area but this is of minor significance to the regional economy. People from the local community are not generally employed in protected area management.</b></p> <p>c. There is a flow of economic benefits to local communities from the existence of the protected area and this is of moderate or greater significance to the regional economy but most of this benefit accrues from activities outside the park boundary (e.g. spending by visitors getting to the Park).</p> <p>d. There is a major flow of economic benefits to local communities from the existence of the protected area and a significant proportion of this derives from activities on the Park (e.g. employment of locals, locally operated commercial tours etc.)</p>	<p>0</p> <p>1</p> <p>2</p> <p>3</p>	1	Mainly through tourism.
9. Communication	<p>a. There is little or no communication between managers and stakeholders involved in the protected area.</p> <p>b. <b>There is communication between managers and stakeholders but this is ad hoc and not part of a planned communication program.</b></p> <p>c. There is a planned communication program that is being used to build support for the protected area amongst</p>	<p>0</p> <p>1</p> <p>2</p>	1	

Issue	Criteria	Rating	Actual score	Comments
	relevant stakeholders but implementation is limited. d. There is a planned communication program that is being used to build support for the protected area amongst relevant stakeholders.	3		
10. Management systems	a. Problems with management systems (e.g. budgeting, office procedures, staff training) significantly constrain management effectiveness. b. Problems with management systems partially constraint management effectiveness. c. <b>Management system provides basic support to managers.</b> d. Management systems provide active and effective support to managers.	0 1 2 3	2	
Additional points	e. <b>There is a structured procedure for developing and allocating annual budgets for the area.</b> f. <b>There are adequate systems for financial management and control, record keeping and retrieval.</b> g. There is an active training program that is skills developing the potential of staff.	+1* +1 * +1	+1	
<b>Additional items for different protected area categories</b>				
<b>Category I</b>				
11. Control over access/ use of Protected Area	a. Protection systems (patrols, permits etc) are ineffective in controlling access or use of the reserve in accordance with designated objectives. b. Protection systems are only partially effective in controlling access or use of the reserve in accordance with designated objectives. c. <b>Protection systems are moderately effective in controlling access or use of the reserve in accordance with designated objectives.</b> d. Protection systems are largely or wholly effective in controlling access or use of the reserve in accordance with designated objectives.	0 1 2 3	2	

Issue	Criteria	Rating	Actual score	Comments
<b>Categories II, III and V</b>				
12. Resident communities and/or traditional landlords	a. <b>Resident communities and/or traditional owners have little or no input into management decisions.</b> b. Resident communities and/or traditional owners have input into management decisions but no direct involvement in decision making. c. Resident communities and/or traditional owners directly contribute to decision making in some areas. d. Resident communities and/or traditional owners directly contribute to decision making in all areas.	0  1  2  3	0	
Additional Points	e. There is open communication trust between local people and protected area managers. f. <b>Programs to enhance local community welfare while conserving protected area resources are being implemented.</b> g. Where permitted, harvesting of natural resources by local people is undertaken in a sustainable manner.	+1  +1  +1	+1	
13. Visitor opportunities	a. No consideration has been given to the provision of visitor opportunities in terms of access to areas of the Park or the diversity of available experiences. b. Some consideration has been given to the provision of visitor opportunities in terms of access to areas of the park or the diversity of available experiences but little or no action has been taken in this regard. c. <b>Consideration has been given to the provision of visitor opportunities in terms of access to areas of the Park and diversity of available experiences.</b> Policies and programs to enhance visitor opportunities have been implemented. d. Management of visitor opportunities is based on research into visitor’s needs and wants. Plans to optimize visitor opportunities have been implemented.	0  1  2  3	2	Financial resources are inadequate to implement most of the planned activities.

Issue	Criteria	Rating	Actual score	Comments
14. Visitors	a. Visitor facilities and services are grossly inadequate (either do not meet the needs of most visitors or visitor use is seriously damaging resources).	0	1	
	b. <b>Visitor facilities and services are inadequate (either do not meet the needs of some visitors or visitor use is damaging resources).</b>	1		
	c. Visitor facilities and services are adequate for current levels of visitation.	2		
	d. Visitor facilities and services are excellent for current levels of visitation.	3		
15. Commercial tourism	a. There is little or no contact between managers and tourism operators using the protected area.	0	2	
	b. There is contact between managers and tourism operators but this is largely confined to administrative or regulatory matters.	1		
	c. <b>There is limited co-operation between managers and tourism operators to enhance visitor experiences and project Park values.</b>	2		
	d. There is excellent co-operation between managers and tourism operators to enhance visitor experiences and project Park values.	3		
<b>CATEGORY V</b>				
16. Management intervention	a. Management interventions required to maintain protected area resources are not known or not being implemented.	0	2	
	b. Management interventions required to maintain protected area resources are known but are not being implemented.	1		
	c. <b>Management interventions required to maintain protected area resources are known but are not being fully implemented.</b>	2		
	d. Management interventions required to maintain protected area resources are being implemented.	3		

Issue	Criteria	Rating	Actual score	Comments
17. Control of land uses and activities	a. Mechanism for controlling inappropriate land use and activities in the protected area are not in place or are largely ineffective.	0	2	Mostly in “additional” areas.
	b. Mechanisms for controlling inappropriate land use and activities exist but there are major problems in effectively implementing them.	1		
	c. <b>Mechanisms for controlling inappropriate land use and activities exist but there are major problems in effectively implemented.</b>	2		
	d. Mechanisms for controlling inappropriate land use and activities exist and are major problems in effectively implemented.	3		
18. Sustainable production	a. Production activities in the area are being conducted in a way that is seriously degrading natural values.	0	<b>Not Applicable</b>	<b>Production activities are legally not permitted in protected areas.</b>
	b. Production activities in the area are being conducted in a way that is partially degrading resource values.	1		
	c. Production activities in the area are being conducted in a largely sustainable manner.	2		
	d. Production activities in the area are being conducted in a wholly sustainable manner.	3		
19. Regional and national development	a. The contribution of production activities in the area are contributing to development is minimal or non-existent.	0	<b>Not Applicable</b>	
	b. Production activities in the area are contributing locally to development but not significantly at a regional scale.	1		
	c. Production activities in the area are significant to regional development but are not nationally significant.	2		
	d. Production activities in the area are contributing significantly to national development.	3		

**Process Assessment Summary Table**

<b>Issues</b>	<b>Maximum Score</b>	<b>Current Score</b>
1. Legislation	3	3
2. Law enforcement	3	2
3. Planning	3	2
Additional Points	3	2
4. Resource inventory	3	1
5. Resource management	3	2
6. Maintenance	3	1
7. Neighbours	3	2
Additional Points	3	0
8. Economic benefits to local communities	3	1
9. Communication	3	1
10. Management system	3	2
Additional Points	3	2
11. Control over access/use of the PA	3	2
12. Resident communities and/or traditional landlords	3	0
Additional Points	3	1
13. Visitor opportunities	3	2
14. Visitors	3	1
15. Commercial tourism	3	2
16. Management interventions	3	2
17. Control of land uses and activities	3	2
18. Sustainable production	-	-
19. Regional and national development	-	-
<b>Total -</b>	<b>63</b>	<b>33</b>
<b>Overall effectiveness</b>	<b>52%</b>	

**Process Assessment Summary Table**

Main Issues	Criteria	Maximum score	Current score	Effectiveness (percentage)
Legal status	1. Legislation	3	2	67%
	2. Law enforcement	3	1.5	50%
Information availability and Planning ability	3. Planning system	3	2	67%
	4. Ecosystem inventory	3	2	67%
Ecosystem management and Vulnerability control	5. Ecosystem management a. Monitoring & Evaluation b. Research c. Restoration	3	2	67%
	6. Control over access/use of KNP	3	1.5	50%
Management systems	7. Facility development	3	1.5	50%
	8. Maintenance	3	1.5	50%
	9. Staffing and staff training	3	1.5	50%
	10. Personnel management	3	1.5	50%
	11. Communication	3	1.5	50%
Finance and budgets	12. Financial sustainability	3	1.5	50%
	13. Budget control and record keeping	3	1.5	50%
Partnership	14. Communication with stakeholders / partners	3	1.5	50%
	15. Communication with neighbors	3	1.5	50%
	16. Benefits to surrounding community	3	1.5	50%
Visitors and nature-conservation tourism	17. Control over visitor access	3	2	67%
	18. Visitor opportunities	3	2	67%
	19. Visitor facilities	3	1.5	50%

## **5.0 OUTPUT ASSESSMENT**

### **5.1 Management Plan Implementation Assessment**

#### **Current System of Assessing Implementation of Management Plan**

Presently a regular system of assessment of the management plan is not formulated. At the time of review of the management plan the extent of implementation in previous years will be taken into consideration. The management actions can be broadly grouped as follows:

- Anti- poaching management
- Flood season management.
- Habitat management.
- Tourism management
- Eco-development
- Animal health management.
- Research, Monitoring and Training

**Management Plan Implementation Assessment**

<b>Issues</b>	<b>Activities</b>	<b>Priority</b>	<b>Category of Implementation</b>	<b>Remarks</b>
Boundary survey and demarcation	Boundary Survey and demarcation (Erection of boundary Pillars)	High	3	Work has not been progressed due to inadequate availability of funds.
<b><i>Control of poaching</i></b>	Camps (Construction)	High	5	Do.
	<b><u>Equipment Procurement</u></b> Procurement of Arms Wireless and accessories Searchlight, binoculars, night-vision, solar lights etc	High	2	Procurement of important items- Night Vision and Binoculars have not commenced due to fund constraints.
	<b><u>Mobility</u></b> Vehicle procurement Country-boat, Mechanized boat, Speed-boat, OBM Excavator	High	6	Procurement of Mechanized boats, Speed boats with OBM enhance the mobility for effective patrolling in 6 <sup>th</sup> . Addition areas.
Flood season measures	Construction of high grounds	High	6	Old high grounds are available but construction of more high grounds as per planned activity not commenced.
	Construction of Rumble strips/ Barriers	High	3	-
Infrastructures	Construction of Bridges/ Culverts	High	7	These items are very important for routine anti-poaching activities.
	New roads and Cause-ways	High	7	

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	Construction of residences for staff and officers	High	7	Available residences are not sufficient and in very dilapidated condition.
Control of livestock grazing/Biotic pressures	Cattle-proof fencing	Medium	7	Prevention of stray incidents of cattle grazing from fringe villages on the south.
Animal Health Surveillance	Departmental Elephants (Housing) Livestock Immunisation (Mobile Van and lab equipments)	High	7	Livestock immunization is a mandatory requirement for preventing any out-break of communicable diseases from the cattle to wild animals.
Grassland Management	Fire lines	High	6	Presently only the existing roads act as block boundaries. Controlled Burning requires more scientific approach for management of grasslands.
Control of wild animals outside managed habitat	Power-fence	Medium	7	Certain strategic location on the east and west of the site may help in reducing the stray incidents of rhinoceros.
Research	Building/ Lab	High	7	Presently research activities are confined to some studies carried out by individuals and organizations for academic interest only.
	Vehicles/Equipment	High	7	
	Furniture	High	7	
Management Information System	Computer & Other Equipments	High	7	Present status is only at primitive stage and requires

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				strengthening commensurate with the WH status of the site.
Man-animal conflicts.	Power-fence	High	7	-
Tourism	Tourism facilities	High	6	Presently available facilities are not sufficient for growing number of visitors.
Interpretation and Conservation Education	Building and facilities	High	6	
Staff amenities	Transit camps etc	High	7	No facilities available at present.

**(Recurring)**

<b>Issue</b>	<b>Activities/Actions</b>	<b>Priority</b>	<b>Category of Implementation</b>	<b>Remarks</b>
Boundary	Survey & demarcation	High	6	Ever changing bank lines of the Brahmaputra River requires annual survey.
	Co-ordination with other Govt. Departments.	High.	6	Co-ordination with other GO.s especially Revenue is necessary for demarcation.
Anti poaching	Repairing of Arms/Wireless	High	3	Nature of the site requires regular address of these items.
	Purchasing of batteries.	High	2	
	Repairing of Vehicles/boats	High	3	
	Repairing of anti poaching camps and buildings	High	3	
	Staffing (Incremental)	High	6	Engagement of incremental staffs is necessary due to vacant post in some frontline cadres.
	POL for vehicles, boats	High	6	Insufficient funds hampers regular supply.
	Maintenance of patrolling paths, boat-lines.	High	3	-
	Kerosene and other logistics.	High	2	-
Flood-fighting measures	Gathering /buying of Information	High	3	
	Repairing of High-grounds, Rumble strips, Barriers, sinages,	High	3	
	Construction of temporary camps	High	3	

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	Logistic support to additional staff.	High	6	Additional staffs are deployed during flood from other Forest Divisions.
	Meetings, Publication of printed matters. Signage	High	3	
	External veterinary services and health check up	High	3	
Control of weeds	Water hyacinth control	High	6	Invasion of water hyacinth in the wetland and Mimosa in the grasslands is a major concern.
	Mimosa control	High	3	
Habitat Management	Uprooting of unwanted saplings	High	3	
	Vegetation, wetland mapping	High	6	
	Water retention for dry season	High	2	
	De-sedimentation	High	6	Silt deposition in the wetlands by flood water deteriorating quality and quantity of the habitat.
Research, Training and Monitoring.	Equipments, Books, stationary and other logistics	High	7	
	Project costs (Monitoring of bank line, wetlands etc.)	High	7	
	Training of staff & officers	High	3	
	Labs, books, in-house projects	High	7	
Population Trends	Census/estimation	High	2	
Veterinary/Elephant care	Livestock immunization	High	6	
	Medicines	High	1	
	Elephant feed/gear/training	High	1	
Infrastructure	Repairing of offices/residences	High	6	Most of the residences are in dilapidated condition.

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	Repairing of roads	High	3	-
	Repairing of bridges/causeways.	High	3	-
Tourism/Interpretation	Tourist amenities	High	6	
	Training	High	6	
	Publicity	High	4	
	Improvement of existing facilities	High	6	
Eco-development	Socio-economic survey	High	4	
	Micro planning	High	4	
	Execution of eco-development activities.	High	6	
Organisation and administration	<b><u>Staff amenities</u></b>			
	Medical facilities, uniforms, camp equipments, ration etc. <b>Office maintenance</b>	High High	3 6	

**Management Plan Implementation Assessment (Non-Recurring)  
(Summary)**

<b>Issues</b>	<b>Status of actions 1-7</b>	<b>Status 1/2</b>	<b>Status 3-5</b>	<b>Status 6/7</b>
Boundary survey and demarcation	3,3	0%	100%	0%
<b>Control of poaching</b>	5,2 ,6,6,6,6,6.	14%	14%	72%
Flood season measures	6,3,3,		67%	33%
Infrastructures	7,7,7,7,7			100%
Control of livestock grazing/Biotic pressures	7			100%
Animal Health Surveillance	7,7			100%
Grassland Management	6			100%
Control of wild animals outside managed habitat	7			100%
Research	7,7,7,7			100%
Management Information System	7			100%
Man-animal conflicts.	7			100%
Tourism	6			100%
Interpretation and Conservation Education	6			100%
Staff amenities	7			100%

**Percentage of actions at the various status codes**

1	2	3	4	5	6	7
0	3%	14%	0%	3%	30%	50%
<b>20%</b>					<b>80%</b>	

**Management Plan Implementation Assessment (Recurring)  
(Summary)**

<b>Issues</b>	<b>Status of actions 1-7</b>	<b>Status 1/2</b>	<b>Status 3-5</b>	<b>Status 6/7</b>
Boundary	6,6,6			100%
Anti poaching	3,3,2,3,3,3,3,6,6,3,3,2,3	15%	70%	15%
Flood-fighting measures	3,3,3,3,3,6,3,3,3,3	0%	90%	10%
Control of weeds	6,3	0%	50%	50%
Habitat Management	3,6,2,6	25%	25%	50%
Research, Training and Monitoring.	7,7,7,7,3,7,7	0%	14%	86%
Population Trends	2	100%		
Veterinary/Elephant care	6,1,1,1,1	80%	0%	20%
Infrastructure	6,3,3,3,	0%	75%	25%
Tourism/Interpretation	6,6,4,6	0%	25%	25%
Eco-development	4,4,6	0%	67%	33%
Organisation and administration	3,3,3,3,6	0%	80%	20%

**Percentage of actions at the various status codes**

1	2	3	4	5	6	7
7%	7%	45%	5%	0%	26%	10%
<b>64%</b>					<b>36%</b>	

## **6.0 OUTCOMES ASSESSMENT**

### **6.1 Biodiversity Health Assessment**

Management has been focused primarily conservation of endangered species with special attention to rhinoceros and its habitat. Problems for this vital objective have been enumerated in the section on “context review”. Though indicators have been identified and an acceptable range has been defined, it may require further study/ research for its scientific accuracy. Likewise, the monitoring indicators that are to be used for measurement need to be established in the park. Presently these are planned and are not being monitored except population estimation.

Though monitoring plan template has been drawn with regard to identification of monitoring parameters and the monitoring agency, the infrastructure and the system is not yet in place.

#### **GAPS**

- There is a lack of information on many ecological parameters used in this analysis.
- Precise information on the acceptable range of variation/ acceptable state is currently unavailable
- Specific monitoring indicators and their measurement methods are not adequately understood

#### **RECOMMENDATIONS**

- Obtain inputs from scientific institutions / individuals for determining the acceptable range of variation/ acceptable state
- Setup mechanism for Long Term Ecological Monitoring (LTEM) for the all the habitats.

**Biodiversity Health Outcomes Data Sheets-1  
Focal Management Target: Rhinoceros**

	<b>Key factor</b>	<b>Acceptable Range of Variation or Acceptable State (describe)</b>	<b>Monitoring Indicator Used for Measurement</b>	<b>Within its acceptable range of Variation? (y/n)</b>	<b>Restorable? (y/n)</b>	<b>Meets preferred status? (y/n)</b>	<b>Overall Biodiversity Health Rank</b>
<b>Size</b>	Population trends—It is increasing and has gone up to 1550 in 1999 from about 1150 in 1993.	Annual range: -2% change from natural causes and below -0.5% per from poaching.	6-yearly census by direct count method.	Y	Y	Y	Good
<b>Condition</b>	Proportion of males, females and calves; recruitment and mortality.	Any major change from the current trends. High mortality or low recruitment would cause concern.	Annual mortality figures and 6-yearly census	Y	Y	Y	Good
	General health and mortality from diseases.	Any major outbreak of disease would cause concern.	Annual mortality figures and occasional health monitoring.	Y	Y	Y	Good
<b>Landscape Context</b>	Vegetation and habitat quality. Currently around 53% of the Park has suitable habitat and about 45% has marginally suitable habitat.	Any decrease in current proportion would cause concern.	Satellite imagery.	Y	Y	Y	Fair
	Wetlands (Beels). About 5% of the Park is permanent wetland and over 40% is wetland by definition.	Decrease in area is a cause of concern.	Size and depth of wetlands (Beels) in dry season.	Y	N	Y	Fair

**Biodiversity Health Outcomes Data Sheets-2**

**Focal Management Target: Wild Buffalo**

	<b>Key factor</b>	<b>Acceptable Range of Variation or Acceptable State (describe)</b>	<b>Monitoring Indicator Used for Measurement</b>	<b>Within its acceptable range of Variation? (y/n)</b>	<b>Restorable? (y/n)</b>	<b>Meets preferred status? (y/n)</b>	<b>Overall Biodiversity Health Rank</b>
<b>Size</b>	Population trends—It is increasing and in 2001 it was about 1700.	Annual range: +-2% change would cause concern. Even rapid increase in population would indicate undesirable addition of feral Buffaloes.	6-yearly census by direct count method.	Y	Y	Y	Fair
<b>Condition</b>	General health and mortality from diseases.	Any major outbreak of disease would cause concern.	Annual mortality figures and occasional health monitoring.	Y	Y	Y	Good
<b>Landscape Context</b>	Vegetation and habitat quality. Currently around 53% of the Park has suitable habitat and about 45% has marginally suitable habitat.	Any decrease in current proportion would cause concern.	Satellite imagery.	Y	Y	Y	Fair
	Wetlands (Beels). About 5% of the Park is permanent wetland and over 40% is wetland by definition.	Decrease in area is a cause of concern.	Size and depth of wetlands (Beels) in dry season.	Y	N	Y	Fair

**Biodiversity Health Outcomes Data Sheets-3**

**Focal Management Target: Swamp Deer**

	<b>Key factor</b>	<b>Acceptable Range of Variation or Acceptable State (describe)</b>	<b>Monitoring Indicator Used for Measurement</b>	<b>Within its acceptable range of Variation? (y/n)</b>	<b>Restorable? (y/n)</b>	<b>Meets preferred status? (y/n)</b>	<b>Overall Biodiversity Health Rank</b>
<b>Size</b>	Population trends—It keeps fluctuating but is largely stable. In 2000 it was about 470 and in 1999 about 525.	Annual range: -2% change would cause concern.	6-yearly census by direct count method.	Y	Y	Y	Fair
<b>Condition</b>	Proportion of males, females and fawns.	Any major change from the current trends would cause concern.	Annual mortality figures and 6-yearly census	Y	Y	Y	Fair
	General health and mortality from diseases.	Any major outbreak of disease would cause concern.	Annual mortality figures and occasional health monitoring.	Y	Y	Y	Fair
<b>Landscape Context</b>	Vegetation and habitat quality. Currently only around 5% of the Park has suitable habitat.	Any decrease in current proportion would cause concern.	Satellite imagery.	Y	Y	Y	Fair
	Short grass habitats - only about 5% of the Park.	Decrease in area is a cause of concern.	Size of short grass areas.	Y	N	Y	Fair

Biodiversity Health Outcomes Data Sheets-4

Focal Management Target: Tiger

	Key factor	Acceptable Range of Variation or Acceptable State (describe)	Monitoring Indicator Used for Measurement	Within its acceptable range of Variation? (y/n)	Restorable? (y/n)	Meets preferred status? (y/n)	Overall Biodiversity Health Rank
Size	Population has been increasing	Annual range: -2% change from natural causes and below -0.5% per from poaching.	4 yearly census by direct count method.	Y	Y	Y	Very Good
Condition	Proportion of males, females and calves; recruitment and mortality.	Major change from the current status will be a cause concern.	Regular 4 yearly census. Regular 2 yearly census.	Y	Y	Y	Good
Landscape Context	Use of habitat.	Tiger seems to travel out side the Park quite often as the density is too high.	<u>Radio collaring of 10 tigers and 5 tigresses</u> to determine the range area.	Y	Y	Y	Fair
	Wetlands (Beels). About 5% of the Park is permanent wetland and over 40% is wetland by definition.	Decrease in area is a cause of concern.	Satellite imagery	N	Y	Y	Poor

**Biodiversity Health Outcomes Data Sheets-5**

**Focal Management Target: Bengal Florican**

	<b>Key factor</b>	<b>Acceptable Range of Variation or Acceptable State (describe)</b>	<b>Monitoring Indicator Used for Measurement</b>	<b>Within its acceptable range of Variation? (y/n)</b>	<b>Restorable? (y/n)</b>	<b>Meets preferred status? (y/n)</b>	<b>Overall Biodiversity Health Rank</b>
<b>Size</b>	Population fluctuates but is more or less stable (approx. 30-40).	Any decrease in population would cause concern.	Number of territorial males in breeding season(Jan-May)	Y	Y	Y	Fair
<b>Condition</b>	Number of breeding territories in any given grassland area.	Decrease in number of territories would cause concern.	Number of good territorial sites in any given grassland	Y	N	Y	Fair
<b>Landscape context</b>	Habitat quality currently less than 2% area is suitable.	Reduction in short grass area would cause concern.	Satellite imagery	Y	N	N	Fair
	Erosion and Siltation by river.	High rate of erosion would cause concern.	Satellite imagery	Y	N	N	Fair

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Size	The wetlands within the site are not of fixed dimension & area in a state of flux, governed by flood regime.	There is likelihood of drastic changes in the wetland areas due to severity of annual flood and note of sediment load.	Only numerical documentation of wetland but not their size & periodicity. <u>Use of depth datum &amp; recording of water level &amp; area during driest months.</u>	Dynamic	Y	Y	Good
	Macrophytic vegetation in wetlands affected by duration of flood, periodicity of water retention & rate of evaporation.	The range of species diversity in wetlands and their productivity along with the mosaic of tall & short wetland grass community changes in the area. Noticeable invasion of woodland into wetland confirms wetlands gradually giving way to woodlands.	Levels of vegetation on ocular estimation scale and some level of satellite imaginary interpretation. <u>Each wetland site mapping twice a year, during November &amp; April.</u>	N	Y	N	Fair
	Hosts of resident & migratory waterfowl as well and obligate mammals use such wetlands.	The loss or reduction of the wetland area and the periodicity determines the number of Fauna using such area.	Population estimation of wetland obligate species such as swamp deer, hog deer, rhino, buffalo & pelicans.	Y	Y	Y	Good
Condition	Turbidity productivity of macrophytic and herbivores & invasion of weeds.	Noticeable changes in population using water body and level of invasion of weeds.	Periodicity of water level & ocular estimation condition. <u>Turbidity &amp; sediment load monitoring based on water samples. Monitoring <i>Eichornia crassipes</i>.</u>	Y	Y	Y	Good

<b>Landscape Context</b>	Seasonal flood is the major affecting factor for the aquatic habitat depository of alluvial & other organic materials in the floodplain depressions are dependent on the source of such sediment.	If the flood regime is too low or too high the wetland habitat obligate species are affected. However, this event is beyond the management control. Nonetheless the well being of the wetland habitat is dependent on regular annual flushing of depositions either by flood or by human interventions.	Regular monitoring of waterflow regimes in the Brahmaputra & other tributaries, from CWPC & rainfall measurements, in the catchment areas. <u>1) Analysis of metrological data of all weather stations in the catchment area.</u> <u>2) Setting up of a metrological center with the Park.</u>	Y	Y	Y	Good
	Inflow of sediment load from all catchment streams into the Park.	Siltation in streambeds & wetlands determines the habitat and dwetation of water availability.	<u>Sediment traps in all inflow streams.</u>	Y	Y	Y	Good

Biodiversity Health Outcomes Data Sheets-7

Focal Management Target: Terrestrial Grassland Woodland Mosaic

	Key factor	[Acceptable Range of Variation or Acceptable State (describe)]  Indicators of key changes to the Focal Management Target	Monitoring Indicator Used for Measurement  ( <u>underlined are proposed indicators</u> )	Within its acceptable range of Variation?	Restorable? (y/n)	Meets preferred status? (y/n)	Overall Biodiversity Health Rank
Size	The terrestrial woodland and grassland dimensions fluctuate depending on severity of annual flood, erosion of riverbanks and siltation of wetland habitat. This is a natural ongoing ecological process.	This pattern cannot be changed significantly & the dimensions of terrestrial habitat is expected remain constant with minor variations.	Erosion maps at macro level based on satellite imagery & ground truthing.	Y	Y	Y	Very good
	Proportion of tall and short grassland to woodland determines the well being of the target ungulate species.	Cover by such identified vegetation type changes over time. The warning signs are noticable expansion of woodland into grasslands and shortgrass into draw down areas of wetland.	Ocular estimation. Vegetation mapping based on transect and ground truthing.	Y	Y	Y	Good

	Key factor	[Acceptable Range of Variation or Acceptable State (describe)]  Indicators of key changes to the Focal Management Target	Monitoring Indicator Used for Measurement  ( <u>underlined are proposed indicators</u> )	Within its acceptable range of Variation?	Restorable? (y/n)	Meets preferred status? (y/n)	Overall Biodiversity Health Rank
Condition	This status of vegetation determines the terrestrial vegetation mosaic and distribution and abundance of herbivores and thereby dependent carnivores.	An y change in particular vegetation type or noticeable increase in invasive plant species in the condition of the vegetation.	Only invasive vegetation expansion sites are being monitored. <u>Macro level vegetation maps based on satellite imaginary and specific site level vegetation maps for impacted areas based on ground truthing is required.</u> <u>Monitoring of Mimosa spread.</u>	Y	Y	Y	Fair
	Seasonal movement & use of terrestrial habitat by major herbivores is a reflection of the state of each vegetation types.	In addition to changes in annual succession herbivores use of such habitats is also influenced by grassland management actions of the Park management particularly annual burning.	Monitoring of distribution and habitat use pattern by Rhino-focal species. <u>Add on to this monitoring of system to other obligate species such as hogdeer, swampdeer florican.</u>	Y	Y	Y	Good
	Inflow of alien vegetation from the surrounding landscape through waterways appears to be spreading to the terrestrial areas of the Park.	Noticeable increase of terrestrial areas under invasion by Mimosa invisa.L in tall wet grassland areas.	Mapping of the invaded area. <u>Experimental eradication measures to be practiced and best approach determined.</u>	Y	Y	Y	Good

	Key factor	[Acceptable Range of Variation or Acceptable State (describe)]  Indicators of key changes to the Focal Management Target	Monitoring Indicator Used for Measurement  ( <u>underlined are proposed indicators</u> )	Within its acceptable range of Variation?	Restorable? (y/n)	Meets preferred status? (y/n)	Overall Biodiversity Health Rank
Landscape Context	Impact of land use pattern in the surrounding landscape such as agriculture, tea-estates play a significant role in changing the terrestrial vegetation structures, which are noticeable only on longer time frame. This is currently beyond the scope of management intervention as regional interventions not a component of management plan.	This would affect water quality, residues of harmful chemicals and organ phosphates alluvial deposits, which in turn will play a significant role in alternation of vegetation structure.	None. <u>Water quality &amp; soil analysis to determine vulnerable areas.</u>	Y	Y	Y	Good

**Biodiversity Health Summary for the World Heritage Site**

<b>Focal Management Target</b>	<b>Size Rating</b>	<b>Condition Rating</b>	<b>Landscape</b>	<b>Overall Biodiversity</b>
Rhinoceros	Good	Good	Fair	Good
Wild-Buffalo	Fair	Good	Fair	Fair
Swamp-Deer	Fair	Fair	Fair	Fair
Tiger	Very Good	Good	Fair	Good
Bengal Florican	Fair	Fair	Fair	Fair
Aquatic Habitats	Good	Good	Good	Good
Grassland	Very Good	Good	Good	Good

**Monitoring Plan Template-1**

<b>FMT</b>	<b>Indicator to be measured</b>	<b>Key factor Biodiversity health category informed</b>	<b>Methods to be employed</b>	<b>Frequency</b>	<b>Timing</b>	<b>Who will measure</b>	<b>Cost (INR)</b>	<b>Funding source</b>
Rhino	Size	Population structure Trends, growth rates etc.	Direct count method	Once in every 3 year	5am-5pm for 2 days	Forest officers & scientists	4 lakhs per Census operation	-
	Landscape Context	Straying, Landscape use	Radio collaring & monitoring		Continues for 1 year	Scientists from WII with forest officers	15 lakhs	-
	Condition	Change in population due to flood related mortality	Survey	3 months every year during flood	Consecutive for 5 years	Foresters & researchers	10 lakhs	

**Monitoring Plan Template-2**

<b>FMT</b>	<b>Indicator to be measured</b>	<b>Key factor Biodiversity health category informed</b>	<b>Methods to be employed</b>	<b>Frequency</b>	<b>Timing</b>	<b>Who will measure</b>	<b>Cost (INR)</b>	<b>Funding source</b>
<b>Swamp Deer</b>	Size, condition	Population trend, structure	Direct count	Once in every year 2 years	March-May	Forest department	3 lakhs per census operation	
	Landscape context	Habitat quality	Imagery analysis	Once in every 2 years		WII/ Park Management/ IIRS	5 lakhs per operation	
<b>Wild buffalo</b>	Size	Population trends, structure	Direct count/Sample survey	Once in every 2 years	Nov-Dec	Forest department	3 lakhs per operation	
	Condition	Health/Diseases	Intensive survey	Once in every 2 years	Oct-Nov	Veterinarian, forest department	5 lakhs per operation	
<b>Tiger</b>	Size	Population trends/ Structure	Pugmark census/Photo trapping	Once in every 2 year	Nov-Dec	Forest department/WII	10 lakhs	
	Landscape context	Use of habitat	Radio collaring	Consecutive for 8 years		WII & forest department	40 lakhs	

**Monitoring Plan Template-3**

<b>FMT</b>	<b>Indicator to be measured</b>	<b>Key factor Biodiversity health category informed</b>	<b>Methods to be employed</b>	<b>Frequency</b>	<b>Timing</b>	<b>Who will measure</b>	<b>Cost (INR)</b>	<b>Funding source</b>
<b>Aquatic habitat</b>	Size	Dimension over time	Depth datum	Twice in a year for a period of 5 years	Apr & Nov	WII & Forest department	5 lakhs	
	Condition	Macrophytic vegetation	Site mapping	Twice in a year for a period of 5 years	Apr & Nov	WII & Forest department	5 lakhs	
		Use of wetland by waterbirds/ mammals	Long time survey	Continuous for 5 years		WII & forest department	15 lakhs	
	Landscape context	Size, Depth, Quality and source of Sedimentation	Sediment traps	5 years		WII & forest department	10 lakhs	
<b>Grasslands</b>	Size	Size & Dimension	Satellite imaginary and ground truthing	Every year for 10 years	After annual flood	WII & forest department	25 lakhs	
	Condition	Proportion of tall & short grassland	Line & other transects			WII & forest department	20 lakhs	
		Forage available to wildlife	Experiment/Survey	For 5 years		WII & forest department	35 lakhs	
	Size	Use of habitat	Observation/Survey	For 5 years		WII & forest department	35 lakhs	

NB : Indian Rupees one lakh = US \$ 2200

## **6.2 Assessment of Threat Status**

As mentioned in “Identifying stresses and threats” following threats to the site have been identified.

### **Current Threats**

1. Poaching
2. High flood
3. Erosion: (Loss of habitat)
4. Sedimentation and weeds (loss & degradation of habitat)
5. Illegal fishing
6. Heavy traffic (Habitat fragmentation, Mortality)
7. Live stock grazing
8. Breach in embankments

### **Potential Threats**

1. Pollution and contamination
2. Intensified organized poaching

**Ranking Stresses and Sources of Stress Worksheet**

<b>Focal management targets</b>	<b>Poaching</b>	<b>Habitat degradation</b>	<b>Loss of Habitat</b>	<b>Habitat Fragmentation</b>	<b>Pollution &amp; Contamination</b>	<b>Illegal fishing</b>
<b>Rhinoceros</b>	1	2	3	3	-	6
<b>Buffalo, Swamp Deer</b>	3	1	4	2	6	6
<b>Tiger, Elephant,</b>	4	1	5	3		6
<b>Raptors, Turtles,</b>	-	1	6	5		4
<b>Grassland and riverine forest</b>		1	2	4		
<b>Floodplains and wetlands</b>		1	2	4	6	5
<b>Mosaic of tall and short grassland habitats</b>		1	2	3		
<b>Tourism</b>	-	5	5	5		5
<b>Ethonobotanical values</b>		4	4	4		

**Current Threat–To-Target Summary Table**

<b>Focal Management Targets</b>	<b>Poaching</b>	<b>Habitat degradation</b>	<b>Loss of Habitat</b>	<b>Habitat Fragmentation</b>	<b>Pollution &amp; Contamination</b>	<b>Illegal fishing</b>
Rhinoceros	<b>High</b>	<b>High</b>	Moderate	Moderate	Low	Low
Buffalo, Swamp Deer	Low	<b>High</b>	Moderate	Moderate	Low	
Tiger, Elephant,	low	<b>High</b>	Moderate	<b>High</b>	Low	
Raptors, Turtles, Rodents	Low	<b>High</b>	Moderate	Moderate	Moderate	<b>High</b>
Grassland and riverine forest	Low	<b>High</b>	Moderate	Low	Moderate	
Floodplains and wetlands	Low	<b>High</b>	Moderate	Low	Low	Low
Mosaic of tall and short grassland habitats	Low	<b>High</b>	Moderate	Moderate	Moderate	
Tourism	Low	Moderate	Low	<i>High</i>	Low	
Ethonobotanical values	Low	<b>High</b>	Moderate	Low	Low	

### **6.3 Achievement of Management Objectives**

Achievement of Management Objectives Assessment : Data Sheet 1

A formal system for assessment of management objectives is not in place. Also present management plan is the first and only approved plan which is being followed from current year . Assessment criteria and a formal system is being prepared. Following objectives have been framed in the management plan.

1. To maintain and wherever necessary restore the demographic features relating to the populations of all endangered, endemic, vulnerable, rare species of animals and plants with special focus on Rhino, Tiger and their habitat.
2. To maintain and wherever necessary restore the physical integrity of the area with special considerations to the flooding pattern.
3. To identify research priorities and implement such programs to establish mechanism and create opportunities for enhancing management capabilities and knowledge of wildlife science.
4. To enhance the quality of educational, recreational and wilderness experience given to the general public.
5. Consistent with above objectives, in the zone of influence with sensitivity to cultural and economical well being of the communities, reduce the dependence on forest based resources.

The achievement status of the Management Plan could not be ascertained during the reporting period and shall be taken up subsequently

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