

REPORT ON THE REGIONAL MEETING FOR INDIA AND NEPAL OF THE IUCN/SSC ASIAN RHINO SPECIALIST GROUP (AsRSG)

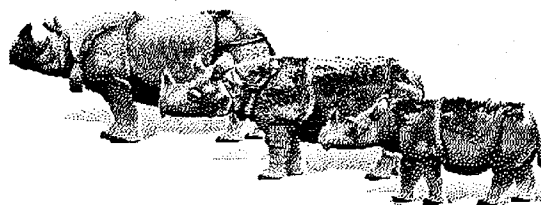
Interpretation Hall, Kohora,
KAZIRANGA, ASSAM, INDIA, 21-27 FEBRUARY 1999

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AsRSG Program Officers

IUCN
The World Conservation Union



SPECIES SURVIVAL COMMISSION



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PREFACE

The Asian Rhino Specialist Group organized its first Regional Meeting in Kaziranga National Park, Assam, India, 21-27 February 1999, to review the current population and conservation status of the Indian or Greater One-horned Rhinoceros (*Rhinoceros unicornis*) in India and Nepal.

The meeting was organized by the Asian Rhino Specialist Group and the Assam Forest Department, and was hosted by the Kaziranga National Park. The Interpretation Hall at the Kohora H.Q. was generously provided by the National Park as venue for the meeting, and Park Staff provided administrative and logistic support.

The Asian Rhino Specialist Group is very grateful for the generous support provided by the Indian Government and its Officials, in particular for the assistance provided by Mr. P. Lahan, Mr. Sonadhar Doley, and Mr. Subhendu Kumar Sen, from the Assam Forest Department and Mr. B.S. Bonal, the Director of Kaziranga National Park.

Special acknowledgments are due to Mr. A.K. "Manju" Barua, of Wild Grass Lodge for his invaluable support for lodging, logistics, transportation and communication.

Financial support for the meeting was provided by the International Rhino Foundation (IRF), WWF-Netherlands, WWF-U.S.; and WWF-UK.

This report contains the documents and data sheets produced by the working groups and the papers and supporting documents presented during the plenary sessions of the AsRSG regional meeting for India and Nepal. All documents were manually or electronically transcribed from the hand-written, typed or printed originals by the editors. Subsequently a draft report was presented to authors for comments and corrections, which were incorporated by the editors.

The editors compared the transcripts to the original documents and attempted to be consistent in the spelling of the names of the rhino areas. The editors, however, did not attempt to check the spelling of scientific names for plants or animals, geographic names, or of specialist terms, numbers and names. The editors corrected the text of the documents only for spelling, punctuation and minor grammatical issues.

The editors thank all authors for the corrections and comments provided. Special thanks are due to Ms. Becky Thompson, AsRSG/IRF Administrative Assistant, for proofreading the final draft.

Some funds from the meeting budget that were not used for the session due to the frugality of the organizers were applied to support census in March/April 1999 of the rhino in Kaziranga, Orang, and Pobitora where full counts have not been conducted since 1993.

Mr. Mohd Khan, AsRSG Chairman

Dr. Nico J. van Strien & Dr. Thomas J. Foose - Editors

POINTS OF AGREEMENT AND RECOMMENDATIONS FROM IUCN/SSC ASIAN RHINO SPECIALIST GROUP REGIONAL MEETING

KAZIRANGA NATIONAL PARK - FEBRUARY 1999

- ① The primary priority of funding of rhino conservation is in situ activities, especially anti-poaching and habitat management combined with eco-development.
- ② Conservation success achieved in India and Nepal in the case of rhino has been possible due to the extraordinary dedication and commitment of the field staff. The service conditions of these field staff, who are the guardians of this species as part of the world's wildlife heritage, needs to be adequately upgraded commensurate with their selfless struggle.
- ③ The intelligence gathering systems for rhino conservation in India and Nepal are inadequate. External funds should be used to support this intelligence gathering until an effective government-support system can be developed.
- ④ The meeting reaffirmed that there should be a viable population of minimally 2,500 *Rhinoceros unicornis* in the wild in at least 10 populations of minimally 100 rhino each, with an ultimate optimal objective of a total wild population of 5,000 individuals.
- ⑤ To develop more recognition and support for rhino conservation, the AsRSG recommends that the Government of India establish a PROJECT RHINO, similar to Project Tiger and Project Elephant.
- ⑥ The Government of India and Nepal are already providing considerable funds to conserve the rhino and their habitat. These government efforts have been very successful in in-situ rhino conservation. However, because of the human demographic pressures in both of these countries, to carry this success forward into the next millennium, the efforts of the Governments of India and Nepal should be augmented with significant funds from international (external) sources.
- ⑦ The AsRSG should have more interface with the *Rhinoceros unicornis* range state governments, so that rhino conservation receives continuing and increasing support.
- ⑧ Toward this objective, the AsRSG will sponsor a technical management advisory group comprising representatives from all major rhino areas in India and Nepal.

**PRIORITIES FOR RHINO CONSERVATION AS DELINEATED AT
AsRSG REGIONAL MEETING FOR INDIA AND NEPAL
FEBRUARY 1999 - KAZIRANGA**

① RHINO PROTECTION

Intelligence
Staff Welfare
Anti-poaching

② HABITAT MANAGEMENT

③ COMMUNITY WORK

④ RHINO CENSUS

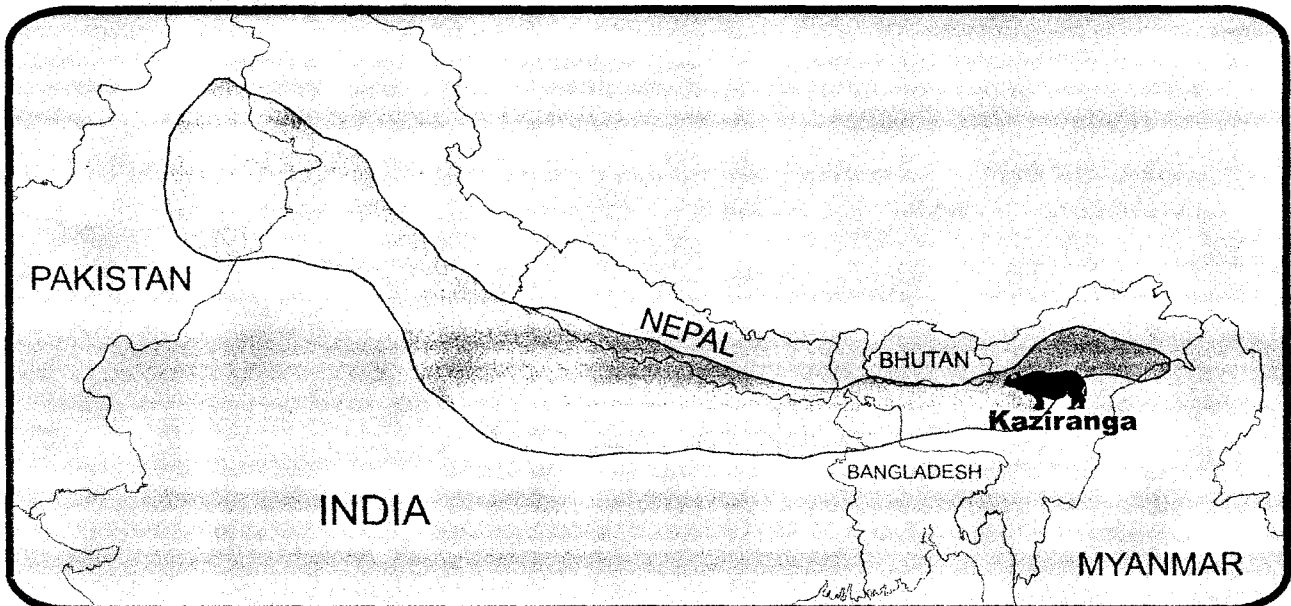
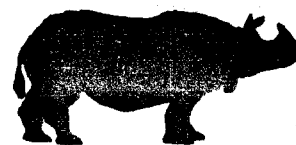


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AGENDA

AsRSG REGIONAL MEETING AT KAZIRANGA

Sunday - 21 February 1999

PARTICIPANTS ARRIVE AT KAZIRANGA.

Monday - 22 February 1999

Morning - INAUGURAL FUNCTION - S.C. Dey and M. Khan Co-Chairs

Welcome Address by Mr. S. Doley, I.F.S.

Key Note Address by Mr. S.C. Dey.

Address by Mr. Mohd Khan Bin Momim Khan.

Address by Mr. P.K. Bora, I.A.S., Chief, Secretary, Govt. of Assam, Guest of Honor.

Address by Mr. H. Sonowal, I.A.S., Commissioner, Forests, Govt. of Assam, Special Guest.

Inaugural Address by the Honorable Minister of State, Forests, Govt. of Assam, Mr. Aminul Islam.

Morning - PLENARY SESSION - RHINO STATUS & ACTION PLAN REPORTS - P. Lahan Chair.

Overview of AsRSG, especially New Structure & Function - M. Khan.

Overview of Status of Asian & African Rhino - T. Foose.

Overview of Indian Rhino Action Plan - S.C. Dey.

Overview of Nepal Rhino Action Plan - N. Poudel.

Afternoon - PLENARY SESSION - RHINO STATUS & ACTION PLAN REPORTS - P. Lahan Chair.

Report on of Rhino Situation & Action Plan in Assam - S. Doley.

Report on Rhino Situation and Action Plan for Kaziranga - B.S. Bonal.

Report on Rhino Situation and Action Plan in West Bengal - A.K. Raha.

Report on Rhino Project in Dudwa - S.P. Sinha.

Report on Rhino Status and Action Plan in Chitwan - N. Poudel.

Report on Rhino Status and Action Plan in Bardia - N. Poudel.

Report on *Rhinoceros unicornis* Trade Issues - E.B. Martin.

Report on CITES success indicators for rhino conservation - R. Emslie

Overview of Global Captive Program for *Rhinoceros unicornis* & A Proposal for a Funding Mechanism - T.J. Foose.

Tuesday - 23 February 1999

Morning - FUNDING STRATEGIES & MECHANISMS - WORKING GROUPS - T. Foose Chair

S.E. Asian Rhino Conservation Programs with Emphasis on Funding Mechanism & Strategy - N. van Strien & M. Khan.

USFWS Rhino & Tiger Conservation Fund - F. Bagley.

Plenary Discussion of Funding Strategy for Action Plans in India and Nepal including Role of Trusts - Facilitated by P. Lahan & T. Foose.

Morning - ORGANIZATION OF WORKING GROUPS - P. Lahan, S.C. Dey, M. Khan, T. Foose, N. van Strien.

Afternoon - WORKING SESSIONS - N. van Strien Chair.

Working Groups on Kaziranga, Chitwan, Bardia-Dudwa complex, West Bengal.

Reports of Working Groups & Discussion.

Wednesday - 24 February 1999

Morning - Field Trip into Kaziranga.

Afternoon - WORKING GROUP SESSIONS - N. van Strien Chair.

Afternoon - REPORTS AND DISCUSSION OF WORKING GROUPS - S.C. Dey Chair .

Afternoon - Field Trip into Kaziranga.

Thursday - 25 February 1999

Morning - WORKING GROUP SESSIONS - N. van Strien Chair.

Working Groups on Orang, Pobitora, Manas, and Translocation.

Morning - WORKING GROUP SESSIONS - N. van Strien Chair.

Morning - FORMULATION OF FIRST DRAFT OF MEETING RECOMMENDATIONS AND REPORT - S.C. Dey Chair.

Afternoon - DISCUSSION AND REFINEMENT OF DRAFT MEETING RECOMMENDATIONS AND REPORT - N. van Strien Chair.

Afternoon - FINALIZATION OF MEETING RECOMMENDATION & REPORT - Khan & Dey Chair.

Afternoon - DISCUSSION OF STRUCTURE AND FUNCTION OF AsRSG - Suggestions for New Members - M. Khan Chair.

Afternoon - CLOSING OF MEETING - P. Lahan, M. Khan, S.C. Dey.

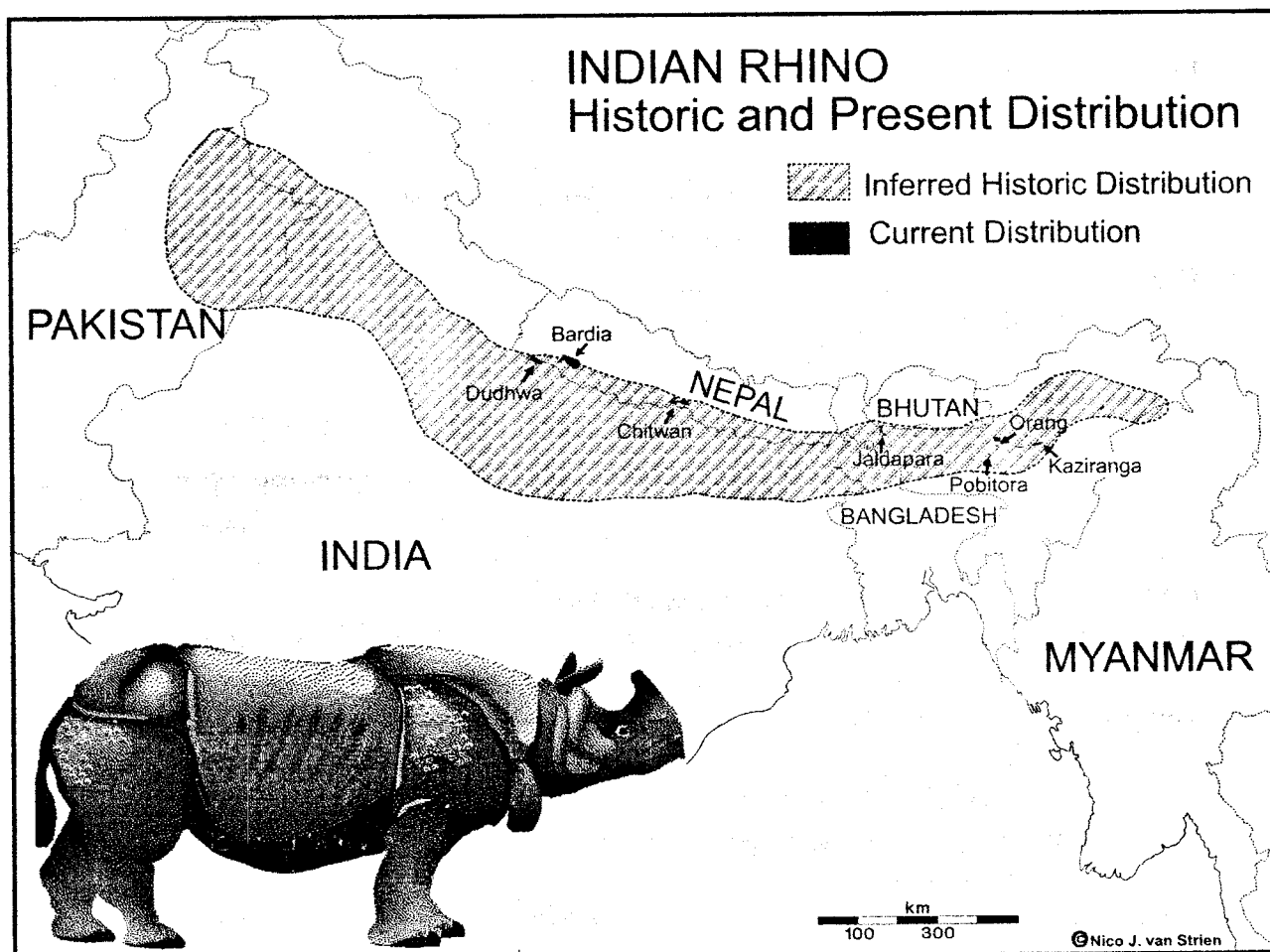
Evening - DINNER & SOCIAL EVENT

Friday - 26 February 1999

FIELD TRIP TO ORANG

Saturday - 27 February 1999

RETURN TO GAUHATI



IN MEMORIAM SANJOY DEB ROY

Sanjoy Deb Roy passed on to the Ages on 16th August 1999, leaving behind a large group of his admirers stunned in disbelief. Born in 1934 in Shillong (Meghalaya), India, educated in Silchar (Assam) he took a degree in Science, later adding to it a Masters of Science in Forestry from the Indian Forest College, Dehra Dun during the year 1959 and became a member of the Indian Forest Service to serve in Assam with distinction.

He was the first Field Director of the famed Manas Tiger Reserve commissioned as such for the first time along with eight other tiger reserves in India during 1973. He was destined to manage, at one time or the other, this one of the spectacular wilderness areas in the world for a total period of 18 years. In 1980 under his able stewardship Manas was designated as a World Heritage Site. He also was the Director of Kaziranga National Park for a period of 3 years. Mr. Deb Roy later became the Chief Conservator of Forests (Wildlife) and the Chief Wildlife Warden of the state of Assam, subsequently to join the Ministry of Environment and Forests, Government of India as the Additional Inspector General of Forests for Wildlife during 1989. He retired in 1992 from government service and continued to serve the cause he had espoused thereafter. One may say that he never retired but simply changed his job!

He was a sportsman, excelling particularly in football, a first rate angler and an expert marksman. Throughout his life the great qualities of a sportsman were easy to see in his attitude. A true outdoors person, he was happiest amidst the wilderness and made a very significant contribution for conservation of wildlife in India, especially the challenging species such as the elephant, tiger, rhino and the pygmy hog to mention a few.

In 1982, the Manas Tiger Reserve was adjudged the best managed wildlife reserve, attracting a national award under the leadership of Mr. Deb Roy.

He was an internationally acclaimed wildlife conservationist and was a member among many others, of the National Environmental Council, the Indian Board for Wildlife, Project Elephant, the Tiger Crisis Cell, also likewise a member of the IUCN's Species Survival Commission and Specialist Groups on Cats, Rhino, and wild pigs. He continued to be associated with a number of other organisations as an expert consultant. He was Director of the Corbett Foundation and closely worked with the Ranthambhor Foundation.

In 1990, he received Norman Borlough Award for his outstanding contribution to the field of conservation.

He was upright, humble and a gentleman's gentleman. He was a role model for many aspiring wildlife managers. Sanjoy Deb Roy lives through such men who embellish today the cause that was pivotal to his life. Only a few are granted such tribute.

Dr. S.P. Sinha



WORKING GROUP REPORTS



**AsRSG Regional Meeting for India and Nepal
Kaziranga, Assam, India, 21-27 February 1999**

Conversion of amounts and currencies

1 Lakh	=	100,000	Rs
1 Crore	=	100	Lakh
1 Crore	=	10,000,000	Rs
1 Lakh Rs	=	~ 2,500	US\$
1 Crore Rps	=	~ 250,000	US\$

1999 POPULATION ESTIMATES FOR RHINO AREAS IN INDIA AND NEPAL
AsRSG REGIONAL MEETING - FEBRUARY 1999 - KAZIRANGA
AND AMENDED WITH RESULTS OF SUBSEQUENT CENSUSES IN ASSAM PARKS

Area	Rhino Population			
	1993	1999	Potential	
PRINCIPAL RHINO AREAS, WITH LARGE POPULATIONS				
KAZIRANGA - India, Assam	~1,200	1,649	2,500	
CHITWAN COMPLEX - Nepal	466	~600	1,050	With buffer zone and Parsa WR (50 RHINO)
SUBSIDIARY RHINO AREAS, WITH SMALL POPULATION				
POBITORA - Assam, India	56	76	150	Extension in process
JALDAPARA COMPLEX - W Bengal, India	38	53	200	To be joined to Buxa Tiger Reserve (0 RHINO)
ORANG - Assam, India	100	46	150	Conflicting information/opinions on number; to be clarified by census.
GORUMARA COMPLEX - W Bengal, India	18	19	50-100	With Chapramari & Jalpaigari FD
DUDWA - BARDIA COMPLEX, Nepal & Uttar Pradesh, India	Nepal	45	52	With Karteniaghat, India (4 RHINO) and Suklaphanta, Nepal (1 RHINO)
	India	13	21	
MANAS - Assam, India	20	~5	300	
POTENTIAL RHINO AREAS, WHERE RHINO BECAME EXTINCT				
LOAKHOWA COMPLEX - Assam, India	0	0	80-100	
SONAI-RUPA - Assam, India	0	0	50-100	
DIBRU-SAIKHOWA - Assam, India	0	0	150-200	
PANI-DEHING - Assam, India	0	0	50	
TOTAL	1956	2,520	4,930-5,110	

Note: The spelling of many of the place names varies between sources. Editors have attempted to be consistent with the spelling in this list

NEPAL RHINO RANGES

CHITWAN NP & PARSA

Size
(sqkm)

Areas Chitwan NP	932
Chitwan buffer zones	750
Parsa	400
Total	2082

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (\$ 1000)	
						GOVT	EXTERN.
RHINO POPULATION							
Size = 600	Detailed population dynamics			soonest	DNPWC & Donor		
Males = 32%							
Females = 20%							
Subadults = 48%							2
TARGET POPULATION							
1000	Carrying capacity		Habitat assessment	soonest		2	25
RHINO POACHING							
	Final market	Reward & Incentive system		soonest	DNPWC & Consultant & CBO	10	30
RHINO PROTECTION							
			Flying squad & networking infrastructure	soonest	DNPWC	3,500	500
EQUIPMENT & TRAINING							
				soonest	DNPWC	50	450
HABITAT MANAGEMENT							
	Long-term monitoring			soonest	DNPWC		250

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (\$ 1000)	
						GOVT	EXTERN.
COMMUNITY WORK							
Large diversified program				soonest	DNPWC	2,000	
HABITAT EXTENSION							
				soonest	DNPWC		500

TOTAL COSTS (5 years) (\$ Million)	5,564	1,773
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TRANS-FRONTIER RHINO RANGES

WESTERN RHINO CONSERVATION UNIT (Dudwa-Bardia Complex)

Size (sqkm)

Areas Dudwa T.R./NP (India-UP)
Karteniaghat WLS (India-UP)
Bardia NP/WLS (Nepal)

800
450
1200
Total
2450

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (\$ 1000)	
						GOVT	EXTERN.
RHINO POPULATION							
[Dudwa/Bardia]▼ Size = 16/51 Males = 1/7 Females = 4/23 Subadults = 11/21	Area survey	Regular census	4y-census	Soonest	UP State & FD, Nepal FD	-	12
TARGET POPULATION							
>300	Potential sites	Partial translocation	More translocation	In 20-30 years, start soonest	UP FD, Nepal FD	-	250
RHINO POACHING							
Cases reported	Poachers activity & media	Anti-poaching	Market survey	Soonest	Internat. & National Body	-	40
RHINO PROTECTION							
	Anti-poaching efforts	Given protection	Training & Infrastructure	Soonest	National	50	
EQUIPMENT							
Insufficient	Immediate need	Partial	Provide soonest	Soonest	Internat.	-	500
HABITAT MANAGEMENT							
	Present status	Initial stage	Proper Inventory Research	Soonest	UP FD, Nepal FD	-	500

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (\$ 1000)	
						GOVT	EXTERN.
COMMUNITY WORK							
Villages around rhino corridor	Cooperation from the people	Eco-development activities	Activate people for cooperation	Soonest	National & Internat.	50	50
TRANSLOCATION							
All rhinos were translocated	Availability of area	Estimate done	Translocate 60 rhinos	Within 3-4 y	National & Internat.	50	100

TOTAL COSTS (5 years) (\$ Million)	0,150	1,452
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INDIA RHINO RANGES

KAZIRANGA NP	Size (sqkm)
Areas Kaziranga NP	430
Kaziranga extensions	429
Total	859

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (Crore Rs)	
						GOVT	EXTERN.
RHINO POPULATION							
Size = 1164('93) ~1,650('99) Males = 498(1993) Females = 490 (1993) Subadults = 176 (1993) Annual incr. 1.5%	Study of population dynamics	Census every 6 years	Research and census every 2 years	Immediate and recurring	Govt.		0.20
TARGET POPULATION							
2500	Monitoring	Management	Extension and Management	Immediate and recurring	Govt.		5.00
RHINO POACHING							
3.9% annually	Trade, Traffic & Eliciting information	Anti-poaching	Intelligence Net work. Legal cell. Protection	Immediate and recurring	Govt. & Enforcem't Agencies		5.00
RHINO PROTECTION							
Improvement of infrastructure	Intelligence Net work. Poacher's profile	Anti-poaching duty	Increase infrastructure, staff & logistics	Immediate and recurring	Govt.		12.00
EQUIPMENT							
Arms, Wireless, Vehicles, Country boats, Motor boats, Speed boats, Uniforms			Required more	Immediate and recurring	Govt.		3.00
HABITAT MANAGEMENT							

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (Crore Rs)	
						GOVT + EXTERN.	
Annual burning. Wetland Management	Impact of management techniques	Annual burning. Desiltation. Clearing of water bodies	Research on grassland ecology, desiltation, habitat manipulation	Immediate and recurring	Govt.		6.00
COMMUNITY WORK							
Eco-development. Generation of public awareness	Impact of Eco-development	Economic development work	Socio-economic survey	Immediate and recurring	Govt.		.25
CAPTIVE POPULATION							
		Rescue of orphans & rehabilitation	Establishment of rescue home	Immediate and recurring	Govt.		10.00

TOTAL COSTS (5 years) (Crore Rs)	56.72
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BREAKDOWN OF FINANCIAL REQUIREMENTS FOR KAZIRANGA NP

(In Crore Rs)

	1 ST YEAR		2 ND YEAR		3 RD YEAR		4 TH YEAR		5 TH YEAR		TOTAL		GRAND TOTAL
	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	
Rhino Population	0.05	-	-	0.01	0.05	0.02	-	0.02	-	0.05	0.10	0.19	0.20
Target Population	0.03	0.97	0.04	0.96	0.05	0.95	0.06	0.94	0.07	0.93	0.25	4.75	5.00
Rhino Poaching	0.01	0.89	0.02	0.93	0.03	0.97	0.04	1.01	0.05	1.05	0.15	4.85	5.00
Rhino Protection	3.29	1.45	3.54	1.50	3.88	1.55	4.23	1.60	4.57	1.66	19.51	7.76	27.27
Equipment	0.06	0.54	0.07	0.53	0.07	0.53	0.08	0.52	0.08	0.52	0.36	2.64	3.00
Habitat Management	-	1.00	0.10	1.00	0.15	1.05	0.20	1.10	0.20	1.20	0.65	5.35	6.00
Captive Population	-	0.10	-	0.02	-	0.03	-	0.04	-	0.06	-	0.25	0.25
Community Work	0.06	1.94	0.08	1.92	0.10	1.90	0.12	1.88	0.14	1.86	0.50	9.50	10.00
Total	3.50	6.89	3.85	6.87	4.33	7.00	4.73	7.11	5.11	7.33	21.52	35.29	56.72

G.F. = Government Funding E.F. = Eternal Funding

Approx. total in US\$ (Million)

5.38 8.80 14.18

WEST BENGAL (Jaldapara-Buxa & Gorumara-ChapraMARI Complex)
Size (sqkm)
Areas

 Jaldapara
 Buxa
 Gorumara
 Chapramari

 216
 780
 90
 10

Total 1096

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (\$ 1000)	
						GOVT	EXTERN.
RHINO POPULATION							
Jaldapara = 53		Census every 2 years	Annual census	2000 onwards	P.A. Mgmt, NGOs, WII	12	12
Gorumara = 19							
TARGET POPULATION							
Jaldapara = 180	Carrying capacity,				State Govt	-	40
Gorumara = 100	population dynamics						
RHINO POACHING							
2 cases in last 5 years	Information on poachers and trade routes		Establish intelligence network & reward system		State Govt	-	37,5
RHINO PROTECTION							
			More camps, arms, patrol paths		State Govt	1,125	125
EQUIPMENT							
			Arms, RT, solar chargers, nightscope, camera, tranq. gun, vet. & lab. equipment, vehicles		State Govt	25	225
HABITAT MANAGEMENT							
		Grassland management	Canopy opening, overwood removal, de-weeding, control burning, soil/water conservation		State Govt	135	145
MONITORING, RESEARCH, HUMAN RESOURCE DEVELOPMENT							
						20	180

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (\$ 1000)	
						GOVT	EXTERN.
COMMUNITY WORK							
EDC survey done					NGOs, For. Dept.	200	1,800
RELOCATION							
						-	60

TOTAL COSTS (5 years) (\$ Million)	1.517	2.962
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POBITORA

Size (sqkm)

38.8

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (Crore Rs)	
						GOVT	+ EXTERN.
RHINO POPULATION							
Size = 68 ('95) 76 ('99) Males = 12 (1995) Females = 30 (1995) Subadults = 26 (1995) Annual incr. 10.7%	Study of population dynamics. Impact of rhino grazing	Census	Research. Monitoring every 2 years	Immediate & recurring	Govt.		0.01
TARGET POPULATION							
100	Monitoring	Management & anti-poaching	Strengthening of anti-poaching duty	Immediate & recurring	Govt.		0.335
RHINO POACHING							
	Trade, Traffic & eliciting information	Anti-poaching	Intelligence net work. Legal cell. Anti-poaching duty	Immediate & recurring	Govt. & enforcement agency		0.10
RHINO PROTECTION							
Improvement of Infrastructure	Intelligence network. Poacher's profile	Anti-poaching duty	Increase infrastructure, staff & logistics. Highlands	Immediate & recurring	Govt.		5.0
EQUIPMENT							
Arms, wireless, vehicle, c/ boat, s/ boat, uniform			Require more	Immediate & recurring	Govt.		0.458
HABITAT MANAGEMENT							
Annual burning	Impact of management technique	Annual burning	Research work, reclamation G.L., desiltation, habitat manipulation	Immediate & recurring	Govt.		1.75
FLOOD DAMAGE							
Damage of infrastructure		Restoration work	Construction & repairing work	Immediate & recurring	Govt.		0.174

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (Crore Rs)	
						GOVT + EXTERN.	
COMMUNITY WORK							
Eco-development. Public awareness	Impact of eco-development	Eco-development	Socio-economic survey	Immediate & recurring	Govt.		0.175
CROP INSURANCE							
Wildlife damage in fringe	Costs of damage	None	Habitat improvement Anti-depred. squad		Govt.		1.00

TOTAL COSTS (5 years) (Crore Rs.)	9.002
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BREAKDOWN OF FINANCIAL REQUIREMENTS FOR POBITORA

(In Crore Rs)

	1 ST YEAR		2 ND YEAR		3 RD YEAR		4 TH YEAR		5 TH YEAR		TOTAL		GRAND TOTAL
	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	
Rhino Population	-	0.002	-	-	0.0025	-	-	-	-	0.003	0.0025	0.0075	0.01
Target Population	0.026	0.034	0.029	0.036	0.032	0.038	0.036	0.039	0.040	0.045	0.163	0.192	0.355
Rhino Poaching	-	0.10	-	0.15	-	0.20	-	0.25	-	0.30	-	0.1	0.1
Rhino Protection	0.5	0.3	0.55	0.35	0.60	0.40	0.65	0.45	0.70	0.50	3.00	2.00	5.00
Equipment	0.01	0.15	0.011	0.05	0.012	0.055	0.02	0.06	0.025	0.065	0.078	0.380	0.458
Habitat Management	-	0.25	-	0.30	-	0.35	-	0.40	-	0.45	-	1.75	1.75
Flood Damage	-	0.015	0.01	0.02	0.012	0.025	0.013	0.03	0.014	0.035	0.049	0.125	0.174
Community Work	-	0.033	0.034	-	-	0.035	0.036	-	-	0.037	0.070	0.105	0.175
Crop Insurance	-	0.05	-	0.10	-	0.15	-	0.20	-	0.25	-	1.00	1.00
Total	0.546	1.47	0.634	1.006	0.6495	1.253	0.751	1.429	0.779	1.685	3.3625	5.6595	9.022

G.F. = Government Funding E.F. = Eternal Funding

Approx. total in US\$ (Million)

0.85

0.42

2.27

ORANG							Size (sqkm)	78.80
KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (Crore Rs)		
						GOVT + EXTERN.		
RHINO POPULATION								
Size = 30 ('91) Males = Females = Subadults = Annual incr. =	76 (1999) 44 (1991) 15 (1991) 8 (1991) 17%	Study of population dynamics	Census every 6 years	Research. Monitoring every 2 years	Immediate & Recurring		0.65	
TARGET POPULATION								
150	Monitoring	Management & Anti-poaching	Strengthening anti-poaching duty	Immediate & Recurring	Govt.		1.0	
RHINO POACHING								
8.71% average	Trade, traffic & eliciting information	Anti-poaching	Intelligence network Legal cell, Anti-poaching duty	Immediate & Recurring	Govt.		1.5	
RHINO PROTECTION								
Improvement of infrastructure	Intelligence network Poachers profile	Anti-poaching duty	Increase of infrastructure, staff & logistics	Immediate & Recurring	Govt. & Enforcem't agency		5.5	
EQUIPMENT								
Arms, wireless, vehicle, c/ boat, s/ boat, uniform			Required more, including m/ boat	Immediate & Recurring	Govt.		2.0	
HABITAT MANAGEMENT								
Annual burning. Wetland management.	Impact of management technique	Annual burning, clearing of water bodies	Research on grass-land ecology, habitat manipulation	Immediate & Recurring	Govt.		2.5	

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (Crore Rs)	
						GOVT + EXTERN.	
CROP INSURANCE							
Crop damage by wildlife in fringe	Costs of damage	None	Habitat improvement, Anti-depredation squad	Immediate & Recurring	Govt.		2.5
COMMUNITY WORK							
Eco-development, public awareness	Impact of eco-development	Eco-development	Socio-economic survey	Immediate & Recurring	Govt.		4.0
FLOOD DAMAGE							
Damage to infrastructure		Repairing & restoring work	Construction & repairing work	Immediate & Recurring	Govt.		2.0

TOTAL COSTS (5 years) (Crore Rs)	21.65
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BREAKDOWN OF FINANCIAL REQUIREMENTS FOR ORANG

(In Crore Rs)

	1 ST YEAR		2 ND YEAR		3 RD YEAR		4 TH YEAR		5 TH YEAR		TOTAL		GRAND TOTAL
	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	
Rhino Population	0.035	0.2	-	0.1	0.04	0.1	-	0.05	0.045	0.05	0.12	0.50	0.65
Target Population	0.088	0.075	0.096	0.085	0.105	0.095	0.115	0.105	0.126	0.110	0.53	0.47	1.00
Rhino Poaching	-	0.2	-	0.25	-	0.3	-	0.35	-	0.4	-	1.50	1.50
Rhino Protection	0.027	0.8	0.03	0.9	0.033	1.1	0.036	1.2	0.04	1.334	0.166	5.334	5.50
Equipment	-	0.3	-	0.35	-	0.4	-	0.45	-	0.5	-	1.50	1.50
Habitat Management	-	0.4	-	0.45	-	0.5	-	0.55	-	0.6	-	2.00	2.00
Crop Insurance	-	0.4	-	0.45	-	0.5	-	0.55	-	0.6	-	2.50	2.50
Community Work	0.042	0.54	0.046	0.64	0.051	0.74	0.056	0.866	0.061	0.988	0.256	3.744	4.00
Total	0.492	2.915	0.172	3.575	0.629	3.735	0.657	4.121	0.272	5.082	2.222	19.428	21.65

G.F. = Government Funding E.F. = Eternal Funding

Approx. total in US\$ (Million)

0.56 4.86 5.42

MANAS							Size (sqkm)	500
							(Rhino area ~ 300 sqkm)	
KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (\$ 1000)		
						EXTERN. Only		
RHINO POPULATION								
Size =	< 10	Present status	-	Survey & habitat assessment	Immediate	Govt.	2	
TARGET POPULATION								
200		Evaluation of habitat	-	Habitat improvement, translocation of rhino	Immediate	Govt. & Research Institut.	11.5	
RHINO POACHING								
53 rhino lost in 1990-95		Trade routes & Modus Operandus	-	Strong contingent of armed force & intelligence gathering	10 years	Govt. & paramilitary	50	
RHINO PROTECTION								
Improvement of infrastructure & gear up patrolling		Training, network of poachers	Anti-poaching work	Improvement infrastructure & camps restoration with Armed Force	10 years	Govt. , police & paramilitary	75	
EQUIPMENT								
Arms, WT, vehicle, boats, binoculars etc		-	Equipment provided	Requirement to be enhanced	10 years	Govt.	75	
HABITAT MANAGEMENT								
Grassland management		Grassland study & management plan	Controlled burning	Water bodies desiltation	10 years	Govt.	50	
COMMUNITY WORK								
Eco-development		Socio-economic PRA/ Plan etc. Need assessment	Eco works & awareness	Extension, local people involvement, alternate income	10 years	MGU/Govt./ local	250	

KNOWN	NEED TO KNOW	BEING DONE	NEED TO DO	WHEN	WHO	COST (\$ 1000)		
						EXTERN. Only		
TRANSLOCATION						10 years	Govt.	1250

TOTAL COSTS (5 years) (\$ Million)	0.301
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BREAKDOWN OF FINANCIAL REQUIREMENTS FOR MANAS

(In \$ 1000) Additional requirements only

	1 ST YEAR		2 ND YEAR		3 RD YEAR		4 TH YEAR		5 TH YEAR		TOTAL	
	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.	G.F.	E.F.
Rhino Population	-	0.8	-	0.5	-	0.5	-	0.2	-	-	-	2
Target Population	-	5	-	2	-	2	-	1.5	-	1	-	11.5
Rhino Poaching	-	10	-	20	-	10	-	5	-	5	-	50
Rhino Protection	-	15	-	15	-	15	-	15	-	15	-	75
Equipment	-	10	-	20	-	10	-	5	-	5	-	50
Habitat Management	-	5	-	5	-	5	-	5	-	5	-	25
Community Work	-	2	-	2	-	2	-	2	-	4.5	-	12.5
Total	-	62.8	-	79.5	-	59.5	-	48.7	-	50.5	-	301

G.F. = Government Funding E.F. = Eternal Funding

EXISTING FUNDING FOR MANAS TIGER RESERVE

- 1) Project Tiger - Rs. 70-100 lakhs/year
 - 2) Biosphere - Rs. 30-40 lakhs/year
 - 3) Ecodevelopment - Rs. 30-40 lakhs/year
 - 4) Non-plan - Rs. 10-15 lakhs/year
- Total - Rs. 140-195 lakhs/year (\$ 345,000-480,000)

REPORT OF THE WORKING GROUP ON TRANSLOCATION OF RHINOS IN ASSAM

1. The working group, referred to the IUCN Status Survey and Conservation Action Plan wherein a sum of US\$ 80,000 was ear-marked for translocation of rhinos in Assam for the establishment of new populations and a further US\$ 30,000 for rhino rescue and rehabilitation centers. No further information was available.
2. The working group listed four areas for re-introduction of *Rhinoceros unicornis* viz:
 - (i) **Laokhowa Complex** (includes Burachapori and Kochmara)
 - (ii) **Dibru-Saikhowa WLS** (proposed National Park)
 - (iii) **Pani-Dehing WLS** (Bird Sanctuary. Proposed WLS)
 - (iv) **Sonai-Rupa WLS**

Mr S. Doley, Chief Conservator of Wildlife of the State, made it clear that the question of translocation to the above areas would be considered by the Forest Department only if infrastructure is made adequate for rhino protection therein.

The working group calculated out an approximate budget which is presented in Annexure. For Laokhowa Complex, an amount of Rs 117.46 lakhs for infrastructural costs and Rs 109.5 lakhs recurring cost for five years would be required. For Dibru-Saikhowa, an amount of Rs 211.20 lakhs for infrastructural cost and Rs 104 lakhs for recurring costs for five years was calculated.

Since rhino still stray into the Laokhowa WLS, this area would be accorded first priority in translocation of rhinos.

3. The working group did not determine the donor sanctuary for translocation of rhinos into Laokhowa complex. It was suggested that a combination of females from Pobitora (given the existent male-female ratio in the sanctuary) and males from Kaziranga would be ideal.
4. Some members of the working group were of the opinion that translocation to Dibru-Saikhowa WLS would be more ideal and put forward the following arguments:
 - (a) While Laokhowa complex is in close proximity to 3 rhino bearing Protected Areas and at one time was contiguous to Kaziranga, Dibru-Saikhowa is at a considerable distance from rhino bearing areas. Besides, Dibru-Saikhowa is to the east of the rhino bearing areas.
 - (b) The human population around Dibru-Saikhowa appear to be more conservation conscious than Laokhowa complex area.
 - (c) Dibru-Saikhowa WLS is more than double the size of Laokhowa Complex and has scope for further extension.
5. As Pani-Dehing WLS is still at the proposed stage, the working group requested Mr S. Doley to help expedite the same.
6. The working group was apprised of the African experience in translocation by Richard Emslie, and further sharing of perceptions in this matter would continue.
7. Mr Debroy informed the working group that a feasibility report would be essential for obtaining clearance from relevant State and Central Government authorities.

The Working Group resolved to proceed phase-wise in this matter

FIRST PHASE (immediate)

An amount of Rs 3.50 lakhs would be raised either as direct grant from Government of India or from local NGOs to undertake feasibility studies. This study will be undertaken by the Forest Department.

SECOND PHASE

Along with the feasibility reports and other statutory documents, the Forest Department will approach the Government of India both for the necessary clearance and for funds to make either Dibru-Saikhowa or Laokhowa Complex adequate in protection infrastructure for rhino translocation.

ANNEXURE: FINANCIAL OUTLAY RHINO TRANSLOCATION**DIBRU-SAIKHOWA WLS**

Infrastructural costs	(In Rp lakhs)	
Vehicle 2 nos	8.00	
25 nos extra camps	61.00	
Speed Boat 4 nos	20.00	
Country Boat 25 nos	5.00	
Arms Purchase	16.00	
Ammunition for 5 years	5.20	
Floating Camps 2 nos	50.00	
Wireless 7 mainsets + 35 handsets	11.00	
Road/patrol paths/bridge	35.00	
	211.20	US\$ 520,000
2. Operational Cost (5 years)		
Home Guards (2 plat.)	36.00	
country boat maintenance	1.00	
camp maintenance	18.00	
vehicle boat POL/maintenance	15.00	
information network	5.00	
contingency (elephant upkeep)	20.00	
road maintenance/patrol path	9.00	
	104.00	US\$ 260,000
Laokhowa-Burachapori-Kochmora Complex		
1. Infrastructural Cost		
Vehicle 2 nos	8.00	
Motor Boat 2 nos	10.00	
Wireless mainset 6 + handset 32	9.76	
New Camps Laokhowa 4 nos	10.00	
Burachapori 4 nos	10.00	
Kochmora 6 nos.	15.00	
Repair 9 nos	4.50	
Country boat 25 nos	6.25	
Arms purchase - Rifle 50, Shotgun 10	10.80	
Ammunition for 5 years	3.15	
Roads and culverts/patrol path	20.00	
Translocation costs	10.00	
	117.46	US\$ 290,000
2. Operational Cost		
Camp logistic 5 years	5.00	
Staff equipment 5 years	15.00	
Elephant upkeep 5 years	20.00	
Wireless maintenance 4years	2.00	
Road/patrol path 4 years	32.00	
Camp maintenance 4 years	20.00	
Information network 5 years	3.50	
Recurring expense of boat/vehicle 5 years	12.00	
	109.50	US\$ 270,000

5-YEAR FUNDING REQUIREMENTS FOR RHINO AREAS IN INDIA & NEPAL AS ESTIMATED AT 1999 AsRSG REGIONAL MEETING - KAZIRANGA

AREA	COSTS (x \$1000)	
	Range State Government	External
DUDWA-BARDIA COMPLEX	400	1,600
CHITWAN COMPLEX	4,515	1,777
KAZIRANGA	6,705	7,475
WEST BENGAL (4 years)	2,625	2,000
TRANSLOCATION AREAS	750	1,750
MANAS	500	420
ORANG	555	4,857
POBITORA	850	1,420
AsRSG TECHNICAL ADVISORY COMMITTEE		10
TOTAL	16,900	21,309

ROUGH ESTIMATE OF FUNDS THAT MAY BE AVAILABLE FROM EXTERNAL SOURCES FOR RHINO CONSERVATION IN INDIA AND NEPAL AS KNOWN OR REPRESENTED AT AsRSG REGIONAL MEETING - FEBRUARY 1999 - KAZIRANGA

DONOR AGENCY	FUNDS AVAILABLE (X 1000\$/YEAR)	
	Minimum	Maximum
USFWS Rhino & Tiger Conservation Fund (RTCF)	110	200
Environmental Investigation Agency (EIA)	20	20
International Rhino Foundation (IRF)	15	315
GEF	?	?
WWF-Nepal	25	25
WWF-INTL Tiger Conservation Program ?	16	16
WWF-India	40	40
UNESCO	(one time) 140	(one time)140
UNDP	40	40
LOCAL NGO	5	8
WILDLIFE TRUST INDIA	5	8
SOS RHINO	10	50
TOTAL	* 286	* 722
5 - YEAR TOTAL	** 1,570	** 3,750

* Not including the one-time UNESCO grant ** Including the one-time UNESCO grant



PAPERS PRESENTED



**AsRSG Regional Meeting for India and Nepal
Kaziranga, Assam, India, 21-27 February 1999**

OVERVIEW OF AsRSG, NEW STRUCTURE & FUNCTION

MOHD KHAN, CHAIRMAN ASIAN RHINO SPECIALIST GROUP

- The IUCN Asian Rhino Specialist Group (AsRSG) has adopted a more activist role in rhino conservation rather than just its advisory function that previously characterized IUCN/SSC Specialist Groups.
- This activism includes coordination of and fund-raising for rhino conservation programs. These functions are already well underway in S.E. Asia.
- Toward this goal, AsRSG is concentrating on function and cost effective activities. Hence, AsRSG is emphasizing a more regional structure and function.
- The structure of AsRSG has evolved to facilitate effective action:
 - There is an overall Chair: **Myself, Mr. Mohd Khan bin Momin Khan**
 - There are two **Deputy Chairs**:
Mr. S.C. Dey for India and Nepal, and
Drs. Effendy Sumardja for S.E. Asia.
- There are also now **Principal Range State Representatives** for the five countries where significant populations of Asian rhino species still survive:
 - India - **Mr. P. Lahan**
 - Nepal - **Dr. Thirta Maskey**
 - Malaysia - **Mr. Musa Nordin**
 - Indonesia - **Mr. Sulaiman Kesumahnegara** (replacing Mr. Heru Basuki Sukiran, feb' 2000)
 - Vietnam - **Dr. Nguyen Xuan Dang**
- Recent evidence suggests that Sumatran rhino may survive in appreciable number in southern Thailand on the border with Malaysia. Hence, AsRSG may add a **Principal Range State Representative** for Thailand.
- Finally, there are also two very active **Program Officers**:
 - **Dr. Tom Foose**, and
 - **Dr. Nico van Strien**
- The Chair, Deputy Chair, Program Officers, and Principal Range State Representatives will constitute an **Executive Committee**. The functions of this Executive Committee will evolve and hopefully, later in this meeting, there will be discussions of useful activities for India and Nepal. AsRSG has also significantly expanded in size, now including over 60 members in an endeavor to involve everyone who is significantly involved in Asian rhino conservation. Later in this meeting, there will be a discussion of possible additional members from India and Nepal.
- Also towards more concentrated and effective activity, AsRSG has decided to conduct regional rather than plenary meetings. This meeting in Kaziranga for the India and Nepal region is the first such session. Only the Chair, Deputy Chairs, Program Officers, and members of AsRSG for the region will attend the regional meetings. Next year, there is expected to be a regional meeting for S.E. Asia, possibly in Vietnam.

PAPERS PRESENTED

- Finally, AsRSG intends to resume publication of its newsletter **ASIAN RHINOS** by early 2000. One very important function for the Principal Range State Representatives is to provide the Program Officers with material for the newsletter.



OVERVIEW OF STATUS OF ASIAN & AFRICAN RHINO

T. J. FOOSE, AsRSG PROGRAM OFFICER & R. EMSLIE, SCIENTIFIC OFFICER,
AFRICAN RHINO SPECIALIST GROUP

There have been both progress and problems over the past five years with the status of the five extant rhinoceros species and their various subspecies. Table 1 (page 36) provides a summary of the latest reported numbers by species and subspecies for both wild and captive populations.

Worldwide, there are now about 14,000 rhino in the wild in 1999. This total number has improved

WHITE RHINO

Historic Distribution and Current Country Totals - 1998

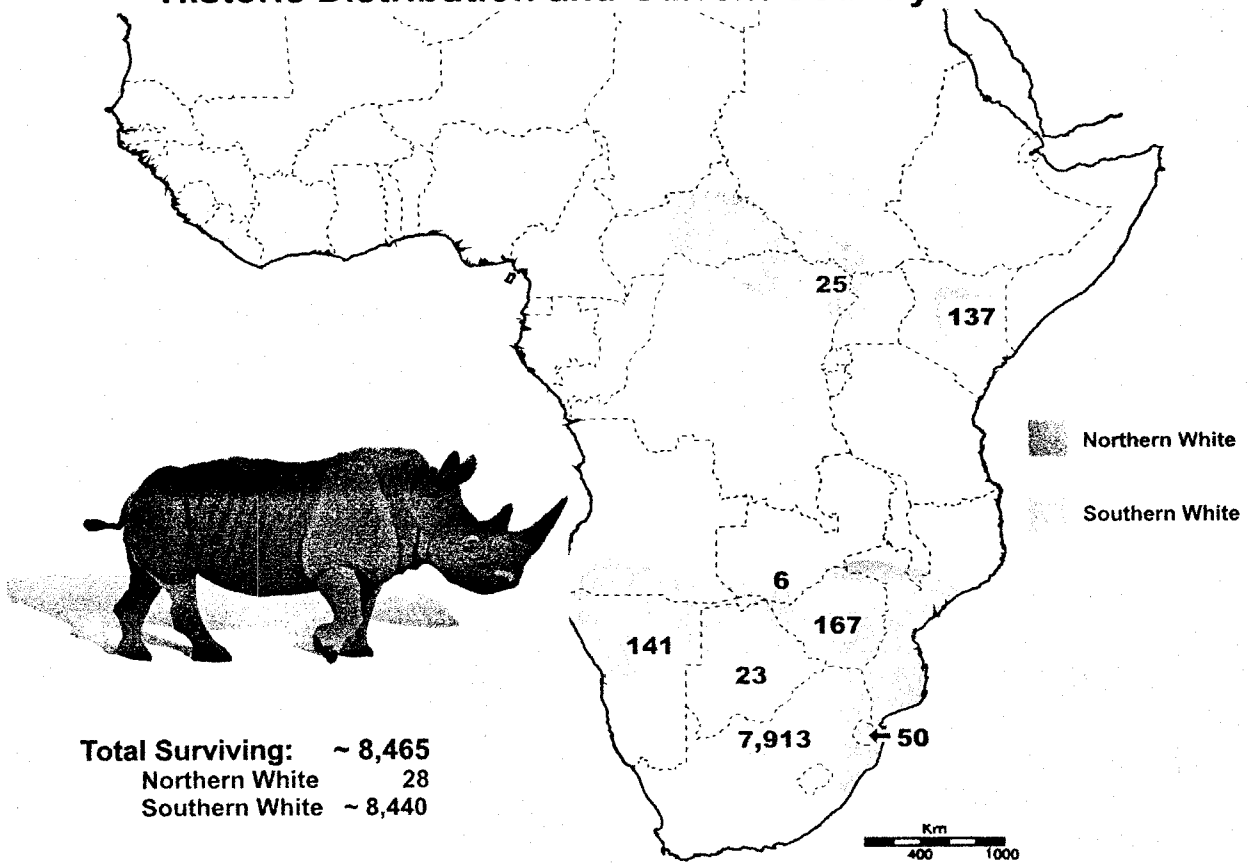


Figure 1

considerably since the early 1990s when total rhinos in the wild were down under 11,000. However, the status of the various rhino taxa varies considerably, some are recovering, others are still declining or at least remaining as precarious as ever.

Over 60% of the surviving rhino are of 1 subspecies, the southern white rhino (*Ceratotherium simum simum*) (Figure 1). This subspecies represents one of the two great success stories in recent rhino conservation. This subspecies has recovered from a low point of about 30 rhino at the start of the 20th Century.

Ironically, the northern subspecies of white rhino (*Ceratotherium simum cottoni*) is one of the 3 most critically endangered taxa of rhino with no more than 25 surviving. This subspecies has fluctuated in

numbers and had been as high as 32 in the early 1990s but has declined again due to two civil wars in the Democratic Republic of Congo, its last range state.

The black rhino (*Diceros bicornis*) declined precipitously from 1970 when there may have been 70,000, to the early 1990s, when numbers were down to 2,300. This precipitous decline has received more publicity than the plight of any other rhino species. However, over the last three to four years, the species, and three of its four subspecies, have been recovering with at least 2,600 at the end of 1997/start of 1998 and probably 100-200 more today. The species is distributed securely in five major range states. However, the fourth subspecies, the western (*D. b. longipes*), is also one of three most critically endangered taxa mentioned before.

BLACK RHINO Historic Distribution and Current Country Totals - 1998

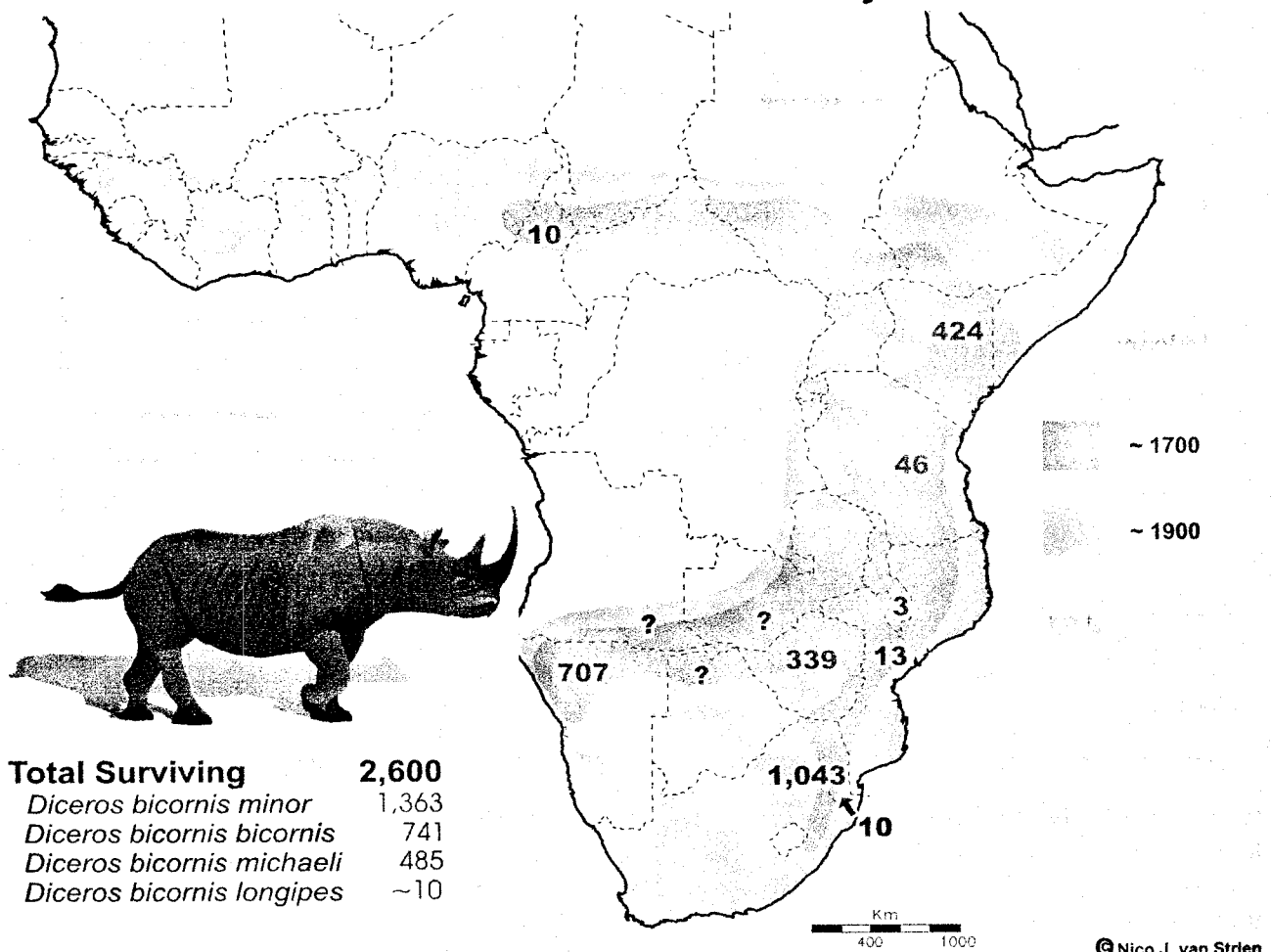


Figure 2

Asian rhinos are more endangered than the African. The numbers of all three species of Asian rhino combined are probably fewer than the rarer of the African species, i.e. the black rhino. (Table 1 & Figure 3). Table 2 provides a summary by species and country of Asian rhino numbers.

Clearly, *Rhinoceros unicornis*, the Indian rhino, is the other great success story in rhinoceros conservation (See map on page 4). In India, numbers have recovered from about 20 rhino at the start of this century to 1,800 today. In Nepal, numbers had declined to below 50 and now recovered to over 600. This success has been achieved by the most intense conservation supported almost entirely by

the governments of India and Nepal. This recovery and the total numbers of this species are most encouraging.

Tabel 1: WILD AND CAPTIVE POPULATIONS OF RHINOCEROS - 1999

SPECIES, SUBSPECIES or GEOGRAPHIC RANGE	WILD POPULATION	CAPTIVE POPULATION
Southwestern Black Rhino	740	0
Northwestern Black Rhino	~10	0
Eastern Black Rhino	485	175
Southern Black Rhino	1,365	60
TOTAL BLACK RHINO	2,600	235
Northern White Rhino	25	9
Southern White Rhino	8,440	~700
TOTAL WHITE RHINO	8,465	~710
AFRICAN RHINO SPECIES	11,065	~945
Indian Rhino - East (Assam, W. Bengal)	1,848	~140
Indian Rhino - West (Nepal, Uttar Pradesh)	672	
TOTAL INDIAN RHINO	2,520	~140
Indonesian Javan Rhino	50-60	0
Vietnamese Javan Rhino	5-8	0
TOTAL JAVAN RHINO	~60	0
Eastern (Borneo) Sumatran Rhino	~50	3
Western (Sumatra/Malaya) Sumatran Rhino	~250	14
TOTAL SUMATRAN RHINO	~300	17
ASIAN RHINO SPECIES	~2,880	~157
ALL RHINO SPECIES	~14,000	~1,100
ALL RHINO SPECIES	~14,000	1,100

However, long-term viability involves distribution as well as abundance and the fact that most of the Indian rhino are in just two populations is a reason for concern. Limited distribution is a concern because of stochastic risks, e.g. the catastrophic floods that occur in Kaziranga or the social unrest that has decimated the once sizable population of Manas. For long-term viability, it is recommended that a rhino taxon achieve a total population of at least 2,500, preferably 5,000, individuals distributed across 10 or more populations, each of which is at least 100 in size and several of which are 500 or more in size.

The rarest of the species of rhino is the Javan (*Rhinoceros sondaicus*) with fewer than 70 estimated to remain in just two populations: one in Java (~ 50 individuals) and the other in Vietnam (with only 5-8 survivors, the last of the three most critically endangered rhino taxa) (Figure 4).

However, the most critically endangered of all rhino species is probably the Sumatran (*Dicerorhinus sumatrensis*) (Figure 5). Although its numbers (~300) are greater than are the numbers of the Javan, the populations are more fragmented and less secure, because the species is still under intense pressure from poachers.

While precarious, the status of both the Southeast Asian rhino species (Sumatran and Javan) has improved over the last three years with the establishment of anti-poaching teams know as Rhino Protection Units or RPUs. The AsRSG and IRF have helped range states organize the RPUs, with support from the Global Environment Facility (GEF), US Fish & Wildlife Service Rhino & Tiger Conservation Fund, WWF, the American Association of Zoo Keepers, the Anna Merz Foundation, and other partners.

In conclusion, the situation for some rhinos is better, but others are still on the brink of extinction. All rhino taxa remain conservation dependent and there is no cause for relaxation or complacency in efforts to conserve these spectacular creatures.

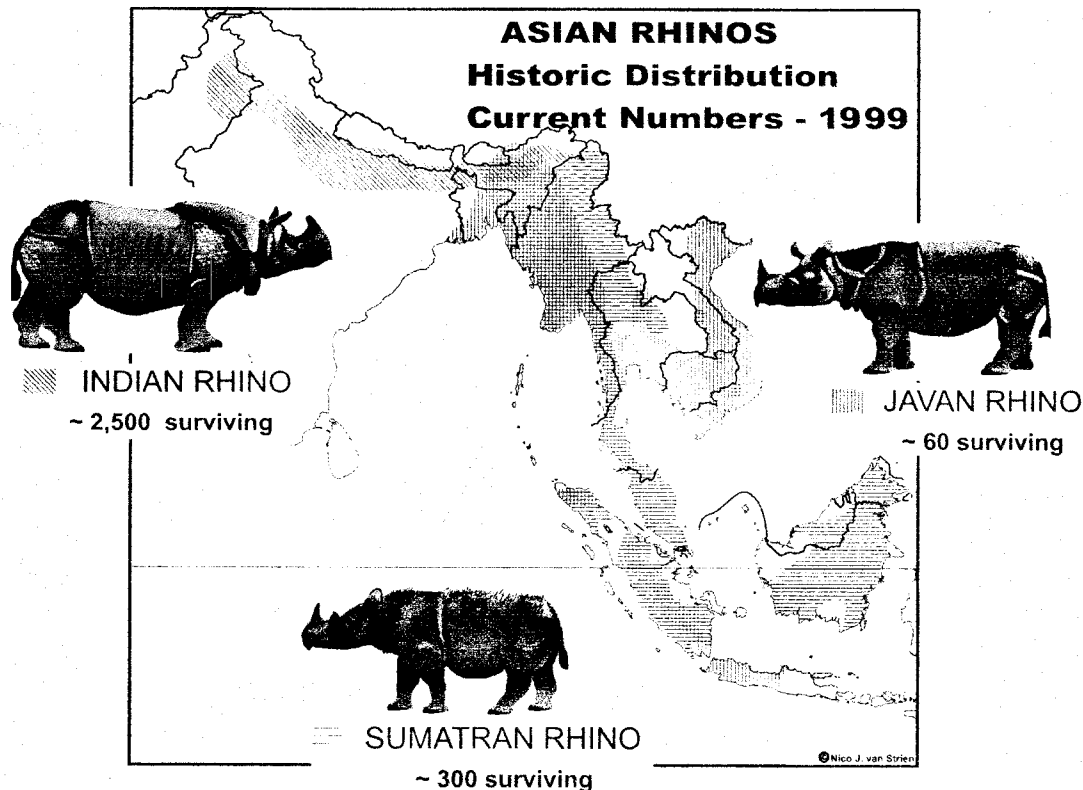


Figure 3

Table 2: 1999 ASIAN RHINO POPULATIONS

	INDIAN RHINO <i>Rhinoceros unicornis</i>	JAVAN RHINO <i>Rhinoceros sondaicus</i>	SUMATRAN RHINO <i>Dicerorhinus sumatrensis</i>	TOTAL
INDIA	~1,820			~1,820
NEPAL	~650			~650
INDONESIA		~50	110-200	160-250
MALAYSIA			120-160 70-90 (Peninsula) 50-70 (Sabah)	120-160
VIETNAM		5-8		5-8
LAOS			?	?
THAILAND			?	?
MYANMAR			10?	10?
TOTAL	~2,470	~60	~300	~ 2,830

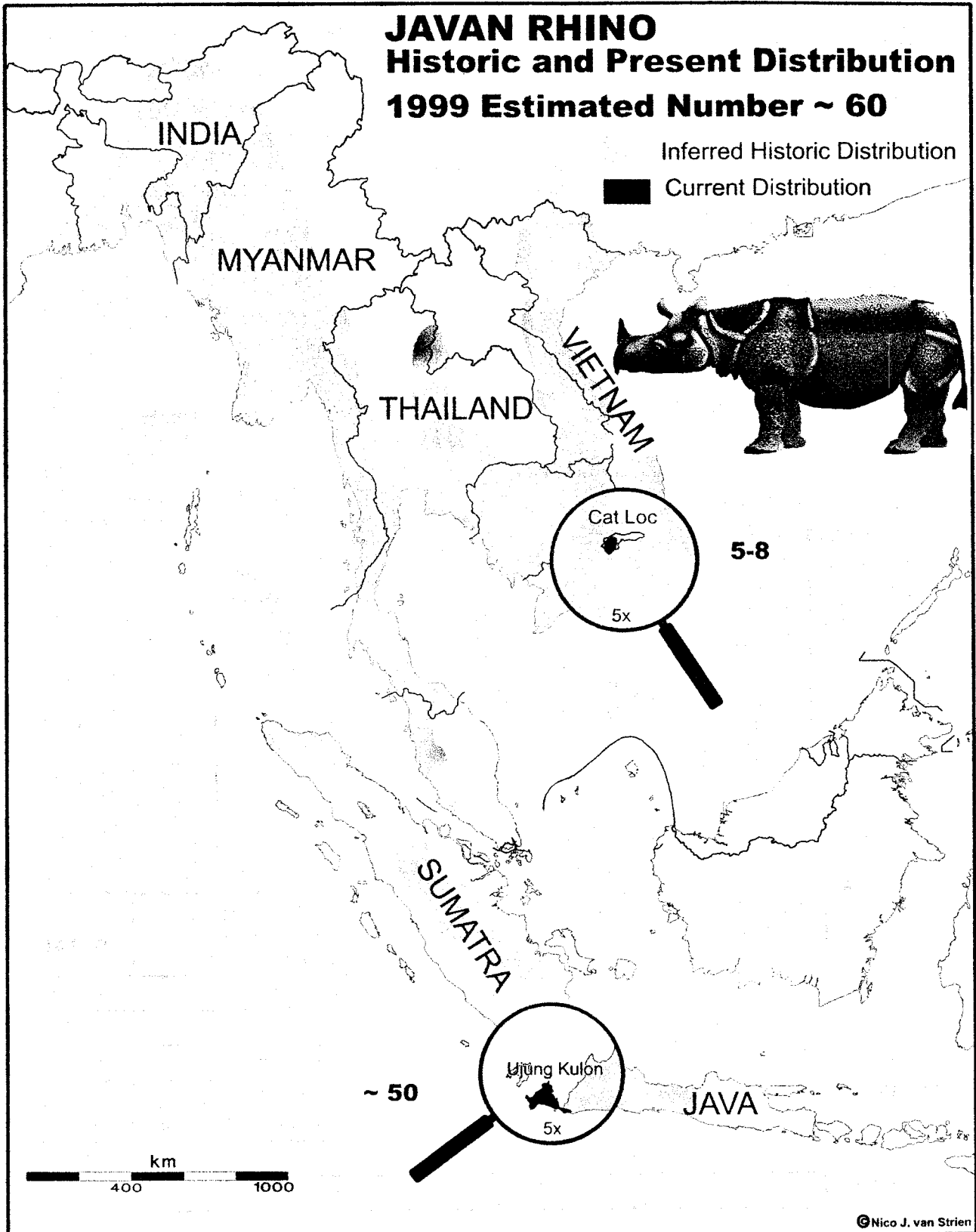


Figure 4

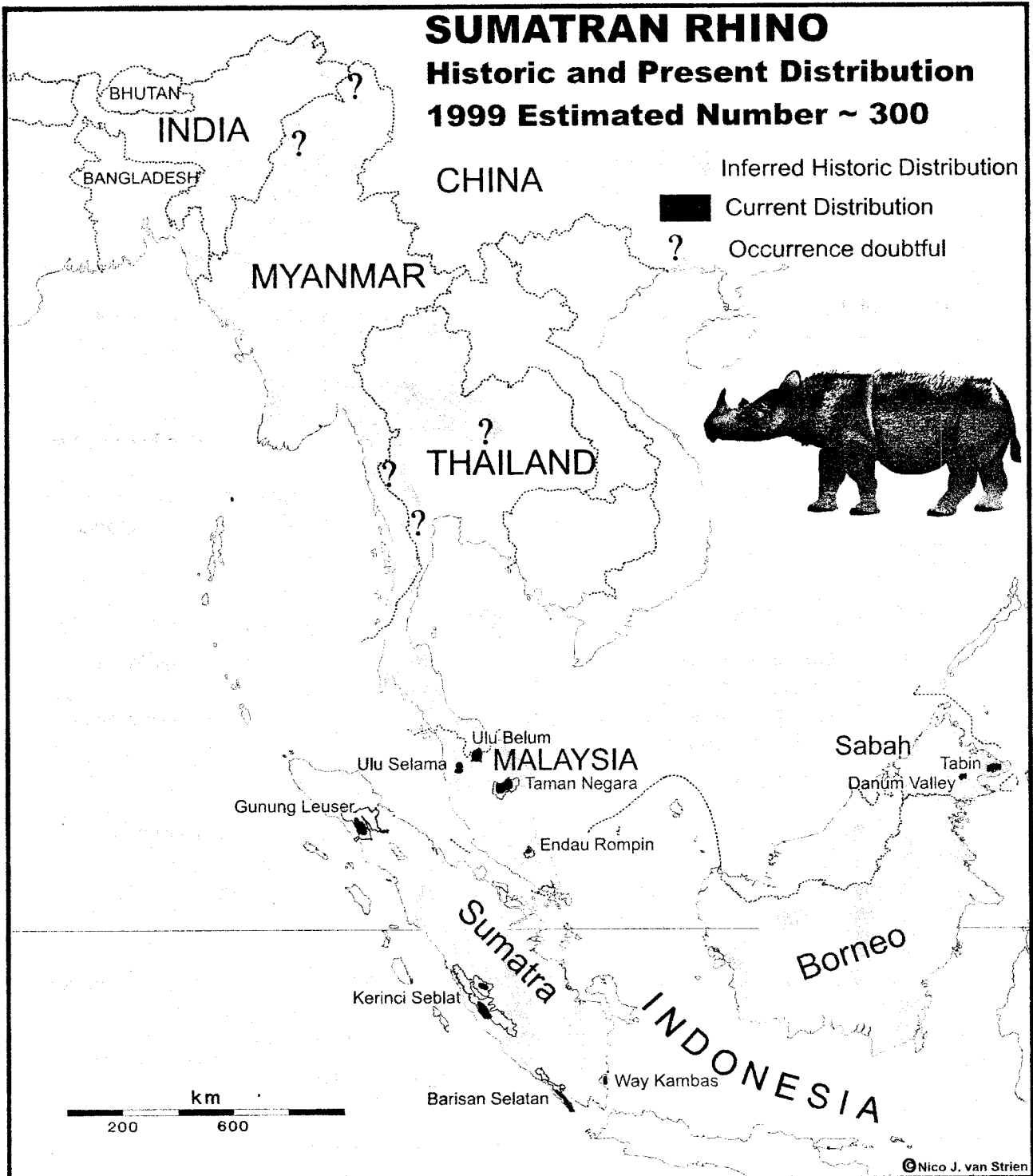


Figure 5



OVERVIEW OF INDIAN RHINO ACTION PLAN

S.C. DEY, DEPUTY CHAIRMAN, ASIAN RHINO SPECIALIST GROUP

BACKGROUND

Out of three species of rhino that roamed over the Indo-Gangetic alluvium, two species, namely Javan rhinoceros (*Rhinoceros sondaicus*) became extinct in the later part of the previous century and the Sumatran rhino (*Dicerorhinus sumatrensis*) became extinct in the early part of the current century. The only species of rhinoceros that is existing in India today is the Great One-horned Rhinoceros (*Rhinoceros unicornis*) restricted to broadly five natural population in Assam, two natural population in West Bengal, one introduced population and one migratory population in Uttar Pradesh. The causes of decline of the rhino population in the past were primarily the following:

- (a) Destruction and fragmentation of rhino habitat primarily for extension of agriculture and tea gardens.
- (b) Poaching of rhino for horns and other parts attributed to have magical medicinal values.
- (c) Hunting of rhino for sports during the Mughal period and early days of British rule in India, and later during the regimes of the Maharajas.

It will be interesting to note that in Assam, Col. Pollock, a Military Engineer engaged in laying of roads in Brahmaputra valley, almost shot a rhino or a wild buffalo for breakfast every day. A sportsman in Bengal Dooars, possibly an English planter, fired about 100 shots at a number of rhinoceros in a day, killing five and seriously wounding more than twenty five. Maharaja Nripendra Narayan of Coochbehar shot 208 rhinoceros between 1871 to 1907.

LEGAL STEPS TAKEN FOR PROTECTION OF RHINOCEROS IN THE PAST

The first attempt to conserve the Rhino in Assam came through Assam Forest Regulation 1891 and subsequently through the Assam Rhinoceros Prevention Act 1915, upgraded in 1954 as Assam Rhinoceros Act 1954. In 1908 a reserve was created in the Brahmaputra basin for protection of rhino which was subsequently declared as a game sanctuary in 1915 and renamed as Kaziranga wildlife sanctuary in 1950. This was upgraded in the year 1974 to a National Park. Other sanctuaries were also notified in the meantime.

In Bengal, the initial control for rhino conservation came through Indian Forest Act 1927 followed by the Bengal Rhinoceros Preservation Act 1932. Jaldapara Game Sanctuary was created in 1941 which was subsequently renamed as Jaldapara Wildlife Sanctuary in 1976 and extended further in 1990. Gorumara Wildlife Sanctuary was created in 1949. This was subsequently extended and upgraded to a National Park in 1994.

The Wildlife (Protection) Act 1972 which is applicable all over India, except Jammu and Kashmir, currently provides protection to rhino and its habitat. In this Act, Rhinoceros has been placed under schedule I (Part-1) which provides complete protection to the species in India.

RISE AND FALL OF CONSERVATION STATUS OF RHINO

Even though there is no precise documentation regarding the population of rhino that existed in India at the turn of the century, its population was believed to be around 100 in the beginning of the current century being roughly 50 to 60 in Assam and 40 to 50 in Bengal. The population in West Bengal rose to about 90 around the mid 60s and the same in Assam to about 1,500 in 1991. Maximum poaching of rhino took place in West Bengal during the period 1968 to 1972, when 32 rhinoceros were poached. In 1986 the rhino population in West Bengal came down to 22. Maximum poaching of rhino in Assam took place in the year 1992 when about 70 rhinos were killed by poachers.

Since then there has been gradual rise in rhino population in West Bengal which is reported to be around 60 in 1998 and the Indian population of rhino currently stand to about 1600 including introduced population in Dudwa (UP) and the migratory population at Katerniaghat (UP).

MANAGEMENTAL INTERVENTION FOR INCREASING RHINO HOMERANGE IN THE WILD AND IMPROVED GENE FLOW.

Uttar Pradesh housed a significant rhino population during the Mughal period from where the rhinos were exterminated through persecution over years. An attempt to reintroduce some rhino population in Dudwa was done in the year 1984 by bringing five rhinos from Assam, of which two died. Subsequently in 1987, four rhinos were brought from Nepal and kept in a very wide enclosure in the forest habitat of Dudwa. The population at Dudwa started breeding slowly registering an increase which is now 16 in number.

The migratory population of rhino at Katerniaghat is also being looked after and their security ensured. Two male rhinos have also been brought from Assam to West Bengal for improving the genetic strain, one each to Jaldapara and Gorumara, and they are now being acclimatized in wide enclosures.

MORTALITY, POACHING AND ANTI-POACHING

The conservation of rhino in India is a story of a relentless fight by the field functionaries with the vagaries of nature, biotic interference, poaching and illegal trade. In the year 1988, in Kaziranga alone, one hundred and twenty nine rhinos died including natural and un-natural causes. On an average 80 to 100 rhinos die in Kaziranga a year including poaching and natural death. One hundred to one hundred twenty rhinos are also born in a year. The number of persons arrested a year for rhino poaching varies from 50 to 70 and the number of poachers killed a year generally varies from six to eight, being the highest of 12 in 1994. The arms recovered from poachers are eight to ten a year being the maximum of twenty in the year 1993. Poaching though continues, but has been reduced to less than thirty a year currently.

SUPPORT TO RHINO CONSERVATION

Currently the conservation of rhino in India is supported under the following budget heads:

- (a) Non-Plan.
- (b) State-Plan.
- (c) Integrated Forestry Development Project.
- (d) Centrally Sponsored Scheme.

The main support from Centrally Sponsored Schemes currently comes from the Scheme of Development of National Park and Sanctuary and eco-development project. Support to some areas also comes from Project Elephant and Project Tiger. Though it is very difficult to segregate the expenditure figures for the conservation of rhino alone, but for conservation of major rhino bearing areas India spends currently about one million US\$ annually from non-plan and about five hundred thousand US\$ annually from plan budget.

MAIN ACTIVITIES TO CONSERVE THE RHINO

The main activities undertaken through National funds include:

1. Protection of the habitat and species by regular patrolling.
2. Improvement of habitat by canopy manipulation and inter-planting.
3. Maintaining camps for anti-poaching operations.
4. Better communication through road and wireless network.

5. Creation, of high lands and water holes, where required.
6. Extension of protected area to cover additional rhino habitat and spill over population.
7. Reducing man animal conflict by electric fencing.
8. Public awareness and educational programmes.
9. Training of staff and other enforcement agencies.
10. Eco-development programme.

All the activities, though undertaken, fall short of requirements in meeting the challenges facing the long term rhino conservation due to limitation of resources.

GLOBAL EFFORT FOR PLANNING OF RHINO CONSERVATION

In the meeting of United Nations Environment Programme in the year 1992 and 1993 at Nairobi, the demand made by India for rhino conservation for three years was 8.33 million US\$ of which external funding demanded was 5.3 million US\$. This demand was subsequently revised in the meeting of Asian Rhino Specialist Group held at Jaldapara in December, 1993 and Sandakan, Sabah, Malaysia during November-December, 1995. The revised demand was worked out at 16.7 million US\$ for the years 1996 to 2000. Out of this, projects with immediate priority (A1) was worked out to be 8.4 million US\$, projects with high priority(A2) as 3.5 million US\$ and general priority projects (A3) as 4.8 million US\$. The work listed in terms of priority were as follows :-

1. Communication network, both road and wireless communication.
2. Capacity building, including training and infrastructural support.
3. Habitat improvement and habitat extension.
4. Education and public awareness programme.
5. Research on species and habitat including continuous monitoring.
6. Compensation, intelligence gathering and rewards.
7. Translocation and rehabilitation of rhinos.
8. Establishment of Veterinary care and immunization programme.
9. Relocation of enclave villagers.
10. Eco-tourism.

It may be mentioned here that even though the Asian Rhino Action Plan was first prepared in the year 1989 by the Asian Rhino Specialist Group and subsequently improved and revised in the meeting of United Nations Environment Programme, in 1993 by the range states and the specialist group in presence of donor agencies and consumer states, the drawing of external financial support was left to the countries. If one looks into the flow of fund, it could be seen that in India, the external aid for in-situ rhino conservation is insignificant, which was almost nil till the year 1993 with only some support coming in the year 1994-95 through integrated forestry development project and subsequently during 1997 and 1998 through the World Heritage Scheme of UNESCO and Tiger and the Rhino Conservation fund of US Fish and Wildlife Services. While the support from international bodies for in-situ rhino conservation in India has been negligible, there is some tendency to focus more priority on ex-situ rhino conservation in some of the South East Asian Countries where the fund flow has been more.

A stage has come now to decide whether more attention for rhino Conservation should be given to countries which have clearly demonstrated the ability to improve the status of rhino from a perilous stage through their own efforts and programmes, or more attention should be given to countries where no such promise has been shown so far and consequently no guarantee for long-term conservation of the rhino in the wild. While the Asian Rhino Specialist Group must address the scientific and

technical aspect of rhino conservation, but their credibility will perhaps depend on how much they can mobilize the global bodies, including developed countries, to provide support to the field-based programmes for the conservation of this prehistoric species, which has undergone the least morphological changes in the evolutionary history of the species over geologic time scale. I am sure my friends and colleagues from Nepal will also share the same concern.



A REPORT ON RHINO SITUATION AND ACTION PLAN IN ASSAM

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INTRODUCTION

Rhinoceros unicornis (Indian One-horned Rhino) which had once a large area of its distribution along the flood plains of Indo-Gangetic and Brahmaputra riverine tracts has now been confined into few pockets in its former range. In Assam, even in the present century this species was distributed all along the Brahmaputra flood plain till the late sixties. But gradually with the influx of human settlements and agricultural practices coupled with ruthless killing, the animal has ultimately been pushed into a few pockets in the Brahmaputra Flood Plain.

The primary reasons for diminishing of the rhino population are :

1. The natural habitat of the rhino is most suitable land for agriculture and thus the human population started encroaching into the rhino habitats in the process of extending agriculture.
2. The rhino horn has traditionally been attributed to have powers of curing complicated human ailments, bringing good fortune and has for long time believed to be of aphrodisiac value. Thus, the species became vulnerable to large scale poaching.

By the turn of the present century, the status of the species even in the above areas went so precariously low that its future existence became extremely doubtful. But, due to timely measures taken up by the Government of Assam to save the rhinos in these areas, the status of the rhino population has gradually been increased.

The first effort made to conserve rhino was taken up as early as 1908 when Kaziranga was declared as a Reserved Forest with the primary objective of protecting the rhinos. The result of this conservation effort is highly encouraging from the fact that during a period of 90 years, rhino population has increased from about a dozen to 1,200. This conservation effort was extended to other rhino bearing areas in the State. Presently, the State has the following major rhino bearing areas:

- i) Kaziranga National Park,
- ii) Orang Wildlife Sanctuary,
- iii) Pobitora Wildlife Sanctuary,
- iv) Manas National Park,
- v) Laokhowa/Burachapori Wildlife Sanctuary.

Despite constant efforts of the Government, the rhino population of Laokhowa faced an unfortunate setback during 1983 in the wave of Assam Agitation. The entire rhino population of this sanctuary was eliminated by poachers. Similarly, due to the ethno-political uprising around Manas National Park since 1988-89, the situation became almost uncontrollable. The infrastructures were damaged, field staff were killed and kidnaped which demoralized the anti-poaching staff.

LEGAL ASPECTS

In the process of the conservation effort, the Assam Government took up various measures. The "Rhinoceros Preservation Act" was enacted during 1915, which prohibited hunting of rhino even in the unclassified forest areas of the State. Subsequently, in 1954, this act was made more stringent through promulgation of the "Assam Rhinoceros Preservation Act", which was made operative all over the State.

Besides, the "Assam Forest Regulation", 1891 also provided protection to the wild animals, birds and reptiles as well as their habitats in the reserve and unclassified forest areas.

Finally, the "Wildlife Protection Act, 1972" has been adopted in the State since 1976. This Act, amended from time to time and considered to be adequate to deal with the legal problems of all the species of wild animals and its habitats, particularly the endangered species including the 'Schedule-I' animals of the said Act.

LEGAL STATUS OF THE RHINO BEARING AREAS

1. KAZIRANGA NATIONAL PARK

Kaziranga was first declared as a reserved forest during 1908 with an area of about 208 km² with the primary objective of conserving the rhinos. It was declared as a Wildlife Sanctuary in 1950 and ultimately constituted to a National Park in 1974 with an area of 430 km². It was declared as *World Heritage Site* during 1985.

The habitat of the Kaziranga National Park is mainly composed of the following forest types:

- 1) Eastern wet Alluvial Grassland (1/4/4D/2S);
- 2) Eastern Dillenia Swamp Forest (1/4/4D/SS).

The area under different biomes are:

Tall Grassland	-	52%
Woodland	-	29%
Swamp/Marshy	-	5%
(Short Grass) Beels	-	7%
Sand cover	-	7%

2. MANAS NATIONAL PARK

Manas Wildlife Sanctuary was brought under Project Tiger in 1973 with a core area of 391 km². It was declared as a National Park in 1990 with an area of 500 km². Manas was declared as a World Heritage Site in 1985 and a Biosphere Reserve during 1989.

The habitat of Manas National Park is composed of the following forest types:

- 1) Sub-Himalayan High Alluvial Mixed Deciduous Forests (2B/C/S);
- 2) Eastern Malayan Moist Mixed Deciduous Forests(3C/C3);
- 3) Low Alluvial Savannah Woodland (3/S);
- 4) Assam Valley Semi-Evergreen Forests (2B/C/ (a,b)).

3. ORANG WILDLIFE SANCTUARY

Orang-Wildlife Sanctuary was proposed during 1985 and finally notified as a Wildlife Sanctuary in 1998 with an area of 78.807 km²

The habitat of Orang Wildlife Sanctuary is composed of the following forest types:

- 1) Eastern Himalayan Moist Mixed Deciduous Forest (1/3/3C/C b);
- 2) Eastern Seasonal Swamp Forests (1/4/4D/SS);
- 3) Eastern Wet Alluvial Grassland (1/4/4D/24) and
- 4) Khoir-Sissoo Forests (11/5/1S).

These forests cover the wooded and grass land areas except on the plantations raised since 1931 till 1985.

The land use pattern of Orang Wildlife Sanctuary is as follows:

Wood land (with plantation)	-	16.2%
Thatch area	-	18.8%
Tall Grass area	-	40.9%
Water Bodies/Swamp	-	12.6%
Chaporil/Sandy area	-	11.95%

4. POBITORA WILDLIFE SANCTUARY

Pobitora was proposed for wildlife sanctuary during 1987 and finally notified in 1998 with an area of 38.806 km².

The habitat of the sanctuary is almost similar to that of Orang Wildlife Sanctuary. The following forest types exist in the area:

- 1) Low alluvial Savannah Woodland (*Salmalia-Albizia*)(1/3/1S);
- 2) *Barringtonia* Swamp Forest(1/4/4D/SS);
- 3) Eastern Wet Alluvial Grassland (1/4/4D/25) &
- 4) Northern Moist Mixed Deciduous Forests (1/3/3C/C/2S).

Different biomes and their extents in the sanctuary are as follows:

- | | | |
|-----------------------|---|--------|
| 1) Woodland | - | 22.84% |
| 2) Grassland | - | 62.25% |
| 3) Swamp/Water bodies | - | 14.91% |

5. LAOKHOWA WILDLIFE SANCTUARY

Laokhowa Reserved Forest was declared as a Wildlife Sanctuary in 1996 with an area of 79.107 km².

The habitat of Laokhowa Wildlife Sanctuary contains the following forest types:

- 1) Low Alluvial Savannah Woodland (1/3/3C/C,2S,)
- 2) Riparian Fringing Forests (1/4/4/RS).

PRESENT CONSTRAINTS

1. POACHING

Though the poaching of rhino is not a recent phenomenon but the pressure on poaching has increased manifold. Primary reason for poaching is for its horn which fetches a high price in the international markets. The rhino has become the target of the organized professional poachers supported by national/internal smugglers. Containing poaching has thus become an extremely hard task. The poachers continually change their poaching techniques to outwit the anti-poaching staff. Though the age old practice of pit-poaching is still continuing, the electrocution method and use of sophisticated firm arms, sometimes fitted with silencers, are also used frequently. Moreover, the incidents of poaching take place any time of the day and night. The poachers take advantage of the difficult terrain of the rhino bearing areas. A statement showing the total number of rhinos killed by poachers in the State since 1988 is given below:

Year	K.N.P.	Orang	Pobitora	Manas	Other Areas
1988	24	8	-	1	4
1989	44	5	4	6	7
1990	34	-	2	1	6
1991	22	1	1	2	2
1992	48	2	3	11	2
1993	40	1	4	22	3
1994	14	7	4	4	2
1995	27	10	4	1	2
1996	26	9	4	-	1
1997	12	11	4	-	2
1998	8	12	4	-	1

In spite of all odds, the anti-poaching staff in the rhino bearing areas are combating the poachers with full dedication. A statement showing poachers killed during encounters, arrested, arms and ammunition seized in rhino bearing areas in the State is given below:

No. of poachers killed

Area	1994	1995	1996	1997	1998
K.N.P.	12	6	9	6	3
Manas	7	3	1	-	1
Total	19	9	10	6	4

No. of poachers arrested

Area	1994	1995	1996	1997	1998
K.N.P.	60	29	19	16	19
Manas	13	7	2	12	-
Pobitora	3	-	-	-	-
Orang	-	-	7	-	-
Total	76	36	28	28	19

Arms seized in K.N.P.

Arms	1994	1995	1996	1997	1998
Rifle	4	1	4	6	2
Gun	7	4	3	2	-
Carbine	1	1	1	-	-
Total	12	6	8	8	2

Ammunition seized (in rounds)

Area	1994	1995	1996	1997	1998
K.N.P.	72	25	71	57	435

2. BIOTIC INTERFERENCE

The rhino bearing areas are mostly devoid of human settlement but these areas are subjected to tremendous biotic pressure mainly in the form of cattle grazing and collection of forest produce illegally. Prohibition of cattle grazing in these areas is one of the very important aspects as this may prevent the spread of contagious diseases like Anthrax, FMD, Rinderpest, etc. In area like Pobitora, grazing pressure is tremendously high as the sanctuary is surrounded by human habitations and more than 3,000 cattle graze inside the sanctuary. About one third of Pobitora's rhino tend to stray out during night and about 75% of poaching incidents take place outside the sanctuary boundary. This biotic interference has created problems in the rhino bearing areas, particularly in Pobitora, Laokhowa and Orang Wildlife Sanctuary.

3. DEGRADATION OF HABITAT

As a result of heavy grazing not only have the habitat attributes been adversely affected but an ecological process of invasion of weeds is also occurring. In the long run, this will create forage problems for the rhinos.

Siltation of water bodies in the rhino bearing areas is also another major problem. Siltation in the rhino bearing areas, particularly in Kaziranga National Park, Orang and Pobitora Wildlife Sanctuaries is becoming prominent in the last two decades. The water bodies in these areas are gradually silted up causing reduction of short grassy areas which is vital foraging site of the rhino.

4. FLOOD/EROSION

The Indian Rhinos appear to prefer the grassland habitat along the rivers/*beels* where more moderate climatic conditions prevail. Climate is strongly influenced by monsoon and hence flooding is a regular feature.

Annual flood is essential for maintaining the ecology of the rhino habitat. The problem arises when there is an incidence of high flood. During high flood the infrastructures, like roads, bridges, anti-poaching camps are damaged along with loss of animal lives. During the recent high flood in Kaziranga National Park as many as 651 animals were drowned/washed away including 39 rhinos, apart from causing heavy damages to the infrastructure of the Park. In Kaziranga National Park and Orang Wildlife Sanctuary, the river Brahmaputra flows along the northern and southern boundaries respectively. Thus during the high flood, erosion takes place reducing the foraging areas of rhino.

Ecological process of reclamation of grassland by tree land is detrimental to the habitat requirements of the rhino population. Though annual control burning holds the natural successional process at grassland stage yet colonization of fire-hardy tree species thrive and gradually make burning ineffective. The invasion of tree land into the grassland is observed to be prominent particularly in Pobitora, where within a period of 20 years about 13% grassland is lost to tree land. Similarly, tree cover in Orang Wildlife Sanctuary and Kaziranga National Park is invading into the grassland areas.

5. STATUS OF RHINO IN ASSAM

Scientific census of rhino was first carried out in Kaziranga National Park in 1966. Since then, regular census has been carried out in every 6th year in Kaziranga National Park. Census of rhino has also been carried out in Orang and Pobitora Wildlife Sanctuary since 1985 and 1987 respectively. In Manas

National Park and Laokhowa/Burachapori Wildlife Sanctuary, no census have so far been carried out. As stated in the foregoing paragraph, the rhino population in Laokhowa Wildlife Sanctuary was wiped out during 1983 when 40 rhinos were killed by poachers during the Assam Agitation. Recently, a few stray rhinos were found to have taken shelter in the area. However, without firm protection measures, the future of the rhinos in this protected area cannot be ensured. Prior to the beginning of the ethno-political uprising during 1989, the rhino population in Manas National Park was estimated to be around 80 in number.

A statement showing the rhino population in different Rhino bearing areas of the State as per census is given below:

Kaziranga N.P.		Orang Wildlife Sanctuary		Pobitora Wildlife Sanctuary	
1966	366	1985	65	1987	56
1972	658	1991	97	1993	56
1978	939	1999	46	1995	65
1984	1080			1999	76
1991	1129				
1993	1164				
1999	1650				

ACTION PLAN

Assam has a century-long rhino conservation history. Both government and the people of this area are dedicated to the cause of conservation of this magnificent species. Unlike the situation in other parts of the globe, the rhino population despite all odds has increased favourably in the State of Assam. The State now is harbouring around 1,750 rhinos, which is about two-thirds of the world's One-horned Rhino population. The major problems in conservation of this species are due to increased agricultural practices, degradation of habitat and poaching for its horn. Poaching has been aggravated by easy availability of illegal sophisticated fire arms across the border taking advantage of the prolonged law and order situation in the region. In such a situation, strong anti-poaching activities with firm commitment for funding is essential. Effective implementation of international ban on rhino horn trade and generating public awareness for conservation are also necessary for sustaining the rhino population in the State.

ANTI-POACHING ACTIVITIES

The success story of increased rhino population in Kaziranga National Park and other rhino bearing protected areas of Assam is primarily due to effective anti-poaching network built up in these areas. The parks and sanctuaries are divided into various administrative compartments. Anti-poaching camps are set up in the vulnerable areas. Communication networks, like road, bridge and patrolling path are built up connecting the camps. Wireless facilities are also provided to most of the camps. For effective patrolling jeeps, boats and elephants are also provided. The facilities provided presently are not at all

adequate. From experience, it is found that poachers are armed with sophisticated fire arms. As such, supply of sophisticated fire arms to the anti-poaching staff is very essential.

HABITAT RESTORATION

Ecological management of rhino habitat necessitates the maintenance of sufficient areas of swampy grassland. The relative abundance of animals in an area changes as per the stand condition or successional stages consisting therein. In rhino bearing areas, emphasis has only been given to anti-poaching activities with the view of protecting the rhinos. In wildlife management, the ecological consideration is an essential and fundamental pre-requisite. This aspect has appeared to be not properly viewed. With increase in population of rhinos, future management plan will have to be cognizant of the new diverse problems and research will be obligatory to resolve such ecology related problems. Since 1966, the population of herbivores in Kaziranga National Park has more than doubled. This has become possible due to the fact that in this park, except for the rhino poaching, the poaching of other animals are almost negligible. Due to fragmentation and degradation of elephant habitat in the Karbi Anglong Hills the rotational grazing of elephants in its home range is disturbed increasing its population by 213% since 1966. Similarly, during this period, the buffalo population has also increased by 119%. These two coarse grazing animals have become the main competitor to the rhinos in the park.

Creation of artificial highland inside Kaziranga National Park to save the rhinos during the high flood is essential. Though this problem was not acute in the long past as the animals could migrate to the natural highlands in the Karbi Anglong Hills, adjacent to Kaziranga National Park but due to human settlement, establishment of tea gardens, markets, construction of highways, etc., the ecology of Kaziranga has been fragmented.

Restoration of *beels*/water bodies inside the protected areas is also another vital necessity. Due to siltation, swampy areas will be colonized by tall grasses. Aquatic flora as well as the short grasses which grow only around the water-bodies are of high forage value. Since 1967, about 25% of the wet land in Kaziranga National Park has been lost. Similarly, in other rhino bearing areas, particularly in Pobitora Wildlife Sanctuary, the wetland is gradually silted up. In view of such situation, de-siltation works are to be carried out in large scale in these protected areas.

FACILITIES TO THE FIELD STAFF

The anti-poaching staff posted in the protected areas have to perform a much more arduous and risky job. The field staff should be provided with sufficient incentives and other facilities, like accommodation in the form of transit camps for their families, health care, education for the children including regular supply of logistic support¹.

TRAINING OF PERSONNEL

Adequate training of field staff in Wildlife Conservation is a basic necessity. Such facilities are not available in the institutions of the State. Though the higher level personnel have the scope of undergoing wildlife management training outside the State, the lower level field staff do not have such scope. Hence, imparting such training to all levels of staff including arms training is also essential.

PEOPLE'S AWARENESS

¹ [Editors] The Rhino Foundation for Nature in North Eastern India, with a grant from the USFWS Rhino & Tiger Conservation Fund, has provided uniforms, boots and field equipment to field staff in most Conservation Areas in Assam.

To make the conservation programme more successful, people's participation in such conservation programmes are to be taken up, particularly in the fringe villages of the protected areas through various publicity media.

LEGAL CELL

Though, with the successive amendments, the Wildlife (Protection) Act, 1972 has been made more stringent, yet problem of effective implementation in the field is still inadequate. Field staff are to be trained about the legal provisions and their proper implementation. Various law enforcing and implementing agencies are to be sensitized in controlling the wildlife crimes. To pursue such activities, a legal cell is essential to be set up with eminent lawyers and counselors.

INTELLIGENCE NETWORK

Apprehension of poachers inside the protected areas is not an easy task. Particularly due to difficult terrain in the rhino bearing areas, the poacher can escape with less difficulties. It is, therefore, very essential to set up intelligence network to elicit information about poachers before they enter into the park.

VETERINARY CARE

In all the rhino bearing protected areas, working elephants are provided for anti-poaching and supply of ration during summer season. These working elephants need proper care and upkeep. Though there are veterinary units in Kaziranga and Manas National Park, no such units are available in other protected area. So, establishment of Veterinary Units in each protected area with all equipments and medicines including tranquilizing facilities are to be set up.

FLOW OF FUNDS

The development and maintenance works in the protected areas are time-bound. As such irregularity/delay in flow of funds will definitely upset the anti-poaching activities.

MONITORING

For effective management, monitoring of the rhino population in the protected area is necessary. For this, scientific census of the rhino population at a regular interval is a must.

TRANSLOCATION/RE-INTRODUCTION

As described in the earlier paragraphs, there are suitable rhino habitats apart from these 5 rhino bearing areas. These are - Sonai-Rupa, Pani-Dehing, Dibru-Saikhowa, etc. These areas have already been brought under the protected area network. In Laokhowa and Burchapori, though there is no settled rhino population, it can be restored by providing adequate protection.

In view of such a situation, rhino from adjoining rhino bearing areas can be translocated and rehabilitated in the above areas. Sufficient infrastructures have to be built up for such purpose. This will ensure the long-term in situ conservation of rhinos.

ECO-DEVELOPMENT

It is needless to emphasize that people's participation in the conservation effort is unavoidable. Particularly, people in the fringe villages are to be involved in conservation programme. It is apparent that in the process of building up of the Protected Area Network, the fringe villagers are the worst

sufferers. They are deprived of the forest produces required by them for their day to day livelihood. In addition, they become the victim of wildlife deprecations including loss of life. Thus, the people have to face severe economic hardship. To ameliorate the economic hardships of these people, economic support in the form of eco-development programme has become very essential.

RESEARCH WORK

With the passage of time, management in the rhino bearing areas has become critical. The management technique must be supported by proper research oriented work. Proper research about rhino and its habitat, siltation, fodder availability, burning etc., are necessary to carry out in the state, which have not been done so far.

FINANCIAL ASPECT

Initially, the entire effort for conservation of rhinos had been born by the State Government as part of the forestry budget. Thus, the financial input had obviously been very small and grossly inadequate. With the increase of rhino population in the protected areas and gradual change of management strategies, the requirement of financial input has enlarged.

The Government of India had introduced a scheme "Conservation of Rhinos in Assam" during 1985 for five years. In addition to this, Government of India has provided financial support in the form of 50:50 and 100% assistance for conservation of rhinos and other wildlife in the protected areas of the State.

Recently, various funding agencies, like WWF, UNESCO, EIA, etc. have come up with financial assistance for conservation and protection works in Kaziranga and Manas National Parks. This has helped in managing the protected areas, considerably. Such type of help is always welcome by the Government.

FINANCIAL AND PHYSICAL OUTLAY AND PHASING

The present budget allocated to different rhino bearing areas are too meager to the management of the protected areas. To implement the Action Plan, budgetary allocation has to be raised. An estimate of funds to be raised along with the present allocation is indicated below:

Figures in Millions (Rupees)						
	1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	5th Yr.	Total
Fund available	42	48	54	60	66	270
Fund to be raised	65	70	75	80	80	370

(Total fund to be raised is 370 Million rupees)

Most major protected areas in Assam hold Rhino population and therefore are being dealt with priority. But, the total forestry budget itself is very poor and inadequate compared to the requirement.

Besides normal expenditures incurred in the protected areas, several schemes have also been introduced in these areas for better and more intensive management. These are:

STATE SCHEMES

- 1) Improvement/Strengthening of Wildlife Organization;
- 2) Development/Management of Other Wildlife Areas;
- 3) Development/Management of Protected Areas;
- 4) Conservation of Rhinos in Assam.

50 : 50 CENTRALLY SPONSORED SCHEME

- 1) Tiger Project.

100% CENTRALLY SECTOR SCHEMES

- 1) Eco-development Scheme around National Parks & Wildlife Sanctuaries;
- 2) Eco-Development Scheme in Manas National Park;
- 3) Biosphere Reserve;
- 4) Assistance for Development of National Parks and Wildlife Sanctuaries;
- 5) Project Elephant.

PHYSICAL TARGET

The following items of work have been selected to be funded, if, and when, funding is available on priority basis.

HABITAT IMPROVEMENT INCLUDING EXTENSION

- 1) Creation of highlands for providing shelters to the wildlife during floods,
- 2) Acquisition of high lands for addition to the natural habitats of the Rhinos as an added measure to provide shelter to the rhinos during floods,
- 3) De-siltation of the silted up water bodies,
- 4) Eradication of exotic weeds and water hyacinth for improvement of fodder,
- 5) Soil conservation measures,
- 6) Manipulation of habitat.

MANAGEMENT

- 1) Strengthening communication network,
- 2) Strengthening anti-poaching measures,
- 3) Strengthening enforcement and legal proceedings,
- 4) People's awareness and natural interpretation,
- 5) Improvement of veterinary care and research,
- 6) Training and research,
- 7) Relocation of villages.

ECO-DEVELOPMENT PROGRAMME IN THE FRINGE AREAS

This programme will be site-specific as such planning will involve peoples' participation in planning and also implementation. Some of the salient priority activities as identified by the Government of India for eco-development, as mentioned below, may be taken up:

- 1) Micro level eco-development planning;
- 2) Initiation of eco-development activities aimed at environmental conservation, biomass generation, income generation and protected area management;
- 3) Human resource development;
- 4) Research and development;

- 5) Environmental education and awareness;
- 6) Monitoring.

Besides, some other activities may be taken up prior to or concurrent with the project, more as a support than as a part of the project. These are:

- 1) Preliminary indicative planning;
- 2) Eco-development training for the Park Directors/Field Directors and other officers;
- 3) Management planning;
- 4) Captive breeding, translocation and rescue home;
- 5) Monitoring.

The demand for funds for the State of Assam is actually much higher than what has been projected here. Only the more important and salient programmes have been included in this plan.

SALIENT FEATURES OF THE RHINO BEARING PROTECTED AREAS

KAZIRANGA NATIONAL PARK

Declared Reserved Forest in 1908	-	Area - 228.830 km ²
Declared Game Reserve in 1916	-	Area - 277.654 km ²
Declared Wildlife Sanctuary in 1950		
Declared National Park in 1974	-	Area - 429.93 km ²
Declared World Heritage Site in 1985		
Present area in 1998	-	Area - 473.717 km ²

ORANG WILDLIFE SANCTUARY

Declared Game Reserve in 1915	-	Area - 80.679 km ²
Proposed as W.L. Sanctuary in 1985	-	Area - 75.608 km ²
Declared as W.L. Sanctuary in 1998	-	Area - 78.807 km ²
Present area in 1999	-	Area - 78.807 km ²

POBITORA WILDLIFE SANCTUARY

Declared as Reserved Forest in 1971	-	Area - 15.847 km ²
Proposed as W.L. Sanctuary in 1987	-	Area - 38.83 km ²
Declared as W.L. Sanctuary in 1998	-	Area - 38.806 km ²
Present area in 1999	-	Area - 38.806 km ²

MANAS NATIONAL PARK

Declared as Reserved Forest in 1905	-	
Declared as Game Reserve in 1928	-	
Declared as W.L. Sanctuary in 1950	-	Area - 391.00 km ²
Declared as Tiger Reserve in 1973	-	Area - 391.00 km ²
Declared as Biosphere Res. in 1989	-	Area - 2,837.00 km ²
Declared as National Park in 1990	-	Area - 500.00 km ²
Decl. as World Heritage Site in 1985	-	

RESULT OF CENSUS IN RHINO BEARING PROTECTED AREAS

1. KAZIRANGA NATIONAL PARK

Animal	Year of Census					
	1966	1972	1978	1984	1991	1993
Rhino	366	658	938	1080	1069	1164
Elephant	349	422	773	523	515	511
Wild Buffalo	471	555	6'10	677	1090	1034
Gaur	1	18	23	30	5	-
Swamp Deer	213	576	697	756	635	927
Sambar	120	105	215	358	55	34
Hog Deer	1311	4551	6855	987	2911	2048
Wild Boar	155	522	733	1645	555	140
Tiger	20	30	40	52	50	8
Bear	-	-	-	-	-	2
Capped langur	-	-	-	-	-	21
Gibbon	-	-	-	-	-	8

The other animals were sighted during rhino census. As per census, the population of tiger and elephant, in the Park are as follows:

	1993	1997
Tiger	72	80
Elephant	1094	945

2. ORANG WILDLIFE SANCTUARY

Animals	Year of Census	
	1985	1991
Rhino	65	8
Hog Deer	-	897
Wild Boar	-	421
Tiger	-	9
Elephant	-	5

During tiger and elephant census, following populations were found:

	1993	1997
Tiger	15	16
Elephant	6	5

3. POBITORA WILDLIFE SANCTUARY

Animal	Census Year		
	1987	1993	1995
Rhino	56	56	68

Besides rhinos, 9 feral buffalos and 30 wild boars were sighted during 1995 census.

STATE WILDLIFE WING

**CCF(WL)
CF(HQ)**

DFO ENFORCEMENT DFO PUBLICITY SR. WL. WARDEN RESEARCH & EDUCATION OFFICER

RHINO BEARING PROTECTED AREAS

DIRECTOR MANAS NATIONAL PARK

DIRECTOR KAZIRANGA NATIONAL PARK

Dy. DIRECTOR

FVO

ACF

RANGES

PANBARI BASBARI BHUYAPARA

DFO MANGALDOI WL. DIVN

RANGE

ORANG

DFO NAGAON WL. DIVN.

RANGES

PABITORA LAOKHOWA

DFO ASSAM STATE ZOO

GHORAKATI WESTERN KAZIRANGA EASTERN

DFO EASTERN ASSAM WL. DIVN.

ACF

AFPF(Bn)

RANGES

FVO

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STATUS REPORT ON KAZIRANGA NATIONAL PARK

B.S. BONAL, DIRECTOR, KAZIRANGA NATIONAL PARK, BOKAKHAT - 758612, ASSAM

FOREWORD

The scope of wildlife conservation and management is very vast and yet to be explored fully. Though much has been achieved in the preservation of the wildlife heritage in Kaziranga over the decades, of which the saving of Indian Rhinoceros from the very brink of extinction remains a striking example of whole-hearted dedication, there is no scope for complacency.

The first Status Report on Kaziranga National Park was compiled by Sri S. K. Sen, IFS in 1993 on the occasion of PHVA Workshop on Indian/Nepali Rhino at Jaldapara and subsequently updated in 1995. The present Status Report, 1998 is basically a revised and updated version of the earlier reports and endeavors to reflect the state of affairs prevailing in Kaziranga National Park vis-a-vis conservation of the flagship species of Rhinoceros, in spite of sheer magnitude of difficulties and problems confronted by the staff in performance of their regular patrolling activities.

I am thankful to Sarbashree P. S. Das, DCF, Aniruddha Dey, ACF, L. N. Baruah, ACF for their sincere co-operation and efforts in updating the Status Report and to Smti. Gitanjali Kalita and Sri Munindra Kr. Bordoloi for printing within a short span of time.

B. S. Bonal, IFS
Director
Kaziranga National Park
Bokakhat: 785612: Assam

CONSERVATION STORY

The entire area from near Bokakhat in the East up to Jakhalabandha on the West was covered with continuous belt of forests extending from the Brahmaputra River up to the hills and the integrated habitat of hills and plains was the ideal habitat for a rich and varied population of wildlife during the major part of the nineteenth century. But with the advent of the present century, ruthless destruction of forests was carried out in the higher terraces for establishing tea gardens and the low lying stretches were opened out for paddy cultivation and incidental habitations. The wild animals were gradually forced out and restricted to the flood plains which now forms the Kaziranga National Park.

The extinction and decline of the Great Indian One-horned Rhinoceros right from the vast stretches of the Indo-Gangetic plains to the Brahmaputra plains was due to ruthless destruction of habitat, persecution in the name of sports and superstition about the magical properties of its horn. The decline in the population of the species was very rapid and it was believed that not more than a dozen surviving Rhinos were left in the Kaziranga area at the beginning of the present century. Realization dawned on the Government of Assam that concrete protective measures were called for and an area of 22,617 Hectares (approx.) was constituted into Kaziranga Reserved Forest in January, 1908 and that was the D-Day for conservation of Great Indian One-horned Rhinoceros. From that day till now, the population is progressively increasing and census carried out in April 1993, in the presence of N.G.Os, and media persons, indicated that the population of Rhinoceros in the National Park was 1164 ±136.

SITUATION

Kaziranga National Park lies between 26°30' and 26°45' N latitudes and 93°40' E to 93°50' E longitude and spreads over in parts of civil districts of Golaghat and Nagaon in the State of Assam, having the River Brahmaputra as a boundary on the North, artificial lines and part of the river course on the East, Moridiflo river, foothills of Karbi Anglong District, Deopani Nallah, National Highway 37 on the South and artificial lines and part of the river course on the West.

EXTENT OF AREA

The reservation process started during 1908 and exclusion and addition to the Kaziranga Reserved Forests continued up to 1967 and details of exclusion and additions were:

Reservation vide Notification	No. 37 F, Dt. 3.1.1908	22,617 Ha
Exclusion vide Notification	No.2069F, Dt.18.4.1911	(-) 577 Ha.
		22,040 Ha.
Addition vide Notification	No. A/95, Dt. 4.6.1911	356 Ha.
-do- -do-	No. 295 R, Dt. 28.1.1913	5,403 Ha.
-do- -do-	No. 3560 R, Dt. 26.7.1917	15,012 Ha.
-do- -do-	No. FOR/WL/512/66/17 Dt. 7.4.1967	60 Ha.
	Total	42,871 Ha (i.e. 428.71 km ²)

Annual flooding and erosion along the northern boundary of the Park and accretion of chapories on the river bed is an annual phenomenon from the inception of the Park. On the north-eastern side, large

areas have been lost due to erosion (1997). At present, the Park has an area of 407.90 km². which is constantly changing due to erosion caused by the Brahmaputra River. The stable chapories (river island) so formed due to erosion of the North Bank are the extended habitat of the wildlife, mostly rhinos and wild buffaloes.

LEGAL STATUS

Immediately after constitution of the area into Reserved Forest in 1908, hunting/shooting/trapping and fishing inside the Reserved Forests were banned. In November 1916, the area was declared as a "Game Sanctuary" and subsequently the nomenclature was changed to "Wildlife Sanctuary" with effect from 1950. After enactment of the State Act on National Park (Assam National Park Act of 1968), Kaziranga Wildlife Sanctuary was proposed for upgrading into a National Park vide Notification No. FOR/WL/722/69/45, Dt. 23.9.69 and it was declared as National Park vide Notification No. FOR/WL/722/68, Dt. 11.2.74. with effect from 1.1.74. With the subsequent adoption of the Wildlife (Protection) Act of 1972 by the Assam State, Kaziranga attained the status of a National Park under the relevant provisions of the said Act.

EXTENSION OF AREAS

The habitat of Kaziranga National Park extended up to the foothills of Karbi Anglong district in the past. But with the establishment of tea gardens, human habitations and agricultural activities on the periphery of the southern boundary of the Park, it has now become difficult for the wild animals to move through certain corridors to the hills during high flood and the animals become easy prey to the poachers. On the other hand, due to constant erosion of the northern boundary and accretion of chapories, the animals move to chapories as these areas are an extended habitat of wildlife. Moreover, there are number of villages on the edge of the southern boundary of the Park which occasionally harbours poachers. At the same time, the annual increment percent of the animal population mainly rhinos is gradually declining which indicates urgent necessity for extension of habitat for rhinos in the National Park. With these backgrounds, the following proposals for extension of areas of Kaziranga National Park were initiated but the proposals were not finalised due to various reasons, such as legal, administrative and financial reasons.

1. 1 st addition (Burapahar)	43.79 km ²
Rs. 38,83,318/- has already been deposited with the Deputy Commissioner, Nagaon as acquisition cost. Final Notification issued Vide FRS/253/90/198, dt. 28.5.97.	
2. 2 nd addition (Sildubi)	6.47 km ²
payment of Rs. 12,13,611 has already been made to the Deputy Commissioner, Golaghat. Acquisition delayed due to High Court case.	
3. 3 rd addition (Panbari)	0.69 km ²
Payment of Rs. 13,27,746 made to the Deputy Commissioner, Golaghat.	
4. 4 th addition Kanchanjuri	0.89 km ²
Final notification has been published but subjudice in the High Court due to a case filed by a tea estate.	

5. 5 th addition (Haldibari)	1.15 km ²
Payment of Rs.13,91,357 has already been made as compensation for land to the Deputy Commissioner, Golaghat.	
6. 6 th addition	376.50 km ²
(Part of Brahmaputra River between Dhansirimukh & Kolia Bhomora Bridge including the chapories and Panpur R.F.). Delayed due to High Court case. Area handed over to Park authorities during December, 1997.	
Total	429.49 km²
	33.00 km ²

An area of 33 sq.km of Karbi Anglong District for which preliminary notification vide No. 16 of 30.7.75 issued and payment of Rs. 4,71,000 had been made in 1979 to the Karbi Anglong District Council Authorities. The KAAC has refunded the amount to Kaziranga National Park during 1996 and has initiated move to declare the area as a Wildlife Sanctuary.

VEGETATION

Three broad categories of vegetation can readily be recognized in the Park.

- a) Aquatic plants in or near the water bodies.
- b) Eastern wet alluvial savanna or grass land, and
- c) Woodland or tree forests.

The water bodies occupy about 6% of the total area of the Park. The predominant species amongst the aquatic vegetation are the Water hyacinth (*Eichhornia crassipes*), floating and straggling grasses like Dal (*Andropogon* spp.), Erali (*Andropogon* spp.) and other species like Kalmou (*Ipomea reptans*), Helonchi (*Enhydra fluctuans*), Borpuni (*Pistia stratiotes*), Harupuni (*Lomma panicostals*), Water Lilies (*Nymphaea* spp.), Lotus (*Nelumba* spp.), etc. make up the aquatic vegetation.

Savanna formation or grass lands cover accretions along with Jhau (*Tamarix dioca*), grasses like *Saccharum spontaneum*, *Imperata cylindrica*, *Erianthus ravennae*, *Narenga porphyrocome*, *Neyrandia reyaundiana*, *Cyminpopogon pendulus* etc. come up in the established extensive grass lands. The most common and widely distributed species of grass in the Park are Ekora (*Erianthus ravennae*). Other associated grasses are Barata kher (*Saccharum elephantinus*) and Ulu kher (*Imperata cylindrica*). Moist low lying locations show presence of species like Khagori (*Phragmites karka*) and Nal (*Arundo donax*). *Microstegium ciliatum* occur as ground cover under the tree canopies in comparatively higher ground. Around the edges of the beds and in marshy areas, short succulent grasses like *Cynodondactylon*, *Chrysopogon aciculatus*, *Andropogon* spp., *Panisetum* spp., *Eragrostis* spp., occur and all these grasses attract the herbivores.

Woodlands are represented by a variety of subtype in different stages of succession and edaphic variations, like riparian fringing forests, different stages of moist mixed deciduous forests, seasonal swamp forests and moist tropical semi-evergreen formation. Cane brakes are a definite edaphic variation. The description and composition of each sub-type will be rather voluminous and hence not attempted here. Woodlands occupy about 28% of the Park.

ECOLOGICAL STATUS

Two important external factors - one man made and the other natural - have influenced the flora and fauna of the Kaziranga National Park since its inception, or even earlier. Large parts of the savanna or grasslands are subjected to annual controlled burning during the winter months (December to February). Such burnings help in arresting further progress of vegetational succession towards woodlands in higher patches of grasslands and retaining its present form as an ideal habitat for terrestrial fauna particularly larger mammals. Sufficient care is taken for preventing fires from creeping into areas with nesting colonies of birds. The low-lying areas, moist pockets, semi-evergreen formations etc. are naturally immune from the fires. Vegetational regrowth being phenomenally fast in the prevailing conditions, no serious deterioration of the habitat occurs and the status-quo of the grassland is maintained. The ash, burnt up stems, roots and emerging shoots attract the herbivores and immediately after burning large congregations of animals are observed in such burnt patches. Since burning is most effective in areas containing tall grasses, which are usually shunned by the animals, the effect of burning is better dispersal of the animals and relieving of the pressure in heavily grazed short-grass locations.

Annual submergence of large areas of the Park, due to high flood level of the Brahmaputra River, coupled with spells of heavy showers in the southern Karbi Anglong Hills, is a regular feature. The floods play an important role in maintaining ecological status of the grassland formations and flush out the growth of water hyacinth which acts as an inhibitor to the water birds from the water ways.

Moreover, the various waterways and *beels* of the Park serve the purpose of breeding grounds and nursery for large fish populations and the annual floods help in replenishing the stock of the fish in the Brahmaputra River.

The submergence is not uniform throughout the Park, the earliest to be flooded being the southern and western parts of the park and the last to be affected being the central part. In the earlier period, there were escape routes for the animals in the shape of inter-connecting corridors of vegetation leading to the southern high hills but with more and more areas being opened up and subjected to habitation and cultivation in the areas adjacent to the southern parts of the Park both in the plains and hills, such escape routes have vanished. During the annual floods, some mortality amongst the animal population, particularly the deer, have been noticed in recent years and the weak and young ones are the most adversely affected. Since there has not been any decline in total population, the loss due to floods probably indirectly helps in maintaining a healthy stock of population. All the herbivores suffer due to paucity of food during and immediately after the floods. There appear to be some changes in the behaviour of the animals, particularly breeding patterns, due to the influence of the floods.

WILDLIFE

The important animals of the Park are Rhinoceros (*Rhinoceros unicornis*), Wild Buffalo (*Bubalus bubalus*), Swamp Deer (*Cervus duvaucelli*), Hog Deer (*Axis porcinus*) and Elephant (*Elephas maximus*). Besides these, Sambar (*Cervus unicolor*), Wild Boar (*Sus scrofa*), Tiger (*Panthera tigris*) and Leopard (*Panthera pardus*) are other animals found in the Park. Host of other animals and birds such as Bengal Florican are noticed in the Park. A check list of animals and birds [Not included here - editors] has been annexed as appendices.

HABITAT EVALUATION

Proper habitat evaluation for all types of animals available in the Park had not been done till today. However, habits and habitat needs of various animals in the Park was studied (Lahon and Sonowal, 1973) and on the basis of this study, evaluation has been done for five animals, viz. Rhinoceros, Wild Buffalo, Swamp Deer, Hog Deer and Elephants (Parihar. et al, 1986). The area of the Park has been divided into one minute by one minute grids for the purpose of habitat evaluation and the total land

area of the Park covers three broad types as described earlier such as woodland, grassland and water bodies. The marshy areas around the *beels* are under short grasses. The larger part of the Park is under cover of tall grasses and woodlands are mostly confined to the high grounds along river and stream banks.

HABITAT SUITABILITY

The whole park area has been divided into 138 grids of one minute by one minute and the overall evaluation of the area indicates that out of 138 grids, 37 have high suitability for rhino and wild buffalo, another 94 grids are found to have moderate suitability and only 7 grids have low suitability.

The assessment of the area for Swamp Deer and Hog Deer also indicates good suitability for the animals as 44 units are found to be highly suitable and 78 as moderate suitable. Only 16 grids have low suitability. The best suitability of the area is found to be for elephants as 81 grids fall under high suitable category and 57 grids have moderate suitability.

The Park has an overall good suitability for all the five animals studied so far, i.e. Rhinos, Wild Buffalo, Swamp Deer, Hog Deer and Elephants. However, the tall grasses occupy a large portion of the habitat which has low fodder value due to its height. Annual burning of these grasses generally add to its food value.

The Park has the largest area of high suitability for elephants. According to the last Elephant census conducted in 1997 the Park has 945 elephants but the number fluctuate from time to time. The management of the Park is Rhinoceros-oriented and as such extension of rhino habitat areas is essential with the growth of the population. Therefore, habitat manipulation through constant controlled burning and de-siltation of water bodies and removal of water hyacinth are essential factors which will make room for short grasses and suitable fodder for rhinos (Parihar, et,al, 1986).

ANIMAL CENSUS

The first scientific animal census in Kaziranga National Park was carried out during 1966 and thereafter the process was repeated every sixth year. The census operation could not be carried out during 1990 due to poor visibility and the same was conducted during 1991. Though during 1991, also the visibility was not conducive for proper count but the population of rhino was found to the extent of 1129. Even though there was serious apprehension amongst the enumerators regarding undercounting, there had been lot of adverse opinion regarding the population of rhinos and census methodology from the conservationist. The matter was raised in the Assurance Committee of the parliament and assurance was given to the Committee that a fresh census will be carried out in presence of the outsider in due course. In pursuance to the commitment given to the Assurance Committee, a special census for the rhinos was carried out during April/1993. But due to intermittent rains during the last part of 1992, and the beginning of 1993, the tall grasses of the park could not be burnt properly and the ideal condition of direct count could not be achieved. There was deep concern and apprehension of under counting remained. The census was carried out in presence of media persons and Non-Governmental Organizations and everybody opined of under-counting of rhinos.

The census in respect of the elephant and the tiger were also carried out in Kaziranga National Park during 1993 and 1997. The census for the other animals were not carried out independently but whatever the numbers of other animals were sighted during census of rhino in Kaziranga National Park were recorded.

Species	1966	1972	1978	1984	1991	1993
1. Rhino	366	658	939	1080	1129(1069)	1164 ±136
2. Elephant	349	422	773	523	515(498)	1094
3. Wild Buffalo	471	555	610	677	1090(1008)	1034
4. Gaur	1	18	23	30	5	-
5. Swamp Deer	213	516	697	756	635(559)	427
6. Sambar	120	105	215	358	55(51)	34
7. Hog Deer	1311	4551	6855	987	2911(2332)	2048
8. Wild Boar	155	522	733	1645	555(447)	140
9. Tiger	20	30	40	52	50	72
10. Bear	-	-	-	-	-	2
11. Capped langur	-	-	-	-	-	21
12. Hoolock Gibbon	-	-	-	-	-	8

N.B.: 1. Figure () means animals sighted during census within the Park area and the balance within the extended habitat.

2. During 1993, the standard deviation calculated was 12%.

Besides, population estimation exercise for particular species were undertaken in 1993, 1997 and 1998 and the results obtained were as follows:

	1993	1997	1998
Tiger	72	80	-
Elephant	1094	945	-
Swamp Deer	-	-	526

MORTALITY

The total number of death of rhinos both poaching and natural death from 1980 onwards is as detailed below:

Year	Poaching			Total poaching	Natural death	Total mortality
	Pit	Gun	Electrocution			
1980	11	-	-	11	58	69
1981	22	2	-	24	39	63
1982	19	6	-	25	48	73
1983	31	6	-	37	46	83
1984	14	14	-	28	50	78
1985	23	21	-	44	37	81
1986	18	27	-	45	38	83
1987	6	17	-	23	41	64
1988	7	17	-	24	105	129
1989	12	29	3	44	54	98
1990	4	29	2	35	57	92
1991	4	18	1	23	79	102

Year	Poaching			Total poaching	Natural death	Total mortality
	Pit	Gun	Electrocution			
1992	2	44	2	48	67	115
1993	2	38	-	40	58	98
1994	3	11	-	14	37	51
1995	6	21	-	27	53	80
1996	1	25	-	26	52	78
1997	6	6	-	12	48	60
1998	4	4	-	8	87	95

TREND OF POACHING

The trend of poaching has taken a dramatic change from pit poaching to shooting. The use of carbines and silencers by the poachers has increased the problem for the untrained staff. The reasons for increased poaching are manifold. The prime reason is the high value of the horn in the international market coupled with socio-economic conditions of the villagers (who act as field men) residing around the Kaziranga National Park. Moreover, easy availability and free movement of sophisticated arms, coupled with militant activities in the North-east has aggravated the problem of poaching. The vulnerability to poaching due to the situation of the Park with no natural barrier and having villages all along the southern boundary and the Brahmaputra River on the North is a constant cause of concern for the Park authorities. The fishery *mahals* and *khuties* in the *chapories* (Accretions) harbours poachers from the North. Having no natural barrier and the tall grasses, makes it difficult to locate the presence of poachers inside the Park once the poachers sneak into the Park. However, with the handing over of the Sixth Addition areas along the northern boundary to the Park authorities, the leases for the fishery *mahals* have been canceled recently but the lessees approached the High Court for restoration of fishing rights.

ANTI POACHING STRATEGY

The anti-poaching strategy now being adopted by maintaining 130 camps situated all over the Park areas is not at all a foolproof method. Moreover, constant patrolling on the southern boundary and the placing of two stationary vessels on the Brahmaputra River and patrolling on river routes are the main anti-poaching activities of the Park. The strategy of having a number of anti-poaching camps inside the Park and patrolling thereof had yielded very good results initially and any counter firing from the camp had proved quite productive as the poachers either used to leave the Park without poaching or without removal of horns after killing of rhinos. But now-a-days, the poachers are using sophisticated arms and taking full advantage of staff, who are not trained for combat fighting. Therefore, the strategy needs changes but due to lack of infrastructures, it is not readily possible to change the present strategy and to move for complete sealing of Northern and Southern Boundaries wherefrom poachers make entry into the Park. Direct encounters between the poachers and the staff of the Park are common but this definitely involves risks. As a result of number of encounters and the raids inside the Park, the following number of poachers were killed, arrested, horn recovered and different kinds of arms and ammunition were recovered from 1985 to 1998 :

Year	No. of poachers		Total arms recovered	Total ammunition recovered	Horn recovered
	Killed	Arrested			
1985	2	10	3	11	11
1986	2	43	5	-	9
1987	3	29	3	-	2
1988	3	13	1	7	1
1989	2	18	1	-	1
1990	3	49	11	104	6
1991	4	51	4	7	9
1992	2	58	9	96	9
1993	8	67	19	43	4
1994	12	46	9	60	1
1995	4	29	4	25	2
1996	9	19	7	71	2
1997	6	18	8	57	2
1998	3	2	2	435	1

Comparative statement of poaching of rhinos month-wise for the years 1985 to 1998 till date is shown below:

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1985	5	2	7	2	5	2	1	3	1	8	2	6	44
1986	6	2	5	5	3	1	4	-	3	6	6	4	45
1987	1	3	1	1	-	3	2	-	1	5	4	2	23
1988	3	-	3	-	2	1	3	-	1	2	1	8	24
1989	1	3	3	5	3	5	1	2	2	4	6	9	44
1990	11	4	3	3	2	-	1	1	1	2	5	2	35
1991	2	3	2	4	2	1	1	2	-	1	1	4	23
1992	4	3	7	5	3	3	3	3	1	5	4	7	48
1993	5	11	3	7	5	1	-	-	1	4	3	-	40
1994	1	-	-	-	-	3	-	2	-	4	-	4	14
1995	2	1	4	1	2	3	2	4	1	1	1	5	27
1996	1	2	4	-	3	5	1	3	2	1	4	-	26
1997	-	-	1	6	1	3	-	-	-	-	-	1	12
1998	1	-	-	-	-	-	1	1	-	3	-	2	08

It has been observed and experienced that the intensity of poaching is on the rise mainly due to escalating high value of the horn in clandestine market consequent to ban on its trade. The last sale of rhino horn in Assam took place during 1978 and during 1980 tenders were called but the sale was stopped. This was the beginning of increased intensity of poaching in Kaziranga National Park as well as other rhino bearing areas. The fact can be established from the figures given below. However, during the past two years number of poaching cases decreased considerably, probably due to acquisition of new rifles and augmentation of wireless network for protection of the Park.

Year	No. of Rhinos killed by poachers	Year	No. of Rhinos killed by poachers
1974	3	1986	45
1975	5	1987	23
1976	1	1988	24
1977	-	1989	44
1978	3	1990	35
1979	2	1991	23
1980	11	1992	48
1981	24	1993	40
1982	25	1994	14
1983	37	1995	27
1984	28	1996	26
1985	44	1997	12
		1998	08

POPULATION STRUCTURE OF RHINOS IN KAZIRANGA NATIONAL PARK

The first scientific census operation started from 1966 in Kaziranga National Park and carried out every 6th year. Classification of rhino's age counted during each Census are given below:

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

ANNUAL INCREMENT IN RHINO POPULATION IN KAZIRANGA

Year	Population	Poaching cases		Death		Total death	Increment rate
		No	%	No	%		
1966	366	5	1.37	11	3.00	16	
1967	414	12	2.92	27	6.52	39	13.11%
1968	462	10	2.16	23	4.98	33	11.60%
1969	510	8	1.57	15	2.94	23	10.39%
1970	558	2	0.36	26	4.66	28	9.41%
1971	608	8	1.32	20	3.29	28	8.96%
1972	658	-	-	20	3.04	20	8.22%
1973	704	3	0.43	59	8.38	62	7.00%
1974	752	3	0.39	20	2.66	23	6.81%
1975	798	5	0.63	34	4.26	39	6.12%
1976	846	2	0.24	20	2.36	22	6.02%
1977	892	-	-	37	4.15	37	5.44%
1978	939	5	0.53	25	2.66	30	5.27%
1979	962	2	0.20	19	1.97	21	2.44%
1980	986	11	1.11	58	5.88	69	2.49%
1981	1009	24	2.37	39	3.86	63	2.33%
1982	1033	26	2.51	47	4.54	73	2.37%
1983	1056	37	3.50	46	4.35	83	2.22%
1984	1080	28	2.59	50	4.62	78	2.27%
1985	1087	44	4.04	37	3.40	81	0.64%
1986	1094	45	4.11	38	3.47	83	0.64%
1987	1101	23	2.08	41	3.72	64	0.64%
1988	1108	24	2.16	105	9.47	129	0.63%
1989	1115	43	3.85	55	4.93	98	0.61%
1990	1122	35	3.11	57	5.08	92	0.63%
1991	1129	23	2.03	79	6.99	102	0.62%
1992	1146	48	4.18	67	5.84	115	1.50%
1993	1164	40	3.43	58	4.98	98	1.57%
1994	-	14	-	37	-	51	-
1995	-	27	-	53	-	80	-
1996	-	26	-	52	-	78	-
1997	-	12	-	48	-	60	-
1998	-	08	-	87	-	95	-

The age/sex classification of Rhinos against poaching and natural death are shown in table "A" and "B" respectively.

AGE/SEX CLASSIFICATION OF RHINOS AGAINST POACHING - TABLE A

Year	Adult			Sub-adult			Calf			? Sex & age	Total
	M	F	?	M	F	?	M	F	?		
1980	3	1	5	-	-	-	-	-	-	2	11
1981	2	-	10	-	-	6	-	-	1	5	24
1982	7	4	3	3	2	3	-	1	1	2	26
1983	5	5	7	6	5	4	-	-	5	-	37
1984	13	8	2	-	-	5	-	1	1	-	30
1985	22	10	4	1	5	-	-	1	1	-	44
1986	17	11	5	3	5	1	2	1	-	-	45
1987	8	11	2	-	-	-	1	-	1	-	23
1988	6	10	5	-	2	-	-	-	1	-	24
1989	18	20	1	1	1	1	-	1	1	-	44
1990	13	11	-	3	5	1	-	1	1	-	35
1991	8	8	2	-	3	1	-	1	-	-	23
1992	19	17	3	4	3	1	-	1	-	1	48
1993	16	16	3	-	-	1	1	2	-	1	40
1994	3	8	1	-	-	1	1	-	-	-	14
1995	15	7	4	1	-	-	-	-	-	-	27
1996	12	10	2	-	-	1	1	-	-	-	26
1997	6	4	2	-	-	-	-	-	-	-	12
1998	3	2	2	-	-	-	-	-	1	-	8

AGE/SEX CLASSIFICATION OF RHINOS AGAINST NATURAL DEATH - TABLE B

Year	Adult			Sub-adult			Calf			? Sex & age	Total
	M	F	?	M	F	?	M	F	?		
1980	24	14	2	-	-	-	5	5	8	-	58
1981	10	8	2	-	-	-	6	3	7	3	39
1982	-	-	30	-	-	-	1	1	14	3	48
1983	13	8	6	-	-	1	6	3	3	6	46
1984	19	13	1	1	-	-	5	7	2	2	50
1985	11	5	7	-	-	-	4	2	7	1	37
1986	13	8	-	-	-	-	6	3	5	3	38
1987	14	11	-	-	-	-	8	1	3	4	41
1988	28	24	7	1	2	-	16	16	9	2	105
1989	18	14	2	1	1	-	8	8	2	1	55
1990	19	10	3	1	-	-	7	6	2	9	57
1991	28	20	3	1	1	-	11	10	5	-	79
1992	21	12	8	2	2	-	7	5	8	1	66
1993	14	16	3	-	1	1	5	8	9	1	58
1994	6	10	3	1	-	1	5	8	3	-	37
1995	16	14	2	-	2	-	-	6	6	5	53
1996	20	14	1	1	1	-	5	2	8	-	52
1997	15	16	2	-	-	-	8	5	2	-	48
1998	28	19	3	2	4	1	7	13	10	-	87

INFRASTRUCTURE AVAILABLE FOR ANTI- POACHING ACTIVITIES

The total area of the Park has been divided into four segments and each segment is under direct control of a Forest Ranger. There are number of camps in each segment in vulnerable places (mostly near *beels*) and the total number of such camps at present is 135 (this number is not fixed). In each camp at least 3(three) number of staff are posted, including daily wage workers. The total strength of staff of different categories under different schemes engaged for anti-poaching works as on March 1998 are as follows:

The Home Guards engaged for the protection of the Park had to be discharged for acute scarcity of funds during 1997. The total number of daily wage workers deployed for the protection of the Park is 165.

S1. No.	Category of post	Sanctioned Strength	Man in position	Actual Requirement
1.	D. C. F.	1	1	1
2.	F.V.O.	1	1	1
3.	W. L. R. O.	1	1	1
4.	A. C. F.	2	2	2
5.	Forest Ranger	7	7	10
6.	Dy. Ranger	9	3	12
7.	Forester - 1	43	36	60
8.	Forester - 11	19	3	20
9.	Head Gamewatcher	5	4	6
10.	Forest Guard	204	180	300
11.	Game Watcher	56	42	100
12.	Boat Man	57	57	100
13.	Driver	16	11	20
14.	M.L. Driver	5	3	6
15.	Mahut	34	27	45
16.	Grass Cutter	34	32	45
17.	Chowkider/Gateman	11	7	11
18.	Office Peon/Duk Runner	7	5	7
19.	Mali	3	2	5
20.	Khansarna	2	1	3
21.	Electrician	1	1	1
22.	Radio Technician	1	1	1
23.	Sweeper	3	1	9
24.	Head Asstt.	1	1	1
25.	U.D. Asstt.	3	3	5
26.	L.D.A./R.A.	7	7	10
27.	Statistical Asstt.	1	1	1
28.	Record Keeper	1	1	1
29.	Paniwalla	1	1	5
30.	Head Mahut	1	1	1
31.	R.C.I.A.	1	1	1
32.	Vety. Asstt.	1	1	4
33.	Handyman	1	1	4
34.	Accountant	1	1	1
	TOTAL	541	445	800

WIRELESS

The position of wireless network and sets available with different Ranges and Headquarters are as follows.

Nature of Sets	Stock in hand at the end of Dec/98			Remarks
	Serviceable	Un-serviceable	Total	
i) J.B.S. Fixed station	9	-	9	
ii) LTS Mobile station	9	-	9	
iii) SXA Portophone	87	18	105	
iv) SBS Repeater	2	-	2	Remain unused
v) VHF Transreceiver	8	-	8	

ARMS AND AMMUNITION

The position of arms and ammunition provided to the staff for anti-poaching activities are as follows.

Nature of Arms	Stock in hand at the end of Dec/98				Remarks
	Serviceable	Un-serviceable	Seized	Total	
i) .315 Rifles	289	14	3	306	
ii) American make Rifle	10	-	-	10	Remained unused due to non availability of standard bullet.
iii) .423 Rifle	-	1	-	1	
iv) .470 DBBL Rifle	1	-	-	1	
v) DBBL Gun	18	8	1	27	
vi) SBBL Gun	32	1	-	33	
vii) Revolver	5	-	-	5	

Ammunition:	Present stock (1.1.99)
i) Bullets of .315 Rifle	8050 Nos.(Divn. H.Q.)
ii) Cartridges of .12 bore gun	1570 (-do-)

INTELLIGENCE NETWORK

There is no particular intelligence network available with the Park authorities. However, a few local people are being engaged for collection of information regarding movement of poachers, illegal trade on wildlife articles, etc. On the basis of information furnished by the informers, good results had been achieved during raids outside the Park. Poachers were also killed during encounters inside the Park, arms and ammunition recovered. On successful raids and encounters, the informers were rewarded.

The information so provided by the informers if found productive after raids and encounters, the informers were

Year	Expenditure
1990-91	Rs. 4,000.00
1991-92	Rs. 7,250.00
1992-93	Rs. 24,617.00
1993-94	Rs. 65,965.00
1994-95	Rs. 37,100.00
1995-96	Rs. 3,000.00
1996-97	-
1997-98	Rs. 75,000.00 (N.G.O)

paid cash as incentive. The expenditures incurred for payment of incentives from 1990-91 to 1997-98 are shown above.

On the basis of such information, the raids were conducted outside the Park and positive results obtained. The result of the same positive raids and encounters are mentioned below:

RAID AND ENCOUNTERS

- 02/02/91 - A rhino was shot by poachers in Dafiong area. Immediately encountered by the patrolling staff. Horn recovered.
- 17/02/91 - A rhino was shot by poachers at Bherbheri area. In the encounter, horn could be recovered and the poachers fled away.
- 05/03/91 - At Borakata, encounter took place with poachers who had shot a rhino. The horn was recovered.
- 10/04/91 - Near Bandarkhal, encounter took place with poachers, who had fled away leaving the rhino horn. Subsequently raid was conducted and 4(four) persons were arrested.
- 23/04/91 - Poachers shot at rhino at Sahabduba and encounter took place. Consequently 2(two) of the Naga poachers got killed whose bodies were recovered on 24 and 25 April 1991.
- 24/04/91 - Two poachers were apprehended in raids conducted at Da-gaon.
- 03/05/91 - An encounter took place with poachers. Consequently a rhino poacher was killed. One rifle and ammunition were recovered.
- 20/05/91 - Raid was conducted at Bohikhowa Village and apprehended poachers.
- 31/5.91 - Encounter took place at Haldibarl with poacher. No casualties reported.
- 17/08/91 - Two rounds of gun shot were heard in Maloni area. The patrolling staff immediately encountered. No rhino could be killed by poachers and fled away.
- 28/08/91 - While patrolling encounter with armed poachers at Kanchanjuri took place. Consequently one poacher succumbed to injuries and another fled away with heavy injury. One DBBL .470 Rifle and one DBBL Gun with ammunitions were recovered. No casualty to staff and rhinos.
- 28/10/91 - Patrolling staff encountered miscreants and apprehended 3(three) persons and others fled away under Naste Camp. Apprehended persons handed over to the Police. A rhino carcass without horn was detected subsequently.
- 14/01/92 - In encounter two poachers were killed by staff of Difaloomukh Beat near Sesonimukh under Western Range. Ammunition recovered.
- 26/06/92 - One poacher Zhakugha Zhemo(Naga) was killed near Tiohtoli Beel under Kaziranga Range by the Range Head Quarter Staff.
- 20/07/92 - Shri Bakul Konwar, Ex-Home Guard, who was entangled with a poaching case was apprehended at his home at Amguri, Sibsagar and on way to Kaziranga to show the place of occurrence of rhino poaching, tried to flee by snatching a Rifle and fired at the Forest Staff. The staff also responded and Konwar was injured in the counter fire and subsequently succumbed.
- 20/08/92 - Two poachers were killed by the staff of Gerakati and Murphulani Camp under Western Range near Gerakati Kathoni. Arms and ammunitions were recovered.
- 26/08/92 - Encounter took place in between the staff of Baghmari Camp under Western Range at the West of Rowmari Nalah. No casualty to staff or rhino occurred. One poacher sustained bullet injuries and hospitalized. Police investigation is going on.
- 14/09/92 - Encounter took place with armed poachers by the staff of Murkhowa Camp under Western Range. One rhino horn could be recovered.
- 01/10/92 - The Staff of Range Head Quarter, Agoratoli apprehended three rhino poachers at Mohkhuti Beel near Kailash Dubi. The accused were handed over to the Police of Bokakhat.
- 23/02/93 - A raid was conducted at Barbheta Gaon near Bokakhat and 2(two) persons, one of them Naga, were arrested with recovery of .303 rifle and 14 rounds of live bullets.
- 26/03/93 - An encounter with patrolling staff took place at Tinibeel Tinali under Eastern Range and 1 (one) notorious poacher was killed. In the raid operation 3(three) persons were arrested with recovery of 25 rounds of live bullets of .303 rifle and Rs. 13,000/- in cash.
- 08/05/93 - An encounter with patrolling staff took place at west of Gotonga under Burapahar Beat and recovered .303 rifle with bullets 1 No. .303 rifle E/S 1 No. and Carbine E/I 1 No.
- 30/05/93 - A raid was conducted at Bokakhat, 3 (three) persons were arrested.
- 22/06/93 - A raid was conducted at Bengenakhua, Golaghat 3(three) persons were arrested with recovery of 1 (one) SBBL Gun with live 2 rounds of cartridges, hand made cartridges 3 Nos. & empty Cartridges 2 Nos. and .303 bullets 7 Nos. and .315 bullet 1 No.

- 31/08/93 - An Encounter with patrolling staff took place at Burapahar Malani area and 2(two) persons were killed and 1 (one) .470 DBBL Gun with 1 bullet and a .500 bore bullet were recovered.
- 03/10/93 - A raid was conducted at Geleki Karbi Gaon under Kaziranga Range and 3 persons were arrested with recovery of 1 .303 rifle, 2 Khaja Guns. and 11 .303 bullets.
- 22/10/93 - A raid was conducted at Kaziranga and 2 persons were arrested with recovery of 1 .303 rifle, 1 silencer and 6 live cartridge.
- 27/10/93 - A raid was conducted at Teliabari Gaon under Eastern Range and recovered 1 hand-made pistol.
- 28/12/93 - Encounter took place between joint patrolling party of Debeswari, Erasuti and Ahotguri camps with poachers in Hatichora Kheroni Tapu and two poachers were killed.
- 20/05/94 - A raid was conducted at Bohikhowa village by Forest and Police Deptt. and one person was arrested.
- 06/06/94 - A raid was conducted at Solung under Nagaon District and three persons were arrested.
- 26/07/94 - A raid was conducted at Bokakhat and one poacher was arrested.
- 30/07/94 - A raid was conducted at Bohikhowa Miching village and one person was arrested.
- 03/09/94 - The Forest Staff with the co-operation of local people of Balijan Amtenga village apprehended one notorious poacher and subsequently the police arrested six more poachers on the basis of clues provided by the arrested person.
- 03/10/94 - A raid was carried out in the house of one Sri Putu Das, a rhino horn smuggler at Moral gaon, Biswanath Chariali by Forest and Police Deptt. The villagers attacked the raid party and the smuggler and his associates managed to flee after grievously injuring an informer.
- 16/10/94 - A raid operation was carried out in Nagaon town and six suspected poachers were arrested.
- 13/11/94 - Encounter took place between staff and poachers in Malani Hill area under western Range, consequent to which 4 poachers were found dead. 1 .3.15 rifle, 1 musket with 8 .303 (live) cartridges were recovered. A raid operation was conducted at Jakhlabandha with the help of police personnel and one poacher was arrested.
- 16/11/94 - A raid operation was carried out in Khotiakholi under Bokakhat P.S. and two persons with ammunition for .303 rifle were arrested.
- 17/11/94 - A raid operation was conducted by Forest and Police in Amguri village under Jakhlabandha P.S. and 4 poachers were arrested, 1 .303 rifle with 20 live bullets and 1 .315 rifle with 7 live bullets were also recovered.
- 21/11/94 - A raid operation was jointly organised by Forest and Police in Balijan Miching Gaon where two notorious poachers were arrested along with ammunition.
- 27/11/94 - In a raid operation conducted by Forest and Police Department at Kandhulimari village under Bokakhat P.S. One Sunil Garh of Naojan was arrested and 1 SLR with magazine and 20 live bullets were recovered.
- 07/12/94 - The patrolling staff apprehended 5 persons in between Joke Tapu and Debeswari inside the Park.
- 08/12/94 - The night patrolling party foiled an attempt for electrocution of rhino behind National Park High School at Kohora and recovered approximately 150 mtrs. Of electric wire hooked to 33,000 volt high tension transmission line.
- 28/12/94 - A raid was conducted by the Forest and Police officials in Difaloo Rubber plantation near Difaloo River and 4 pit poachers were apprehended along with pit-digging implements.
- 29/12/94 - Forest staff conducted raid in the house of one Rarn Bahadur Subba and arrested him for illegal possession of 2 country made guns.
- 30/03/95 - A raid operation was conducted by Forest and Police officials in Tarnulipathar Kamargaon and 1 DBBL Gun was recovered from the house of one Bhubeneswar Gogoi.
- 25/10/95 - An encounter took place between Forest Staff and poachers near Laudubi Camp and the poachers managed to flee, leaving behind 1 American Carbine with 22 rounds of ammunition, which were recovered subsequently.
- 03/02/96 - An encounter took place in 1 Harmoti area under Western Range at 5.25 A.M. consequently one poacher was killed. Six rounds of .303 bullets and 4(four) rounds of spent bullets were also recovered.
- 22/02/96 - An encounter took place between poachers and patrolling staff in Rifletika area under Kaziranga Range. One poacher killed and 2 bullets of .303 and 2 Rounds of carbine bullets recovered.
- 21/06/96 - An encounter took place between staff and poachers in Bidhoba Kathoni Nallah of Murphuloni camp under Western Range. One dead poacher was recovered with five rounds of ammunition.
- 26/06/96 - An encounter took place between staff and poachers in Solmora camp area under Kaziranga Range. 3(three) unidentified dead body were recovered with a rifle, one USA

carbine along with 5 rounds of rifle bullets and 9 rounds of carbine bullets.

- 09/11/96 - An encounter took place between patrolling staff and poachers in the evening of 9 November, 1996 at 5.35 P.M. at Arimora and Naste area, 2(two) bodies of poachers were recovered.
- 22/11/96 - An encounter took place between staff and poachers near Borbeel area under Kaziranga Range on 22 November/96 at 7.25 A.M. One dead poacher was recovered.
- 06/04/97 - An encounter took place with the poachers in Boralimora area of Eastern Range on the Northern Boundary of the Park. One body was recovered along with one Gun and one .315 Rifle (stolen from the Deptt.) with 10 rounds.
- 17/04/97 - An encounter took place in Baruntika area of Kaziranga Range with a pit poaching party. On searching the side of encounter and nearby areas, a body and a half dug pit were detected along with a spade and two baskets near the pit.
- 03/07/97 - A raid was conducted by A.C.F.(H.Q) and staff of Burapahar Range at Phuloguri and Amguri village and 2 persons were arrested.
- 04/07/97 - A raid operation was carried out by the Range Officer, Western Range and staff with the help of Dwar Baguri Police in Timung Gaon of Karbi Anglong District outside the Park area and arrested 7 (seven) poachers, 2 .303 rifles along with 2 (two) rhino horns were also recovered.
- 22/07/97 - An encounter took place between staff and poachers inside Karasing Kathoni under Kaziranga Range. On searching a dead unidentified poacher, 2 rubber tubes were recovered.
- 04/12/97 - An encounter took place in Gorolmari area under Western Range between the Staff of Donga camp and the poachers. The poachers managed to escape.
- 21/12/97 - An encounter took place in Laodubi area under Kaziranga, Range between patrolling staff and rhino poachers. On searching the area, 3

(three) bodies of unidentified poachers were recovered with a .303 Rifle with 17 bullets and 4 spent bullets.

- 07/02/98 - The Range officer, Kaziranga Range along with Range Head Quarter staff with the S.D.P.O. and S.D.00 of Dhansiri Sub Division, Sarupathar jointly conducted a raid operation at the house of Sri Manik Talukdar of Bongaon, Naojan village under Sarupathar Police Station. During search operation 5 (five) bullets (AK-47) from a bundle of cloth and a plastic bag with .303 rifle bullets numbering 429 kept hidden in a pit were recovered.
- 13/06/98 - An encounter between Forest staff of Daflong camp and a gang of intruders comprising of three persons, occurred at about 12.15 A.M. near Bogoriati. The following morning, i.e 13/06/98, the body of a person along with a boat was recovered by the police personnel of Duwar Baguri outpost from Bandardubi village located on the Southern boundary of Kaziranga National Park. Another body of a person, involved in the encounter on 13/06/98 was recovered on 16/06 98 on the East of Daflong beel.
- 18/06/98 - An encounter took place in Sarunalani beel under Kathpara camp of Western Range between the poachers and patrolling guards where one country boat and a fishing net with 2(two) torch lights have been recovered from the poachers.
- 14/09/98 - An encounter between Forest Staff and a poacher occurred on 14/09/98 at 1.55 A.M. at Maloni area near pipeline inside National Park. One body and 4 empty shells of .303 rifle and 1 (one) bullet of .303 rifle were recovered.
- 18/12/98 - An encounter took place near Difaloo river under Murphuloni camp between Forest staff and poachers where one .303 rifle and one live cartridge and two spent bullets were recovered.

DEATH OF RHINOS DUE TO FLOOD

Flood is an annual phenomenon for the Kaziranga National Park. Some of the animals of the Park migrate during the high floods to the hills through certain corridors but most of the animals remain inside the Park. Animals take shelter in the of high lands constructed inside the Park area. Even then, there is mortality of animals during the flood and year-wise and age-wise statement of rhino death due to flood from 1980 onwards is tabulated on the right:

Year	Adult	Sub-Adult	Calf	Total
1980	6	1	6	13
1981	2	-	1	3
1982	1	-	-	1
1983	-	-	-	-
1984	-	-	-	1
1985	-	-	1	1
1986	1	-	-	1
1987	1	-	2	3
1988	9	10	19	38
1989	1	-	-	1
1990	-	-	1	1
1991	3	-	3	6
1992	-	-	-	-
1993	1	-	3	3
1994	-	-	2	2
1995	3	-	2	5
1996	1	-	1	2
1997	-	-	1	1
1998	18	5	16	39

DEATH OF RHINOS DUE TO PREDATION

Predation by tiger/leopard of mostly the rhino calves is a common phenomenon in the Park. The number of deaths of rhino calves due to tiger/leopard predation from 1980 onwards is tabulated below:

Year	No	Year	No	Year	No	Year	No
1980	8	1985	13	1990	13	1995	13
1981	14	1986	14	1991	21	1996	11
1982	14	1987	9	1992	16	1997	9
1983	13	1988	19	1993	18	1998	10

CONSTRAINTS OF ANTI-POACHING

With no natural barriers to protect the perimeters, keeping a look out for intruders is a Herculean task for the staff of Kaziranga National Park. Possession and movement of illegal arms and ammunition in areas surrounding the Park need to be eliminated. The Army operation code name 'Rhino and Bajarang' in the State of Assam during 1991 and under unified command structure since 1997 resulted in restriction in movements of illegal arms and activities of all types of anti-social elements including poachers as reflected by reduced number of poaching cases.

The lack of deterrents to neutralize the activities of habitual offenders, harbor of poacher in nearby villages, advantages taken of the weakness and loopholes in the judicial process by persons engaged in poaching activities as well as their accomplices are the chronic disadvantages. Lack of information

on the planning process, execution, financing illegal traffic and trade in rhino horn to meet international demand continues to be a hurdle. The main constraints are:

- i) Lack of information and intelligence system.
- ii) Delayed finalisation of 6 (six) proposed additions.
- iii) Absence of Eco-development programmes.
- iv) Possession and movement of illegal arms and ammunition.
- v) Lack of trained staff in combat fighting.
- vi) Lack of appropriate system of awarding incentive to the staff and informers for commendable works for conservation of rhinos.

RESEARCH

To ensure proper and scientific management of the Park, more research on the available resources and proper planning is a must. The sound management of the Park depends upon a sound research background. It is very important for the authority to know the viability of rhino population with the existing habitat of the Park and, for this purpose, it is essential to take up systematic research work on habit, habitat and reproductive growth rate of rhinos in relation to other animals in the Park.

There is only one study on habit and habitat (Lahan and Sonowal, 1973) of Kaziranga National Park and the other study of habitat suitability made by Shri Parihar (Parihar et al, 1986) are only the research work available till now. There is no work done on the morphology of rhinos in Kaziranga National Park. Habitat suitability needs further study since there are number of herbivores available inside the Park and depend upon the same types of vegetation.

Research on grassland ecology is one of the most important ones and on which the viability of rhinos in Kaziranga National Park depends. Another study on succession of vegetation inside the Park can be taken up. Further study on invasion and control of exotic climbers which is posing a problem in maintenance of tall grasses inside the Park needs attention of researchers.

TOURISTS AND REVENUE

Tourism is mainly dealt by the Tourism Department of Government of Assam. However, for elephant ride and visit to the Park by vehicle, fees are being realized for the Forest Department. The entry fee and other charges which are being realized from the tourists have been furnished in the Annexure 'A.' However, a table showing the number of Indian and foreign tourists visited the Park and revenue collected thereof are shown below:

Year	Visitors			Revenue Collected
	Foreign	Indian	Total	
1984-85	24	46,244	46,268	Rs. 1,68,832.00
1985-86	204	50,632	50,836	Rs. 2,21,015.00
1986-87	403	61,207	61,610	Rs. 2,24,493.00
1987-88	614	65,273	65,887	Rs. 3,03,914.00
1988-89	841	52,160	53,001	Rs. 2,85,686.00
1989-90	454	50,021	50,475	Rs. 2,75,381.00
1990-91	463	22,704	23,167	Rs. 3,10,298.00
1991-92	526	26,827	27,553	Rs. 6,13,811.00
1992-93	659	27,943	28,602	Rs. 8,49,428.00

Year	Visitors			Revenue Collected
	Foreign	Indian	Total	
1993-94	892	55,560	56,452	Rs. 7,99,583.00
1994-95	1,392	53,243	54,635	Rs. 8,46,936.00
1995-96	3,191	24,897	28,088	Rs. 8,80,951.00
1996-97	1,677	16,715	18,382	Rs. 19,70,062.00
1997-98	2,408	17,117	19,523	Rs. 21,97,068.00

FUNDING

The expenditure for maintenance of the Park and anti-poaching works are being funded from Non-Plan and State Plan Budget to a limited extent. During the VIII Five Year Plan, the Government of India through a 100% assisted scheme named "Rhino Conservation" had provided the main stay and backbone for management and conservation of the National Park. The infrastructure including entertainment of staff, construction of buildings, high lands, roads and bridges etc. were taken up during the period. Land acquisition cost for expansion of the Park area was provided within the framework of the scheme. But the transfer of the scheme to the State Plan from the VIII Five year Plan without ensuring the State's capability of taking the extra burden resulted in drying of financial source and the development of the Park has come almost to a standstill on all fronts. The marginal increase in the State budget provision has been wiped off by the enhancement of salary and wage component of the staff resulting in no room for undertaking any development works except meeting the demands for maintenance.

No external funding has so far been made available for conservation and protection of rhinos in Kaziranga National Park. A project proposal was submitted for external funding under UNESCO and IUCN and an amount of \$ 50,000 has been sanctioned. Incentive to the staff, who work at par with the paramilitary forces could not be provided due to acute shortages of fund. The year-wise expenditure under Non-Plan, State Plan and Centrally Sponsored Schemes are furnished in the Annexure- 'II' & 'III'. However, a statement showing the total expenditure incurred combining all the schemes (State Plan, Non Plan and Centrally Sponsored Schemes) from 1986-87 to 1997-98 are tabulated above.

1986-87	Rs. 67,21,661.00	1992-93	Rs. 76,46,597.00
	Rs. 62,37,846.00		Rs. 83,64,135.00
	Rs. 1,29,59,507.00		Rs. 1,60,10,732.00
1987-88	Rs. 50,54,588.00	1993-94	Rs. 90,57,808.00
	Rs. 78,35,145.00		Rs. 91,87,909.00
	Rs. 1,28,89,733.00		Rs. 1,82,45,717.00
1988-89	Rs. 94,46,558.00	1994-95	Rs. 1,11,27,731.00
	Rs. 79,64,090.00		Rs. 97,61,075.00
	Rs. 1,74,10,648.00		Rs. 2,08,88,806.00
1989-90	Rs. 71,63,963.00	1995-96	Rs. 1,21,38,241.00
	Rs. 62,90,161.00		Rs. 93,14,375.00
	Rs. 1,34,54,124.00		Rs. 2,14,52,616.00
1990-91	Rs. 89,32,829.00	1996-97	Rs. 1,69,35,393.00
	Rs. 68,84,713.00		Rs. 1,42,67,230.00
	Rs. 1,57,17,542.00		Rs. 3,12,02,623.00
1991-92	Rs. 88,15,379.00	1997-98	Rs. 1,45,44,637.00
	Rs. 73,97,191.00		Rs. 1,36,30,073.00
	Rs. 1,62,12,570.00		Rs. 2,81,74,710.00
Line 1=State Plan: Line 2=Non Plan: Line 3=Centrally Sponsored Schemes			

A FEW SALIENT FEATURES OF ANTI POACHING SUPPORT SYSTEM ARTIFICIAL HIGHLANDS

Location	No. of High Land	Length in meters
Eastern Range	1	1,650
Western Range	2	1,000
Eastern Range	2	350
Eastern Range	9	200
Kaziranga and Eastern Range	22	100
Kaziranga and Western Range	29	30
Eastern Range	3	25
Total	68	9,295

After devastating flood of 1987-88 when casualty of maximum number animals took place, about 68 highlands were constructed inside the Park to provide shelter for the marooned animals during the floods, which is shown on the left.

Fourteen highlands were reconstructed and extended under "Flood Damage Restoration" scheme during 1997-98.

The Indian Army had contributed by constructing additional 10 artificial highlands in the 1st addition to Kaziranga National Park.

FLOATING CAMPS

There are 2 Floating Camps, viz. Hawk Float and Samrat in the Brahmaputra River to prevent intrusion of poachers from northern side of the National Park. Both these vessels are in deplorable condition and requires repairing urgently.

COUNTRY BOATS

To facilitate the anti-poaching activities as well as to supply rations and other logistic support to the staff at different camps situated in the interior part, the country boats are the only means of transport during the rainy seasons. There are 105 Nos. of country boats in the Park of which 35 are out of order. Every year, the boats require repair or replacement.

SPEED BOATS

There are four boats fitted with Outboat motors which are operational in the Park but very frequently require repairing. As such, better quality O.B.Ms are necessary for anti-poaching measures during the rainy days. Besides, three mechanized boats have also been procured to facilitate anti-poaching patrolling in Sixth Addition Area.

DEPARTMENTAL ELEPHANTS

There are at present 49 Departmental Elephants in the Park, out of which 29 are adult, 9 sub-adult and the rest (11) are calves. 8 elephants are generally engaged for tourists visits during the tourists season and the rest are meant for anti-poaching measures.

DEPARTMENTAL VEHICLES

The position of vehicles, at present are mentioned below:

No. of Vehicles	Serviceable	Unserviceable	Total
Truck	2	-	2
Pick Up Van	-	1	1
Jeep	3	5	8
Gypsy	3	1	4
Trax	-	1	1
Tractor	-	1	1
Van	-	2	1
Standard 20	-	1	2
Motor Cycle	2	4	6
Ambulance	1	-	1
Mini Truck	1	-	1
Mini Bulldozer	1	-	1
Car	1	-	-
Total	14	16	30

Eight unserviceable vehicles have been condemned and four of these were disposed of as scrap material.

FACILITIES FOR THE WILD-LIFE STAFF

It has been indicated in the earlier paragraphs that the job of the staff engaged for anti-poaching works inside and outside the Park are most arduous in nature and extremely risky yet they are not granted any due reciprocate consideration. It has also been indicated earlier that the job of the staff of the Park should be considered at par with Paramilitary Forces and they should be provided with all facilities which are being provided to the

Paramilitary Forces, such as special allowance, compulsory one month's leave, free ration and full uniform etc. At present, the low paid Forest Guards and Foresters are maintaining double establishments and are away from their families for months at a time. The morale of the staff can only be boosted by providing facilities which are actually due to them.

PEOPLE'S AWARENESS

The intensity of man-animal conflict is on the rise commensurate with increase of rhino as well as human population within a well defined and confined area. This is more so since the villagers are already under stress of various socio-economic pressures.

It is no doubt a fact that the general public are quite aware about the need for conservation and protection of animals, particularly the rhinos of the Park but active and constructive awareness is confined only to limited number of person. The large scale depredation and damages of crops and proper-ties for which poor villagers are not getting adequate compensation coupled with socio-economic condition of the villagers have created a barrier of understanding between the Park authorities and the villagers. The villagers, who co-operated with ready information regarding poachers earlier are slowly distancing themselves from the same being afraid of retaliation by the poachers and consequently there is decline in interactions between Park staff and the villagers. To narrow down this gap, massive eco-development programmes in the villages surrounding the Park is the call of the day.

ANNEXURE I - MAMMALS COMMONLY FOUND IN KAZIRANGA NATIONAL PARK

No.	English Name	Scientific Name	Local Name (Assamese)
1	Great Indian One-horned Rhinoceros	<i>Rhinoceros unicornis</i>	Gorh
2	Wild Buffalo	<i>Bubalus bubalis</i>	Bonoria Moh
3	Indian Elephant	<i>Elephas maximus</i>	Hati
4	Royal Bengal Tiger	<i>Panthera tigris</i>	Dhekiapatia Bagh
5	Indian Wild Boar	<i>Sus scrofa</i>	Bonoria Gahori
6	Indian Gaur	<i>Bos gaurus</i>	Gaur
7	Swamp Deer	<i>Cervus duvauceli</i>	DolHorina
8	Sambar	<i>Cervus unicolor</i>	HorPahu
9	Barking Deer	<i>Muntiacus muntjak</i>	HugoriPahu
10	Hoolock or White Browed Gibbon	<i>Hylobates hoolock</i>	HalouBandar
11	Hog Deer	<i>Axis porcinus</i>	Khotia Pahu
12	Capped Langur or Leaf Monkey	<i>Presbytis pileatus</i>	Tupipindha Hanuman Bandar
13	Rhesus Macaque	<i>Macaca mulatta</i>	Molua Bandar
14	Assamese Macaque	<i>Macaca assamensis</i>	Jati Bandar
15	Leopard	<i>Panthera pardus</i>	NabarphutukiBagh
16	Sloth Bear	<i>Melursus ursinus</i>	Mati Bhaluk
17	Indian Porcupine	<i>Hystrix indica</i>	Ketela Pahu
18	Fishing Cat	<i>Felis viverrina</i>	Masuoï Mekuri
19	Jungle Cat	<i>Felis chaus</i>	Ban Mekuri
20	Large Indian Civet	<i>Viverra zibetha</i>	Joharnal
21	Small Indian Civet	<i>Viverricula indica</i>	HaruJohamal
22	Common Mongoose	<i>Herpestes edwardsi</i>	Neul
23	Small Indian Mongoose	<i>Herpestes auropunctatus</i>	Haru Neul
24	Indian Fox	<i>Vulpes bengalensis</i>	Ram Hial
25	Jackal	<i>Canis aureus</i>	Hial
26	Common Otter	<i>Lutra lutra</i>	Ud
27	Chinese Ferret Badger	<i>Melogale moschata</i>	-
28	Hog Badger	<i>Arctonyx collaris</i>	-
29	Eastern Mole	<i>Talpa micrura</i>	Utonua
30	Pangolin	<i>Manis crassicaudata</i>	Bon Row
31	Gangetic Dolphin	<i>Platanista gangetica</i>	Hihu
32	Squirrel	<i>Dremnomys lokriah</i>	Kerketua
33	Himalayan Bear	<i>Selenarctos thibetanus</i>	Kolabhaluk
34	Bat	Various Spp	Baduli

ANNEXURE II - PARK ENTRY FEES

Elephant Charges	Indian	Foreigner
	Adult- Rs. 100/-	Rs. 525/-
	Child- @50% of adult	
View Fees	Indian	Foreigner
	Rs. 10/-	Rs. 175/-

***Duration of the ride is approximately one hour.

Vehicle charges inside the Park	Indian	Foreigner
Jeep/ Car	Rs. 150/-	Rs. 150/-
Camera Charges	Indian	Foreigner
Still without tele-lens	Rs. 10/-	Rs. 175/-
Still with tele-lens	Rs. 50/-	Rs. 210/-
Movie(8mm)	Rs. 100/-	Rs. 280/-
Movie(16mm)	Rs. 200/-	Rs. 350/-
Video Camera	Rs. 500/-	Rs. 525/-
For professional photographers:	Indian	Foreigner
Still camera	Rs. 150/-	Rs. 350/-
Movie(8&16mm)	Rs.750/-	Rs 3500/-
Movie(35mm)	Rs. 1500/-	Rs.7000/-
Video Camera(35mm)	Rs. 1500/-	Rs.7000/-

*** *Special concession for all types of visitors who make visits continuously for 3 or more days, 25% rebate on all items.*

ANNEXURE III - STATEMENT SHOWING EXPENDITURE INCURRED UNDER PLAN SCHEME FROM 1986-87 TO 1997-98 UNDER EASTERN ASSAM WILDLIFE DIVISION

Year	Salary/TA (Rs.)	Wages (Rs.)	Works (Rs.)	Total (Rs.)
1986-87	5,37,822	5,47,000	51,53,024	62,37,946
1987-88	7,41,586	5,50,000	37,63,002	50,54,588
1988-89	7,43,376	7,59,000	79,44,182	94,46,558
1989-90	15,28,323	7,59,240	48,75,700	71,63,963
1990-91	17,79,751	7,16,072	64,37,006	89,32,829
1991-92	42,05,002	7,19,164	38,91,213	88,15,379
1992-93	47,36,756	7,58,510	21,59,331	76,46,597
1993-94	45,70,683	10,56,831	34,30,224	90,57,808
1994-95	68,68,509	11,04,094	31,55,128	111,27,731
1995-96	83,37,107	13,35,311	24,65,823	121,38,241
1996-97	80,05,421	14,81,100	74,48,872	169,35,393
1997-98	99,10,987	7,29,799	39,03,851	145,44,637

ANNEXURE IV - STATEMENT SHOWING EXPENDITURE INCURRED UNDER NON-PLAN SCHEME FROM 1986-87 TO 1997-98 UNDER EASTERN ASSAM WILDLIFE DIVISION

Year	Salary/TA (Rs.)	Wages (Rs.)	Works (Rs.)	Total (Rs.)
1986-87	48,84,324	6,30,123	12,07,214	67,21,661
1987-88	45,97,036	7,06,276	15,31,833	78,35,145
1988-89	49,75,097	7,56,242	22,32,751	79,64,090
1989-90	48,19,216	-	14,70,245	62,90,161
1990-91	49,19,900	-	19,64,813	68,84,713
1991-92	59,76,168	-	14,21,023	73,97,191
1992-93	61,97,611	4,07,945	17,58,579	83,64,135
1993-94	61,97,715	2,00,514	19,89,680	91,87,909
1994-95	80,51,861	1,29,591	15,79,623	97,61,075
1995-96	80,60,268	8,55,615	5,45,758	93,14,375
1996-97	117,50,118	13,13,248	12,03,864	142,67,230
1997-98	1,11,53,957	14,64,337	10,11,779	136,30,073



ANNUAL ACTION CALENDAR FOR MANAGEMENT OF KAZIRANGA NATIONAL PARK

B.S. BONAL, DIRECTOR, KAZIRANGA NATIONAL PARK, BAKAKHAT - 758612, ASSAM

FOREWORD

A Management Plan is a pre-requisite for identifying management needs, setting priorities and organizing the approach to the future for a protected area. A Management Plan provides direction for management of a protected area for a specified period of time. Though in India, the Forest Working Plan has a history of about 125 years, the first wildlife management plan was formulated in the year 1970.

A strict code of practice of preparing and implementing management had not been set up in Indian wildlife management. Consequently like most other protected areas in India, the routine affairs of the Kaziranga National Park are being managed on the basis of Management Action Plan written by Sri P. Lahan, IFS. As the preparation of the management plan for Kaziranga National Park- a time consuming process- has been taken up very recently, an annual action calendar of operations has been developed for implementation in the protected area as an interim arrangement.

A large number of practical aspects of wildlife management planning adopted in the Annual Action Calendar of operations have emerged from the tenets of wildlife conservation methods practiced in Kaziranga since the beginning of this century.

The goals and objectives of the Annual Action Calendar of operations from the framework for determining what actions to take, when they will be taken and personnel required to implement them. The Annual Plan of operation is subject to modifications as new information is obtained and feedback of the actions taken in the Annual Plan of operation shall be incorporated with appropriate weight in the Management Plan under preparation.

I also acknowledge the assistance rendered by Sri A. Dey, ACF for preparation of the 'Annual Action Calendar of Operations' as well that of Ms. Gitanjali Kalita, LDA & Sri M.K. Bordoloi for computerizing the same.

By Sri B.S. Bonal, IFS Director
Kaziranga National Park

MANAGEMENT PRACTICE OF KAZIRANGA NATIONAL PARK THE ACTION CALENDAR & ITS OVERVIEW

BASIC INFORMATION

The name "Kaziranga National Park", bounded by the mighty Brahmaputra on the North and verdant hills of Karbi Anglong on the South, conjures up visions of animals, birds, flowers and vast rolling expanses of wild grasslands. Kaziranga is unique among Indian Wildlife habitats in that no visitors fails to see its most important residents, Rhino and Wild Buffalo, even if he makes but a single trip into it. Besides he will come across many other animals and avifauna too.

The Park is of rough oval shape, approximately 50 km (31 miles) long and 16 km (10 miles) wide at his broadest point, and of 430 sq. km (166 sq. miles) area. It lies on the south bank of the Brahmaputra, and its south side boundary follows for the most part the Mori Difaloo River which is close and parallel to National Highway No.37, the main arterial highway in Assam. Two other rivers, Difaloo and Bhengrai, flow through it, and a number of small streams originating in the Karbi Anglong Hills drain into these rivers or the *beels*. The whole area is one of vast swamps interspersed with great expanses of high, coarse grasses, often collectively called 'elephant grass' 5 m. (16 ft.) or more high, open forest, waterways, *beels* and reed beds. A feature of many of the *beels* is the excessive growth of the water-hyacinth, a plant exotic to the Park but introduced into it for some unknown reason. South of the highway are the Karbi Anglong Hills rising to 1,220 m. (4,000 ft.) which have a special significance to the park, as the wildlife seek refuge on the hills when virtually the whole park becomes inundated by the flood waters of the Brahmaputra and the other rivers during the monsoon. Much wildlife is lost at this time.

Some of the outstanding universal conservation value of Kaziranga National Park are enumerated below:

- a) The world's largest population of Indian One-horned Rhinoceros (65% of total world population).
- b) The world's largest population of Wild Buffalo (50% of total world population) and Eastern Swamp Deer (65% of world population).
- c) The largest non-disturbed and representative area of Brahmaputra Valley flood plain grassland and forest with associated large herbivore, waterfowl and wetland values (including turtle, dolphins).
- d) Significant population of Tigers and Elephants.
- e) Transitional and successional examples of grassland to forest and flood plain to hill evergreen forest communities.
- f) Considerable research, education and recreation value.

CONSTRAINTS OF MANAGEMENT

FLOOD

Floods are always considered to be a dreaded period for Kaziranga National Park and its animal life but since last decade the increasing level of multi-wave flood is really threatening the future of the Park and not only the rhino. Due to various reasons, mainly deforestation in the upper catchment area of the Brahmaputra, the intensity of the flood is continuously on the rise. During flood most of the animals including the rhinos have to migrate from the Park and take shelter on the adjacent high grounds in Karbi Anglong Hills or wherever they may find shelter. These areas are populated and protection of the animals during the period of migration from and back to the Park becomes an uphill task as enforcement network is almost non-existent in such areas. Many animals, especially the deer and

particularly the young, old and infirm lose their lives by drowning, poaching or are run over by vehicular traffic on the National Highway.

Flood is also necessary and beneficial for maintaining the ecology of the grasslands and forests though it has some adverse effect. The gradual rising of the water level and quick recession is undoubtedly beneficial but floods of severe intensity which submerge the entire Park for a prolonged period, deprive the animals of food and shelter.

EROSION

The Brahmaputra River along the northern boundary is well known for bank erosion as also huge accretion that is caused by depositing of silt during annual floods. These accretions gradually get established in the form of large and small islands and are colonised by grass thus forming ideal rhino habitat. But the land in the National Park is also eroded by floods and has already been reduced considerably, specially during the last three decades. The present area of the Park, taking into account the erosion as well as accretion, during a period of thirty years, as computed from analysis of remote sensing data is 408 Sq. Km. On the other hand the population of all the mega-herbivores have increased manifold during the same period. Therefore, to attain the goal of progressive increase in the population of rhino as well as other species, it is essential that additional area are included in the Park by way of finalisation of the proposal for Six Addition areas to Kaziranga National Park which are pending for a protracted period due to legal, administrative and financial reasons.

POACHING

Poaching of rhinos has been the major threat to the Kaziranga National Park and will continue to do so as the superstitious belief regarding the aphrodisiac and medicinal value attributed to the rhino horn persists. It has been observed and experienced that the intensity of poaching increased mainly due to escalation in high value of the horn consequent to imposing ban on its trade. The last sale of rhino horns in Assam took place during 1978 and though tenders were invited during 1980 but sale was stopped. That marked the beginning of greater intensity of poaching in Kaziranga National Park as well as other rhino inhabited areas. However, in recent past the onslaught of poachers in Kaziranga had been contained to considerable extent.

CROP RAIDING

The animal depredation on crop and property and occasional cattle lifting by large predators cause considerable hardship to the poor people who reside on the fringe of the National Park. These people depend on their crop for a living and most work their land with plough animals. When their crops are destroyed by animals or their plough animals killed by predators, their economy is shattered. Antagonism towards wildlife is a natural reaction. No amount of preaching and education on conservation can retrieve the situation. Thus, it is essential for the Department to provide some material help to these people through compensation for crop losses and loss of livestock because of animal predation.

FISCAL DEFICIT

Though the current infrastructure of Kaziranga National Park to counter the menace of poaching is inadequate the field personnel have exhibited remarkable resilience to minimize poaching incidents. The budgetary allocations for maintenance and creation of infrastructure for anti-poaching is inadequate to fulfil even the minimum requirements. Consequently, it might result in profoundly detrimental impact on the management of Kaziranga National Park in the long run.

ACTION CALENDER

NEED FOR ACTION CALENDER

The management of Kaziranga National Park is conservation oriented and has two main components viz. anti-poaching surveillance to counter the threat from poachers and to maintain the ecological status of grasslands, to provide an optimum habitat for rhinoceros. Conservation of resources can only be achieved by competent management of those resources, the habitat component that sustains the resources and of biotic pressures that affect the resources. A good Management Plan is, therefore, pre-requisite for good management. Since the preparation of a Management Plan for Kaziranga National Park is under process, an Action Calender for management of the Park has been prescribed as an interim measure. The Action Calender, presents strategies and operational schedules for achievements of objectives of Management within a time bound frame work of one year. The importance of various operational schedules are summarized below.

Action Calender showing action to be initiated, continued and to be completed during the specified period as indicated in calender as Annexure.

I) ANTI POACHING INFRASTRUCTURE

a) CREATION & REPAIRING OF ROADS AND BRIDGES

The extent of damage of the roads and bridges in Kaziranga depends on the intensity of floods. Speed and mobility being the paramount factors in combating the threats of poaching the restoration of roads and bridges must be accorded top priority immediately after the receding of water.

b) CLEARING OF PATROLLING PATH

With the onset of the monsoon the grasses grow luxuriantly and obliterate the patrolling path. The patrolling paths constitute the life line of anti-poaching and therefore it is imperative that the patrolling paths are cleared of vegetation before the onset of, and immediately after, the monsoon to facilitate anti-poaching surveillance.

c) REPAIRING OF CAMPS

The camps are located inside and on the fringe of the National Park in strategic areas to pre-empt entry of poachers and to prevent poaching and enable the staff to react immediately in case of any unwarranted eventuality. The camps are the smallest administrative units for anti-poaching surveillance. As majority of the camps are semi-permanent structures, constructed of thatch, *ekora* and timber, these are often ravaged by the vagaries of weather specially during the monsoon. Therefore, it is essential to undertake repairing of the camps before the onset of monsoon to provide congenial work environment to the anti-poaching staff.

d) ELEPHANT HEALTH CAMPS

The fleet of elephants are an effective means for transportation of supplies to camps during monsoon and also render immense support in patrolling of areas, inaccessible by vehicles, boat and foot. The elephants, if overworked and under-nourished, are prone to a variety of disease. Periodic checks on the health of the elephant are essential for their proper upkeep.

e-f) SERVICING OF WIRELESS EQUIPMENTS AND RIFLES/GUNS

The VHF transceivers are a potent medium through which information is exchanged among staff on anti-poaching activities and rifles/ guns provide the staff with requisite fire-power to combat the poachers besides scaring away of wild animals encountered during patrolling. Therefore, it is essential in the interest of protection of the Park that the VHF trans-receivers and the rifles/ guns are inspected periodically by authorised technicians to obtain proper service from the equipment.

g) INFORMATION NETWORK

Receiving advance information on the activities and movement of poachers is extremely important to apprehend the criminals including in such nefarious activities. Therefore, a clandestine channel of information collection system should be maintained to assist the anti-poaching staff and a process of purchasing information by providing secret fund be Implemented.

II) PRE & POST FLOOD MEASURES**a) BOAT-LINE CLEARANCE**

During flood, communication between camps and Range Headquarters becomes very difficult. Some camps can be reached only by boats by long detour. During such time patrolling is done mainly by boats. Therefore, to facilitate patrolling by boat, the clearing of waterway clogged by vegetation should be done before the onset of monsoon.

b-c) CONSTRUCTION OF COUNTRY BOATS & REPAIRING OF COUNTRY BOAT/ SPEED BOAT/ OBM

With the passage of time, some of the country boats used by the patrolling staff are damaged beyond repair. Some country boats are also damaged by wild animals inside the Park. Inspection and replacement such damaged country boats is essential for smooth functioning of anti-poaching surveillance during monsoon. Irreparable Country Boats should be replaced immediately by new boats for the safety of the staff. Besides country boats/ speed boats/ OBM, that require minor repairing should be restored well ahead of monsoon so that these may be pressed into service effectively when required.

d) NATIONAL HIGHWAY PATROLLING

When the areas within the Park are inundated, animals during the course of crossing over to the hills of Karbi Anglong, are often run over or knocked down by speeding automobiles on the National Highway 37. This is particularly true in case of smaller animals like deer. The purpose of highway patrolling by the staff is to reduce such cases of animal mortality besides regulating the speed of the vehicles.

e) SHIFTING OF CAMPS FROM INSIDE TO OUTSIDE THE PARK AND VICE VERSA

A number of camps inside the Park are abandoned by the staff during high flood due to inundation. Such camps are usually relocated outside the Park in fringe areas or the foothills on the South and the service of the staff are utilised in highway patrolling or to keep track of the stray animals that take shelter in the high ground outside the Park.

f) REMOVAL OF WATER HYACINTH, MIMOSA AND MIKENIA

These plants together constitute a major factor in ecological degradation of the Park. Though water hyacinth is eaten by some herbivores during pinch period, their excessive growth in wetland inhibits the avifauna from visiting such areas. Mikenia, a straggling climber and Mimosa have also started invading the grassy areas in patches thus reducing the area ecologically suitable for wild animals. It is imperative that these plants be eradicated manually to restore the habitat as use of weedicides or any chemicals is undesirable in a natural ecosystem. The removal of water hyacinth may also be achieved by judicious manipulations of the current while the water recedes from the Park.

g) REPAIRING/CREATION OF HIGHLANDS

After the devastating flood of 1988, some artificial highlands were created inside the Park to enable the animals to take shelter during high flood. However, the recurrent floods have caused considerable deterioration of these highlands every year. Hence the repair of these highland should be done as a corrective measure every year. Besides, some new highlands should also be created to cope with the emergent situation during flood.

h) ASSESSMENT OF AREAS AFFECTED BY EROSION

Large chunks of areas along the northern boundaries of the Park are lost every year due to cut bank erosion. The extent of the area eroded away is usually determined by taking offsets from well defined reference points in locations vulnerable to erosion, prior to, and immediately after, the receding of water and subsequent comparison of the available data. The method also help in identifying the pattern of channel migration of the Brahmaputra over the years.

III) HABITAT MANIPULATION**a) GRASSLAND BURNING**

The annual burning of grassland is a well established management practice and apparently has very little adverse impact on the flora and fauna of Kaziranga National Park. Fire is the most important factor in arresting the natural progress of vegetational succession from grasslands to tree forests. The new shoots that come up after burning attract the herbivores and consequently there is greater frequency of sighting of animals in burnt patches. The burning also enhances visibility and facilitates anti-poaching surveillance, especially in detection of pits that might remain out of sight among tall grasses. Though, ideally, burning should be done between December and February, it usually extends till April due to climatic factors.

b) BUND CONSTRUCTION TO RETAIN WATER IN WETLANDS

This is done during November/December mainly with a view to attract the avifauna which are of great interest to the visitors to the Park.

c) DE-SILTATION

Brahmaputra is one of the largest sediment load carrying rivers in the world. The receding water of Brahmaputra leaves behind large quantities of silt and mud, which gradually silt up the wetland. This is a continuous process that reduces the depth and gradually reduces the area of wetland which, in turn, diminishes the ecological area available to aquatic fauna. As wetlands are an all important constituent of the eco-system of Kaziranga, de-siltation of wetlands would contribute immensely towards eco-restoration of the Park.

d) CUTTING AND UPROOTING OF SAPLINGS OF TREES

This is an important factor to preclude the invasion of grassland by tree species. It has special significance for the fire hardy tree species that regenerate profusely and colonise the grassland.

IV) AMENITIES TO STAFF**a-b) SUPPLY OF UNIFORM, JERSEY, RAINCOATS, FLASH LIGHT, KEROSENE, ETC. TO STAFF**

These articles constitute the basic necessity of the staff deployed in anti-poaching operation. The uniforms, besides inculcating a sense of unity and discipline amongst the staff, also prevent any unwarranted clashes due to mistaken identity which might be fatal as most of the personnel inside the Park are equipped with rifles/guns. Similarly, the raincoats and jersey provides comfort to staff in execution of duties during monsoon and winter, respectively. Flashlights are necessary for patrolling at night, as encounters with wild animals are very frequent. The batteries for the flashlights remain serviceable for a month, at the most, and must be replaced with regular supply of new batteries. The camp staff carries out regular camp activities e.g. cooking, writing of reports at night with the help of lamps lit by kerosine oil. Therefore, to ensure effective surveillance of the park, a regular supply of the articles is mandatory.

V) AWARENESS PROGRAMME**a) DEPLOYMENT OF CROP-PROTECTION SQUADS**

Crop raiding by elephant, buffaloes, rhinos and deer in the villages located on the periphery of the Park is a common problem. It is not always possible to deploy armed Forest Staff in such areas to scare away the wild animals due to prevalent shortage of personnel. Therefore, some local youths are engaged to scare away the animals from the crop fields by providing with firecrackers, kerosine, flashlights etc. and also to assist the staff from the nearest forest office in cases of severe depredation. The measure minimizes the extent of crop damage of local villagers and at the same time provides employment opportunities to local youths.

b-c) FREE MEDICAL/VETERINARY CARE CAMPS

These are organised by the Park authority in collaboration with NGOs and local Government Agencies for the benefit of the residents of villages located in the fringe area of the National Park. Such camps are mainly organised with the objective of attracting the good will of the local populace towards conservation efforts.

d-e) WILDLIFE WEEK CELEBRATION MEETING

Wildlife week is celebrated all over the State every year in the first week of October to generate mass-awareness on the need to conserve wildlife and their habitat. Public meeting and film shows are arranged from time to time in adjacent villages of the National Park to mobilize public opinion against poaching of rhinos and involve the locals in conservation of wildlife at grass root level.

VI) TOURISM**a,b,c) MAINTENANCE OF ELEPHANT GEARS, WATCH TOWERS, ETC**

The Park usually remains open to visitors from the month of October to April. Therefore, to provide the visitor with requisite facilities for Park visit, it is essential that repairing of elephant gears and watch towers are completed well ahead of the commencement of tourism activities in the Park.

VII) MISCELLANEOUS

a) ANIMAL CENSUS

The estimation of the number of a particular species provides an idea about the population dynamics of species and appropriate strategies may be formulated by the Park Manager for conservation of the species. This can be achieved only if the census for the animals are conducted periodically to monitor the emerging trends in their population over a prolonged period. The month of March is most suitable for such census Operation due to burning of grasslands which increases the visibility considerably.

b) SURVEY AND BOUNDARY DEMARCATION

This is an important aspect of management to initiate effective action against encroachment, unauthorised fishing and grazing inside the National Park that may arise from time to time and pose a serious problem if not tackled immediately. The matter also assumes significance in view of the fact that there are six proposed addition to Kaziranga National Park which are under process of annexation.

c) REVIEW OF ANTI-POACHING STRATEGIES

Monitoring and evaluation of anti-poaching strategies is an integral part of dynamic management to contain the menace of poaching. This enables the Park Managers to eliminate the deficiencies of strategies that fail to deliver the desired goals and put into practice, the strategies that might be more result oriented.

d) COLLECTION OF SKULLS, ANTLERS

It is mandatory for the staff to collect rhino horn and ivory from dead animals, within their respective camp jurisdiction and deposit these articles to the concerned Range Office. The skulls and antlers of other animals are collected for display for education the public on Wildlife and ancillary matters.

e) ANNUAL REPORT

The annual report documents the multifarious activities in the National Park and the consequent impact on management. It is an useful record for future reference and reflect the achievement and deficiencies of Management during the year.

CONCLUSION

With more than two-thirds of the world's surviving population of Great Indian One-horned Rhinoceros concentrated in one place, Kaziranga has a special and unique role to play for Conservation of the species. The conservation of rhinos and also other wildlife, can be achieved through successful implementation of various activities included in the Annual Calendar within the specified time frame and regular flow of funds is a pre-requisite to attain the goals. Unfortunately, the allocation of funds for the maintenance and creation of infrastructure to augment protection measures in the Park have not been commensurate with the requirements after transfer of the Central Sector Scheme, "Conservation of rhino in Assam" to State sector since 1992-93. This has ultimately resulted in an accrual of huge amounts as arrear, incurred by way of procurement of supplies and maintenance cost of assets on credit, for the protection of the Park. Thus, there is a regular cycle in which current year's funds are utilised to liquidate the arrears of previous year and the process continued with progressive accumulation of arrears over the years. It is, therefore, reiterated that the matter of providing sufficient finance for effective execution of various strategies prescribed in the Annual Calendar of operations be accorded top-priority to remedy the prevailing scenario in the interest of securing the protection and

survival of all the resident species in general and Rhinoceros in particular as well their habitat in Kaziranga National Park in perpetuity.

ACTION CALENDER FOR MANAGEMENT OF KAZIRANGA NATIONAL PARK

Sl.No.	Details of item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Remarks
I	ANTI-POACHING INFRASTRUCTURE													
	(a) Creation & Repairing of roads & bridges.	XXX	XX	XX	-	-	-	-	-	X	XX	XXX	XXX	
	(b) Clearing of patrolling path	-	-	-	X	XX	-	-	-	X	XX	XX	XXX	
	(c) Repairing of camps	X	X	XX	X	-	-	-	-	-	XX	XX	XXX	
	(d) Elephant Health Camp(Deptl.)	-	-	XX	-	-	XX	-	-	XX	-	-	XX	
	(e) Repairing & Check up of Wire-less Set	-	-	XX	-	-	-	-	-	XX	-	-	-	
	(f) Servicing of Arms	-	-	XX	-	-	-	-	-	XX	-	-	-	
	(g) Information Net Work	X	X	X	X	X	X	X	X	X	X	X	X	
II	PRE & POST FLOOD MEASURES													
	(a) Boat-line clearance	-	X	XX	XX	X	-	-	-	-	-	-	-	
	(b) Country Boat repairing/ construction	-	X	XX	XX	-	-	-	-	-	-	-	-	
	(c) Speed boat/OBM repairing	-	-	X	XX	XX	X	-	-	-	-	-	-	
	(d) National Highway patrolling	-	-	-	-	-	XX	XX	XX	-	-	-	-	
	(e) Shifting of temporary Camps from & into the Park	-	-	-	-	X	XX	XX	-	-	XX	XX	-	
	(f) Clearance of (i)Water hyacinth (ii)Mikenia & Mimosa	-	-	-	-	-	-	XX	XX	X	XX	X	-	When the flood recedes from the flow of water hyacinth be canalized to ensure its removal
	(g) Highland construction/rep.	X	XX	XX	-	-	-	-	-	-	-	-	X	
	(h) Monitoring of erosion	XXX	-	-	-	-	-	-	-	-	-	-	X	
III	HABITAT MANIPULATION													
	(a) Grassland burning	XX	XX	XX	XX	-	-	-	-	-	-	-	X	Thatched must be burnt before February to avoid damage to nesting of Bengal Florican
	(b) Bund construction to retain water	-	-	-	-	-	-	-	-	-	-	-	X	
	(c) De-siltation	XX	XXX	XX	-	-	-	-	-	-	-	-	X	
	(d) Cutting and uprooting of saplings & tree species	-	-	XX	XX	-	-	-	-	-	-	-	-	
IV	AMENITIES TO STAFF													
	(a) Supply of logistic support (torch, battery & kerosine)	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	
	(b) Supply of uniform-													

	(i) Jersey	-	-	-	-	-	-	-	-	X	XX	-	-
	(ii) Raincoat	-	-	X	XX	-	-	-	-	-	-	-	-
	(iii) Others	-	-	XX	XX	-	-	-	-	-	-	-	-
V	AWARENESS PROGRAMME												
	(a) Deployment of crop protection Squad	-	-	-	-	-	-	-	X	XX	XX	XXX	XXX
	(b) Free Health Camps	X	-	-	-	X	-	-	-	-	-	-	-
	(c) Veterinary Care Camps(Eco-Dev.)	-	-	-	-	-	-	XX	-	-	XX	-	-
	(d) Wildlife Week celebration	-	-	-	-	-	-	-	-	-	XX	-	-
	(e) Public Awareness Meeting/ Film Show	-	-	-	-	XX	-	-	-	-	XX	-	XX
VI	TOURISM												
	(a) Maintenance of elephant gear (Gaddi & Gedda)	-	-	-	-	-	-	-	X	XX	XXX	-	-
	(b) Maintenance of elephant riding tower/watch tower	-	-	-	-	-	-	-	X	XX	XXX	-	-
	(c) Tourism activities (period)	X	X	X	X	-	-	-	-	-	-	X	X
VI	MISCELLANEOUS												
	(a) Animal census	-	-	XX	X	-	-	-	-	-	-	-	-
	(b) Survey & boundary demarcation	X	X	XX	-	-	-	-	-	-	-	-	-
	(c) Training/briefing and debriefing of anti-poaching strategies	XX	-	-	-	-	X	-	-	-	-	-	-
	(d) Collection of skulls antlers etc	X	X	X	XXX	XX	X	X	X	X	X	X	X
	(e) Preparation of Annual report	-	-	-	XX	X	-	-	-	-	-	-	-

- N. B. **X** Denotes the intensity of activities - May execute
 XX Denotes the intensity of activities - Should be executed
 XXX Denotes the intensity of activity - Must be executed and completed



ACTION PLAN FOR KAZIRANGA NATIONAL PARK

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The management of Kaziranga National Park comprises two main components viz. **Anti-poaching activities** to counter the threat of organised gangs of poachers and **Habitat manipulation** to maintain the grasslands, wetlands in perpetuity to provide a suitable habitat for the rhinos and other wildlife.

I. ANTI-POACHING MANAGEMENT

The anti-poaching activities in Kaziranga National Park may again be divided into three phases as detailed below:

- 1. PRE-ENTRY:** The main activity in this phase is a **pro-active action** that includes intelligence gathering on the activities of poachers in the vicinity of the Park. The **intelligence gatherer** are usually local villagers or poachers who have turned over a new leaf. Effort are also made by the park authorities to involve the local people in furnishing information on the movement of poachers through implementation of eco-development works as well as massive education and awareness drive in the fringe villages of the National Park.
- 2. POST-ENTRY:** This calls for a **reactive action** which denotes the activities undertaken by the staff to track down and apprehend the poachers inside the Park, if any information regarding such intrusion is received by the Park authorities from any informer. The logistics of such a track down operation is enormous and calls for **radical improvement in the existing infrastructure** for anti-poaching operations viz. improvement of **surface communication** and **radio communication** network, upgrading of **arms & ammunition**, improvement in **accommodation facilities** for field staff, greater mobility on land surface and water through **procurement of vehicles and boats, hover craft** in the mighty Brahmaputra, augmentation of **surveillance facilities** through construction of watch towers on suitable locations, etc. Over and above these improvement measures, it is also imperative to create **Mobile Squads** to react immediately in case of any emergency.
- 3. POST-EXIT:** This is the **investigative and prosecutive** action after the poachers escape from the park, usually after committing an offence inside the Park. This phase mainly consists of co-ordination with other **Law-enforcing Departments**, e.g., Police to keep track of the poachers and nab them. However, past experiences have shown that though the poachers are apprehended, they are seldom convicted in the court as the cases on behalf of the Department are not properly represented. Therefore, a **legal cell** may be constituted to pursue the cases related to rhino poaching for conviction of the poachers. Besides, a system of **reward for the staff** as an incentive to recognize their efforts in apprehending rhino poachers, is also required.

There are number of cases where the anti-poaching staffs are bitten and injured by rhinos, tiger and other wild animals rendering them invalid for normal duty. The meager medical allowance they receive is not at all sufficient for proper treatment. As such a provision for medical help is very essential.

II. HABITAT MANAGEMENT

The other important aspect of management in Kaziranga is to maintain the climatic climax stage of grassland by preventing the invasion of trees. This is achieved primarily through annual burning of grasslands so as to discourage the growth of tree saplings. The operation also helps in enhancing the nutritional value of coarse grasses by facilitating growth of new shoots, which attract the herbivores.

DE-SILTATION

It is observed that a number of water bodies inside the Park have shrunk in size due to siltation caused by flood. As the wetlands are an integral part of ecosystem in Kaziranga, it is imperative that these water bodies be de-silted manually or mechanically.

ERADICATION OF WEEDS

The proliferation of various weeds like Mikenia, Mimosa and water hyacinth, causing eco-logical degradation of the habitat, is a major problem confronting the Park authorities. Eradication of these weeds should be taken up urgently to preclude any further degradation of habitat for wildlife in the Park. Increasing cane brakes also now becoming a matter to be ponder upon.

BUND CONSTRUCTION

With the onset of dry season, bunds are also constructed in some of the *beels* (water bodies) to retain water to attract various species of migratory avifauna.

HIGHLAND CONSTRUCTION

Some highlands have been constructed inside the Park to provide shelter to the animals during high flood. However, some more highlands with bigger dimension are required to be constructed to provide shelter to the marooned animals.

WOODLAND MANIPULATION

Another management practice adopted in Kaziranga is the uprooting of tree saplings to prevent invasion of trees into the grassland areas.

III. MISCELLANEOUS ASPECTS OF MANAGEMENT IN K.N.P:

RESEARCH & MONITORING

To ensure proper planning for management of the National Park, research on the natural resources is a must. Sound management techniques can be devised only on the basis of sound research background. But very little research has been done on the habit or habitat of Indian rhinos in Kaziranga. Therefore, it is imperative that research on the morphological and ecological characters of rhino in Kaziranga should be taken up on a priority basis.

TRAINING IN ARMS HANDLING

Though the staff of Kaziranga are equipped with .315 rifles or guns, they lack any formal basic training in handling of arms. Therefore it is imperative to impart basic training in handling of arms to the field staff.

TRAINING FOR WILDLIFE MANAGEMENT

Most of the staff do not have any training in wildlife management. Therefore, to enhance their efficiency, capsule courses on wildlife management may be devised specially for the benefit of the staff of Kaziranga National Park.

AMENITIES TO FIELD STAFF

In view of the arduous nature of duties to be performed in the Park, appropriate incentives are required to be provided to field staff by way of accommodation for family members, education facilities for children, regular supply of uniform, etc. so as to attract the best persons available in the Department.

CREATION OF RESCUE HOME & VETERINARY FACILITIES

At present the Forest Veterinary Officer looks after the departmental elephants and specific cases of ailments of wildlife which are reported from time to time. However, there is pressing need to create an rescue home for treatment of animals rescued during flood, prior to their relocation.

ANIMAL CENSUS

Estimation of the population of different species of animal at regular interval furnishes insight into the population dynamics of those species. At present census operation in Kaziranga is done every sixth year. But for the purpose of better understanding of the trend in population of different endangered resident species of the Park, it is advisable that population estimation exercise for larger mammals should be undertaken every fourth year.

BOUNDARY DEMARCATION OF THE ADDITION AREA

Erosion along the northern boundary of the boundary causes considerable havoc to the geographical area of the Park. Therefore, to compensate for the loss incurred by way of erosion, it is imperative that the six proposals for inclusion of addition areas are finalised urgently. Some of these addition areas along the boundary of the Park are also used by animals for migration to hills during flood.

On finalisation of the proposal for extension of the Addition areas, the boundaries should be surveyed and demarcated immediately to preclude any encroachment of the Park area.

FLOOD FIGHTING MEASURES

During the floods, country boats and speed boats are the only effective means of communication. The repairing of country boats, speed boats and opening of boat line are to be accorded top most priority as flood combating measure.

EROSION CONTROL PROJECT

Cut bank erosion by the Brahmaputra River along the northern boundary of the Park is a threat looming large on the existence of Kaziranga National Park. The problem of erosion is most severe along the northern boundary on the north-eastern corner. The main causes of erosion of the National Park may be attributed to gradual elevation of the river bed due to siltation and consequent channel migration of the Brahmaputra River. Since combating erosion requires technical expertise, an integrated approach to tackle the problem should be devised by proper co-ordination amongst various agencies like Forest Department, Brahmaputra Board, Central Water Commission, ARSAC etc. to secure the future of Kaziranga National Park.

PROJECT COST

I. ANTI-POACHING MANAGEMENT

Pro-active	Total (Rs in lakh)
1. Development of information net work @ Rs. 100.00/ year	5.00
2. Eco-development programme in the fringe villages to K.N.P. 131 @ 200 Lakhs/year	1,000.00
3. Education and Awareness programme in each fringe village including training. 131 @ 1.00 Lakh/year	5.00
Reactive	
4. Strengthening of communication net work.	
4.1. Construction of all weather road, widening repairing including bridge/culvert construction @ 6.00 lakh/km 40 km.	240.00
4.2. Improvement of fair weather road @ .50 -400 km including bridge/ culvert.	200.00
4.3. Reconstruction of patrolling path 1000 km x 5=5000.02/km 200.00	100.00
4.4. Construction of wooden boats 80. @.15/- 12.00	12.00
4.5. Purchase of O.B.M.(diesel) 5 @ 3.00	15.00
4.6. Purchase of Hover craft I @ 10.00	10.00
4.7. Construction of pontoon bridge at Holalpath on Difaloo River.	8.00
5. Construction of anti-poaching camps raised with RCC pillar @ 2.00 for 20 Nos.	40.00
6. Construction of floating camp (Mechanized boat) in Brahmaputra River @ 1.30 for 4 Nos.	4.00
7. Wireless network.	
a) Fixed station 5 @ .40/-	2.00
b) Mobile 20 @15/-	3.00
c) Battery 100 @ .03/- 3.00	3.00
d) Solar battery charger 20 @ 20	4.00
8. Arms & ammunition:	
8.1. Purchase of 3 revolver @ .80	2.40
8.2. Purchase of 15 .315 Rifles @ .30/Rifle	45.00
8.3. Purchase of ammunition	10.00
9. Construction of 10 Watch towers @ 2.00	20.00
10. Purchase of 100 Binoculars @ .05	5.00
11. Logistic support, i.e., purchase of battery cells, torches, kerosine etc. 5.00/year	25.00
INVESTIGATIVE	
12. Strengthening of enforcement, reward etc. @ 2/- year.	10.00
13. Payment to the staff for disablement & medical treatment due to injury caused during anti- poaching work by wild animals. @ 2.00/year.	10.00
II. HABITAT MANAGEMENT	
14. Deepening of silted water bodies 20 @ 10.00	200.00
15. Removal of water hyacinth & eradication weeds @ 2.00/year	10.00
16. Construction bunds to retain water after flood @ .50/year.	2.50

17. Construction of 20 highlands @ 4.00/ year	80.00
18. Wood land manipulation for 1.00 hect. @ .20 lakh	20.00
III.MISCELLANEOUS	
19. Research & monitoring in K.N.P. @ 200/year	10.00
20. Arms training to the field staff .50/year.	2.50
21. Training of Park personnel	10.00
22. Amenities to staffs.	
22.1. Family accommodation for field staff 20.00/year	100.00
22.2. Uniform, winter clothing, rain coats etc. for 600 staff @ .02/year	60.00
23. Animal census to be carried out every 4 years interval 5.00/	10.00
24. Demarcation of boundary of Additions & Park area @ 2/- x 5 years	10.00
25. Boat line construction & Boat repairing @ 2.00/ year L.S.	10.00
26. Creation of rescue home for marooned wild animals.	5.00
27. Veterinary care for rescued animals and departmental elephants.	5.00
28. Purchase of 5 vehicles @ 4 lakhs	20.00
29. Purchase of Mini-dozer with accessories.	30.00
30. Publication of brochures, leaflets, Management Plan, Status Report, Annual Plan, etc.	20.00
31. Contingency.	16.60
	2400.00
(Total- Twenty four crores only)	

An additional amount of Rupees *Five to Ten crores* may be earmarked for investigative studies and formulation of project for erosion control measure in co-ordination with other Agencies.

BREAKDOWN OF PROJECT COST DURING IMPLEMENTATION

Sl. No	Item	1 st year (Rs. In lakh)	2 nd year (Rs. In lakh)	3 rd year (Rs. In lakh)	4 th year (Rs. In lakh)	5 th year (Rs. In lakh)	Total (Rs. In lakh)
I	Anti poaching Management						
	Pro-active						
	1. Development of information/ intelligence network.	1.00	1.00	1.00	1.00	1.00	5.00
	2. Eco-development programme.	200.00	200.00	200.00	200.00	200.00	1000.00
	3. Education & awareness programme.	1.00	1.00	1.00	1.00	1.00	5.00
	Re-active						
	4. Strengthening of communication network.						
	4.1	48.00	48.00	48.00	48.00	48.00	240.00
	4.2	40.00	40.00	40.00	40.00	40.00	200.00
	4.3	20.00	20.00	20.00	20.00	20.00	100.00
	4.4	2.40	2.40	2.40	2.40	2.40	12.00
	4.5	3.00	3.00	3.00	3.00	3.00	15.00
	4.6	10.00	-	-	-	-	10.00
	4.7	8.00	-	-	-	-	8.00
	5. Construction of anti-poaching camp.	8.00	8.00	8.00	8.00	8.00	40.00
	6. Construction of floating camp.	1.00	1.00	1.00	1.00	-	4.00
	7. Wireless network.	4.00	3.00	3.00	2.00	-	12.00
	8. Purchase of arms & ammunition.	10.00	45.00	2.40	-	-	57.40
	9. Construction of watch tower.	4.00	4.00	4.00	4.00	4.00	20.00
	10. Purchase of binocular.	2.00	2.00	1.00	-	-	5.00
	11. Logistic support.	5.00	5.00	5.00	5.00	5.00	25.00
	Investigative						
	12. Strengthening enforcement & rewards.	2.00	2.00	2.00	2.00	2.00	10.00
	13. Medical treatment for injured staff	2.00	2.00	2.00	2.00	2.00	10.00

Sl. No	Item	1 st year (Rs. In lakh)	2 nd year (Rs. In lakh)	3 rd year (Rs. In lakh)	4 th year (Rs. In lakh)	5 th year (Rs. In lakh)	Total (Rs. In lakh)
II	Habitat Management						
	14. Deepening of silted water bodies.	40.00	40.00	40.00	40.00	40.00	200.00
	15. Removal of water hyacinth & weeds.	2.00	2.00	2.00	2.00	2.00	10.00
	16. Construction of bunds.	.50	.50	.50	.50	.50	2.50
	17. Construction of highland.	16.00	16.00	16.00	16.00	16.00	80.00
	18. Woodland manipulation.	4.00	4.00	4.00	4.00	4.00	20.00
III	Miscellaneous						
	19. Research & Monitoring.	2.00	2.00	2.00	2.00	2.00	10.00
	20. Arms training for staff.	.50	.50	.50	.50	.50	2.50
	21. Training of Park personnel.	2.00	2.00	2.00	2.00	2.00	10.00
	22. Amenities to staffs.						
	22.1 Family accommodation	20.00	20.00	20.00	20.00	20.00	100.00
	22.2 Uniforms etc	12.00	12.00	12.00	12.00	12.00	60.00
	23. Animal census.	5.00	-	5.00	-	-	10.00
	24. Boundary demarcation.	2.00	2.00	2.00	2.00	2.00	10.00
	25. Boat repairing & boat line clearance.	2.00	2.00	2.00	2.00	2.00	10.00
	26. Creation of rescue home for marooned animals.	2.50	2.50	-	-	-	5.00
	27. Veterinary care for elephant & rescued animals	1.00	1.00	1.00	1.00	1.00	5.00
	28. Purchase of vehicles.	4.00	4.00	4.00	4.00	4.00	20.00
	29. Purchase of mini dozer.	30.00	-	-	-	-	30.00
	30. Publicity, data base etc.	4.00	4.00	4.00	4.00	4.00	20.00
	31. Contingency.	3.00	4.00	3.00	3.60	3.00	16.60
	Total	523.90	505.90	463.80	454.40	452.00	2400.00



STATUS REPORT ON RHINO CONSERVATION AND ACTION PLAN FOR WEST BENGAL

A. K. RAHA, CONSERVATOR OF FORESTS, WILDLIFE CIRCLE, WEST BENGAL

1. INTRODUCTION

- 1.1. The Great Indian one-horned (*Rhinoceros unicornis*) was once upon a time distributed over large areas of gangetic flood plains of West Bengal. The Asiatic two-horned Sumatran rhino, which was smaller in size and inhabited dense forests in the foothills of North Bengal became extinct in the early twenties of this century. The Javan Rhino or *R. sondaicus* were also found in parts, of the then Bengal but this spp. also became extinct in late nineteenth century. the only surviving spp. of Asian Rhino in W. Bengal is *R. unicornis* which is at present confined only in two Protected Areas(P.A.) of the state, namely Gorumara National Park and Jaldapara Sanctuary.
- 1.2. Jaldapara was first notified as a sanctuary in 1940 under Indian Forest Act, 1927, which was subsequently notified as a wildlife sanctuary in 1976 (115 km²) under WL Protection Act 1972. The area of the sanctuary was further increased to 216 km² by a final notification In 1998. Similarly, Gorumara which was constituted as a wildlife sanctuary as early as 1940, was notified as Sanctuary over 8 km² during 1976 and later upgraded to the status of National Park during 1994 with a much larger forest area of 88 sq. km.
- 1.3. The distribution of rhino in North Bengal used to extend up to Buxa forests even up to 1950s. However, with the gradual loss of corridors between the grassland forests and conversion of the P.A.s into isolated, island habitats surrounded by the Tea gardens, habitations and agriculture, the species became restricted to these two P.A.s and survived because of extreme degree of protection it received over the last two decades.
- 1.4. The population of rhino in W. Bengal has seen a wide fluctuation during the last few decades, as will be evident from the following figure:

Year	Population
1964	72+
1975	23+
1978	19+
1980	32
1985	22
1989	39
1992	44
1996	57
1998	68

- 1.5. The reason for fast dwindling of population up to 1985 was the increased degree of poaching for rhino horn, lack of appropriate protection machinery, political unrest during transition phase and gradual loss of rhino habitat. From mid-eighties, when political stability showed up and there was

increased awareness at all levels towards environment conservation, did the decreasing trend of rhino population get reversed. Intensified protection efforts, coupled with devotion and sacrifices on the part of P.A. management and staff, saved the small population of 14 rhinos in Jaldapara and 8 in Gorumara from extinction.

2. PROBLEMS IN RHINO CONSERVATION

The problems can be identified as follows:-

- 2.1. Poaching of rhinos- Poaching was most intense in the sanctuary between 1960s and 1985 which had brought down the population to almost threshold level. The incidences of poaching was again far greater in Jaldapara as compared to Gorumara. The problem with Jaldapara is that it is having an international border with Bhutan as well as is situated very close to Buxa Tiger Reserve which is adjoining Assam. International and national-level mafia are very active in and around the boundaries. Till the eighties, poaching used to be carried out mostly using long-range rifles whereas the recent trend in Jaldapara appears to be poisoning using the pesticide "Thiaden" which finds extensive use in agriculture and tea gardens. Such attempts in poaching the rhinos through poisoning has been recorded at least once in Jaldapara during March 96.
- 2.2. The weaknesses faced by the Forest Department in controlling poaching can be identified as follows:
 - 1) Large interface between sanctuary and the revenue villages due to irregular shape of the sanctuary.
 - 2) Close proximity of the international borders with Bhutan and Bangladesh.
 - 3) Lack of sufficient trained and competent patrolling staff.
 - 4) Lack of sophisticated fire arms.
 - 5) Insufficiency of patrolling elephants.
 - 6) Lack of coordination amongst various enforcement agencies.
 - 7) Lack of intelligence gathering mechanism at departmental level.
 - 8) Terrorist activities in neighbouring regions.
 - 9) Easy availability of pesticides, used in adjoining agriculture and tea gardens, which is increasingly being used for poisoning.
 - 10) Lack of employment opportunities in fringe villages, making poor people succumb to mafia activities.
- 2.3. Grazing of cattle from fringe villages in the periphery of P.A.-It exposes the rhino population to epidemics of cattle-borne diseases.
- 2.4. Advancement of woody spp. into grassland through succession process- The pioneer spp. like Simul, Sissoo, Sidha, Siris etc spread into the grassland since most of the natural grassland do not get periodically flooded because of topography change and results into loss of forage base for rhino.
- 2.5. Extension of weeds like Lemon grasses, *Leea* spp etc., into drier grasslands is another serious problem in maintaining grassland habitat of rhino.
- 2.6. Uncontrolled fire, set in by the cattle-grazers and by the fringe villagers to facilitate collection of Simul floss, adversely affect the spatial distribution of rhino population sometimes forcing them towards the boundary and exposing them to risk of poaching.
- 2.7. The past forestry practises, in which some of the prime grasslands then considered as commercially low-value, had been raised with high-value tree spp which resulted in shrinkage of rhino habitat. This was particularly relevant in case of Gorumara.

- 2.9. The present population of 50 rhinos (approx.) in Jaldapara has been built up from a small population of around 14 in 1985. This may lead to genetic depression low fertility and disease epidemic due to repeated inbreeding in a small population.

3 STATUS OF RHINO PROTECTION

With the transfer of Jaldapara Sanctuary under the administrative control of Wildlife Wing and with increased political stability in the state, poaching incidences started coming down gradually. Installation of R.T. network, supply of .315 Rifles and intensification of protection efforts through a band of dedicated staff helped in increased population trend. Between Jan 94 and Jan 99, there has been only one instance of death of a female due to poisoning (horn was intact) and another instance where the horn of a young male was removed by local miscreants after the animal was found lying dead in the river bed and spotted first by the villagers. The missing horn could be ultimately recovered by the sanctuary staff. In Gorumara, there has been no incidence of poaching during last five years.

4. BUDGET

At the current level, an average of Rs 100 lakh is spent under Non-Plan for recurrent expenses and Rs 10 lakh under Plan fund of the State Govt. for Jaldapara. For Gorumara, these figures are Rs 25 lakh and Rs 5 lakh respectively. G.O.I. assistance in Plan sector for development activities are Rs 30 lakh for Jaldapara and Rs 20 lakh for Gorumara.

5. WILD ANIMAL HEALTH

West Bengal is one of the leading states in the country which has a commendable record in chemical capture of rhino for treatment of the injured animals.

6. ECO-DEVELOPMENT ACTIVITIES

Out of the two P.A.s having rhino population in the state, Jaldapara Sanctuary is having tremendous pressure from the adjoining fringe population. There are more than thirty revenue/forest villages, having a population around 75000. In case of Gorumara, the biotic pressure is much less. Since protection aspect in these habitats cannot be considered in isolation from the fringe people, the Park managers resorted to participatory management with active support from the fringe population. Eco-development activities were initiated in right earnest from 1990 onwards which aimed at not only reduction of pressure on P.A. through creation of employment opportunities, but also to strengthen information network to prevent poaching.

CURRENT STRATEGIES FOR CONSERVATION OF RHINO IN P.A.s

1 ZONATION AND ZONE PLANS

Before we discuss specific strategies, we adopt the broad strategy of creating 3 zones for dividing the entire sanctuary into 3 management zones. This is necessary in order to ensure that some of the strategies of management, which are mutually exclusive, are well separated in the spatial frame and other strategies which are mutually compatible may be implemented in the overlapping zones. Clear identification of such zones in the sanctuary help in simplifying operations by the field level staff and reducing possibility of skewed achievement of certain objectives at the cost of other. For this purpose, the National Park or Sanctuary should be delineated into following 3 zones.

- 1) **Wilderness Zone:-** The forest in this zone should be so managed as to retain them in their pristine status and the interference, for development in this zone should be minimum. The managerial interference, here would only be protection oriented and the habitat should be regularly monitored. This zone will primarily act as biodiversity conservation zone.
- 2) **Habitat Improvement Zone:-** Active managerial intervention, including habitat manipulation, will be carried out in this zone for development of the forest area as ideal rhino and other wildlife habitat.
- 3) **Eco-tourism Zone:-** This will be a zone which may be partly overlapping with both the above zones.

2. STRATEGY FOR CONSERVATION OF BIODIVERSITY AND CONTROL OF POACHING OF RHINO.

2.1 Conservation of biodiversity.

The wilderness zone, with no habitat manipulation activities and no outside interference, will be maintained primarily for the conservation of biodiversity, and to represent all the bio-geographic sub-zones of this sanctuary. Both the P.A.s lie in the bio-geographical zone (7b Lower Gangetic plain) as per classification of Rodgers and Panwar, 1988.

2.2 Control of poaching of rhino and other species and illicit felling of timber.

To achieve the above objective, the strategy will be mainly building up protection network, developing infrastructure for better implementation of the rules and regulations, building up information network and building other State Plan Schemes.

However, there is problem of procurement of cartridges as these are normally supplied from ammunition factory at Khadki, Pune and such supplies are not forthcoming.

In order to ensure security of the Range Officers, Asstt. Wildlife Warden and the DFO at the time of undercover operations for apprehending the smuggling gangs, it is proposed that small arms (revolvers) be provided to them for which there may be already provision under the existing Forest Manual. If, however, it needs special permission under the Arms Act, the same has to be processed and approval sought.

2.3 Strengthening wireless network.

The erstwhile Jaldapara Wildlife Sanctuary, comprising an area of 116 km². is having a well connected wireless network of frequency 71.65 MHz. which is different from VHF frequency of Northern Circle (159.90 MHz). All the Range Headquarters, Beats and most of the camps are provided with either fixed stations or mobile phones or Walkie-Talkies. The newly added area of the sanctuary, which was under the control of Divisional Forest Officer, Coochbehar Division earlier, but is at present under unified control is having a different RT frequency (belonging to Northern Circle). In case of Gorumara N.P., the R.T. Network, which has the frequency of 159.900 MHz is in the initial stage of expansion.

2.6 Establishment of intelligence network for collecting information and provision of secret fund.

The success of any protection job depends on the quality of information gathered by the management. At present the Asstt. Wildlife Warden, the Range Officers and Beat Officers collect information through their personal level networks and informers. Since there is no such mechanism in the Forest Deptt. for collection of information professionally, in most of the cases

the information collection system becomes highly personalised and its effectiveness depends upon the initiative taken by the official concerned.

The mechanism of information gathering can become effective only when there is a specific provision for the same under the rules and when there is provision to buy information. Like in the Police, Customs, BSF and other enforcement agencies, Forest Deptt. should also have provision for operating a secret fund by the Divisional Forest Officer to facilitate purchasing information regularly from the informers. The secret fund will be operated by the Divisional Forest Officer and vouchers for any payment made by the Divisional Forest Officer from this fund will not be sent to AG, West Bengal along with the accounts in normal course. Only an abstract voucher indicating the amount disbursed will accompany the accounts. This is required in order to maintain the secrecy of the source of information and to safeguard the lives of the persons supplying information. The power of Divisional Forest Officer to operate such secret fund may be kept restricted to Rs.50,000/- per year and the original vouchers will be retained by the Divisional Forest Officer confidentially which may be subject to audit verification on specific request.

Similarly, the system of paying rewards to informers for providing valuable information which has led to seizures/confiscation of illegal wildlife products and arrest of persons involved in such illegal activities, will facilitate the flow of valuable information from the fields/villages and other sources to the sanctuary managers.

2.7 Coordination amongst various law enforcement agencies.

Since poaching is always associated with the inter-state and/or international smuggling of the poached product, a regular coordination between various enforcement agencies like BSF, Railway Police, Customs, Director of Revenue, Intelligence, Police etc. is a must to control poaching and illegal trade of wildlife products. For this purpose a coordinating body comprising the Divisional Forest Officer, Asst. Wildlife Warden and representatives of various enforcement agencies should be constituted. The Divisional Forest Officer will be the convenor of such coordinating body and the coordination meetings will be held at least once in, every 6 month for sharing of vital information and to ensure further coordination amongst the field level staff working in the field level.

2.8 Incentive and rewards to staff.

At present, there is a provision for reward under the existing Forest Manual but the same is not sufficient to tackle the menace of poaching in the present day context.

A proposal had been submitted by the Chief Wildlife Warden, West Bengal for grant of rewards and the same is at present lying in the forest Dept., Govt. of West Bengal for approval. An immediate sanction of the scheme is required to ensure speedy flow of information on poaching/poachers and also to motivate the staff in taking risks while apprehending offenders.

2.9 Publicity, nature education and awareness generation.

Dissemination of information on the objectives of management of the sanctuary to the local people as well as to all others is extremely important towards the efforts of conservation of biodiversity and prevention of poaching. Such publicity and awareness generation can be achieved through the following means:-

- 1) Through three well equipped nature interpretation centers at Madarihat, Kunjanagar and Lataguri.
- 2) Installation of hoardings at strategic points on the National and State Highways.
- 3) Circulating, free of cost as well as at cost, leaflets and brochures to the visitors and local people, highlighting the importance and activities of the sanctuary.

- 4) Organising regular relevant film shows in the fringe villages.
- 5) Releasing advertisement on the sanctuary through audiovisual media like TV, radio, cinemas, newspapers and magazines.
- 6) Organising regular camps of school children and college students in the sanctuary from the urban as well as rural areas.
- 7) Setting up of Multi-Media System for interactive education in the Interpretation Center.

3 STRATEGY FOR CONSERVATION AND SUSTAINABLE GROWTH OF RHINO AND OTHER WILD LIFE POPULATION.

3.1 Habitat improvement.

Jaldapara Wildlife Sanctuary and Gorumara N.P. are the only two rhino habitats of the State and the great Indian one-horned rhinoceros is the key-stone species of these P.A.s. The other associated species of the P.A.s are elephants, gaur, tiger (only in Jaldapara), different species of deer, wild boar and a large number of species of birds, reptiles amphibians and insects. Hence any habitat development activity should primarily aim at developing the habitat of rhino while, at the same time, preserving the habitat and food-base of other species as well. Since the food chain in any ecosystem is highly complicated and any large scale manipulation of the ecosystem may set in an irreversible process of degradation, one has to be extremely careful while carrying out habitat manipulation activities for the purpose of development.

3.2 While undertaking habitat development works, the activities should remain confined within the following premises :-

- 1) Wherever habitat manipulation activities are being taken up, some control plots should be laid out for future monitoring of the effects, of such manipulations.
- 2) No exotic tree fodder species should be introduced.
- 3) The focus of habitat development should be aimed towards expanding the habitat and fodder base of rhino.
- 4) Take up habitat development works which will also help in improving the habitat of other species without generating interspecies contest.
- 5) Maintain special habitats like snag, den trees, caves, overhangs etc. for other species.

3.3 Overwood Removal and Fodder Plantation.

Since rhinos prefer riverine grassland and savannah grassland for food and shelter, controlling the invasion of grassland by the pioneer tree species is an important strategy for development of rhino habitat. Since the sanctuary has a comparatively small area as ideal rhino habitat and since the rhinos have to be kept restricted within the sanctuary areas, the process of overwood removal followed by artificial regeneration for maintaining grassland habitat is an extremely important component of management.

3.3.1 Overwood Removal

The following guidelines should be followed while taking up overwood removal and fodder plantation works

- 1) Overwood removal, followed by fodder plantation, should be carried out in grassland dominated areas in habitat improvement zones.
- 2) No tree over 90 cm. gbh should be removed. In case of Khair and Sissoo, no tree above 60 cm. gbh should be removed.
- 3) The process of overwood removal will be preferably girdling for the trees above 30 cm. gbh.

- 4) The tree species to be removed will be pioneer species like Khair, Sisoo, Simul, Tantari (*Dillenia indica*), Malata (*Macaranga denticulata*) Sidha (*Lagerstroemia speciosa*).
- 5) No fruit trees like Amlaki, Sindura, Bohera, Haritaki etc. should be removed. A few young tantari trees, which are liked by rhino, may also be retained.
- 6) Immediately after overwood removal the areas should be planted up with indigenous grasses like Dhadda. (*Saccharum* spp.). Planting should be at spacings of 1 mtr.x 1 mtr. of the stumps and would be taken up after controlled burning of the overwood removal area.
- 7) Every year a total of 60 hect. will be taken up under overwood removal operation in Jaldapara and 40 hect. in Gorumara.
- 8) No overwood removal area should be chosen which is close to the forest fringe/boundary. This is necessary to ensure that the rhinos and other animals are not attracted out of the sanctuary towards the fringes through creation of fodder plantations/grass regeneration.
- 9) Only those areas should be chosen for overwood removal where the process of succession and invasion of grassland by tree species have started.

3.3.2 Planting of indigenous grasses.

The following guidelines are prescribed

- 1) Such planting areas include the overwood removal areas as well as forest blanks/ degraded grassland.
- 2) Cleaning of weeds/climbers and control burning of the same should be done during December/January.
- 3) Another weeding and burning of the debris should be done immediately before starting of soil work in the month of May.
- 4) For eradication of weeds like *Leea* etc., ploughing may be necessary to uproot the weeds thoroughly.
- 5) After ploughing, planting lines will be aligned and stacking will be done at 1 mtr. interval. The entire procedure should be completed by the end of May.
- 6) Meanwhile, soil of the planting area may be tested in some soil testing laboratory for finding the pH, organic carbon content, percentage of organic matters, percentage of total nitrogen, C/N ratio etc.
- 7) Stump planting of the grasses should start with the onset of monsoon and preferably should be completed by June unless there is near-drought condition.
- 8) Local and indigenous fodder species like *Saccharum* species Dhadda, Chepti, Malsa, Madhua, Ekra, Nal (*Arundo donax*), Khagra (*Phragmites karka*), Bhuttagrass (*Coix lachrymajobi*), Banspati (*Setaria* spp.), etc. Purundi (*Alpinia* spp.) should be planted. No exotic grass species will be planted anywhere. Slips of grasses will be collected locally and planted. However, it must be ensured that local collection of grass species is not done intensively from any particular area and collection should preferably be done from well-stocked plantation/natural grassland.
- 9) Spacing of planting of grass slips: Fodder grass stumps will be 1 mtr. x 1 mtr. and the species mix should be such that Dhadda is not more than 60% of the planting stock.
- 10) In one line, only one species will be planted.
- 11) The planting will be maintained in future as follows:

1st year maintenance ...	Three cleanings in February/March, July and October; infilling vacancies in July.
2nd year maintenance ...	Two cleanings in February/March and October.

- 12) Infilling of vacancies will be done along with the weeding cleaning during the 1st year maintenance.
- 13) In low line areas having water logging problem species like Purundi (*Alpinia* spp.), Nal (*Arundo donax*), Khagra (*Phragmites karka*) etc. will be planted.
- 14) No fodder planting should be raised in forest areas which are close to the periphery/boundary of the sanctuary.
- 15) Such planting of fodder grasses are recommended only in JP2,3,4,5 compartments, Malangi-1,2,3 compartments, Torsa-1,2,3 compartments, CP-1,2 compartments of Jaldapara and Jaldhaka and Dhupjhora Blocks of Gorumara.
- 16) Every year 100 hect. of fodder grass planting would be taken up in overwood removal areas and 50 hect. of fodder grass planting would be taken up in blank areas as well as in predominantly thatch grass areas in the above mentioned compartments only.

3.4. Weed eradication and climber cutting.

3.4.1 Weeds and climbers are acute problems in Jaldapara Wildlife Sanctuary and Gorumara N.P. The most common and proliferating weeds are *Leea* spp., *Cassia tora*, *Mikania* spp., *Eupatorium* spp., *Lantana camara* and *Clerodendron bengalensis*. Prolific growth of fern is also a special feature in Jaldapara as it assumes the form of weed and sometimes surpasses the growth of grass. However, fern is not considered as weed since it plays an extremely important role in maintenance of swampy habitat. Among the fern, spp. like *Christella dentata*, *Diplazium esculentum* and *Amplopteris prolifera* are common. Removal of fern should not be taken up in the sanctuary under weed eradication programme.

3.4.2 For eradication of *Leea* spp., uprooting should be done at the time of flowering of the species to prevent further propagation of the species through its seeds. Normally flowering time for *Leea* is September. Similarly cutting of *Lantana camara* should be done in the month of October. All such weed eradication operation should be done manually and no weedicide should be used.

3.4.3 Restriction of thatch grass and *Cymbopogon* spp. Thatch grass and lemon grass (*Cymbopogon*), though eaten by the herbivores when young, are normally shunned by the wild herbivores as fodder.

Suppression of *Cymbopogon* will be possible through increase of soil-moisture regime. This is being dealt with separately under a separate paragraph on the measures for improvement of soil moisture.

For suppression of thatch grasses in large open areas, it is proposed to take up these areas under fodder grass planting for converting the thatch areas into grassland of palatable species.

3.5 Control burning of old grass planting for natural regeneration of grass land.

3.5.1 The fodder grass planting, which were earlier raised in Jaldapara Wildlife Sanctuary, as well as the coarse fodder grass areas also start losing their importance as foraging areas since the rhinos do not prefer coarse and old Dhadda grasses as fodder. All such older planting and natural grassland with good stem density should be gradually taken up for cut back operations to be followed by control burning to facilitate regeneration of young shoots.

Fodder grass plantations which are more than 3 years old should be brought under this operation. Every year of such old fodder grass areas should be taken up for cut back operations in the month of December-January, to be followed by control burning. The operations have to be completed by January. In order to create less disturbance to the rhinos and to provide them shelter and fodder while carrying out these operations, each patch should not be more than 5 hect. and there should not be more than 12 to 15 such patches of operation every year.

3.5.2 A few guidelines to be followed for use of fire as a management tool:

- 1) Burning should be done and completed during December and January, that is during the cool period.
- 2) Burning should not be done on windy days when there is a possibility of spreading of fire.
- 3) Burning should not be done extensively and simultaneously in all the areas since in that case the animals may be trapped by fire.
- 4) Burning should be done in small patches at a time.
- 5) The burnt area should be monitored to prevent spread of any fire from ignited material of the area.
- 6) Control burning will be restricted only in overwood removal areas, fodder planting areas and cut back operation areas.
- 7) Control burning will always be resorted to for maintaining the fire lines.

3.5.3 No other burning regime is prescribed for the sanctuary since the extent of natural grass land in the sanctuary is limited and extensive use of fire in the grassland may adversely affect other species including avifauna like Bengal Florican, Black partridges etc.

3.6 Control of wild fire.

Accidental and man-made wild fire is common in Jaldapara Sanctuary, as has been stated under Chapter 5. To control the man-made fire the following strategies are proposed:

- 1) Existing fire lines should be maintained and works completed by January, i.e. before the dry season sets in.
- 2) Patrolling paths, which also act as fire lines, should be similarly maintained.
- 3) During the dry period, extensive patrolling should be taken up specially around the fringe areas where fires are set in by the graziers.
- 4) Whenever any wild fire is detected, every effort should be taken to extinguish it. No negligence should be shown by the staff in this respect.
- 5) Whenever any patrolling staff detect any wild fire, the same should be noted in his diary or patrol record. Similarly entries will have to be made in the Beat Office and Range Office records.
- 6) Before the start of the dry season, Asstt. Wildlife Warden will hold meeting with the Range Officers and the Beat Officers and identify the man-made fire-prone areas and mount up vigil in those areas to prevent such fires.
- 7) Efforts should be made through the eco-development committees to impress upon the fringe villagers against creation of man-made fires.

4 CONTROL OF GRAZING BY LIVESTOCK OF FRINGE VILLAGES.

4.1.1 Grazing poses a great threat to the habitat. A total of 32 fringe villages and 4 forest villages around Jaldapara Sanctuary contain around 70,000 cattle. Moreover, nine tea gardens situated in the fringe area contain huge no. of cattle (112000-15000) belonging to laborers. Domestic livestock from the fringe villages not only compete with the wild herbivores for food, they also spread diseases like Anthrax and Foot and Mouth disease among wild animals which can cause death.

4.1.2 The strategy should be as follows:-

- 1) Extensive patrolling should be done by the staff, specially along the forest boundaries and the grazing-prone areas to stop illicit grazing.
- 2) Sending the cattle, seized for illicit grazing, to the cattle pounds.
- 3) Planting areas of fodder grasses should be raised on private and community lands in the fringe villages, initially at Govt. cost, and plantation areas should be managed as rotational grazing grounds. Initially, Animal Resource Development Dept. may be involved in creation of such cattle fodder plantation which should be located away from the forest fringe to prevent straying of wild animals. Species to be planted will be hybrid Napier, Anjan, Guinea, Paspalum, Maize, Dinanath etc. and legumes like stylo, rice bean etc. The local Eco-development Committees should be involved for raising such fodder planting areas on sustainable basis.
- 4) Reduction of low yielding variety cattle through castration of inferior bulls and artificial insemination for improvement of stock.
- 5) Regular immunization of domestic cattle against FIVID, Anthrax etc. in the fringe villages within 5 km. of sanctuary boundary.
- 6) Replacement of low yield varieties by high yield variety cow through cattle improvement programme with the help of Eco-development Committees.
- 7) Involvement of Eco-development Committees and seeking their cooperation to prevent illicit grazing of cattle in the sanctuary.
- 8) Formation of milk producers' cooperative in the fringe villages for the purpose of reduction of low yielding varieties, introduction of high yielding varieties and to facilitate marketing of milk.
- 9) Keeping of cattle by the staff inside the sanctuary will be banned.

5 CONSTRUCTION OF WATER HARVESTING/RECHARGING STRUCTURES.

Four concrete rectangular weir structures constructed on two perennial streams flowing through Harindangar Char under JP-5 comptt., during 1995-96, have yielded excellent result in creating shallow stretches of wetlands and perennially inundating appreciable quantum of dry lands of Harindangar Char. Such inundation has been effective in suppressing thatch and lemon grasses colonising in this areas and have facilitated regeneration of Typha, Dhadda and other palatable grass species.

Since such measures, are most cost effective method to improve soil-moisture regime in the drier uplands of Harindangar Char, 20 such structures should be constructed in series, after proper contour survey of Harindangar Char so as to create long stretches of shallow water pools along the existing perennial streams. Two such structures should be constructed per year and it should start from southern part of Harindangar Char and then proceed upstream towards northern part.

6 PROPOSAL TO REDUCE MAN-ANIMAL CONFLICT.**6.1** The following measures are suggested

- 1) The entire forest boundary having interface with the villages, in Jaldapara East, Jaldapara West and Jaldapara North range will be erected with power fencing and these should be regularly maintained. Such fencing is required for Gorumara also without blocking the elephant movement route.
- 2) The local EDCs should be involved in maintenance of the fencings.
- 3) The villagers in the other forest fringe areas may be encouraged to go for cultivation of non-edible cash crops.

- 4) Awareness generation program should be carried out with the help of EDCs for conservation of wild animals which occasionally stray out of the sanctuary.

7 STRATEGY TO TACKLE PROBLEMS DUE TO LARGE INTERFACE.

7.1 The following strategies are proposed to resolve the problems arising out of this:-

- 1) Erecting power fencing all along the exposed boundary of the sanctuary, barring the portion through which elephants move in and out of the sanctuary during their normal migration.
- 2) Encourage social fencing around the sanctuary through the Eco Development Committees.
- 3) Generate awareness amongst the fringe villagers with regard to wild life conservation and importance of the sanctuary.
- 4) Step up family welfare measures in the villages adjoining the sanctuary.
- 5) Take up literacy drive amongst the fringe villagers.

8 TRANS-BOUNDARY PROBLEM.

The problem is concentrated mostly in the Titi-1 and Joygaon-1,2 blocks of the sanctuary adjoining the Bhutan border. Strategies to overcome the problem will be as follows:

- 1) Initiate an intensive joint patrolling with the counterpart forest personnel of the Royal Government of Bhutan, all along the northern boundary of the sanctuary.
- 2) Development and strengthening the intelligence network of the sanctuary by the PA manager.
- 3) Periodic coordination meeting between the officials of the West Bengal Forest Department and the Royal Government of Bhutan for sharing and exchange of information on illegal trade and illicit activities in the forest.

Some relevant information about the State of West Bengal

Total Geographical Area of the State	88,752 km ²
Population of the State as per 1991 Census	67.88 Million
Percentage of total area under cultivation	60.3 %
Percentage of total area forest	13.4 %
Percentage of total area of land which is barren / unculturable	26.3 %
Total forest area in the State	11,879 km ²
Total protected area network in the State	3960 km ²
Percentage of protected area	
(a) To geographical area	4 %
(b) To forest area	13 %
Density of human population per km ²	764.82

CHECKLIST OF CONSERVATION AREAS OF WEST BENGAL

No.	Name	National Park	Sanctuary	Reserve Forest	Total area (km ²)
1.	Sunderban Biosphere Reserve				
a)	Sunderban Tiger Reserve	1330.10	-	892.60	-
	(I) Sajnakhali	-	362.40	-	2585.10
b)	24-Pargenas Division				
	(I) Holiday Island	-	5.95	-	-
	(II) Lothian Island	-	38.00	-	-
2.	Buxa Tiger Reserve	117.10	251.89	389.83	758.82
3.	Singalila	78.60	-	-	78.60
4.	Neora Valley	88.00	-	-	88.00
5.	Jaldapera	-	216.51	-	216.51
6.	Gorumara	-	8.52	-	8.52
7.	Chapramari	-	9.49	-	9.49
8.	Mahananda	-	127.22	-	127.22
9.	Senchal	-	36.88	-	38.88
10.	Jorepokri	-	00.04	-	00.04
11.	Raiganj	-	1.30	-	1.30
12.	Ballavpur	-	2.00	-	2.00
13.	Bethuadahari	-	0.67	-	0.67
14.	Ramnabegan	-	0.14	-	0.14
15.	Bibhutibhushan	-	0.64	-	0.64
16.	Marendrapur	-	0.10	-	0.10
	Total	1613.80	1063.75	1292.43	3959.96

FLUCTUATIONS IN RHINO POPULATION

Year	Jaldapara	Gorumara
1955-56	Not recorded	5
1956-57	65	8
1958	Not recorded	7
1958-59	Not recorded	4
1964 (May)	72	Not recorded
1965	Not recorded	14
1965-66	75	10 (including 2 calves)
1968-69	80 (including 5 calves)	12 (including 2 calves)
1971-72	Not recorded	13
1972-73	Not recorded	7
1975	23	Not recorded
1978	19	6-8
1980	22	Not recorded
1985.	14	8
1988 (April)	24	Not recorded
1989 (February)	27	13
1992 (April)	33	Not recorded

FINANCIAL STATEMENT OF JALDAPARA MANAGEMENT PLAN OVER A PERIOD OF 5 YEARS

(RS. IN LAKHS)

	Rate	Unit	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
			Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.
A. CONSOLIDATION, INFRASTRUCTURE DEVELOPMENT PROTECTION AND COMMUNICATION												
Survey of demarcation & Boundary	0.05	Km	10	0.5	10	0.5	10	0.5	10	0.5	10	0.5
Construction of range office	2	No			1	2	1	2	1	2		
Construction of F.R.'s Qtrs.	3	No	1	3	1	3						
Construction of B.O. Qtrs.	1.5	No	1	1.5	2	3	2	3	2	3	1	1.5
Construction of Gr. 'D'. Qtrs.	1.25	No	2	2.5	4	5	4	5	4	5	6	7.5
Construction of staff Qtrs.	0.1	No	5	0.5	5	0.5	10	1	10	1	15	1.5
Construction of Camp sheds	1	No	3	3	5	5	5	5	5	5	2	2
Construction of Watch towers	0.75	No	1	0.75	1	0.75	1	0.75	1	0.75	1	0.75
Construction of Check post	1	No	1	1	1	1						
Renovation OF Hollong, Barodabri lodges & youth hostel	5	No			1	5	1	5	1	5		
Construction of Subordinate FRH	1	No			1	1						
Construction of Bridge/culvert	0.5	No	2	1	3	1.5	5	2.5	3	1.5	2	1
Reconstruction of Forest Roads	0.25	Km	10	2.5	10	2.5	15	3.75	15	3.75	20	5
Reconstruction of Patrolling path	0.02	Km	10	0.2	15	0.3	20	0.4	25	0.5	30	0.6
Purchase of vehicle	3.5	No			1	3.5	1	3.5	1	3.5		
Purchase of Patrolling Boat	0.5	No			1	0.5	1	0.5				
Purchase of Motor Cycle	0.5	No			1	0.5	2	1	2	1	3	1.5
Purchase of elephant	5	No			1	5	1	5	1	5	1	5
Purchase of R.T. sets	0.2	No	5	1	5	1	8	1.6	8	1.6	16	3.2
Purchase of arms & ammunition	0.3	No	5	1.5	5	1.5	5	1.5	10	3	15	4.5
Constr. of Boulder-Sausage structure for roads/embarkment prot'n	0.0025	Cu.m	400	1	400	1	400	1	600	1.5	600	1.5
Maintenance of fire lines	0.01	Km	60	0.6	60	0.6	60	0.6	60	0.6	60	0.6
Construction of cattle-proof trenches	0.5	Km	2	1	2	1	2	1	2	1	2	1
P.O.L. for Deptl. Vehicle	0.5	No	3	1.5	4	2	5	2.5	6	3	6	3
P.O.L. for Motorcycle	0.15	No			1	0.15	3	0.45	5	0.75	8	1.2
SUB TOTAL				23.05		47.8		47.55		48.95		41.85
B.HABITAT IMPROVEMENT												
Overwood removal in grassland	0.02	Ha	60	1.2	60	1.2	60	1.2	60	1.2	60	1.2
Plantation of fodder grass after overwood removal	0.08	Ha	60	4.8	60	4.8	60	4.8	60	4.8	60	4.8

(RS. IN LAKHS)

	Rate	Unit	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
			Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.
Canopy opening in Mono-culture plantation	0.025	Ha	20	0.5	20	0.5	20	0.5	20	0.5	20	0.5
Plantation of bamboo/fodder after canopy opening	0.08	Ha	20	1.6	20	1.6	20	1.6	20	1.6	20	1.6
Plantation of fodder grass in blanks/ thatch areas	0.08	Ha	50	4	50	4	50	4	50	4	50	4
RDF pltn. in Forest blanks	0.09	Ha	60	5.4	60	5.4	60	5.4	60	5.4	60	5.4
Infilling vacancies in 1st yr of pltn.	0.015	Ha	110	1.65	190	2.85	190	2.85	190	2.85	190	2.85
Infilling vacancies in 2nd yr of pltn.	0.01	Ha	110	1.1	110	1.1	130	1.3	130	1.3	130	1.3
Weed Eradication & Climber cutting	0.01	Ha	100	1	100	1	100	1	100	1	100	1
Cut back and controlled burning of old fodder grass areas.	0.015	Ha	60	0.9	60	0.9	60	0.9	60	0.9	60	0.9
Mechanical & Silvicultural thinning in older pltn.	0.025	Ha	40	1	401	10.03	40	1	40	1	40	1
Construction of water holes	0.50	Ha			1	0.5	1	0.5		0		
Construction of water conservation structure	1.00	Ha	1	1	1	1	1	1	1	1	1	1
SUB TOTAL				24.15		34.88		26.05		25.55		25.55

C. REDUCING MAN-ANIMAL CONFLICT

Erection of power fencing	0.2	Km	10	2	10	2	10	2	10	2	10	2
Purchase of search lights/crackers	0.01	Set	10	0.1	10	0.1	10	0.1	10	0.1	10	0.1
Introduce non-browseable cash-crops in forest fringes	0.08	Ha	10	0.8	15	1.2	20	1.6	25	2	30	2.4
Purchase of tranquilising guns & drugs/medicine	0.5	Set	1	0.5	2	1	2	1	2	1	3	1.5
Construction of winch-mounted trucks for transportation of wild animals	7	Set			1	7					1	7
Construction of sledges for dragging tranquilized animals	0.5	Set			1	0.5			1	0.5		
Construction of trap cages for straying animals	0.25	Set	1	0.25	1	0.25	1	0.25	1	0.25	1	0.25
Purchase of special nets for trapping wild animals	0.15	Set	2	0.3	2	0.3	2	0.3	2	0.3	2	0.3
Construction of anti-depredation voluntary squads in villages	0.1	Set	10	1	10	1	10	1	10	1	10	1
Hiring vehicles for anti-depredation squads	0.75	No	2	1.5	2	1.5	2	1.5	2	1.5	2	1.5
SUB TOTAL				6.45		14.85		7.75		8.65		16.05

D. REDUCING GRAZING PRESSURE

Cultivate fodder on private land for rotational grazing	0.05	Ha	15	0.75	15	0.75	15	0.75	15	0.75	15	0.75
Cattle improvement programme in fringe EDC village	0.1	Camp	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5
Purchase fodder for departmental elephants from Ramsai farm	0.1	No	5	0.5	10	1	15	1.5	20	2	25	2.5
Distribute tree fodder seedlings for F/F prog. In EDC village	0.025	Ha	10		15	0.375	20	0.5	25	0.625	30	0.75

(RS. IN LAKHS)

	Rate	Unit	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
			Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.
SUB TOTAL				1.75		2.625		3.25		3.875		4.5
E. VETERINARY CARE FOR WILD ANIMALS, DEPARTMENTAL ELEPHANTS & FRINGE AREA CATTLE												
Immunisation programme for fringe cattle & domestic elephants	0.5	EDC	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5
Relocation of Rescue Centre at Madarihat	3	LS			1	3						
Purch. of vet. Drugs for de-worming & treatment of injured animals	1	LS	1	1	1	1	1	1	1	1	1	1
Construction of squeeze cage for treatment of rescued animals	0.5	No					1	0.5			1	0.5
Establishment of veterinary testing centre at Madarihat	5	No					1	5				
Purchase of laboratory equipment & testing chemicals	1	LS					1	1				
Maintenance of rescue centre	1	LS	1	1	1	1	1	1	1	1	1	1
SUB TOTAL				2.5		5.5		9		2.5		3
F. TRAINING, MONITORING & RESEARCH												
In-house training of staff in wildlife mgmt/mahout training etc.	0.25	No	2	0.5	2	0.5	3	0.75	3	0.75	4	1
Training of Officers & Staff at training institute	0.5	No	1	0.5	2	1	2	1	2	1	3	1.5
In-house monitoring of achievements vis-a-vis targets & objectives	0.5	LS	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5
Evaluation & achievements of goals vis-a-vis objectives of mgmt	1	LS									1	1
Carrying out Deptt. research on identified topics	1	No			2	2	2	2	2	2	2	2
Collaborative research on Jaldapara WL:S	5	No			1	5	1	5	1	5	1	5
SUB TOTAL				1.5		9		9.25		9.25		11
G. ECO-TOURISM, PUBLICITY, AWARENESS GENERATION												
Printing publicity materials/booklets	1	LS	1	1	1	1	1	1	1	1	1	1
Making badges/Poster/Souvenirs items for publicity	0.5	LS	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5
Creation/Extension of N.I.C.	3	No			1	3			1	3		
Equipment for N.I.C.	1	No	1	1	1	1	1	1	1	1	1	1
Development of camping sites	1	No			1	1	1	1				
Procurement of equipment for camping facility	1	Set			1	1	1	1	1	1	2	2
Developing nature trails	1	No					1	1	1	1		
Construction of nature observatory	1	No	1	1	1	1	1	1				
SUB TOTAL				3.5		8.5		6.5		7.5		4.5

(RS. IN LAKHS)

	Rate	Unit	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
			Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.
H. CAPTIVE BREEDING / REINTRODUCTION PROGRAMME												
Setting up reintroduction centres for:												
i) Barashingha	3	Set	1	3								
ii) Gharial	2	Set			1	2						
Cost of procurement of Barashingha & Gharial from Lucknow zoo/ Assam zoo	2	LS	1	2	1	2						
Improvement of deer reintroduction centre	1	LS	1	1	1	1	1	1	1	1	1	1
Programme for translocation of two female rhino from Jaldapara to Gorumara and 2 female rhino from Gorumara to Jaldapara to improve genetic stock	1		1	1								
Radio collaring & monitoring the male rhino migrates from Assam after releasing in the wild	1				1	1						
SUB TOTAL				7		6		1		1		1
I. ECO-DEVELOPMENT ACTIVITIES												
Input for EDCs @ Rs. 5 lakhs per year per EDC for various capability-building, income-generating activities and training of staff and EDC members including coordination establishment at various levels	5	No	20	100	26	130	32	160	32	160	32	160
SUB TOTAL				100		130		160		160		160
GRAND TOTAL				170		259		270		267		267

FINANCIAL STATEMENT OF GORUMARA MANAGEMENT PLAN OVER A PERIOD OF 5 YEARS

(RS. IN LAKHS)

	Rate	Unit	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
			Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.
A. CONSOLIDATION, INFRASTRUCTURE DEVELOPMENT PROTECTION AND COMMUNICATION												
Survey of demarcation & Boundary	0.05	Km	5	0.25	5	0.25	5	0.25	5	0.25	5	0.25
Construction of range office	2	No			1	2	1	2	1	2		
Construction of F.R.'s Qtrs.	3	No			1	3	1	3				
Construction of B.O. Qtrs.	1.5	No			1	1.5	1	1.5	1	1.5	2	3
Construction of Gr. 'D'. Qtrs.	1.25	No	2	2.5	2	2.5	2	2.5	2	2.5	4	5
Construction of staff Qtrs.	0.1	No	4	0.4	4	0.4	4	0.4	4	0.4	4	0.4
Construction of Camp sheds	1	No	2	2	2	2	2	2	2	2	2	2
Construction of Watch towers	0.75	No			1	0.75			1			
Construction of Check post	1	No			1	1						
Renovation at Gorumara FRH	5	No			0.5	2.5	0.5	2.5				
Construction of DFO/ADFO's Qtrs.	10	No					1	10	1	10		
Construction of Bridge/culvert	0.5	No	2	1	4	2	4	2	4	2	4	2
Purchase of Patrolling Boat	0.5	No			1	0.5	1	0.5	1		1	0.5
Reconstruction of Forest Roads	0.25	Km	10	2.5	15	3.75	20	5	25	6.25	30	7.5
Purchase of vehicle	4	No			1	4	1	4				10
Purchase of Motor Cycle	0.5	No					2	1	2	1	2	1
Purchase of elephant	5	No					1	5	1	5	2	10
Purchase of R.T. sets	0.2	No	3	0.6	3	0.6	3	0.6	3	0.6	10	2
Purchase of arms & ammunition	0.3	No	3	0.9	3	0.9	3	0.9	3	0.9	3	0.9
Constr. of Boulder-Sausage structure for roads/embarkment prot'n	0.0025	Cu.m	400	1	600	1.5					1000	2.5
Maintenance of fire lines	0.01	Km	60	0.6	60	0.6	60	0.6	60	0.6	60	0.6
Construction of cattle-proof trenches	0.5	Km			5	2.5	5	2.5	5	2.5	5	2.5
P.O.L. for Deptl. Vehicle	0.5	No	3	1.5	4	2	5	2.5	5	2.5	5	2.5
P.O.L. for Motorcycle	0.15	No					2	0.3	4	0.6	6	0.9
SUB TOTAL				13.25		34.25		49.05		40.6		53.55
B.HABITAT IMPROVEMENT												
Overwood removal in grassland	0.02	Ha	40	0.8	40	0.8	40	0.8	40	0.8	40	0.8
Plantation of fodder grass after overwood removal	0.08	Ha	40	3.2	40	3.2	40	3.2	40	3.2	40	3.2
Canopy opening in Mono-culture plantation.	0.025	Ha	40	1	40	1	40	1	40	1	40	1

(RS. IN LAKHS)

	Rate	Unit	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
			Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.
Plantation of bamboo/fodder after canopy opening	0.08	Ha	40	3.2	40	3.2	40	3.2	40	3.2	40	3.2
Plantation of fodder grass in blanks/ thatch areas,	0.08	Ha	20	1.6	20	1.6	20	1.6	20	1.6	20	1.6
RDF pltn. in Forest blanks	0.09	Ha	5	0.45	5	0.45	5	0.45	5	0.45	5	0.45
Infilling vacancies in 1st yr of pltn.	0.015	Ha			80	1.2	80	1.2	80	1.2	80	1.2
Infilling vacancies in 2nd yr of pltn.	0.01	Ha					80	0.8	80	0.8	80	0.8
Weed Eradication & Climber cutting	0.01	Ha	50	0.5	50	0.5	50	0.5	50	0.5	50	0.5
Cut back and controlled burning of old fodder grass areas.	0.015	Ha	40	0.6	40	0.6	40	0.6	40	0.6	40	0.6
Mechanical & Silvicultural thinning in older pltn.	0.025	Ha	20	0.5	201	5.025	20	0.5	20	0.5	20	0.5
Construction of water holes	0.50	Ha			1	0.5	1	0.5	1	0.5	1	0.5
Construction of water conservation structure	1.00	Ha	1	1	1	1	1	1	1	1	1	1
SUB TOTAL				12.85		19.08		16.35		15.35		16.35

C. REDUCING MAN-ANIMAL CONFLICT

Erection of power fencing	0.2	Km	5	1	5	1	5	1	5	1	5	1
Purchase of search lights/crackers	0.05	Set	2	0.1	2	0.1	2	0.1	2	0.1	2	0.1
Introduce non-browseable cash-crops in forest fringes	0.08	Ha	20	1.6	20	1.6	20	1.6	20	1.6	20	1.6
Purchase of tranquillising guns & drugs/medicine	0.5	Set			1	0.5			1	0.5		
Constr. of winch-mounted trucks for transportation of wild animals	7	Set					1	7				
Construction of sledges for dragging tranquillized animals	0.5	Set							1	0.5		
Construction of trap cages for straying animals	0.25	Set			2	0.5	2	0.5	2	0.5		
Purchase of special nets for trapping wild animals	0.15	Set	2	0.3	1	0.15	1	0.15	1	0.15	2	0.3
Construction of anti-depredation voluntary squads in villages	0.1	Set	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5
Hiring vehicles for anti-depredation squads	0.75	No	1	0.75	1	0.75	1	0.75	1	0.75	1	0.75
SUB TOTAL				4.25		5.1		11.6		5.6		4.25

D. REDUCING GRAZING PRESSURE

Cultivate fodder on private land for rotational grazing	0.05	Ha	5	0.25	5	0.25	5	0.25	5	0.25	5	0.25
Cattle improvement programme in fringe EDC village	0.1	Camp	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5
Purchase fodder for departmental elephants from Ramsai farm	0.1	No	1	0.1	2	0.2	3	0.3	4	0.4	5	0.5
Distribute tree fodder seedlings for F/F prog. in EDC village	0.025	Ha			10	0.25	10	0.25	10	0.25	10	0.25
SUB TOTAL				0.85		1.2		1.3		1.4		1.5

(RS. IN LAKHS)

	Rate	Unit	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
			Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.
E. VETERINARY CARE FOR WILD ANIMALS, DEPARTMENTAL ELEPHANTS & FRINGE AREA CATTLE												
Establishment of veterinary testing centre at Latagiri	2	No							1	2		
Purchase of laboratory equipment & testing chemicals	1	LS							1	1		
Immunisation programme for fringe cattle & domestic elephants	0.1	EDC	5	0.5	5	0.5	5	0.5	5	0.5	5	0.5
Creation of Rescue Centre at Gorumara/Lataguri	3	LS	0.5	1.5	1.5	4.5						
Purch. of vet. Drugs for de-worming & treatment of injured animals	0.5	LS			1	0.5	1	0.5	1	0.5	1	0.5
Construction of squeeze cage for treatment of rescued animals	0.5	No					1	0.5				
Maintenance of rescue centre	1	LS			1	1	1	1	1	1	1	1
SUB TOTAL				2		6.5		2.6		5		2
F. TRAINING, MONITORING & RESEARCH												
In-house training of staff in wildlife management/mahout training etc.	0.25	No	2	0.5	2	0.5	2	0.5	2	0.5	2	0.5
Training of Officers & Staff at training institute	0.5	No			1	0.5	1	0.5	1	0.5		
In-house monitoring of achievements vis-a-vis targets & objectives	0.5	LS			1	0.5	1	0.5	1	0.5	1	0.5
Evaluation & achievements of goals vis-a-vis objectives of mgmt	1	LS									1	1
Carrying out Deptt. research on identified topics	1	No			1	1	1	1	1	1	1	1
Collaborative research on Gorumara NP	2	No			1	2	1	2	1	2	1	2
SUB TOTAL				0.5		4.5		4.5		4.5		5
G. ECO-TOURISM, PUBLICITY, AWARENESS GENERATION												
Printing publicity materials/booklets	0.5	LS	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5
Making badges/Poster/Souvenirs items for publicity	0.5	LS	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5
Creation/Extension of N.I.C.	3	No	1	3			1	3			1	3
Equipment for N.I.C.	0.5	No	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5
Development of camping sites	1	No			1	1			1	1		
Procurement of equipment for camping facility	1	Set			1	1			1	1		
Developing nature trails	1	No					1	1			1	1
Construction of nature observatory	1	No			1	1	1	1	1	1	1	1
SUB TOTAL				4.5		4.5		6.6		4.5		6.5

(RS. IN LAKHS)

	Rate	Unit	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
			Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.	Phy.	Fin.
H. CAPTIVE BREEDING / REINTRODUCTION PROGRAMME												
Setting up reintroduction centres for:												
i) Gharial	2	Set			1	2						
ii) Spotted Deer	1	Set	1	1	1	1						
Cost of procurement from Lucknow zoo / Calcutta zoo	2	LS	1	2	1	2						
Improvement of deer reintroduction centre	1	LS					1	1	1	1	1	1
Programme for translocation of two female rhino from Jaldapara to Gorumara and 2 female rhino from Gorumara to Jaldapara to improve genetic stock	2						1	2	1	2	1	2
Radio collaring & monitoring the male rhino migrates from Assam after releasing in the wild	1						1	1	1	1	1	1
SUB TOTAL				3		5		4		4		4
I. ECO-DEVELOPMENT ACTIVITIES												
Input for EDCs @ Rs. 5 lakhs per year per EDC for various capability-building, income-generating activities and training of staff and EDC members including coordination establishment at various levels	5	No	2	10	4	20	6	30	10	50	14	70
SUB TOTAL				10		20		30		50		70
GRAND TOTAL				51.2		100		125		131		162



STATUS REPORT ON ORANG WILDLIFE SANCTUARY
ASSAM FOREST DEPARTMENT

1. INTRODUCTION

1.1. BACKGROUND

The Orang Wildlife Sanctuary is located within the geographical limits of 92° 16' E to 92° 27' E longitude and 26° 29' N to 26° 40' N latitude. The sanctuary falls under two civil districts viz. Darrang and Sonitpur, State of Assam, on the northern bank of the Brahmaputra Rver.

The Orang Wildlife Sanctuary can be approached from NH 52 through gravel roads running from Orang town and Dhansiri Mukh. It is 65 kms (approx.) from Tezpur town and about 120 kms from Guwahati City.

1.2. PAST HISTORY

The area was previously an abandoned village where 26 manmade ponds still exist. Some of the areas were covered with various species of grasses, which invited some wildlife and for conservation and protection of these wildlife in this area, the area was declared as "Orang Game Reserve" covering an area of 8054.0 hectare, vide O. No. 2276 / R, dtd, 31.05.1951.

During 1931, an area of 1729.0 hectare had been de-reserved from the Northern side of the reserve to settle farmers under the grow more food campaign- vide O. -No. 3378/R, Dtd. 30.11.1931. Again, an area of 873.0 hectare had been added to the Game Reserve as 1st addition on 18.06.1969. Thus total area of the Game Reserve came to an area of 71.98 km².

i.e. =	a. No. 2276/R, Dtd. 31.05.1915	-	80.54 km ²
	b. No. 3378/R, Dtd. 39.11.1931	-	17.29 km ²
	(De-reserved):		
	c. 1st addition, Dtd 18.06.1969	(+)	8.73 km ²
	Total	=	71.98 km²

Later, during 1985 covering an area of 75.60 km² was notified as Wildlife Sanctuary 'vide Govt. notification - Frs.133 / 85 / 5, Dtd. 20th September, 1985. Again, during Feb / 90 an area of 320 hectare had been included into the sanctuary in the western boundary.

As a part of the afforestation programme during 1960-62, Orang Game Reserve was taken up by afforestation Division and from 1962 to 1965 a total area of 1328.03 hectare of the game reserve was planted species like *Gmelima arborea*, *Albezia procera*, *Lagerstromea flosreganae*, *Bombax ceiba*, *Dalbergia sissoo*, *Terminalia myriocarpa*, *Acacia catechu*, *Antyhirocephalus cadamba*, *Tectona grandis*, *Eucalyptus spp*, *Mischelia champaca* etc. Due to presence of additional staff engaged for planting works, led to better surveillance of the area indirectly resulted a better protection of wildlife, specially the precious Great Indian One-horned Rhinoceros, in other wildlife. Attempts to raise further plantation were ultimately given up in 1965 and completely dedicated to the cause of wildlife conservation and managed as wildlife sanctuary. The Orang Game Reserve Sanctuary was managed under the project tiger as an auxiliary reserve area from 1972 to 1981.

2. SURROUNDING AND THE STATUS OF BOUNDARY

The northern boundary runs along the de-reserved portion done during 1931 and is now in the form of a forest road up to Borsola crossing the Panchnoi River. The southern and eastern boundaries comprises the channels, and islands of the Brahmaputra River. The western boundary is also an artificial boundary demarcated by a trench from the villages.

The villages surround the entire area almost from its all sides. Even in the southern also, the islands of the Brahmaputra River are now inhabited by human habitation and the sanctuary is under constant biotic pressures.

3. GEOLOGY ROCK AND SOIL

The area comprised of alluvial flood plains of the Brahmaputra river. Two distinct alluvial terraces, the lower portion of mere recent origin along the river Brahmaputra and older upper portion to its North are separated by a high bank transgressing the sanctuary from East to West.

4. CONFIGURATION

The sanctuary on the whole is a flat land. The terrain is gentle slope from North to South. The altitude is 45 to 70 mt above MSL.

5. CLIMATE

The area enjoys typical subtropical monsoon climate. The major precipitation being during the period from May to September. The average rainfall is approximately 2000 mm. The temperature varies from 7° C to 35° C. The relative humidity ranges between 60% to 90%.

6. DRAINAGE

Both the Dhansiri and Pachnoi Rivers originate from the Bhutan hills and flow by the side and through the sanctuary respectively. The area is dotted by a number of abandoned course of river (channels) and artificial ponds.

7. FLOOD

The Orang Wildlife Sanctuary experiences annual flooding as the area is being situated in the flood basin of the Brahmaputra River. The higher northern terrace remains free from floods. The flush flood caused by the Dhansiri and Pachnoi Rivers causes damage to the higher layer of the area. The effect of flood in Orang is not much due to the northern higher terrace, as a result of no death to rhinos has so far been reported due to flood in the area. The Brahmaputra and the Dhansiri Rivers are eroding the southern as well as western parts of the area every year, which is one of the threat to the sanctuary.

8. VEGETATION TYPE

The vegetation of Orang Wildlife Sanctuary is basically 1) Eastern Wet Alluvial Grass Lands - 4d /2.5.2 (Chapman and Seth) and 2) Man-made Deciduous Forests.

9. FLORA AND FAUNA

9.1 FLORA AND VEGETATION COVERAGE

Table 1. Vegetation cover of Orang Wildlife Sanctuary

Habitat	Area in km ² (Approx.)
1. Thatch area	13.62
2. <i>Arundo donax</i> and <i>Erianthus revenae</i> area	12.98
3. Wetland area	09.53
4. Pure Forest area	14.27
5. Natural area	09.98
6. Plantation area	09.38
7. Brahmaputra char area	09.04
Total	78.8

The details of vegetation cover are as shown in table no. 1. From the table it is seen thatch and grasses cover major portion of the sanctuary. In the grasslands several tree species are occasionally found. The common grasses are *Saccharum spp.*, *Imperata cylindrica*, *Themeda arundinae*, *Fragmities kakra*, *Erianthus ravanae* etc. In fresh alluvial deposit areas, the *Saccharum spp.* dominated with *Tamarix dioca* and colonizer. A little further away, association of *Erianthus ravanae*. *Saccharum spp.*, *Arundo donax* is seen. The shorter grasses, *Imperata cylindrica* predominate along the banks of Dhansiri and Pachnoi.

Along the edges of water bodies, on the seasonally inundated area contain shorter grasses like *Cynodon dactylon*, *Hemarthia compressa*, such grass land areas are favorite foraging sites for herbivores.

The Water bodies support a variety of aquatic vegetation, some of which are predominated by water hyacinth. Other species seen in these areas are *Andropogon spp.*, *Ipomea spp.*, *Enhydra fluctuans*, *Pistia spp.*, *Lemna spp.*, *Nymphaea spp.* etc. The main waterbeds of the higher terrace contain *Nelumbo spp.*

In addition to plantations, woodlands are mostly confined to the high land only. There are few natural patches of miscellaneous formation containing mainly *Acacia catechu*, *Bombax ceiba*, *Albezzia procera*, *Trewa nudifera*, *Biscofia javanica*. *Dalbergia sissoo* etc.

9.2 FAUNA

The Great Indian One-horned Rhinoceros *Rhinoceros unicornis* is the dominant species of the Sanctuary. The other species sharing the habitat are Royal Bengal Tiger (*Panthera tigris*), Asiatic Elephant (*Elephas maximus*), Hog Deer (*Axis porcinus*), Wild Boar (*Sus scrofa*) etc. Besides these there are other small mammals like Civet cats, Leopard Cat, Hare, Porcupine etc.

There is no full-fledged survey of the genetical resources with regards to the fish fauna. However, common fishes available in the sanctuary are *Labeo rohita*, *Labeo bata*, *Labeo nandina*, *Heteropneustes fossilis*, *Calisa faciatus*, *Clarius batracus*, *Channa striatus*, *Channa punctatus*, *Channa marulius*, *Catla catla*, *Pmhipnous cushia*, *Mystus seenghala*, *Mistus vittatus*, *Notopterus notopterus*. *Ompok pabo*, *Wallago attu* etc.

Among the reptiles, *Lissemys punctata*, Genus *Python*, *Kachuga tecta*, *Ophiophaqua hanna* is common.

The Orang Wildlife sanctuary is also rich in butterflies and honeybees. among the butterflies available are *Danus crysippus*, *Danus limniace*, *Danus plexippus*, *Badamia exclamation*, *Coprona ransemnsti*, *Harsora chromas*, *Pamara mathis*, *Amblypodia anita*, *Castalius resimen*, *Euchryseps cnvusy*, *Jamides colene*, *Lampides beaticus*, *Syntarucus plinius*, *Virachola isocretes*, *Zizeeria maha*, *Zizina otis*, *Acraea vesta*, *Acraea tersicora*, *Ariande ariadne*, *Cethosia biblis*, *Charaxes bernardus*, *Charaxes solon*, *Euthalia garuda* etc. Among the honey bees *Apis dorsata*, *Apis cerna*, *Maffia spp.* are available (study required).

The Orang Wildlife Sanctuary is also rich in avifauna. There is a breeding colony of spot bill pelican, called -"Bhelajar". According to the BNHS, after Manas National Park, Orang Wildlife Sanctuary is the most important habitats of Bengal Florican in Assam. Estimated population is 30 - 40 nos. Regarding other species of birds in the sanctuary, a checklist has been prepared by Sri B. N. Talukdar, and Sri P. Sarma.

10. ANIMAL CENSUS

The first-ever detailed census in Orang Sanctuary was conducted during 1985 covering an area of about 61.70 km². A total of 65 rhinos were counted in the area which are shown below:

RESULTS OF THE 1985 RHINO CENSUS

Adult			Sub-adult			Total
M	F	U/S	M	F	U/S	
23	23		7	2	10	65

Another detailed census in Orang Wildlife Sanctuary was carried out during 1991 covering an area of about 80 sq. km. including the islands of the Brahmaputra River. The Sanctuary was divided into 20 census blocks and counted the number of rhinos. The result are shown as below:

RESULTS OF THE 1991 RHINO CENSUS

Adult			Sub-adult			Total
M	F	U/S	M	F	U/S	
28	41	5	7	14	8	98

The Other mammals counted during the 1991 census are :

1	Hog deer	897
2	Wild boar	421
3	Royal Bengal Tiger (sighted)	9
4	Asiatic Elephant	5

And 8 Bengal Floricans were sighted during census. During the year 1997 tiger census was carried out and the estimated population is 28 (not declared).

11. ADMINISTRATIVE SET UP

The Chief Conservator of Forest cum Chief Wildlife Warden heads the Wildlife organization of the state of Assam. All matters relating to the policy, planning and budget etc. looked after by him, and his office is at Guwahati.

The Orang Wildlife Sanctuary is under the Mangaldoi Wildlife Division, with the headquarters at Mangaldoi. The actual extension of works in the field, supervision of patrolling duties, etc., are carried out by the Range Officer, Orang Wildlife Sanctuary. Whose office is at Silbori, inside the Sanctuary. At present there are staff of different categories in the control of Range Officer who are engaged for field works like supervision of developmental works, anti-poaching, anti-depredation and other official

works. Forest Staff of Orang Wildlife Sanctuary under different categories are shown in the table below.

12. PATROLLING ROADS AND PATHS

During winter season all camps of Orang Wildlife Sanctuary can be approached by jeep or light vehicle. A total of 90 kms (Approx.) Jeepable roads are available in the sanctuary which gives a good network for supervision of the sanctuary.

Sl. No.	Categories of Staff	Number
1	Ranger	1
2	Dy. Ranger	1
3	Forester-I	3
4	Forester-II	1
5	Forest Guard	16
6	Game Watcher	5
7	Boat Man	10
8	Mahout	10
9	Grass Cutter	4
10	Driver	2

13. ANTI-POACHING CAMPS

The Sanctuary has an established network of anti-poaching camps spreading all over the sanctuary. Altogether there are 21 such camps spreading over the area which give effective protection from the poachers. Most of the anti-poaching camps are temporary thatch huts. More camps are required for effective anti-poaching and anti-encroachment drive. The mortality of rhinos in Orang since 1980 is shown below

14. WIRELESS COMMUNICATION NETWORK

The Orang Wildlife Sanctuary has good network of wireless communication. There are two (2) Fixed station and fifteen (15) walkie-talkie in the sanctuary. Of course the wireless network, will have to be improved further in near future, which is very important from communication point of view.

Year	Natural Death	Death Due to Poaching	Total
1980	2	3	5
1981	3	2	5
1982	8	5	13
1983	9	4	13
1984	7	3	10
1985	1	8	9
1986	1	3	4
1987	3	4	7
1988	2	5	7
1989	3	3	6
1990	1	0	1
1991	2	1	3
1992	3	2	5
1993	2	1	3
1994	4	6	10
1995	8	9	17
1996	4	10	14
1997	3	11	14
1998	3	12	15

15. ARMS AND AMMUNITION

The staff of Orang wildlife Sanctuary is equipped with ".315" rifles and shot guns. There are four (4) SBBL gun, two (2) DBBL gun and sixteen (16) .315 rifle in the sanctuary. More improvement is required for effective protection of rhinos, tigers and other precious wildlife of the sanctuary by acquiring more numbers of arms and ammunition.

16. VEHICLES

There are two light vehicles in Orang WLS for discharging patrolling duties and other works of the sanctuary. Some more vehicles are required for carrying out effective patrolling duties and other developmental works.

17. BOATS

Boats are required for patrolling duties carrying ration and anti-poaching staff posted in remote places specially during flood season. Only few camps are equipped with country boats. There are two (2) OBM and nine (9) country boats for patrolling. Some faster moving motor boats are required for apprehending smugglers who come to the sanctuary through rivers and *nallahs* specially during the flood period.

18. ELEPHANTS

There are 21 elephants including out of which 12 matured individuals are working while the rest are calf. The working elephants are used patrolling duties and carrying rations for anti-poaching staff posted in the remote areas of the sanctuary.

19. FINANCIAL INPUT

The fund flow from the year 1989-90 to 1993-94 is summarised below which has been categorised as plan schemes and non plan schemes.

Year	Name of Schemes	Plan Scheme	Non-Plan	Total
1989-90	Rhino Conservation Scheme (Centrally Sponsored Scheme)	7,76,000.00	-	7,76,000.00
	Other Wildlife Area	-	-	
1990-91	Rhino Conservation Scheme (CSS)	13,04,000.00	-	19,47,000.00
	Other Wildlife Area	6,43,000.00	-	
1991-92	Rhino Conservation Scheme (CSS)	9,18,000.00		29,79,000.00
	Other Wildlife Area	6,36,000.00	14,25,000.00	
1992-93	Rhino Conservation Scheme (CSS)	6,93,000.00		29,79,000.00
	Other Wildlife Area	4,20,000.00	16,30,000.00	
1993-94	Protected Areas	5,96,000.00		31,78,000.00
	Other Wildlife Area	7,02,000.00	18,80,000.00	

The fund flow from the year 1994-95 to 1997-98 is summarized below which has been categorized as plan schemes and non plan schemes.

Year/Heads	Pay	Wages	Other	Total
1994/95				
Non-Plan	14,10,021.00	30,679.00	1,71,800.00	16,12,500.00
R.C.S.	5,13,730.00	0	0	5,13,730.00
Other WL area/PA	0	2,59,302.00	5,26,989.00	7,86,291.00
1995/96				
Non-Plan	11,69,320.00	1,20,034.00	2,49,958.00	15,39,312.00
R.C.S.	7,42,433.00	0	0	7,42,433.00
Other WL area/PA	0	2,57,740.00	1,63,008.00	4,20,748.00
1996/97				
Non-Plan	18,12,220.00	36,018.00	2,52,730.28	21,01,562.00
R.C.S.	5,30,839.00	0	0	5,30,839.00
Other WL area/PA	0	34,018.00	3,75,380.00	4,09,398.72
1997/98				
Non-Plan	18,73,686.00	1,65,111.35	2,08,367.00	22,47,164.30
R.C.S.	4,68,646.00	0	0	4,68,646.00
Other WL area/PA	42,944.00	6,14,668.00	0	6,57,612.00

19. CONCLUSION

The protection measures in Orang have to be improved further and it has been realised that the sanctuary needs more forest staff, arms and ammunition and other infra-structure to enhance anti-poaching initiatives. Poaching of rhinos and encroachment are the main threats to the sanctuary at present. Some Non-Governmental Organizations (NGOs) namely Rhino Foundation and Aranyak Nature Club of Guwahati, Green Society of Mangoldoi are helping the department in various ways to enhance conservation of flora and fauna in Orang.

The Orang has been already finally notified as Orang Wildlife Sanctuary in the year 1998 vide Govt. Notification No. FRW.28/90/116, dtd 17/3/98. To conserve and protect the important and endangered species, both flora and fauna, specifically the rhinos and tigers, a proposal has been submitted to the Govt. of Assam to declare Orang as a National Park to upgrade the conservation measures. The proposal is under consideration of the state government.



A STATUS REPORT ON POBITORA WILDLIFE SANCTUARY

INTRODUCTION

50 km east of Guwahati on the southern bank of the Brahmaputra River, in the District of Morigaon, Assam situates the Pobitora Wildlife Sanctuary. It was originally a grazing Reserve (P.G.R.) before 1971 providing grazing facilities to the surrounding villages together with permanent Bullalo "Khuties". Finally, during 1971, two P.G.Rs covering an area of 1,584.62 hect. were constituted into a Reserve Forest vide govt. notification No. FOR/SETT/542/65/54, dt. 8/11/71.

Due to increase of rhino population, more areas were subsequently added to the Pobitora Reserve Forest and was declared as Pobitora Wildlife Sanctuary vide Govt. notification No FWR19/87/39 dt.16/7/87. Pobitora proved to be a suitable homeland for rhino and its population showing considerable increase in last decade. Considering this the Sanctuary area is extended to 38.84 km². vide govt. notification No. FRS 19/87/152 dt. 17/3/98.

BASIC INFORMATION

The climate of the Pobitora W.L. Sanctuary can be treated as sub-tropical monsoon type with three district season. The dry mild winter which experience occasional showers i.e. Nov. to Mid Feb. This period has an average maximum temperature of 20^o C and average minimum temperature of 9^o C. The humidity at this time is 40%. This is followed by a humid and windy summer i.e. from mid Feb to May with maximum temperature of 35^o C and minimum of 12^o C. The latter part of this period experiences rains.

The rainy season, i.e. from May to Sept., experiences an average rainfall of 2000mm. This period is both hot and humid. The maximum average temp being 25^o C and humidity is above 95%.

The entire area is part of the Brahmaputra flood plains. Being low-lying it is subject to annual floods. The soil is termed as fertile clayey-loam with silt.

The Garanga Beel and Haduk Beel are the perennial sources of water in the Sanctuary. The shallow nallahs also scattered all over the sanctuary. Though there is no any water scarcity in the sanctuary after heavy flood this year all the wetlands were heavily silted.

FLORA AND FAUNA

The vegetation of the sanctuary is classified in three distinguished forest type.

- 1) Eastern wet alluvial grassland
- 2) *Barringtonia* swamp, Forest.
- 3) Low alluvial savannah (*Salmania-Albizzia*) wood land

Due to excessive grazing for years together, a 'PAN' has already been formed on the soil for which growth of grasses inside the Sanctuary are stunted comparatively than similar areas in out-side. The intensity of grazing is highest during the winter season.

An area of 1 km² area was fenced up during 1990 for releasing *Cervus eldi eldi* (Manipur brow-antlered deer) at the heart of the Sanctuary. As a result of protection from grazing, better growth of grasses and profuse regeneration of *Albeggia procera* (Koroi) could be seen in this area. A thin layer of tree belt covers the southern corner of the Sanctuary along the bank of Garanga Beel. This part is comparatively a bit higher than the rest of the area.

Proper survey of growing stock of the flora has not yet been taken out. Roughly, the present land use may be estimated as follows:

Proper survey of growing stock of the flora has not yet been taken out. Roughly, the present land use may be estimated as follows:

a) Tree land	13.09%
b) grass land	72.25%
c) Perennial water logged area	10.61%
d) Swampy area	4.05%

The following species are commonly found on the Sanctuary:

Albezia procera, Salmainia malabaricum, Baringtonia acutenguia, Strabler asper, Streculia vilosa, Triwia mediflora, Casca fistula, Tetramilis nudiflora, Legestromea flosregance, Ugenia spp, Ficus spp, Lenea grandis, Toona ciliata, Erianthus ravanae, Saecharum elephantimus, Imparata cylindrica, Pollinia ciliata, Phongmites kakra, Saeherum munja, Arundo dank, cynodon doctylon, Lopomea reptans, Enhydra fluctuans etc.

Pobitora W.L. Sanctuary is already included in the world map for the highest density of rhino population. Apart from rhino the other mammals recorded are :

- | | |
|---------------------------|-------------------------------|
| 1. Common leopard | 12. Feral buffalo |
| 2. Jungle cat | 13. Flying fox |
| 3. Fishing cat | 14. Short nosed fruit bat |
| 4. Leopard cat | 15. Rhesus macaque (visitors) |
| 5. Wild boar | 16. Barking deer (visitors) |
| 6. Large Indian civet cat | 17. Grey mask shrew |
| 7. Small Indian civet cat | 18. Common house rat |
| 8. Common fox | 19. Three striped squirrel |
| 9. Jackal | 20. Small Indian mongoose |
| 10. Rufous-tailed hare | 21. Crab eating mongoose |
| 11. Chinese pangolin | 22. Smooth Indian otter |

Apart from mammals, so far 36 spp. of fish and eight species of fresh water turtle & terrapin were checklisted.

Pobitora W.L. Sanctuary is a birds paradise. So far 214 spp of birds were check listed. The waterfowl census has been carried out for last 9 years continuously. First year we have counted more than 20,000 birds inside the sanctuary.

RHINOCEROS UNICORNIS (POPULATION DYNAMICS)

When Pobitora was declared as R.F. in the year 1971 only 8 rhino's were sighted. After introduction of forest management in Pobitora the rhino population started increasing visibly up to 56. In 1987 scientific grassland management was introduced in these areas too following the good result of the system yielded at Kaziranga National Park and Orang Wildlife Sanctuary.

The census result of Pobitora W.L. Sanctuary is given below:

YEAR	ADULT			SUB-ADULT			CALF	TOTAL
	M	F	U	M	F	U		
1971								8
1987	17	19		5	8		5	54
1993	18	21	1	1	2	2	11	56
1995	11	28	3	3	1	13	9	68

In a span of 25 years, the rhino population in Pobitora has increased from 8 to 68. However the area under present management is only 16 km², and has remained the same. Though the area is extended up to 38.84 km² the rest of the areas are yet to be handed over to forest department.

Along with that the sanctuary is facing various adverse factors.

- a) Excessive live stock grazing.
- b) Siltation.
- c) Flood.
- d) Encroachment.
- e) Fragmentation.
- f) Poaching.

Due to over population around 25 to 30 rhino's stray out from the sanctuary and raided the adjacent crop. Very frequently, mainly during winter rhinos of Pobitora stray out of Mongoldoi, Panbari, Kurua, Jagiroad, Amsoi, Dharamtul covering an area of 1000 km².

Flood is another major threat to the rhino population. As Pobitora does not have any highland, flood causes major health problems to the animal. This year Pobitora has faced the worst flood of the decade. During flood 2 rhino calves died.

Due to flood, almost all the lakes, *nalas*, were heavily silted causing water scarcity during winter. Hence rhino stray out from the sanctuary for their regular water activities and become easy pray to the poachers.

Encroachment is also a problem to the sanctuary. Around 300 *Bighas* of land were encroached. The entire matter is sub judice at Guwahati High Court.

Fragmentation is also a major problem to the rhino population. Due to large scale settlement of human population in adjacent areas, all the migration track was blocked, which may create heterozygotical effect on entire population.

Livestock grazing also one of the acute adverse problem to the sanctuary. Around 50% of the total grass land have been degraded due to overgrazing of livestock. In few areas the grass height is found to reduce to 25 to 30 cm. In the last flood the sanctuary was under water continuously for more than 40-45 days, which have also affected greatly to the grass land.

Poaching is still a uncontrollable problem to the Sanctuary. The rate of poaching at Pobitora W.L. Sanctuary is 3.30%. The detail poaching record are given below.

YEAR	BULLET	PIT	ELECTRO-CUTION	POISON	TOTAL
1987	-	-	-	2	2
1988	3	-	-	-	-
1989	2	-	2	-	4
1990	2	-	-	-	2
1991	1	-	-	-	-
1992	1	-	2	-	3
1993	4	-	-	-	4
1994	-	-	-	-	4
1995'	2	-	-	-	2
1996	1	-	4	-	5
1997	3	-	-	-	3
1998	3	-	1	-	4

From the year 1998 a very strong Initiative were taken to down the poaching. Due to overall effort of the forest staff 11 poachers were arrested, One rhino horn was recovered and 6 arms along with ammunition and other poaching materials were recovered.

INFRASTRUCTURE

The Sanctuary is manned by 76 Staff (regular) and is having 21 camps in and around the Sanctuary. The infrastructure, presently in use for anti-poaching activity is as follows

- 1) Vehicle 1 (Maruti Gypsy) donated by U.S. Fish and Wildlife Deptt. Through Ronthombhore Foundation.
- 2) Arms & Ammunition
 - a) 315 Rifle - 22 Nos.
 - b) DBBL (12 Box) - 5 Nos.
- 3) Wireless
 - a) VHF - 1 set.
 - b) Walkie Talkie - 15 Sets (9 Sets donated by U.S. F&W Deptt. through Rhino Foundation.
- 4) Boat
 - a) OBM - 1(Yamaha engine with fibre boat.
 - b) Country Boat 1 Nos.
- 5) Elephant 5 Nos.

EXPENDITURE

In a nutshell, the expenditure incurred for Pobitora W.L. Sanctuary for the last three Financial Years are shown below. The major component of the expenditure is salary and wages for both Non-Plan and Plan heads.

Year	Amount Sanctioned(Rs)		Amount Spent (Rs)
	(For both Laokhawa & Pobitora WL)		
1995-96	Plan	61,28,650	21,95,446.00
	Non Plan	30,43,000.00	9,25,848.00
	Subtotal	91,71,650.00	31,21,294.00
1996-97	Plan	56,15,438.00	26,66,910.00.
	Non-Plan	27,29,000.00	7,68,609.00
	Subtotal	83,44,438.00	34,35,519.00
1997-98	Plan	62,82,116.00	27,28,843.00
	Non-Plan	30,35,000.00	11,04,648.00
	Subtotal	93,17,116.00	38,33,491.00



STATUS OF RHINOCEROS UNICORNIS IN MANAS NATIONAL PARK

DR. S.P. SINGH, I.F.S., FIELD DIRECTOR, PROJECT TIGER, MANAS

1. INTRODUCTION

Indian One-horned Rhino, one of the five surviving species of rhinos in the world namely, the African black rhino (*Diceros bicornis*), African white rhino (*Ceratotherium simum*), Sumatran rhino (*Dicerorhinus sumatrensis*), Javan rhino (*Rhinoceros sondaicus*) and Indian rhino (*Rhinoceros unicornis*), is found only in small numbers in Manas at present.

2. HABITAT

About two thirds of the park constitutes an ideal habitat for rhino (S. Deb Roy: Tiger paper, 1991). The habitat of rhino in Manas comprises of open grasslands interspersed with marshes, swamps, and small water bodies called *Beels*. The grassland is of two types: the drier savannah, and a more swampy Terai. Both have wooded forest of the semi-evergreen or evergreen type in the immediate vicinity. Regarding the nature of these grasslands, two theories are in vogue. As per one theory, Savannah and Terai are edaphic-climaxes caused due to soil-conditions. Terai type occurs in areas with high water-table and successive layers of debris, humus, sand, silt, and clay. Savannah occurs in proximity of the Bhabhar where the water table is low and soil is a dry sandy loam with a layer of humus. Another theory, while not refuting the role of soil conditions, says that the grassland as a whole is a stage of arrested succession, i.e. biotic-climax caused due to the regular practice of burning the grasslands. Natural springs are common in the Terai region, and these are the places where all types of wild animals, including the rhino, congregate during the drier months.

Manas, along with Kaziranga once formed part of a contiguous and extensive rhino habitat in eastern India which is now reduced to small pockets. In earlier times, the population of rhino in Manas interbred with that of North Bengal forests on the western side, and with Orang, Pobitora, Bamadi and Kaziranga on the eastern side. But now, due to fragmentation of the forests and development of human habitation in-between, the rhino population in Manas has become isolated and is probably undergoing genitic drift.

To the question as to why the rhino population in Manas has never been as large as that of Kaziranga, inadequacy of wallowing space is cited as a limiting factor for population growth. Indeed there seems to be a strong correlation between rhino distribution and rainfall distribution, drier zones with longer seasons like Manas enjoying smaller populations. Manas itself has a vast dry and rocky terrain to the north called Bhabhar where rhino population seldom ventures. But for the Ai, Beki and Manas rivers, most of the streams and *nallahs* are seasonal, and do not allow for sufficient wallowing for the rhino. Though the larger among *Beels* and perennial, most of them are nothing more than shallow natural depressions seasonally storing rainwater. Among the grasslands too, savannah is a relatively drier type.

In the past, locations in Manas national park where good chances of siting a rhino existed were, Garuchara, Rabang, Gundabil, Sarpuli, Lathajhar, Biati, Panbarijhar, Raisinglazhar (all under Bansbari Range), Sikangandha, Bilattari, Makibaha, Sanmari nala, Koraibarizhar, Bansbari Nala (all under Bhuyanpara Range), Sandan Nala and Gabharukhunda Nala (all under Panbari Range) (See map attached). The overall population was estimated to be more than 80 individuals which was slowly increasing prior to the Bodo agitation (S. Deb Roy: Tiger Paper, March 1991) though systematic census was possibly not carried out for the rhino. The park was affected since 16.02.89 when the first armed attack occurred at Lafasari Beat under Panbari range, where two staff were killed. This was followed by a series of gory attacks on the Beats and Camps, and the resultant evacuation of staff from the interior locations in Panbari and Bhuyanpara Range. This in turn had left the habitat of rhino under

these two ranges unguarded and vulnerable to poaching. Monitoring of rhino populations could not be done on regular basis due to disfunctioning of the camps and tenuous law and order situation. For a while, Bansbari Range was relatively less affected by the violence and monitoring was carried out regularly. But even this could not be sustained after the attack on Bansbari Range H.Q. in march 1993 in which the Range Officer himself was seriously wounded. Miscreants thereafter took advantage of the situation, and poached 22 rhinos in Bansbari Range in 1993 alone. Most of the poaching was by gunshot. Presently, the rhino population in the park is not expected to be more than 10 individuals based on direct sightings and hoof marks near waterholes. This is mostly confined to Lathajhar, Garuchara, Giat, Narayanguri areas. The exact numbers, composition, pattern and viability of the population can be determined only after conducting a systematic census.

3. MORTALITY

A total of 53 rhino deaths were reported since 1990 due to natural causes as well as poaching. The mortality details year wise are given in Table 1, below.

Table 1: Losses of rhino in Manas National Park

Year	Poached	Other	Total
1990	1	3	4
1991	3	2	5
1992	11	4	15
1993	22	1	23
1994	4	-	4
1995	1	-	1
1996	-	1	1
1997	-	-	-
1998	-	-	-
Total	42	11	53

4. FINANCIAL ASSISTANCE FOR RHINO CONSERVATION

It is worth mentioning that the fund under Rhino Conservation Plan Scheme is being allotted only for the payment of salary and wages of the staff since the last few years. Even the financial assistance under the Schemes for Project Tiger, Eco-development and Biosphere has been erratic and is meant only for the general management work in the Park. The details of expenditure are given below in Table II.

5. THREATS

One of the main threats to rhino in Manas has been poaching, partially due to growing militancy in the area and inadequate protection measures. The second alarming threat is the very low population which may not be in viable numbers.

6. IMMEDIATE STEPS TO BE TAKEN FOR THE RESTORATION OF RHINO POPULATION

Though most of the rhino habitat is intact and continues to enjoy greater diversity in plant species palatable to rhino, the population of rhino under some of the habitat in Panbari and Bhuyanpara Ranges seems to have been almost wiped out, and that in the rest of the habitat under Bansbari Range reduced to below threshold levels. In order to restore the past glory of the park and ensure that the rhino population in Manas is not totally wiped out, a strong armed contingent may be deployed at Uchilla and other identified locations from where anti-poaching operations can be undertaken effectively.

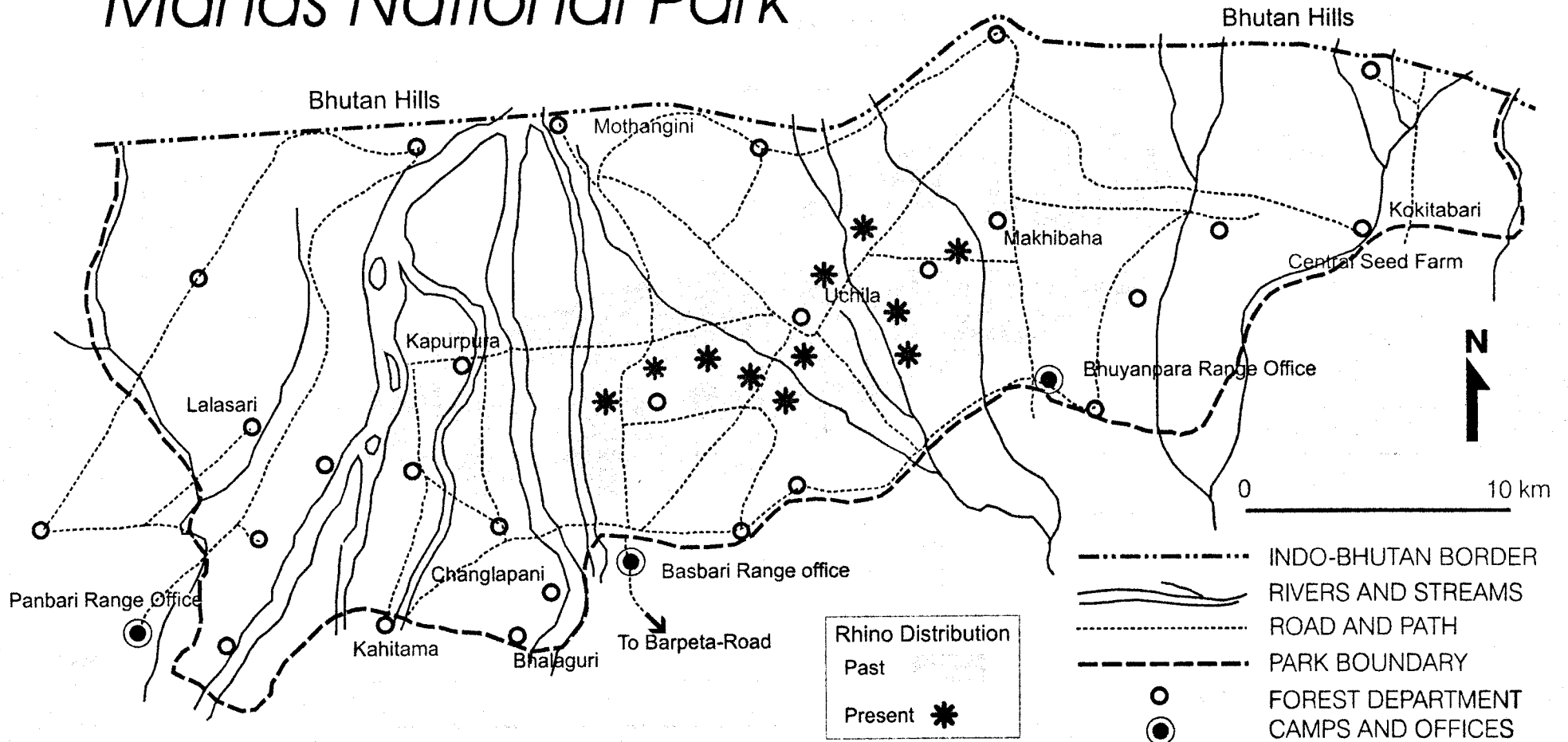
It is equally important to know the exact number and composition of the remaining population of the rhino. A census is required to be conducted as and when the funds and armed personnel are made available. Once this is done, further strategies, including translocation of some individuals from other areas if needed, can be formulated to save rhinos of the Manas National park from extinction.

Table II: Statement of Fund Allocated and Utilized under Plan Scheme

Year	Scheme	Total amount sanctioned (Lakhs.)	Amount utilized	Remarks
1995-96	Project Tiger	95.55	70.18	Only recurring expenditure is done
	Biosphere	13.45	-	The amount was not released by State Govt.
	Eco-development	5.20	-	The amount was not released by State Govt.
1996-97	Project Tiger	86.47	86.47	
		16.30	16.30	Unspent balance of 95-96 revalidated for 96-97
	Biosphere	47.00	47.00	
		13.45	13.45	Unspent balance of 95-96 revalidated for 96-97
	Eco-development	8.80	8.80	
1997-98		5.20	5.20	Unspent balance of 95-96 re-validated for 96-97
	Project Tiger	110.30	58.35	Only salary and wages of the staff
	Biosphere	30.00	-	Fund not released by the State Govt.
	Eco-development	10.25	-	Fund not released by the State Govt.
1998-99 (Dec '98)	Project Tiger	70.00	51.00	Only salary and wages
	Biosphere	30.00	-	Fund not released by the State Govt.
		30.00	30.00	Unspent balance of 97-98 re-validated for 98-99
	Eco-development	-	-	
		10.25	10.25	Fund not released by the State Govt.

* Note: Under the Rhino Conservation Scheme, the fund was provided only for the salary of the staff by the State Government.

Manas National Park



MANAGEMENT OF THE REINTRODUCED GREATER ONE-HORNED RHINOCEROS (*RHINOCEROS UNICORNIS*) IN DUDWA NATIONAL PARK UTTAR PRADESH, INDIA²

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1. INTRODUCTION

The five species of Rhinoceros which still exist in the parts of Africa and Asia are subjected to serious threat as result of excessive poaching for its horn, illegal trade and habitat destruction. Twenty years ago the world population of Rhinoceros which was about 70,000 has dropped down to around 11,000 in recent time.

In Asia 3 species of Rhinoceros found are, the Great Indian one-horned Rhinoceros (*Rhinoceros unicornis*) found in India, Bhutan and Nepal. The smaller one-horned or Javan Rhinoceros (*Rhinoceros sondaicus*) found in Indonesia and Vietnam, and the Asiatic Two-horned Rhinoceros (*Dicerorhinus sumatrensis*) found in the parts of Indonesia and Malaysia in the wild.

The Great Indian one-horned Rhinoceros (*Rhinoceros unicornis*) which was once widely distributed from the foot hills of the Hindukush Mountain Range (Pakistan) to Myanmar and also all along the flood plain of Ganges River. In the last 200 years due to over hunting, fragmentation of habitat by clearing forest for cultivation, disparate land use for agriculture, extension of tea gardens, reclamation of grasslands and swamps for fulfilling the basic needs of expanding human and livestock population and uncontrolled fires were the major causes of elimination of Indian Rhinoceros from most of its former range of distribution. The last rhino in Uttar Pradesh (UP) was shot in the Pilibhit district adjacent to the Dudwa National Park (N.P.) in 1878 [1].

At present the Indian rhino population of around 1900 rhino are restricted to protected areas (PA) in Assam, West Bengal and Nepal. The Kaziranga NP in Assam has 1164 rhinos and the Royal Chitwan N.P. in Nepal 400 [2]. The remaining rhino populations with the exception of Manas, India, are surviving in small and insecure habitat patches with insecure future of survival (Table 1).

Table 1: Indian Rhino Population in India and Nepal (1993).

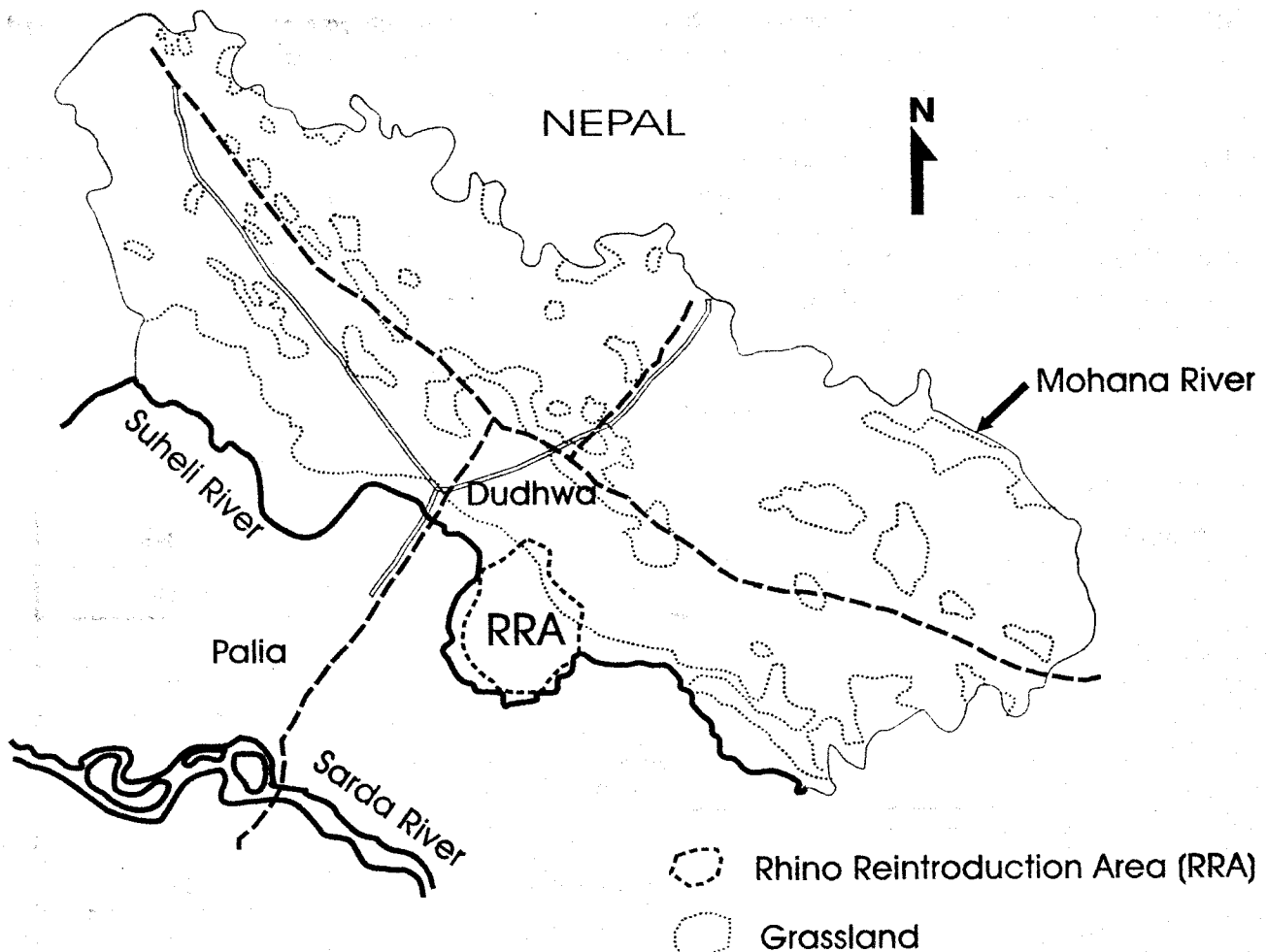
Country	State	PA	Number
INDIA	Assam	Kaziranga NP	1164
		Manas WLS*	60
		Orang WLS	97
		Pobitara WLS	39
		Other Areas	40
	West Bengal	Jaldapara WLS	35
		Gorumara WLS	12
NEPAL		Royal Chitwan and Bardia NP	400

* Present Status Uncertain

² Paper presented in the International Conference on the Rhinoceros Ecology and Management, San Diego, California, USA, 9-11 May, 1991

Despite the protective measures and dedication of field managers and forest staff to protect, the persecution of this animal continues due to rising price of Indian rhino horn in the International Market. In the Kaziranga NP between 1983-89, a total of 235 rhinos were killed by the poachers for horns [3]. The state of the clandestine rhino horn trade by [4] and new means of poaching in Kaziranga NP and mass poaching of rhinos in Manas NP is documented [5]. These examples are illustrative of the present threats to the rhinos and problems faced by the field forest staff and in number of cases field guards are killed by the poachers.

By considering the current highly restricted distribution with poaching pressure, habitat specificity and in consideration to the scattered small population, it becomes imperative to reintroduce the species in suitable habitats in its former range of distribution as one of the measures to be adopted for the long-term survival of this species. IUCN Rhino Specialist Group and the Rhino Sub-Committee of the Indian Board of Wildlife (IBWL) recommended the establishment of an additional rhino population in India [6]. The Dudwa N.P. fulfilled all the criteria required for the reintroduction among the various sites surveyed in India by a panel of experts [7]. Thus, Dudwa become the first and currently the only site of reintroduction of rhino in India during 1984-85. Another reintroduced rhino population exists in the Bardia N.P. Nepal.



Map 1

2. THE DUDWA NATIONAL PARK

The Dudwa National Park declared as Dudwa Tiger Reserve under Project Tiger in 1987 is in the Kheri district of Uttar Pradesh (UP) and lies between 28°18'N and 28°42'N latitudes and 80°28'E and 80°57'E

longitudes, approximately 30 km south of the Nepal Himalayas. It is 490 sq km in extent. With buffer zone of 124 sq km under the Park administration (Map. 1).

The park is a compact block of approximately 50 km in length by 10 km in width. The Mohana and Suheli Rivers constituted respectively the northern and the southern boundaries. An area of 25 sq km within Kakraha block surrounded by a power fence constitutes the Rhino Reintroduction Area (RRA). A section of the fence perimeter has a parallel stretch of trench. The RRA habitat is a mix of tall wet grassland, woodland complex with ten perennial swamps (Table 2). South of the RRA flows the river Suheli.

Table 2: Vegetation Types within RRA

No.	Vegetation Type	Area in hectares
1	Tall Grassland	343
2	Short Grassland	807
3	Marshy Grassland	563
4	Water Bodies (Aquatic vegetation)	107
5	Fringes & Riparian	107
6	Woodland	584

The vegetation consists of some of the best forests of Sal (*Shorea robusta*) in India, mixed moist forest, riparian communities, tall wet grasslands with patches of short grasses. Interspersed within the grasslands are a number of swamps within the park, grasslands cover 20% of the total area. So far, 75 species of trees, 21 species of shrubs, 17 species of climbers, 77 species of grass and grassland plants, 179 species of aquatic plants have been listed.

The list of larger vertebrates includes: tiger (*Panthera tigris*), Leopard (*Panthera pardus*), sloth bear (*Melursus ursinus*), jackal (*Canis aureus*), elephant (*Elephas maximus*), rhino (*Rhinoceros unicornis*), swamp deer (*Cervus duvauceli*), hog deer (*Cervus porcinus*), chital/spotted deer (*Cervus axis*), barking deer (*Muntiacus muntjac*), nilgai (*Boselaphys tragocamelus*), wild pig (*Sus scroffa*) and non-human primates includes common langur (*Presbytis entellus*) and rhesus monkey (*Rhesus mulata*).

Overall faunal documentation lists 40 species of mammals, 292 species of birds, 25 species of reptiles, 3 species of amphibians and 20 species of fish. Of these, 11 species of mammals, 6 species of birds and 5 species of reptiles are listed as endangered under Wildlife Protection Act of India 1972 updated to 1991. North of the National Park, and within India, lie patches of reserved forests, villages and agricultural fields of local tribals called *tharu*. Across the international boundary the forested areas are cut over, degraded and covered by human settlements. Along west, south and east are forested areas with interspersed sugarcane cultivation and villages.

3. RHINO REINTRODUCTION IN DUDWA N.P.

The reintroduction of rhino in Dudwa took place in two phases. The first phase in 1984, in which five rhinos comprising 2 males and 3 females were captured, and translocated to Dudwa from Pobitora WLS, Assam [6]. These animals were released in the Rhino Reintroduction Area (RRA) in a specially constructed stockades for health care and for experiencing electric fence before final release into the main fenced area of RRA.

4. MONITORING REHABILITATION OF THE REINTRODUCED RHINOS

In 1987, the Wildlife Institute of India in collaboration of the forest department, Uttar Pradesh, launched a project to study the rehabilitation process of the reintroduced rhinos. It was designed to focus on the ranging and habitat utilization patterns, the inter and intra specific behaviour and monitoring the general state of health. Apart from the investigations, the project handled all aspects of Managements of the RRA and also give training to the forest staff deputed to this project.

4.1 Monitoring Rhinos

Every day, four riding elephants were used to locate all the rhinos, seldom were all rhinos sighted everyday due to poor sighting in the tall grasslands condition. Except for a short period after the burning of grassland when most of the rhinos were located. Rhinos were also sighted on foot, using a motorcycle and from machan tops (observation platforms). Each location of rhino was recorded on a grided map of RRA indicating vegetation classification. Each grid cell on the ground was 100x100 meters.

4.2 Identification of individual Rhinos

All the adult rhinos were identified individually by recording different physical traits, such as: arrangement of the neck folds, tubercles, folds, length of tail, length of horn and shape, wound mark on body and shape of white pigmentation patch between horn and upper lip. [8]. Each rhino bears a name derived from either a river or a mountain.

5. STUDY RESULTS

5.1 General

The study reveal that in RRA, the rhinos used 55 different plants species belongs to 25 families as food in different seasons. These include grasses and herbs species (25) which is the major part of food, aquatic plants (9), tree species (12), climber (5), shrubs(5) and fern.

During winters, grass species accounted for 45% of the diet of rhinos, aquatic plants, 18% and the rest of the diet consisted of woody plants, climbers, shrubs and tree species.

Towards the end of winter, most of the grass species attain full maturity and start drying. Water levels in most of the water bodies starts receding. During this period the aquatic plants become more accessible. During winter, rhinos seek thermal cover in woodland and do not emerge from the woodland till the late morning hours.

The prescribed burning of grasslands within the RRA is accomplished between February or, latest, by March each year. During the period, rhinos feed on *Teliacora acuminata* a climber and leaves and twigs of a medium-sized tree *Malloutus phillippinensis*. Around tals (water bodies), rhino feed mainly on *Cynodon dactylon*, *Hygrorhyza cristata*, *Trappa* and *Vallesnaria*. Within 2-3 days following the grassland burning, rhinos start feeding on burned swards of tall grasses and lick the ash on the ground.

By adopting the [9] statistical technique, habitat preference of rhinos in terms of percentage area of a particular habitat used in relation to the total habitat types available in the RRA was estimated. Table 3 summarises the observations for the different season. Aquatic habitats were used by rhinos throughout the year but in summer they were used significantly more than in the other seasons. Marshy grasslands exhibited similar trends of use. Tall grassland was equally significant in monsoon and winter. Thirty two percent of the RRA is occupied by short grassland which is comparatively little used by the rhinos. Main reasons attributed is the absence of water bodies in short grassland area.

Table 3: Habitat use in relation to the area available and degree of preference

Habitat Type	% area Available	Summer	Monsoon	Winter
Aquatic	4.3	28.0	22.2	21.1
Fringes/Riparian	4.3	5.6	5.5	3.4
Marshy Grassland	22.4	30.0	11.1	15.3
Short Grassland	32.1	8.2	8.6	14.2
Tall Grassland	13.7	13.2	24.2	22.5
Woodland	23.3	15.4	29.2	24.2

5.2 Spatial Use Pattern

By using Harmonic Mean Transformation Polygon (HMT), areas of maximum use at 50-90% level were calculated separately for different seasons. It was found that during summer 40.76% of the RRA was used by cows and calves. During the monsoon and winter, percentage area of RRA used was respectively 35.64% and 29.0%. There was variation between 10.19-4.16 km² in summer, in monsoon between 6.41-2.08 km² and in winter between 7.25 sq.km-1.95 km². In case of the lone male the percentage of area used in different seasons varied from 36.25 km²-47.8%. Area used in different seasons varied between 2.50-11.95 km².

5.3 Monitoring Health Condition

Every day, rhinos located were thoroughly scrutinized for wounds or scars. If any fresh wounds were noticed, usually, prescribed medicines were sprayed with the help of a modified pump. Dung samples were collected in all seasons to estimate parasitic load. During the period of study, the parasitic load was not considered to be a problem. Professional veterinarians were consulted as and when necessary.

6. MAINTENANCE OF POWER FENCE

The original 1.5m high, 3 strand power fence was, in 1988, raised to the height of 2.8 meters, with 7 strands alternately energized by two energizers sharing the total fence perimeter. The alteration in the fence was carried out to prevent entry of tigers having overlapping home ranges within the RRA to preclude the threat of rhino calf predation. The fence was closed after ascertaining that no tigers were present within the RRA. The fence was unsuccessful in context of preventing entry of tigers. So far the tigers have not posed any real threat.

The main problem had been the repairs of imported energizers for lack of spares and expertise. Some indigenously manufactured energizers were found to be better in the long run. These have to be run on heavy duty 12 volt batteries for lack of mains source of power. In the remote forest area it is difficult to maintain the schedule for charging batteries and battery replacement as batteries must be transported to a distance of at least 20 km for the purpose.

It is especially problematic in rains when the area is flooded. While rhinos respect the fence, power or not, wild elephants periodically passing through Kakraha during their stay in the park have broken through the temporarily non functional strands of fence whenever the batteries were down. Floods cause sections of the fence to collapse. Sections of wire can get rusty and need replacement. A regular checking of the entire fence is scheduled on everyday basis.

Following the birth of a rhino calf, the mother and calf were temporarily sequestered in a 3 sq.km, power fence enclosed area within the RRA not so much to keep the tigers at bay but to keep the

animals conveniently under observation to preclude any threat to the calf during the critical early period of growth. Two observation posts were located nearby. Availability of essential habitat components was ensured within the fenced area.

7. THREATS

7.1 Small Population

The small population of rhinos as it currently exists attracts all well documented threats generally applicable to small populations in the wild [10]. It is quite clear that no debate is necessary to conclude that random natural events have the potential of severely limiting the future survival of the current reintroduced rhino population, possibly even on the short term basis as the events in the last twelve years of project.

In the last couple of years, it has been observed that lone bull made a habit of attacking other rhinos specially the male members. During this, two bulls were attacked and one bull died and another introduced from a zoo was badly injured. Similarly, one adult pregnant cow and her male calf were killed by this lone bull.

7.2 Operation of the Power Fence

This has been discussed earlier and the problems in maintaining the fence are critical, at least for some years till the population can build up to the level recommended by the IBWL, i.e., thirty rhinos with expansion of the RRA over portions of the estimated potential habitat of approx 90 sq.km. in the park through a combination of more translocation and in-situ breeding. This cannot be achieved easily as further translocation are proving very difficult for various reasons.

7.3 Poaching

Currently the dedicated managerial effort has ensured the desired security. However, poaching possibilities can never be discounted. The park infrastructure will need appropriate strengthening as indeed is being planned.

7.4 Translocation of a Fresh Batch of Rhinos and Development of Another Rhino Area Inside the Dudwa NP.

Considering the behaviour aspect of a lone bull, introduction of a fresh batch of rhinos in RRA can be fatal. To break the bonding between individual rhinos in RRA, another potential rhino Area-Bhadhital could be an option to shift 2 females from RRA and translocate a fresh batch of 2 female rhinos in RRA and one mature bull with 3 females in Bhadhital Area. Initially, Bhadhital Area should be electrically fenced to stop rhinos straying outside the park area. In future with the increase in rhino population two areas can be joined together by extending the electric fence.

8. CONCLUSIONS

Though the current population of the reintroduced rhinos is small, it is well adapted to its new home. The animals are in good health condition and are breeding well.

The available potential rhino habitat needs intensive management as that extended to the RRA with an eye on the future. Habitat management approach is documented [11, 12,13].

Park communication, basic staff amenities, equipment and other infrastructural support need to be realistically developed, especially in context of the eastern half of the park. There is no functional buffer.

The management actions required on several critical issues are implicit in context of the expressed threats in the earlier section and do not bear repetition.

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STRATEGIES OF RHINO CONSERVATION IN NEPAL, 1999
DEPARTMENT OF NATIONAL PARKS AND WILDLIFE CONSERVATION, HMG

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INTRODUCTION

The rapid rise and spread in the human population has meant the gradual elimination of many large mammals from their historical range in the past, the principal reason being loss of habitat. Wildlife habitat deteriorated so rapidly in the last few decades that Nepal witnessed a colossal loss in its wildlife especially large mammals such as rhinos, elephants, tigers, gangetic dolphin and snow leopards. The conversion of forests for agriculture, hydroelectric projects, and encroachment from human-related developments have constricted and fragmented wildlife habitat, and threatened the life-support systems of many species.

This paper is a synthesis of existing information on Nepal's one-horned rhino (*Rhinoceros unicornis*) to identify issues connected with their distribution, population dynamics, critical habitats, and threats. Such synthesis provides perspicacity to conserve rhinos through action plan.

The rhinos are of special conservation interest because of their role in the maintenance of Terai biodiversity as their phylogeny, ecology, and nutritional energetics have evolved around the grassland ecosystem. The one-horned rhinoceros is the second largest of the five extant species which was once widespread on the Indian sub-continent. As a result of habitat destruction and hunting for the much valued horn, there are fewer than 2000 individuals, restricted almost entirely to eight small protected areas in Assam and West Bengal of India, southern Nepal, and Bhutan. Nepal has by far the second-largest remaining population of the one-horned rhino.

The massive reduction of the rhino has been primarily due to the disappearance of most of the alluvial plain grasslands as they were also the most suitable for rice cultivation. By the 1970s, rhinos were confined to the Royal Chitwan National Park only and later they were reintroduced in the Royal Bardia National Park. Catastrophes such as an epidemic disease, severe flooding or a breakdown in protection measures could drastically deplete the total rhino population as only two protected areas contain rhinos. Furthermore, these small patches of alluvial plains in these protected areas face a danger that could change the course of vegetational succession to a climax condition unsuitable for successional species like the rhino. Therefore, the long-term future of the rhino in Nepal lies within protected areas but these protected areas are increasingly interrupted by human activities and development programs.

STATUS OF RHINO POPULATION IN CHITWAN

The Chitwan rhino population declined from an estimated 1000 animals in 1950 to 60-80 animals by 1962 when land clearing was followed by malaria eradication and heavy poaching. Strict protection reversed this decline. Investigations revealed that the population had increased to 270-310 individuals by 1975 with 73 (32.3%) adult females, 45 (19.9%) adult males, 48 (21.2%) Sub-adults and 60 (26.6%) calves. After 25 years of protection, the Royal Chitwan National Park now supports a viable population of 500-600 rhinos at a growth rate of 3.7%. The increase in rhino number since the late 1960s demonstrates that populations can rebound vigorously when provided with sufficient habitat and protection.

Chitwan rhinos provide an example of a population that almost went extinct while still carrying high genetic diversity. Eric Dinerstein and Gary McCracken suggest that the high heterozygosity is a consequence of the large population size prior to 1950 and long generation time on average. The genetic bottleneck occurred only recently. The present rhinos have retained 90% of the heterozygosity of the original population going back to 1400 A.D. Given the accelerating rate of extinction, threatened species like *R. unicornis*, which were, until recently, common and widespread, may yet retain a substantial proportion of their original heterozygosity.

Studies in the past have suggested that the Chitwan rhino population will continue to grow to a size exceeding 500 rhinos. Several large tracts of grasslands, suitable to maintain high densities of rhinos, are currently underutilized which could have been the result of harassment by cattle herders occupying these areas. The northeast population in Chitwan is indicative of a large herbivore population still in the expansion phase as the population has increased by 86 animals (48.9%) between 1975 -1988 with an average annual rate of increase of 3.76%/year. In contrast, the West population has increased by only 22% since 1975 for a mean annual rate of increase of 1.7%/year. In the eastern part of the park, poaching may have artificially reduced rhino densities. However, some of these grasslands are bordered by sal forest, a habitat offering little forage for rhinos and other large ungulates. It is doubtful if these areas will support increased numbers of dispersing subadults and non-breeding adults.

HABITAT STATUS

Increased numbers of rhinos are apparent within blocks of the suitable rhino habitats in Chitwan. rhinos occur in highest densities along the flood plain grasslands and riverine forests bordering the Rapti, Narayani, Reu, Dhungre and Icharni Rivers, suggesting riverine grasslands as the single most critical habitat dominated by 4-6 m. tall *Saccharum spontaneum*. These grasslands are interspersed with patches of riverine forests which together account for only 30% of the Park's 932 km². In contrast, the vast sal forests (*Shorea robusta*), all evergreen association on well-drained slopes, covering 70% of the Park, are rarely used. rhino densities were positively correlated with the percent of the block covered by *Saccharum spontaneum* grassland, along stream banks. *Saccharum* is fundamental as it exceeds 50% of the rhino diet each month. *Saccharum spontaneum* is unique among the common tall perennial grasses because plants sprout new shoots soon after cutting, grazing, or inundation by floods whereas others do not sprout again after these manipulations. Such dominance depends on annual habitat disturbance by monsoon floods. Monsoon floods deposit silt on the *S. spontaneum* grasslands bordering major rivers and, after receding, create favorable germination sites for seeds of this tall grass. Floods have probably been a frequent phenomenon in this ecosystem because of the steep mountain chain to the North and heavy precipitation concentrated in a 4-month wet season. Large herbivores which feed heavily in these dense near-monotypic stands would be expected to reach high local densities.

Avoidance of heat stress, nutritional requirements, and predator densities constrain habitat selection in large ungulates. rhinos average 8 hour/day in wallows or streams during August and September, the period of peak daily relative humidity. Wallowing occurs for at least 1 hour/day in every month except December and January. Thus, open water is crucial for rhinos most of the year.

Agriculture in former rhino habitat has resulted in serious crop depredation. However, past studies suggest that high densities were not related to the proximity of agriculture fields as densities in grasslands away from croplands exceeded or equaled to those densities in blocks bordered by croplands. However, densities in the eastern block, where rhino habitats are comparatively small, fluctuated seasonally with the ripening of rice, corn, wheat, and lentils grown in the adjacent fields.

REINTRODUCTION

Between 1986 - 1991, 38 rhinos were translocated from Chitwan to the Royal Bardia National Park. Although the majority of them have contained their movements within the park, 2 animals move frequently in and out of the park. Of this introduced population, 3 have been killed by the poachers. It is yet to be seen how their population will react and adapt to the new environment and with the other ungulates and human settlements.

In 1984, the Indian Government translocated 5 rhinos from Pobitora Sanctuary, Assam, to Dudwa National Park, Uttar Pradesh. In addition, Nepal provided 4 rhinos from Chitwan. Both these operations had four casualties, resulting in 2 deaths in each operation.

RHINO POACHING

Since the establishment of the Royal Chitwan National Park, a total of 109 rhinos died, 80% of which were from natural death and 20% from poaching in a span of 18 years (1973 - 1991). A spurt in poaching was noticed in 1992 when 9 rhinos were poached and 3 rhinos died of natural death. The recent surge in the smuggling of rhino horns out of the country into the Southeast Asian markets, has activated rhino poaching in Nepal's protected areas.

The Department of National Parks and Wildlife Conservation realizes that laws and enforcement alone are not sufficient to curb the poaching of protected wild species and the cooperation of the people who live closest to them may provide a strong likelihood to counter the wildlife trade in and outside the protected areas. The Department has made efforts to control poaching by forming anti-poaching units with village-level informants. In January 1993, eleven persons were arrested with evidence suggesting the strategy works. However, these units are poorly equipped - no vehicles, no communication equipments and no firearms. The Park awards village informants up to the amount of Rs.50,000. Penalties for poaching rhinos are 5 - 15 year imprisonment with a fine of Rs. 50,000 -100,000.

The Department also will seek to impose stringent trade restrictions and surveillance at the major custom posts in Nepal. Furthermore, the Department will make a formal effort to go beyond the realm of political frontiers and will consolidate with Indian counterparts to ensure survival of the threatened wildlife species. It has also realized that only cohesive steps at multi-national level will effectively address such illicit international markets which are far-reaching, wide flung, and rival those of illegal drugs and arms.

RHINO ACTION PLAN

The strategies of rhino conservation in Nepal is to ensure long-term viability of the one-horned rhino throughout its range, while minimizing conflict with people. Such objectives have to be achieved while continued increase in human population, economic influence of development on natural areas, and the need for land for agriculture and settlement.

It will not be possible to save Nepal's every rhino in terms of physical protection, but losses can be kept to a minimum if economic development plans take into account the needs of threatened wildlife species, and planning for conservation takes into consideration the needs of local people. Conservation of the rhino depends on the political will and concerted action of the government and people. Without political will and commitment, application of the conservation recommendations outlined here will be difficult although they are based on sound ecological, economic, and cultural arguments.

1. Rivers and Flood Plain Grasslands

Viewed on a regional scale, rhinos probably spread along the flood plains at the base of the world's highest mountain range because of the presence of the highly productive but low diversity grassland community that flanked South Asia's major river systems. It is unclear to what extent recent deforestation in the Himalayas has intensified floods. However, the flood levels and extent of erosion in the plains increase every year. Aerial photographs from 1968 offer little resemblance to the current distribution of river courses, channels and grasslands along the Narayani River. Changes in the courses of these rivers could destroy the rhinos' habitats, and the human population pressure on the surrounding land is such that alternative refuges are scarce.

The future of the rhino population is in conflict due to other external factors which continue to deteriorate the environment outside the park, in particular, the water development in the Rapti River which will reduce water base flows and impact base flow variations. Such development is considered to be detrimental to the sensitive flood plain grasslands of the Park. Intensified economic activity in the immediate park vicinity may add to the problem through increased groundwater and river flow abstraction for irrigation. Increased water demands for domestic use and small-scale industries are foreseen. Thus, the cost of maintaining floodplain grasslands in the Park area under protection will increase. However, based on floodplain dynamics, indicator communities or key phenomena including landscape pattern that will reflect broader ecological trends of the flood plain grasslands, need to be monitored with a focus to those sensitive to water quality and quantity.

2. National and International Corridors

As it is not realistic now to establish new, sufficiently large protected areas, exploration to determine existing habitat corridors should be investigated between protected areas. Existing habitat corridors may facilitate range extension and migration later between protected areas. Land use planning should recognize such vital corridors and routes, and protect them from incompatible forms of development and settlement. Maintenance of critical habitats in such areas, will minimize conflicts between rhinos and people.

International cooperation is required where corridors and routes cross frontiers. It is particular that such areas are not disrupted, or very serious conflicts between rhinos and people may result. The frequent movements of rhinos from Nepal (Royal Bardia National Park) into India and rhinos from India (Dudwa National Park) into Nepal, corroborates such conservation action.

Nepal should explore potentials for introducing rhinos in existing protected areas to re-establish their historical range. Such areas need to be of sufficient size and ecological diversity to accommodate potentially growing populations of one-horned rhinos because maintaining a Minimum Viable Population does not necessarily mean surety from natural hazards and stochastic events. Thus, the objective should be to maintain several rhino populations within protected areas, wherever possible.

3. Mitigating People-Rhino Conflicts

Ideally, protected areas should provide for rhino needs so that the stimulus to move elsewhere is minimized. However, in present conditions, conservation initiatives for rhinos are in conflict with human interests. Depredation of crops costs hundreds of thousands of Nepalese rupees. The rhino will only be accepted by local people when its impact on human interests can be minimized or the damages are compensated by some social advancements. Limited compensation and insurance for crop damage may be organized but compensation has created numerous problems to conservation. Therefore, it is not a permanent solution.

Rhino movement can be controlled by the use of barriers of various kinds to exclude them from areas used by people or to keep them in reserves. Natural barriers are to be preferred, such as belts around cultivated fields having laterally-furrowed trenches. Alternatively, a potential exists to distract them by not growing crops which would not attract rhinos. A man-made belt of land unfavorable to rhinos may help to minimize conflict with people. Such barriers like trenches, high voltage electric fence, and

steep-sided canals which rhinos cannot enter, are effective. Thus, establishing and maintenance of man-made barriers to protect people and their crops should be supported in the form of social compensation.

Rhinos cause substantial damage to agricultural crops particularly if the cropland is adjacent or near grasslands or a riverine forests. Even those crops which are not used by the rhinos are often destroyed by trampling during the rhino journey. The conservation of rhino would require not only protection of its habitat but also in fostering positive attitude, particularly among local people, who reside next to the habitat of the rhinos. Attainment of such is achieved through institutional disposition.

4. Control of Poaching

Poaching for rhino horns is a primary threat to rhinos, and thereby to the population. Adequate staff, funds, and equipment should be allocated to anti-poaching units. The Department envisions a long-term and extensive approach by emphasizing local involvement and cooperation to reduce the supply activities of the trade. This approach may even utilize the knowledge of poachers by providing local employment to them to counter the offense quickly. The Department strategy will involve:

- 1) Strengthening of the present system of anti-poaching unit,
- 2) Establishment of network communication between local communities and the park management,
- 3) Establishment of Awards and Incentives for local communities and park staff who will contribute to the campaign to save the wildlife,
- 4) Education, Awareness and communication, and
- 5) Workshops and training for the both government and non-government agencies connected with regulating the wildlife trade in Nepal.

5. Trained Manpower

It might appear that the number of protected areas taken in conjunction with rhino conservation has ensured the survival of substantial rhino numbers. However, the protection and management of these areas depends very much on the availability of trained personnel and adequate financial resources, both of which are less than insufficient. As a result, there is a wide discrepancy in the degree of protection.

RECOMMENDED ACTIONS

1. The integrity of present reserves containing one-horned rhinos should be maintained and their areas extended where possible to cover seasonal movements. This will require a network of well managed flood plain grasslands and carefully designed multi-use zones, aimed at meeting the needs of local people without jeopardizing wildlife resources.
2. The ecological relationship between river flow, groundwater level and grassland maintenance with a specific focus that will increase landscape diversity and grassland biomass production, shall be determined with development of a detailed long-term program to monitor the ecological system of the Park. The grassland areas bordering the Rapti River and the water required to maintain its diversity, are vital for rhino conservation. This plan should also identify the pesticides used in the area and elaborate on their potential toxicity.
3. Resources should be provided to strengthen anti-poaching measures. This is specially important as slaughter of rhinos will damage the genetic composition of the rhino population.

4. Core rhino habitats should be given both legal and long-term physical protection. Enlargement of existing protected, and the creation of buffer zones should be employed where possible.
5. Eco-development projects to meet the needs of the human population around key rhino areas are highly desirable to relieve the pressure on forests. Emphasis in project design should be placed on passive rhino management features. These can include minor modification in infrastructure, either to facilitate or block rhino movements, and the creation of buffer zones to separate production areas and pastures refuges.
6. It is highly desirable that both India and Nepal cooperate in protecting and managing rhinos that move across their common frontier. Establishment of a link will not only safeguard transient rhinos but also has a potential to monitor poaching activities.
7. A long term monitoring program to assess numbers, population trends, ecological requirements, movements, and people/rhino conflicts should be put into effect to provide a scientific basis for all management decisions. Additionally, surveys should be made on a regular basis to evaluate the nature and extent of habitat encroachment and poaching in the protected areas. The result should be the basis for recommendations for improving the management of these reserves and the rhinos in them.

PROJECT DESCRIPTION AND FUNDING APPLICATION**FOR PRIORITY CONSERVATION PROGRAM**

PROJECT TITLE : Environmental Monitoring of Riverine Grasslands and Flood Plain Dynamics for Rhino Conservation in the Royal Chitwan National Park and Royal Bardia National Park.

PROPOSER:

Title: Director General

Name: Dr. T. M. Maskey

Postal Address: Dept. of National Parks & Wildlife Conservation, P. O. Box 860, Babar Mahal, Kathmandu, Nepal

Tel No. Code: 220912,227926

Fax No. Code: 977-1-227675

Organization: Department of National Parks and Wildlife Conservation (DNPWC)

DATE OF PROPOSAL: June 1998

PROJECT DURATION: Proposed commencement immediately.

Proposed completion after 5 years of commencement

FUNDS REQUIRED:

Year 1: US\$ 150,420 Year 2 US\$ 26,220

Year 3: US\$ 35,420 Year 4 US\$ 17,020

Year 5: US\$ 28,520

Total: US\$ 257,600 over 5 years

PROJECT DESCRIPTION:

Objectives: To maintain and monitor critical rhino habitats in the Royal Chitwan National Park and Royal Bardia National Park.

Project Title: Environmental monitoring of Riverine Grasslands and flood plain dynamics for rhino conservation in the Royal Chitwan National Park and Royal Bardia National Park.

Database Project No: **Date last update:**

Region : Central-South & West **Country :** NEPAL

Summary Information

Project Status: Concept

Project Objective: To maintain and monitor critical rhino habitats in the Royal Chitwan National Park and Royal Bardia National Park.

Project Activities: 1. Core rhino habitat maintenance.

Funding Start Date: **End Date:**

Directly affected: over 400 rhinos in both Chitwan & Bardia.

Budget Information:

Total Budget : US \$ 257,600 (Exchange Rate Used : Rs 80.00)

Budget Breakdown

Yr. 1 \$ 150,420 Yr. 2 \$ 26,220 Yr. 3: \$ 35,420

Yr. 4 \$ 17,020 Yr. 5 \$ 28,520

Costs:

Staff Costs: \$ 117,000 Recurrent Costs: \$ 33,580

Equipment: \$ 85,000 Miscellaneous: \$ 22,000

Fund Raising Information:

Funds needed: \$ 257,600

Funds needed for current year: \$ 150,420

Origin of funds:

Organization:

Amount:

Organizations and People Involved with the Project

Govt/Local agency Address: P.O. Box 860

executing project: DNPWC, Kathmandu, Nepal

Project Executants: Royal Chitwan National Park & Royal Bardia National Park

Collaborating Bodies:

Background: Since rhino core habitats are being encroached rapidly with human population expansion, a more serious threat has been anticipated through river water development such as large scale irrigation where donor agencies are involved. If Nepal's rhino are to be preserved over a long time, critical rhino habitats must be ensured by understanding the involved complexities of the ecosystems. Furthermore, there is an

urgent need to know to what extent the development of river waters outside the protected areas impact the dynamics of the floodplain and grasslands on which the rhino subsists.

Activities: The project will study intensively, as well as extensively, the flood-plain dynamics and monitor riverine grasslands over a period of five years. This strategies will help the park authority to know what are critical environmental parameters that contributes to rhino conservation. Activities will involve international and national experts, and both government and private organizations. This, eventually, will build capabilities within the Department of National Parks and Wildlife Conservation to address environmental and conservation issues on scientific merit.

Output: Long-term conservation of viable rhino populations in Nepal's protected areas.

BUDGET SUMMARY SHEET

Item	Year 1	Year 2	Year 3	Year 4	Year 5
	US \$	US \$	US \$	US \$	US \$
Staff					
Int. Riverine Grassland Ecologist (1)	8,000	-	8,000	-	8,000
Int. GIS Remote Sensing Forestry Specialist (1)	8,000	8,000	8,000	-	-
Local Biologist (2)	6,000	6,000	6,000	6,000	6,000
Local Hydrologist(I)	3,000	3,000	3,000	3,000	3,000
Survey assistance (4)	4,800	4,800	4,800	4,800	4,800
Equipment					
Vehicles	25,000	-	-	-	-
Motorcycle (2)	6,000	-	-	-	-
Water monitoring Equipment	10,000	-	-	-	-
GIS/Remote System	40,000	-	-	-	-
Laptop Computer & Printer	4,000	-	-	-	-
Office space equipment	15,000	-	-	-	-
Printing/Publishing	1,000	1,000	1,000	1,000	3,000
Contingencies 15%	19,620	3,420	4,620	2,220	3,720
TOTAL	150,420	26,220	35,420	17,020	28,520

PROJECT DESCRIPTION AND FUNDING APPLICATION**FOR PRIORITY CONSERVATION PROGRAM**

PROJECT TITLE : Royal Chitwan & Royal Bardia National Parks
Anti-poaching Units

PROPOSER:

Title: Director General

Name: Dr T. M. Maskey

Postal Address: Dept. of National Parks & Wildlife Conservation P. O. Box 860, Babar Mahal,
Kathmandu, Nepal

Tel No. Code 220912, 227926,

Fax No. Code 977-1-227675

Organization: Department of National Parks and Wildlife Conservation (DNPWC)

DATE OF PROPOSAL: June 1998

PROJECT DURATION: Proposed commencement: Immediately

Proposed completion: after 5 years of commencement

FUNDS REQUIRED:

Year 1: US\$ 58,300

Year 2 US\$ 33,300

Year 3: US\$ 30,600

Year 4 US\$ 31,200

Year 5: US\$ 36,200

Total: US\$ 189,600

PROJECT DESCRIPTION:

Objectives: To combat increasing rhino poaching in national parks effectively.

Project Title: Royal Chitwan & Royal Bardia National Parks Anti-Poaching Unit

Database Project No: Date last update:

Region : Central-South & West Country : NEPAL

Summary Information

Project Status: Concept

Project Objective : To combat increasing rhino poaching effectively.

Project Activities: 1. Security

Funding Start Date: End Date:

Directly affected: 400 rhinos in Chitwan & Bardia

Approx Numbers: 440

Budget Information

Total Budget: US \$ 189,600 Exchange Rate Used : Rs 50.00

Budget Breakdown

Yr. 1	\$ 58,000	Yr. 2	\$ 33,300	Yr. 3: \$ 30,600
Yr. 4	\$ 31,200	Yr. 5	\$ 36,200	

Costs:

Staff Costs: \$ 121,800 Recurrent Costs: \$ 7,700

Equipment: \$ 54,200 Miscellaneous: \$ 5,900

Fund Raising Information:

Funds needed: \$ 189,600

Funds needed for current year: \$ 58,000

Origin of funds: Organization: Amount:

Organization through which funds are being channeled: WWF or KMTNC

Organizations and People Involved with the Project

Govt/Local agency executing project: DNPWC

Address: P.O. Box 860, Kathmandu, Nepal

Project Executants: Royal Chitwan National Park & Royal Bardia National Park

Collaborating Bodies:

Background:

Since the establishment of the Royal Chitwan National Park, a total of 109 rhinos died, 20% of which were from poaching in a span of 18 years (1973-1991). A spurt in poaching was noticed

in 1992 when 9 rhinos were poached. The recent surge in the smuggling of rhino horns Out of the country into the South-East Asian markets, has activated rhino poaching in Nepal's protected areas.

Poaching for rhino horns is primarily a threat to rhinos, and thereby to the population. Adequate staff, funds, and equipments should be allocated to anti-poaching units.

Activities:

Five groups, each consisting of 5 persons locally employed, will be formed as an anti-poaching unit to combat rhino poaching and will be supported by number of informants. Motorbikes, radio communications equipment and field kits for 25 staff will be purchased. Surveillance for the rhinoceros will be increased by regular and rigorous patrolling.

Output: Achieve secure populations of rhinoceros within the national parks.

BUDGET SUMMARY SHEET

Item	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Staff					
Patrolling Group 5 (1:4) (3 + 2); Informants 10(7+3) *	21,000	21,000	25,200	25,200	29,400
Equipment					
Field kits					
Tent (6)	1,500				
Sleeping bags & mats (30)	1,500				
Uniform/boots/rain gears	2,500	2,000	2,700	2,800	3,300
Non expendable:					
Motorbikes (3)	3,000	1,600			
Bicycles (10)	300	400			
Rubber Boot (2)	5,000	5,500			
Binoculars (8)	500	600			
Walkie-Talkie(7)	21,000				
Total Non expendable	35,300	10,100			
Recurrent					
Fuel/lubricant/ maintenance	1,000	1,200	1,500	2,000	2,000
Miscellaneous					
First aid and other expenses	1,000	1,000	1,200	1,200	1,500
Totals	58,300	33,300	30,600	31,200	36,200
Grand total: US\$					189,600

* Rs 2500/p/m for 1st 2 yrs, Rs 3000/p/m for 3rd & 4th yr Rs 3500/p/m for 5th yr



RHINO CONSERVATION ACTION PLAN FOR NEPAL
DEPARTMENT OF NATIONAL PARKS AND WILDLIFE CONSERVATION, HMG

- **BACKGROUND**
- **ACTION PLAN**
- **PROTECTION**
 - i. **Strict Law**
 - ii. **Innovative and effective implementation**
 - iii. **Establishment of anti-poaching units**
 - iv. **Peoples, participation in conservation**
- **HABITAT IMPROVEMENT**
 - i. **Maintenance of Rivers and Flood Plain Grasslands**
 - ii. **Implementation of habitat improvement program**
 - a. **Control of natural succession**
 - b. **Weed control**
 - c. **Planting of favorable grass and tree species**
 - d. **Fire management**
 - e. **Creation of water pools and improve management of existing wetland**
 - iii. **Grazing control**
- **REHABILITATION**
- **EXTENSION**
 - i. **Extension of protected area to cover additional important rhino habitats**
 - ii. **Establishment of buffer zones, National and International corridors.**
- **INSTITUTIONAL STRENGTHENING**
 - i. **Policy analysis and improvement**
 - ii. **DNPWC strengthening and capacity building**
 - iii. **Training**
- **TRANSLOCATION/REINTRODUCTION**
- **LONG-TERM RESEARCH AND MONITORING**
- **CONSERVATION EDUCATION**
- **COMMUNITY DEVELOPMENT PROGRAM**
 - i. **Mitigating People-Rhino Conflicts**
 - ii. **Buffer Zone Development Program**
 - a. **Park people program**
 - b. **Livestock improvement program**
 - c. **Income generating program**
 - d. **Eco-tourism program**
- **INTERNATIONAL/REGIONAL/TRANSBOUNDARY COOPERATION**
- **LOAN TO INTERNATIONAL AGENCIES FOR SCIENTIFIC STUDY AND EX SITU CONSERVATION**
- **ESTABLISHMENT OF ORPHAN CENTER AND REHABILITATION OF STRAY POPULATION**



RHINO ACTION PLAN IN ROYAL CHITWAN NATIONAL PARK

DEPARTMENT OF NATIONAL PARKS AND WILDLIFE CONSERVATION, BABAR MAHAL, KATHMANDU, NEPAL

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 - 1.1 Status of rhino in Chitwan
 - 1.2 Rhino Habitat
 2. ACTION PLAN
 - 2.1 Habitat Improvement
 - 2.2 Control on Livestock Grazing and Crop Depredation
 - 2.3 Rehabilitation of Rhino Habitat
 - 2.4 Translocation/Reintroduction
 - 2.5 Translocation within the RCNP towards Madi (south)
 - 2.6 Strengthening Anti-poaching Capability
 - 2.7 Loan to International Agencies for Scientific Studies
 - 2.8 Population Monitoring Carrying Capacity
 - 2.9 Conservation Education
 - 2.10 Income Generation Activities
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 3. CONCLUSIONS
- Estimated budget for rhino conservation
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RHINO ACTION PLAN IN ROYAL CHITWAN NATIONAL PARK

1 INTRODUCTION

Historically, One-horned Asian Rhino (*Rhinoceros unicornis*) ranged throughout the plains of Ganges and Brahmaputra in south Asia. Its range decreased tremendously resulting in distinct meta-populations because of the disappearance of suitable rhino habitats. At present, the Asian rhino populations in wild are found in protected areas of Nepal and India.

1.1 Status of Rhino in Chitwan

In Nepal, prior to the malaria eradication and subsequent massive migration of hill people in the 1950s, the rhino population in the Chitwan valley alone was estimated at 1000. The rhino population decimated, counting only about 60-80 animals in 1962 by virtue of forest clearance for agriculture and heavy poaching. With the establishment of "Gainda Gasti" or Rhino Patrol Unit in 1961, and then later, the Royal Chitwan National Park in 1973, the rhino population was again on the increase reaching up to 270-310 individuals by 1975 (Laurie, 1978). rhino counting in 1994 estimates the rhino population

in the Royal Chitwan National Park (RCNP) between 446 and 466. The rhino population in the RCNP is growing at the rate of 3.7 % (Yonzon, 1994). There are rhino outside the RCNP such as Tikauli. The increase in rhino population at the present numbers clearly indicates that with protection and availability of habitat the population can quickly rebound. Various studies suggest that the Chitwan rhino population will continue to grow.

1.2 Rhino Habitat

The Narayau and Rapti Rivers have a remarkable influence on the soil of the RCNP. Recent flood plains of these rivers are quickly dominated by *Saccharum spontaneum* (Lehmkul, 1989). Flood plain grasslands dominated by 4-6 m tall *Saccharum spontaneum* are the most critical rhino habitat (Dinerstein and Price, 1991). Grasslands interspersed with patches of riverine forests together make about 30 % of the park area and are composed of *Saccharum* sps., *Narenga* sps., and *Themeda* sps. This grass species is the fundamental food resource comprising more than 50 % of the rhino diet. Sal (*Shorea robusta*) forest associated with species such as *Dillenia pentagyna*, *Syzigium cumini*, *Trijuga oleofera*, *Lagerstroemia parviflora*, *Terminalia tomentosa*, *T. belleric*, *Phyllanthus emblica* comprise 70% of the Park and are seldom used by rhino. Rhino and *Saccharum spontaneum* densities are positively correlated (DNPWC, 1993).

Inundation by regular flooding of the alluvial plains along major rivers in the RCNP creates favorable conditions for quick appearance of sprouts and germination to maintain the dominance of *Saccharum spontaneum*. Therefore, the monsoon flood is very critical for the maintenance of rhino habitat in Chitwan.

Oxbow lakes and other open water bodies are also very critical for rhino. A rhino spends about 8 hours/day in wallows or streams during period of high humidity (August-September). Except December and January, a rhino spends at least 1 hour/day wallowing.

2 ACTION PLAN

2.1 Habitat Improvement

Considering the rate of increase in the rhino population in the RCNP, it is apparent that the rhino population is likely to increase with the availability of the suitable rhino habitats and protection. Various studies suggest that at present, the rhino habitat in the RCNP is under-utilized. However, the grazing pressure from the livestock has rendered many ideal habitats literally unsuitable for rhino. This has ensured the food competition between the livestock and rhino leading to increased crop depredation in surrounding areas. This also poses a risk of transmission of disease.

With the present population growth rate of 3.7 % , the carrying capacity of the Park for rhino is likely to be exceeded in the future. This may lead to various environmental catastrophes resulting into decline in population and genetic viability. We need to be prepared to address such issues in future. To begin with, it is important to assess the carrying capacity of the Park so that necessary measures can be taken in time.

To avoid such instances, it is necessary to improve the quality of existing habitats so that it can sustain a viable population to its full capacity. Although, it is considered agreeable to let nature take its own course, certain manipulation is necessary depending on the target species. For example, control on natural succession of flood plain grassland to a woodland would be necessary to maintain populations of species such as rhino. Habitat improvement through weed elimination and planting with indigenous grass species preferred by rhino such as *Saccharum spontaneum* should be done. Flood plain grasslands and riverine forests bordering the Rapti, Narayani, Reu, Dhungre, and Icharni Rivers contain the highest density of rhino in Chitwan. Several prime rhino habitats in the Park are taken over by unpalatable grass species, weeds (*Pogostemon* ssp., *Eupatorium* ssp. Etc.), and tree species such as Simal (*Bombax ceiba*), Sissoo (*Dalbergia sissoo*), Khair (*Acacza catechu*), etc. Subsequently making them less suitable for rhino.

Uprooting of the weeds and tree species or regular grass cutting so as to suppress their growth is likely to improve the rhino habitat. Prime rhino habitat particularly, the Icharnee Tappu, Jaya Mangala Ghol, Duniariya, and Kachhuwani require urgent attention. Flood plain in the RCNP is very dynamic and is dependent on the course of the river. It is necessary to study the change in grassland ecology due to the change in river course.

Fire line (at least 2.5 m wide) in the grassland should be developed with narrow opening on either side (to avoid vehicular traffic) for a controlled burning. This will help to survive many grassland dependent fauna during the burning season in addition to rhino as another part of the grassland across the fire line will not be under fire.

Wetland is very important for rhino to avoid heat stress and meeting nutritional requirements. Maintenance of open water is equally important in maintaining the rhino habitat as the flood plain grasslands. Improvement of wetlands through desolation, control on invasion by undesirable aquatic vegetation, and regular removal of water hyacinth are important. Rehabilitation of Jaya Mangala Ghol by improving the water source to ensure regular water supply and controlling drainage points should be done. Decrease in water level in Rapti during the dry period of the year as a result of East Rapti Irrigation Project may have long term impact on the survival of rhino protection of which is the prime reason for the establishment of the RCNP.

2.2 Control on Livestock Grazing and Crop Depredation

Livestock grazing is increasingly putting pressure on the rhino population through food competition. In addition, this poses a threat to the health of wildlife in general, with a potential risk of transmission of disease.

Livestock grazing in the park area and crop depredation by rhino are positively correlated. Incidence of crop damage by rhino in the fringe areas of the Park has been rising in recent years. This is primarily because of the agricultural farming in former rhino habitat and displacement of rhino as a result of increased livestock grazing. These are some of the major issues of park and people dissension.

Livestock grazing in the Park can be possibly reduced by implementing veterinary facilities to the local people and extension programs to furnish alternatives to free ranging cattle grazing. An extension package should be incorporated with the vet facilities to encourage the local farmers to rear improved HYV (High Yielding Variety) of livestock and stall feedings. Such animals are largely for agricultural purposes and dairy production. There are a large number of unproductive cattle that are being raised because of the religious beliefs and their real output is only the farm manure. Discouraging farmers from raising such unproductive animals and gradually eliminating them from the fringe areas and stall feeding of cattle are crucial to reduce the grazing pressure in the Park. However, the effectiveness of any approach to achieve this goal which means a change in tradition is likely to take long time. Stall feeding will help farmers for the operating of bio-gas which will reduce local pressure on the Park for firewood. Long-term sustainability of such programs should be substantiated prior to implementation to avoid public resentments ensuing to the same old situation of conflict once the program terminates.

Silvi-pastoral plantation in the community land in the buffer area needs to be done to sustain the grazing and fodder needs of the livestock. Crop damage by the wild animals has been a serious issue that has been deteriorating the Park-people relationship among others. Past efforts of fencing and trenching in order to control crop damage have been very expensive to maintain. Therefore, various community development activities as has been planned once the buffer zone management starts, may help create positive image about the parks among the local community. This is likely to create a cooperative environment for the conservation and management of wild animals.

2.3 Rehabilitation of Rhino Habitat

Rehabilitation of Padampur Village elsewhere and development of a habitat suitable to rhino in that area is likely to sustain increasing population of rhino in the RCNP. In addition people of Padampur are also interested to be resettled somewhere else because of the existing problems such as crop

damage, firewood and grazing land crisis and reach of annual flood. The rehabilitation of this village will greatly facilitate the Park management in undertaking various conservation activities. Present location of Padampur has been creating several technical difficulties in park management. Development of rhino habitat in Padampur area, once it is rehabilitated, however, needs a study to explore the possibility of creating a habitat suitable for rhino. This is important to note here that all grassland is not necessarily suitable for rhino. Certain manipulations are required in order to make a habitat suitable for rhino. A rhino habitat can be developed in the areas by encouraging the growth of preferred grass species such as *Saccharum spontaneous* and others. Planting of this species can also be done if they fail to grow in the area. Although both the majority of the people of Padampur Village and the Park management conform the rehabilitation, each having their own interest, a strong political commitment is necessary for its realization. Such a rehabilitation program should be settled by a special commission that includes representatives from a wider sector of the society and from the Department of National Parks and Wildlife Conservation. This will be a special project in itself.

It is important to note that rhino also inhabit forest areas outside the RCNP, particularly the Tikauli forest. These forest areas also need to be managed and protected for the rhino conservation. It is preferable that these forest areas are included in the Park area with gazettelement rather than just making this as buffer zone.

2.4 Translocation/Reintroduction

Thirty-eight rhinos were translocated from the RCNP to the Royal Bardia National Park in 1986/88 and 1991. It will be too early to infer that the translocated rhinos in the RBNP have adapted to the new environment, however, there are some indications that the population is doing well. Considering the historical range of rhino (all throughout the Gangetic plain) the possibility of translocating some individuals to other protected areas needs to be explored. However, there are only two protected areas. Namely, Royal Bardia NP (RBNP) and Royal Suklaphanta Wildlife Reserve that can sustain a reintroduced rhino population. Nevertheless, considering the past experience of rhino reintroduction in the RBNP, it is highly recommended that a detail study of the proposed site for the reintroduction should be done beforehand. It is very important that the study should include the possible crop damage issue resulting from the translocated rhino population.

2.5 Translocating Within the RCNP Toward Madi (south)

The rhino population is concentrated in the northern boundary of the RCNP particularly in Sauraha, Went Rapti Narayani, and Bandar Jhoola areas. The population may disperse naturally to the southern parts of the Park across Surung once the population reaches the level of carrying capacity in the north. A study to explore the availability of suitable rhino habitat in other areas particularly in the southern parts of the Park needs to be conducted. If suitable habitat exists, what is the limiting factor for the dispersal of rhino population in these areas would be another question to be studied. Translocation of some individuals within the Park is suggested depending on the availability of suitable rhino habitats in other parts. However, it is strongly suggested to have the public reaction before such project is launched.

Considering close location of Madi area with the Nepal - Indian international border and susceptibility of increased poaching, a strong and regular surveillance and monitoring are required in the Madi area if the rhino population ever extends to this area.

2.6 Strengthening Anti-poaching Capability

At the beginning of the Park establishment, in addition to the Rhino Patrol Guard which was primarily, responsible to control poaching outside the Park, an anti-poaching unit was established in cooperation with Flora and Fauna Preservation Society to curb escalating rhino poaching. Poaching took a toll of 20 % (21.8) of the total rhino deaths (109) in 18 years (1973-1991). In average 1.21 rhino per year were killed by poachers in those years. Poaching reached its height in 1992, an all time record when

9 rhinos were found killed by poachers in one year. This escalation in poaching is attributed to the recent surge in the smuggling of rhino horns out of the country into the South-East Asian markets.

Considering such spurring poaching activity, an anti-poaching unit has been constituted once again with the support from World Wildlife Fund and International Trust for Nature Conservation. The strategy of the Unit is to work in close collaboration with local people who work as secret informants to the Park management in order to apprehend the poachers. Arrest of a number of poacher every year indicates that once again, this system works effectively in curbing the poaching intensity. In January 1993, 11 poacher were arrested. Efficiency of these units are restricted due to the inadequacy of equipment such as vehicles, portable communication equipment, and necessary fire arms. Rhino poaching is likely to be controlled by strengthening the Anti Poaching Unit by allocation of adequate staff, fund, and equipment.

The Park awards to the village informants up to the amount of Rs. 50,000 and the penalties for poaching rhino are 5 to 15 years of imprisonment with a fine of Rs. 50,000 to 100,000. Despite such severe penalties and efforts, occasional poachings are still reported. This indicates that stringent laws alone are not sufficient in curbing the poaching of endangered wildlife species. Cooperation of local people living adjacent to the protected areas is the key to achieving success in such issues. However, cooperation from the local people can be expected only when they see some direct benefit to them from the protection of wildlife species. The recent amendment of the Buffer Zone Act to channel 30 to 50% of the Park revenue into local development may develop some positive attitudes in the local community.

It is also necessary to explore the possibility of imposing stringent trade restrictions and surveillance at the major custom posts in Nepal. CITES Implementation Workshops similar to the one held in 1995 in Kathmandu should be held frequently to make various agencies such as police, custom, forest, administrators, journalists, etc. understand and help to implement effective trade control as per CITES requirements. Trans-boundary collaboration to implement CITES regulation with neighbouring countries will provide additional opportunities to curb poaching activities and the illegal trade of endangered wildlife.

2.7 Loan to International Agencies for Scientific Studies.

Rhinos have always been in high demand in zoos and research stations of several countries. A number of rhinos were provided to various agencies in the past.

Until Count Rhino '94, we weren't sure about the exact population of rhino in the RCNP and hence, we were reluctant to grant any of the requests for rhino by international agencies. Results from Count Rhino '94 reveals that the rhino population is increasing in the RCNP. In such circumstances, providing a few individuals to international organizations, strictly for research purposes is unlikely to have a negative impact on the source population. However, to avoid controversy, all the terms of such exchanges should be transparent and necessary CITES regulations should be followed. Funding support, if any, arising from such exchanges should be strictly applied to the rhino conservation efforts. The recovery process of such loans should be clearly defined before the exchange is ever made. This is still a very sensitive issue and therefore, every precaution should be observed so as to avoid controversy.

2.8 Population Monitoring

To transpire a scientific basis for rhino conservation and management, a long term monitoring program should be initiated to assess numbers, population trend, ecological requirements, carrying capacity, and people/rhino conflicts (DNPWC, 1993). A rhino census similar to Count Rhino'94 is suggested every 5 years to assess the population trends and status.

Carrying Capacity

A study to assess the rhino carrying capacity of the Park should be conducted. Since the establishment of the RCNP, 109 rhino deaths have been reported (DNPWC, 1993). Natural death constituted about 80 % of the total deaths and 20 % from poaching in 18 years (1973-1991). Recently, frequency of injured rhinos and the rate of crop damage are on the rise. This is possibly because the present rhino population is beyond the carrying capacity. Some studies suggest that the rhino habitat in the RCNP at present is under-utilized. It is argued that the high injury rate and crop damage at present is the result of displacement of rhinos by the livestock. Livestock grazing in the rhino habitat in the Park has become widespread.

2.9 Conservation Education

Conservation awareness programs need to be actively launched in the area in cooperation with the local NGOs and institutions and various other relevant organizations. Conservation education through radio, TV, audio-visual arrangements at the local level, posters, papers, bill-boards, Visitor Center, etc., need to be activated. CITES status of the rhino, fines and punishments, rewards to the informers, and other relevant information should be furnished simultaneously to the local people.

2.10 Income Generation Activities

Cooperation from the local people can be realized only when they see the direct benefit from the existence of the Park and protection of wildlife. Most of the local people in the surrounding areas are subsistence farmers. They can not think of conservation of wildlife if their life-sustaining system is disrupted. At present, local people are realizing very little benefit directly from the tourism in the parks. They should be trained in hotel/lodge management, as tour operators and nature guides to accrue the benefit from tourism. If this can happen, they will put all their efforts in sustaining the income source, i.e., protection of wildlife.

Increase in the living standard of the local people will lead to reduction in pressure in the parks from several means. For example, firewood consumption will be reduced, number of livestock will be reduced, and moreover, they will be conscious about nature conservation.

2.11 Fund for Orphanage Center

It has been noticed that on average, every year, the Park has been raising one or two rescued, orphan rhino calves from the wild. Such calves are either abandoned by the mother or injured by some predators. Although, this is incidental, a regular fund needs to be set aside for necessary care and raising of such orphans in an orphanage center.

2.12 Training

To increase the efficiency of Park personnel in rhino conservation, specific training such as habitat improvement, population monitoring, anti-poaching, conservation education and extension, orphan rearing, etc. are necessary.

3 CONCLUSIONS

The Royal Chitwan National Park was established in 1973, primarily to protect the rhino population in Nepal. Until recently, this Park was the last stronghold of rhinos in Nepal. With the adequate protection and conservation measures, the rhino population has rebounded to about 600 individuals in the Park. The Park is likely to lose its fame in the world if the rhino population dwindles. Habitat improvement and rehabilitation, conservation education campaign, strengthening the anti-poaching unit, population monitoring are urgently needed to support the increasing rhino population. Strong conservation commitment (both political and technical) is required for the long term survival of the rhino in the RCNP.

Estimated Budget for rhino conservation (in \$ 1,000)

Habitat Improvement	200
Translocation/Reintroduction studies	20
Translocation of 40 rhino	100
Strengthening Anti-Poaching Unit	500
Population Monitoring and Census	50
Conservation Education	50
Income Generation Activities	55
Fund for Orphanage Center	25
Training	100
TOTAL	1,050

Rehabilitation of Prime Rhino Habitats

Resettlement of Padampur and Ram-Mauri Bhata \$ 1,000,000

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APPENDIX

(A) Baby Rhino Born in Royal Chitwan National Park (1998)

- i) Temple Tiger Area 11 Baby rhino with mother
- ii) Bandar Jhula Area 2 Baby rhino with mother
- iii) Bhimle Area 6 Baby rhino with mother
- iv) Bagmara Area 2 Baby rhino with mother
- v) Icherni Area 2 Baby rhino with mother

(B) Recent death

- i) One baby rhino female in Kasara and one baby rhino male in Jameli
- ii) One male, old rhino was killed at Benkatta near Sapan Khola due to fighting
- iii) One male, 16-18 year old, rhino was killed in Amaltari-Kujarli area due to fighting

Royal Chitwan National Park
Gaida Status

Year	Natural Death	Poaching	Killed by Tiger	Total
1973 to 1992	120	51	19	190
1993	8	7	3	18
1994	3	1	1	5
1995	6	-	1	7
1996	6		1	7
1997	1	-	1	2
1998	9	5	-	14
Total	153	64	26	243

HISTORY

- 1846 Chitwan valley declared as hunting reserve by Rana prime Minister Jung Bahadur
- 1911 King George V of England visited Chitwan for hunting. The hunting party bagged 38 rhino
- 1938 Lord Linlithgow, the Viceroy of India and his party bagged 38 rhinos in Chitwan
- 1950 Rhino population 800
- 1957 Rhino population 400
- 1959 Rhino population 300
- 1959 Rhino patrol or Gainda gasti was established
- 1960 Rhino population 200-225
- 1966 Rhino population 100
- 1973 Royal Chitwan National Park gazetted
- 1975 Rhino population 270-310
- 1986 4 rhino translocated to Duduwa National Park in exchange of 16 elephants
- 1986 13 rhino translocated to Royal Bardia National Park
- 1988 Rhino population estimated at 358
- 1990 25 rhino translocated to Royal Bardia National Park
- 1991 Anti poaching unit established
- 1994 Rhinoceros population estimated between 446-466
- 1996 Establishment of buffer zone
- 1998 Community veterinary health service clinic operational with the help of ZSL



ROYAL BARDIA NATIONAL PARK

DEPARTMENT OF NATIONAL PARKS AND WILDLIFE CONSERVATION, BABAR MAHAL, KATHMANDU, NEPAL

Royal Bardia National Park Thakurdwara, Bardia

Establishment:

- B.S. 2026 (1969) - Royal Hunting Protected Forest
B.S. 2031 (1976) - Royal Kamali Wildlife Reserve announced (348 sq. km)
B.S. 2038 (1982) - Royal Bardia Wildlife Reserve (naming)
B.S. 2036 (1969) - Royal Hunting Protected Forest
B.S. 2040 (1984) - Extension of Babai valley and East Chisapani (968 sq. km)
B.S. 2045 (1988) - Royal Bardia National Park

Maximum Height from sea level	- 1441 meter (Sukarmala)
Minimum Height from sea level	- 152 meter (Manau Ghat area)
Length of the park	- around 70 km
Breadth of the park	- around 10 to 20 km
Highway going through the park is about	- 20 km
Forest Roads inside the park	- 185 km

Importance of this park:

- 70% of the forest area is covered by Sal forest, others are river banks, grasslands, *Khair/Sissoo* forest, mixed forest and open *phantas* for different wildlife habitat
- 38 species of mammals, 25 species of reptiles, 60 species of fish and around 400 species of birds
- Magnificent view of Babai Valley
- Successfully translocated rhino area
- Gharial Protection Area
- Involved in blackbuck protection
- Buffer zone declaration with 83 user committees in 17 VDCs
- Increasing number of wild elephant
- Protection of dolphins
- National park area used for highway, irrigation, electricity and contributed in national development
- Magnificent suspension bridge of Kamali River

Rhinoceros (Gaida)

10 Male and 28 female rhinos translocated from Chitwan	= + 38
Poacher killed 5 male and 4 female rhino	= - 9
Natural death of 2 male and one female	= - 3
Young born in Bardia 27 + 2	= + 29
Death of 8 young ones born in Bardia	= - 8
Total	= 47

Current status of translocated rhino

	Translocated			Poached			Natural Death			Remaining		
	M	F	Tot	M	F	Tot	M	F	Tot	M	F	Tot
Babai	5	20	25	3	2	5		1*	1	2	17	19
Karnali	5	8	13	2	2	4	2*		2	1	6	7
	10	28		5	4		2	1		3	23	26

* Injured by the Male and fighting

Information on the young born in Bardia

	New Born	Died	Total	Reasons
Babai	11	2	9	2 killed by tiger
Kamali	18	6	12	3 were killed by tiger, 2 were drowned and 1 body found dead
Total			21	

Currently 2 rhinos have been translocated in Guthi from Chitwan and from Sarlahi. Therefore, the total number now is 51



TRANSLOCATION OF GREATER ONE-HORNED RHINOCEROS

SHANT RAJ JNAWALI, PhD, PROJECT DIRECTOR KMTNC-BCP

At present the family rhinocerotidae contain five herbivorous species. They include white (*Ceratotherium simum*) and black (*Diceros bicornis*), Javan (*Rhinoceros sondaicus*) rhinoceros, Sumatran (*Dicerorhinus sumatrensis*) and greater one-horned (*Rhinoceros unicornis*) rhinoceros. Of the five species, white and black rhinoceros are restricted to the African continent, Javan and Sumatran rhinos are confined in South-East Asia and the greater one-horned rhinoceros is found only in South Asia mainly in Nepal and India.

The greater one-horned rhinoceros (henceforth called as rhinoceros) once inhabited throughout the Indus, Brahmaputra and Gangetic floodplains and nearby foothills of south Asia. Due to rampant poaching and loss of suitable habitat, rhinoceros are now restricted to a few isolated pockets of protected areas. Few greater one-horned rhinoceros roaming in forested areas of Sindha, Pakistan, are believed to have disappeared by early 1990s. Similarly, few animals residing along Indo-Bhutan border are also inclined to poaching.

At present, only two populations contain above 600 individuals. Royal Chitwan National Park in mid lowland, Nepal and Kaziranga National Park, Assam India. Kaziranga holds the largest population with an estimated present population of about 1500 animals at present.

In Nepal, Chitwan Valley harbored about 1000 animals until 1950. Indiscriminate poaching and destruction of their prime habitats between 1950s and 1960s drastically reduced this population to about 100 animals. However, with the creation of the National Park in 1973, and adequate protection, the population in Chitwan has now revived to above 600 individuals.

To establish a new viable breeding population and to protect this species from natural calamities and disease, several individuals were translocated from Chitwan to Dudwa National Park, India, and Royal Bardia National Parks, western lowland Nepal. Among 38 rhinoceros translocated to Royal Bardia National Park, 13 were released in Kamali floodplain in 1986 and 25 were released in Babai Valley in 1991.

The newly established sub-population in Bardia seems to be doing well as new births have been recorded in different occasions. Although an exact number of animals in both areas remains unknown, as no such scientific census has been carried out to estimate population size of rhinoceros to date. A crude estimate ($n = ca. 40$ animals in both areas) of rhino number in Bardia shows that the population has not yet reached the viable number as a minimum number for a viable rhino population is said to be 50 individuals.

Considering this, a few more animals of both sexes need to be translocated in the area, preferably in Babai Valley. The possible conflict between human and rhinoceros is expected to be minimal if Babai Valley is considered for further rhino translocation. However, the following criteria should be met before any further attempts of rhino translocation in Bardia is being made:

1. **Habitat study:** A detail study of suitable habitats available for rhinoceros in the area should be carried out before any further translocation is made. This will help to determine the carrying capacity of the potential rhino areas.
2. **Rhino guard-post:** As poaching incidents have occasionally been recorded in Bardia, construction of rhino guard-posts in different poaching prone areas is inevitable to ensure protection of the animals against probable poaching incidents. The following sites have been proposed for rhino guard-posts: Babai Valley: Lalmati, Shivpur, Thulosiri and Kalinara Geruwa area: Sarkhol, Pattharhoji, both outside the park boundary

3. **Monitoring system:** A lack of a systematic monitoring system has caused tremendous difficulties in proper management of released rhinoceros in both Karnali floodplain and Babai Valley. Therefore, a systematic scientific monitoring system should be developed and implemented as soon as possible to ensure long-term survival of this endangered species.

4. **Strengthening of existing anti-poaching unit:** The existing anti-poaching unit in Bardia has been able to minimize poaching incidents satisfactorily. However, the crew seems to have inadequate field gear required during the operation. This includes a good 4-wheel drive vehicle, motorbikes (2), good flashlights, night vision, etc.



OVERVIEW OF GLOBAL CAPTIVE PROGRAM FOR *RHINOCEROS UNICORNIS* AND A PROPOSAL FOR A FUNDING MECHANISM

THOMAS. J. FOOSE, COORDINATOR IUCN/SSC RHINO GLOBAL CAPTIVE ACTION PLAN

World-wide there are about 1,100 rhino in captivity (See Table 1 in the paper: Overview of Status of Asian and African Rhinos) However, analogous to the situation with rhinos in the wild, over half of these rhinos are southern white rhinoceros.

There are 140 *Rhinoceros unicornis* in captivity globally, 50 in North America where they are part of the Species Survival Plan (SSP) program to manage and propagate this species scientifically. A similar program, the EEP, exists in Europe.

In general, there are four main roles and goals for captive programs as part of conservation strategies for threatened species like the rhino:

- (1) **Propagation** to provide a genetic and demographic reservoir that could be used to reinvigorate or re-establish wild populations if and when the need and opportunity occur.

In other words, a captive population provides an insurance policy against catastrophes in the wild. It is usually easier to ensure protection of rhino when they are in captive situations. Ideally, captive populations can be part of the metapopulation that will include integrated and interactive management of numerous disjunct wild populations (Figure 1).

- (2) **Education** to provide the public with information and an appreciation of these magnificent species, their plight in the wild, and the need for active conservation programs.
- (3) **Research** to provide information that can be useful to management of the species both in captivity and the wild.
- (4) **In Situ Support** to provide funds for conservation in the wild from contributions recruited through captive institutions and programs.

Currently, captive institutions are the source of over \$1,000,000/year for *in situ* conservation although virtually all of these funds to date have been directed to the African and Southeast Asian rhino species. However, at this meeting, I am happy to announce that through a contribution from Mrs. Anna Merz, the International Rhino Foundation (IRF) will provide at least \$ 5,000 to Assam for intelligence work and another \$ 5,000, for census work.

Basically, the organization for which I work as Program Director, the International Rhino Foundation (IRF), is committed to assisting rhino conservation through both:

- (1) Support for in situ efforts; and
- (2) The development of viable captive populations as a back-up, or insurance policy, for rhinos in the wild.

The IRF works closely with the North American (American Zoo & Aquarium Association = AZA) Species Survival Plan (SSP) program for *Rhinoceros unicornis*. The AZA SSP is the scientific and organized program for management and propagation of endangered species like *Rhinoceros unicornis* in the zoos and other conservation centers in the United States and Canada. IRF also collaborates closely with the analogous program in Europe, the EEP. Hence, IRF presents this proposal on behalf of both the SSP and the EEP.

Demographically, the SSP and EEP population of *Rhinoceros unicornis* are doing very well (Table 1). There are 50 *Rhinoceros unicornis* in the SSP population and it is increasing at about 4% per annum, which is close to the growth of some wild populations. The EEP population has 35 individuals and also is doing well demographically. However, the genetic foundation of both the SSP & EEP populations are

limited and needs to be expanded by more founder animals from the wild to achieve its long-term objective of preserving 90% of the gene diversity of the wild population. For example, in the North American SSP population, there are currently the equivalent of 6 genetic founders and the potential, if management is perfect, of only 11. A "founder" is defined as a rhino from the wild gene pool. For viability, there should be at least 20-25 genetic founders for a population. Hence the SSP needs up to 14 and the EEP up to 6 additional founders, i.e. animals from or representing lineages from wild populations with no known relationship to rhino currently in the SSP or EEP populations.

As stated above, the IRF mission is promote rhino conservation through linkage of in situ and ex situ efforts. In this regard, IRF proposes for consideration by the range states for *Rhinoceros unicornis* a cooperative program with in situ and ex situ components:

- (1) Provision through IRF of US \$1.5 to 3 Million for *in situ* rhino conservation.

METAPOPULATION

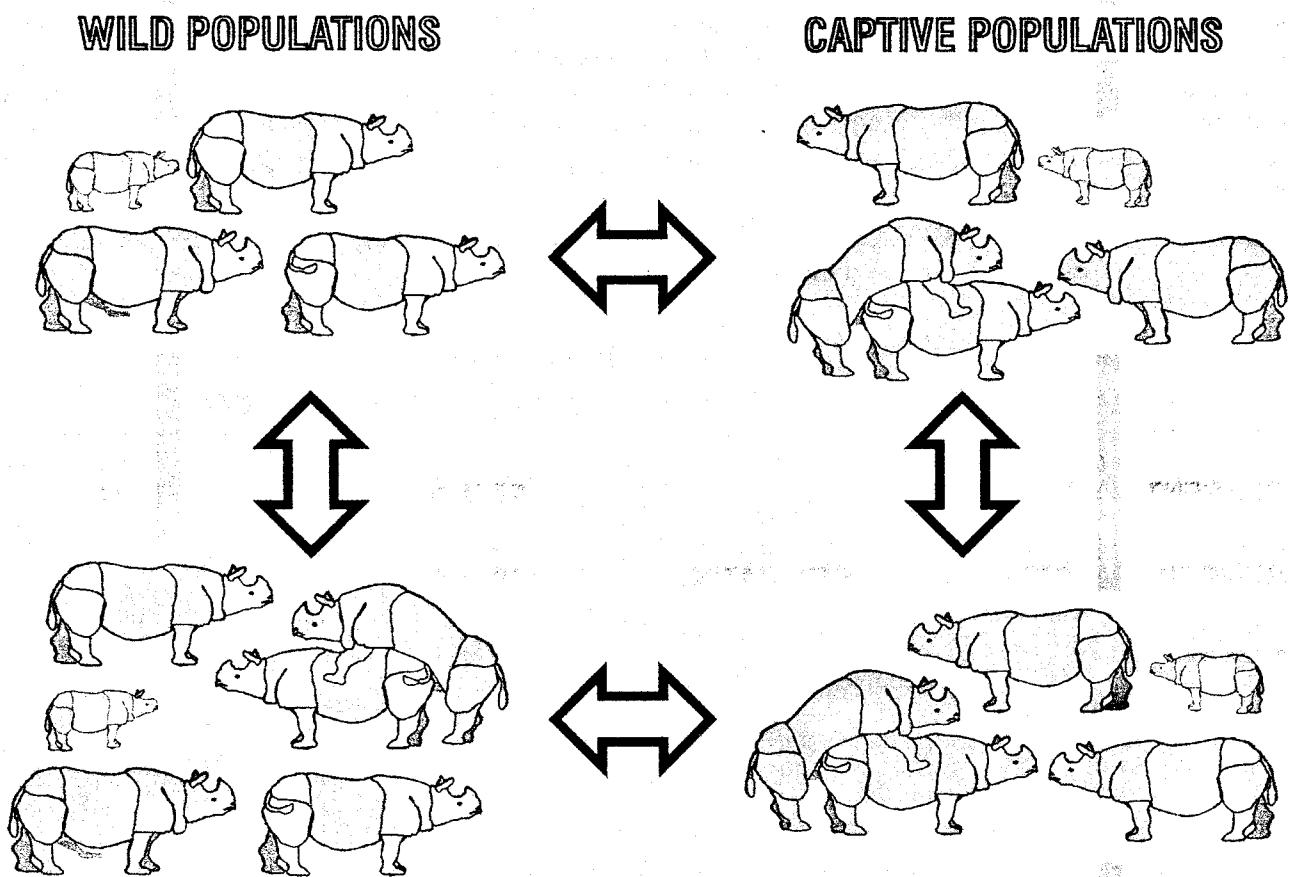


Figure 1

- (2) Provision by the range states, India (specifically Assam) and Nepal of 14 new founders for the SSP population in North America and 6 new founders for the EEP population in Europe.

This program could extend over a period of 3-5 years. Moreover, the rhino to be provided by the range states could be orphans from the floods, other rhino currently in captivity (e.g. at the state zoo in Gauhati) or rhino captured for this purpose. The numbers of rhino reported at this meeting and subsequently from the census conducted in Kaziranga in April 1999 (See the 1999 Population Estimates Table in the Working Group Reports section) clearly indicate that this number could be

removed from Kaziranga and/or Chitwan over the 3-5-year period without any detriment demographically or genetically to these wild populations. In fact, the removals might even be beneficial in Kaziranga which may be near carrying capacity. Managers of African rhino populations try to keep numbers below carrying capacity to protect habitat and maximize rhino population growth (Emslie).

The IRF has engaged in such cooperative programs with range states in Africa (Zimbabwe and Republic of South Africa) for both black and southern white rhino. It should also be mentioned that with the black rhino program, rhino born in captivity in North America and Europe are already moving back to range states for introduction into the wild.

Finally, it is recognized that there may be opposition from some conservationists against both captive populations and linking provision of rhinos to ex situ facilities with contribution of funds for in situ conservation. However, IRF believes that diversified strategies using both in situ and ex situ are the most secure for the rhino. IRF also believes that conservationists should be pragmatic. In this regard, the case of the Republic of South Africa may be instructive. RSA, along with India and Nepal, are the great success stories of rhino conservation. Populations of rhino in these countries have recovered spectacularly. To date, this successful rhino conservation has been supported almost entirely by these range states themselves. However, it is becoming increasingly difficult for these countries to provide all the funds needed. Hence, there will be need for more funds from external sources in the future. RSA has adopted a very pragmatic approach by dispersing modest numbers of rhino from government reserves to ex situ facilities both to reinforce the captive gene pools and to generate revenue for in situ rhino conservation.

TABLE 1: RHINOCEROS UNICORNIS IN CAPTIVITY IN NORTH AMERICAN SPECIES SURVIVAL PLAN (SSP) POPULATION

CURRENT POPULATION:	25 Males + 25 Females = 50 Total
NUMBER OF INSTITUTIONS PARTICIPATING:	18 Institutions
TARGET POPULATION:	45 Males + 45 Females = 90 Total
CAPTIVE POPULATION GROWTH RATE:	~ 4 %/Year
EFFECTIVE NUMBER OF FOUNDERS NOW:	6 Actual & ~ 11 Potential
NUMBER OF ADDITIONAL FOUNDERS NEEDED:	7 Males + 7 Females = 14 Total
POTENTIAL NEW PARTICIPATING INSTITUTIONS:	5+ Institutions



RHINOCEROS UNICORNIS TRADE ISSUES

ESMOND BRADLEY MARTIN, RHINO TRADE SPECIALIST, IUCN & WWF

By introduction, I wish to thank the International Rhino Foundation (IRF) for making it possible for me to attend this meeting here in Kaziranga. I would like to discuss with you several important issues.

First, we know a lot about the rhino horn trade in India and Nepal. We know the size of the poaching gangs (four to six people on average), the approximate amount of money earned by the gangs (\$1,500 to \$3,000 for a kilo of horn, the price the middleman will sell horn to another middleman in a major town (around \$3,000 to \$6,000 a kilo) and the price a trader can obtain for a horn from the Greater One-horned Rhino in Thailand or Taiwan (\$9,000 to \$ 10,000 a kilo).

We also know the main trade routes. In Nepal these are from Narayanghat, Pokhara and Kathmandu and then to eastern Asia by air. In India (well documented by Vivek Menon and myself working totally independently of each other) these are:

- a) West Bengal: Siliguri to Phuntsholing, Thimpu and Paro and then to eastern Asia by air
- b) Assam: 1) From Manas to Siliguri, Phuntsholing, Thimpu and Paro and then to eastern Asia by air;
2) Kaziranga to Nagaland, and probably overland to Burma.

In addition, we understand the methods of killing rhinos in India and Nepal: shooting, pits, electrocution, snaring and poisoning.

What we do not know is the end market for rhino products from the Greater One-horned Rhino in eastern Asia. This lack of information is a scandal.

On two recent trips to Burma, I saw no rhino products in Rangoon, Mandalay, Myawaddy nor Tachilek. I did see Asian rhino horns in Laos in 1989, but none in Vietnam in 1989 and 1990, nor in Cambodia in the mid-1990s.

In order to better conserve the Greater One-horned Rhino it is imperative to do surveys to ascertain where the horns from India and Nepal end up.

My second point is that at the Ninth Meeting of the Conference of Parties to CITES in 1994, the Parties adopted a resolution (Conf. 9.14) prepared by the IUCN African Rhino Specialist Group. This resolution, among other points, directed the Standing Committee to evaluate the effectiveness of actions to reduce the illegal trade in rhino products and to develop standardized indicators of success to measure any changes in the levels of illegal hunting and the status of rhinos.

One indicator of success is the status of consumer demand for rhino products in the main markets. If the demand goes up, prices may also increase for rhino horn, putting even more poaching pressure on rhinos in India and Nepal. Fortunately, although the supply of both African and Asian horns on the world's markets has decreased over the past few years, the price has not increased significantly. However, this needs detailed monitoring in Yemen and eastern Asia as no fieldwork has been carried out in these places over the past few years.

On the other hand, we have good information on the numbers of rhinos which have died in Nepal and India over the past 20 years or so (from the 1960s to 1997 at least 950 have died from various causes, including poaching, in Assam alone). We know approximately how many of these horns went onto the world's markets. Thus, we have some data on supply. Now we need to know changes in prices in the consuming countries in order to obtain some data on changes in demand.

Specifically, we need to study the markets in the following places that were previously major importers and consumers of Asian rhino horns: Thailand, Singapore, Macao, Hong Kong, Japan and Taiwan. We also need to obtain economic data from some of the entrepots for Asian rhino products such as Bhutan

and Burma. Obtaining and analyzing this data will be an important component for the CITES indicators of success for rhino conservation.

A third issue I would like to bring up is that at the last IUCN Asian Rhino meeting in Sabah, delegates from Indonesia told me that they knew almost nothing about the trade in rhino products in their country and that they wanted to set up a study. However, this project has still not been initiated.

Another general point is that Yemen, which is probably the largest importer of African rhino horn in the world, has not been studied for over two years. Although, no Asian horn is imported into the country because it is too expensive, the shavings from the African horns are exported to eastern Asia for medicinal purposes. We have a lot of detailed information on the demand, supply and prices of horn in Yemen since 1978, so it is imperative that this still important market is once again monitored.

A fifth issue which I would like to discuss is that one of the major reasons so few rhinos have been killed in India and Nepal over the past few years is because large sums of money are spent on their protection: \$500 to \$2,000 per km² per year. Kaziranga National Park allocates just under \$2,000 per km² per year while the Forest Department in Jaldapara in West Bengal spends just over \$2,000. For comparison, the budgets for Indonesia's protected areas with rhinos is under \$80 per km² a year; no wonder there has been extensive rhino poaching in Indonesia since 1984.

Manpower on the ground is also an important component for success in rhino conservation. In Nepal and India, there is one man patrolling for every one or two km² in rhino protected areas. In Kaziranga, for example, there is one man for each km². In some African countries where rhino conservation has failed, there is only one person for every 100 or so km².

My final point is that another major component for success in rhino conservation is adequate money for intelligence. Relatively small amounts have been very successful. For example, in Nepal an NGO has been giving small amounts of money to pay informers around Chitwan National Park. Starting in 1991, with only \$45 allocated to intelligence on average each month, eight rhino poachers and eight tiger poachers were caught in that year. In 1992 three tiger poachers were caught, while in 1993 with \$3,000 of informant money for the whole year 37 rhino poachers and three tiger poachers were apprehended. In Africa, studies have demonstrated that spending money on intelligence is 30 times more cost effective than putting an extra person on patrol in the field.

In Kaziranga National Park, only eight rhinos were poached in 1998, the lowest figure since 1979, due partly to good intelligence.

Money for good intelligence gathering and for informants is thus of the highest importance for successful rhino conservation. I am therefore pleased to announce that Anna Merz, who recently visited Kaziranga for the first time and was very impressed with what she was shown, has donated \$3,000 specifically for intelligence gathering. This will be channelled through the IRF which has promised to raise an additional \$2,000, thus making a total of \$5,000 for intelligence. I wish to thank Anna Merz, a close friend of mine, and the IRF for their financial support for rhino conservation in Assam.





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