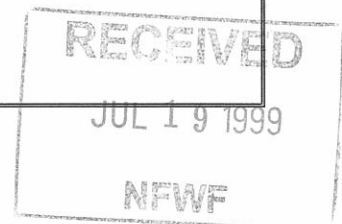


**Tiger Conservation and Priority Areas for Ecological Restoration:  
A Landscape Approach**

**Field Report # 1**

**Submitted to:  
National Fish and Wildlife Foundation  
Save the Tiger Fund**

**Submitted by:**  
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## **Background**

In spring of 1998, our proposal “Tiger Conservation and Priority Areas for Ecological Restoration: A Landscape Approach” was funded by the National Fish and Wildlife Foundation. The goal of our project was to support efforts to preserve and increase the effective land base that supports tigers in Nepal. Our objectives were to:

- 1) Establish a long-term tiger monitoring program, in which we would determine tiger presence / absence, estimate prey abundance, and use satellite data to monitor habitat quality.
- 2) Identify priority areas for biological conservation through a GIS analysis of the Terai.
- 3) Develop a detailed management plan for the Terai incorporating tiger and other biodiversity information, development activities, and NGO supported conservation activities.
- 4) Select a pilot restoration site from the priority areas identified through the GIS analysis.
- 5) Develop a Global Environmental Facility (GEF) proposal for tiger conservation in the Terai.

## **Introduction**

Mahendra Shrestha returned to Nepal in October 1998 to begin work toward reaching project objectives. Upon his arrival, the Director General of the Department of National Parks and Wildlife Conservation (DNPWC) asked him to undertake the following tasks:

- 1) Attain approval for the Nepal Tiger Action Plan from the DNPWC and the Ministry of Forest and Soil Conservation. Approval required submitting the plan to the DNPWC for review and then submitting it to the Ministry for approval. See Appendix 1 for the approved Tiger Action Plan (TAP).
- 2) As part of the TAP and the Department’s approval, M. Shrestha was asked to do the following:
  - a) Draft a proposal to the GEF upon completion of the NFWF project, based on his plan (developed in part 3)
  - b) Conduct transboundary surveys and liaison with tiger biologists in India on transboundary issues.
  - c) Carry out the research plan outlined in NFWF proposal.

Anup Joshi arrived in Nepal February 22 to begin developing a model for identifying priority sites for restoration for the Chitwan, Parsa, Valmiki Tiger Conservation area. Sean Ahearn and J.L. David Smith joined him in early March and spent 2 weeks in Parsa developing a protocol for ground truthing TM and Spot imagery; they also surveyed for relative abundance of natural and domestic prey. M. Shrestha returned from western Nepal and joined them. Smith and Ahearn returned to the U.S. and Joshi and Shrestha surveyed Valmiki Tiger Reserve in India.

In late March Bhim Gurung, who had just completed his first 2 quarters at the University of Minnesota, joined M. Shrestha to continue tiger distribution, livestock depredation and prey abundance surveys.

### **Progress as of 5 Apr 1999**

#### **A. Approval of Tiger Action Plan (TAP)**

In December 1998, the TAP was approved by HMG Nepal. The goal of the plan is to preserve, recognize, restore and increase the effective land base that supports tigers in Nepal. The premise of the plan is that ecosystem management, with an emphasis on building partnerships with local people, is crucial for maintaining tiger habitats outside protected areas. Some of the main points of the plan include:

1. surveying and monitoring the status of tigers and their habitats;
2. identifying priority areas for tiger habitat restoration;
3. studying tiger biology; increasing public awareness;
4. strengthening anti-poaching efforts;
5. strengthening institutional development;
6. coordinating transboundary tiger conservation action;
7. developing stronger HMG collaboration with national and international agencies.

#### **B. Tiger and Prey Surveys**

##### **1. Kanchanpur District (Royal Suklaphanta Wildlife Reserve and forest outside, extending to Corbet Wildlife Reserve, India)**

Surveys for tiger presence / absence and tiger prey abundance were carried out inside the Royal Suklaphanta Wildlife Reserve (RSWR), and in forested areas outside the Reserve in the Kanchanpur District in far western Nepal (Table 1). Streambeds and dirt roads were surveyed for tiger signs. Based on pugmarks, there are an estimated 16 - 18 breeding tigers in the Reserve. A total of forty-five 1.25 km long transects was surveyed to estimate prey abundance. Each transect had fifty 10 m<sup>2</sup> plots. The extension area of RSWR has promising habitat with healthy prey base potential to support a good tiger population but is currently under various human pressures. As a result, the prey base in the extension area is poor and relocation of some human settlements out of the extension area has become a conservation challenge. In addition to the RSWR (core and extension), the Laljhadi forest (outside the protected area) is potential tiger habitat. Unfortunately, the connecting link between Dudwa National Park in India and the Laljhadi forest (about a 3 km gap) that ultimately connects with the RSWR through the forest in the northern foothills has been lost on the Nepal side due to a prior government supported settlement program (Table. Prey abundance survey in Kanchanpur District)

#### **Results from prey surveys in the Kanchanpur District:**

- Human pressure in the extension area and other national forests in the District is more or less similar.
- Distribution of wild boar is more or less similar in all forested areas.

**Prey abundance survey Kanchanpur District, Nepal**

Tr#	Hab. Tree		Pelletes														Tracks				
	cov	cut	bd	4 H	ch	hd	sb	sw	bb	rb	mn	ln	wb	cow	g	buf	drt	wbd	cwt	gt	buft
1	53.0	0.8	0.0	0.0	2.7	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	23.0	0.3	0.1	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	29.0	1.1	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	33.0	0.0	0.0	0.0	1.3	0.4	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	41.5	0.0	0.0	0.0	2.8	0.2	0.0	8.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	41.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	25.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	20.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.3	0.3	0.1	0.0	1.2	0.0	0.0	0.0
9	42.5	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.2	0.1	0.2	0.0	0.0	0.2	0.0	0.0	0.0
10	26.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
11	19.5	1.6	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.3	0.1	0.0	0.2	0.1	0.0	0.0
12	28.5	0.7	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.3	0.1	0.0	0.1
13	35.0	0.7	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.0	0.3	0.0	0.0	0.1
14	12.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.2	0.0	0.2
15	12.5	2.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.0
16	8.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.1
17	3.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
18	20.5	0.8	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.3	0.8	0.0	0.1
19	2.5	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	1.2	0.0	0.2
20	19.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.3	0.7	0.0	0.5
21	7.5	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.3	0.8	0.1	0.1
22	10.0	0.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.7	0.0	0.5
23	38.5	0.5	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.5	0.0	0.1	0.1	0.0	0.1	0.0	1.1	0.1	0.6	0.0	1.8
24	31.5	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.3	0.1	0.7	0.0	0.0	0.2	2.1	0.5	0.1
25	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.2	0.0	0.0
26	18.0	2.6	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2	0.2	0.1	0.0	0.1
27	30.0	2.5	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1
28	25.5	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.3	0.3	0.4	0.1	0.5
29	14.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.2	0.0	0.0	0.2	1.9	0.2	0.3
30	17.5	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.2	0.1	0.2	0.0	0.2	0.8	0.6	0.0	0.4
31	41.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.1
32	8.0	2.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.2	0.0	0.0
33	24.5	1.7	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.0	0.1	0.3	0.0	0.0	0.0
34	15.5	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.4	0.0	0.1	0.2	0.8	0.0	0.9
35	24.0	1.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.3	0.1	1.2	0.0	0.9	0.1	0.5
36	56.0	1.1	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.1	0.5	0.2	0.9	0.0	0.5
37	24.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1
38	9.0	1.6	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.1
39	35.5	1.7	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.1
40	28.5	2.4	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.1	0.1	0.0	1.3	0.0	0.4
41	46.0	2.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.3	0.6	0.0	0.0	0.1	0.9	0.0	0.2
42	57.0	1.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.1	0.4	0.0	0.2	1.5	0.5	0.0	0.3
43	58.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.0	0.0	0.0	0.8	0.1	0.2
44	40.5	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9	0.0	0.0	0.0	0.0	0.0	0.0
45	60.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.1	0.5	0.0	0.0	0.0	0.1	0.0	0.0

ln = langur  
 wb = wild boar  
 cov = % horizontal cover  
 cut = # cutting of vegetation  
 cow = cow scat

g = goat pellet gt = goat track  
 buf = buffalo sc buft = buffalo track  
 drt = deer track  
 wbd = wild boar digging  
 cwt = cow track

- Tiger sign was recorded at only 2 places in the extension area outside the RSWR core area.
- Spotted deer occur in all forested areas.
- Sambar deer numbers are very low across the District.
- Swamp deer are restricted to the grasslands of Suklaphanta.
- Some blue bulls occur in the forested areas outside the Reserve.
- Grazing pressure and poisoning of tiger is high in RSWR.

## **2. Kailali District**

Surveys for tiger presence / absence and tiger prey abundance were carried out in the forested areas of the Kailali District in far western Nepal (Table 2). A new small tiger population has been located in the Basanta forest (about 20 Km east of Dhangadhi) of the Kailali District. At present, this is the only promising tiger habitat in the District but the area may be able to support more tigers provided some management measures are undertaken. (In 1986, M. Shrestha observed a tiger in the same forest while serving in the Kailali District Forest Office). Fresh scats, urine and ground scratch marks were recorded, and the pugmarks of 3 different tigers (1 male and 2 females) were identified. A total of 42 transects were surveyed to estimate prey abundance. A fairly good prey base (mainly spotted deer) with good ground cover was recorded in the Kailali District during the survey. Interestingly, this is the largest forest patch in this District that extends north-south; it is connected to the eastern end of Dudwa National Park in India. Human pressure is fairly low in the forest (Table. Prey abundance survey in Kailal District)

### **C. Transboundary Activities**

A Regional Symposium on Conservation of the Royal Bengal Tiger was held in Royal Chitwan National Park, Sauraha, December 12-15, 1998. The Symposium was jointly convened by the Department of National Parks and Wildlife Conservation, the King Mahendra Trust for Nature Conservation, and WWF Nepal Program. The Symposium was attended by more than 57 participants from Bangladesh, Bhutan, India, Myanmar, Nepal and representatives from the IUCN Cat Specialist Group, WWF-UK, WWF-US, WWF-Bhutan, WWF-India, WWF-International, Wildlife Institute of India, Institute of Forestry - Nepal, Global Tiger Forum, National Fish and Wildlife Foundation, and the International Trust for Nature Conservation.

During the Symposium, representatives from India and Nepal met separately to discuss transboundary conservation issues. Expertise and experiences on conservation were shared and further opportunities for cooperation between the two countries were discussed. Contact persons and cooperation opportunities along transboundary protected areas were identified. The issue of conservation at a regional scale was discussed. It was agreed that issues of this type would be further discussed in the transboundary consultative meeting on biodiversity conservation to be held in India. The focus of the meeting was the tiger and prey abundance study in the Terai of Nepal supported by the National Fish and Wildlife Foundation (NFWF). A plan was laid out to identify the connecting links between large forest patches and protected areas in India and Nepal.



Prey abundance survey  
 Kailali District, Far West Nepal Terai  
 Transect Information (average figure out of 50 plots in each transect)  
 Total number of transects = 42

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 Kailali District, Far West Nepal Terai  
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Tr #	UTM Coordinates		P E L L E T S										P E L L E T S										T R A C K S / D I G									
	Start	End	bd	4H	ch	hd	sb	sw	bb	rb	mn	wb	cov	cut	cow	g	buf	drt	wbd	cwt	gt	buf										
1	44 0489867E	3171371N	44 0470940E	3171342N	0	0	0	0	0	0	0	0.02	0.128	0.135	3.62	0.551	0.44	0	0	0.64	1.56	0.04	0									
2	44 0472058E	3171093N	44 0472806E	3170227N	0	0	0	0	0	0	0.18	0.1	0.41	3.36	0.22	0.48	0.02	0	0	0.14	0.96	0	0.24									
3	44 0471731E	3170154N	44 0473043E	3169929N	0	0	0	0	0	0.04	0.12	0	0.375	3.12	0.16	0.56	0.06	0.02	0.32	0.96	0	0.58										
4	44 0473413E	3168907N	44 0479279E	3161823N	0	0	0	0	0	0.14	0.04	0	0.06	4.6	0.3	1.06	0.04	0.06	0	0.2	0	0.12										
5	44 0483348E	3160966N	44 0484483E	3160766N	0	0	0	0	0	0.46	0.2	0	0.6	2.32	0.14	0.2	0.04	0	0	0.16	0	0.4										
6	44 0485539E	3161189N	44 0486603E	3161110N	0	0	0.08	0	0	0	0.1	0	0.535	2.34	0.16	0.38	0.04	0.08	0.34	0.26	0	0.16										
7	44 0487421E	3162092N	44 0486139E	3162065N	0	0	0.22	0	0	0	0.02	0.12	0.7	1.06	0.1	0.1	0	0	0.24	0.14	0	0.04										
8	44 0484733E	3158808N	44 0485421E	3158156N	0	0	0.04	0	0	0.04	0.06	0.06	0.47	6.1	0.102	0.08	0.1	0.28	0	2.776	0	1.34										
9	44 0486044E	3158071N	44 0486098E	3159079N	0	0	0.28	0	0	0.7	0.04	0.02	0.275	3.72	0.38	0.12	0.1	0	0.14	1.72	0	1.14										
10	44 0486468E	3160091N	44 0485683E	3160781N	0	0	0.32	0	0	0	0.06	0	0.04	0.545	3.82	0.04	0.06	0	0.5	0.36	1.46	0.22										
11	44 0485248E	3166086N	44 0484320E	3166046N	0	0	0.04	0	0	0	0.02	0.02	0.122	0.835	2.98	0	0	0.02	0.34	1.16	0.532	0.36										
12	44 0485246E	3166034N	44 0484316E	3166050N	0.04	0	0.12	0	0	0	0.02	0	0.122	0.835	2.98	0	0	0.02	0.34	1.16	0.532	0.36										
13	44 0482844E	3167703N	44 0483895E	3167695N	0.04	0	0.14	0	0	0	0.08	0.06	0.06	0.835	2.6	0.08	0	0	0.08	0.8	0.04	0.24										
14	44 0483041E	3164973N	44 0484116E	3164895N	0	0	0	0	0	0	0.1	0.08	0	0.675	1.68	0.12	0	0	0.64	0.761	0	0.2										
15	44 0485482E	3164669N	44 0486261E	3164475N	0	0	0.18	0	0	0	0.18	0.06	0	0.415	1	0.12	0.1	0	0	0.3	0.1	0.14										
16	44 0486699E	3164252N	44 0487586E	3164236N	0	0	0.24	0	0	0	0.02	0.06	0.02	0.455	1.4	0.08	0.02	0	0.42	0.06	0	0.14										
17	44 0483838E	3169225N	44 0484748E	3169085N	0.02	0	0.22	0	0	0	0.22	0	0.06	0.575	2.2	0	0.02	0	0.34	0.62	0.755	0.14										
18	44 0485430E	3168884N	44 0486492E	3168742N	0	0	0.1	0	0	0	0	0	0.04	0.695	2.58	0.04	0	0.02	0.18	0.46	1.78	0.38										
19	44 0486279E	3167989N	44 0485366E	3168074N	0	0	0.4	0	0	0	0	0	0.79	1.98	0	0.02	0	0	0.6	0.66	0.26	0.38										
20	44 0484749E	3168153N	44 0483659E	3168232N	0	0	0.14	0	0	0	0.06	0	0.1	0.74	1.7	0.12	0	0	0.58	0.86	0.9	0.06										
21	44 0474768E	3184494N	44 0474825E	3185063N	0	0	0	0	0	0	0.28	0	0	5.82	0.46	0.34	0	0	0	0.9	0.22	0.02										
22	44 0474785E	3186074N	44 0474868E	3186047N	0	0	0	0	0	0	0.32	0	0.105	4.6	0.1	0.2	0.02	0	0	0.306	0.06	0.04										
23	44 0468828E	3186949N	44 0468185E	3187666N	0	0	0	0	0.02	0	0.02	0	0.07	5.32	0.2	0.08	0.14	0	0	2.36	0.06	0.44										
24	44 0467498E	3188033N	44 0467385E	3187059N	0	0	0	0	0	0	0	0	0.14	4.84	0.1	0.3	0.02	0	0	1.88	0.18	0.32										
25	44 0479918E	3181731N	44 0479891E	3182791N	0	0	0	0	0	0.04	0.02	0	0.15	2.7	0.02	0.28	0	0	0.02	0.224	0.02	0.2										
26	44 0481040E	3183854N	44 0482015E	3183870N	0	0	0	0	0	0	0.04	0	0.28	2.12	0.1	0.44	0	0	0	0.1	0.04	0.02										
27	44 0482790E	3184710N	44 0483379E	3183875N	0	0	0	0	0	0.02	0.08	0	0.06	3.96	0.02	0.08	0	0	0	0.68	0.08	0.08										
28	44 0474606E	3182847N	44 0485463E	3182953N	0	0	0.08	0	0	0	0.04	0.06	0	4.78	0.02	0.2	0	0	0	0.5	0.24	0.06										
29	44 0486953E	3183272N	44 0487957E	3183464N	0	0	0.02	0	0	0	0	0.04	0	5.6	0.04	0.34	0	0	0	1.3	0.28	0.18										
30	44 0488035E	3182473N	44 0487989E	3181584N	0	0	0	0	0	0	0.1	0	0.07	5.72	0.12	0.74	0.02	0	0	0.34	0.12	0.2										
31	44 0489966E	3181089N	44 0488018E	3180153N	0	0	0.04	0	0	0.06	0.06	0	0.21	5.84	0.06	0.7	0.02	0	0	0.28	0	0.2										
32	44 0494541E	3180729N	44 0495189E	3179925N	0	0	0	0	0	0	0	0.06	0.075	4.1	0.14	0.5	0.04	0	0	1.6	0.2	0.14										
33	44 0493026E	3182219N	44 0493725E	3181550N	0	0	0	0	0.02	0	0.04	0	0.11	3.88	0.02	0.3	0	0	0	0.4	0.08	0.08										
34	44 0491085E	3181905N	44 0491730E	3182558N	0	0	0	0	0	0	0.04	0	0.065	1.2	0.22	0.7	0	0	0	0.42	0.52	0										
35	44 0499688E	3180041N	44 0500809E	3179970N	0	0	0	0	0	0	0.04	0	0.25	3.34	0.14	0.34	0	0	0	0.48	0	0.06										
36	44 0501369E	3180383N	44 0502311E	3180316N	0	0	0	0	0	0.14	0	0.25	3.22	0.1	0.14	0	0	0.04	0	0.32	0.14	0.06										
37	44 0502644E	3179381N	44 0503555E	3179536N	0	0	0	0	0	0.02	0	0.15	3	0.08	0.18	0	0	0	0.22	0.28	0.08	0.12										
38	44 0503695E	3178864N	44 0503597E	3177831N	0	0	0	0	0	0	0.04	0	0.255	3.9	0	0.08	0	0.02	0.36	0.46	0	0.5										
39	44 0516896E	3168463N	44 0517691E	3168086N	0	0	0	0	0	0	0	0.02	0.105	4.02	0.16	0.44	0.02	0	0.38	0.78	0	0.12										
40	44 0515628E	3169342N	44 0516355E	3168815N	0	0	0	0	0	0.18	0.02	0	0.11	4.06	0.34	0.5	0.02	0	0	1.08	0	0										
41	44 0514637E	3170355N	44 0514981E	3169762N	0	0	0	0	0	0	0.04	0	0.255	3.38	0.2	0.6	0	0	0	1.56	0.06	0										
42	44 0518569E	3167625N	44 0519964E	3167201N	0	0	0	0	0	0	0.16	0	0.03	5.44	0.4	0.18	0.02	0	0.12	0.82	0	0										

Tr # = transect number  
 bd = barking deer  
 4 H = 4-horned antelope  
 ch = Chital/ Axis deer  
 hd = hog deer  
 sb = sambar deer  
 sw = swamp deer  
 bb = blue bull  
 rb = rabbit  
 mn = monkey  
 In = langur  
 wb = wild boar  
 cov = % horizontal cover  
 cut = # vegetation cut  
 cow = cow scat  
 g = goat pellet  
 buf = buffalo scat  
 drt = deer track  
 wbd = wild boar digging  
 cwt = cow track  
 gt = goat track  
 buf = buffalo track

The NFWF study was entrusted to look for corridors and connectivity between the protected areas in the transboundary region between Nepal and India.

After the Symposium, the Department of National Parks and Wildlife Conservation assigned M. Shrestha to be the liaison person with Indian officials. He will explore and identify the opportunities for joint/complementary projects between India and Nepal along the transboundary areas for tiger conservation. Mahendra has visited Forest Division offices and Duduwa National Park in India to discuss conservation issues and possibilities joint management of adjoining protected areas between Nepal and India. He was accompanied by Mr. Ram Prit Yadav, Chief Warden, RSWR while visiting Dudwa National Park and Corbett National Park. A team composed of Mr. Laxmi P. Manandhar, Chief Warden, Royal Chitwan National Park, Dr. Anup R. Joshi, Arun Rijal, and Mahendra Shrestha visited Valmiki Tiger Reserve (VTR) in India. In addition to meeting with field officials and sharing conservation issues, they also conducted prey surveys in the VTR.

#### **Officials visited in India**

3. Mr. Harish Kumar SRF, Researcher, Dudwa National Park, Dudwa
4. Mr. S. Khan, Sub-Divisional Officer, Terai East Forest Division, Khatima
5. Mr. G. S. Suhaga, Divisional Forest Officer, Terai East Forest Division, Haldwani
6. Mr. A. K. Singh, Divisional Forest Officer, Haldwani Forest Division (Tanakpur portion), Haldwani - Not available
7. Mr. R. C. Gautam, Director, Corbett Tiger Reserve, Ram Nagar, Nainital
8. Mr. A. K. Parmar, Range Officer, Gonauli Range, Valmiki Tiger Reserve
9. Mr. Bhubaneswor Ray, Range Officer, Madanpur Range, Valmiki Tiger Reserve
10. Mr. A. K. Jha, Forester, Madanpur Range, Kotraha, Valmiki Tiger Reserve
11. Mr. Bhubanewor Khan, Forester, Gonauli Range, Valmiki Nagar, Valmiki Tiger Reserve

#### **D. Report for the Transboundary meeting, India**

A country status paper was prepared by M. Shrestha for presentation in the Second Transboundary Consultative Meeting on Biodiversity Conservation between India and Nepal (Feb 28 – March 1, 1999) and International Tiger Symposium (March 3-4, 1999) in India. The reports were based on the tiger and prey abundance surveys and visits to the transboundary protected areas. A report was also prepared for the Royal SuklaPhanta Wildlife Reserve for the same transboundary meeting.

The transboundary meeting was very productive as ideas and information on relevant conservation issues were exchanged and shared between the 2 countries. The action plan discussed in the meeting and the resolutions approved during the meeting were impressive and indicate great potential for future transboundary cooperation. Potential linkages between Royal Bardia National Park, Nepal and Katarniaghat Wildlife Sanctuary, India, the protected area in Pilibhit District, India adjoining to Royal Suklaphanta Wildlife Reserve, and the extension of Koshi Tappu Wildlife Reserve were

discussed and agreed upon. These initiatives may facilitate close collaboration on wildlife conservation issues between conservation officials of India and Nepal.

#### **Participants from Nepal in the Transboundary Meeting in India**

1. Dr. Tirtha M. Maskey, Director General, Department of National Parks and Wildlife Conservation
2. Mr. Narayan Poudel, Ecologist, DNPWC
3. Mr. Laxmi P. Manandhar, Chief Warden, Royal Chitwan National Park
4. Mr. Ram Prit Yadav, Chief Warden, Royal Suklaphanta Wildlife Reserve
5. Mr. Shiva R. Bhatta, Act. Chief Warden, Royal Bardia National Park
6. Mr. Jagannath Singh, Warden, Koshi Tappu Wildlife Reserve
7. Mr. Rabi Sharma Aryal, Legal Officer, Ministry of Forest and Soil Conservation
8. Mr. Darshan Das Shrestha, Under Secretary, Ministry of Forest and Soil Conservation

#### **E. Identify priority areas for biological conservation through a GIS analysis of the Terai.**

This phase of our project involves developing a model for selecting priority areas for restoration of tiger habitat. Joshi, Ahearn, Smith and Shrestha conducted field research in February and March on the relationship between remote sensing data, spatial and geographic data (e.g. elevation, aspect, distance from water and human activities), and prey distribution. The objectives were to:

1. Estimate relative prey abundance
2. Examine the extent of human use and habitat degradation
3. Classify forest cover using TM and Spot digital data
4. Identify sites where habitat restoration will have maximum effect on tiger population dynamics

Parsa Wildlife Reserve was chosen as a study area for developing the prey abundance/vegetation cover model because we have obtained a time series of Thematic Mapper and Spot satellite imagery for this area. Relative prey abundance surveys both within and outside of the Chitwan/Parsa/Valmiki Tiger Conservation Area were conducted at 35 sites (Tables 1a, 1b; Figure 1, 2).

Thematic Mapper data were classified using an unsupervised cluster analysis procedure (Lillesand and Kiefer, 1994). The classification was ground truthed in Parsa Wildlife Reserve using ESRI Tracking Analyst and a GPS to determine the precise locations of classified pixels from the satellite classification. This technology, although quite simple, is relatively new and provides a new dimension in ground truthing because it allows field workers to move through the forest and literally view the classified data as they traverse the forest. Sites were visually classified while conducting prey surveys and also quantitatively inventoried to determine vegetation, stem density and crown closure. Four 100 m<sup>2</sup> vegetation plots were placed at 150 m intervals along our 600 m long prey survey transects Tables 2a, 2b. Using Tracking Analyst we were able to resolve several



Table 1 a. Prey distribution in 3 protected areas of Chitwan-Parsa-Valmuki TCU.

Parks/Reserve	Site	Forest type	Number of pellet seen/25 plots					Mean pellets /10m <sup>2</sup>	Proportion plots with pellets		
			Spotted deer	Sambar deer	Barking deer	Wild boar	Blue bull			Monkey	
Chitwan	Patch 1, RCNP	Reverine forest	145	23	8	0	0	0	7.0	0.9	
	Patch 3, RCNP	Reverine forest	72	9	0	2	0	0	6.4	1.0	
	South of Gaida tented camp	Sal forest	26	1	1	2	1	0	2.4	0.8	
	South of Gaida tented camp	Sal forest	25	13	0	5	0	0	1.7	0.8	
	Mean			67.0	11.5	2.3	2.3	0.3	0.0	4.4	0.9
Parsa											
	Parsa WR	Mix deciduous	2	0	2	8	0	0	11	1.0	0.6
	Parsa WR	Sal forest	4	0	6	0	0	0	5	0.6	0.3
	North of Churial Hill	Mix deciduous	3	7	3	1	0	0	0	0.6	0.5
	Bhata Khola	Mix deciduous	9	19	1	0	0	0	0	1.2	0.6
	Bhata Khola	Sal forest	0	2	0	0	0	0	8	1.0	0.4
Mean			1	1	0	0	0	0	2	0.3	0.3
			3.2	4.8	2.0	1.5	0.0	4.3	0.8	0.5	
Valmiki											
	Raghia Block	Mix deciduous	7	6	0	0	0	0	1	0.6	0.4
	Naurangia Block	Hill Sal forest	4	11	0	0	0	0	11	1.0	0.6
	Gardi, Core area	Hill Sal forest	0	1	0	0	0	0	1	0.1	0.1
Mean			3.7	6.0	0.0	0.0	0.0	4.3	0.6	0.3	

Table 1b. Prey distribution in forestlands (outside protected areas) of Chitwan-Parsa-Valmuki TCU.

Site	Forest type	Number of pellet seen/25 plots						Mean pellets /10m <sup>2</sup>	Proportion plots with pellets
		Spotted deer	Sambar deer	Barking deer	Wild boar	Blue bull	Monkey		
Chitwan									
Chitrashen Community forest	Sal forest	18	10	8	2	0	0	1.5	0.7
Bagmara Community forest	Reverine forest	0	18	3	0	0	0	0.8	0.3
Bagmara Community forest (I)	Sisoo plantation	4	11	0	0	0	0	0.7	0.5
Barandabar	Sal forest	18	3	2	6	0	0	1.2	0.5
Sunachari	Sal forest	0	0	7	0	0	0	0.3	0.3
Brahmasthan Community Forest	Riverine forest	5	0	1	0	0	1	0.9	0.6
Milijuli Community Forest	Sal forest	49	2	2	0	0	0	2.1	0.8
Bishajari tal Forest	Sal forest	5	0	5	2	0	0	0.5	0.4
Basheni (Tikauli N of Hywy)	Sal forest	21	0	0	0	0	0	1.0	0.6
North of Shagun Tol	Sal forest	28	0	7	0	0	0	1.4	0.6
Bet Arun and Binai Khola	Sal forest	2	0	0	0	0	0	0.1	0.1
Mean		13.6	4.0	3.2	0.9	0.0	0.1	1.0	0.5
Parsa									
N Manuwa village	Mix deciduous	6	0	2	1	0	1	0.5	0.2
N Madhuban Village	Mix deciduous	4	0	2	0	0	7	0.5	0.4
Madhuban Village	Sal forest	4	0	0	1	0	0	0.2	0.2
North of Range Post	Mixdeciduous	9	2	0	0	0	15	1.0	0.6
11 km from Patlaya; S Hywy	Mixdeciduous	8	1	0	5	0	3	0.7	0.4
Patlaya, W. High way.	Sal forest	5	0	0	0	0	3	0.4	0.2
Harkhoria Dah	Mixdeciduous	0	0	0	0	0	0	0.0	0.0
Mean		5.1	0.4	0.6	1.0	0.0	4.1	0.5	0.3
Valmiki									
Madanpur Block	Sal forest	37	2	0	1	0	1	1.6	0.6
Goverdhana Block	Sal forest	0	1	0	0	0	0	0.1	0.1
Somesora Block	Sal + Bamboo	1	3	0	0	0	1	0.5	0.3
Manguraha Block	Sal forest	0	2	0	0	0	2	0.3	0.2
Mean		9.5	2.0	0.0	0.3	0.0	1.0	0.6	0.3

Table 2a. Rapid analysis of forest conditions and human use inside protected areas of Chitwan-Parsa-Valmiki TCU.

Parks/Reserve	Forest type	% Under cover	%Crown closure	Basal area m <sup>2</sup> /ha	Tree regen/ 10m <sup>2</sup>	Human use
Chitwan NP						
Patch 1, RCNP	Reverine forest	89.0	67.0	13.7	5.6	6.4
Patch 3, RCNP	Reverine forest	48.1	58.8	6.7	8.7	3.1
South of Gaida tented camp	Sal forest	42.0	38.4	15.5	15.8	0.8
South of Gaida tented camp	Sal forest	82.7	67.7	7.1	5.2	4.6
Mean		65.4	58.0	10.7	8.8	3.7
Parsa WR						
Parsa WR	Mix deciduous			0.0		12.0
Parsa WR	Sal forest	77.0	53.0	13.8		5.6
North of Churial Hill	Mix deciduous	77.0	65.0	16.5	20.9	4.0
Bhata Khola	Mix deciduous	69.0	54.8	14.5	11.9	9.6
Bhata Khola	Sal forest	67.5	76.5	44.1	16.4	12.0
Bhata Khola	Sal forest	44.2	49.2	12.0	21.6	21.5
Mean		66.9	59.7	16.8	17.7	10.8
Valmiki TR						
Raghia Block	Mix deciduous	33.0	65.5	16.1	12.4	25.5
Naurangia Block	Hill Sal forest	75.0	57.8	18.7	10.4	8.0
Gardi, Core area	Hill Sal forest	75.0	38.2	17.6	9.3	9.6
Mean		61.0	53.8	17.5	10.7	14.4

Table 2b. Rapid analysis of forest conditions and human use outside protected areas of Chitwan-Parsa-Valmiki TCU.

Forestlands	Forest Type	% Under cover	%Crown closure	Basal area m <sup>2</sup> /ha	Tree regen/		Human use
					10m <sup>2</sup>	10m <sup>2</sup>	
Chitwan							
Chitrashe Community forest	Sal forest	78.1	34.2	14.3	18.6	0.8	
Bagmara Community forest	Reverine forest	81.3	68.8	9.5	1.9	66.7	
Bagmara Community forest (I)	Sisoo plantation	94.6	53.5	12.2	1.6	81.7	
Barandabar	Sal forest	46.0	22.8	15.3	23.2	40.4	
Sunachari	Sal forest	84.8	26.5	17.2	20.8	72.6	
Brahmasthan Community Forest	Riverine forest	93.3	24.3	11.2	1.4	186.0	
Milijuli Community Forest	Sal forest	39.0	11.6	17.4	33.1	55.6	
Bishajari tal Forest	Sal forest	88.0	13.0	13.7	22.9	17.2	
Basheni (Tikauli N of Hywy)	Sal forest	22.0	18.0	15.1	36.6	10.8	
North of Shagun Tol	Sal forest	94.0	45.2	12.4	0.3	72.4	
Bet Arun and Binai Khola	Sal forest	36.3	13.8	15.8	16.8	52.0	
Mean	Sal forest	79.7	38.3	13.3	11.3	74.7	
Parsa							
N Manuwa village	Mix deciduous					46.8	
N Madhuban Village	Mix deciduous	74.0	65.6	17.7	33.4	61.7	
Madhuban Village	Sal forest	83.3	37.1	10.9	18.1	52.1	
North of Range Post	Mixdeciduous	66.7	71.9	20.1	18.1	75.8	
11 km from Patlaya; S Hywy	Mixdeciduous	78.0	40.0	12.9	7.4	30.4	
Patlaya, W. High way.	Sal forest	45.8	53.1	14.5	20.3	98.3	
Harkhoria Dah	Mixdeciduous	83.3	46.7	11.6	2.0	46.0	
Mean		71.9	52.4	14.6	16.5	58.7	
Valmiki							
Madanpur Block	Sal forest	68.0	50.0	11.4	6.2	36.9	
Goverdhana Block	Sal forest	72.5	55.3	13.5	17.1	63.0	
Somesora Block	Sal + Bamboo	51.7	34.3	11.0	1.3	94.7	
Manguraha Block	Sal forest	84.6	65.4	15.5	10.8	64.0	
Mean		69.2	51.2	12.9	8.8	64.7	

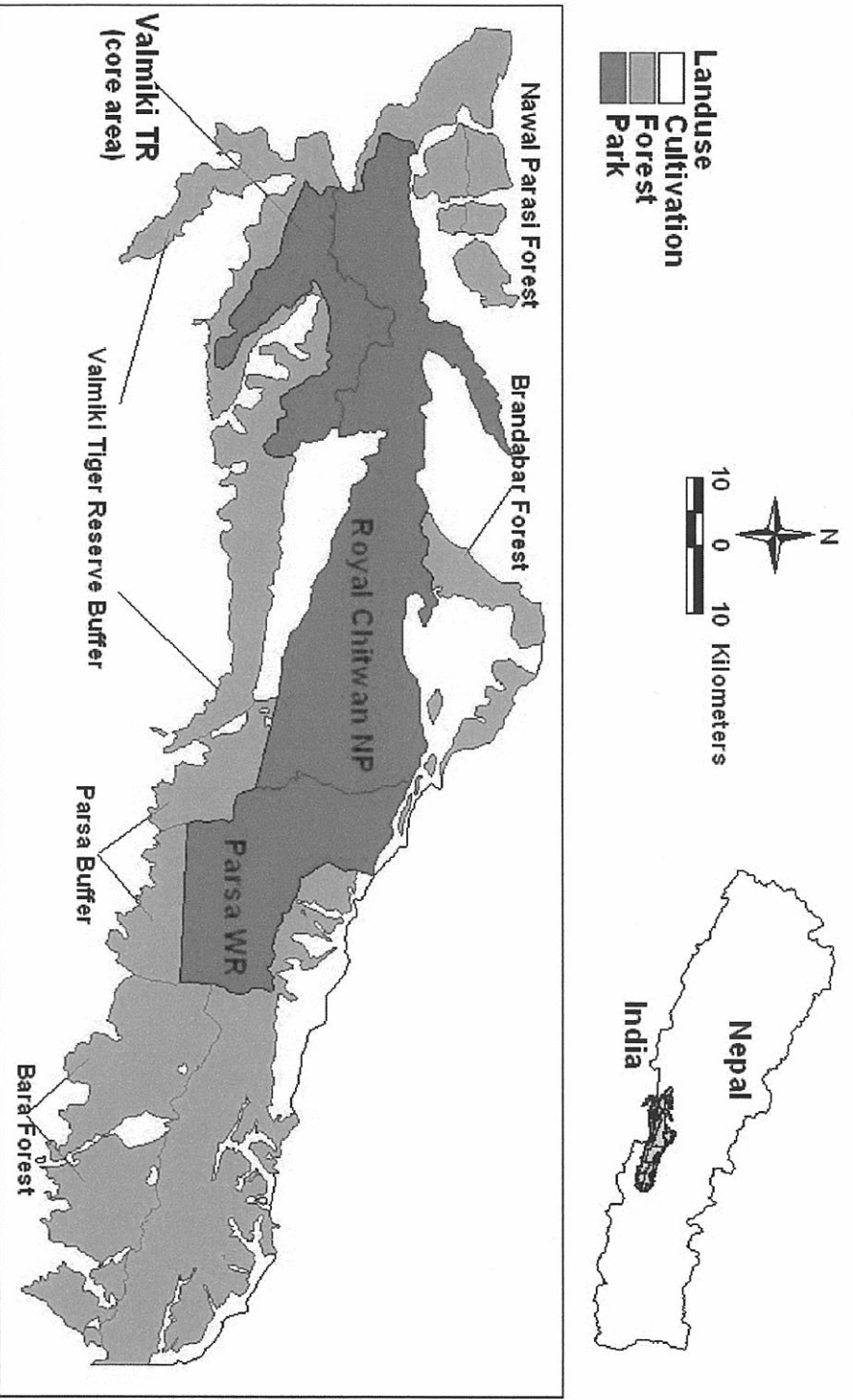
Table 3. General information on vegetation plots in Chitwan-Parsa-Valmiki TCU.

Site #	Forest type	Location		Trees/ha	Tree height (m)	%Crown cover	Dominant Species
		Latitude	Longitude				
1	Intact Riverine Forest	27.561556	84.467306	575.0	13.9	70	Trewia nudiflora + Ehretia laevis
2	Intact Sal Forest	27.534667	84.464333	400.0	19.3	65	Shorea robusta
3	Moderately Degraded Riverine Forest	27.569111	84.488972	400.0	10.6	40	Trewia nudiflora
4	Moderately Degraded Sal Forest	27.538806	84.458611	200.0	21.2	60	Shorea robusta
5	Open Riverine Forest	27.576667	84.487861	300.0	22.0	30	Trewia nudiflora
6	Open Sal Forest	27.569444	84.490028	250.0	14.6	45	Shorea robusta
7	Plantation	27.595833	84.483889	900.0	14.2	70	Dalbergia sissoo
8	Plantation with succession	27.592500	84.485000	700.0	15.6	93	Albizia lucida
9	Regenerated Riverine forest	27.590278	84.491667	1100.0	13.8	90	Albizia lucida
10	Degraded Sal Forest	27.635000	84.439722	350.0	16.3	30	Shorea robusta
11	Highly DegradedSal Forest	27.633889	84.437778	100.0	29.0	25	Shorea robusta
12	Moderately Degraded Sal Forest	27.598389	84.478306	250.0		75	Shorea robusta
13	Open Sal Forest	27.599667	84.474861	200.0	25.5	55	Shorea robusta
14	Degraded Sal Forest	27.591667	84.469722	366.7	22.5	55	Shorea robusta
15	Moderately Degraded Sal forest	27.589722	84.466667	400.0	17.2	60	Shorea robusta + Terminalis alata
16	Highly Degraded Riverine Forest	27.576944	84.716944	300.0	12.2	40	Trewia nudiflora
17	Moderately Degraded Riverine Forest	27.575000	84.710833	900.0	7.6	70	Albizia lucida + Trewia nudiflora
18	Degraded Riverine Forest	27.580000	84.731944	500.0	15.0	75	Trewia nudiflora
19	Degraded Sal forest	27.575833	84.735000	400.0	29.3	70	Shorea robusta
20	Highly Degraded Riverine Forest	27.579444	84.735556	200.0	7.0	20	Trewia nudiflora
21	Highly Degraded Sal Forest	27.578056	84.739167	250.0	23.6	40	Shorea robusta
22	Regenerating Sal Forest	27.578056	84.741111	350.0	14.7	84	Shorea robusta
23	Degraded Sal Forest	27.616667	84.484722	267.0	23.3	45	Shorea robusta
24	Moderately Degraded Sal Forest	27.616667	84.484722	300.0	25.7	55	Shorea robusta
25	Degraded Sal Forest	27.203333	84.873611	100.0	21.0	20	Shorea robusta
26	Highly Degraded Sal Forest	27.206111	84.984167	100.0	12.4	10	Shorea robusta
27	Intact Sal Forest	27.234722	84.929167	1166.6	16.2	77	Shorea robusta
28	Moderately Degraded Sal Forest	27.204722	84.874722	400.0	11.2	26.3	Shorea robusta
29	Open Sal Forest	27.235278	84.959444	550.0	12.4	43	Shorea robusta

Contd.....



Contd...		Location		Trees/ha	Tree height (m)	%Crown cover	Dominant Species
Site #	Forest type	Latitude	Longitude				
30	Sal Regeneration	27.239444	84.990833	1300.0	11.8	80	Shorea robusta
31	Degraded Riverine Forest	27.330111	83.890694	800.0	10.8	80	Mallotus philippinensis
32	Moderately Degraded Riverine Forest	27.324278	83.810250	600.0	12.7	75	Mallotus philippinensis + Dalbergia
33	Moderately Degraded Hill Sal Forest	27.427972	84.029611	825.0	16.6	80	Shorea robusta
34	Moderately Degraded Sal Forest	27.421833	83.972444	487.5	19.4	70	Shorea robusta
35	Degraded Mixed Deciduous Forest	27.323611	84.366944	933.0	21.4	82	Premna integrifolia + Dalbergia
36	Moderately Degraded Mixed Deciduous	27.321944	84.368056	900.0	15.9	90	Mallotus philippinensis + Litsea
37	Moderately Degraded Sal Forest	27.388750	84.087139	800.0	14.1	77	Shorea robusta
38	Moderately Degraded Sal Forest	27.573889	84.482194	600.0	21.4	82	Shorea robusta



**Figure 1. Chitwan -Parsa-Valmiki Tiger Conservation Unit.**

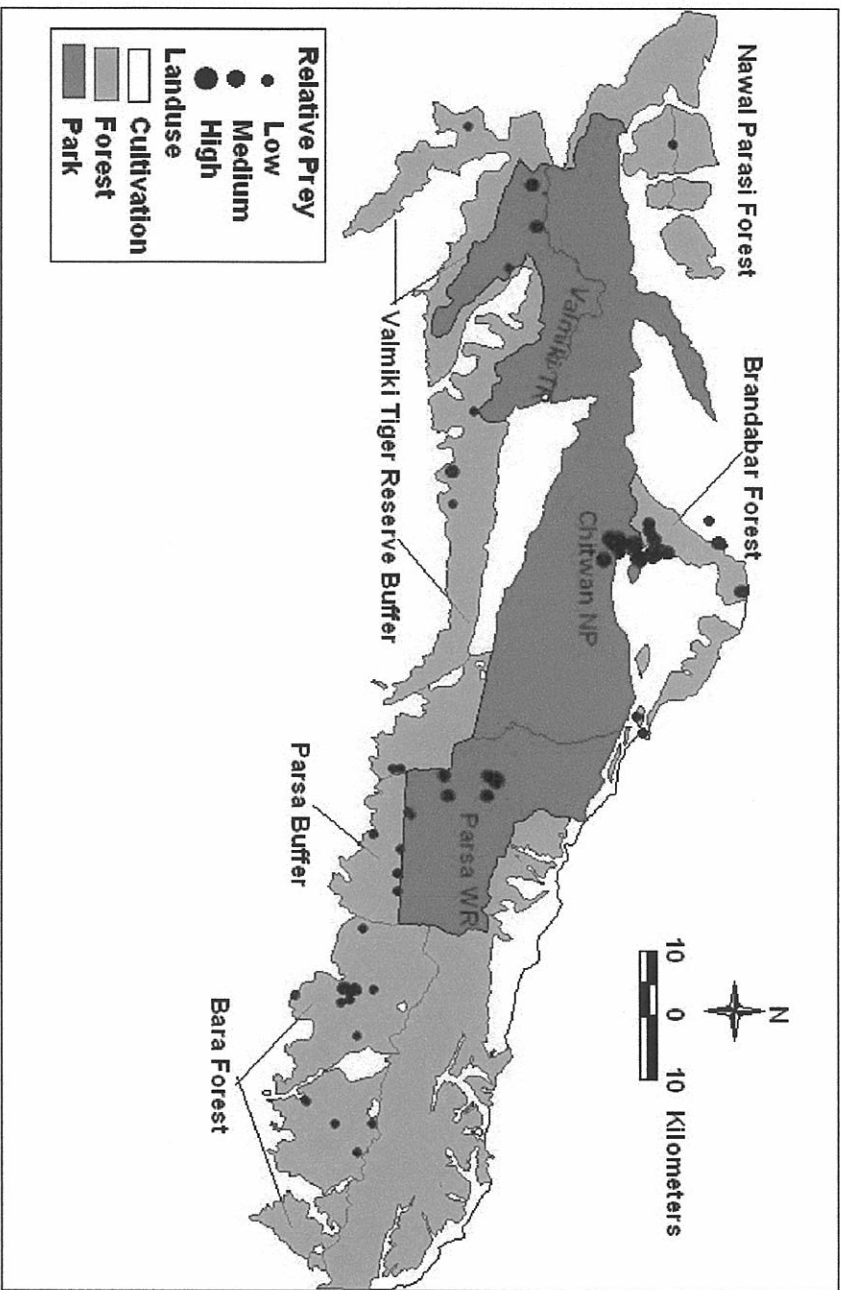


Figure 2. Relative prey distribution in Chitwan-Parsa-Valmiki TCU.