Forest Cover in Tiger Reserves of India: Status and Changes

This was the second study taken up by the FSI in 2004 at the behest of the Project Tiger Directorate, Government of India, to assess the current status of forest cover in existing Tiger Reserves (TRs) and also to detect changes during the previous five years. Many reasons necessitated the study. Firstly, there has been an increase in the total number of Tiger Reserves in the country which now stands at 28. Secondly, more stringent amendments got incorporated in the Wildlife (Protection) Act, 1972 in 1991 whose impact on Tiger habitat improvement called for a study. Earlier, FSI undertook a study in 1993 to assess the changes in the vegetation cover between 1983 and 1989 of the then existing 18 TRs. Both in terms of management techniques as well as in remote sensing techniques considerable advances have been made since then.

Objectives:

- 1. To prepare a comprehensive report on the status of forest cover in 28 Tiger Reserves of India using the technique of digital interpretation of satellite data.
- 2. To generate the maps showing the status of forest cover for each Tiger Reserve for the period 1997 and 2002 and change of forest cover during the period 1997-2002. In these maps the minimum area of delineation would be one hectare

Study Area and the Period of Assessment:

The peripheral area of the 10 km radial distance from the periphery of Tiger Reserve boundary (referred to as 'Outer Surround') was also studied in addition to the total area inside the 28 TRs. In addition to 1997 & 2002 the states of vegetation cover was also assessed and mapped for the year 2000 with the help of digital satellite data acquired from National Remote Sensing Agency (NRSA), Hyderabad.

Methodology:

The methodology for the assessment of forest cover involved digital image processing (DIP) followed by intensive field verification. The administrative maps of all TRs were procured from the respective State Forest Departments. These hard copy maps were scanned, geo-referenced with Survey of India toposheets and were digitized in the vector format and additional boundary of the Outer Surround was also created. The satellite data specifications were as under:

Satellite	IRS-IC/1D
Sensor	LISS-III
Data Period	1997, 2000 & 2002
Product	Digital Data
Spatial Resolution	23.5 m x 23.5 m
Spectral Resolution	4 bands

The satellite imagery was classified as per forest density classification used in State of Forest Report {Very Dense Forest (VDF): canopy density more than 70%, Moderately Dense Forest (MDF): canopy density between 40 & 70%, Open Forest (OF): canopy density between 10 & 40%}, by DIP techniques. For area computation, vector layer of the TR boundaries was overlaid on the classified images of the year 1997, 2000 & 2002. Maps showing the change in the forest cover of TRs and the 'Outer Surround' for 1997-2002 were then generated. Ground verification was then carried out and the necessary corrections incorporated were before preparing the final maps and area figures.

Major Findings:

An overview of the status and changes in forest cover of the 28 TRs is provided in Table 20. The table reveals that during the period 1997-2002 the overall forest cover in all the Tiger Reserves is estimated to decrease by 1994 km² (from 29,987 km² to 29,893 km²). Out of the total decrease 62 km² is estimated to have decreased during 1997-2000 and 32 km² during 2000-2002. The VDF increased by 33 km², the OF increased by 124 km², whereas the MDF decreased by 251 km². Five Tiger Reserves showed an increase in forest cover, eleven TRs showed a decrease, and 12 TRs, no change.

Table 21 provides information on change in forest cover in the Outer Surround of the TRs. Overall there was a decrease of 124 km^2 (from 25,563 km² to 25,439 km²) of forest cover. Of this, 74 km² decreased between 1997- 2000 and 50 km² between 2000-2002. The overall loss in forest cover in the Outer Surrounds exceeded that within TRs.

Table 20: Forest Cover and Changes therein in Tiger Reserves	(Area in
km ²)	

	Geog.	Forest Cover within Tiger Reserve						
Tiger Reserve	Area	1997	2000	2002	Change 1997- 2000	Change 2000- 2002	Change 1997- 2002	

Bandhavgarh	1,162	860	860	861	0	1	1
Bandipur - Nagarhole	1,509	1,380	1,379	1,379	-1	0	-1
Bhadra	492	437	437	437	0	0	0
Bori - Satpura	1,502	1,279	1,279	1,279	0	0	0
Buxa	761	643	633	621	-10	-12	-22
Corbett	1,318	1,196	1,197	1,197	1	0	1
Dampa	500	485	479	478	-6	-1	-7
Dudhwa -							
Katarniaghat	1,284	1,031	1,030	1,030	-1	0	-1
Indravati	2,799	2,289	2,288	2,278	-1	-10	-11
Kalakad -							
Mundanthurai	895	724	724	724	0	0	0
Kanha	1,945	1,297	1,294	1,293	-3	-1	-4
Manas	2,840	1,566	1,559	1,555	-7	-4	-11
Melghat	1,677	1,485	1,485	1,485	0	0	0
Nagarjunasagar	3,568	2,621	2,622	2,628	1	6	7
Namdapha	1,985	1,855	1,858	1,858	3	0	3
Nameri	344	214	178	169	-36	-9	-45
Pakhui	862	846	846	844	0	-2	-2
Palamu	1,026	893	891	891	-2	0	-2
Panna	542	482	482	482	0	0	0
Pench (MP)	758	593	593	593	0	0	0
Pench (Maharashtra)	257	231	231	231	0	0	0
Periyar	777	650	650	650	0	0	0
Ranthambore	1,394	740	740	740	0	0	0
Sariska	881	674	674	674	0	0	0
Simlipal	2,750	2,658	2,658	2,658	0	0	0
Sundarbans	2,585	1,540	1,538	1,538	-2	0	-2
Tadoba - Andheri	620	584	584	584	0	0	0
Valmiki	840	734	736	736	2	0	2
Total	37,873	29,987	29,925	29,893	-62	-32	-94

Table 21: Forest cove in km ²)	er and Cha	nges therein in Outer Surround of Tiger Reserves	(Area

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	Geog.	Forest Cover in Outer Surround						
Lider Reserve	Area	1997	2000	2002	Change 1997- 2000	Change 2000- 2002	Change 1997- 2002	
Bandhavgarh	2,325	662	661	661	-1	0	-1	
Bandipur-Nagarhole	3,807	1,767	1,763	1,763	-4	0	-4	
Bhadra	1,817	1,167	1,168	1,167	1	-1	0	
Bori-Satpura	2,398	1,346	1,346	1,346	0	0	0	
Buxa	1,376	447	438	438	-9	0	-9	
Corbett	2,107	1,049	1,048	1,048	-1	0	-1	
Dampa	810	772	754	754	-18	0	-18	
Dudhwa-	2,819	477	476	476	-1	0	-1	

Katarniaghat							
Indravati	2,570	1,906	1,904	1,904	-2	0	-2
Kalakad-					0	0	0
Mundanthurai	2,138	857	857	857			
Kanha	2,259	1,216	1,216	1,216	0	0	0
Manas	3,236	453	452	452	-1	0	-1
Melghat	2,499	1,384	1,384	1,384	0	0	0
Nagarjunasagar	4,330	1,125	1,123	1,123	-2	0	-2
Namdapha	1,421	1,214	1,223	1,223	9	0	9
Nameri	1,265	599	583	583	-16	0	-16
Pakhui	1,828	1,685	1,682	1,682	-3	0	-3
Palamu	2,733	1,481	1,462	1,462	-19	0	-19
Panna	1,692	631	631	631	0	0	0
Pench (MP)	2,028	807	807	807	0	0	0
Pench(Maharashtra)	764	463	462	462	-1	0	-1
Periyar	1,961	1,499	1,499	1,499	0	0	0
Ranthambore	3,856	369	364	364	-5	0	-5
Sariska	2,491	464	463	463	-1	0	-1
Simlipal	2,595	678	678	678	0	0	0
Sundarbans	1,803	230	233	233	3	0	3
Tadoba - Andheri	1,588	709	708	708	-1	0	-1
Valmiki	1,415	106	104	104	-2	0	-2
Total	61,931	25,563	25,489	25,439	-74	-50	-124