

11.13

KARNATAKA

11.13.1 Introduction

Karnataka, the seventh largest State of the country, with a geographical area of 1,91,791 sq km accounts for 5.83% of the geographical area of the country. The State is located in the south western region of India and lies between 11°30' N to 18°30' N latitudes and 74°00' E to 78°30' E longitudes and is bordered by Maharashtra and Goa in the North, Telangana and Andhra Pradesh in the east, Kerala & Tamil Nadu on the South and the Arabian Sea on the West. The State can be divided into two distinct physiographic regions viz the 'Malnad' or hilly region comprising Western Ghats and 'Maidan' or plain region comprising the inland plateau of varying heights. The average annual rainfall varies from 2,000 mm to 3,200 mm and the average annual temperature between 25°C and 35°C. The Western Ghats, which has an exceptionally high level of biological diversity and endemism, covers about 60% of forest area of the State. East flowing rivers in Karnataka mainly Cauvery & Krishna along with its tributaries drain into Bay of Bengal and west flowing rivers mainly Sharavathi & Kali drain into Arabian Sea. The State has 30 districts, amongst which 5 are tribal and 6 are hill districts. As per the 2011 census, Karnataka has a population of 61.13 million, which is 5.05% of India's population. The rural and urban populations constitute 61.43% and 38.57% respectively. Tribal population is 6.96% of the State's population. The population density of the State is 319 per sq km, which is less than the national average. The 19th Livestock census 2012 has reported a total livestock population of 27.70 million, which is about 5.4% of the livestock population of the country.

TABLE 11.13.1: Land Use Pattern

Land Use Types	Area (in 000' ha)	Percentage
Geographical Area	19,179	
Reporting area for land utilization	19,052	100.00
Forests	3,073	16.13
Not available for land cultivation	2,248	11.80
Permanent pastures and other grazing lands	904	4.74
Land under misc. tree crops and groves	277	1.45
Culturable wasteland	409	2.15
Fallow land other than current fallows	525	2.76
Current fallows	1,572	8.25
Net area sown	10,044	52.72

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2014-15)

11.13.1.1 A Brief Overview of Forestry Scenario

The State is endowed with diverse climate, topography and soils which has resulted in rich biodiversity. The diverse ecological niches support characteristic flora and fauna. The evergreen forests of the Western Ghats, which cover about 60% of forest area of State, is recognized as one of the 35 Biodiversity Hotspots in the World and one of the four Biodiversity Hotspots of the India. As per the Champion & Seth classification of the Forest Types (1968), the forests in Karnataka belong to eight Forest Type Groups, which are further divided into 21 Forest Types. Protection and management of degraded forests through community participation is a major thrust area of the State Forest Department besides bio-diversity conservation and eco-tourism.

The major species found in the forests of the State are *Tectona grandis*, *Santalum album*, *Terminalia spp*, *Dalbergia latifolia*, *Pterocarpus spp*, etc. In the Scrub and Thorny Forests, *Acacia spp*, *Balanites roxburghii*, *Cordia myxa*, *Capparis spp.*, *Prosopis spp.*, etc are found.

Recorded Forest Area (RFA) in the state is 38,284 sq km of which 28,690 sq km is Reserved Forest, 3,931 sq km is Protected Forest and 5,663 sq km is Unclassed Forests. In Karnataka, during the period 1st January 2015 to 5th February 2019, a total of 802.75 hectares of forest land was diverted for various non-forestry purposes under the Forest Conservation Act, 1980 (MoEF & CC, 2019). As per the information received from the state during that last two years 1,07,496 ha of plantations were raised in the State.

Five National Parks, 30 Wildlife Sanctuaries, 15 Conservation Reserves and one Community Reserve constitute the Protected Area network of the State covering 5.33% of its geographical area. Karnataka supports about 10% of total tiger population and 25% of elephant population of the country.

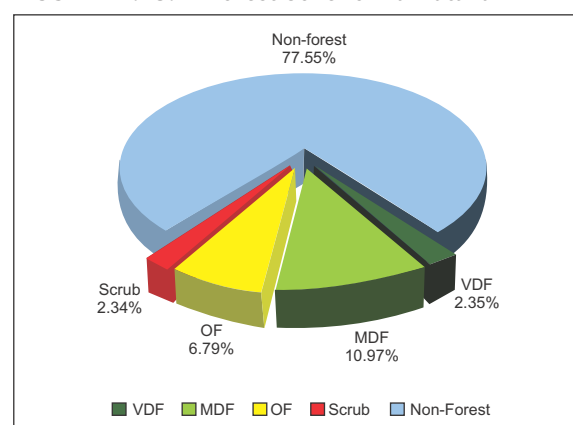
11.13.2 Forest Cover

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Nov 2017 to March 2018, the Forest Cover in the State is 38,575.48 sq km which is 20.11% of the State's geographical area. In terms of forest canopy density classes, the State has 4,501.15 sq km under Very Dense Forest (VDF), 21,048.09 sq km under Moderately Dense Forest (MDF) and 13,026.24 sq km under Open Forest (OF). Forest Cover in the State has increased by 1,025.48 sq km as compared to the previous assessment reported in ISFR 2017.

TABLE 11.13.2 Forest Cover of Karnataka
(in sq km)

Class	Area	% of GA
VDF	4,501.15	2.35
MDF	21,048.09	10.97
OF	13,026.24	6.79
Total	38,575.48	20.11
Scrub	4,484.07	2.34

FIGURE 11.13.1 Forest Cover of Karnataka



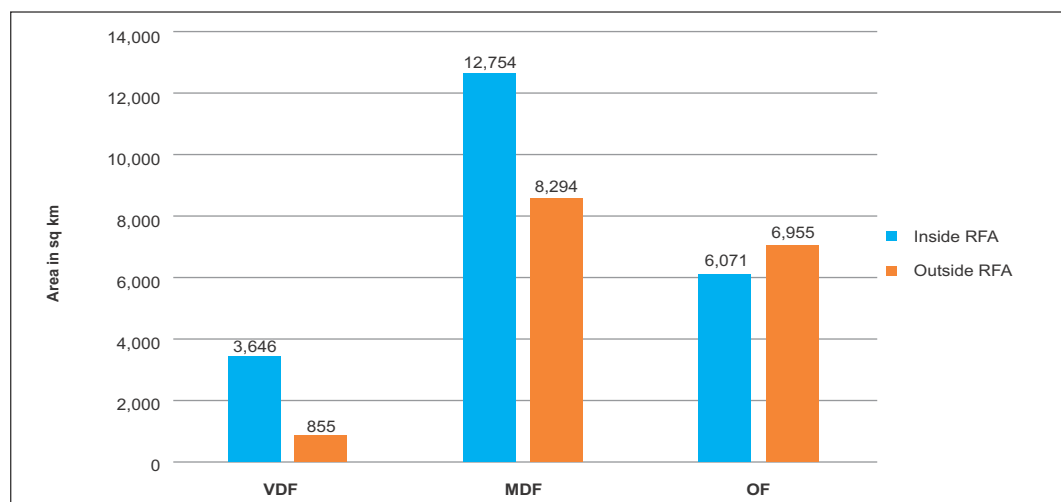
11.13.2.1 Forest Cover inside and outside Recorded Forest Area (or Green Wash)

The State has reported extent of recorded forest area (RFA) 38,284 sq km which is 19.96% of its geographical area. The reserved, protected and unclassified forests are 74.94%, 10.27% and 14.79% of the recorded forest area in the State respectively. However as the digitized boundary of recorded forest area from the state covers 31,036.84 sq km and the analysis of forest cover inside and outside this area is given below.

TABLE 11.13.3 Forest Cover inside and outside Recorded Forest Area or (Green Wash) in Karnataka (in sq km)

Forest Cover inside the Recorded Forest Area (or Green Wash)				Forest Cover outside the Recorded Forest Area (or Green Wash)			
VDF	MDF	OF	Total	VDF	MDF	OF	Total
3,646	12,754	6,071	22,471	855	8,294	6,955	16,104
16.22%	56.76%	27.02%		5.31%	51.50%	43.19%	

*in case of Karnataka RFA boundaries have been used.

FIGURE 11.13.2 Forest Cover inside and outside RFA in Karnataka**TABLE 11.13.4** District- wise Forest Cover in Karnataka

(in sq km)

District	Geographical Area (GA)	2019 Assessment				% of GA	Change wrt 2017 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Bagalkot	6,552	0.00	18.99	233.98	252.97	3.86	-0.03	399.00
Bangalore	2,196	0.00	24.64	262.79	287.43	13.09	53.43	8.00
Bangalore Rural	2,298	0.00	24.04	138.71	162.75	7.08	47.75	23.36
Belgaum ^H	13,433	35.99	736.85	368.76	1,141.60	8.50	7.60	688.00
Bellary	8,461	0.00	109.89	629.33	739.22	8.74	5.22	466.00
Bidar	5,448	0.00	22.00	66.42	88.42	1.62	3.42	37.00
Bijapur	10,498	0.00	0.00	25.05	25.05	0.24	1.05	10.00
Chamrajnagar	5,648	90.97	1,527.31	1,105.91	2,724.19	48.23	4.19	129.00
Chikkaballapura	4,244	0.00	18.56	251.14	269.70	6.35	20.70	181.00
Chikmagalur TH	7,202	901.80	2,581.08	468.90	3,951.78	54.87	15.78	74.00
Chitradurga	8,436	0.00	47.06	529.55	576.61	6.84	22.61	595.00
Dakshina Kannada TH	4,861	557.92	1,473.94	1,032.80	3,064.66	63.05	139.66	3.00
Davanagere	5,924	11.00	167.02	531.55	709.57	11.98	0.57	320.00
Dharwad	4,260	0.00	222.29	152.13	374.42	8.79	-7.58	3.00
Gadag	4,657	0.00	0.00	141.62	141.62	3.04	-1.38	117.00
Gulbarga	10,954	0.00	92.00	103.05	195.05	1.78	3.05	29.00
Hassan	6,814	147.95	774.31	556.18	1,478.44	21.70	34.44	68.00
Haveri	4,823	0.00	145.35	197.90	343.25	7.12	-17.75	103.00
Kodagu TH	4,102	795.90	1,888.21	579.27	3,263.38	79.56	12.38	2.00

Contd.

District	Geographical Area (GA)	2019 Assessment				% of GA	Change wrt 2017 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Kolar	3,979	0.00	58.97	322.42	381.39	9.59	61.39	68.00
Koppal	5,570	0.00	0.00	33.32	33.32	0.60	3.32	172.00
Mandya	4,962	0.00	114.21	385.11	499.32	10.06	127.32	96.70
Mysore ^T	6,307	124.96	586.20	341.67	1,052.83	16.69	23.83	29.92
Raichur	8,442	0.00	0.94	43.29	44.23	0.52	0.23	149.00
Ramanagara	3,516	0.00	196.45	468.24	664.69	18.90	53.69	170.09
Shimoga ^H	8,478	476.95	2,841.60	952.23	4,270.78	50.38	-49.22	23.00
Tumkur	10,597	0.00	72.89	1,211.15	1,284.04	12.12	308.04	387.00
Udupi ^T	3,582	214.96	1,405.09	663.33	2,283.38	63.75	145.38	0.00
Uttara Kannada ^H	10,277	1,142.75	5,881.18	1,099.82	8,123.75	79.04	5.75	2.00
Yadgir	5,270	0.00	17.02	130.62	147.64	2.80	0.64	131.00
Grand Total	1,91,791	4,501.15	21,048.09	13,026.24	38,575.48	20.11	1,025.48	4,484.07

TABLE 11.13.5 Forest Cover Change Matrix for Karnataka

(in sq km)

Class	2019 Assessment					Total ISFR 2017
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	4,501	1	0	0	0	4,502
Moderately Dense Forest	0	20,138	0	0	306	20,444
Open Forest	0	0	11,395	0	1,209	12,604
Scrub	0	0	0	4,484	0	4,484
Non Forest	0	909	1,631	0	1,47,217	1,49,757
Total ISFR 2019	4,501	21,048	13,026	4,484	1,48,732	1,91,791
Net Change	-1	604	422	0	-1,025	

Main reasons for the increase in forest cover in the State are plantation and conservation activities as well as improvement in interpretation.

TABLE 11.13.6 Altitude-wise Forest Cover in Karnataka

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	41,511	1,441	5,793	2,918	10,152 (26.32%)	284
500-1000	1,46,593	2,602	13,512	9,606	25,720 (66.67%)	4,119
1000-2000	3,687	458	1,743	502	2,703 (7.01%)	81
Total	1,91,791	4,501	21,048	13,026	38,575	4,484

(based on SRTM, Digital Elevation Model, 30 m, 2016)

TABLE 11.13.7 Forest Cover in different slope classes in Karnataka

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	161,569	930	9,600	8,284	18,814 (48.77%)	2,528
5-10	15,763	982	5,399	2,365	8,746 (22.67%)	965
10-15	6,715	894	2,906	1,066	4,866 (12.61%)	466
15-20	3,796	712	1,642	609	2,963 (7.68%)	271
20-25	2,122	477	855	365	1,697 (4.40%)	155
25-30	1,085	277	403	201	881 (2.28%)	72
>30	741	229	243	136	608 (1.58%)	27
Total	1,91,791	4,501	21,048	13,026	38,575	4,484

(based on SRTM, Digital Elevation Model, 30 m, 2016)

FIGURE 11.13.3 Forest Cover Map of Karnataka

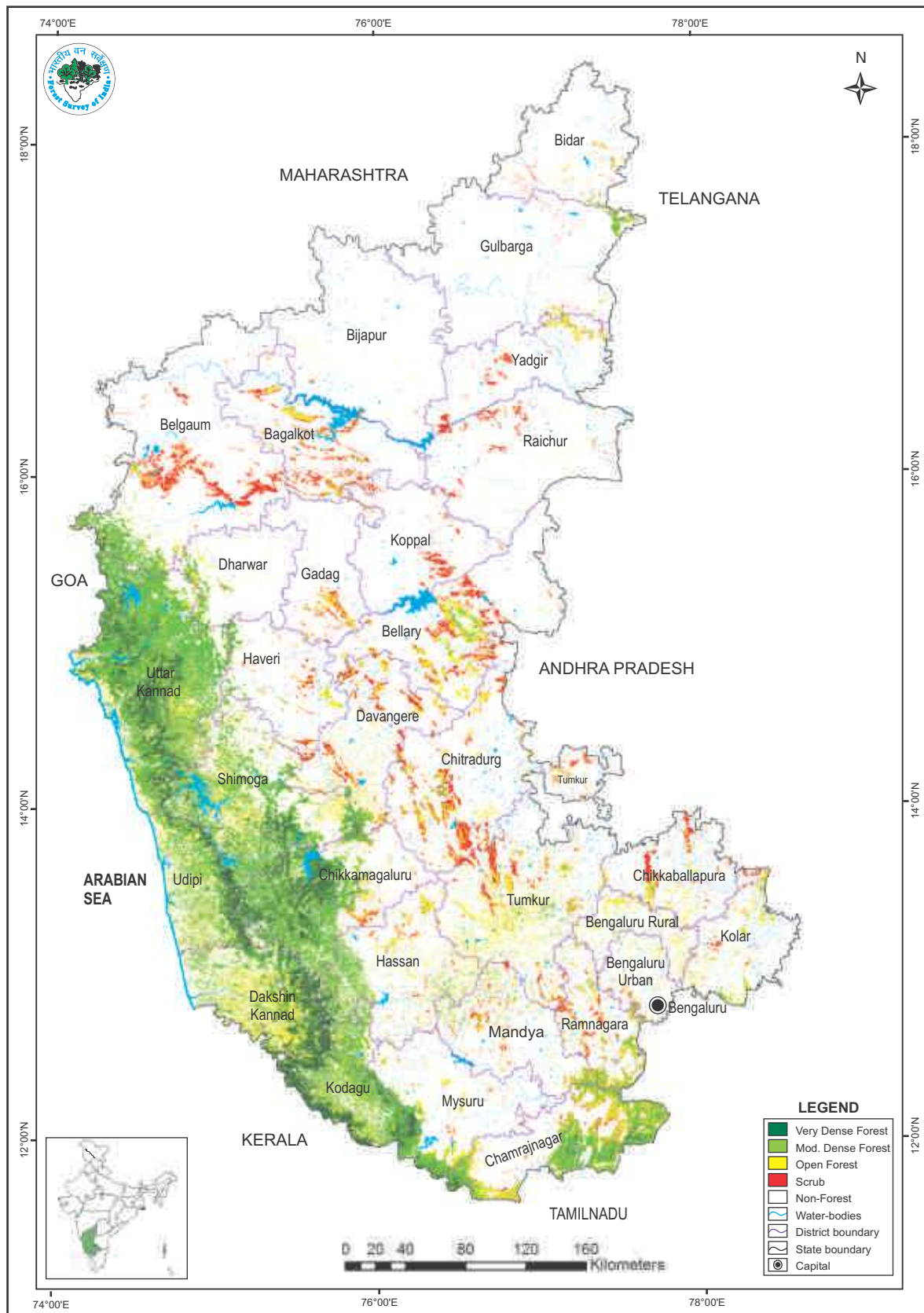


TABLE 11.13.8 Wetlands inside the Recorded Forest Area (or Green Wash)

(in ha)

Wetland Category	No. of Wetlands	Total Wetland Area
Inland Wetlands - Natural		
Lake/Pond	13	396
Riverine wetland	2	8
Waterlogged	9	67
River/Stream	99	14,873
Sub - Total	123	15,344
Inland Wetlands - Man-made		
Reservoir/Barrage	38	31,292
Tank/Pond	595	5,196
Sub - Total	633	36,488
Coastal Wetlands - Natural		
Creek	3	8
Sand/Beach	9	10
Intertidal mud flat	7	6
Mangrove	2	2
Sub - Total	21	26
Wetlands (<2.25 ha)	1,261	1,261
Total	2,038	53,119
Total Recorded Forest (or Green Wash) Area (in ha)		31,03,684
% of Wetland area inside Recorded Forest (or Green Wash) Area		1.71%

(analysis based on the National Wetland Atlas: India, 2011)

11.13.3 Forest Types & Biodiversity

Forest Type Maps of 2011 have been refined in the recently completed exercise by FSI. Percentage area under different forest types of Karnataka as per the Champion & Seth classification (1968), according to the latest exercise are presented in the following table.

Table 11.13.9 Percentage area under different forest types of Karnataka

Sl.No.	Forest Type	% of Forest cover
1	1A/C4 West Coast Tropical Evergreen Forest	12.65
2	2/E3 Moist Bamboo Brakes	0.00
3	2/E4 Lateritic Semi-Evergreen Forest	0.39
4	2A/2S1 West Coast Secondary Evergreen Dipterocarp Forest	0.73
5	2A/C2 West Coast Semi-Evergreen Forest	10.52
6	3B/2S1 Southern Secondary Moist Mixed Deciduous Forest	1.62
7	3B/C1b Moist Teak Forest	4.67
8	3B/C1c Slightly Moist Teak Forest	2.37
9	3B/C2 Southern Moist Mixed Deciduous Forest	11.70
10	4B/TS1 Mangrove Scrub	0.02
11	5/2S1 Secondary Dry Deciduous Forest	0.09
12	5/DS1 Dry Deciduous Scrub	7.12
13	5/DS4 (Dry Grass Land)	0.26

Contd.

Sl.No.	Forest Type	% of Forest cover
14	5/E4 <i>Hardwickia</i> Forest	1.08
15	5/E7 Laterite Thorn Forest	0.28
16	5A/C1b Dry Teak Forest	6.07
17	5A/C3 Southern Dry Mixed Deciduous Forest	7.73
18	6A/C1 Southern Thorn Forest	4.63
19	6A/DS1 Southern Thorn Scrub	7.49
20	8A/C1 Nilgiri Sub Tropical Hill Forest	0.83
21	11A/DS2 Southern Montane Wet Grassland	0.18
22	Plantation/ TOF	19.57
	Total	100.00

11.13.3.1 Assessment of Biodiversity

Findings of the rapid assessment of Biodiversity carried out at the national level for natural forests during September 2018 to May 2019 as part of the forest type mapping exercise is summarized below in table 11.13.10 and table 11.13.11 in respect of Karnataka.

TABLE 11.13.10 No. of species observed during the rapid assessment

Plant Type	Number of Species
Tree	325
Shrub	140
Herb	40

TABLE 11.13.11 Shannon-Wiener Index of Tree, Shrub and Herb species in different Type Groups of Karnataka

Sl.No.	Forest Type Group	Shannon-Wiener Index		
		Tree	Shrub	Herb
1.	Group 1- Tropical Wet Evergreen Forests	4.19	3.09	2.22
2.	Group 2- Tropical Semi-Evergreen Forests	4.00	2.58	1.85
3.	Group 3- Tropical Moist Deciduous Forests	3.56	2.66	2.24
4.	Group 5- Tropical Dry Deciduous Forests	3.66	2.68	1.04
5.	Group 6- Tropical Thorn Forests	3.09	2.32	1.01
6.	Group 8- Subtropical Broadleaved Hill Forests	2.53	2.55	1.29
7.	Group 11- Montane Wet Temperate Forest	1.88	*	*

* adequate number of sample plots were not available

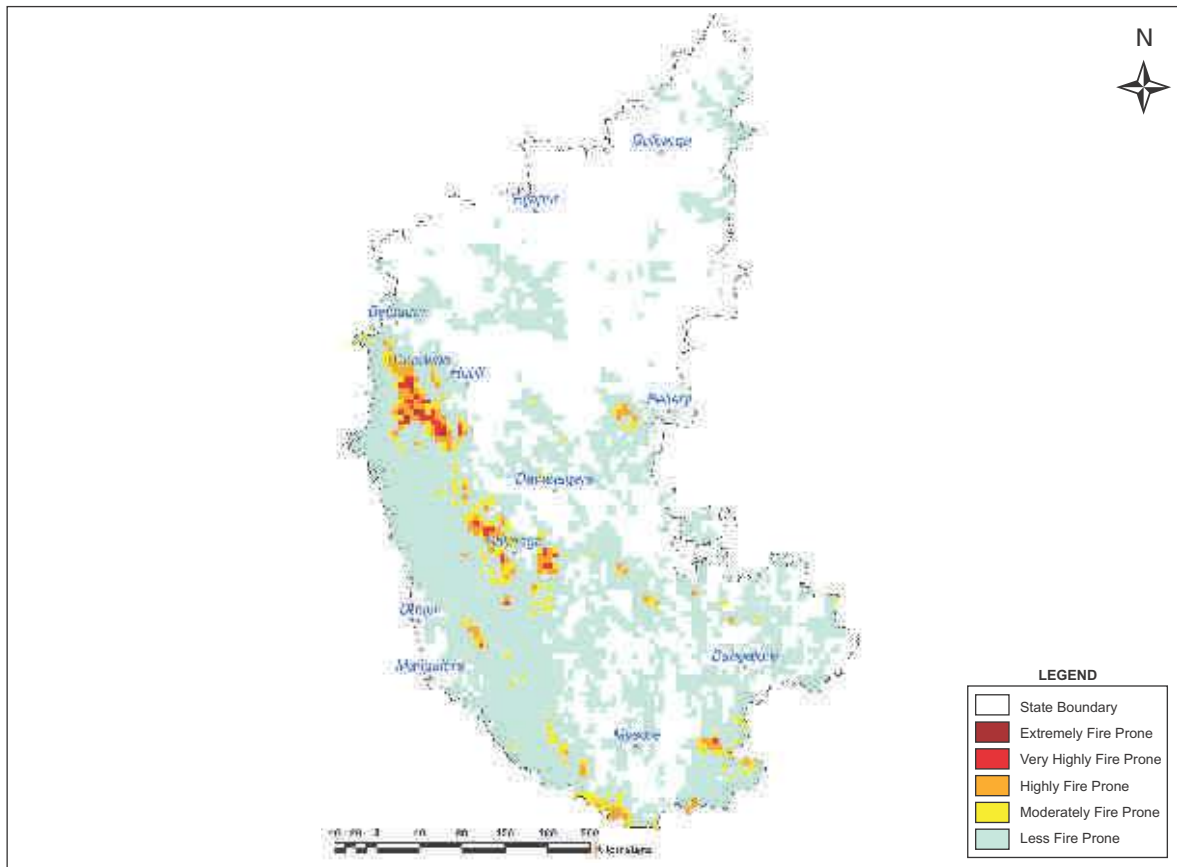
11.13.4 Fire Prone Forest Areas

Geographical area under different classes of forest fire proneness are given in the following table.

TABLE 11.13.12 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Geographical Area	% of Total forest cover
1.	Extremely fire prone	100.00	0.29
2.	Very highly fire prone	999.95	2.61
3.	Highly fire prone	3,067.40	6.96
4.	Moderately fire prone	5,056.71	9.99
5.	Less fire prone	80,436.10	80.15
	Total	89,660.16	100.00

FIGURE 11.13.4: Fire prone forest areas under different fire prone classes



11.13.5 Tree Cover

Forest cover presented in the section 11.13.2 accounts for tree patches of size 1 ha and more having canopy density more than 10%. However, trees occurring in patches of size less than 1 ha including scattered trees are assessed through sampling based methodology. Tree cover in Karnataka has been estimated as given in table 11.13.13.

TABLE 11.13.13 Tree Cover in Karnataka (in sq km)

Tree Cover	Area
	6,257

Tree cover of Karnataka has increased by 544 sq km as compared to the previous assessment reported in ISFR 2017.

11.13.6 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. FSI maps forest cover using satellite data and assesses tree cover outside forests using sampling based method. Forest Cover outside the recorded forest area is derived using boundaries of RFA or Green Wash. Extent of TOF therefore may be estimated as the sum of extent of forest cover outside the recorded forest areas (RFA) and tree cover as given in the preceding section.

TABLE 11.13.14 Extent of TOF in Karnataka (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
16,104	6,257	22,361

11.13.7 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Karnataka is given in the table 11.13.15. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 11.13.16

TABLE 11.13.15 Growing Stock in Karnataka (in m cum)

Growing Stock (GS)		% of Country's GS
Growing Stock in Recorded Forest Area	334.08	7.82
Growing Stock in TOF	103.03	6.27

TABLE 11.13.16 Diameter class distribution of top five species inside RFA in Karnataka (in '000)

Sl.No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Terminalia paniculata</i>	44,378	13,439	2,703
2.	<i>Terminalia tomentosa</i>	28,262	9,509	1,501
3.	<i>Tectona grandis</i>	43,773	10,957	857
4.	<i>Xylia xylocarpa</i>	35,123	10,236	832
5.	<i>Anogeissus latifolia</i>	34,644	4,040	245

11.13.8 Carbon Stock in Forest

The total Carbon stock of forests in the State including the TOF patches which are more than 1 ha in size is 383.76 million tonnes (1,407.12 million tonnes of CO₂ equivalent) which is 5.39% of total forest carbon of the country. Pool wise forest carbon in Karnataka is given in the following table.

TABLE 11.13.17 Forest Carbon in Karnataka in different pools (in '000 tonnes)

AGB	BGB	Dead wood	Litter	SOC	Total
1,28,882	38,742	1,993	8,931	2,05,215	3,83,763

11.13.9 Growing Stock of Bamboo

Bamboo bearing area and growing stock inside the recorded forest area (RFA)/ Green Wash in the State which include culms of 1 year age and above are given in the table 11.13.18

TABLE 11.13.18 Growing Stock of Bamboo in Karnataka

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	10181	6.36
Total number of culms (in millions)	1,910	4.84
Total equivalent green weight (in 000' tonnes)	26,456	9.53

11.13.10 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Karnataka in Rural and Urban areas are given in the table 11.13.19 and table 11.13.20 respectively.

TABLE 11.13.19 Top five tree species in TOF (Rural) in Karnataka

Sl. No.	Species	Relative Abundance (%)
1.	<i>Azadirachta indica</i>	22.27
2.	<i>Areca catechu</i>	10.13
3.	<i>Cocos nucifera</i>	9.90
4.	<i>Mangifera indica</i>	6.65
5.	<i>Acacia arabica</i>	5.26

TABLE 11.13.20 Top five trees species in TOF (Urban) in Karnataka

Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	22.62
2.	<i>Areca catechu</i>	20.75
3.	<i>Acacia auriculiformis</i>	8.24
4.	<i>Mangifera indica</i>	4.63
5.	<i>Tectona grandis</i>	3.02

11.13.11 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the table 11.13.21 and table 11.13.22 respectively.

TABLE 11.13.21 Major NTFP species in the State of Karnataka

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Solanum nigrum</i>	Herb	99.45
2.	<i>Rubus ellipticus</i>	Shrub	0.55

TABLE 11.13.22 Major invasive species in the State inside the RFA/Green Wash in Karnataka (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	2,863
2.	<i>Chromolaena odorata</i>	2,485
3.	<i>Ageratum conyzoides</i>	141
4.	<i>Acacia farnesiana</i>	122
5.	<i>Cassia tora</i>	109

Major NTFP species are given in terms of relative abundance whereas invasive species are given in terms of their estimated extent.

11.13.12 Quantified estimation of Dependence of People living in forest fringe villages on forests in Karnataka

Through a nation-wide study, FSI has done estimation of dependence of people living in the villages close to forest for fuel wood, fodder, small timber and bamboo in quantified terms for each State & UT of the country (Please refer to Chapter 10 in Vol. I for details). The estimated quantities of the four produce for Karnataka is given in the table 11.13.23

TABLE 11.13.23 Estimation of Dependence of People in Forest Fringe Villages on Forests in Karnataka

Fuelwood (tonnes)	Fodder (tonnes)	Bamboo (tonnes)	Small Timber (cum)
63,23,071	2,15,01,153	397	41,098

