

11.1 Andhra Pradesh

11.1.1 Introduction

The Andhra Pradesh Reorganization Act, 2014 bifurcated the erstwhile State of Andhra Pradesh into two separate States of Andhra Pradesh & Telangana in June, 2014. Andhra Pradesh, now the 8th largest State of the country is situated along the Bay of Bengal on the southeast coast of the country. Geographical area of the State is 1,62,968 sq km which is 4.96% of the geographical area of the country. The State lies between 12° 37' N to 19° 55' N latitude and 76° 45' E to 84° 46' E longitude and is bordered by Odisha & Chhattisgarh in the north, Telangana & Karnataka in west and Tamilnadu in the south. Bay of Bengal is on the East to the State. After Gujarat, Andhra Pradesh has the second longest coastline among the States of India. Physiographically, the State can be divided into Coastal Andhra and the comparatively drier Rayalaseema regions. The State experiences hot and humid climate. The annual rainfall ranges between 1,100 mm to 1,250 mm and the annual temperature varies from 15°C to 45°C. The State is drained by number of rivers, main rivers being the Godavari, Krishna and Penna. There are 13 districts in the State, out of which five are tribal districts. As per the 2011 census, Andhra Pradesh has a population of 49.39, million which is 4.08% of India's population. The urban & rural population constitute 29.58% and 70.42% respectively. The Tribal population is 5.32 %. The population density of the State is 308 persons per sq km which is lower than the national average. The 19th Livestock census 2012 has reported a total livestock population of 56.10 million for the undivided State of Andhra Pradesh.

Table 11.1.1 Land Use Pattern

Land Use Types	Area (in 000' ha)	Percentage
Geographical Area	16,276	
Reporting area for land utilization	16,276	100.00
Forests	3,663	22.51
Not available for land cultivation	3,353	20.60
Permanent pastures and other grazing lands	214	1.32
Land under misc. tree crops and groves	159	0.98
Culturable wasteland	391	2.40
Fallow land other than current fallows	858	5.27
Current fallows	1,401	8.61
Net area sown	6,236	38.31

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

11.1.1.1 A Brief Overview of Forestry Scenario

The State has variety of vegetation types rich in flora and fauna. Its varied topography ranging from the hills of Eastern Ghats and Nallamala is to the shores of Bay of Bengal, supports varied ecosystems. The forests in the State can broadly be divided into four major biotic provinces viz Deccan Plateau, Central Plateau, Eastern Highland and the East Coastal Plains. As per the Champion & Seth Classification of Forest Types (1968), the forests in Andhra Pradesh belong to five Type Groups which are further categorized into 16 Forest Types. Eastern Ghats region of the State is home to dense tropical forests, while the vegetation becomes sparse as the Ghats give way to the Deccan Plateau, where shrub vegetation is more common. The vegetation is largely dry deciduous type with a mixture of Teak, and species of the genera *Terminalia*, *Dalbergia*, *Pterocarpus*, *Anogeissus* etc. Red

Sanders (*Pterocarpus santalinus*) is endemic to Andhra Pradesh and is highly valued for its rich red colour and grain pattern. Andhra Pradesh is one of the pioneer States to adopt Joint Forest Management and about one-third of the forest area of the State is under JFM.

The State is also ranked 8th in terms of the Recorded Forest Area (RFA) which is 37,258 sq km. Reserved Forest, Protected Forest and Unclassed Forest constitute 31,959 sq km, 5,069 sq km and 230 sq km respectively. In Andhra Pradesh, during the period 1st January 2015 to 05th February 2019, a total of 3,474.57 hectares of forest land has been diverted for 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, 15,107 ha of plantations have been raised.

Andhra Pradesh has 3 National Parks and 13 Wildlife Sanctuaries covering an area of 7,311.08 sq km which is about 4.49 % of the geographical area of the State. The long sea coast provides the nesting ground for sea turtles, the back water of Pulicat lake are the feeding grounds for Flamingo & Grey Pelican, the estuaries of river Godavari and Krishna support rich mangrove forests.

Three National Parks, 13 Wildlife Sanctuaries, and 4 Community Reserves constitute the Protected Area network of the State covering 3.24% of its geographical area.

11.1.2 Forest Cover

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Nov 2017 to Oct 2018, the Forest Cover in the State is 29,137.40 sq km which is 17.88 % of the State's geographical area. In terms of forest canopy density classes, the State has 1,994.22 sq km under Very Dense Forest (VDF), 13,938.36 sq km under Moderately Dense Forest (MDF) and 13,204.82 sq km under Open Forest (OF). Forest Cover in the State has increased by 990.40 sq km as compared to the previous assessment reported in ISFR 2017.

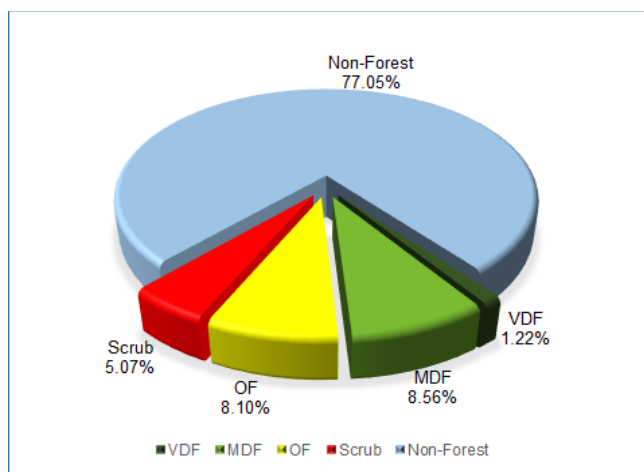


Figure 11.1.1 Forest Cover of Andhra Pradesh

Table 11.1.2 Forest Cover of Andhra Pradesh
(in sq km)

Class	Area	% of GA
VDF	1,994.22	1.22
MDF	13,938.36	8.56
OF	13,204.82	8.10
Total	29,137.40	17.88
Scrub	8,254.84	5.07

11.1.2.1 Forest Cover within and outside Recorded Forest Area (or Green Wash)

The State has reported extent of recorded forest area (RFA) 37,258 sq km which is 22.86 % of its geographical area. The reserved, protected and unclassified forests are 85.78 % and 13.60 % and 0.62 % respectively of the recorded forest area in the State. However, as the digitized boundary of recorded forest area from the State covers 37,920 sq km, the analysis of forest cover within and outside this area is given below.

Table 11.1.3 Forest Cover within and outside Recorded Forest Area or (Green Wash) in Andhra Pradesh

(in sq km)

Forest Cover within 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
1,965	12,821	9,333	24,119	29	1,117	3,872	5,018
8.15%	53.16%	38.69%		0.58%	22.26%	77.16%	

**in case of Andhra Pradesh RFA boundaries have been used.*

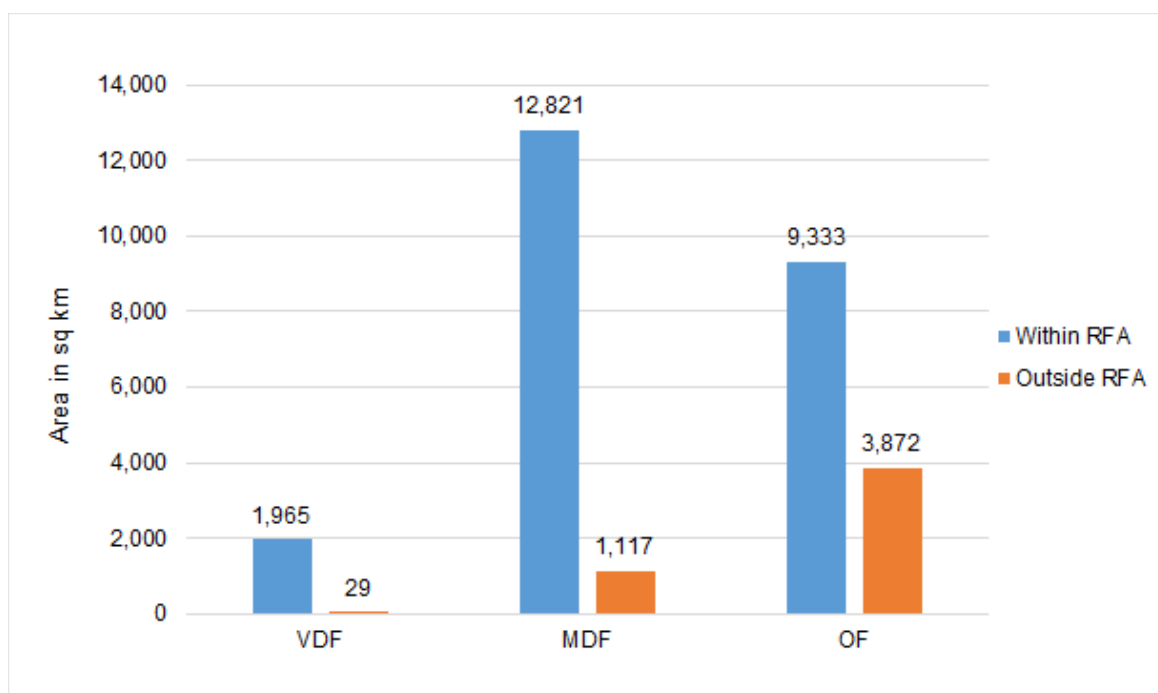


Figure 11.1.2 Forest Cover Within and Outside of RFA in Andhra Pradesh

Table 11.1.4 District- wise Forest Cover in Andhra Pradesh

(in sq km)

District	Geo-graphical Area (GA)	2019 Assessment				% of GA	Change wrt 2017 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Anantapur	19,130	0.00	213.14	773.69	986.83	5.16	-0.17	1,116.68
Chittoor	15,152	0.00	1,245.67	1,954.76	3,200.43	21.12	-0.57	1,281.85
East Godavari ^T	12,805	1,103.72	2,589.00	1,301.38	4,994.10	39.00	268.10	142.12
Guntur	11,391	1.00	291.32	595.68	888.00	7.80	10.00	451.17
Krishna	8,727	38.00	139.58	472.60	650.18	7.45	167.18	25.13
Kurnool	17,658	87.00	1,509.92	575.65	2,172.57	12.30	-1.43	680.38
Prakasam	17,626	254.22	1,802.61	1,247.01	3,303.84	18.74	12.84	1,194.36
Sri Potti Sriramulu Nellore	13,076	27.00	628.59	686.07	1,341.66	10.26	10.66	689.47
Srikakulam ^T	5,837	0.00	149.27	670.04	819.31	14.04	39.31	421.63
Visakhapatnam ^T	11,161	66.65	1,876.52	1,813.26	3,756.43	33.66	64.43	869.64
Vizianagaram ^T	6,539	0.00	230.91	821.08	1,051.99	16.09	189.99	354.85
West Godavari ^T	8,507	376.63	554.61	673.16	1,604.40	18.86	246.40	2.31
YSR Kadapa/ Cuddapah	15,359	40.00	2,707.22	1,620.44	4,367.66	28.44	-16.34	1,025.25
Grand Total	1,62,968	1,994.22	13,938.36	13,204.82	29,137.40	17.88	990.40	8,254.84

Table 11.1.5 Forest Cover Change Matrix for Andhra Pradesh

(in sq km)

Class	2019 Assessment					Total 2017
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	1,952	0	0	0	5	1,957
Moderately Dense Forest	40	13,630	51	54	276	14,051
Open Forest	2	163	10,955	288	731	12,139
Scrub	0	30	760	7,622	1,148	9,560
Non Forest	0	115	1,439	291	1,23,416	1,25,261
Total ISFR 2019	1,994	13,938	13,205	8,255	1,25,576	1,62,968
Net Change	37	-113	1,066	-1,305	315	

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

Table 11.1.6 Altitude-wise Forest Cover in Andhra Pradesh

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	1,35,122	1,082	8,556	10,032	19,670 (67.51%)	6,286
500-1000	25,747	840	5,223	3,017	9,080 (31.16%)	1,668
1000-2000	2,099	72	159	156	387 (1.33%)	301
Total	1,62,968	1,994	13,938	13,205	29,137	8,255

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

Table 11.1.7 Forest Cover in different slope classes in Andhra Pradesh

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	131,263	525	4,224	5,903	10,652 (36.56%)	4,277
5-10	10,695	374	2,321	1,876	4,571 (15.69%)	1,305
10-15	6,738	324	2,068	1,568	3,960 (13.59%)	911
15-20	5,500	288	1,893	1,404	3,585 (12.30%)	723
20-25	4,285	239	1,600	1,157	2,996 (10.28%)	537
25-30	2,718	154	1,076	778	2,008 (6.89%)	323
>30	1,769	90	756	519	1,365 (4.68%)	179
Total	1,62,968	1,994	13,938	13,205	29,137	8,255

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

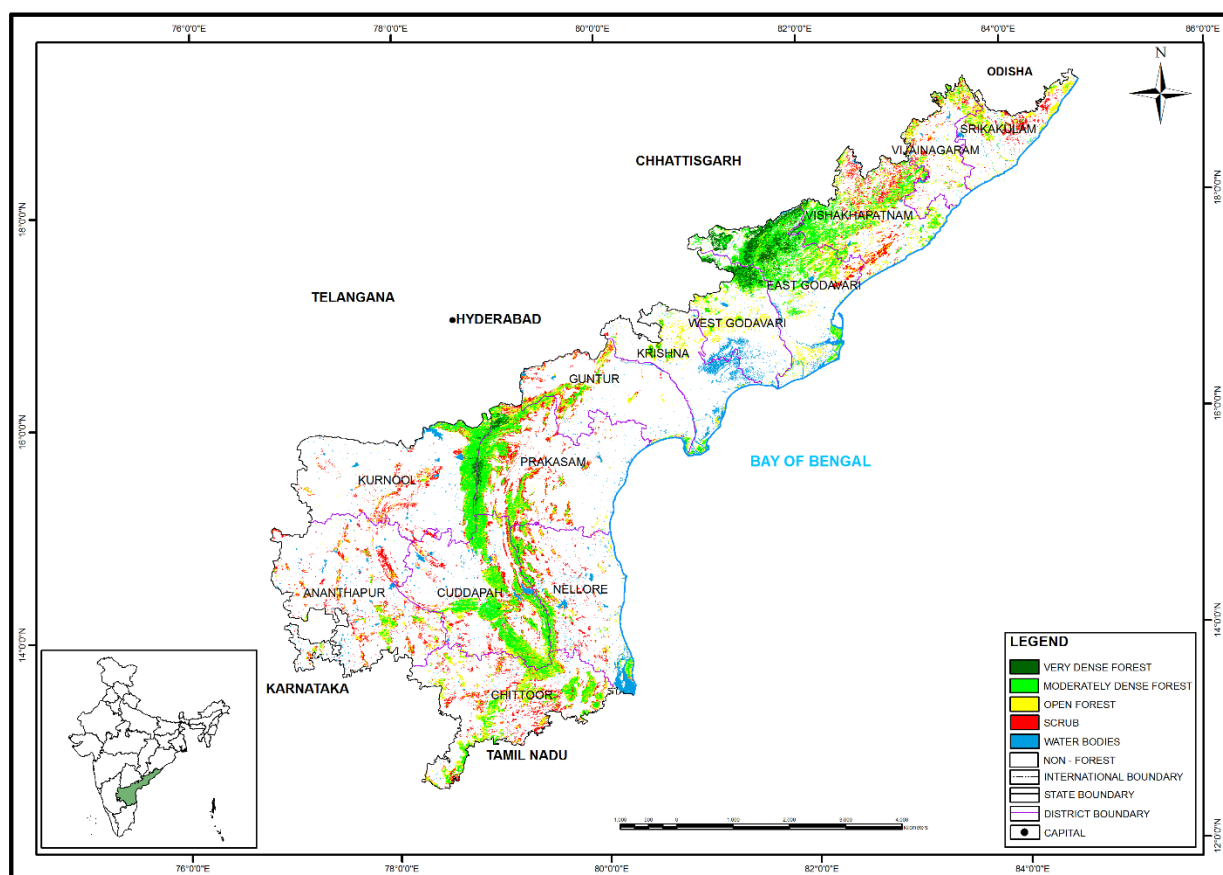


Figure 11.1.3 Forest Cover Map of Andhra Pradesh

Table 11.1.8 Wetlands within the Recorded Forest Area (or Green Wash) in Andhra Pradesh
(in ha)

Wetland Category	No. of Wetlands	Total Wetland Area
Inland Wetlands - Natural		
Lake/Pond	1	2
Waterlogged	3	6
River/Stream	95	9,794
Sub - Total	99	9,802
Inland Wetlands -Man-made		
Reservoir/Barrage	219	18,011
Tank/Pond	339	1,944
Waterlogged	1	1
Sub - Total	559	19,956
Coastal Wetlands - Natural		
Lagoon	1	35
Creek	29	2,366
Sand/Beach	22	2,139
Intertidal mud flat	60	8,090
Salt Marsh	3	254
Mangrove	98	29,413
Sub -Total	213	42,297
Wetlands (<2.25 ha)	303	303
Total	1,174	72,358

Total Recorded Forest (or Green Wash) Area	37,92,023
% of Wetland within Recorded Forest (or Green Wash) Area	1.91%

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

11.1.3 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 Andhra Pradesh as per the Champion & Seth classification (1968), according to the latest exercise are presented in the following table.

Table 11.1.9 Percentage area under different forest types of in Andhra Pradesh

Sl. No.	Forest Type	% of Forest Cover
1.	3B/C2 Southern Moist Mixed Deciduous Forest	5.20
2.	4A/L1 Littoral Forest	0.22
3.	4B/Ts2 Mangrove Forest	1.07
4.	5A/C1b Dry Teak Forest	1.57
5.	5A/C2 Dry Red Sanders-Bearing Forest	2.63
6.	5A/C3 Southern Dry Mixed Deciduous Forest	42.97
7.	5B/C1c Dry Peninsular Sal Forest	0.00
8.	5B/C2 Northern Dry Mixed Deciduous Forest	0.00
9.	5/DS1 Dry Deciduous Scrub	31.58
10.	5/DS2 Dry Savannah Forest	0.15
11.	5/DS4 (Dry Grass Land)	0.97
12.	5/E4 Hardwickia Forest	0.04
13.	5/E9 Dry Bamboo Brake	0.82
14.	5/2S1 Secondary Dry Deciduous Forest	2.11
15.	6A/C1 Southern Thorn Forest	5.03

Sl. No.	Forest Type	% of Forest Cover
16.	6A/C2 Karnatak Umbrella Thorn Forest	0.07
17.	6A/DS1 Southern Thorn Scrub	0.12
18.	6A/DS2 Southern Euphorbia Scrub	0.00
19.	7/C1 Tropical Dry Evergreen Forest	1.40
20.	7/DS1 Tropical Dry Evergreen Scrub	0.05
21.	Plantation/TOF	4.00
	Total	100.00

11.1.3.1 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 11.1.10 and Table 11.1.11 in respect of Andhra Pradesh.

Table 11.1.10 Assessment of Biodiversity in Andhra Pradesh

Plant Type	Number of Species
Trees	242
Shrubs	138
Herbs	44

Table 11.1.11 Shannon-Weiner Index of Tree, Shrub and Herb species in different Type Groups of Andhra Pradesh

Sl.No.	Forest Type Group	Shannon-Weiner Index		
		Tree	Shrubs	Herbs
1.	Group 3- Tropical Moist Deciduous Forests	3.15	2.98	2.71
2.	Group 4- Littoral and Swamp Forests	*	1.43	*
3.	Group 5- Tropical Dry Deciduous Forests	4.07	3.48	1.99
4.	Group 6- Tropical Thorn Forests	3.74	3.01	1.45
5.	Group 7- Tropical Dry Evergreen Forests	3.28	2.99	1.92

* adequate number of sample plots were not available

11.1.4 Fire Prone Forest Areas

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

Table 11.1.12 Forest Fire Prone Classes

Sl.No	Forest Fire Prone Classes	Geo graphical Area	% of Total Forest Cover
1	Extremely fire prone	1,147.69	4.26
2	Very highly fire prone	3,784.74	13.04
3	Highly fire prone	5,017.28	15.27
4	Moderately fire prone	7,172.12	18.72
5	Less fire prone	64,626.70	48.71
Total		81,748.53	100.00

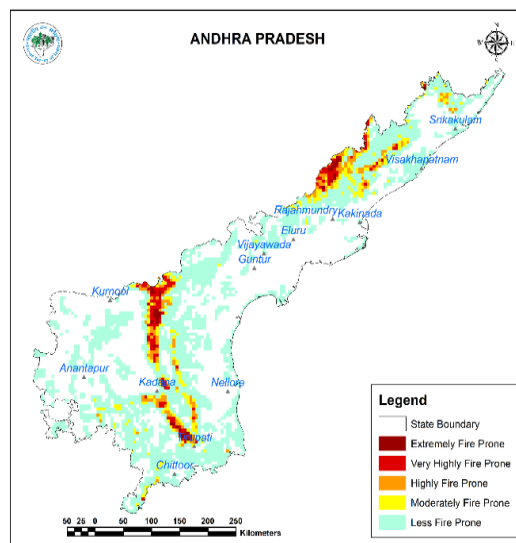


Figure. 11.1.4: Fire prone forest areas under different fire prone classes

11.1.5 Tree Cover

Forest cover presented in the section 11.1.2 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 Andhra Pradesh has been estimated as given in Table 11.1.13.

Table 11.1.13 Tree Cover in Andhra Pradesh

(in sq km)	
Tree Cover	Area
	3,914

Tree cover of Andhra Pradesh has increased by 161 sq km as compared to the previous assessment reported in ISFR 2017.

11.1.6 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 11.1.14 Extent of TOF in Andhra Pradesh

(in sq km)		
Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
5,018	3,914	8,932

11.1.7 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Andhra Pradesh is given in the Table 11.1.15. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 11.1.16

Table 11.1.15 Growing Stock in Andhra Pradesh

Growing Stock (GS)		(in m cum)
		% of Country's GS
Growing Stock in Recorded Forest Area	119.02	2.79
Growing Stock in TOF	67.68	4.12

Table 11.1.16 Diameter class distribution of top five species within RFA in Andhra Pradesh

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Xylia xylocarpa</i>	42,011	6,137	536
2.	<i>Anogeissus latifolia</i>	58,061	1,845	0
3.	<i>Hardwickia binata</i>	17,689	2,309	179
4.	<i>Terminalia crenulata</i>	18,057	2,653	179
5.	<i>Tamarindus indica</i>	1,129	977	626

11.1.8 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 218.735 million tonnes (802.028 million tonnes of CO₂ equivalent) which is 3.07 % of total forest carbon of the country. Pool wise forest carbon in Andhra Pradesh is given in the following table

Table 11.1.17 Forest Carbon in Andhra Pradesh in different pools

(in '000 tonnes)					
AGB	BGB	Dead wood	Litter	SOC	Total
60,707.46	24,090.30	627.17	3,066.92	13,0242.97	2,18,734.83

11.1.9 Growing Stock of Bamboo

Bamboo bearing area and growing stock within the recorded forest area (RFA)/ Green Wash which include culms of 1 year age and above are given in the Table 11.1.18

Table 11.1.18 Growing Stock of Bamboo in Andhra Pradesh

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area within RFA/Green Wash	7,003 sq km	4.38
Total number of culms	1820 millions	4.61
Total equivalent green weight (in 000' tonnes)	16,157	5.82

11.1.10 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Andhra Pradesh in Rural and Urban areas are given in the Table 11.1.19 and Table 11.1.20 respectively

Table 11.1.19 Top five tree species in TOF (Rural) in Andhra Pradesh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	29.44
2.	<i>Borassus flabelliformis</i>	11.72
3.	<i>Azadirachta indica</i>	9.84
4.	<i>Cocos nucifera</i>	7.95
5.	<i>Anacardium occidentale</i>	5.20

Table 11.1.20 Top five tree species in TOF (Urban) in Andhra Pradesh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	16.46
2.	<i>Azadirachta indica</i>	11.66
3.	<i>Mangifera indica</i>	7.69
4.	<i>Tectona grandis</i>	7.23
5.	<i>Bongamia glabra</i>	6.88

11.1.11 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 11.1.21 and Table 11.1.22 respectively.

Table 11.1.21 Major NTFP species in the state of Andhra Pradesh

Sl No.	Species	Plant type	Relative Abundance (%)
1.	<i>Solanum nigrum</i>	Herbs	98.98
2.	<i>Acacia concina /acacia sinuata</i>	Shrub	0.72
3.	<i>Oscimum bassilicum</i>	Herbs	0.20
4.	<i>Nervilia aragoana</i>	Herbs	0.10

Table 11.1.22 Major invasive species in the state within the RFA/Green Wash in Andhra Pradesh

Sl No.	Species	Estimated Extent (in sq km)
1.	<i>Lantana camara</i>	518.49
2.	<i>Ageratum conyzoides</i>	375.17
3.	<i>Chromolaena odorata</i>	202.34
4.	<i>Cuscuta spp.</i>	100.11
5.	<i>Prosopis juliflora</i>	93.79

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

11.1.12 Quantified estimation of Dependence of People living in forest fringe villages on forests in Andhra Pradesh

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 Andhra Pradesh is given in the Table 11.1.23

Table 11.1.23 Estimation of Dependence of People in Forest Fringe Villages on Forests in Andhra Pradesh

Fuelwood (tonnes)	Fodder (tonnes)	Bamboo (tonnes)	Small Timber (cum)
27,89,052	2,50,42,838	29,477	5,72,654