

11.9

HARYANA

11.9.1 Introduction

Haryana is situated in the northern part of India and has a geographical area of 44,212 sq km which constitutes 1.34% of the geographical area of the country. The State lies between latitude 27°39'N to 30°55'N and longitude 74°27'E to 77°36'E. Physiographically Haryana falls in the Indo Gangetic plain although some of the areas fall in Shiwalik hills as well. Climate of the State varies from moist sub-tropical in north bordering Himachal Pradesh to arid in southern part bordering Rajasthan. The State is bordered by Himachal Pradesh and Punjab in the North, Uttarakhand, Uttar Pradesh and Delhi on the East and Rajasthan on the West & South. The average annual rainfall varies from about 200 mm to 1,400 mm and the average annual temperature ranges between 1°C to 45°C. The Yamuna and the Ghaggar are the important rivers of the state. The state has 21 districts, none are classified as tribal or hill districts. As per the 2011 census, Haryana has a population of 25.35 million accounting to 2.1% of India's population. The rural and urban population constitutes 34.87% and 65.13% respectively. The population density of the State is 573 per sq km which is higher than the national average. The 19th Livestock census 2012 has reported a total livestock population of 8.82 million.

TABLE 11.9.1 Land Use Pattern

Land Use Types	Area (in 000' ha)	Percentage
Geographical Area	4,421	
Reporting area for land utilization	4,371	100.00
Forests	37	0.86
Not available for land cultivation	653	14.94
Permanent pastures and other grazing lands	25	0.57
Land under misc. tree crops and groves	9	0.20
Culturable wasteland	17	0.39
Fallow land other than current fallows	22	0.51
Current fallows	86	1.97
Net area sown	3,522	80.56

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



11.9.1.1 A Brief Overview of Forestry Scenario

Haryana is primarily an agricultural State of India and 80% of the total geographical area is under agriculture. As per the Champion & Seth Classification of Forest Types (1968), the forests in Haryana belong to three Forest Type Groups i.e. Tropical Dry Deciduous Forest, Tropical Thorn Forest and Subtropical Pine Forests which are divided into 10 Forest Types. Over 500 bird species have been recorded in the State which is almost 40% of total bird species in the country. Although, the maximum portion of the geographical area consists of agricultural fields, over a time, the State has achieved a unique status in the field of agroforestry which has enabled the forest deficient State to support a large number of wood-based industries based on farm-grown timber. Poplar and Eucalyptus trees are the major agroforestry species which have become the main resource for improvement of livelihood of farmers in northern and central parts of the State.

Special emphasis is being given to Soil and Moisture Conservation works in the hills to conserve water and deliver it to adjacent farmlands for increasing their productivity and enhancing incomes. Herbal Parks have been developed in every district to bring people closer to the natural ecosystem.

Recorded Forest Area (RFA) in the State is 1,559 sq km of which 249 sq km is Reserved Forests, 1,158 sq km is Protected Forests and 152 sq km is Unclassed Forests. In Haryana, during the period 1st January 2015 to 5th February 2019, a total of 1,529 hectares of forest land was diverted for non-forestry purposes under the Forest Conservation Act, 1980 (MoEF & CC, 2019).

Two National Parks, eight Wildlife Sanctuaries and two Conservation Reserves constitute the Protected Area network of the State covering 0.75% of its geographical area.

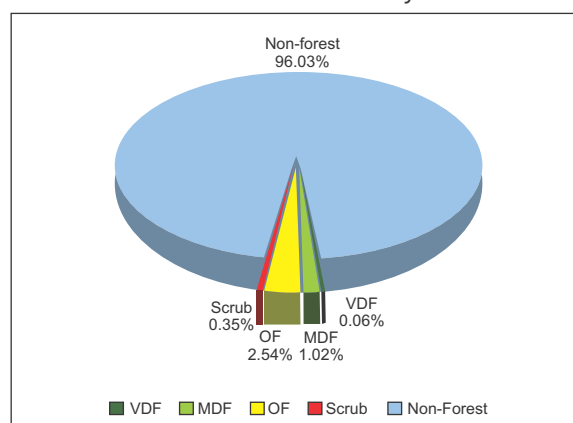
11.9.2 Forest Cover

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Oct to Dec 2017, the Forest Cover in the State is 1,602.44 sq km which is 3.62% of the State's geographical area. In terms of forest canopy density classes, the State has 28.00 sq km under Very Dense Forest (VDF), 450.90 sq km under Moderately Dense Forest (MDF) and 1,123.54 sq km under Open Forest (OF). Forest Cover in the State has increased by 14.44 sq km as compared to the previous assessment reported in ISFR 2017.

TABLE 11.9.2 Forest Cover of Haryana
(in sq km)

Class	Area	% of GA
VDF	28.00	0.06
MDF	450.90	1.02
OF	1,123.54	2.54
Total	1,602.44	3.62
Scrub	154.29	0.35

FIGURE 11.9.1 Forest Cover of Haryana



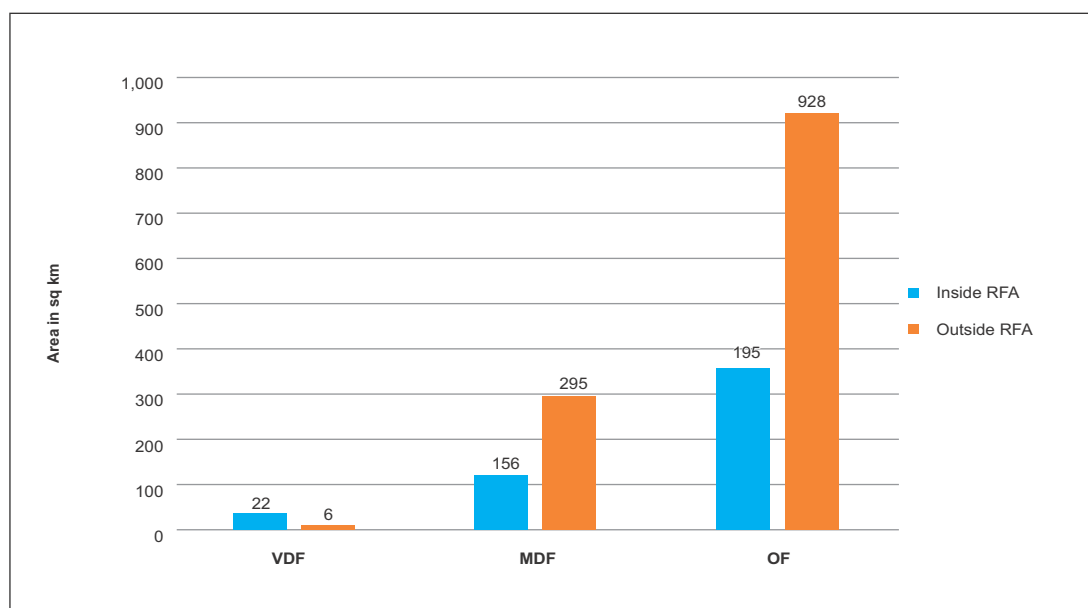
11.9.2.1 Forest Cover inside and outside Recorded Forest Area (or Green Wash)

The State has reported extent of recorded forest area (RFA) 1,559 sq km which is 3.53% of its geographical area. The reserved, protected and unclassified forests are 15.97%, 74.28% and 9.75% of the recorded forest area in the State respectively. However, as the digitized boundary of recorded forest area from the State covers 565.81 sq km, the analysis of forest cover inside and outside this area is given below.

TABLE 11.9.3 Forest Cover inside and outside Recorded Forest Area or (Green Wash) in Haryana (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
22	156	195	373	6	295	928	1,229
5.85%	41.89%	52.26%		0.50%	23.96%	75.54%	

*in case of Haryana RFA boundaries have been used.

FIGURE 11.9.2 Forest Cover inside and outside RFA in Haryana**TABLE 11.9.4** District-wise Forest Cover in Haryana (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			
Ambala	1,574	0.00	18.00	33.35	51.35	3.26	-0.65	1.00
Bhiwani	4,778	0.00	8.00	105.81	113.81	2.38	1.81	11.00
Faridabad	741	0.00	26.05	53.89	79.94	10.79	-0.06	17.76
Fatehabad	2,538	0.00	3.00	15.00	18.00	0.71	0.00	0.00
Gurgaon	1,258	0.00	33.69	82.49	116.18	9.24	-0.82	17.00
Hisar	3,983	0.00	11.86	45.78	57.64	1.45	0.64	4.32
Jhajjar	1,834	0.00	0.00	25.93	25.93	1.41	1.93	4.00
Jind	2,702	0.00	4.98	16.02	21.00	0.78	0.00	0.00
Kaithal	2,317	0.00	23.92	33.15	57.07	2.46	0.07	0.00
Karnal	2,520	0.00	4.00	28.24	32.24	1.28	0.24	0.76
Kurukshetra	1,530	0.00	17.60	22.15	39.75	2.60	0.75	2.50
Mahendragarh	1,899	0.00	22.00	81.29	103.29	5.44	4.29	35.00
Mewat	1,507	0.00	14.00	97.18	111.18	7.38	1.18	25.38
Palwal	1,359	0.00	1.97	12.00	13.97	1.03	-0.03	0.00
Panchkula	898	6.00	150.90	233.80	390.70	43.51	-0.30	23.84

Contd.

District	Geographical Area (GA)	2019 Assessment				% of GA	Change wrt 2017 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Panipat	1,268	0.00	2.95	12.93	15.88	1.25	-0.12	1.00
Rewari	1,594	0.00	10.00	52.45	62.45	3.92	3.45	8.44
Rohtak	1,745	0.00	2.97	18.16	21.13	1.21	2.13	0.39
Sirsa	4,277	0.00	3.01	53.59	56.60	1.32	-0.40	0.00
Sonipat	2,122	0.00	3.00	17.97	20.97	0.99	0.97	0.97
Yamunanagar	1,768	22.00	89.00	82.36	193.36	10.94	-0.64	0.93
Grand Total	44,212	28.00	450.90	1,123.54	1,602.44	3.62	14.44	154.29

TABLE 11.9.5 Forest Cover Change Matrix for Haryana

(in sq km)

Class	2019 Assessment					Total ISFR 2017
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	28	0	0	0	0	28
Moderately Dense Forest	0	451	0	0	1	452
Open Forest	0	0	1,103	0	5	1,108
Scrub	0	0	5	148	1	154
Non Forest	0	0	15	6	42,449	42,470
Total ISFR 2019	28	451	1,123	154	42,456	44,212
Net Change	0	-1	15	0	-14	

Main reasons for the increase in forest cover in the State are plantation and conservation activities.

TABLE 11.9.6 Altitude-wise Forest Cover in Haryana

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	43,838	16	336	969	1,321 (82.46%)	142
500-1000	330	12	94	133	239 (14.92%)	11
1000-2000	44	0	21	21	42 (2.62%)	1
Total	44,212	28	451	1,123	1,602	154

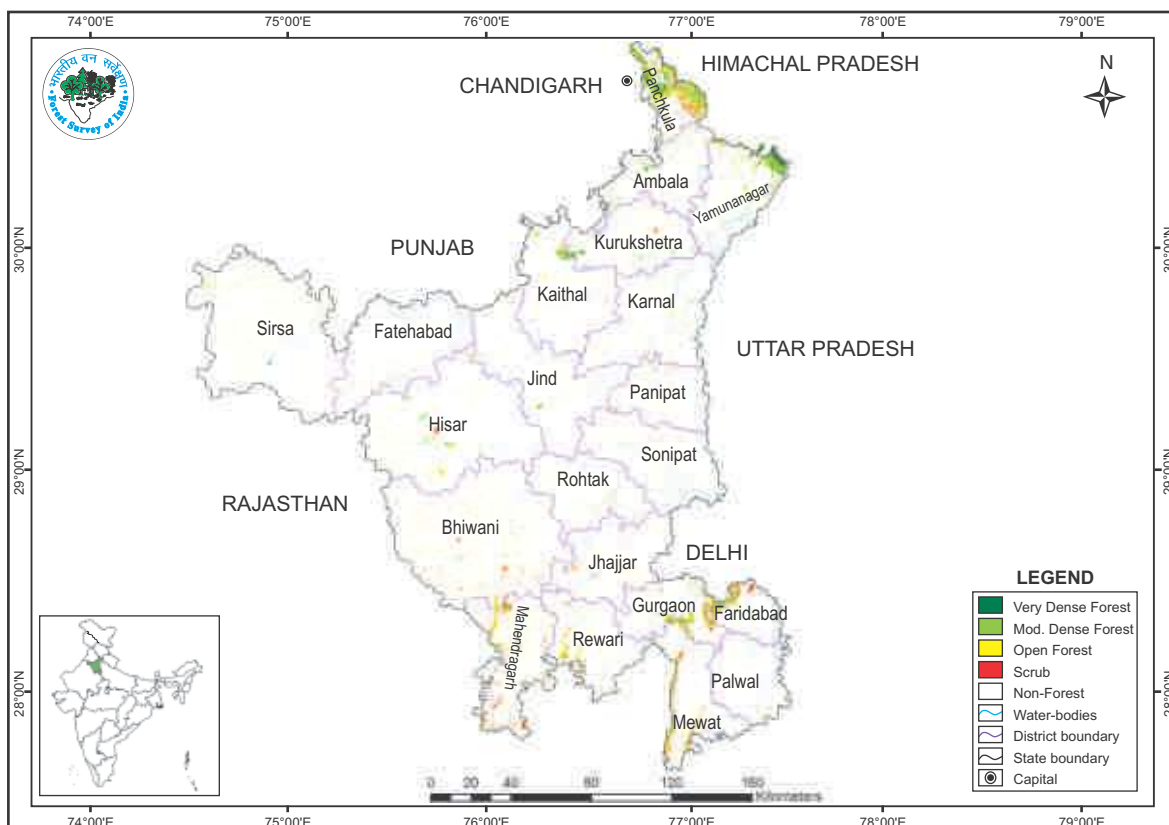
(based on SRTM, Digital Elevation Model, 30 m, 2016)

TABLE 11.9.7 Forest Cover in different slope classes in Haryana

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	42,615	14	246	782	1,042 (65.04%)	91
5-10	1,104	7	75	128	210 (13.11%)	24
10-15	228	4	55	84	143 (8.93%)	15
15-20	126	2	36	58	96 (5.99%)	11
20-25	74	1	21	37	59 (3.68%)	7
25-30	41	0	12	21	33 (2.06%)	4
>30	24	0	6	13	19 (1.19%)	2
Total	44,212	28	451	1,123	1,602	154

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

FIGURE. 11.9.3 Forest Cover Map of Haryana**TABLE 11.9.8** Wetlands inside the Recorded Forest Area (or Green Wash) in Haryana

(in ha)

Wetland Category	No. of Wetlands	Total Wetland Area
Inland Wetlands - Natural		
Lake/Pond	5	671
Waterlogged	2	7
River/Stream	9	1,022
Sub - Total	16	1,700
Inland Wetlands -Man-made		
Tank/Pond	16	61
Waterlogged	11	89
Sub - Total	27	150
Wetlands (<2.25 ha)	35	35
Total	78	1,885
Total Recorded Forest (or Green Wash) Area (in ha)		56,581
% of Wetland area inside Recorded Forest (or Green Wash) Area		3.33%

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

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

TABLE 11.9.9 Percentage Area under different forest types of Haryana

Sl.No.	Forest Type	% of Forest cover
1.	5B/C1a Dry Siwalik Sal Forest	2.66
2.	5B/C2 Northern Dry Mixed Deciduous Forest	30.20
3.	5/DS1 Dry Deciduous Scrub	1.62
4.	5/E9 Dry Bamboo Brakes	0.41
5.	5/E1/DS1 <i>Anogeissus Pendula</i> Scrub	0.89
6.	5/E1 <i>Anogeissus Pendula</i> Forest	5.00
7.	6B/C2 Ravine Thorn Forest	14.32
8.	6B/C1 Desert Thorn Forest	6.08
9.	6/1S1 Desert Dune Scrub	6.40
10.	9/C1a Siwalik Chir Pine Forest	0.72
11.	Plantation/ TOF	31.70
	Total	100.00

11.9.3.1 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 11.9.10 and table 11.9.11 in respect of Haryana.

TABLE 11.9.10 No. of species observed during the rapid assessment

Plant Type	Number of Species
Tree	45
Shrub	43
Herb	50

TABLE 11.9.11 Shannon-Wiener Index of Tree, Shrub and Herb species in different Type Groups of Haryana

Sl.No.	Forest Type Group	Shannon-Wiener Index		
		Tree	Shrub	Herb
1	Group 5- Tropical Dry Deciduous Forests	2.69	1.88	1.70
2	Group 6- Tropical Thorn Forests	1.94	1.96	2.24
3	Group 9- Subtropical Pine Forests	*	2.62	2.23

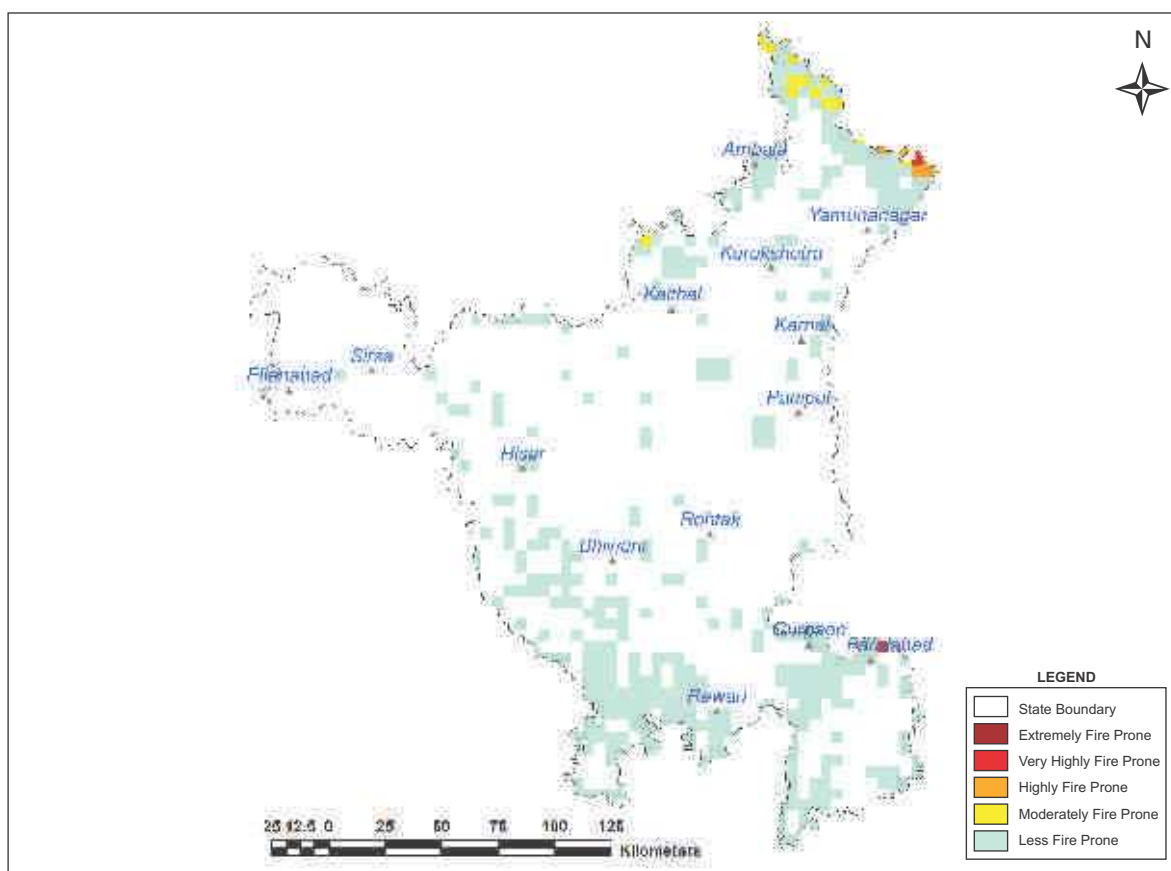
*adequate number of sample plots were not available

11.9.4 Fire Prone Forest Areas

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

TABLE 11.9.12 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Geographical Area	% of Total forest cover
1	Extremely fire prone	0.00	0.00
2	Very highly fire prone	44.28	2.33
3	Highly fire prone	72.69	5.87
4	Moderately fire prone	283.08	18.08
5	Less fire prone	9,317.45	73.72
	Total	9,717.50	100.00

FIGURE 11.9.4 Fire prone forest areas under different fire prone classes

11.9.5 Tree Cover

Forest cover presented in the section 11.9.2 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 Haryana has been estimated as given in table 11.9.13.

TABLE 11.9.13 Tree Cover in Haryana (in sq km)

Tree Cover	Area
	1,565

Tree cover of Haryana has increased by 150 sq km as compared to the previous assessment reported in ISFR 2017.

11.9.6 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 11.9.14 Extent of TOF in Haryana (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
1,229	1,565	2,794

11.9.7 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Haryana is given in the table 11.9.15. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 11.9.16

TABLE 11.9.15 Growing Stock in Haryana (in m cum)

Growing Stock (GS)		% of Country's GS
Growing Stock in Recorded Forest Area	4.22	0.10
Growing Stock in TOF	17.56	1.07

TABLE 11.9.16 Diameter class distribution of top five species inside RFA in Haryana (in '000)

Sl.No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Eucalyptus species</i>	2,347	301	0
2.	<i>Dalbergia sissoo</i>	1,707	350	0
3.	<i>Prosopis juliflora</i>	3,038	158	0
4.	<i>Acacia catechu</i>	3,114	0	0
5.	<i>Acacia tortolis</i>	2,244	65	0

11.9.8 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 10.47 million tonnes (38.39 million tonnes of CO₂ equivalent) which is 0.15% of total forest carbon of the country. Pool wise forest carbon in Haryana is given in the following table.

TABLE 11.9.17 Forest Carbon in Haryana in different pools (in '000 tonnes)

AGB	BGB	Dead wood	Litter	SOC	Total
2,455	929	18	137	6,927	10,466

11.9.9 Growing Stock of Bamboo

Bamboo bearing area and growing stock inside the recorded forest area (RFA)/ Green Wash which include culms of 1 year age and above are given in the table 11.9.18

TABLE 11.9.18 Growing Stock of Bamboo in Haryana

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	72	0.04
Total number of culms (in millions)	-	-
Total equivalent green weight (in '000' tonnes)	-	-

11.9.10 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Haryana in Rural and Urban areas are given in the table 11.9.19 and table 11.9.20 respectively

TABLE 11.9.19 Top five tree species in TOF (Rural) in Haryana

Sl. No.	Species	Relative Abundance (%)
1.	<i>Eucalyptus species</i>	22.02
2.	<i>Dalbergia sissoo</i>	12.06
3.	<i>Prosopis cineraria</i>	9.26
4.	<i>Azadirachta indica</i>	8.19
5.	<i>Populus species</i>	6.56

TABLE 11.9.20 Top five tree species in TOF (Urban) in Haryana

Sl. No.	Species	Relative Abundance (%)
1.	<i>Eucalyptus species</i>	15.37
2.	<i>Azadirachta indica</i>	11.06
3.	<i>Prosopis juliflora</i>	8.99
4.	<i>Morus species</i>	6.08
5.	<i>Melia azadirachta</i>	6.05

11.9.11 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the table 11.9.21 and table 11.9.22 respectively

TABLE 11.9.21 Major NTFP Species in the state of Haryana

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Calamus longisetus</i>	Shrub	100.00

TABLE 11.9.22 Major invasive species in the state inside the RFA/Green Wash in Haryana (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	78
2.	<i>Prosopis juliflora</i>	54
3.	<i>Saccharum spontaneum</i>	54
4.	<i>Ageratum houstonianum</i>	26
5.	<i>Leucaena leucocephala</i>	14

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

11.9.12 Quantified estimation of Dependence of People living in forest fringe villages on forests in Haryana

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 Haryana is given in the table 11.9.23

TABLE 11.9.23 Estimation of Dependence of People in Forest Fringe Villages on Forests in Haryana

Fuelwood (tonnes)	Fodder (tonnes)	Bamboo (tonnes)	Small Timber (cum)
5,00,015.80	68,40,019.08	39	16,471