

11.20

NAGALAND

11.20.1 Introduction

Nagaland is a North Eastern State covering an area of 16,579 sq km which constitutes 0.50% of the geographical area of the country. The state lies between 25°10' N to 27°4' N longitude and 93°15' E to 95°6' E longitude and is bordered by Arunachal Pradesh and Assam in the north, and Manipur in the south. It shares the international border in the east with Myanmar. Physiographically, Nagaland consists of a narrow strip of hilly country running Northeast to Southwest and facing the Assam plains to its North and Northwest. The State is drained by a number of important rivers, of which Barak river is the major river. The annual rainfall ranges between 1,800 mm to 2,500 mm and the annual temperature varies from 21°C to 40°C. The State has 11 districts, all of which are tribal as well as hill districts. As per the 2011 census, Nagaland has a population of 1.98 million which is 0.16% of India's population. The rural and urban population constitute 71.14% and 28.86% respectively. The tribal population of the State is 86.48%. The population density of the State is 119 per sq km which is much lower than the national average. The 19th Livestock census 2012 has reported a total livestock population of 0.91 million.

TABLE 11.20.1 Land Use Pattern

Land Use Types	Area (in 000' ha)	Percentage
Geographical Area	1,658	
Reporting area for land utilization	1,652	100.00
Forests	863	52.23
Not available for land cultivation	95	5.77
Permanent pastures and other grazing lands	-	-
Land under misc. tree crops and groves	92	5.58
Culturable wasteland	69	4.15
Fallow land other than current fallows	99	5.99
Current fallows	50	3.05
Net area sown	384	23.23

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



11.20.1.1 A Brief Overview of Forestry Scenario

Though Nagaland is a small State, it has been endowed with a wide variety of forest types on account of its unique geographic location and wide range of physiographic terrain. As per the Champion & Seth Classification of Forest Types (1968), the forests in Nagaland belong to seven Type Groups, which are further divided into 10 Forest Types. The forest area in Nagaland is limited and therefore the department has purchased land from private owners for Biodiversity Conservation and taking up plantations. The total land purchased by the department is approximately 192.47 sq km. Forests in Nagaland are largely under the community and private forests. The Forest Department owns only certain areas classified as Reserved Forests, Protected Forests, Wildlife Sanctuaries, National parks, Nurseries & Botanical Gardens. The State has started 'Joint Forest Management' program to elicit active participation of villagers in creation, management and protection of plantations. Intensification of Forest Management was carried out in the State by creating adequate infrastructure and controlling the incidences of forest fire.

Recorded Forest Area (RFA) in the State is 8,623 sq km of which 234 sq km is Reserved Forest and 8,389 sq km is Unclassed Forests. In Nagaland, during the period 1st January 2015 to 5th February 2019, no forest land was diverted for non-forestry purposes under the Forest Conservation Act, 1980 (MoEF & CC, 2019).

One National Park, three Wildlife Sanctuaries and 57 Community Reserves constitute the Protected Area network of the State covering 5.19% of its geographical area.

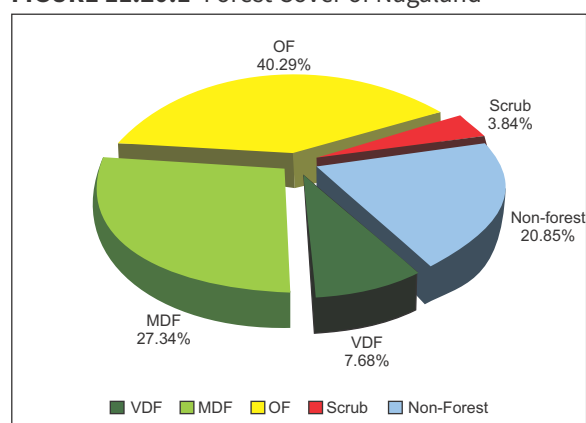
11.20.2 Forest Cover

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Oct 2017 to February 2018, the Forest Cover in the State is 12,486.40 sq km which is 75.31 % of the State's geographical area. In terms of forest canopy density classes, the State has 1,273.19 sq km under Very Dense Forest (VDF), 4,533.72 sq km under Moderately Dense Forest (MDF) and 6,679.49 sq km under Open Forest (OF). Forest Cover in the State has decreased by 2.60 sq km as compared to the previous assessment reported in ISFR 2017.

TABLE 11.20.2 Forest Cover of Nagaland
(in sq. km)

Class	Area	% of GA
VDF	1,273.19	7.68
MDF	4,533.72	27.34
OF	6,679.49	40.29
Total	12,486.40	75.31
Scrub	635.49	3.84

FIGURE 11.20.1 Forest Cover of Nagaland



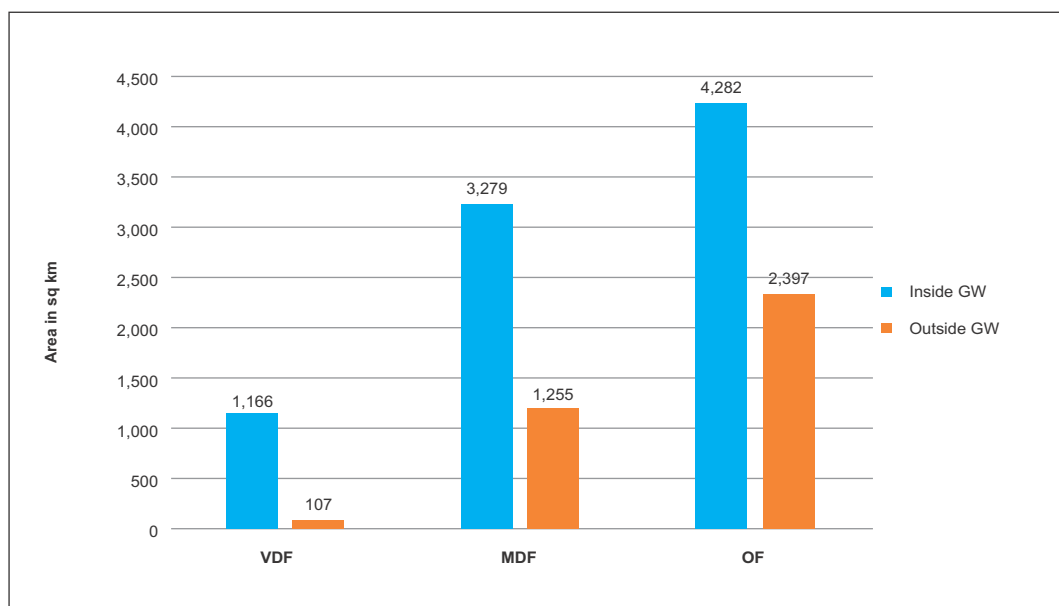
11.20.2.1 Forest Cover inside and outside Recorded Forest Area (or Green Wash)

The State has reported extent of recorded forest area (RFA) 8,623 sq km which is 52.01% of its geographical area. The reserved and unclassified forests are 2.71% and 97.29% of the recorded forest area in the State respectively. Due to non-availability of digitized boundary of recorded forest areas from the State, the updated Green Wash from Sol toposheets which is 10,633.44 sq km has been used as proxy to the RFA boundary and the analysis of forest cover inside and outside this area is given below.

TABLE 11.20.3 Forest Cover inside and outside Recorded Forest Area or (Green Wash) in Nagaland (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
1,166	3,279	4,282	8,727	107	1,255	2,397	3,759
13.36%	37.57%	49.07%		2.85%	33.38%	63.77%	

*in case of Nagaland Green Wash boundaries have been used

FIGURE 11.20.2 Forest Cover inside and outside Green Wash in Nagaland**TABLE 11.20.4** District-wise Forest Cover in Nagaland

(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			
Dimapur TH	927	24.00	161.71	406.38	592.09	63.87	3.09	9.23
Kiphire TH	1,130	151.72	277.80	405.06	834.58	73.86	-0.42	62.35
Kohima TH	1,463	131.70	377.68	673.28	1,182.66	80.84	-3.34	57.60
Longleng TH	562	0.00	125.45	246.95	372.40	66.26	-2.60	33.52
Mokokchung TH	1,615	1.89	501.89	823.83	1,327.61	82.20	5.61	22.08
Mon TH	1,786	32.00	431.32	739.50	1,202.82	67.35	-4.18	127.00
Peren TH	1,651	136.06	644.46	634.30	1,414.82	85.69	-23.18	76.66
Phek TH	2,026	272.61	637.83	705.37	1,615.81	79.75	-8.19	85.34
Tuensang TH	2,536	438.57	547.10	713.99	1,699.66	67.02	26.66	92.35
Wokha TH	1,628	1.00	465.13	839.68	1,305.81	80.21	-0.19	10.47
Zunheboto TH	1,255	83.64	363.35	491.15	938.14	74.75	4.14	58.89
Grand Total	16,579	1,273.19	4,533.72	6,679.49	12,486.40	75.31	-2.60	635.49

TABLE 11.20.5 Forest Cover Change Matrix for Nagaland

(in sq km)

Class	2019 Assessment					Total ISFR 2017
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	1,273	0	0	0	6	1,279
Moderately Dense Forest	0	4,533	0	3	51	4,587
Open Forest	0	0	6,432	16	175	6,623
Scrub	0	1	81	416	5	503
Non Forest	0	0	166	200	3,221	3,587
Total ISFR 2019	1,273	4,534	6,679	635	3,458	16,579
Net Change	-6	-53	56	132	-129	

Main reasons for the decrease in forest cover in the State are shifting cultivation and development activities.

TABLE 11.20.6 Altitude-wise Forest Cover in Nagaland

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	3,910	0	1,005	1,964	2,969 (23.78%)	65
500-1000	5,051	9	1,286	2,367	3,662 (29.33%)	247
1000-2000	6,520	561	1,998	2,254	4,813 (38.55%)	315
2000-3000	1,075	689	238	92	1,019 (8.16%)	8
3000-4000	23	14	7	2	23 (0.18%)	0
Total	16,579	1,273	4,534	6,679	12,486	635

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

TABLE 11.20.7 Forest Cover in different slope classes in Nagaland

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,704	23	336	649	1,008 (8.07%)	29
5-10	2,006	78	535	918	1,531 (12.26%)	66
10-15	2,804	154	751	1,234	2,139 (17.13%)	113
15-20	3,098	220	849	1,296	2,365 (18.94%)	136
20-25	2,809	247	792	1,114	2,153 (17.24%)	129
25-30	2,115	225	618	794	1,637 (13.11%)	94
>30	2,043	326	653	674	1,653 (13.25%)	68
Total	16,579	1,273	4,534	6,679	12,486	635

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



FIGURE 11.20.3 Forest Cover Map of Nagaland

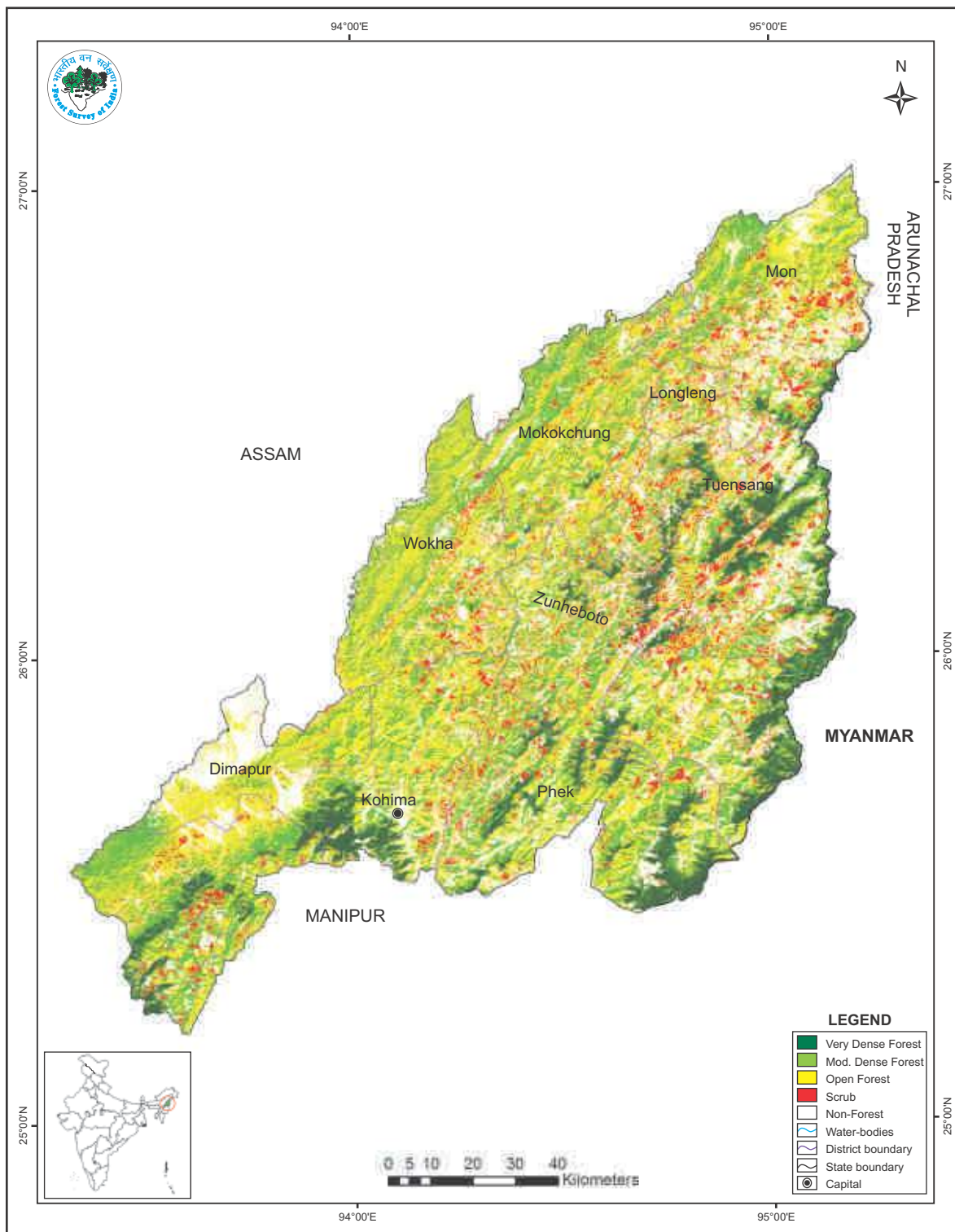


TABLE 11.20.8 Wetlands inside the Recorded Forest Area (or Green Wash) in Nagaland (in ha)

Wetland Category	No. of Wetlands	Total Wetland Area
Inland Wetlands - Natural		
Lake/Pond	1	3
Ox-bow lake/Cut-off meander	2	6
Waterlogged	45	176
River/Stream	27	11,200
Sub - Total	75	11,385
Inland Wetlands - Man-made		
Reservoir/Barrage	1	11
Tank/Pond	2	7
Sub - Total	3	18
Wetlands (<2.25 ha)	119	119
Total	197	11,522
Total Recorded Forest (or Green Wash) Area (in ha)		10,63,344
% of Wetland area inside Recorded Forest (or Green Wash) Area		1.08%

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

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

TABLE 11.20.9 Percentage area under different forest types of Nagaland

Sl.No.	Forest Type	% of Forest cover
1.	1B/C1 Assam Valley Tropical Wet Evergreen Forest (Dipterocarpus)	0.61
2.	1/2S1 Pioneer Euphorbiaceous Scrub	4.30
3.	2B/2S2 Eastern Alluvial Secondary Semi-Evergreen Forest	17.55
4.	2/2S1 Secondary Moist Bamboo Brakes	5.09
5.	3C/C3b East Himalayan Moist Mixed Deciduous Forest	38.44
6.	8B/C2 Khasi Sub-Tropical Wet Hill Forest	16.09
7.	9/C2 Assam Sub-Tropical Pine Forest	5.84
8.	9/C2/DS1 Assam Subtropical Pine Savannah	0.17
9.	11B/C2 Naga Hill Wet Temperate Forest	11.32
10.	12/DS1 Montane Bamboo Brakes	0.07
11.	Plantation/TOF	0.52
	Total	100.00

11.20.3.1 Assessment of Biodiversity in Nagaland

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 11.20.10 and table 11.20.11 in respect of Nagaland.

TABLE 11.20.10 No. of species observed during the rapid assessment

Plant Type	Number of Species
Tree	56
Shrub	137
Herb	113

TABLE 11.20.11 Shannon-Wiener Index of Tree, Shrub and Herb species in different Type Groups of Nagaland

Sl.No.	Forest Type Group	Shannon-Wiener Index		
		Tree	Shrub	Herb
1	Group 1- Tropical Wet Evergreen Forests	*	3.09	2.81
2	Group 2- Tropical Semi-Evergreen Forests	2.15	2.97	2.35
3	Group 3- Tropical Moist Deciduous Forests	2.94	3.48	3.61
4	Group 8- Subtropical Broadleaved Hill Forests	2.62	3.40	2.92
5	Group 9- Subtropical Pine Forests	1.31	1.55	2.19
6	Group 11- Montane Wet Temperate Forests	1.04	1.17	1.90
7	Group 12- Himalayan Moist Temperate Forests	*	1.16	*

* adequate number of sample plots were not available

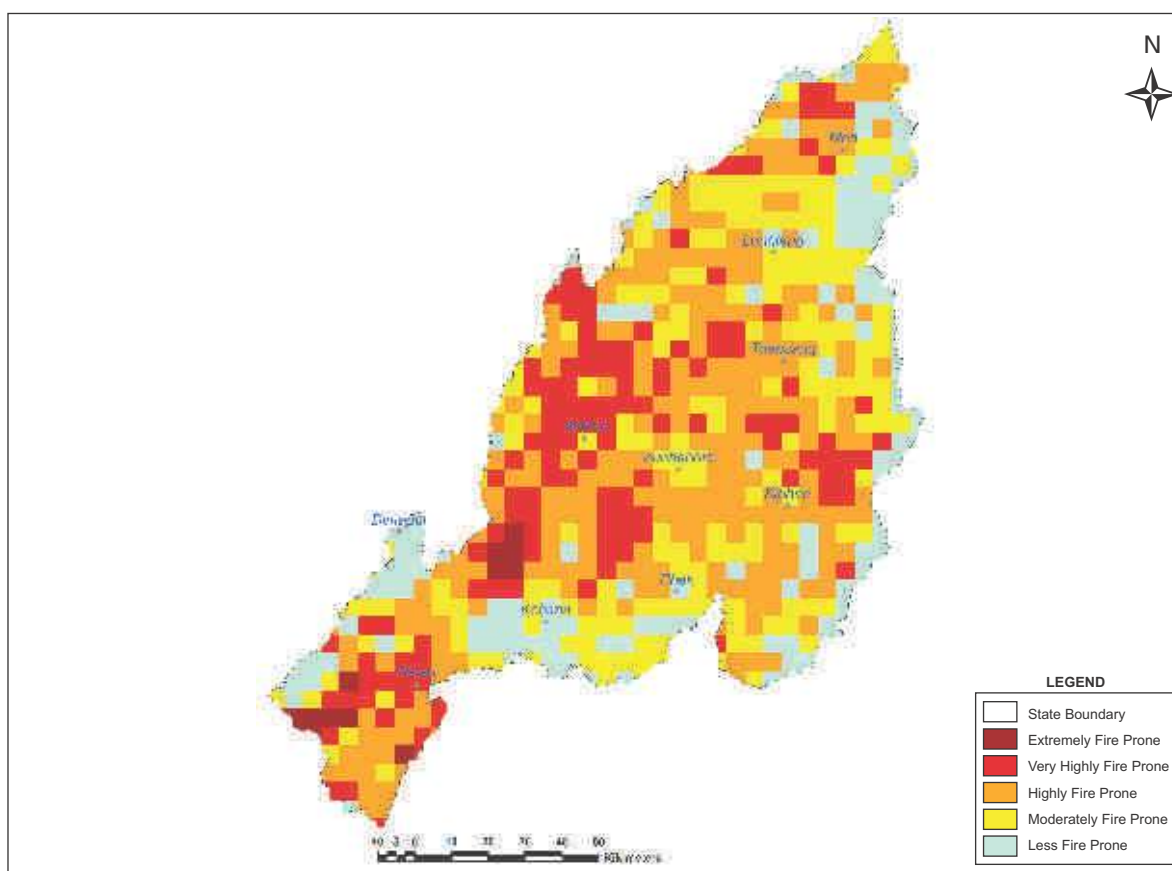
11.20.4 Fire Prone Forest Areas

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

TABLE 11.20.12 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Geographical Area	% of Total forest cover
1.	Extremely fire prone	482.53	3.05
2.	Very highly fire prone	2,931.97	18.48
3.	Highly fire prone	6,121.94	38.05
4.	Moderately fire prone	4,485.63	25.65
5.	Less fire prone	2,556.46	14.77
	Total	16,578.53	100.00



FIGURE. 11.20.4 Fire prone forest areas under different fire prone classes

11.20.5 Tree Cover

Forest cover presented in the section 11.20.2 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 Nagaland has been estimated as given in table 11.20.13.

TABLE 11.20.13 Tree Cover in Nagaland (in sq km)

Tree Cover	Area
	362

Tree cover of Nagaland has decreased by 17 sq km as compared to the previous assessment reported in ISFR 2017.

11.20.6 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 11.20.14 Extent of TOF in Nagaland (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
3,759	362	4,121

11.20.7 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Nagaland is given in the table 11.20.15. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 11.20.16

TABLE 11.20.15 Growing Stock in Nagaland (in m cum)

Growing Stock (GS)		% of Country's GS
Growing Stock in Recorded Forest Area	29.52	0.69
Growing Stock in TOF	13.72	0.84

TABLE 11.20.16 Diameter class distribution of top five species inside RFA in Nagaland (in '000)

Sl.No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Ficus species</i>	7,225	0	657
2.	<i>Schima wallichii</i>	8,084	1,971	0
3.	<i>Endospermum melaccense</i>	12,202	0	0
4.	<i>Albizia species</i>	12,025	0	0
5.	<i>Sterculia villosa</i>	7,806	0	0

11.20.8 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 135.53 million tonnes (496.94 million tonnes of CO₂ equivalent) which is 1.90% of total forest carbon of the country. Pool wise forest carbon in Nagaland is given in the following table.

TABLE 11.20.17 Forest Carbon in Nagaland in different pools (in '000 tonnes)

AGB	BGB	Dead wood	Litter	SOC	Total
35,850	9,612	522	2,897	86,646	1,35,527

11.20.9 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 11.20.18

TABLE 11.20.18 Growing Stock of Bamboo in Nagaland

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	4,284	2.68
Total number of culms (in millions)	2,544	6.45
Total equivalent green weight (in '000' tonnes)	20,547	7.40

11.20.10 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Nagaland in Rural and Urban areas are given in the table 11.20.19 and table 11.20.20 respectively

TABLE 11.20.19 Top five tree species in TOF (Rural) in Nagaland

Sl. No.	Species	Relative Abundance (%)
1.	<i>Alnusne palensis</i>	8.80
2.	<i>Schima wallichii</i>	7.51
3.	<i>Terminalia myriocarpa</i>	3.60
4.	<i>Duabanga grandiflora</i>	3.00
5.	<i>Mallotus albus</i>	2.87

TABLE 11.20.20 Top five tree species in TOF (Urban) in Nagaland

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	11.39
2.	<i>Areca catechu</i>	7.74
3.	<i>Tectona grandis</i>	5.88
4.	<i>Artocarpus integrifolia</i>	3.96
5.	<i>Gmelina arborea</i>	3.61

11.20.11 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the table 11.20.21 and table 11.20.22 respectively.

TABLE 11.20.21 Major NTFP species in the state of Nagaland

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Rhus Semialata</i>	Tree	37.50
2.	<i>Oroxylum Indicum</i>	Tree	25.00
3.	<i>Embilica officinalis</i>	Tree	25.00
4.	<i>Litsea citara</i>	Tree	12.50

TABLE 11.20.22 Major invasive species in the State inside the RFA/Green Wash in Nagaland (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	93
2.	<i>Mikania micrantha</i>	86
3.	<i>Ageratum conyzoides</i>	7
4.	<i>Parthenium hysterophorus</i>	2

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

11.20.12 Quantified estimation of Dependence of People living in forest fringe villages on forests in Nagaland

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 Nagaland is given in the table 11.20.23

TABLE 11.20.23 Estimation of Dependence of People in Forest Fringe Villages on Forests in Nagaland

Fuelwood (tonnes)	Fodder (tonnes)	Bamboo (tonnes)	Small Timber (cum)
2,77,670	4,87,566	1,088	12,225