



सत्यमेव जयते

TECHNICAL INFORMATION SERIES

Volume 3 No. 2 2026

Surface Fuel Load Mapping 2023-24



भारतीय वन सर्वेक्षण

Forest Survey of India

Ministry of Environment, Forest & Climate Change

Government of India Dehradun-248195

© Forest Survey of India
ISBN: 978-81-979398-0-8

FSI TECHNICAL INFORMATION SERIES

Volume 3 No. 2 2026

Surface Fuel Load Mapping 2023-24



FOREST SURVEY OF INDIA

Ministry of Environment, Forest & Climate Change

Government of India

Kaulagarh Road, Dehradun-248195

© Forest Survey of India
ISBN: 978-81-979398-0-8

PROJECT TEAM

Overall guidance of	Shri Santosh Tewari, IFS Director General, Forest Survey of India Shri Anoop Singh, IFS Former Director General, Forest Survey of India Ms. Shivani Dogra, IFS Joint Director, Forest Geo-informatics Division (FGD), Forest Survey of India Smt. Meera Iyer, IFS Former Joint Director, FGD Forest Survey of India
Project investigator	Shri Arvind Dattu Mundhe, IFS Deputy Director, Forest Survey of India Dr. Sunil Chandra, Deputy Director (Retd.), FGD, Forest Survey of India
Technical investigator	Shri Vikas Gusain, STA, FGD, Forest Survey of India Shri Satyendra Kumar, Sr.TA, FGD, Forest Survey of India Shri Rashpal, Sr.TA, FGD, Forest Survey of India Shri Priyonath Adhikary Sr.TA, FGD, Forest Survey of India
Image analysts	Shri Satyendra Kumar, Sr. TA Shri Rashpal, Sr. TA Shri Anupam Pal, Sr. TA Shri Manish Uniyal, Sr. TA Shri Kanwal Preet Singh, Ex. Sr. TA Smt. Triparna Barman, Sr. TA Shri Digvijay Singh, Sr. TA Smt. Sonam Bahuguna, TA Shri Rahul Jay Prakash Sharma, TA Km. Malavika M., Ex TA Shri Akhilesh Panwar, TA Shri Das Jay Sapan, TA

ABBREVIATIONS & ACRONYMS

AWiFS-	Advanced Wide Field Sensor
DEM -	Digital Elevation Model
DIP -	Digital Image Processing
FC -	Forest Cover
FCC -	False Colour Composite
FCM -	Forest Cover Map
FSI -	Forest Survey of India
FTG -	Forest Type Group
FTM -	Forest Type Map
GA -	Geographical Area
GIS -	Geographical Information System
GOI -	Government of India
GT -	Ground Truth
GW -	Green Wash
LiDAR-	Light Detection and Ranging
MCDA-	Multi-Criteria Decision Analysis
MDF -	Moderately Dense Forest
MMU -	Minimum Mappable Unit
MODIS-	Moderate Resolution Imaging Spectroradiometer
MoEFCC-	Ministry of Environment, Forest and Climate Change
NF -	Non-Forest
NFI -	National Forest Inventory
OF -	Open Forest
PA -	Protected Area
PF -	Protected Forest
RF -	Reserved Forest
RFA -	Recorded Forest Area
SOI -	Survey of India
SRTM -	Shuttle Radar Topography Mission
UAV -	Unmanned Aerial Vehicles
UT -	Union Territory
VDF -	Very Dense Forest

GLOSSARY

Digital Image Processing	Interpretation and classification of digital satellite data using computer and software.
False Colour Composite	The image generated by projecting any three spectral bands of the satellite data on the red, green and blue channels and does not show features in true colours.
Forest Area	The area recorded as a forest in the Government records. It is also referred to as “Recorded Forest Area”.
Forest Cover	All lands, more than or equal to one hectare in area, with a tree canopy of more than or equal to 10%, irrespective of ownership and legal status; and includes orchards, bamboo, and palm
Geographic Information System	A computer based system for capturing, storing, manipulating, analysing and displaying data, which are spatially referenced to the earth.
Green wash area	The extent of wooded areas generally shown in light green colour on the Survey of India topographic sheets.
Litter	Woody material of trees having diameter <5cm and >2mm, which is not decomposed.
Moderately Dense Forest	All lands with forest cover having a canopy density between > 40, and less than 70 percent.
Multi-Criteria Decision Analysis	It is a structured approach used to evaluate and prioritize different decision alternatives based on multiple conflicting criteria. It helps decision-makers analyze various factors—such as cost, benefits, risk, environmental impact, and feasibility—when choosing the best option. MCDA uses quantitative and qualitative data to provide a comprehensive view of options, supporting informed, objective decisions in complex situations where trade-offs between different goals need to be considered.
Open Forest	Lands with forest cover having a canopy density between ≥ 10 and <40 percent
Plantation	A stand composed primarily of trees established by planting or artificial seeding.
Recorded Forest Area	Area recorded as forest in Government records.
Remote Sensing	Remote sensing is the process of detecting and monitoring the physical characteristics of an area by measuring its reflected and emitted radiation at a distance. (Source: www.usgs.gov/faqs)
Scrub	Forest lands having canopy density less than 10 percent, generally with Shrubs interspersed with trees.

Soil organic matter	It is the organic component of soil containing small plant residues, small living soil organism and decomposed organic matter.
Spatial Resolution	The minimum area on earth's surface that can be captured by a satellite sensor as being separate from its surroundings and is represented by a "pixel".
Spectral Resolution	It refers to the width and number of spectral bands. The range of wavelengths that a satellite imaging system can detect. The narrower the bands, the greater the number of spectral resolution.
Surface Fuel Load	Surface Fuel Load refers to the amount of combustible material, such as dead vegetation, leaves, twigs, and branches, on the forest floor. It plays a crucial role in the spread and intensity of wildfires, as it determines how much fuel is available for combustion during a fire event.
Thematic Maps	A thematic map is a map created to display information about a topic or theme
Tree cover	Tree cover comprises all tree patches outside the forest area, which are less than one hectare in extent including all the scattered trees found in the rural and urban settings, and not captured under the forest cover assessment.
Tree Outside Forests (TOF)	It refers to all trees growing outside recorded forest areas irrespective of patch size.
Very Dense Forest	Lands with forest cover having a canopy density of 70 per cent and above.

Chapter 1

Surface Fuel Load Mapping

1.1 Introduction

Fuel is a combustible biomass found in forests and can be divided into fine fuels such as leaves, grasses, small twigs, and larger fuels such as shrubs, branches on the ground, downed trees, and logs¹. Surface fuel load material includes both dead and live vegetation, organic matter, and other flammable materials found on the forest floor. The forest fuel loads includes the quantities of duff, litter, fine-woody debris, and coarse woody debris or logs distributed over the ground surface of the forest². Major factors influencing surface fuel load are Vegetation Density & Type, Climatic factors, Topography, Human Influence etc. Surface fuel load primarily depends upon the species composition, phenology, and canopy height. Therefore, the distribution of surface fuel load is a consequence of the interaction of multiple factors such as forest type, topographic relief, and climate³.

Fuel load estimation is a fundamental aspect of forest fire management used to map extent of fires and understanding their behavior under different environmental conditions. By assessing fuel load, foresters, land managers, stakeholders can more effectively evaluate fire risks, develop successful mitigation strategies, and strengthen the resilience of fire-prone ecosystems. Very high and high surface fuel load forest areas requires intensive monitoring and management during fire season, as these areas are very susceptible to large forest fires. The escalating frequency and intensity of wildfires in India underscores the importance of accurate surface fuel load mapping. Over the years, specific regions across the country have experienced severe fires for which accumulation of fuel load over the time has been one of the major factors for trigger and spread of fires.

Various studies have highlighted the importance of integrating remote sensing and GIS techniques for effective fuel load assessment. Chuvieco et al. (2003) demonstrated the use of satellite imagery, such as Landsat and MODIS, for mapping fuel types and estimating biomass in fire-prone regions.

¹ Fitzgerald, S.; Berger, C.; Leavell, D., 2019. Fire FAQs: What is forest fuel, and what are fuel treatments? In EM9230; Oregon State University Extension Service: Corvallis, OR, USA.

² Sikkink, P.G.; Lutes, D.E.; Keane, R.E., 2009. Field Guide for Identifying Fuel Loading Models; Gen. Tech. Rep. RMRS-GTR-225; Fort USDA, Forest Service, Rocky Mountain Research Station: Collins, CO, USA; 33p.

³ Jakubowski, M.K.; Guo, Q.; Collins, B.; Stephens, S.; Kelly, M., 2013. Predicting surface fuel models and fuel metrics using lidar and CIR imagery in a dense, mountainous forest. Photogram. Eng. Remote Sens., 79, 37–49.

Their study emphasized that combining remote sensing data with field observations provides more accurate and scalable results⁴.

Rothermel (1972) developed foundational fire behavior models, where slope and fuel load were identified as critical parameters influencing fire spread rates⁵. Slope gradients, derived from digital elevation models (DEMs), were later integrated into spatial models to simulate the influence of topography on fire risk. Mutlu et al. (2008) applied GIS-based weighted overlay methods to integrate factors such as fuel load, forest type, and topography to identify high-risk zones, demonstrating the applicability of Multi-Criteria Decision Analysis (MCDA) in fire management planning⁶.

Furthermore, advancements in data acquisition, such as LiDAR and UAV technologies, have improved the resolution and accuracy of fuel load estimations. Andersen et al. (2005) highlighted the potential of LiDAR in capturing vertical and horizontal fuel distributions, which are often underestimated by traditional methods⁷. Overall, the literature review reveals that spatial modeling approaches, supported by remote sensing and GIS tools, are helpful for assessing forest fuel loads and managing fire risk. Combining datasets like fuel load field measurements, topographic layers such as slope, and forest cover & forest type maps has proven effective for creating comprehensive fire management plans. These studies collectively form the basis for adopting integrated methodologies in forest fuel load mapping to mitigate fire hazards.

In the present report, in-situ fuel samples from field have been used to map fuel load for pan India. Fuel load data at sample locations has been collected in various slope gradients and forest types. A total of 15,114 validation points were taken into consideration for training the fuel load model. These points were collected by ground truth teams in areas adjacent to fire affected area and in different forest strata further supported with NFI data. This field data accompanied with geo-spatial data has been used to generate surface fuel load map of the country. The spatial layers used for the analysis includes Forest Type Map, Forest Cover Map and Slope data. The generated

⁴ Chuvieco, E., Aguado, I., Cocero, D., & Riaño, D. (2003). Design of an empirical index to estimate fuel moisture content from NOAA-AVHRR images in forest fire danger studies. *International Journal of Remote Sensing*, 24(8), 1621–1637.

⁵ Rothermel, R.C., 1972. *A mathematical model for predicting fire spread in wildland fuels* (Vol. 115). Intermountain Forest & Range Experiment Station, Forest Service, US Department of Agriculture.

⁶ Mutlu M., Popescu S.C., Stripling C., Spencer T., 2008. Mapping surface fuel models using LiDAR and multispectral data fusion for fire behavior, *Remote Sensing of Environment*, Volume 112, Issue 1, pp 274-285.

⁷ Andersen H.E., McGaughey R.J., Reutebuch S.E., 2005. Estimating forest canopy fuel parameters using LIDAR data, *Remote Sensing of Environment*, Volume 94, Issue 4, pp 441-449.

surface fuel load map using geo-spatial data can be used as a baseline map for forest fire management, including forest floor clearance, resource allocation and extra reinforcement of manpower, fire tender in the high fuel load regions during the fire season.

1.2 Objective of the Study

The primary objective of this study is to map Forest Surface Fuel Load using spatial modeling techniques. This is carried out by integrating multiple datasets, including field sample surface fuel load data, slope derived from SRTM (Shuttle Radar Topography Mission) DEM (Digital Elevation Model), Forest Type Map (FTM), and Forest Cover Map (FCM). The study further aims to:

1. Identify and map the spatial distribution of forest fuel loads to map areas with varying levels of combustible material.
2. Estimate state wise surface fuel load in gram per square feet.
3. Assess the influence of slope and forest characteristics (type and cover) on fuel load accumulation and fire risk potential.

1.3 Data Used

Forest cover map, forest type map and slope class derived from SRTM DEM has been used as geospatial layers. The detailed description of the dataset used have been given below:

1.3.1 Surface fuel load data from field

Field surveys has been carried out across pan India to collect surface fuel load data in different slope gradients. Sites have been selected in areas with relatively heterogeneous forest type groups. From each location, a sample of the surface fuel load has been collected, and its initial weight recorded as shown in the figure 1.1.

For calculation of fuel moisture, the field samples have been oven dried for 3 hours at a temperature of ~50 °C to remove the moisture content. The dry mass of the sample fuel load was calculated based on the initial and final weights, the moisture content in the sample was determined to estimate the total dry sample surface fuel load as shown in figure 1.2. As a matter of fact, the less is the fuel moisture, the more is the rate of fire spread.



Sample Plot



Collected Fuel Load



Plot after sample collection



Sample surface fuel load collection with the official of State Forest Department

Figure 1.1 Collection of sample of Surface Fuel Load



Surface Fuel Load being prepared for estimation of oven dry weight



Weighing of fuel load with moisture content



Crushing of fuel load for estimation of oven dry weight



Sample fuel load prepared for estimation of oven dry weight



Figure 1.2 Preparation of fuel load for estimation of oven dry weight

1.3.2 Collateral Data

For mapping of surface fuel load of pan India, collateral datasets such as forest cover map, forest type map from FSI and slope data derived from SRTM DEM (30 meter interval) has been used.

1.3.2.1 Forest Cover Map

Forest cover is defined as all lands, more than one hectare in area, with a tree canopy density of more than 10 percent irrespective of ownership, legal status and species of trees. Such land may not necessarily be a recorded forest area or a part of the government owned forest. Apart from the RFAs, it may include trees outside forests under orchards, bamboo and palm. In this study, Forest Cover Map (FCM) has been used as forest mask to extract forest areas. The details of different forest density classes present in the forest cover map are provided in the Table 1.1.

Table 1.1 Forest cover classified in terms of canopy density classes

Class	Description
Very Dense Forest	All lands with tree canopy density $\geq 70\%$
Moderately Dense Forest	All lands with tree canopy density $\geq 40\%$ and $\leq 70\%$
Open Forest	All lands with tree canopy density $\geq 10\%$ and $\leq 40\%$
Scrub	Forest lands with tree canopy density $\leq 10\%$
Non-forest	Land not included in any of the above classes.

1.3.2.2 Forest Type Map

Forest Type is defined as ‘a unit of vegetation which possesses broad characteristics in physiognomy and structure sufficiently pronounced to permits its differentiation from other units. This is irrespective of physiographic, edaphic or biotic factors’⁸. Forest Type of India gives the description of forest types in terms of climatic parameters like temperature, rainfall range and physiography and species composition. FSI has carried out Forest Type Mapping (FTM) of India based on the baseline forest cover data of 2021 at the scale of 1:50,000. Forest type map includes 17 forest types groups including Plantation/ToF, which have been provided in the Table 1.2. The FTM has been used as one of the layers for mapping surface fuel load in different forest types groups. Forest types have a direct impact on the type of fuel load and a direct impact of the fuel load towards fire susceptibility. The fuel load of certain species is highly inflammable as compared to others.

⁸ Champion, H.G. and Seth, S.K., 1968. *A revised survey of the forest types of India*. Manager of publications.

Table 1.2 Forest Type Groups

Group Number	Forest Type Group
Group 1	Tropical Wet Evergreen Forests
Group 2	Tropical Semi-Evergreen Forests
Group 3	Tropical Moist Deciduous Forests
Group 4	Littoral and Swamp Forests
Group 5	Tropical Dry Deciduous Forests
Group 6	Tropical Thorn Forests
Group 7	Tropical Dry Evergreen Forests
Group 8	Subtropical Broadleaved Hill Forests
Group 9	Subtropical Pine Forests
Group 10	Subtropical Dry Evergreen Forests
Group 11	Montane Wet Temperate Forests
Group 12	Himalayan Moist Temperate Forests
Group 13	Himalayan Dry Temperate Forests
Group 14	Sub Alpine Forests
Group 15	Moist Alpine Scrub
Group 16	Dry Alpine Scrub
Group 17	Plantation/ToF

1.3.2.3 Slope

Surface fuel load and slope are intricately connected, influencing fire behaviour and management strategies. On a steep slope, the dry fuel load is closer to fire flames causing fire to spread at a greater speed. Higher fuel loads typically increase fire intensity and duration, particularly on steeper slopes where fire can spread more rapidly due to convection currents⁹. For a detailed understanding of terrain variations, SRTM DEM data with a 30 m resolution was used. This DEM was utilized to derive different slope gradients as shown in the Table 1.3.

Table 1.3 SRTM DEM derived different slope gradients

Class	Slope in degree
1	0-10
2	11-20
3	21-30
4	>30

⁹ Bates, J.D., Sharp, R.N. and Davies, K.W., 2013. Sagebrush steppe recovery after fire varies by development phase of *Juniperus occidentalis* woodland. *International Journal of Wildland Fire*, 23(1), pp.117-130.

1.4 Methodology

This study presents a systematic methodology for forest fuel load mapping using spatial modeling techniques. This study presents the State/UT-wise Fuel load mapping of pan- India using Ground sampling data integrated with FCM, FTM and slope.

The field surface fuel load data provide quantitative estimates of combustible material, while the slope layer, derived from SRTM DEM, highlights the influence of terrain steepness on fire spread. The Forest Type Map (FTM) classifies the forest types, which directly influence the fuel load characteristics, and the Forest Cover Map (FCM) identifies the spatial extent and density of the forest canopy. A methodology for mapping surface fuel load is shown in the Figure 1.3.

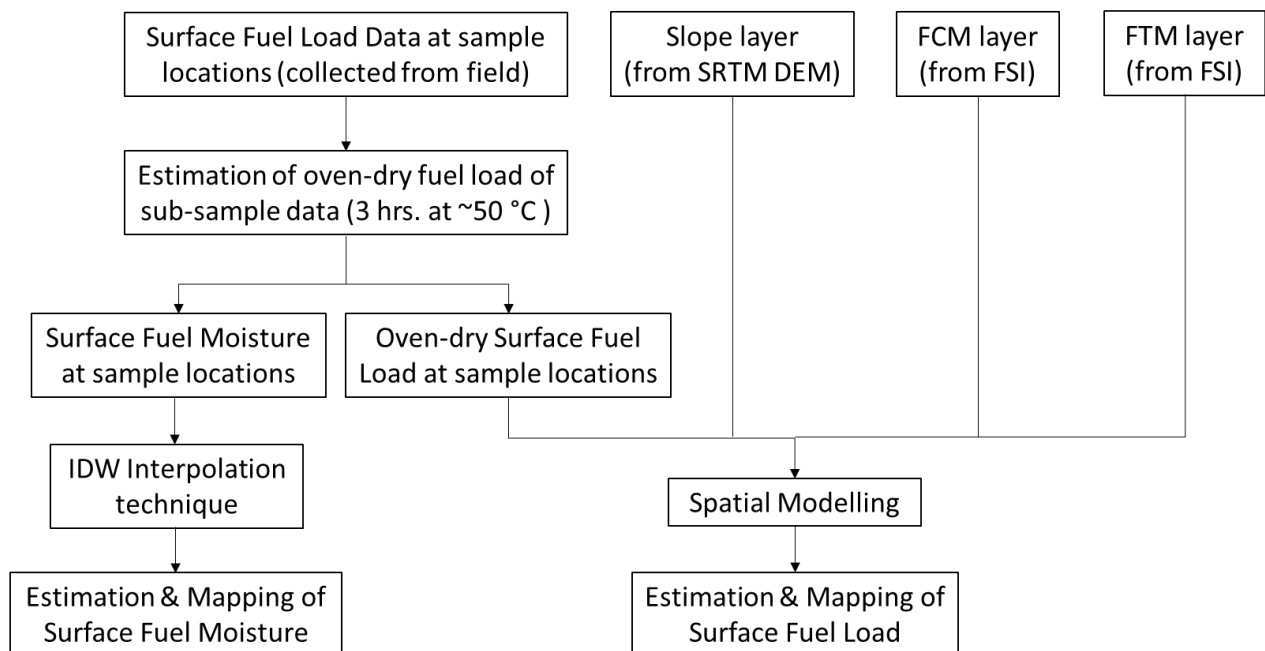


Figure 1.3 Methodology for estimation & mapping of Surface Fuel Load and Surface Fuel Moisture

1.4.1 Data Preprocessing

The first step involved preprocessing the collected datasets to ensure uniformity in spatial resolution, format, and coordinate systems. The field surface fuel load data were georeferenced and standardized to align with the study area. The slope layer was generated from the SRTM DEM using GIS tools, where the terrain slope was calculated in degrees and categorized into classes from 0° - 10° to greater than 30°. Forest Type Map (FTM) and Forest Cover Map (FCM)

representing variations in forest type and canopy density, were also ensured for compatibility during spatial modeling.

1.4.2 Spatial Modeling

The spatial modeling integrates the geo-spatial layers in a GIS environment. The layers were overlaid involving 17 classes from FTM, 4 classes from FCM and 4 classes from slope data making a total of 272 different strata for analysis of fuel load. The field surface fuel load data were then overlaid over the geo-spatial layers falling over different strata. Those strata where values were not captured from the field were merged with the other similar strata. For each strata, the mean values of the field surface fuel load data were provided to generate the surface fuel load data.

1.4.3 Estimation and Mapping of Surface Fuel Load

The output of the spatial model as described in section 1.4.2 is a Surface Fuel Load Map as shown in the Figure 1.4. The map provides a clear understanding of spatial variations in surface fuel load across the landscape. The surface fuel load map has been classified into four categories i.e. Very High, High, Moderate and Low. The details of the surface fuel load classes is shown in the Table 1.4.

Table 1.4 Details of the surface fuel load classes

Classes	Description
Very High Fuel Load	Surface fuel load greater than 60 g/ft ²
High Fuel Load	Surface fuel load greater than 40 and less than 60 g/ft ²
Moderate Fuel Load	Surface fuel load greater than 20 and less than 40 g/ft ²
Low Fuel Load	Surface fuel load greater than 0 and less than 20 g/ft ²

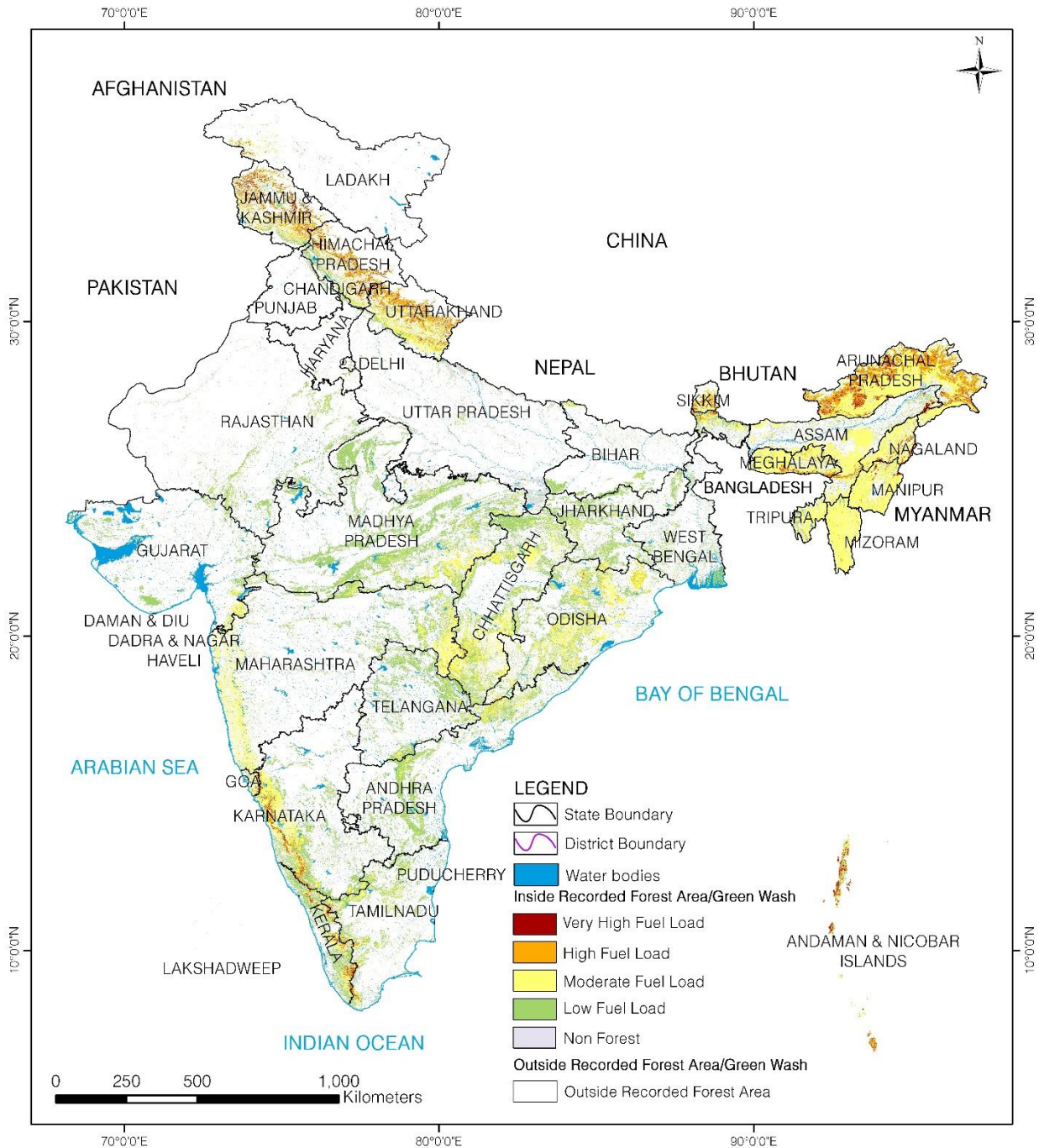


Figure 1.4 Surface fuel load map of the country

1.4.4 Estimation and Mapping of Surface Fuel Moisture

The field sample surface fuel load data collected from the ground were oven dried for 3 hours at a temperature of $\sim 50^{\circ}\text{C}$ to remove the moisture content. The dry mass of the sample fuel load was then calculated, and using the initial and final weights, the moisture content in the sample was

determined to estimate the total dry sample surface fuel load. Using 516 sample locations of the collected surface fuel load data, a surface fuel moisture map has been generated using the Inverse Distance Weighted (IDW) interpolation technique.

In the IDW interpolation method, the sample points are weighted during interpolation such that the influence of one point relative to another declines with distance from the unknown point for which the value is to be required. Weighting is assigned to sample points through the use of a weighting coefficient that controls how the weighting influence will drop off as the distance from new point increases. The greater the weighting coefficient, the less the effect points will have if they are far from the unknown point during the interpolation process. As the coefficient increases, the value of the unknown point approaches the value of the nearest observational point¹⁰.

The surface fuel moisture map along with the surface fuel load map acts as a crucial layer in the fire progression. The surface fuel moisture map of the country is shown in the Figure 1.5.

¹⁰[https://docs.qgis.org/2.18/en/docs/gentle_gis_introduction/spatial_analysis_interpolation.html#:~:text=Inverse%20Distance%20Weighted%20\(IDW\),to%20create%20\(see%20figure_idw_interpolation\).](https://docs.qgis.org/2.18/en/docs/gentle_gis_introduction/spatial_analysis_interpolation.html#:~:text=Inverse%20Distance%20Weighted%20(IDW),to%20create%20(see%20figure_idw_interpolation).)

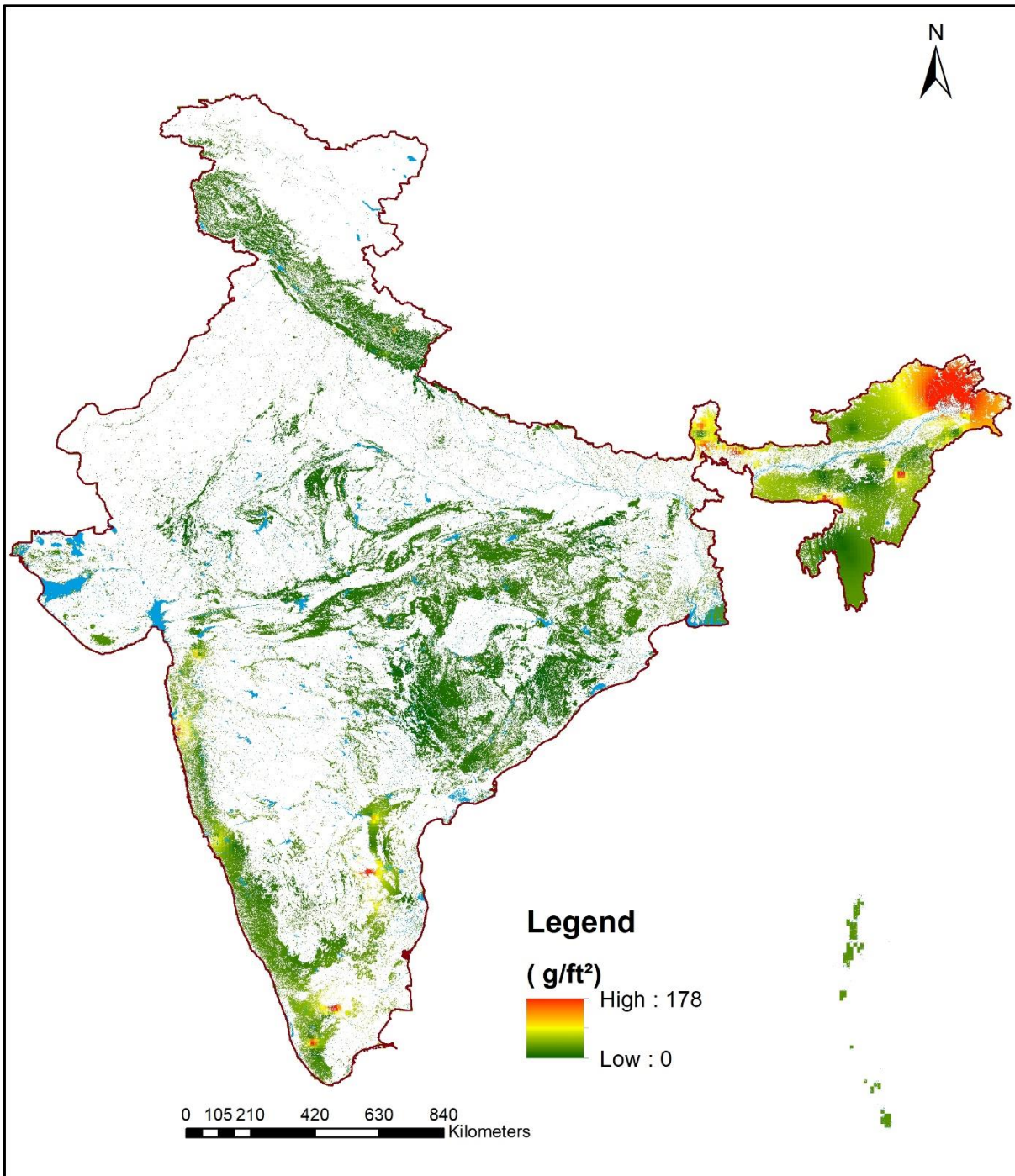


Figure 1.5 Surface fuel moisture map of the country

From the map, it can be inferred that during the peak fire months, the fuel moisture is low throughout the country except in few regions, making forest area vulnerable in case the fire outbreak is observed. Higher fuel moisture inhibits the incidence and rate of fire spread in a region. The accuracy of fuel moisture map can be affected by the incidents of sudden and unexpected rains

and other climatic disturbances in specific landscapes. However, such incidents are rare and can be correlated with the available climate and weather data.

1.5 Results

Based on the analysis of results, the entire forest cover within RFA/Greenwash is categorized into four distinct classes. Recorded Forest Area/ Green Wash area falling over different Surface Fuel Load classes is shown in the Table 1.5. From the table it can be inferred that 2.08% of the total RFA/GW area falls under very high fuel load class, 8.25% under high fuel load class, 31.57% under moderate fuel load class and 31.34% under low fuel load class.

Table 1.5 RFA/GW area in different fuel load classes

S.No.	Surface fuel load class	Area (in km ²)	% of Total Digitized RFA/GW Area
1	Very High Fuel Load	15,382.54	2.08
2	High Fuel Load	61,159.29	8.25
3	Moderate Fuel Load	2,34,033.20	31.57
4	Low Fuel Load	2,32,302.43	31.34
	Total Fuel Load	5,42,877.46	73.24

The State/UT-wise surface fuel load data with different fuel load classes is shown in the Table 1.6. From the table it can be observed that maximum forest area under very high surface fuel load class is found in Arunachal Pradesh, Jammu & Kashmir and Andaman & Nicobar Islands. These states have the dominance of Montane Wet Temperate Forests, Himalayan Moist Temperate Forests and Tropical Semi- Evergreen Forests respectively. Maximum forest area under high surface fuel load class is falling in Arunachal Pradesh, followed by Uttarakhand and Jammu & Kashmir. These states have the dominance of Montane Wet Temperate Forests, Subtropical Pine Forests and Himalayan Moist Temperate Forests respectively.

Table 1.6 State/UT-wise surface fuel load data with different fuel load classes

(Area in km²)

State/UTs	RFA/ GW area	Surface Fuel Load Class				
		Very High	High	Moderate	Low	Total
Andhra Pradesh	37,095.46	0.00	201.05	7,057.57	21,408.53	28,667.15
Arunachal Pradesh	63,752.00	4,689.85	21,514.28	31,849.86	564.95	58,618.94
Assam	27,545.50	729.52	1,318.45	17,134.01	617.30	19,799.28
Bihar	6,378.06	0.00	45.34	890.79	4,144.46	5,080.59
Chhattisgarh	53,034.54	0.00	449.00	19,942.70	22,376.29	42,767.99

State/UTs	RFA/ GW area	Surface Fuel Load Class				
		Very High	High	Moderate	Low	Total
Delhi	96.97	0.00	0.00	3.20	70.51	73.71
Goa	1,326.48	144.87	336.35	725.44	21.96	1,228.62
Gujarat	30,354.00	0.00	133.80	2,427.52	7,667.88	10,229.20
Haryana	1,628.34	0.00	2.57	102.83	684.39	789.79
Himachal Pradesh	14,024.98	1,204.10	6,044.05	1,900.18	1,615.65	10,763.98
Jharkhand	19,096.52	0.00	2.32	1,943.48	10,808.92	12,754.72
Karnataka	31,036.84	944.16	3,392.91	10,412.52	11,091.01	25,840.60
Kerala	11,554.99	1,003.82	2,651.70	4,893.77	1,396.58	9,945.87
Madhya Pradesh	92,769.42	0.00	433.40	11,636.70	57,492.07	69,562.17
Maharashtra	57,724.83	0.00	528.75	19,528.75	17,544.23	37,601.73
Manipur	17,476.61	310.89	579.97	14,057.44	543.76	15,492.06
Meghalaya	17,490.61	277.11	1,645.91	12,436.43	857.06	15,216.51
Mizoram	20,570.21	0.01	106.20	17,822.52	2.35	17,931.08
Nagaland	10,610.99	527.35	1,235.05	6,875.03	219.98	8,857.41
Odisha	42,430.62	0.00	1,642.08	17,854.41	15,278.74	34,775.23
Punjab	924.03	0.00	13.39	30.74	740.72	784.85
Rajasthan	35,963.43	0.00	1.68	1,422.07	14,123.73	15,547.48
Sikkim	5,414.38	269.31	1,130.18	832.32	29.42	2,261.23
Tamil Nadu	21,585.02	233.50	1,072.74	5,912.48	10,964.56	18,183.28
Telangana	26,881.38	0.00	4.07	2,206.21	17,550.99	19,761.27
Tripura	5,955.00	0.00	105.27	4,978.29	404.77	5,488.33
Uttar Pradesh	13,407.59	0.00	96.25	3,252.29	6,301.19	9,649.73
Uttarakhand	25,494.47	1,150.21	7,869.42	6,995.97	958.36	16,973.96
West Bengal	11,787.40	141.14	382.40	2,293.31	4,949.03	7,765.88
Andaman & Nicobar Is.	6,747.11	1,729.77	1,404.44	2,433.04	606.36	6,173.61
Chandigarh	11.32	0.00	0.00	1.40	7.59	8.99
Dadra & Nagar Haveli and Daman & Diu	196.95	0.00	0.00	148.90	13.78	162.68
Jammu and Kashmir	27,702.46	1,997.07	6,672.94	3,359.67	1,218.34	13,248.02
Ladakh	3,184.79	29.86	143.33	671.36	23.83	868.38
Lakshadweep	0.00	0.00	0.00	0.00	0.00	0.00
Puducherry	9.51	0.00	0.00	0.00	3.14	3.14
Total	7,41,262.81	15,382.54	61,159.29	2,34,033.20	2,32,302.43	5,42,877.46

1.6 Conclusion

The present methodology broadly carries out the analysis of major factors responsible for contributing and accumulation of fuel load in the forest areas. Other ancillary data including meteorological datasets may be helpful in the precise estimation and mapping of surface fuel

moisture. However, the same at present has not been taken into consideration due to the broad scale of these datasets and its interoperability with the forest fuel load layers. As the fuel load accumulation is heavily dependent on forest types, climatic, topographic and local practices, its calculation cannot be carried out with high precision with single date imagery. Periodic collection of samples is a requirement for better precision, for which a system could be devised in further studies on wall to wall surface fuel load mapping and estimation.

Chapter 2

2.1 Andhra Pradesh

2.1.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.1.1. From the table, it can be inferred that 0.54% of the total RFA area falls under high fuel load class, 19.03% under moderate fuel load class and 57.71% under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.1.1.

Table 2.1.1. District-wise RFA/GW Area in different fuel load classes in Andhra Pradesh
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Alluri Sitharama Raju	0.00	178.49	3,042.29	3,028.97	6,249.75
Anakapalli	0.00	0.00	161.20	304.57	465.77
Ananthapuramu	0.00	0.00	59.26	450.46	509.72
Annamayya	0.00	0.00	354.39	2,042.53	2,396.92
Bapatla	0.00	0.00	1.79	82.49	84.28
Chittoor	0.00	0.00	117.95	1,154.21	1,272.16
East Godavari	0.00	0.00	3.44	60.41	63.85
Eluru	0.00	22.53	493.36	518.83	1,034.72
Guntur	0.00	0.00	1.27	5.35	6.62
Kakinada	0.00	0.00	56.42	312.01	368.43
Konaseema	0.00	0.00	0.00	61.57	61.57
Krishna	0.00	0.00	0.07	104.14	104.21
Kurnool	0.00	0.00	10.51	127.57	138.08
Nandyal	0.00	0.00	375.71	2,156.02	2,531.73
NTR	0.00	0.03	65.44	192.53	258.00
Palnadu	0.00	0.00	92.95	1,032.63	1,125.58
Parvathipuram Manyam	0.00	0.00	281.40	487.32	768.72
Prakasam	0.00	0.00	890.32	3,061.11	3,951.43
Sri Potti Sriramulu Nellore	0.00	0.00	151.12	1,126.16	1,277.28
Sri Sathya Sai	0.00	0.00	103.12	802.81	905.93
Srikakulam	0.00	0.00	78.93	270.17	349.10
Tirupati	0.00	0.00	275.91	1,685.47	1,961.38
Visakhapatnam	0.00	0.00	19.09	100.23	119.32
Vizianagaram	0.00	0.00	34.55	112.04	146.59

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
West Godavari	0.00	0.00	0.00	0.02	0.02
YSR Kadapa	0.00	0.00	387.08	2,128.91	2,515.99
Total	0.00	201.05	7,057.57	21,408.53	28,667.15

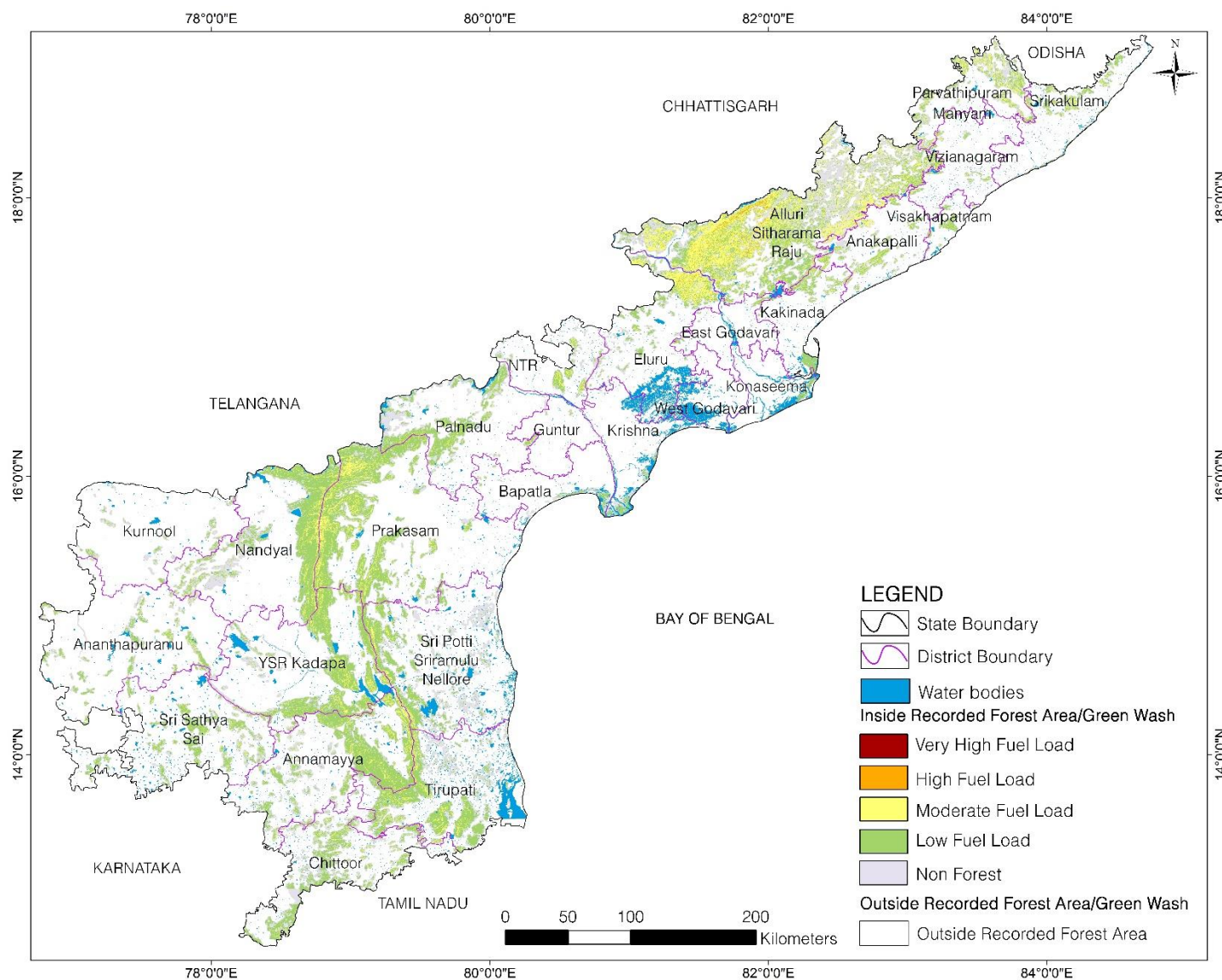


Figure 2.1.1. Surface fuel load map of Andhra Pradesh

2.1.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Alluri Sitharama Raju, Prakasam and Nandyal districts. This area is dominated by *Terminalia spp.*, *Anogeissus latifolia*, *Acacia spp.* etc forest species.

2.2 Arunachal Pradesh

2.2.1 Surface Fuel Load

Different surface fuel load classes inside GW is shown in the Table 2.2.1. From the table, it can be inferred that 7.36% of the total GW area falls under very high fuel load class, 33.75% under high fuel load class, 49.96% under low fuel load class and 0.88% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.2.1.

Table 2.2.1 District-wise RFA/GW Area in different fuel load classes in Arunachal Pradesh
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Anjaw	200.63	2,416.95	1,124.31	17.86	3,759.75
Changlang	330.80	1,198.54	2,604.46	90.15	4,223.95
Dibang Valley	331.56	3,536.27	1,743.96	51.54	5,663.33
East Kameng	399.61	1,366.50	1,476.52	29.67	3,272.30
East Siang	2.07	41.40	810.12	32.72	886.31
Kamle	42.09	103.94	1,021.85	4.30	1,172.18
Kra Daadi	118.32	392.14	986.12	8.76	1,505.34
Kurung Kumey	523.16	1,621.20	1,083.39	18.65	3,246.40
Lepa Rada	0.13	1.13	676.42	2.20	679.88
Lohit	125.59	709.27	1,169.71	19.85	2,024.42
Longding	10.98	36.59	404.36	21.16	473.09
Lower Dibang Valley	84.25	781.84	1,370.15	39.84	2,276.08
Lower Siang	33.53	107.92	1,486.02	1.91	1,629.38
Lower Subansiri	90.36	142.77	1,301.98	24.50	1,559.61
Namsai	89.14	272.92	225.33	68.61	656.00
Pakke Kessang	144.70	251.90	1,320.56	7.83	1,724.99
Papum Pare	290.09	600.94	2,029.30	31.85	2,952.18
Shi Yomi	486.38	1,049.04	457.30	7.30	2,000.02
Siang	62.26	444.65	1,994.98	4.11	2,506.00
Tawang	2.92	245.99	195.04	12.26	456.21
Tirap	63.25	124.73	540.91	6.64	735.53
Upper Siang	242.03	1,992.52	2,579.93	23.78	4,838.26
Upper Subansiri	376.54	2,052.81	2,853.45	17.37	5,300.17
West Kameng	587.10	1,832.78	1,585.72	18.61	4,024.21
West Siang	52.36	189.54	807.97	3.48	1,053.35
Total	4,689.85	21,514.28	31,849.86	564.95	58,618.94

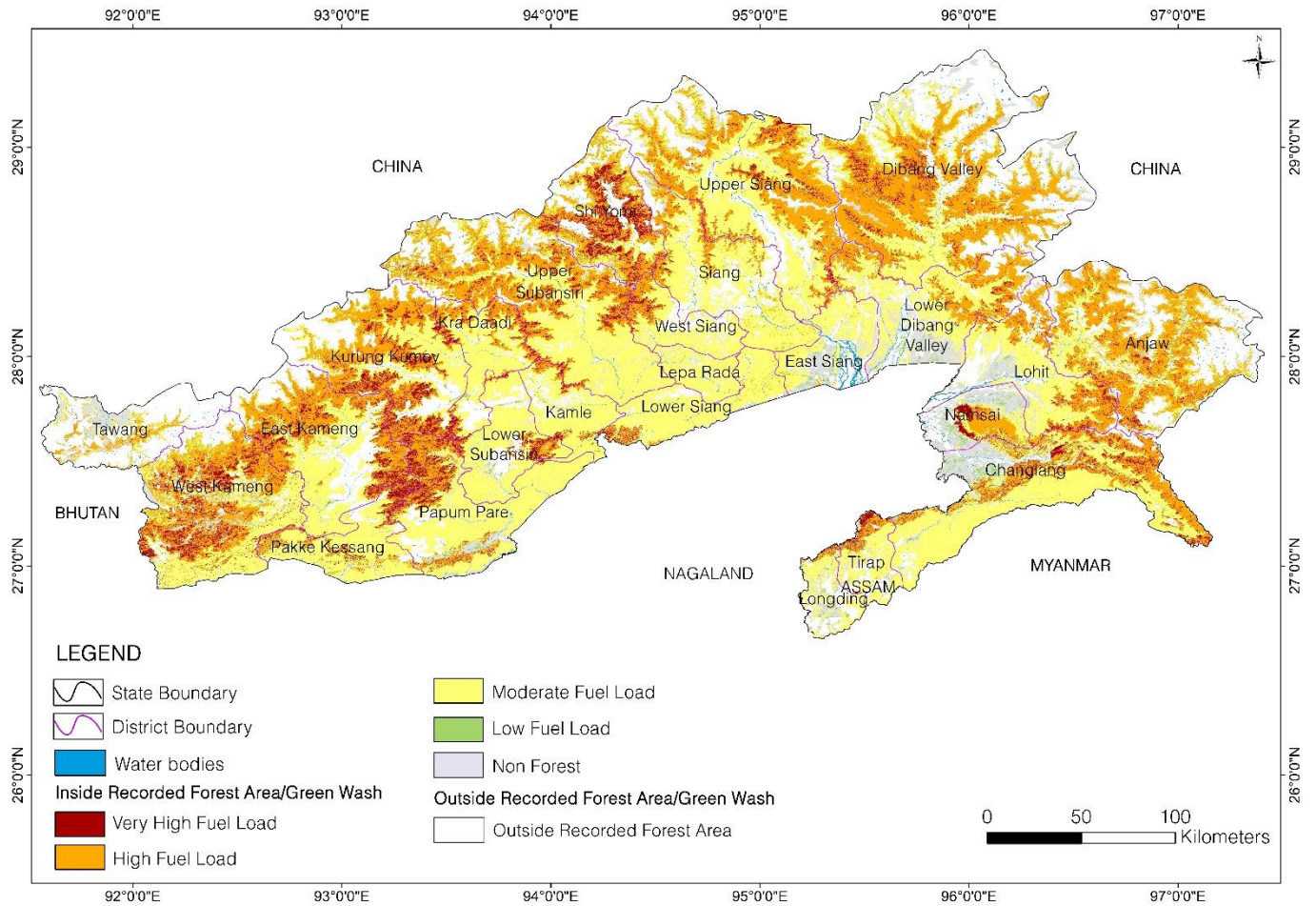


Figure 2.2.1 Surface fuel load map of Arunachal Pradesh

2.2.2 Results and Analysis

41.11% of the forest cover inside GW falls in the very high fuel load and very high fuel load category. These districts are dominated by *Quercus spp.*, *Castanopsis spp.*, *Macaranga spp.* etc forest species.

2.3 Assam

2.3.1 Surface Fuel Load

Different surface fuel load classes inside GW is shown in the Table 2.3.1. From the table, it can be inferred that 2.65% of the total GW area falls under very high fuel load class, 4.79% under high fuel load class, 62.20% under moderately fuel load class and 2.24% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.3.1.

Table 2.3.1 District-wise RFA/GW Area in different fuel load classes in Assam

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Baksa	0.00	8.48	140.79	3.87	153.14
Barpeta	0.00	0.00	0.50	0.46	0.96
Biswanath	0.00	0.00	111.24	25.16	136.40
Bongaigaon	0.00	0.00	97.97	31.89	129.86
Cachar	108.58	256.39	1,410.02	39.91	1,814.90
Charaideo	9.24	74.12	38.51	19.65	141.52
Chirang	0.00	3.07	217.02	20.65	240.74
Darrang	0.00	0.00	3.47	0.05	3.52
Dhemaji	20.18	81.36	30.15	7.53	139.22
Dhubri	0.00	0.00	15.48	3.90	19.38
Dibrugarh	83.37	56.03	32.69	8.24	180.33
Dima Hasao	154.16	320.79	3,344.75	0.81	3,820.51
Goalpara	0.00	0.43	195.22	89.17	284.82
Golaghat	0.00	0.19	172.24	64.73	237.16
Hailakandi	6.60	31.07	578.03	11.76	627.46
Hojai	0.00	0.14	362.84	10.89	373.87
Jorhat	0.74	9.56	196.87	12.46	219.63
Kamrup	0.00	28.63	599.12	34.50	662.25
Kamrup Metropolitan	0.00	0.00	120.96	1.54	122.50
Karbi Anglong	0.01	2.44	5,292.89	12.93	5,308.27
Karimganj	0.81	2.78	392.50	8.88	404.97
Kokrajhar	0.00	7.48	980.53	28.23	1,016.24
Lakhimpur	19.48	57.30	77.55	13.59	167.92
Majuli	0.00	0.00	0.00	0.00	0.00
Morigaon	0.00	8.09	94.32	1.06	103.47
Nagaon	0.00	17.34	163.37	17.51	198.22
Nalbari	0.00	0.00	0.00	0.00	0.00

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Sivasagar	0.00	0.44	52.64	22.38	75.46
Sonitpur	0.06	5.82	324.52	39.78	370.18
South Salmara Mankachar	0.00	0.00	9.96	0.41	10.37
Tinsukia	326.29	248.56	205.77	68.56	849.18
Udalguri	0.00	0.11	16.13	5.00	21.24
West Karbi Anglong	0.00	97.83	1,855.96	11.80	1,965.59
Total	729.52	1,318.45	17,134.01	617.30	19,799.28

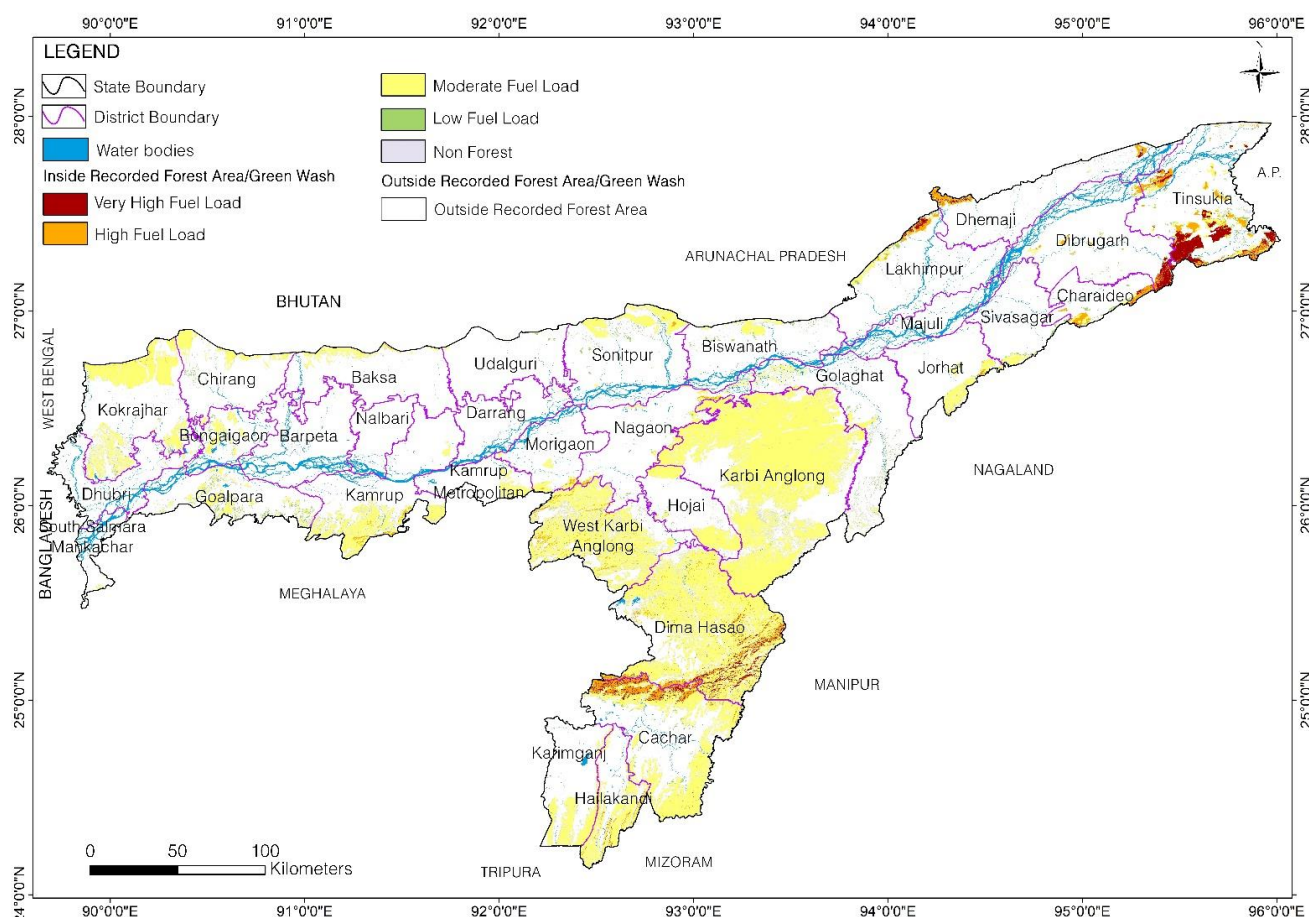


Figure 2.3.1 Surface fuel load map of Assam

2.3.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Tinsukia, Dibrugarh, Cachar, Dima Hasao. This area is dominated by *Dipterocarpus spp.*, *Shorea spp.*, *Palaquium polyanthum* etc forest species. Around 64.44% of the forest over inside GW falls under moderate to low fuel load class.

2.4 Bihar

2.4.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.4.1. From the table, it can be inferred that 0.71% of the total RFA area falls under high fuel load class, 13.97% under moderate fuel load class and 64.98% under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.4.1.

Table 2.4.1 District-wise RFA/GW Area in different fuel load classes in Bihar

Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Araria	0.00	0.00	0.00	5.92	5.92
Arwal	0.00	0.00	0.00	0.00	0.00
Aurangabad	0.00	0.00	8.89	142.78	151.67
Banka	0.00	0.00	7.47	218.37	225.84
Begusarai	0.00	0.00	0.00	0.00	0.00
Bhagalpur	0.00	0.00	0.00	0.08	0.08
Bhojpur	0.00	0.00	0.00	0.00	0.00
Buxar	0.00	0.00	0.00	0.00	0.00
Darbhanga	0.00	0.00	0.00	0.00	0.00
East Champaran	0.00	0.00	0.00	0.08	0.08
Gaya	0.00	0.00	19.78	582.77	602.55
Gopalganj	0.00	0.00	0.00	0.00	0.00
Jamui	0.00	0.00	87.56	517.27	604.83
Jehanabad	0.00	0.00	0.60	4.48	5.08
Kaimur	0.00	0.00	62.16	970.35	1,032.51
Katihar	0.00	0.00	0.00	0.00	0.00
Khagaria	0.00	0.00	0.00	0.00	0.00
Kishanganj	0.00	0.00	0.00	0.00	0.00
Lakhisarai	0.00	0.00	43.93	114.31	158.24
Madhepura	0.00	0.00	0.00	0.00	0.00
Madhubani	0.00	0.00	0.00	0.00	0.00
Munger	0.00	0.00	69.87	237.78	307.65
Muzaffarpur	0.00	0.00	0.00	0.00	0.00
Nalanda	0.00	0.00	6.40	33.44	39.84
Nawada	0.00	0.00	32.75	465.53	498.28
Patna	0.00	0.00	0.00	0.00	0.00
Purnia	0.00	0.00	0.00	1.87	1.87

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Rohtas	0.00	0.00	59.45	571.87	631.32
Saharsa	0.00	0.00	0.00	0.00	0.00
Samastipur	0.00	0.00	0.00	0.00	0.00
Saran	0.00	0.00	0.00	0.00	0.00
Sheikhpura	0.00	0.00	0.00	0.00	0.00
Sheohar	0.00	0.00	0.00	0.00	0.00
Sitamarhi	0.00	0.00	0.00	0.00	0.00
Siwan	0.00	0.00	0.00	0.00	0.00
Supaul	0.00	0.00	0.00	0.00	0.00
Vaishali	0.00	0.00	0.00	0.00	0.00
West Champaran	0.00	45.34	491.93	277.56	814.83
Total	0.00	45.34	890.79	4,144.46	5,080.59

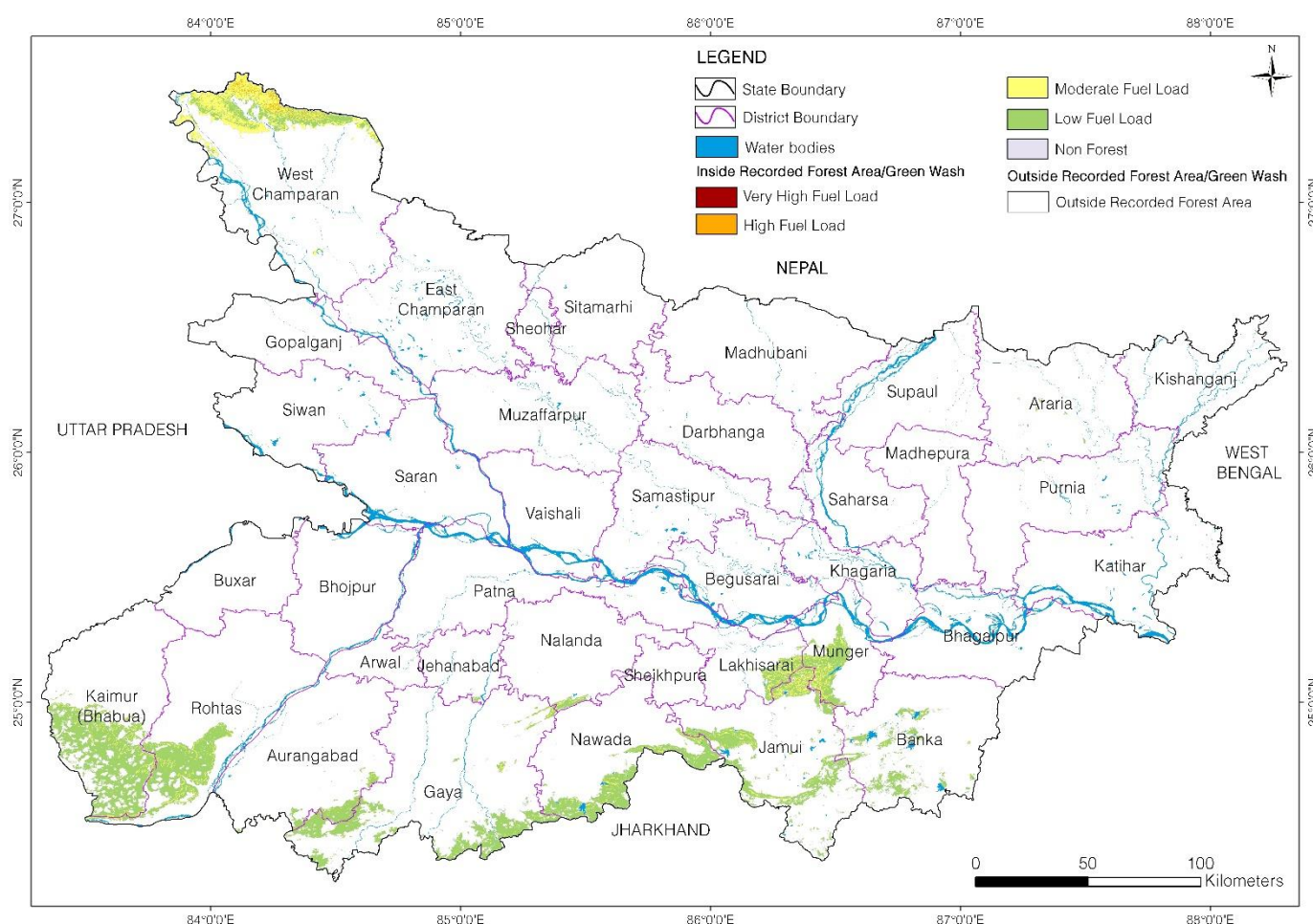


Figure 2.4.1 Surface fuel load map of Bihar

2.4.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in West Champaran, Jamui and Munger districts. This area is dominated by *Shorea robusta*, *Terminalia tomentosa*, *Terminalia balerica* and *Dalbergia latifolia* etc forest species. Around 78.95% of the forest cover inside RFA falls under moderate to low fuel load class.

2.5 Chhattisgarh

2.5.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.5.1. From the table, it can be inferred that 0.85% of the total RFA area falls under high fuel load class, 37.60% under moderate fuel load class and 42.19% under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.5.1.

Table 2.5.1 District-wise RFA/GW Area in different fuel load classes in Chhattisgarh
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Balod	0.00	2.63	236.67	408.83	648.13
Balodabazar Bhatapara	0.00	3.64	245.13	694.50	943.27
Balrampur	0.00	2.93	586.22	2,081.89	2,671.04
Bastar	0.00	55.60	1,340.56	300.82	1,696.98
Bemetara	0.00	0.00	0.00	0.00	0.00
Bijapur	0.00	130.37	2,844.78	1,819.36	4,794.51
Bilaspur	0.00	1.19	390.56	189.49	581.24
Dantewada	0.00	27.02	385.10	326.74	738.86
Dhamtari	0.00	2.32	1,035.19	697.14	1,734.65
Durg	0.00	0.00	0.00	0.00	0.00
Gariaband	0.00	0.06	1,473.48	755.95	2,229.49
Gaurela Pendra Marwahi	0.00	1.89	284.84	346.62	633.35
Janjgir Champa	0.00	0.04	31.47	104.24	135.75
Jashpur	0.00	0.16	610.95	913.75	1,524.86
Kawardha (Kabirdham)	0.00	8.63	694.80	671.79	1,375.22
Kondagaon	0.00	7.14	1,449.10	313.34	1,769.58
Korba	0.00	37.17	2,101.68	777.29	2,916.14
Korea	0.00	0.00	230.07	3,457.58	3,687.65
Mahasamund	0.00	0.10	99.49	677.59	777.18
Mungeli	0.00	47.22	849.07	107.21	1,003.50

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Narayanpur	0.00	32.97	345.39	176.45	554.81
Raigarh	0.00	1.22	462.52	1,514.20	1,977.94
Raipur	0.00	0.00	1.99	15.24	17.23
Raj Nandgaon	0.00	2.70	768.09	1,478.79	2,249.58
Sukma	0.00	13.45	642.48	1,379.97	2,035.90
Surajpur	0.00	0.61	447.33	1,767.24	2,215.18
Surguja	0.00	7.49	683.53	488.13	1,179.15
Uttar Bastar Kanker (Kanker)	0.00	62.45	1,702.21	912.14	2,676.80
Total	0.00	449.00	19,942.70	22,376.29	42,767.99

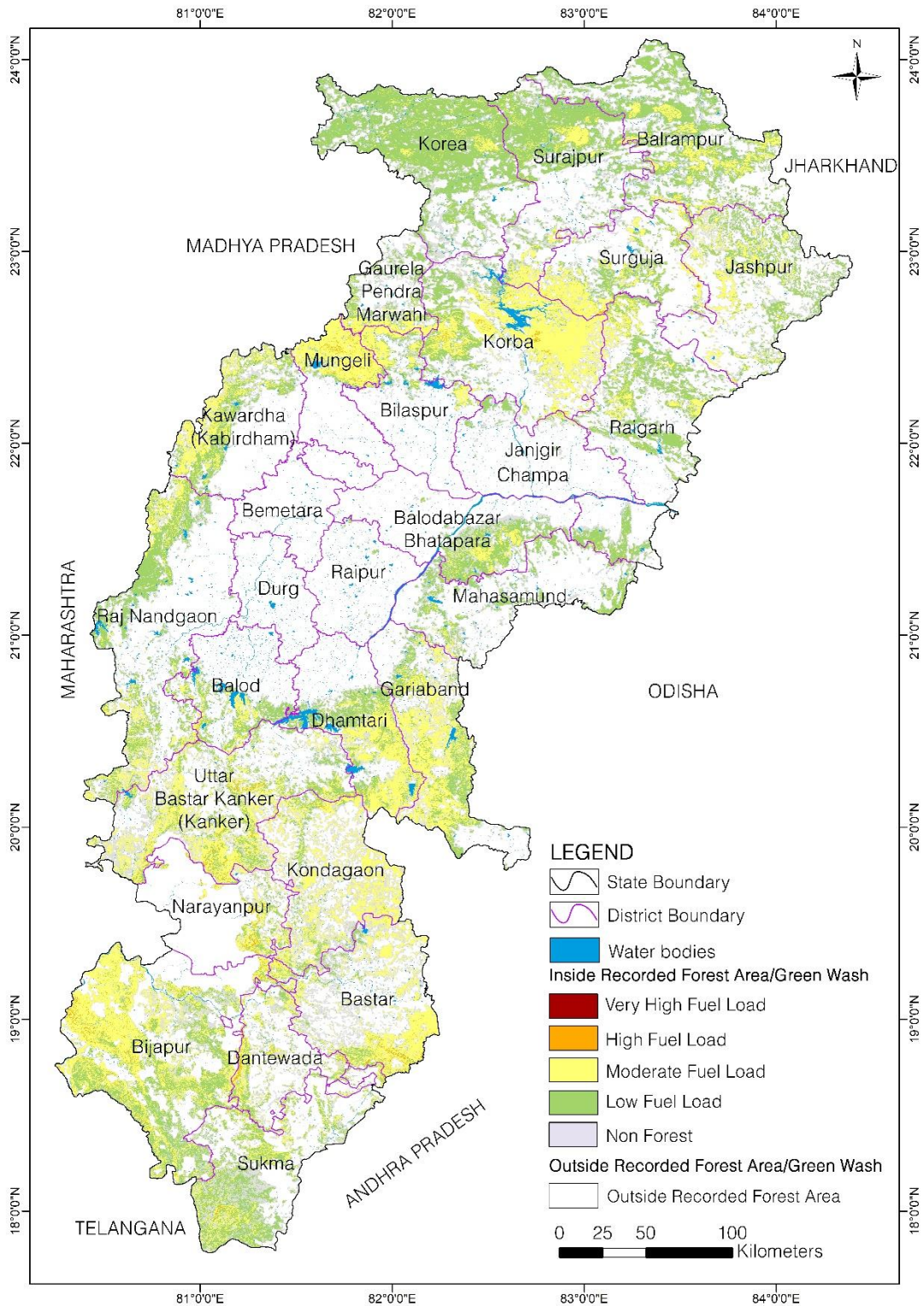


Figure 2.5.1 Surface fuel load map of Chhattisgarh

2.5.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Korba followed by Bijapur, Dhamtari and Gariaband districts. This area is dominated by *Madhuca longifolia*, *Diospyros melanoxylon* etc forest species. Around 79.79% of the forest cover inside RFA falls under the moderate to low fuel load class.

2.6 Delhi

2.6.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.6.1 From the table, it can be inferred that 3.30% of the total RFA falls under moderate fuel load class and 72.71% under low fuel load class. No area inside RFA has been observed in the very high fuel load and high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.6.1.

Table 2.6.1 District-wise RFA/GW Area in different fuel load classes in Delhi
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Central Delhi	0.00	0.00	0.01	2.98	2.99
East Delhi	0.00	0.00	0.00	0.00	0.00
New Delhi	0.00	0.00	2.91	17.63	20.54
North Delhi	0.00	0.00	0.00	0.00	0.00
North-East Delhi	0.00	0.00	0.00	0.00	0.00
North-West Delhi	0.00	0.00	0.00	0.00	0.00
Shahadra	0.00	0.00	0.00	0.00	0.00
South Delhi	0.00	0.00	0.28	45.64	45.92
South-East Delhi	0.00	0.00	0.00	4.05	4.05
South-West Delhi	0.00	0.00	0.00	0.04	0.04
West Delhi	0.00	0.00	0.00	0.17	0.17
Total	0.00	0.00	3.20	70.51	73.71

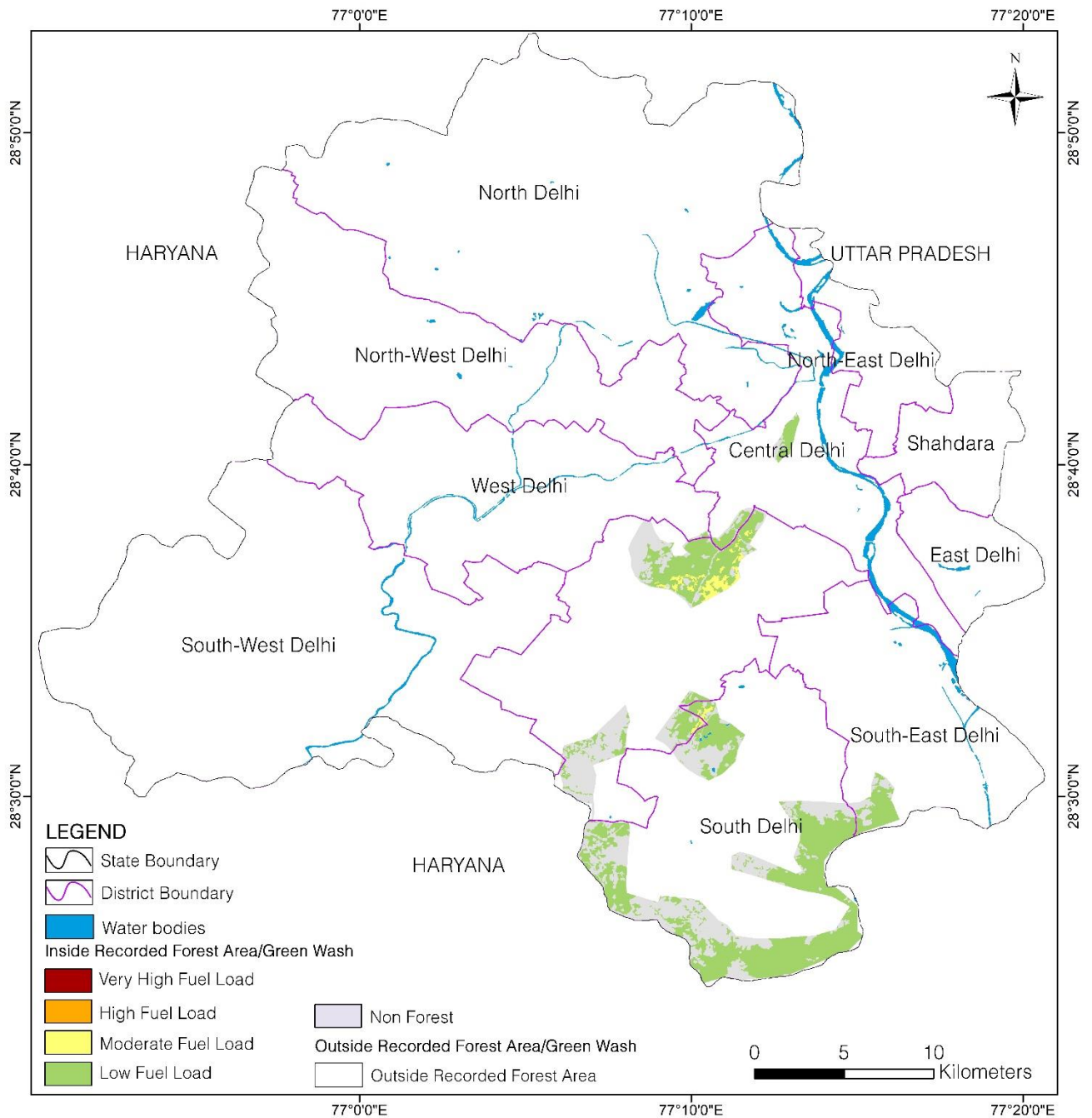


Figure 2.6.1 Surface fuel load map of Delhi

2.6.2 Results and Analysis

Around 76.01% of the forest cover inside RFA falls under the moderate to low fuel load class.

2.7 Goa

2.7.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.7.1. From the table, it can be inferred that 10.92% of the total RFA area falls under very high fuel load class, 25.36% under high fuel load class, 54.68% under moderate fuel load class and 1.66% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.7.1.

Table 2.7.1 District-wise RFA/GW Area in different fuel load classes in Goa

District	Surface Fuel Load Class				Area in km ²
	Very High	High	Moderate	Low	Total
North Goa	26.97	84.48	243.27	7.57	362.29
South Goa	117.90	251.87	482.17	14.39	866.33
Total	144.87	336.35	725.44	21.96	1,228.62

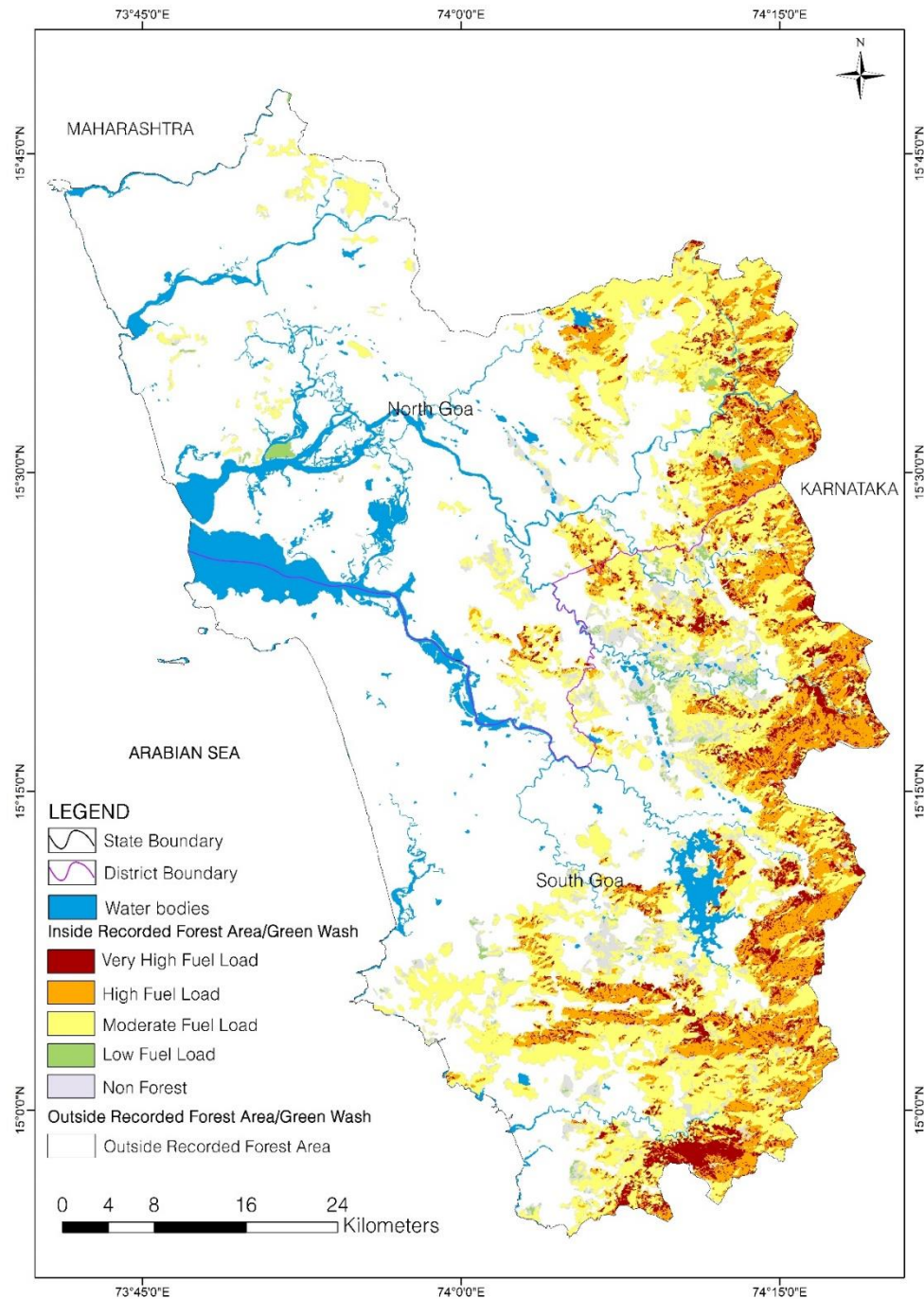


Figure 2.7.1 Surface fuel load map of Goa

2.7.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in South Goa followed by North Goa districts. This area is dominated by *Acacia spp.*, *Terminalia spp.*, *Carissa congesta* etc. forest species. Around 80.04% of the forest cover inside RFA falls under high to moderate fuel load class.

2.8 Gujarat

2.8.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.8.1. From the table, it can be inferred that 0.44% of the total RFA area falls under high fuel load class, 8.00% under moderate fuel load class and 25.26% under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.8.1.

Table 2.8.1 District-wise RFA/GW Area in different fuel load classes in Gujarat
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Ahmadabad	0.00	0.00	0.00	0.04	0.04
Amreli	0.00	0.00	5.95	188.13	194.08
Anand	0.00	0.00	0.00	0.00	0.00
Arvalli	0.00	0.00	14.57	181.42	195.99
Banaskantha	0.00	0.00	108.12	589.25	697.37
Bharuch	0.00	0.00	2.27	109.07	111.34
Bhavnagar	0.00	0.00	1.25	77.04	78.29
Botad	0.00	0.00	0.00	3.91	3.91
Chhotaudepur	0.00	0.00	29.16	333.03	362.19
Dahod	0.00	0.00	11.82	394.16	405.98
Dang	0.00	106.45	761.40	81.19	949.04
Devbhumi Dwarka	0.00	0.00	5.34	121.50	126.84
Gandhinagar	0.00	0.00	0.11	12.64	12.75
Gir Somnath	0.00	0.00	0.01	82.02	82.03
Jamnagar	0.00	0.00	0.30	147.05	147.35
Junagadh	0.00	0.00	58.13	1,439.74	1,497.87
Kachchh	0.00	0.00	0.00	1,296.52	1,296.52
Kheda	0.00	0.00	0.01	14.07	14.08
Mahisagar	0.00	0.00	4.67	174.00	178.67
Mehesana	0.00	0.00	2.36	38.67	41.03
Morbi	0.00	0.00	0.00	105.95	105.95
Narmada	0.00	0.33	109.35	703.12	812.80
Navsari	0.00	3.65	125.64	55.74	185.03
Panchmahals	0.00	0.00	9.30	339.96	349.26
Patan	0.00	0.00	0.00	67.28	67.28
Porbandar	0.00	0.00	1.79	120.65	122.44

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Rajkot	0.00	0.00	0.36	39.67	40.03
Sabarkantha	0.00	0.00	78.49	400.70	479.19
Surat	0.00	0.01	127.80	73.21	201.02
Surendranagar	0.00	0.00	0.00	74.94	74.94
Tapi	0.00	23.36	553.18	182.72	759.26
Vadodara	0.00	0.00	0.12	8.58	8.70
Valsad	0.00	0.00	416.02	211.91	627.93
Total	0.00	133.80	2,427.52	7,667.88	10,229.20

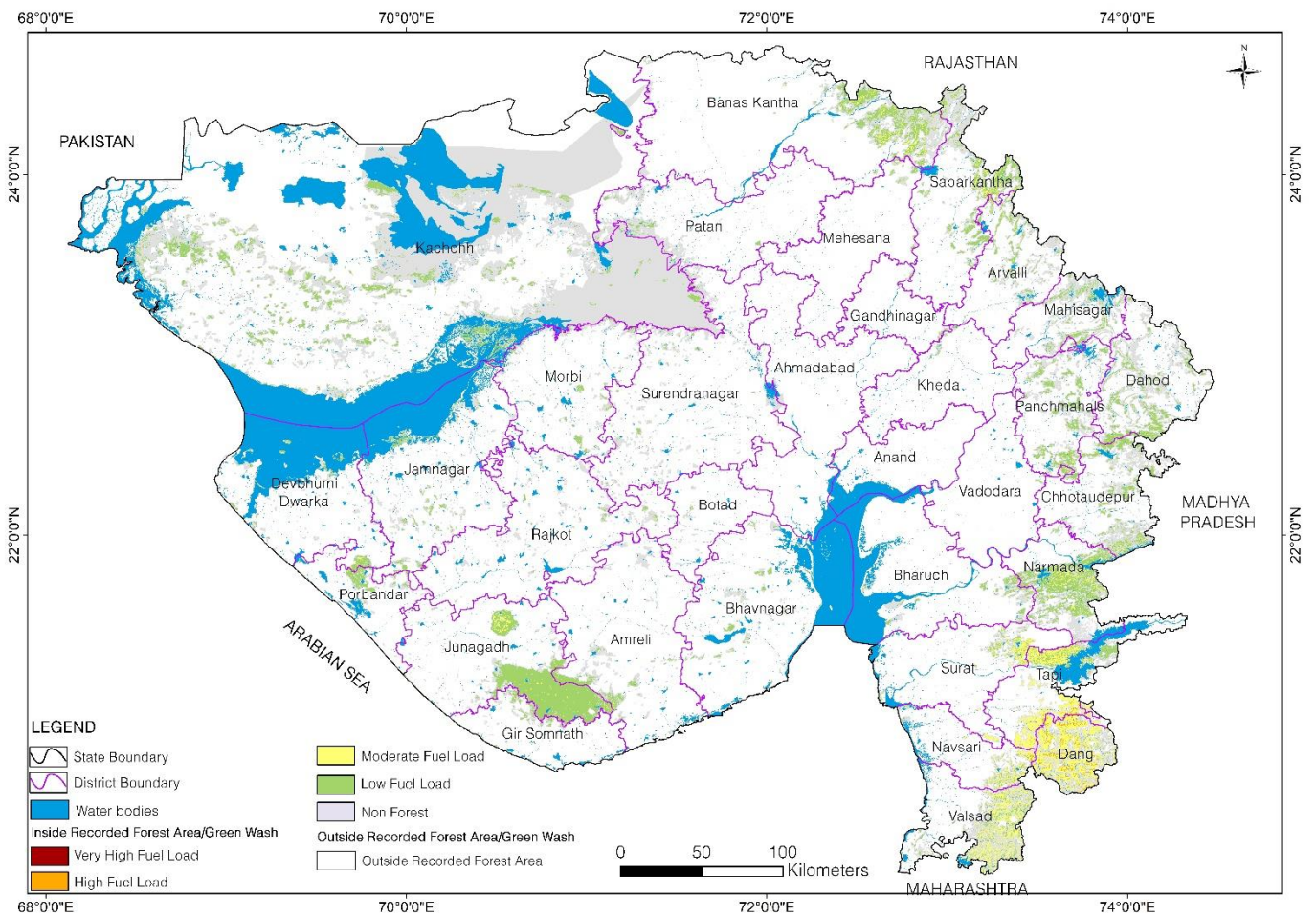


Figure 2.8.1 Surface fuel load map of Gujarat

2.8.2 Result and Analysis

Around 33.26% of the forest cover inside RFA falls under moderate to low fuel load class.

2.9 Haryana

2.9.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.9.1. From the table, it can be inferred that 0.16% of the total RFA area falls under high fuel load class, 6.31% under moderate fuel load class and 42.03% under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load map classes is shown in the map of the state in Figure 2.9.1.

Table 2.9.1 District-wise RFA/GW Area in different fuel load classes in Haryana
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Ambala	0.00	0.00	0.00	8.75	8.75
Bhiwani	0.00	0.00	0.00	2.92	2.92
Charkhi Dadri	0.00	0.00	0.00	0.50	0.50
Faridabad	0.00	0.00	0.00	52.49	52.49
Fatehabad	0.00	0.00	0.00	0.43	0.43
Gurugram	0.00	0.00	0.20	62.87	63.07
Hisar	0.00	0.00	0.00	4.62	4.62
Jhajjar	0.00	0.00	0.00	3.56	3.56
Jind	0.00	0.00	0.00	4.68	4.68
Kaithal	0.00	0.00	0.00	27.89	27.89
Karnal	0.00	0.00	0.00	4.00	4.00
Kurukshetra	0.00	0.00	0.00	17.70	17.70
Mahendragarh	0.00	0.00	0.85	26.94	27.79
Mewat	0.00	0.00	5.59	81.49	87.08
Palwal	0.00	0.00	0.00	1.47	1.47
Panchkula	0.00	2.57	64.03	224.38	290.98
Panipat	0.00	0.00	0.00	0.23	0.23
Rewari	0.00	0.00	0.56	32.89	33.45
Rohtak	0.00	0.00	0.00	1.88	1.88
Sirsa	0.00	0.00	0.00	0.07	0.07
Sonipat	0.00	0.00	0.00	0.00	0.00
Yamunanagar	0.00	0.00	31.60	124.63	156.23
Total	0.00	2.57	102.83	684.39	789.79

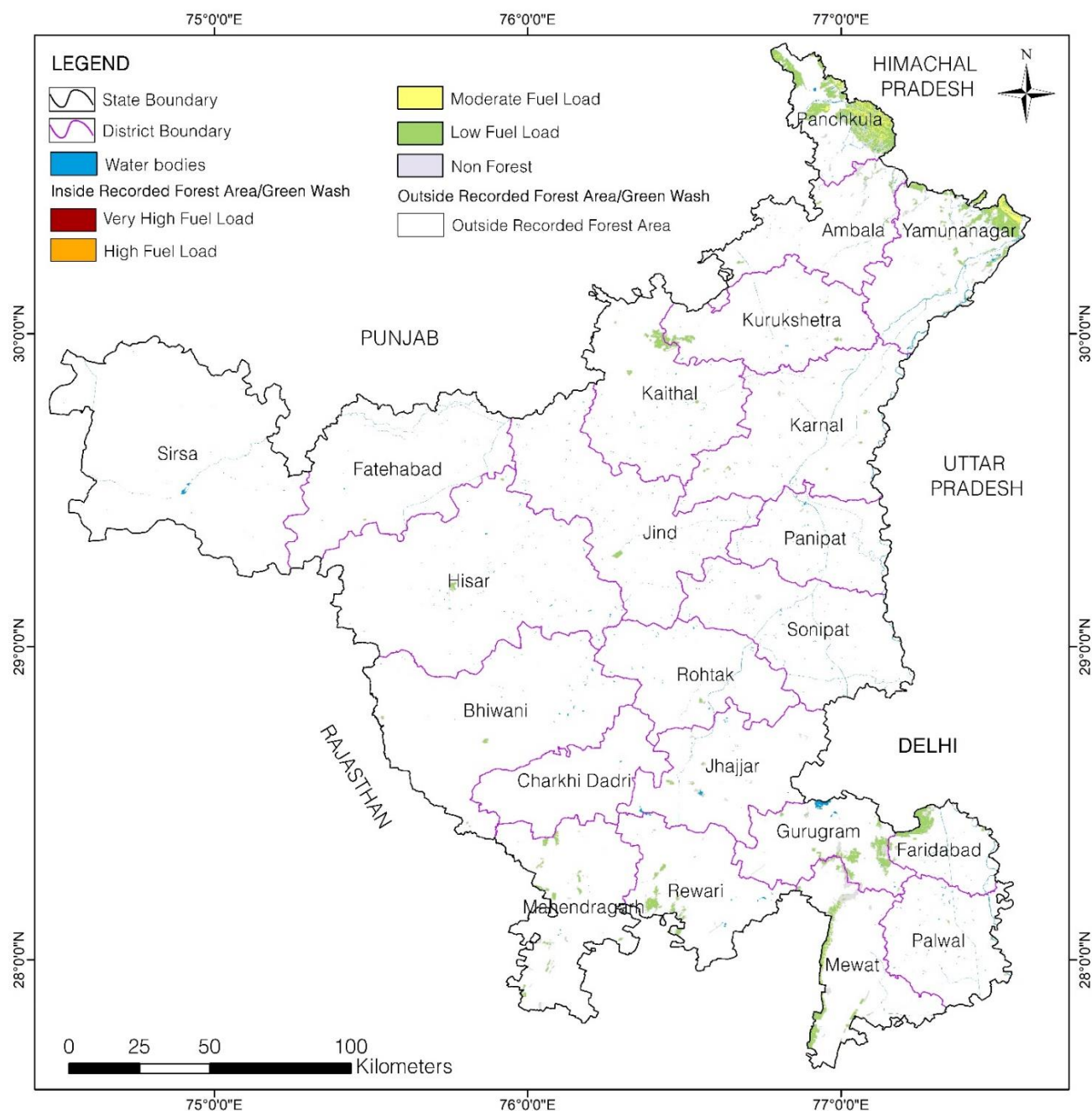


Figure 2.9.1 Surface fuel load map of Haryana

2.9.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Panchkula and Yamunanagar districts. This area is dominated by *Prosopis spp*, *Acacia spp.*, *Anogeissus latifolia* etc. forest species. Around 48.34% of the forest cover inside RFA falls under moderate to low fuel load class.

2.10 Himachal Pradesh

2.10.1 Surface Fuel Load

Different surface fuel load classes inside GW is shown in the Table 2.10.1. From the table, it can be inferred that 8.59% of the total GW area falls under very high fuel load class, 43.09% under high fuel load class, 13.55% under moderate fuel load class and 11.52% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.10.1.

Table 2.10.1 District-wise RFA/GW Area in different fuel load classes in Himachal Pradesh
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Bilaspur	0.08	19.29	87.44	85.76	192.57
Chamba	245.98	1,157.85	265.65	38.42	1,707.90
Hamirpur	0.00	85.35	51.16	57.37	193.88
Kangra	60.12	525.59	245.76	640.30	1,471.77
Kinnaur	152.61	272.18	68.81	16.86	510.46
Kullu	210.61	1,237.80	104.47	11.43	1,564.31
Lahaul & Spiti	23.37	33.54	29.99	4.05	90.95
Mandi	130.99	821.07	197.57	50.79	1,200.42
Shimla	352.98	1,496.75	75.80	16.59	1,942.12
Sirmaur	26.51	293.84	482.54	271.24	1,074.13
Solan	0.85	77.10	244.19	194.41	516.55
Una	0.00	23.69	46.80	228.43	298.92
Total	1,204.10	6,044.05	1,900.18	1,615.65	10,763.98

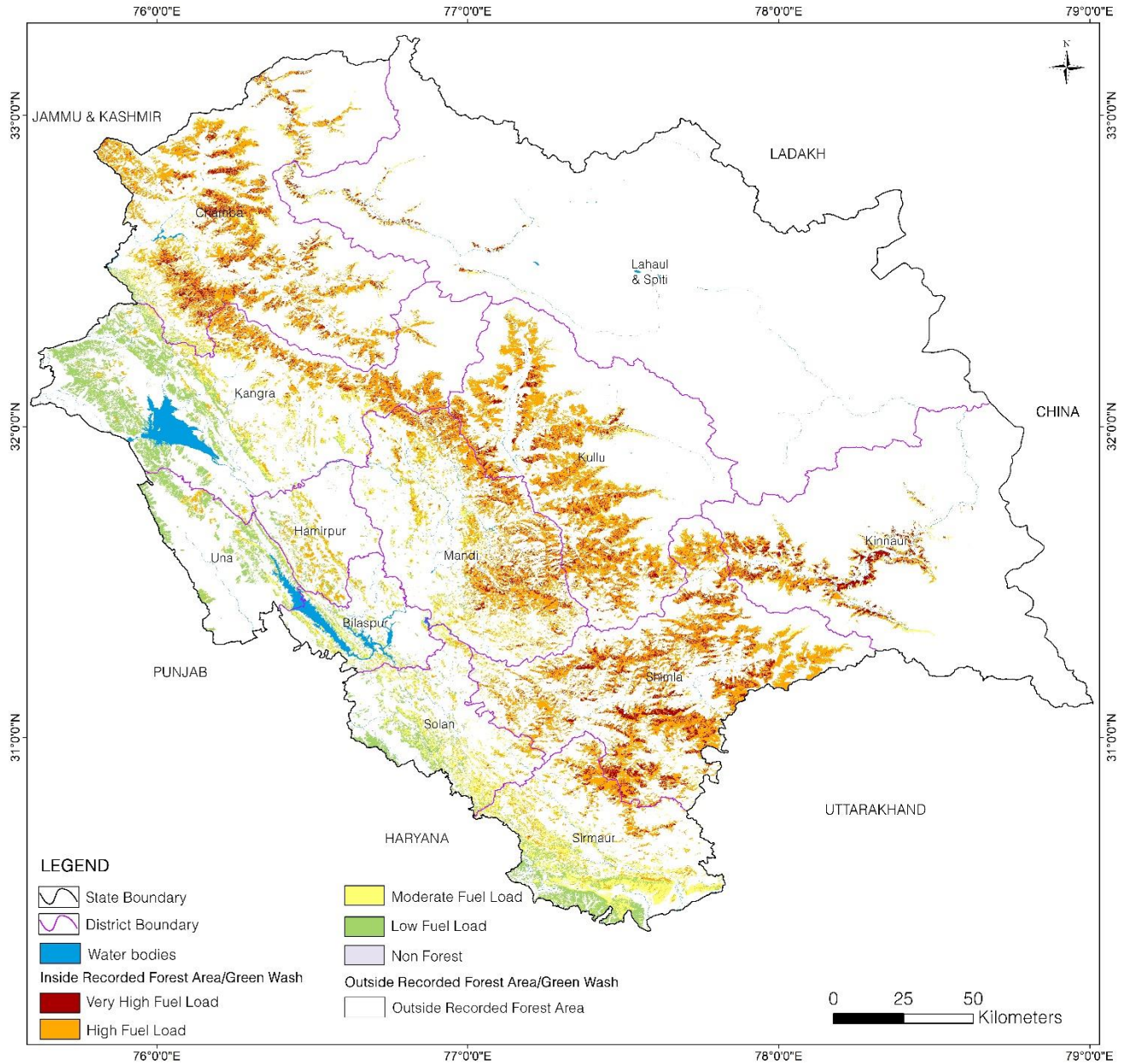


Figure 2.10.1 Surface fuel load map of Himachal Pradesh

2.10.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in almost all the hill districts in the state. This area is dominated by *Pinus spp.*, *Quercus spp.*, *Cedrus deodara etc.* forest species. Around 51.68% of the forest cover inside GW falls under very high to high fuel load class.

2.11 Jharkhand

2.11.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.11.1. From the table, it can be inferred that 0.01% of the total RFA area falls under high fuel load class, 10.18% under moderate fuel load class and 56.60 % under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.11.1.

Table 2.11.1 District-wise RFA/GW Area in different fuel load classes in Jharkhand

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Bokaro	0.00	0.00	69.22	352.46	421.68
Chatra	0.00	0.00	256.70	1,366.66	1,623.36
Deoghar	0.00	0.00	5.56	57.48	63.04
Dhanbad	0.00	0.00	8.46	115.57	124.03
Dumka	0.00	0.00	14.55	186.23	200.78
East Singhbhum	0.00	0.24	113.80	721.18	835.22
Garhwa	0.00	0.29	148.22	1,106.35	1,254.86
Giridih	0.00	0.00	43.64	501.94	545.58
Godda	0.00	0.00	1.91	28.26	30.17
Gumla	0.00	0.06	229.25	532.40	761.71
Hazaribagh	0.00	0.00	244.05	1,191.12	1,435.17
Jamtara	0.00	0.00	0.02	0.28	0.30
Khunti	0.00	0.04	41.01	208.36	249.41
Kodarma	0.00	0.00	51.51	393.53	445.04
Latehar	0.00	0.38	245.87	820.51	1,066.76
Lohardaga	0.00	0.00	146.71	212.39	359.10
Pakur	0.00	0.00	3.48	36.50	39.98
Palamu	0.00	0.00	58.38	839.54	897.92
Ramgarh	0.00	0.00	38.06	230.58	268.64
Ranchi	0.00	0.01	70.15	519.00	589.16
Sahibganj	0.00	0.00	2.02	33.62	35.64
Saraikela Kharsawan	0.00	0.00	30.62	255.73	286.35
Simdega	0.00	0.11	24.84	424.64	449.59
West Singhbhum	0.00	1.19	95.45	674.59	771.23
Total	0.00	2.32	1,943.48	10,808.92	12,754.72

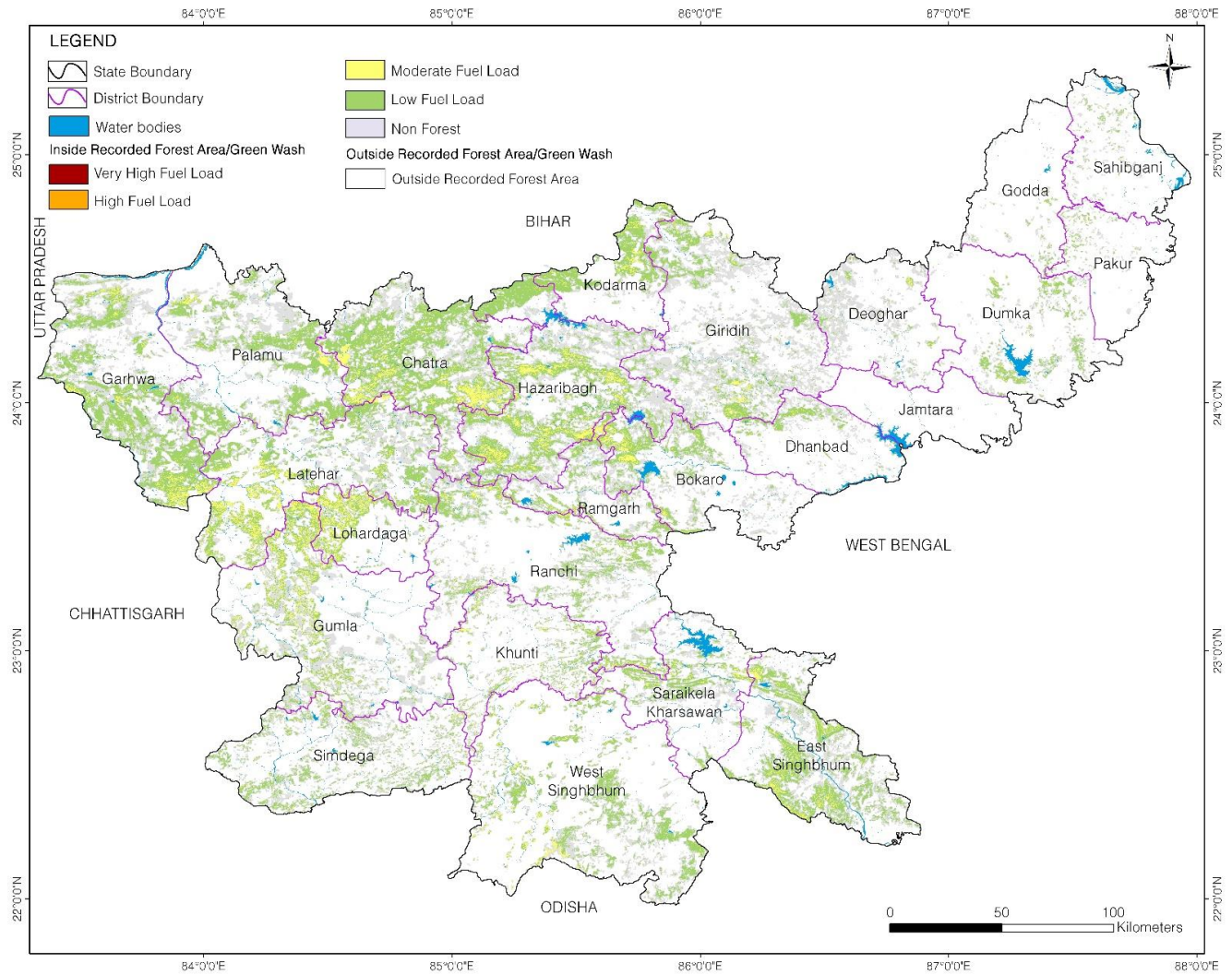


Figure 2.11.1 Surface fuel load map of Jharkhand

2.11.2 Results and Analysis

The state is dominated by *Shorea robusta*, *Madhuca indica*, *Terminalia spp.*, *Butea monosperma* etc forest species. Around 66.78% of the forest cover inside RFA falls under moderate to low fuel load class.

2.12 Karnataka

2.12.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.12.1. From the table, it can be inferred that 3.04% of the total RFA area falls under very high fuel load class, 10.93% under high fuel load class, 33.55% under moderate fuel load class and 35.74% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.12.1.

Table 2.12.1 District-wise RFA/GW Area in different fuel load classes in Karnataka

Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Bagalkot	0.00	0.00	0.03	536.62	536.65
Ballari	0.00	0.00	40.38	909.91	950.29
Belagavi	17.20	96.00	645.45	616.24	1,374.89
Bengaluru	0.00	0.00	0.06	40.66	40.72
Bengaluru Rural	0.00	0.00	0.43	97.43	97.86
Bidar	0.00	0.00	0.10	67.93	68.03
Chamarajanagar	8.91	50.72	806.48	1,790.55	2,656.66
Chikkamagaluru	44.46	217.60	819.42	436.47	1,517.95
Chikballapura	0.00	0.00	41.80	223.65	265.45
Chitradurga	0.00	0.00	5.02	644.84	649.86
Dakshina Kannada	103.83	368.58	579.18	115.96	1,167.55
Davanagere	0.00	0.00	37.83	546.34	584.17
Dharwad	0.00	0.00	15.49	313.23	328.72
Gadag	0.00	0.00	17.13	202.86	219.99
Hassan	20.15	69.31	92.10	215.68	397.24
Haveri	0.00	0.00	11.10	341.37	352.47
Kalaburagi	0.00	0.00	1.68	167.10	168.78
Kodagu	145.52	584.78	438.57	177.26	1,346.13
Kolar	0.00	0.00	6.84	225.80	232.64
Koppal	0.00	0.00	0.00	72.60	72.60
Mandya	0.00	0.00	17.33	211.74	229.07
Mysuru	0.02	4.87	245.00	675.26	925.15
Raichur	0.00	0.00	0.00	91.19	91.19
Ramanagara	0.00	0.00	26.94	575.01	601.95
Shivamogga	113.10	243.00	1,042.12	466.77	1,864.99
Tumakuru	0.00	0.00	21.14	557.78	578.92
Udupi	87.74	279.57	441.74	17.84	826.89
Uttara Kannada	403.23	1,478.48	5,059.14	572.97	7,513.82
Vijayapura	0.00	0.00	0.02	7.70	7.72

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Yadgir	0.00	0.00	0.00	172.25	172.25
Total	944.16	3,392.91	10,412.52	11,091.01	25,840.60

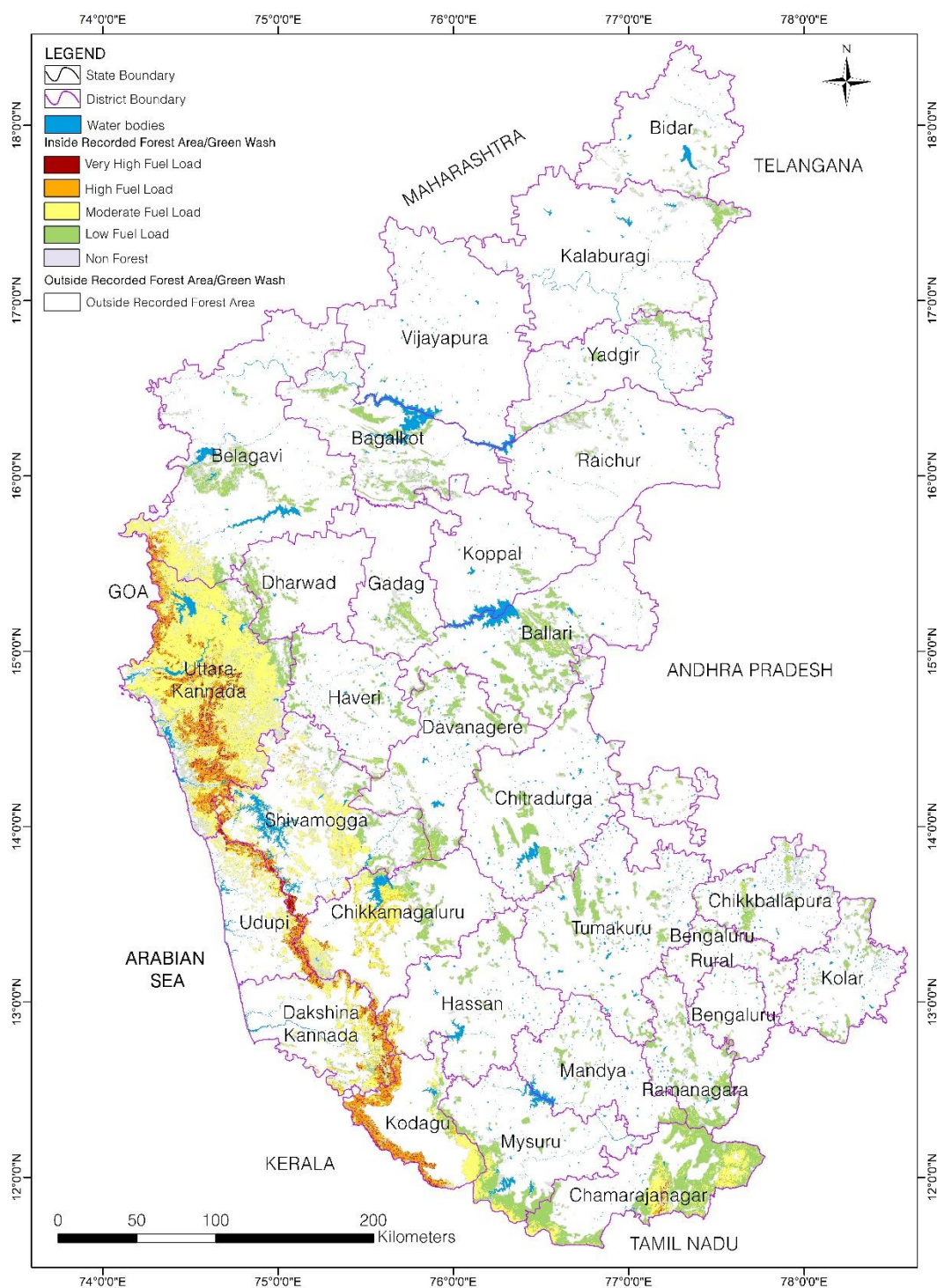


Figure 2.12.1 Surface fuel load map of Karnataka

2.12.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Uttar Kannada, Udupi, Dakshin Kannada and Kodagu districts. This area is dominated by *Terminalia spp.*, *Tectona grandis*, *Anogeissus latifolia etc* forest species. Around 69.29% of the forest cover inside RFA falls under the moderate and low fuel load class.

2.13 Kerala

2.13.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.13.1. From the table, it can be inferred that 8.69% of the total RFA area falls under very high fuel load class, 22.95% under high fuel load class, 42.34% under moderate fuel load class and 12.09% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.13.1.

Table 2.13.1 District-wise RFA/GW Area in different fuel load classes in Kerala

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Alappuzha	0.00	0.00	0.00	0.00	0.00
Ernakulam	50.68	134.49	588.68	36.58	810.43
Idukki	212.38	627.87	775.89	617.64	2,233.78
Kannur	37.75	65.23	132.35	35.40	270.73
Kasargod	0.05	0.90	63.65	6.23	70.83
Kollam	67.40	180.49	448.58	100.38	796.85
Kottayam	0.08	0.14	45.04	17.82	63.08
Kozhikode	56.02	90.83	109.19	27.52	283.56
Malapuram	84.30	242.91	334.45	50.25	711.91
Palakkad	147.29	407.00	478.25	216.52	1,249.06
Pathanamthitta	203.88	505.86	643.02	40.94	1,393.70
Thiruvanthapuram	27.11	95.20	304.79	53.43	480.53
Thrissur	68.82	156.45	511.19	129.90	866.36
Waynad	48.06	144.33	458.69	63.97	715.05
Total	1,003.82	2,651.70	4,893.77	1,396.58	9,945.87

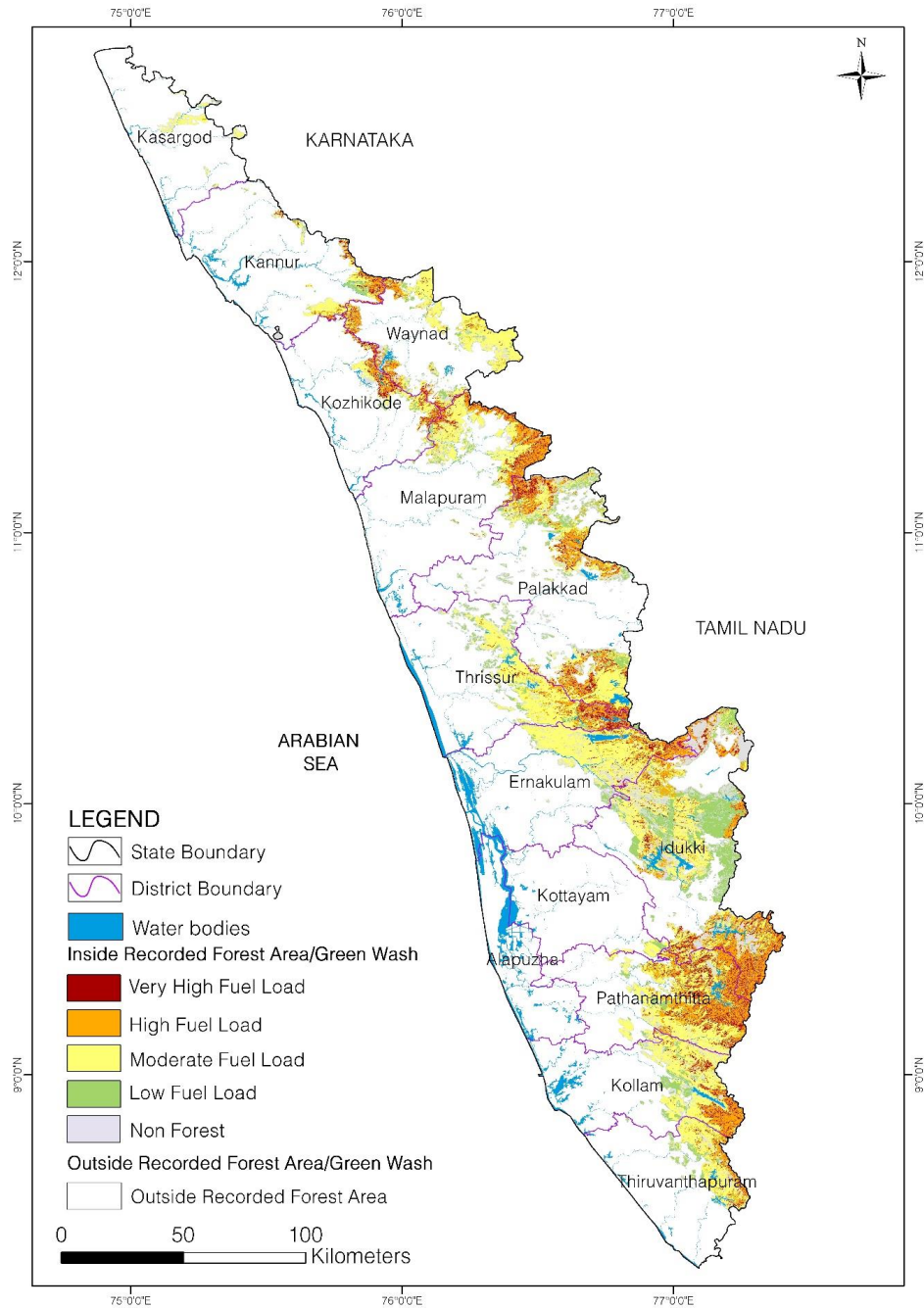


Figure 2.13.1 Surface fuel load map of Kerala

2.13.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in most of the districts. This area is dominated by *Tectona grandis*, *Melia dubia*, *Acacia auriculiformis*, *Terminalia arjuna*, *Cymbopogon citratus* and *Pennisetum purpureum*. Around 22.95% and 42.34% of the forest cover inside RFA falls under the high fuel load and moderate fuel load class respectively.

2.14 Madhya Pradesh

2.14.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.14.1. From the table, it can be inferred that 0.47% of the total RFA area falls under high fuel load class, 12.54% under moderate fuel load class and 61.97% under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.14.1.

Table 2.14.1 District-wise RFA/GW Area in different fuel load classes in Madhya Pradesh
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Agar Malwa	0.00	0.00	0.04	5.79	5.83
Alirajpur	0.00	0.00	40.95	513.54	554.49
Anuppur	0.00	0.25	120.29	525.63	646.17
Ashoknagar	0.00	0.00	8.60	614.76	623.36
Balaghat	0.00	134.43	2,649.99	1,725.84	4,510.26
Barwani	0.00	0.00	81.87	723.22	805.09
Betul	0.00	0.01	362.09	2,825.99	3,188.09
Bhind	0.00	0.00	0.01	46.42	46.43
Bhopal	0.00	0.00	1.54	253.57	255.11
Burhanpur	0.00	0.00	105.36	1,020.48	1,125.84
Chhatarpur	0.00	0.00	220.40	1,324.29	1,544.69
Chhindwara	0.00	0.02	679.87	3,021.59	3,701.48
Damoh	0.00	0.00	22.41	2,307.31	2,329.72
Datia	0.00	0.00	0.36	189.21	189.57
Dewas	0.00	0.00	33.51	1,814.81	1,848.32
Dhar	0.00	0.00	20.61	486.66	507.27
Dindori	0.00	187.51	1,249.37	540.88	1,977.76
Guna	0.00	0.00	5.07	1,286.59	1,291.66
Gwalior	0.00	0.00	10.73	1,134.14	1,144.87
Harda	0.00	0.00	34.66	862.05	896.71
Hoshangabad	0.00	0.01	393.24	1,889.18	2,282.43
Indore	0.00	0.00	37.09	515.71	552.80
Jabalpur	0.00	0.00	53.30	670.12	723.42
Jhabua	0.00	0.00	9.63	224.34	233.97
Katni	0.00	0.00	107.14	957.87	1,065.01
Khandwa (East Nimar)	0.00	0.00	181.06	1,869.95	2,051.01
Khargone (West Nimar)	0.00	0.00	59.45	1,105.47	1,164.92
Mandla	0.00	105.05	2,171.61	754.73	3,031.39

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Mandsaur	0.00	0.00	3.08	303.60	306.68
Morena	0.00	0.00	5.08	627.69	632.77
Narsinghpur	0.00	0.00	99.12	1,141.75	1,240.87
Neemuch	0.00	0.00	10.42	1,040.16	1,050.58
Niwari	0.00	0.00	0.02	4.14	4.16
Panna	0.00	0.00	153.30	2,603.16	2,756.46
Raisen	0.00	0.00	64.18	2,480.84	2,545.02
Rajgarh	0.00	0.00	1.94	128.26	130.20
Ratlam	0.00	0.00	11.23	77.63	88.86
Rewa	0.00	0.00	94.79	648.69	743.48
Sagar	0.00	0.00	7.36	2,327.37	2,334.73
Satna	0.00	0.00	66.59	1,654.37	1,720.96
Sehore	0.00	0.00	42.66	1,153.45	1,196.11
Seoni	0.00	5.99	954.12	1,674.02	2,634.13
Shahdol	0.00	0.00	128.74	1,375.63	1,504.37
Shajapur	0.00	0.00	0.00	0.00	0.00
Sheopur	0.00	0.00	44.43	3,401.58	3,446.01
Shivpuri	0.00	0.00	34.07	2,355.25	2,389.32
Sidhi	0.00	0.00	361.90	1,384.48	1,746.38
Singrauli	0.00	0.01	451.89	1,358.62	1,810.52
Tikamgarh	0.00	0.00	5.23	226.67	231.90
Ujjain	0.00	0.00	0.01	9.30	9.31
Umaria	0.00	0.12	432.12	1,547.04	1,979.28
Vidisha	0.00	0.00	4.17	758.23	762.40
Total	0.00	433.40	11,636.70	57,492.07	69,562.17

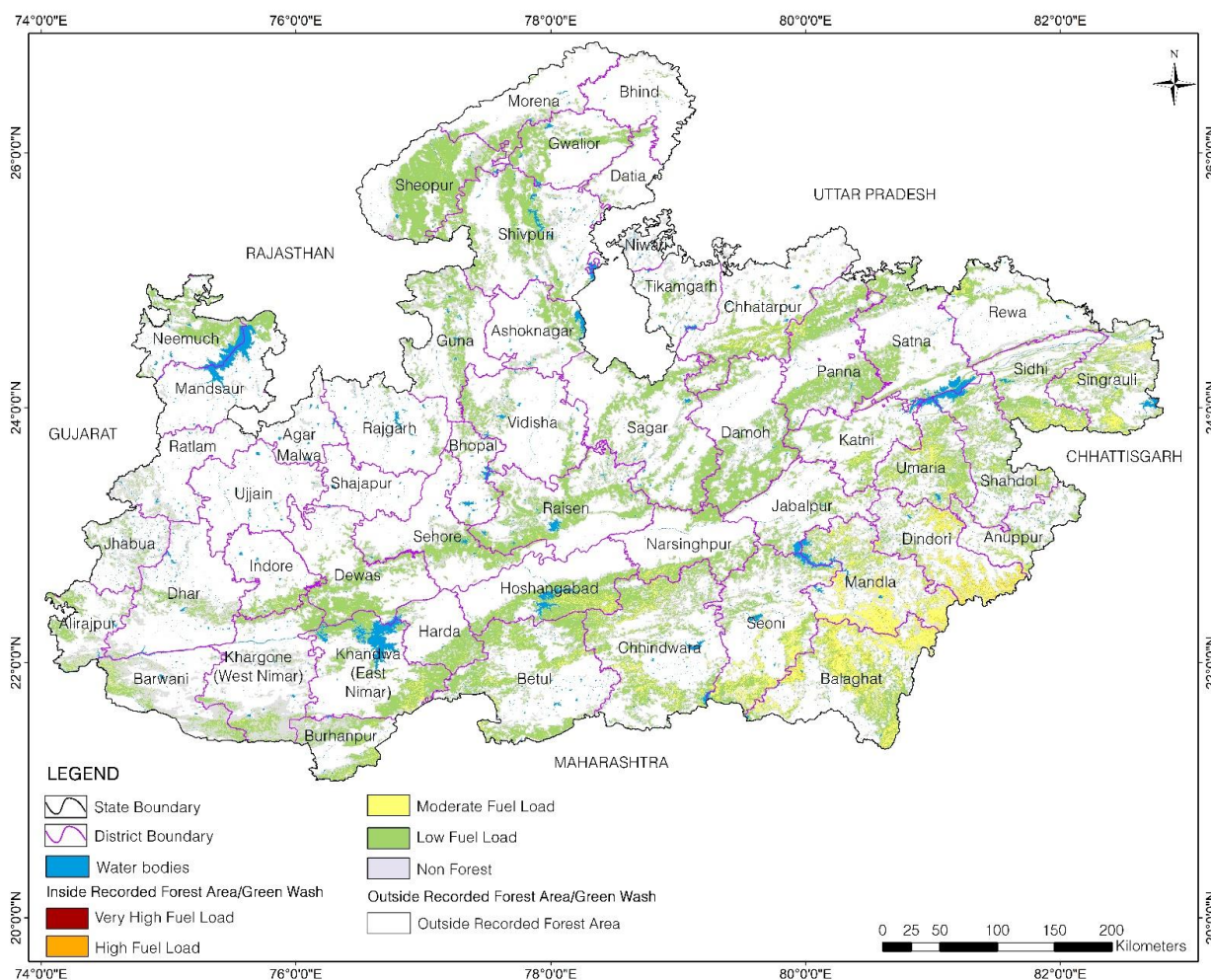


Figure 2.14.1 Surface fuel load map of Madhya Pradesh

2.14.2 Result and Analysis

Accumulation of high to moderate fuel load has been observed in Balaghat, Mandla, Dindori and Seoni districts. This area is dominated by species name *Tectona grandis*, *Diospyros tomentosa*, *Syzygium cumini*, *Shorea robusta*, *Boswellia serrata*, *Dalbergia paniculata*, *Anogeissus latifolia*, *Madhuca indica*, *Terminalia tomentosa* and *Lagerstroemia parviflora*. Around 61.97% of the forest cover inside RFA falls under the low fuel load class.

2.15 Maharashtra

2.15.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.15.1. From the table, it can be inferred that 0.92% of the total RFA area falls under high fuel load class, 33.83% under moderate fuel load class and 30.39% under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.15.1.

Table 2.15.1 District-wise RFA/GW Area in different fuel load classes in Maharashtra
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Ahmednagar	0.00	0.00	204.65	246.37	451.02
Akola	0.00	0.00	13.21	253.70	266.91
Amravati	0.00	0.00	816.45	2,316.03	3,132.48
Aurangabad	0.00	0.00	69.78	394.89	464.67
Beed	0.00	0.00	14.19	101.19	115.38
Bhandara	0.00	0.00	196.49	761.49	957.98
Buldhana	0.00	0.00	70.54	517.71	588.25
Chandrapur	0.00	0.00	1,367.57	2,466.10	3,833.67
Dhule	0.00	0.00	32.16	254.35	286.51
Gadchiroli	0.00	511.89	7,928.31	1,614.49	10,054.69
Gondia	0.00	0.02	887.10	848.61	1,735.73
Hingoli	0.00	0.00	0.50	67.42	67.92
Jalgaon	0.00	0.00	113.09	874.01	987.10
Jalna	0.00	0.00	2.78	23.67	26.45
Kolhapur	0.00	2.97	1,253.31	84.35	1,340.63
Latur	0.00	0.00	0.23	10.11	10.34
Mumbai city	0.00	0.00	0.00	3.14	3.14
Mumbai Suburban	0.00	0.00	53.21	59.51	112.72
Nagpur	0.00	0.00	414.43	1,373.09	1,787.52
Nanded	0.00	0.00	67.79	685.85	753.64
Nandurbar	0.00	0.00	231.27	766.73	998.00
Nashik	0.00	0.15	558.39	359.25	917.79
Osmanabad	0.00	0.00	1.43	31.00	32.43
Palghar	0.00	0.00	1,019.17	23.04	1,042.21
Parbhani	0.00	0.00	0.16	21.72	21.88
Pune	0.00	0.00	783.61	151.50	935.11
Raigad	0.00	1.49	1,129.90	18.84	1,150.23

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Ratnagiri	0.00	0.62	46.60	3.38	50.60
Sangli	0.00	0.00	127.96	67.67	195.63
Satara	0.00	9.16	719.32	240.12	968.60
Sindhudurg	0.00	2.45	427.31	4.46	434.22
Solapur	0.00	0.00	4.39	41.63	46.02
Thane	0.00	0.00	814.69	44.91	859.60
Wardha	0.00	0.00	12.21	675.59	687.80
Washim	0.00	0.00	5.35	215.38	220.73
Yavatmal	0.00	0.00	141.20	1,922.93	2,064.13
Total	0.00	528.75	19,528.75	17,544.23	37,601.73

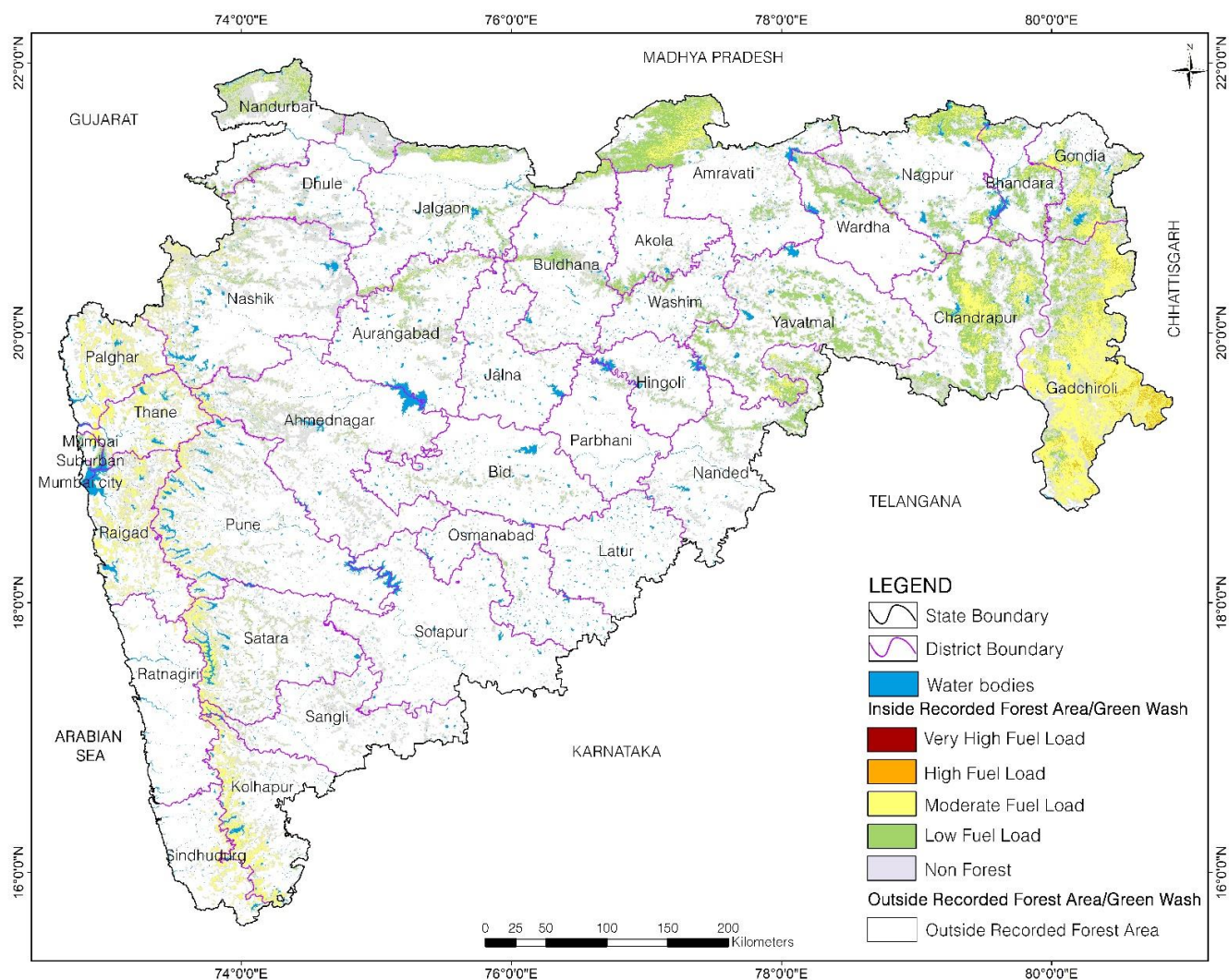


Figure 2.15.1 Surface fuel load map of Maharashtra

2.15.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Gadchiroli, Chandrapur and Gondia districts. This area is dominated by species name *Tectona grandis*, *Terminalia alata*, *Dalbergia latifolia*, *Diospyros melanoxylon*, *Anogeissus latifolia*, *Madhuca latifolia* etc. Around 64.22% of the forest cover inside RFA falls under moderate to low fuel load class.

2.16 Manipur

2.16.1 Surface Fuel Load

Different surface fuel load classes inside GW is shown in the Table 2.16.1. From the table, it can be inferred that 1.78% of the total GW area falls under very high fuel load class, 3.32% under high fuel load class, 80.43% under moderate fuel load class and 3.11% low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.16.1.

Table 2.16.1 District-wise RFA/GW Area in different fuel load classes in Manipur

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Bishnupur	0.00	0.65	7.90	0.10	8.65
Chandel	0.00	35.67	1,718.89	50.64	1,805.20
Churachandpur	0.00	39.70	1,851.30	53.12	1,944.12
Imphal East	0.00	1.51	13.49	1.25	16.25
Imphal West	0.00	0.82	10.44	0.08	11.34
Jiribam	0.00	0.00	92.78	5.91	98.69
Kakching	0.00	0.07	7.53	0.00	7.60
Kamjong	50.77	53.47	1,456.11	44.54	1,604.89
Kangpokpi	26.29	61.90	559.07	35.99	683.25
Noney	0.17	2.70	1,085.43	14.80	1,103.10
Pherzawl	2.95	38.13	2,022.69	13.55	2,077.32
Senapati	76.62	168.84	994.00	136.67	1,376.13
Tamenglong	85.37	82.83	2,517.63	49.67	2,735.50
Tengnoupal	0.00	3.24	637.77	7.66	648.67
Thoubal	0.00	0.00	0.00	0.00	0.00
Ukhrul	68.72	90.44	1,082.41	129.78	1,371.35
Total	310.89	579.97	14,057.44	543.76	15,492.06

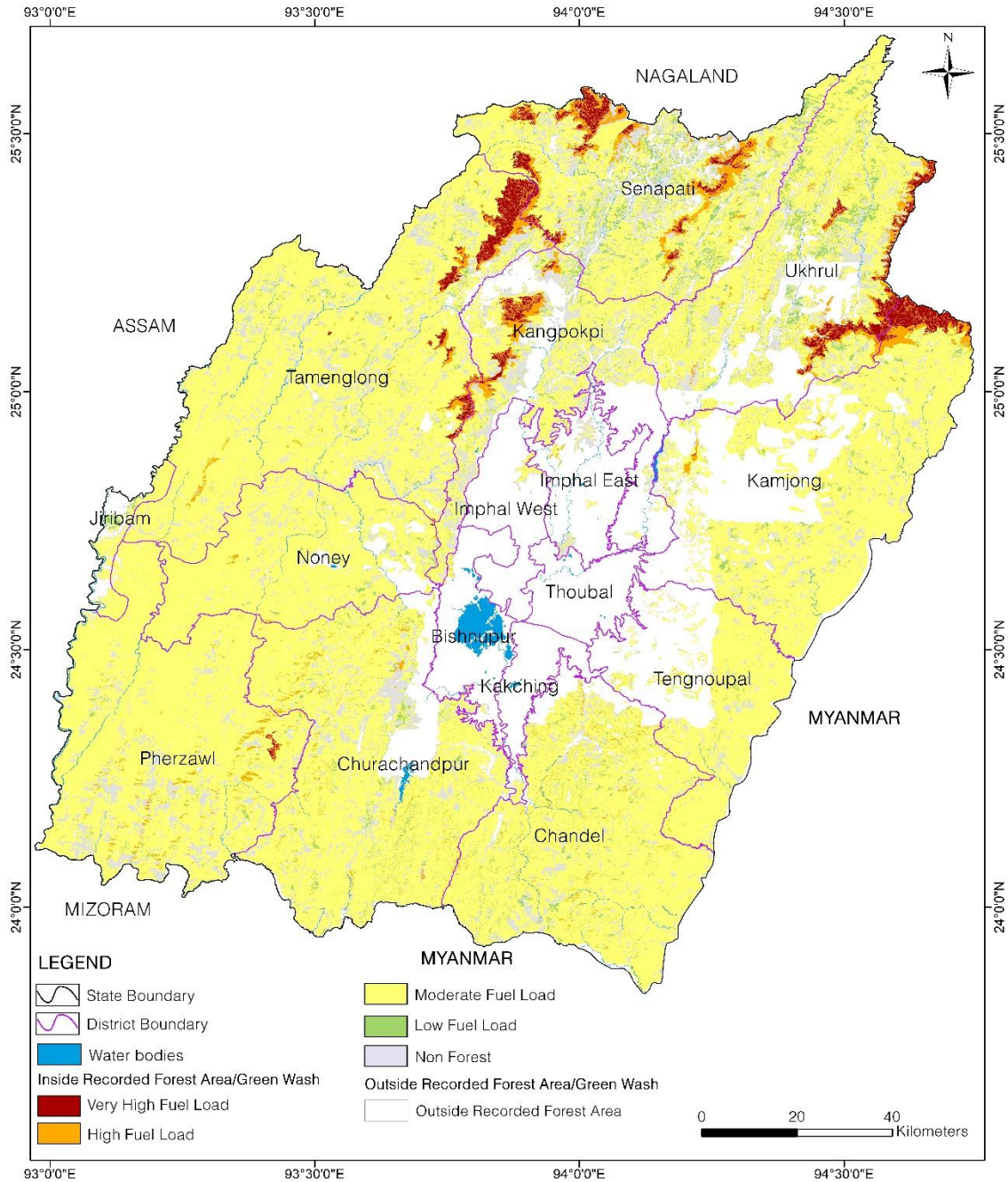


Figure 2.16.1 Surface fuel load map of Manipur

2.16.2 Results and Analysis

Accumulation of very high to high fuel load has been observed in Ukhrul, Tamenlong, Senapati and Kangpokpi. This area is dominated by species *Pinus spp.*, *Tectona grandis*, *Shorea robusta*, *Areca catechu*, *Bambusoideae spp.* etc forest species. Around 80.43% of the forest cover inside GW falls under the moderate fuel load class.

2.17 Meghalaya

2.17.1 Surface Fuel Load

Different surface fuel load classes inside GW is shown in the Table 2.17.1. From the table, it can be inferred that 1.58% of the total GW area falls under very high fuel load class, 9.41% under high fuel load class, 71.11% under moderate fuel load class and 4.90% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.17.1.

Table 2.17.1 District-wise RFA/GW Area in different fuel load classes in Meghalaya

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
East Garo Hills	0.20	26.65	1,253.02	14.39	1,294.26
East Jaintia Hills	82.24	373.87	574.36	181.51	1,211.98
East Khasi Hills	45.23	321.77	891.68	125.15	1,383.83
Eastern West Khasi Hills	0.32	73.84	452.60	12.20	538.96
North Garo Hills	0.32	7.67	992.28	76.44	1,076.71
Ri-Bhoi	0.71	105.95	1,694.79	28.80	1,830.25
South Garo Hills	32.34	114.76	1,446.12	13.91	1,607.13
South West Garo Hills	0.00	1.11	507.08	64.87	573.06
South West Khasi Hills	85.09	306.99	465.54	27.26	884.88
West Garo Hills	0.44	17.06	1,909.16	123.55	2,050.21
West Jaintia Hills	2.52	142.65	641.39	156.76	943.32
West Khasi Hills	27.70	153.59	1,608.41	32.22	1,821.92
Total	277.11	1,645.91	12,436.43	857.06	15,216.51

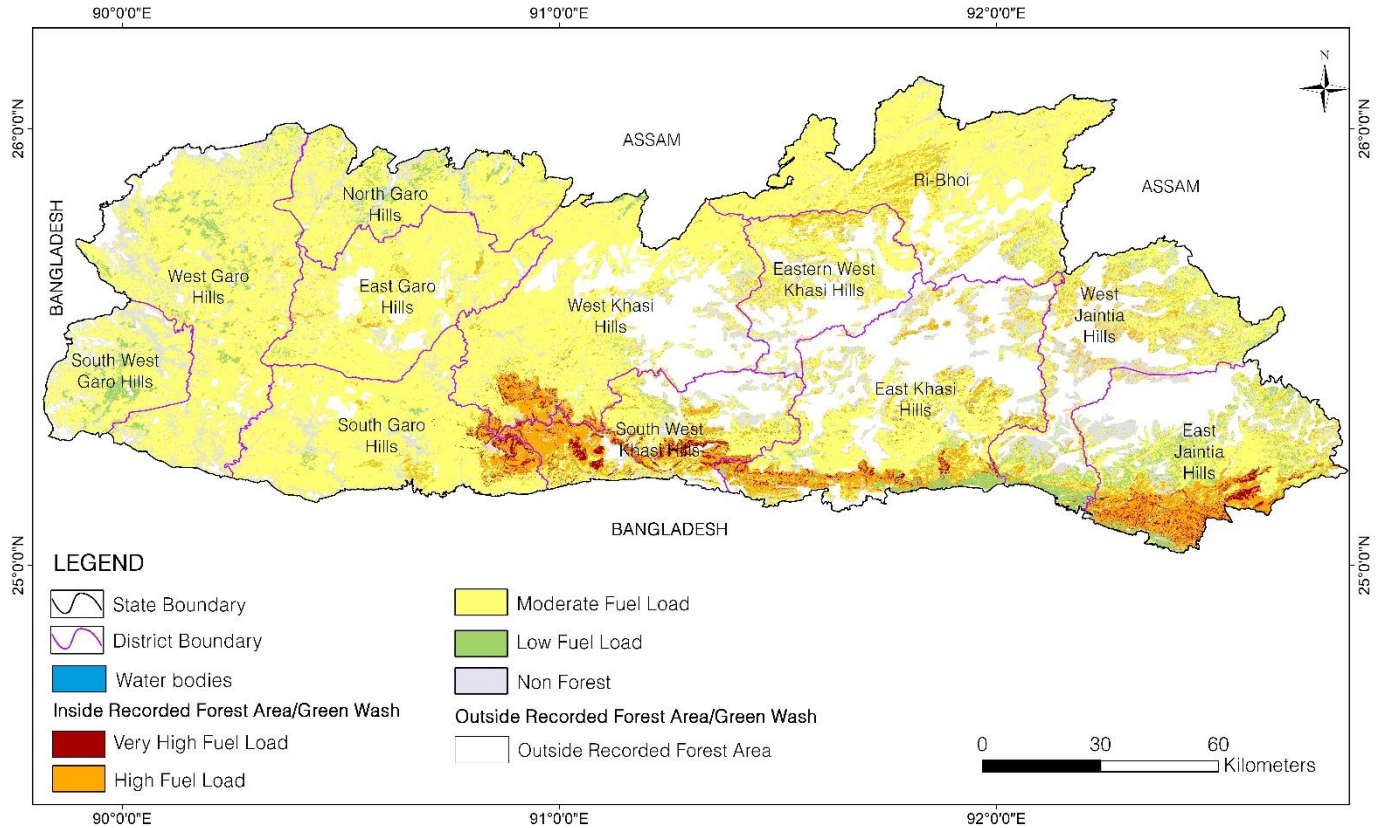


Figure 2.17.1 Surface fuel load map of Meghalaya

2.17.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in South West Khasi Hills followed by East Jantia Hills and East Khasi Hills districts. This area is dominated by *Pinus kesiya*, *Alnus nepalensis*, *Areca catechu*, *Bambusoideae spp.*, *Dipterocarpus macrocarpus* etc forest species. Around 80.52% of the forest cover inside RFA falls under high to moderate fuel load class.

2.18 Mizoram

2.18.1 Surface Fuel Load

Different surface fuel load classes inside GW is shown in the Table 2.18.1. From the table, it can be inferred that 0.52% of the total GW area under high fuel load class, 86.64% under moderately fuel load class and 0.01% under low fuel load class. Spatial distribution of surface fuel load map of the state is shown in Figure 2.18.1.

Table 2.18.1 District-wise RFA/GW Area in different fuel load classes in Mizoram

District	Surface Fuel Load Class				Area in km ²
	Very High	High	Moderate	Low	Total
Aizawl	0.01	0.00	1,915.99	1.01	1,917.01
Champhai	0.00	44.28	1,221.93	0.00	1,266.21
Hnahthial	0.00	0.00	704.28	0.00	704.28
Khawzawl	0.00	6.97	788.66	0.00	795.63
Kolasib	0.00	0.00	1,290.40	0.07	1,290.47
Lawngtlai	0.00	44.30	1,907.46	0.00	1,951.76
Lunglei	0.00	3.00	3,317.63	0.00	3,320.63
Mamit	0.00	7.32	2,760.26	0.30	2,767.88
Saitual	0.00	0.33	1,343.61	0.00	1,343.94
Serchhip	0.00	0.00	1,194.78	0.97	1,195.75
Siaha	0.00	0.00	1,377.52	0.00	1,377.52
Total	0.01	106.20	17,822.52	2.35	17,931.08

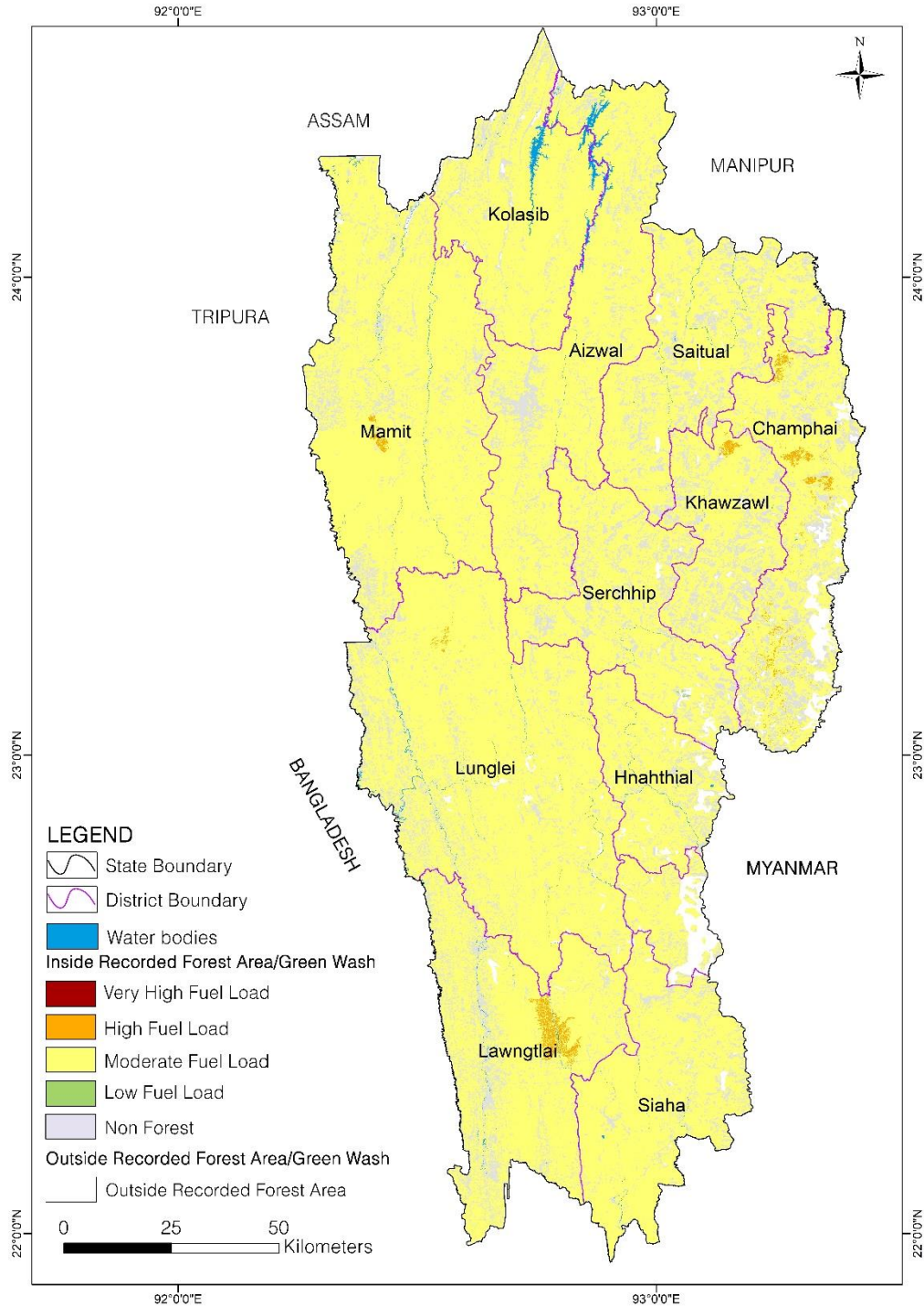


Figure 2.18.1 Surface fuel load map of Mizoram

2.18.2 Results and Analysis

Around 86.64% of the forest cover inside GW falls under the moderate fuel load class and observed in almost all the districts of the state.

2.19 Nagaland

2.19.1 Surface Fuel Load

Different surface fuel load classes inside GW is shown in the Table 2.19.1. From the table, it can be inferred that 4.97% of the total GW area falls under very high fuel load class, 11.64% under high fuel load class, 64.79% under moderate fuel load class and 2.07% under low fuel load class. Spatial distribution of surface fuel load map classes is shown in the map of the state in Figure 2.19.1.

Table 2.19.1 District-wise RFA/GW Area in different fuel load classes in Nagaland
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Dimapur	3.83	9.71	392.21	21.29	427.04
Kiphire	78.84	158.91	202.94	7.14	447.83
Kohima	48.42	108.23	904.06	25.16	1,085.87
Longleng	1.46	17.53	229.32	5.37	253.68
Mokokchung	0.66	5.75	352.24	5.87	364.52
Mon	48.21	151.55	722.67	15.70	938.13
Peren	8.99	99.86	1,438.51	37.03	1,584.39
Phek	127.19	255.49	877.94	29.54	1,290.16
Tuensang	178.84	288.47	327.55	37.54	832.40
Wokha	0.31	6.27	947.77	18.11	972.46
Zunheboto	30.60	133.28	479.82	17.23	660.93
Total	527.35	1,235.05	6,875.03	219.98	8,857.41

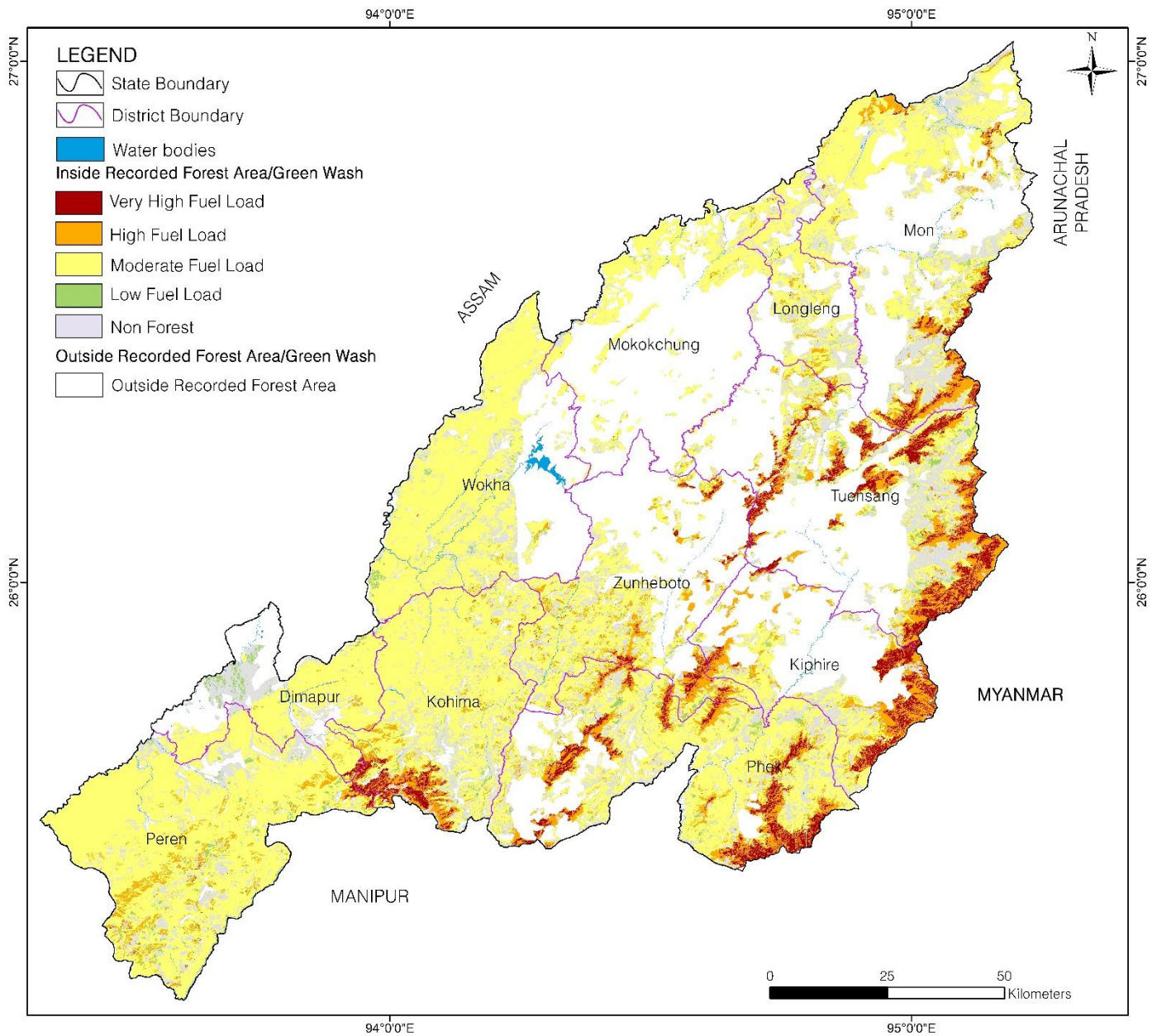


Figure 2.19.1 Surface fuel load map of Nagaland

2.19.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Tuensang, Phek and Kiphire districts. This area is dominated by species *Alnus spp.*, *Quercus spp.*, *Pinus kesiya*, *Tectona grandis* and *Dipterocarpus macrocarpus*. Around 76.43% of the forest cover inside GW falls under high to moderate fuel load class.

2.20 Odisha

2.20.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.20.1. From the table, it can be inferred that 3.87% of the total RFA area falls under high fuel load class, 42.08% under moderate fuel load class and 36.01% under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.20.1.

Table 2.20.1 District-wise RFA/GW Area in different fuel load classes in Odisha

District	Surface Fuel Load Class				Area in km ²
	Very High	High	Moderate	Low	Total
Angul	0.00	163.13	927.91	811.46	1,902.50
Balangir	0.00	0.00	121.81	810.73	932.54
Baleswar	0.00	5.42	167.19	114.00	286.61
Bargarh	0.00	0.01	241.09	616.66	857.76
Bhadrak	0.00	0.00	0.00	14.90	14.90
Boudh	0.00	73.66	498.15	443.90	1,015.71
Cuttack	0.00	20.47	540.69	57.72	618.88
Deogarh	0.00	36.50	370.94	517.01	924.45
Dhenkanal	0.00	64.90	657.11	242.91	964.92
Gajapati	0.00	77.02	831.57	597.55	1,506.14
Ganjam	0.00	21.32	1,182.26	1,084.26	2,287.84
Jagatsinghpur	0.00	0.00	0.00	20.01	20.01
Jajpur	0.00	3.53	212.53	22.25	238.31
Jharsuguda	0.00	0.00	18.00	132.18	150.18
Kalahandi	0.00	109.39	886.76	888.96	1,885.11
Kandhamal	0.00	207.60	2,506.83	860.17	3,574.60
Kendrapara	0.00	0.00	0.00	29.28	29.28
Kendujhar	0.00	119.07	1,106.41	744.51	1,969.99
Khordha	0.00	7.26	313.75	101.89	422.90
Koraput	0.00	4.28	359.56	691.70	1,055.54
Malkangiri	0.00	5.54	313.22	292.11	610.87
Mayurbhanj	0.00	294.65	1,502.23	650.74	2,447.62
Nabarangpur	0.00	15.77	326.31	438.40	780.48
Nayagarh	0.00	62.03	1,054.94	332.18	1,449.15
Nuapada	0.00	16.45	364.74	823.44	1,204.63
Puri	0.00	0.00	0.65	81.42	82.07
Rayagada	0.00	65.72	1,014.32	797.41	1,877.45
Sambalpur	0.00	100.55	1,052.67	1,179.21	2,332.43
Subarnapur	0.00	0.00	59.69	250.85	310.54
Sundargarh	0.00	167.81	1,223.08	1,630.93	3,021.82
Total	0.00	1,642.08	17,854.41	15,278.74	34,775.23

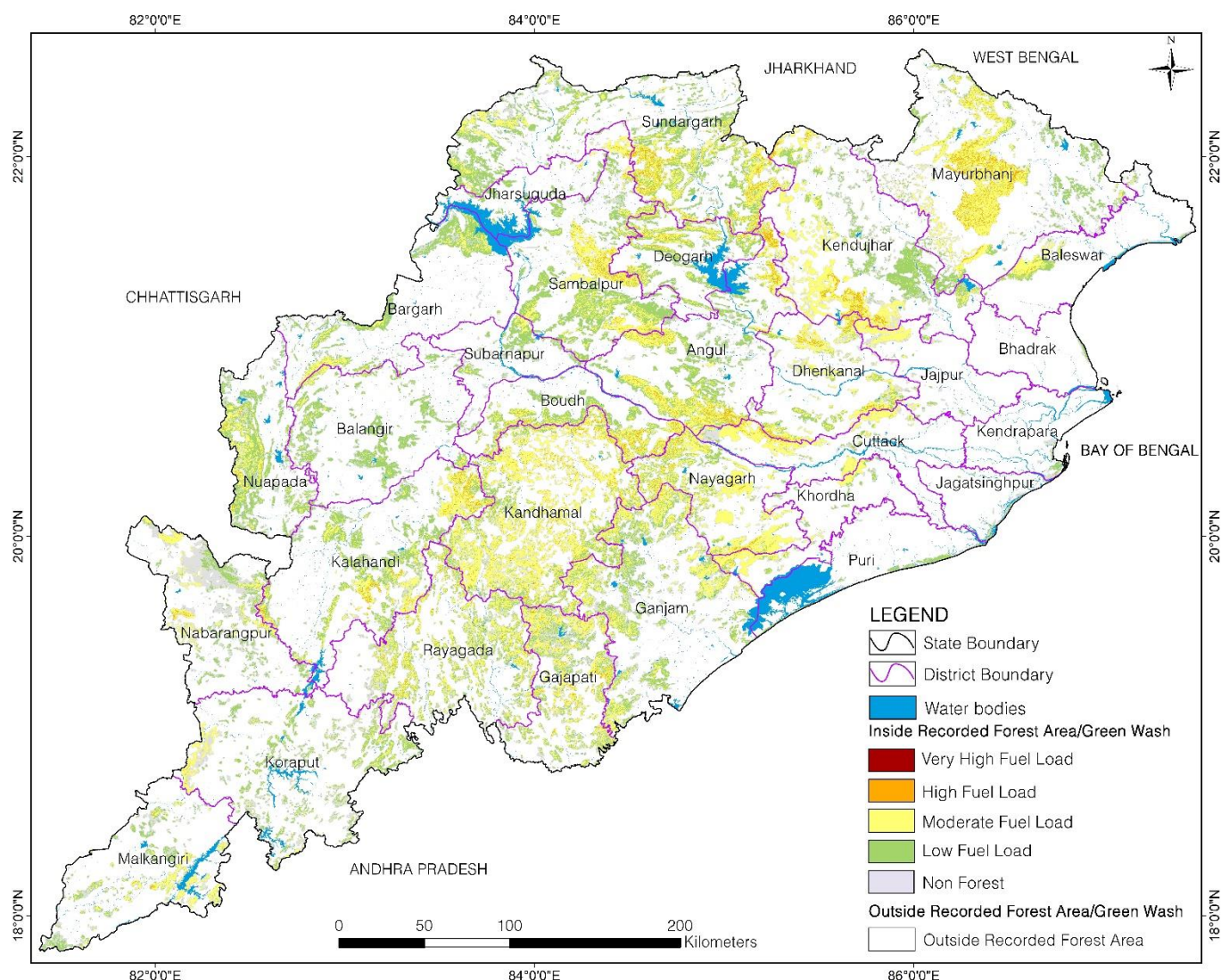


Figure 2.20.1. Surface fuel load map of Odisha

2.20.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Kandhamal followed by Mayurbhanj and Nayagarh districts. This area is dominated by *Madhuca longifolia*, *Diospyros melanoxylon* etc forest species. Around 78.09% of the forest cover inside RFA falls under moderate to low fuel load class.

2.21 Punjab

2.21.1 Surface Fuel Load

Different surface fuel load classes inside GW is shown in the Table 2.21.1. From the table, it can be inferred that 1.45% of the total GW area falls under high fuel load class, 3.33% under moderate fuel load class and 80.16% under low fuel load class. No area inside GW has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.21.1.

Table 2.21.1 District-wise RFA/GW Area in different fuel load classes in Punjab
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Amritsar	0.00	0.00	0.66	2.97	3.63
Barnala	0.00	0.00	0.00	1.54	1.54
Bathinda	0.00	0.00	0.00	8.74	8.74
Faridkot	0.00	0.00	0.00	1.35	1.35
Fatehgarh Sahib	0.00	0.00	0.00	0.04	0.04
Fazilka	0.00	0.00	0.00	0.00	0.00
Firozpur	0.00	0.00	0.00	0.62	0.62
Gurdaspur	0.00	0.00	0.00	0.86	0.86
Hoshiarpur	0.00	9.26	6.88	317.82	333.96
Jalandhar	0.00	0.00	0.00	0.77	0.77
Kapurthala	0.00	0.00	0.00	1.93	1.93
Ludhiana	0.00	0.00	0.00	12.53	12.53
Mansa	0.00	0.00	0.00	0.06	0.06
Moga	0.00	0.00	0.00	0.38	0.38
Muktsar	0.00	0.00	0.00	0.00	0.00
Pathankot	0.00	4.13	14.66	80.47	99.26
Patiala	0.00	0.00	2.97	51.36	54.33
Rupnagar	0.00	0.00	1.71	90.53	92.24
Sangrur	0.00	0.00	0.00	2.26	2.26
SAS Nagar	0.00	0.00	1.98	107.28	109.26
SBS Nagar	0.00	0.00	0.88	56.51	57.39
Tarn Taran	0.00	0.00	1.00	2.70	3.70
Total	0.00	13.39	30.74	740.72	784.85

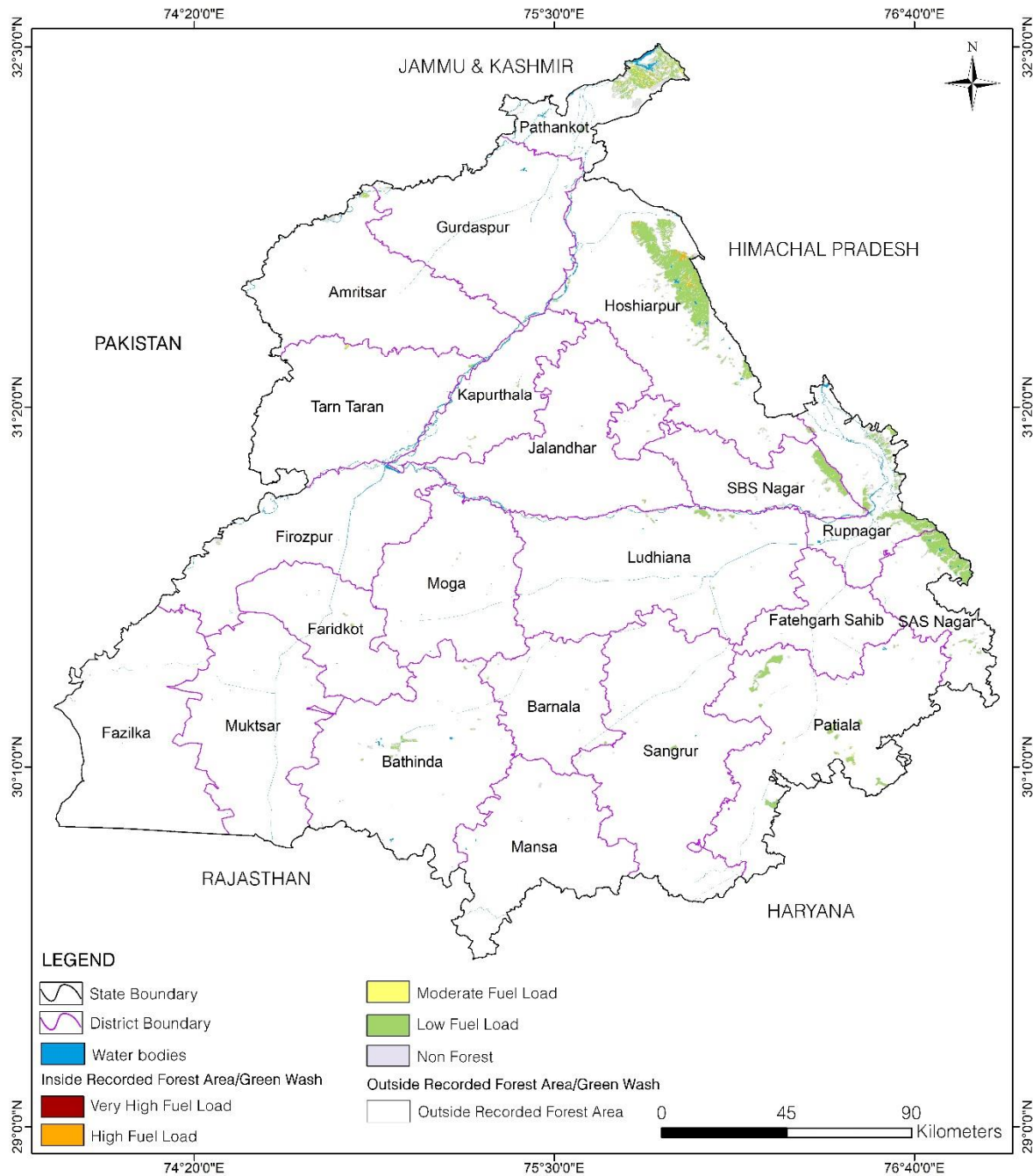


Figure 2.21.1 Surface fuel load map of Punjab

2.21.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in few patches in Hoshiarpur, Pathankot and SAS Nagar districts. This area is dominated by *Prosopis spp.*, *Anogeissus latifolia*, *Acacia spp.*, *Delbergia sissoo* etc. forest species. Around 80.16% of the forest cover inside GW falls under the low fuel load class.

2.22 Rajasthan

2.22.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.22.1. From the table, it can be inferred that 3.95% of the total RFA area falls under moderate fuel load class and 39.28% under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.22.1.

Table 2.22.1 District-wise RFA/GW Area in different fuel load classes in Rajasthan
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Ajmer	0.00	0.00	18.34	332.78	351.12
Alwar	0.00	0.00	202.61	803.53	1,006.14
Banswara	0.00	0.00	14.84	263.98	278.82
Baran	0.00	0.00	8.67	1,010.64	1,019.31
Barmer	0.00	0.00	0.00	163.93	163.93
Bharatpur	0.00	0.00	7.43	100.39	107.82
Bhilwara	0.00	0.00	16.86	284.56	301.42
Bikaner	0.00	0.27	0.00	67.40	67.67
Bundi	0.00	0.00	38.65	396.44	435.09
Chittaurgarh	0.00	0.00	23.65	892.19	915.84
Churu	0.00	0.00	0.00	38.72	38.72
Dausa	0.00	0.00	8.94	165.06	174.00
Dholpur	0.00	0.00	4.00	412.73	416.73
Dungarpur	0.00	0.00	7.92	266.84	274.76
Hanumangarh	0.00	1.41	0.00	24.28	25.69
Jaipur	0.00	0.00	96.65	672.05	768.70
Jaisalmer	0.00	0.00	0.00	15.31	15.31
Jalor	0.00	0.00	1.74	187.75	189.49
Jhalawar	0.00	0.00	3.76	434.53	438.29
Jhunjhunun	0.00	0.00	16.12	315.49	331.61
Jodhpur	0.00	0.00	0.00	35.03	35.03
Karauli	0.00	0.00	32.07	833.99	866.06
Kota	0.00	0.00	8.52	477.12	485.64
Nagaur	0.00	0.00	2.00	142.57	144.57
Pali	0.00	0.00	52.86	435.60	488.46
Pratapgarh	0.00	0.00	38.18	1,107.39	1,145.57
Rajsamand	0.00	0.00	56.47	219.39	275.86
Sawai Madhopur	0.00	0.00	39.48	482.08	521.56
Shriganga Nagar	0.00	0.00	0.00	19.03	19.03

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Sikar	0.00	0.00	15.53	359.25	374.78
Sirohi	0.00	0.00	192.75	765.52	958.27
Tonk	0.00	0.00	10.02	164.20	174.22
Udaipur	0.00	0.00	504.01	2,233.96	2,737.97
Total	0.00	1.68	1,422.07	14,123.73	15,547.48

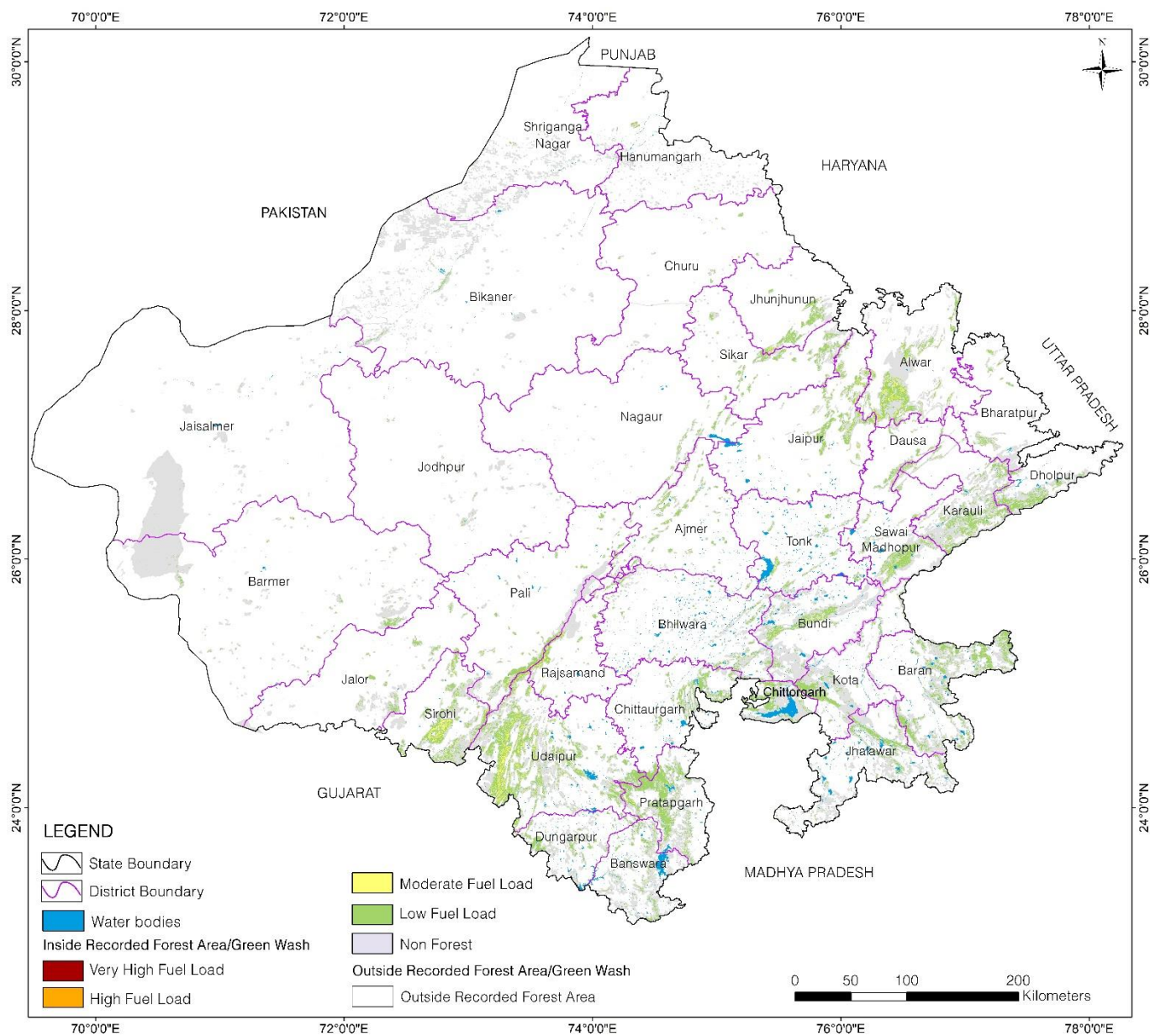


Figure 2.22.1 Surface fuel load map of Rajasthan

2.22.2 Result and Analysis

Accumulation of high to moderate fuel load has been observed in Udaipur, Pratapgarh, Chittaurgarh and Sirohi districts. Around 43.23% of the forest cover inside RFA falls under moderate to low fuel load class.

2.23 Sikkim

2.23.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.23.1. From the table, it can be inferred that 4.97% of the total RFA area falls under very high fuel load class, 20.87% under high fuel load class, 15.38% under moderate fuel load class and 0.54% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.23.1.

Table 2.23.1 District-wise RFA/GW Area in different fuel load classes in Sikkim

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
East Sikkim	44.44	166.27	120.92	7.10	338.73
North Sikkim	122.77	597.99	471.22	15.26	1,207.24
South Sikkim	56.75	134.83	116.60	2.72	310.90
West Sikkim	45.35	231.09	123.58	4.34	404.36
Total	269.31	1,130.18	832.32	29.42	2,261.23

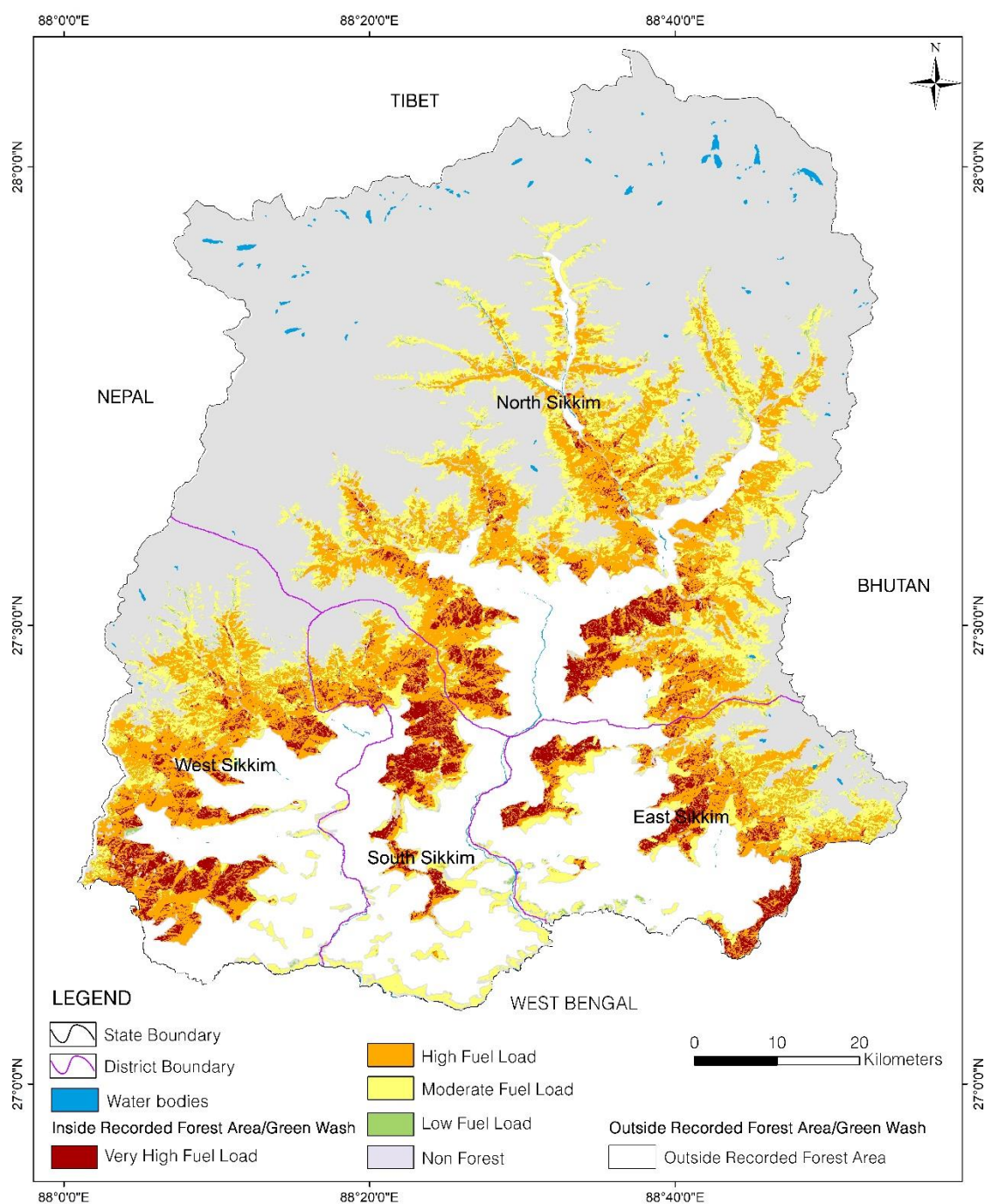


Figure 2.23.1 Surface fuel load map of Sikkim

2.23.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in almost all the districts in the state. This area is dominated *Shorea robusta*, *Terminalia spp.*, *Schima wallichii* etc. forest species. Around 41.22 % of the forest cover inside RFA falls under the very high to moderate fuel load class.

2.24 Tamil Nadu

2.24.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.24.1. From the table, it can be inferred that 1.08% of the total RFA area falls under very high fuel load class, 4.97% under high fuel load class, 27.39% under moderate fuel load class and 50.80% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.24.1.

Table 2.24.1 District-wise RFA/GW Area in different fuel load classes in Tamil Nadu

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Ariyalur	0.00	0.01	0.00	57.90	57.91
Chengalpattu	0.00	0.00	3.53	120.38	123.91
Chennai	0.00	0.00	0.00	2.93	2.93
Coimbatore	38.71	183.19	376.36	368.69	966.95
Cuddalore	0.00	0.00	0.00	70.93	70.93
Dharmapuri	0.00	2.73	365.00	1,137.90	1,505.63
Dindigul	11.41	170.33	463.38	776.33	1,421.45
Erode	0.00	0.04	958.91	1,274.18	2,233.13
Kallakurichi	0.00	0.00	166.84	393.96	560.80
Kancheepuram	0.00	0.00	0.11	18.09	18.20
Kanyakumari	20.27	84.97	204.78	77.35	387.37
Karur	0.00	0.00	4.84	44.69	49.53
Krishnagiri	0.00	11.17	228.45	969.69	1,209.31
Madurai	0.00	10.48	167.78	298.75	477.01
Mayiladuthurai	0.00	0.00	0.00	2.23	2.23
Nagapattinam	0.00	0.00	0.00	8.76	8.76
Namakkal	0.00	0.00	205.18	206.27	411.45
Perambalur	0.00	0.00	29.33	109.17	138.50
Pudukkottai	0.00	0.00	0.60	127.20	127.80
Ramanathapuram	0.00	0.00	0.00	29.59	29.59
Ranipet	0.00	0.00	2.59	61.69	64.28
Salem	0.00	0.12	439.26	635.05	1,074.43
Sivaganga	0.00	0.00	3.65	86.45	90.10
Tenkasi	18.80	86.51	136.30	109.28	350.89
Thanjavur	0.00	0.00	0.00	10.30	10.30
The Nilgiris	47.16	180.07	360.40	476.25	1,063.88
Theni	15.81	77.91	408.94	399.61	902.27
Thiruvavarur	0.00	0.00	0.00	3.91	3.91
Thoothukudi	0.00	0.00	0.81	74.24	75.05

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Tiruchchirapalli	0.00	0.00	115.80	272.10	387.90
Tirunelveli	63.56	237.86	360.81	96.92	759.15
Tirupathur	0.00	0.01	186.19	579.82	766.02
Tiruppur	12.17	13.87	181.69	146.94	354.67
Tiruvallur	0.00	0.00	5.93	103.07	109.00
Tiruvannamalai	0.00	0.00	327.61	968.11	1,295.72
Vellore	0.00	0.01	108.77	628.30	737.08
Viluppuram	0.00	0.00	3.95	104.22	108.17
Virudhunagar	5.61	13.46	94.69	113.31	227.07
Total	233.50	1,072.74	5,912.48	10,964.56	18,183.28

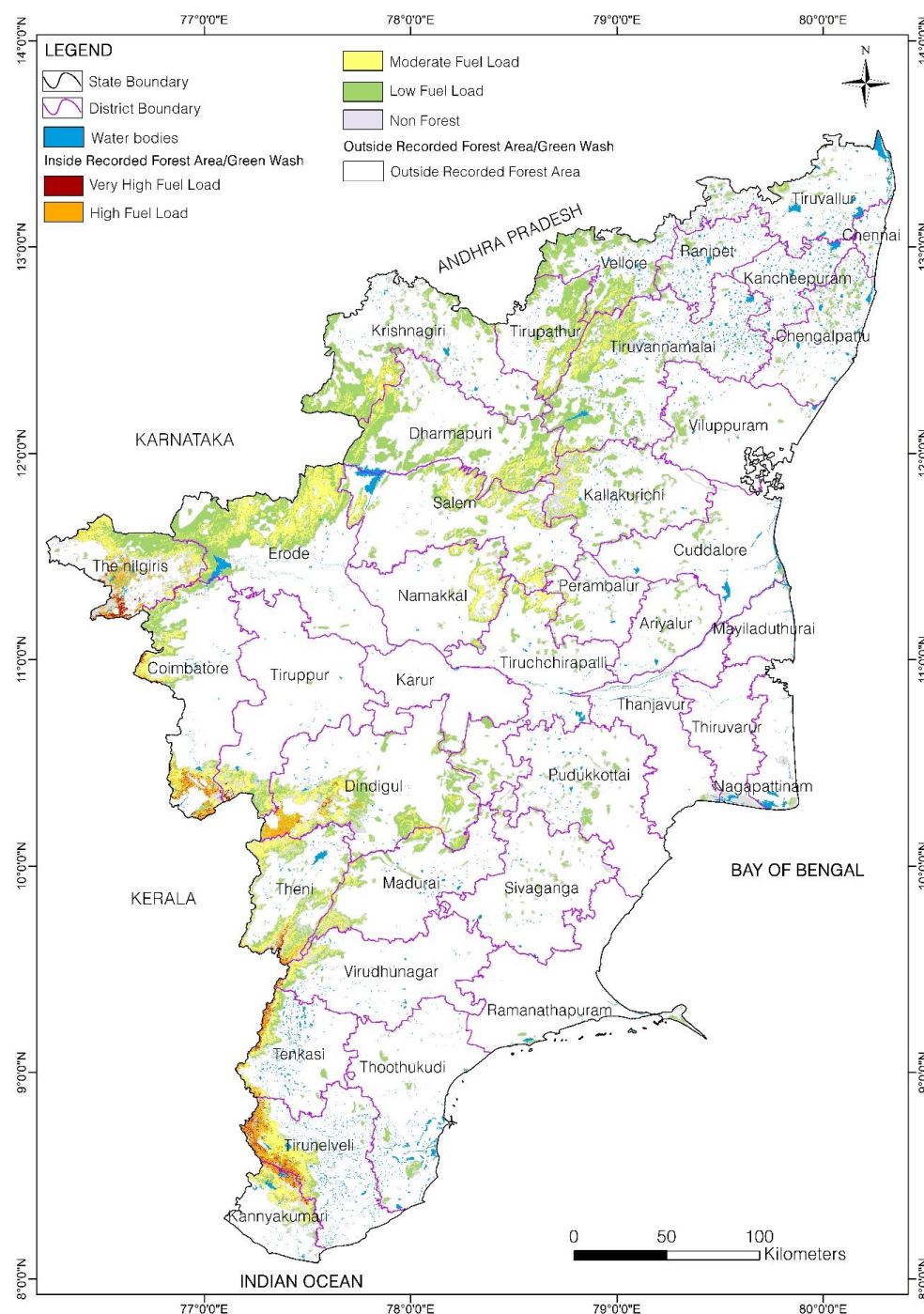


Figure 2.24.1 Surface fuel load map of Tamil Nadu

2.24.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Tirunelveli Raju followed by The Nilgiris and Dindigul districts. This area is dominated by teak and sandalwood. Around 78.19% of the forest cover inside RFA falls under moderate to low fuel load class.

2.25 Telangana

2.25.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.25.1. From the table, it can be inferred that 0.02% of the total RFA area falls under high fuel load class, 8.21% under moderate fuel load class and 65.28% under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.25.1.

Table 2.25.1 District-wise RFA/GW Area in different fuel load classes in Telangana
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Adilabad	0.00	0.00	43.18	1,038.80	1,081.98
Bhadradi Kothagudem	0.00	2.99	705.25	1,797.93	2,506.17
Hanumakonda	0.00	0.00	2.39	18.71	21.10
Hyderabad	0.00	0.00	0.00	1.42	1.42
Jagtial	0.00	0.00	16.98	464.13	481.11
Jangaon	0.00	0.00	0.40	22.91	23.31
Jayashankar Bhupalpally	0.00	0.00	80.92	1,088.15	1,169.07
Jogulamba Gadwal	0.00	0.00	0.00	0.30	0.30
Kamareddy	0.00	0.00	1.92	569.15	571.07
Karimnagar	0.00	0.00	0.38	3.76	4.14
Khammam	0.00	0.57	88.00	360.30	448.87
Kumuram Bheem	0.00	0.00	109.25	1,615.39	1,724.64
Mahabubabad	0.00	0.43	152.41	745.97	898.81
Mahabubnagar	0.00	0.00	6.92	173.87	180.79
Mancheria	0.00	0.00	66.73	1,398.69	1,465.42
Medak	0.00	0.00	0.92	427.92	428.84
Medchal-Malkajgiri	0.00	0.00	0.21	68.49	68.70
Mulugu	0.00	0.08	332.66	2,344.47	2,677.21
Nagarkurnool	0.00	0.00	446.48	1,696.62	2,143.10
Nalgonda	0.00	0.00	34.62	417.32	451.94
Narayanpet	0.00	0.00	4.92	54.35	59.27
Nirmal	0.00	0.00	72.96	951.89	1,024.85
Nizamabad	0.00	0.00	5.77	684.49	690.26
Peddapalli	0.00	0.00	11.80	239.46	251.26
Rajanna Sircilla	0.00	0.00	3.01	245.41	248.42
Rangareddy	0.00	0.00	4.91	243.35	248.26
Sangareddy	0.00	0.00	0.09	125.21	125.30
Siddipet	0.00	0.00	1.77	182.90	184.67

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Suryapet	0.00	0.00	0.23	78.53	78.76
Vikarabad	0.00	0.00	0.71	305.79	306.50
Wanaparthy	0.00	0.00	6.42	64.59	71.01
Warangal	0.00	0.00	0.19	32.85	33.04
Yadadri Bhuvanagiri	0.00	0.00	3.81	87.87	91.68
Total	0.00	4.07	2,206.21	17,550.99	19,761.27

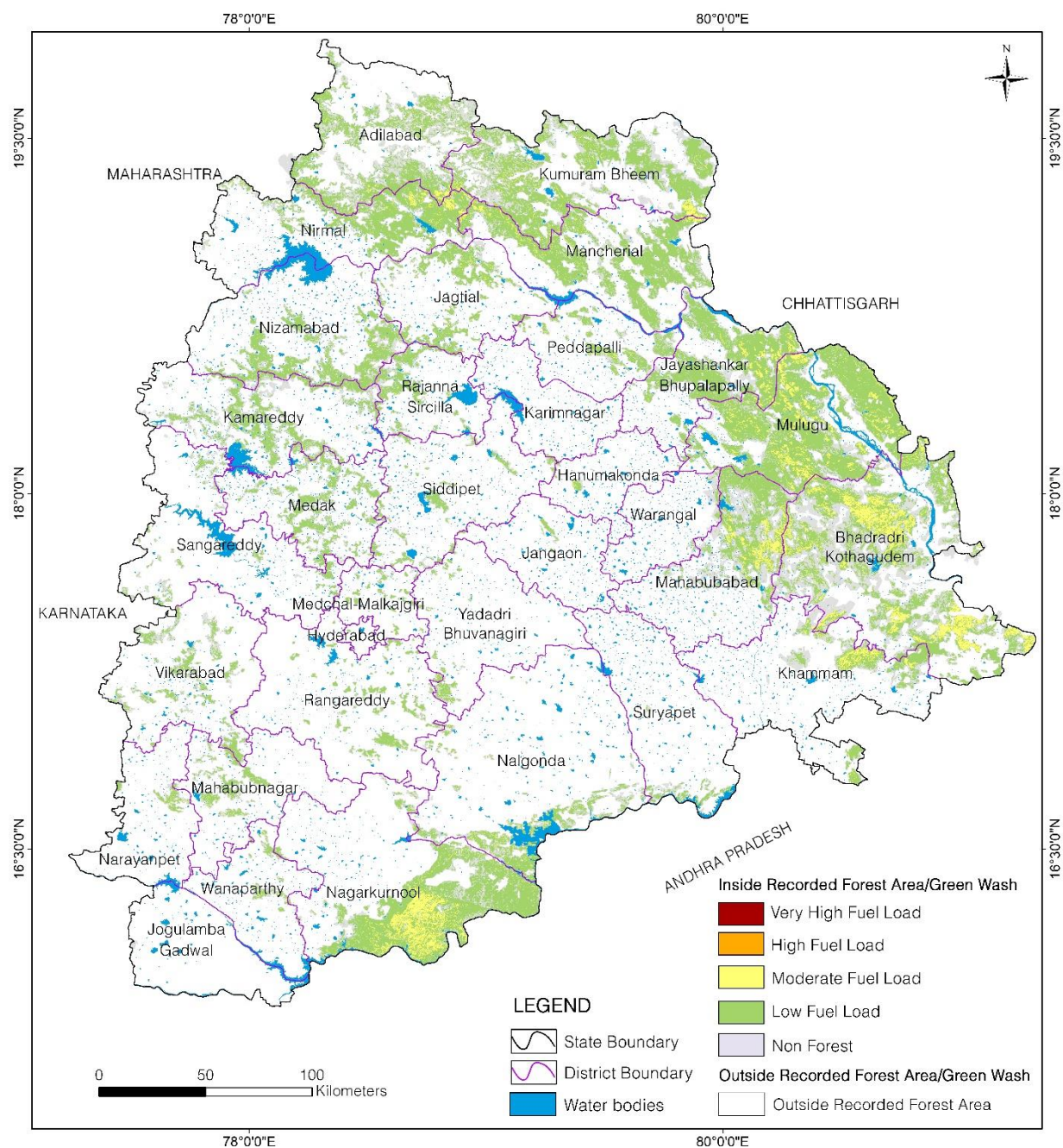


Figure 2.25.1 Surface fuel load map of Telangana

2.25.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Bhadradi Kothagudem and Nagarkurnool districts. This area is dominated by *Tectona grandis*, *Bamboo*, *Anogeissus latifolia*, *Hardwickia binata* and *Ziziphus jujuba* etc forest species. Around 73.49% of the forest cover inside RFA falls under moderate to low fuel load class.

2.26 Tripura

2.26.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.26.1. From the table, it can be inferred that 1.77% of the total RFA area falls under high fuel load class, 83.59% under moderate fuel load class and 6.80% under low fuel load class. No forest cover inside RFA has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.26.1.

Table 2.26.1 District-wise RFA/GW Area in different fuel load classes in Tripura
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Dhalai	0.00	12.36	1,590.19	6.76	1,609.31
Gomati	0.00	12.37	910.03	43.83	966.23
Khowai	0.00	11.59	503.63	51.20	566.42
North Tripura	0.00	5.63	828.72	8.69	843.04
Sepahijala	0.00	11.98	169.03	87.05	268.06
South Tripura	0.00	39.22	547.11	159.85	746.18
Unakoti	0.00	8.90	288.41	8.58	305.89
West Tripura	0.00	3.22	141.17	38.81	183.20
Total	0.00	105.27	4,978.29	404.77	5,488.33

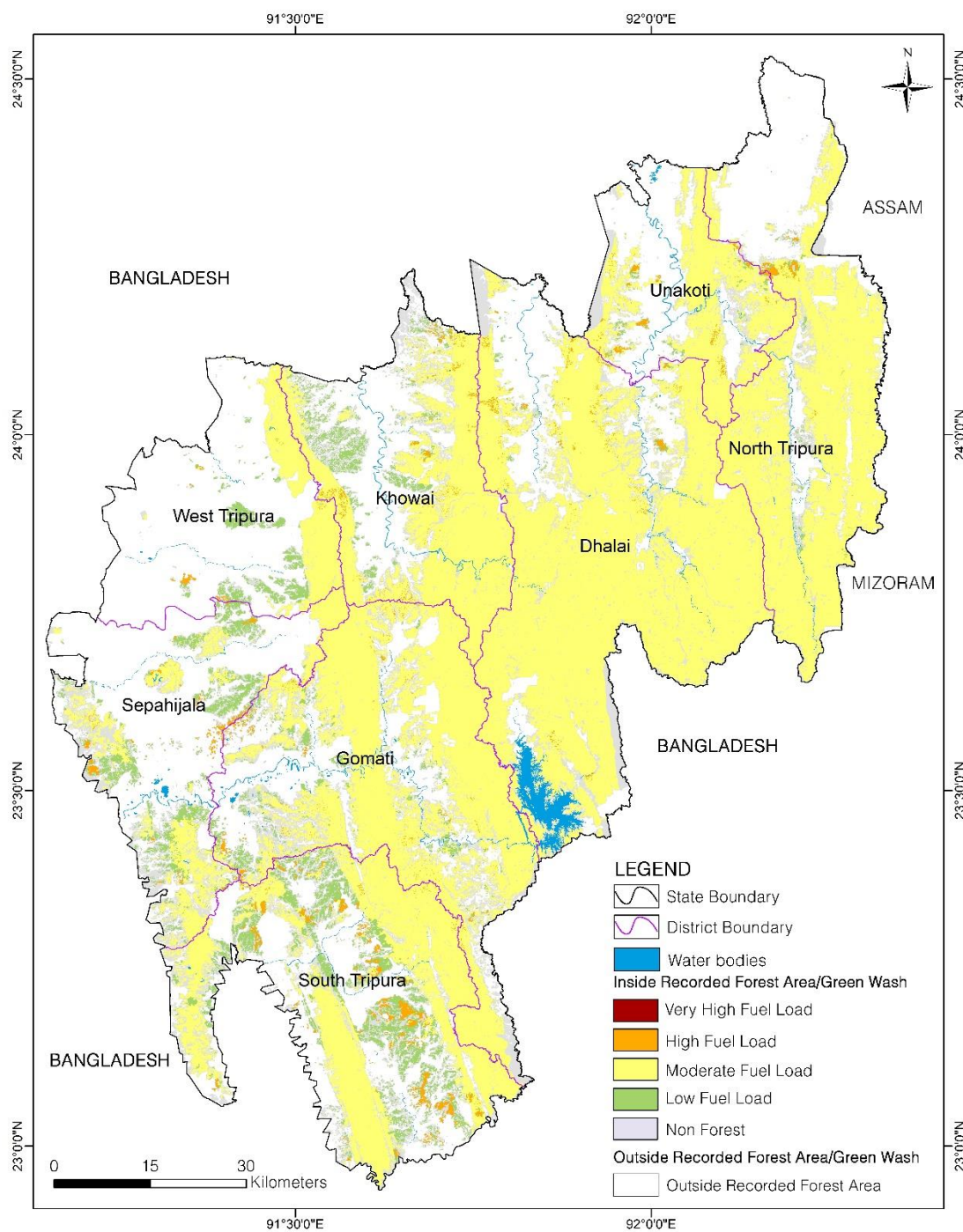


Figure 5.26.1 Surface fuel load map of Tripura

2.26.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in all the districts of the state. This area is dominated by *Dipterocarpus spp.*, *Terminalia spp.*, *Shorea robusta*, *Bamboo etc* forest species. Around 90.39% of the forest cover inside RFA falls under moderate to low fuel load class.

2.27 Uttar Pradesh

2.27.1 Surface Fuel Load

Different surface fuel load classes inside GW is shown in the Table 2.27.1. From the table, it can be inferred that 0.72% of the total GW area falls under high fuel load class, 24.25% under moderate fuel load class and 47.00% under low fuel load class. No forest cover inside GW has been observed in the very high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.27.1.

Table 2.27.1 District-wise RFA/GW Area in different fuel load classes in Uttar Pradesh

District	Surface Fuel Load Class				Area in km ²
	Very High	High	Moderate	Low	Total
Agra	0.00	0.00	0.26	220.86	221.12
Aligarh	0.00	0.00	0.00	0.01	0.01
Ambedkar Nagar	0.00	0.00	0.00	0.00	0.00
Amethi	0.00	0.00	3.95	4.84	8.79
Amroha /Jyotiba Phule Nagar	0.00	0.00	0.00	6.92	6.92
Auraiya	0.00	0.00	0.01	33.78	33.79
Ayodhya / Faizabad	0.00	0.00	3.51	10.57	14.08
Azamgarh	0.00	0.00	0.00	0.00	0.00
Baghpat	0.00	0.00	0.00	5.09	5.09
Bahraich	0.00	9.72	263.78	182.59	456.09
Ballia	0.00	0.00	0.00	0.00	0.00
Balrampur	0.00	7.91	446.34	35.85	490.10
Banda	0.00	0.00	3.30	29.08	32.38
Bara Banki	0.00	0.00	3.31	4.98	8.29
Bareilly	0.00	0.00	0.00	0.00	0.00
Basti	0.00	0.00	1.08	4.19	5.27
Bhadohi / Sant Ravidas Nagar	0.00	0.00	0.00	0.15	0.15
Bijnor	0.00	2.00	28.60	222.81	253.41
Budaun	0.00	0.00	0.00	11.14	11.14
Bulandshahr	0.00	0.00	0.00	3.81	3.81
Chandauli	0.00	0.00	12.28	525.24	537.52
Chitrakoot	0.00	0.00	93.96	476.03	569.99
Deoria	0.00	0.00	0.00	0.00	0.00
Etah	0.00	0.00	0.00	0.00	0.00
Etawah	0.00	0.00	0.05	178.30	178.35
Farrukhabad	0.00	0.00	0.00	1.31	1.31

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Fatehpur	0.00	0.00	0.00	2.90	2.90
Firozabad	0.00	0.00	0.03	57.99	58.02
Gautam Buddha Nagar	0.00	0.00	0.00	1.16	1.16
Ghaziabad	0.00	0.00	0.00	0.00	0.00
Ghazipur	0.00	0.00	0.00	0.00	0.00
Gonda	0.00	5.90	65.85	12.43	84.18
Gorakhpur	0.00	0.44	40.44	1.10	41.98
Hamirpur	0.00	0.00	0.00	131.12	131.12
Hapur	0.00	0.00	0.00	0.00	0.00
Hardoi	0.00	0.00	0.00	5.74	5.74
Hathras / Mahamaya Nagar	0.00	0.00	0.00	0.63	0.63
Jalaun	0.00	0.00	0.01	166.97	166.98
Jaunpur	0.00	0.00	0.00	0.00	0.00
Jhansi	0.00	0.00	1.66	157.58	159.24
Kannauj	0.00	0.00	0.00	3.76	3.76
Kanpur Dehat	0.00	0.00	0.00	1.32	1.32
Kanpur Nagar	0.00	0.00	0.00	1.02	1.02
Kasganj / Kanshiram Nagar	0.00	0.00	0.00	0.00	0.00
Kaushambi	0.00	0.00	0.00	0.00	0.00
Kheri	0.00	19.60	959.63	37.64	1,016.87
Kushinagar	0.00	0.00	0.08	2.23	2.31
Lalitpur	0.00	0.00	1.98	509.62	511.60
Lucknow	0.00	0.00	0.00	20.35	20.35
Mahoba	0.00	0.00	3.18	98.25	101.43
Mahrajganj	0.00	2.67	283.07	37.71	323.45
Mainpuri	0.00	0.00	0.00	0.57	0.57
Mathura	0.00	0.00	0.00	8.42	8.42
Mau	0.00	0.00	0.00	0.00	0.00
Meerut	0.00	0.00	0.00	19.35	19.35
Mirzapur	0.00	0.00	17.92	604.60	622.52
Moradabad	0.00	0.00	0.00	0.00	0.00
Muzaffarnagar	0.00	0.00	0.00	14.80	14.80
Pilibhit	0.00	1.74	530.21	44.65	576.60
Pratapgarh	0.00	0.00	0.00	1.02	1.02
Prayagraj / Allahabad	0.00	0.00	8.68	83.27	91.95
Raebareli	0.00	0.00	0.00	3.47	3.47
Rampur	0.00	0.00	1.47	32.97	34.44
Saharanpur	0.00	0.00	39.82	262.43	302.25
Sambhal	0.00	0.00	0.00	0.00	0.00

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Sant Kabir Nagar	0.00	0.00	0.00	0.05	0.05
Shahjahanpur	0.00	0.54	25.00	0.67	26.21
Shamli	0.00	0.00	0.00	0.00	0.00
Shravasti	0.00	45.73	217.41	66.25	329.39
Siddharthnagar	0.00	0.00	5.45	3.25	8.70
Sitapur	0.00	0.00	0.00	14.72	14.72
Sonbhadra	0.00	0.00	189.97	1,933.25	2,123.22
Sultanpur	0.00	0.00	0.00	0.21	0.21
Unnao	0.00	0.00	0.00	0.17	0.17
Varanasi	0.00	0.00	0.00	0.00	0.00
Total	0.00	96.25	3,252.29	6,301.19	9,649.73

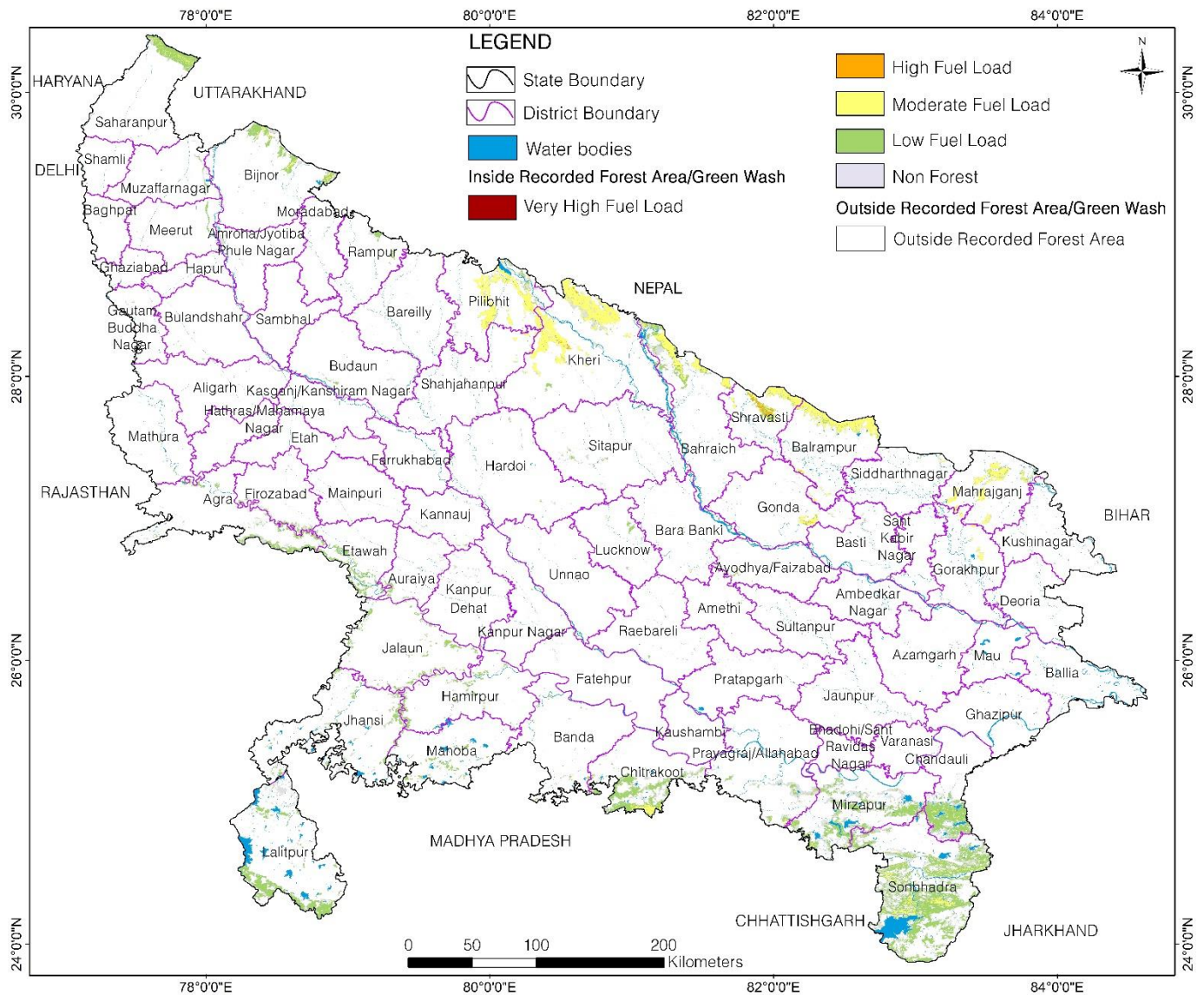


Figure 2.27.1 Surface fuel load map of Uttar Pradesh

2.27.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Kheri followed by Pilibhit and Bahraich districts. This area is dominated by *Shorea robusta*, *Tectona grandis* and *Madhuca longifolia*. Around 71.25% of the forest cover inside GW falls under moderate to low fuel load class.

2.28 Uttarakhand

2.28.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.28.1. From the table, it can be inferred that 4.51% of the total RFA area falls under very high fuel load class, 30.87% under high fuel load class, 27.44% under moderate fuel load class and 3.76% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.28.1.

Table 2.28.1 District-wise RFA/GW Area in different fuel load classes in Uttarakhand
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Almora	25.75	323.68	393.39	12.79	755.61
Bageshwar	34.99	345.87	282.86	0.16	663.88
Chamoli	279.90	1,452.56	266.81	3.72	2,002.99
Champawat	28.05	257.22	391.74	8.30	685.31
Dehradun	57.43	317.12	772.94	140.50	1,287.99
Garhwal	76.98	584.47	1,238.35	232.27	2,132.07
Haridwar	0.00	8.14	126.03	378.51	512.68
Nainital	38.65	568.47	1,665.97	118.47	2,391.56
Pithoragarh	102.71	450.60	124.39	2.15	679.85
Rudraprayag	95.78	626.61	161.97	3.14	887.50
Tehri Garhwal	86.91	1,104.62	641.07	8.41	1,841.01
Udham Singh Nagar	0.00	1.81	416.87	44.55	463.23
Uttarkashi	323.06	1,828.25	513.58	5.39	2,670.28
Total	1,150.21	7,869.42	6,995.97	958.36	16,973.96

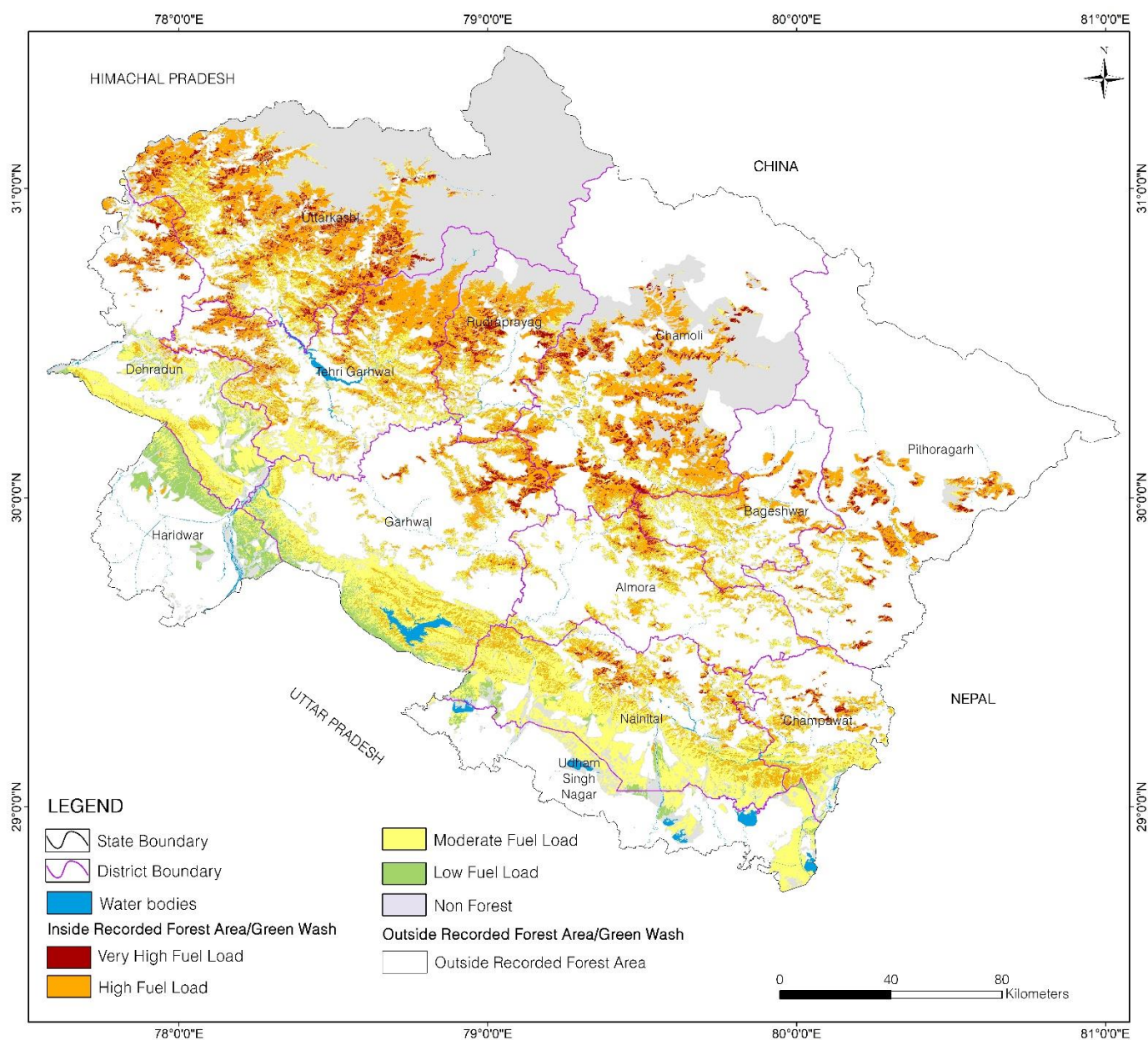


Figure 2.28.1 Surface fuel load map of Uttarakhand

2.28.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Nainital followed by Chamoli and Rudrapur districts. This area is dominated by *Quercus leucotrichophora*, *Pinus roxburghii*, *Rhododendron*, etc forest species. Around 62.82% of the forest cover inside RFA falls under the very high to moderate fuel load class.

2.29 West Bengal

2.29.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.29.1. From the table, it can be inferred that 1.20% of the total RFA area falls under very high fuel load class, 3.24% under high fuel load class, 19.46% under moderate fuel load class and 41.98% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the state in Figure 2.29.1.

Table 2.29.1 District-wise RFA/GW Area in different fuel load classes in West Bengal

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Alipurduar	0.00	33.71	733.64	153.11	920.46
Bankura	0.00	9.59	207.69	730.97	948.25
Birbhum	0.00	0.12	0.38	100.44	100.94
Cooch Behar	0.00	0.00	9.93	12.80	22.73
Dakshin Dinajpur	0.00	0.00	2.79	2.18	4.97
Darjeeling	78.30	167.20	244.16	46.40	536.06
Hoogly	0.00	0.00	0.00	2.07	2.07
Howrah	0.00	0.00	0.00	0.00	0.00
Jalpaiguri	0.00	4.01	424.66	70.79	499.46
Jhargram	0.00	0.99	121.34	547.45	669.78
Kalimpong	62.84	159.77	294.08	12.20	528.89
Kolkata	0.00	0.00	0.00	0.00	0.00
Malda	0.00	0.00	1.74	5.18	6.92
Murshidabad	0.00	0.00	0.88	2.64	3.52
Nadia	0.00	0.02	8.47	2.24	10.73
North 24 Parganas	0.00	0.00	0.00	26.00	26.00
Paschim Bardhaman	0.00	3.85	42.58	74.21	120.64
Paschim Medinipur	0.00	0.78	129.15	532.57	662.50
Purba Bardhaman	0.00	1.07	10.59	70.86	82.52
Purba Medinipur	0.00	1.25	0.00	5.80	7.05
Purulia	0.00	0.00	58.51	524.45	582.96
South 24 Parganas	0.00	0.04	0.00	2,025.16	2,025.20
Uttar Dinajpur	0.00	0.00	2.72	1.51	4.23
Total	141.14	382.40	2,293.31	4,949.03	7,765.88

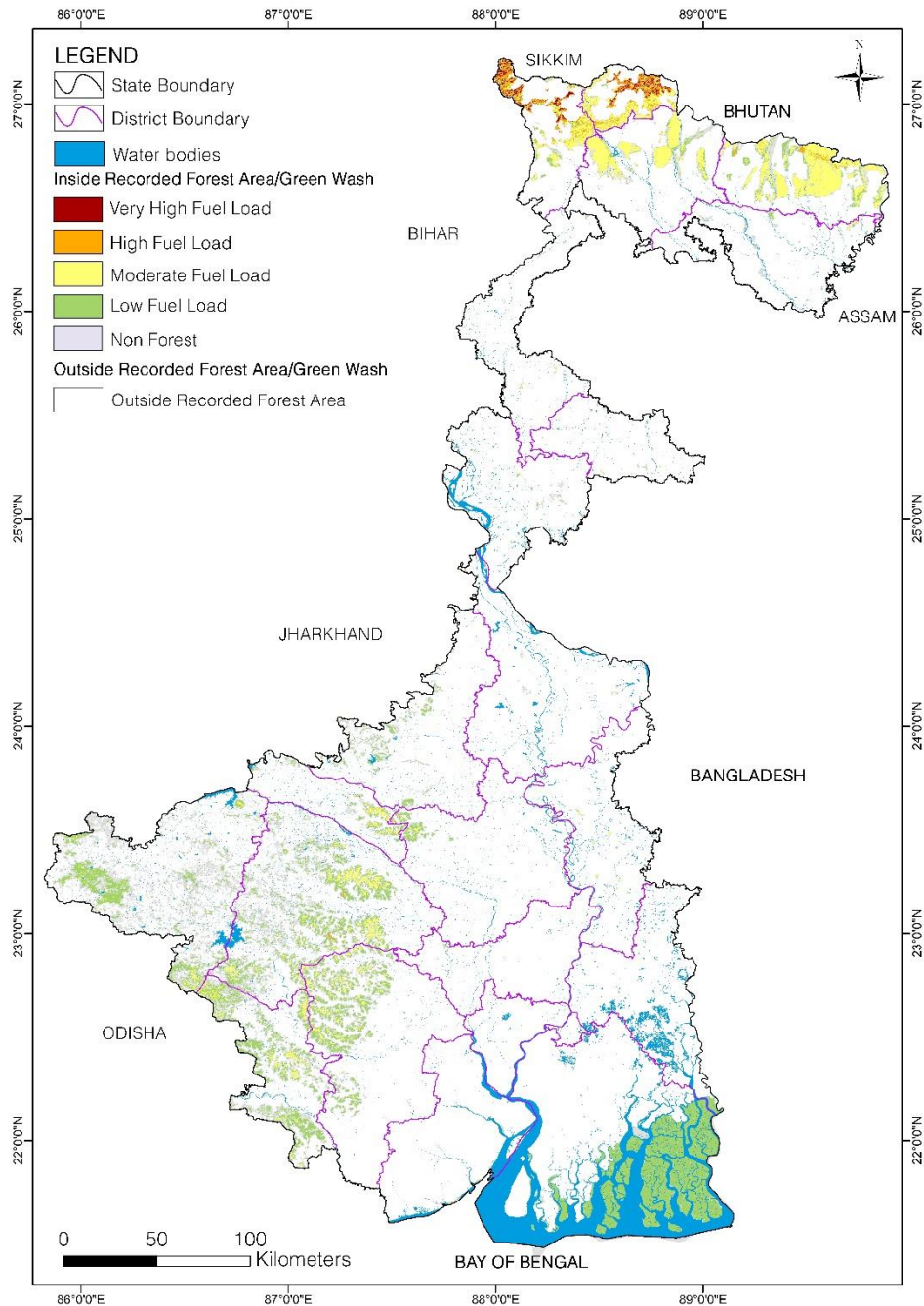


Figure 2.29.1 Surface fuel load map of West Bengal

2.29.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Alluri Kalimpong followed by Darjeeling and Alipurduar districts. This area is dominated by *Tectona grandis* and *Shorea robusta* etc. Around 61.44 % of the forest cover inside RFA falls under moderate to low fuel load class.

2.30 Andaman & Nicobar Islands

2.30.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.30.1. From the table, it can be inferred that 25.64% of the total RFA area falls under very high fuel load class, 20.82% under high fuel load class, 36.05% under moderate fuel load class and 8.99% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the UT in Figure 2.30.1.

Table 2.30.1 District-wise RFA/GW Area in different fuel load classes in Andaman & Nicobar Islands
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Nicobar	259.74	471.98	542.72	44.59	1,319.03
North & Middle Andaman	715.59	522.34	1,204.19	365.44	2,807.56
South Andaman	754.44	410.12	686.13	196.33	2,047.02
Total	1,729.77	1,404.44	2,433.04	606.36	6,173.61

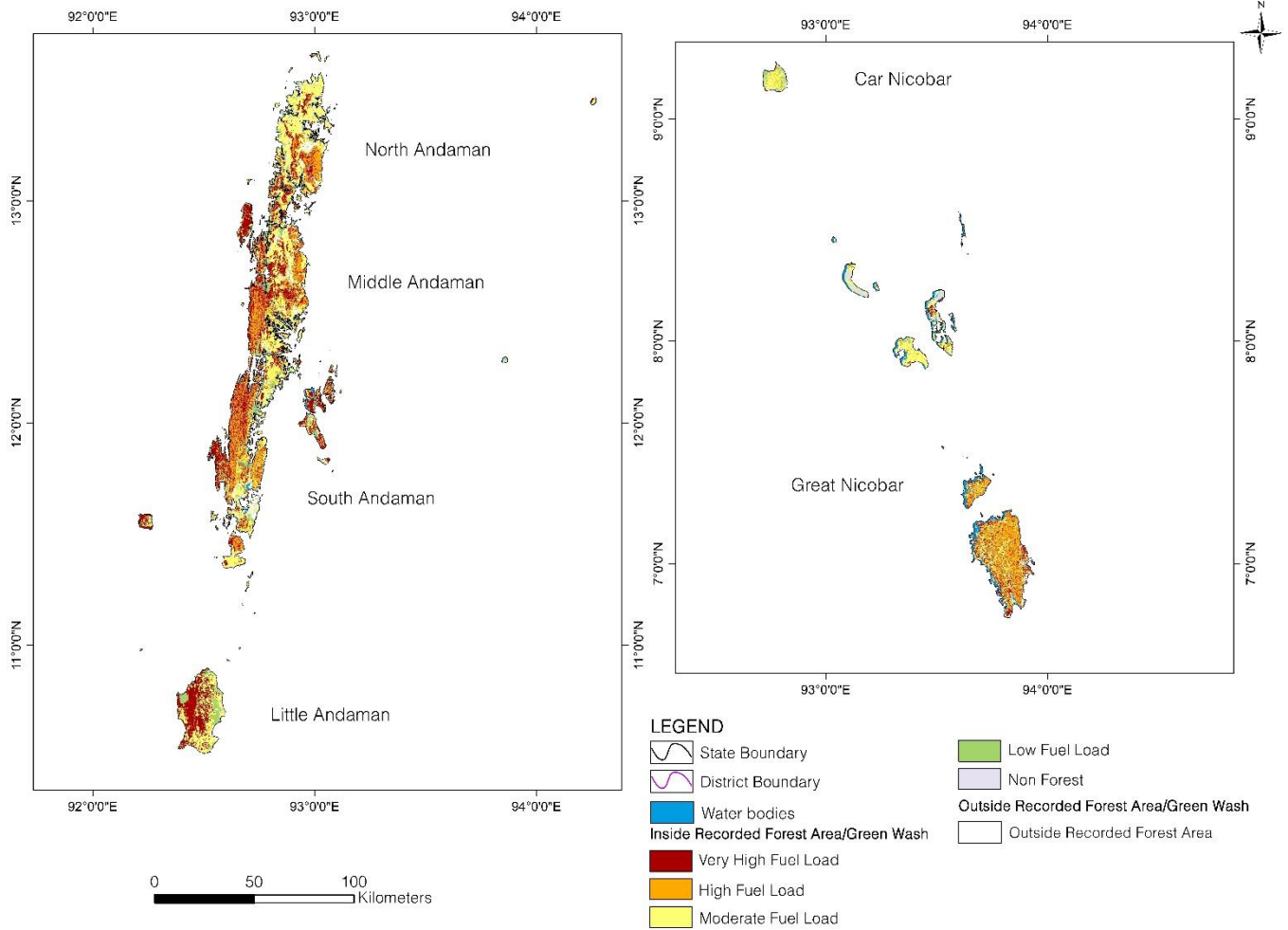


Figure 2.30.1 Surface fuel load map of Andaman & Nicobar Islands

2.30.2 Results and Analysis

Accumulation of very high to moderate fuel load has been observed with around 82.51% of the forest cover inside RFA falls under very high to moderate fuel load class around in the UT.

2.31 Chandigarh

2.31.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.31.1. From the table, it can be inferred that 12.37% of the total RFA area falls under moderate fuel load class and 67.05% under low fuel load. No forest cover inside RFA has been observed in the very high fuel load and high fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the UT in Figure 2.31.1.

Table 2.31.1 District-wise RFA/GW Area in different fuel load classes in Chandigarh

Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Chandigarh	0.00	0.00	1.40	7.59	8.99
Total	0.00	0.00	1.40	7.59	8.99

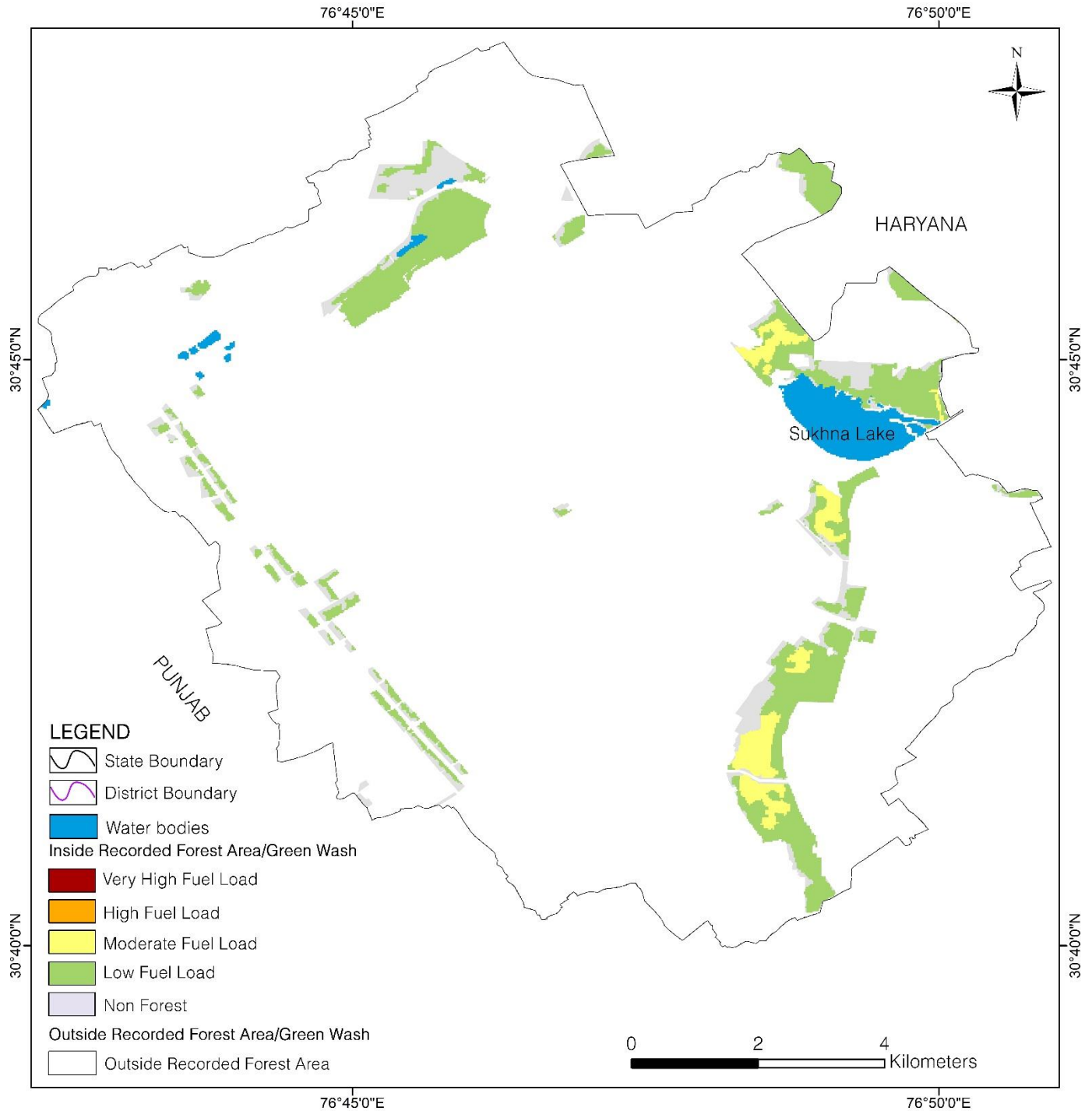


Figure 2.31.1 Surface fuel load map of Chandigarh

2.31.2 Results and Analysis

Accumulation of moderate to low fuel load has been observed in UT. This area is dominated by *Eucalyptus spp*, *Dalbergia sissoo*, *Morus spp*. Around 79.42% of the forest cover inside RFA falls under moderate to low fuel load class.

2.32 Dadra & Nagar Haveli and Daman & Diu

2.32.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.32.1. From the table, it can be inferred that 75.60% of the total RFA area falls under moderately fuel load class, 7.00% under low fuel load class. No area inside RFA has been observed in the very high and high fuel load class. Spatial distribution of surface fuel load is shown in the map of the UT in Figure 2.32.1.

Table 2.32.1 District-wise RFA/GW Area in different fuel load classes in Dadra & Nagar Haveli and Daman & Diu

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Dadra & Nagar Haveli	0.00	0.00	148.90	13.78	162.68
Daman	0.00	0.00	0.00	0.00	0.00
Diu	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	148.90	13.78	162.68

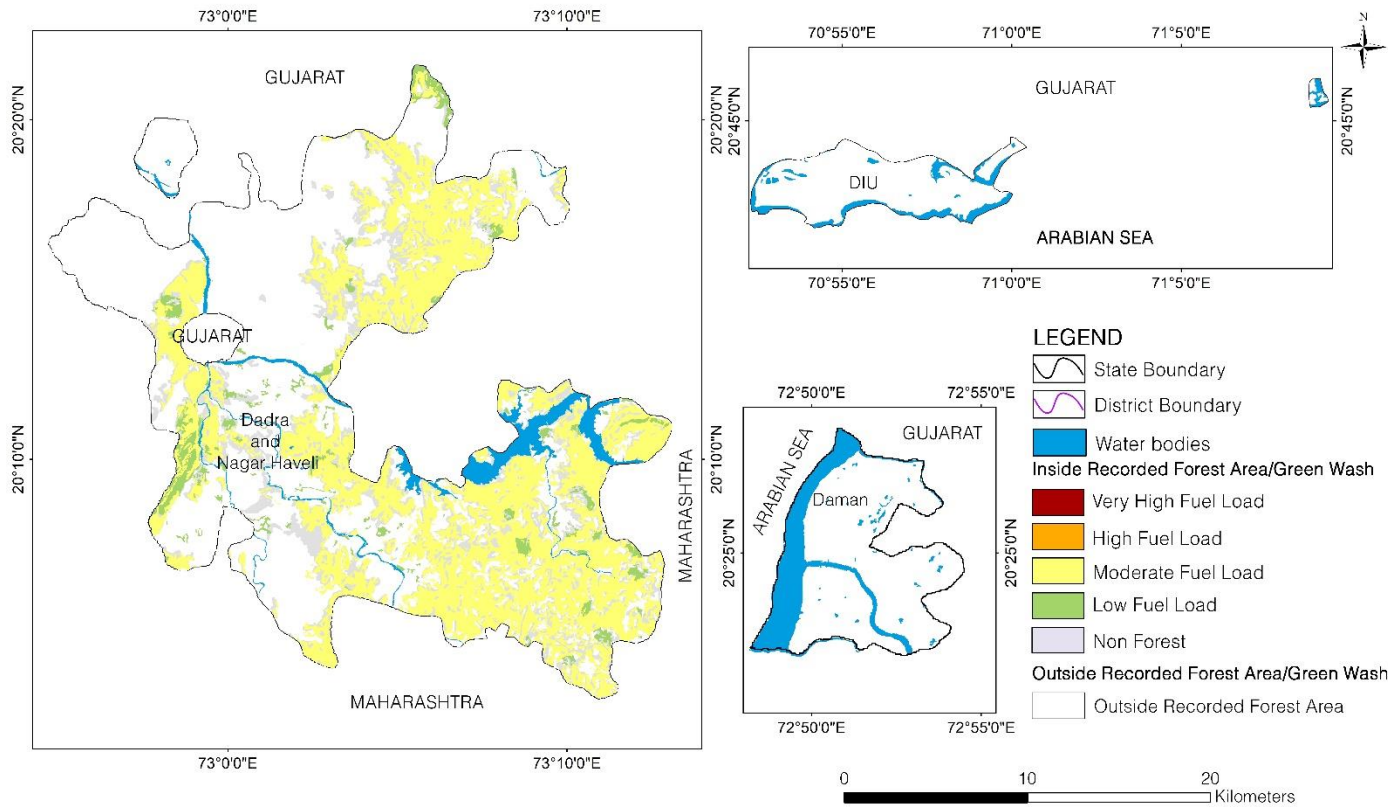


Figure 2.32.1 Surface fuel load map of Dadra & Nagar Haveli and Daman & Diu

2.32.2 Results and Analysis

Accumulation of moderate to low fuel load has been observed in UT. Around 82.60% of the forest cover inside RFA falls under moderate to low fuel load class.

2.33 Jammu & Kashmir

2.33.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.33.1. From the table, it can be inferred that 7.21% of the total RFA area falls under very high fuel load class, 24.08% under high fuel load class, 12.13% under moderate fuel load class, and 4.40% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the UT in Figure 2.33.1.

Table 2.33.1 District-wise RFA/GW Area in different fuel load classes in Jammu & Kashmir
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Anantnag	409.21	316.34	125.86	102.12	953.53
Badgam	34.47	130.16	25.03	9.66	199.32
Bandipura	107.79	248.16	265.08	50.67	671.70
Baramula	141.06	357.80	77.33	24.47	600.66
Doda	143.95	993.76	146.17	1.77	1,285.65
Ganderbal	52.60	257.06	16.64	5.68	331.98
Jammu	0.00	69.21	137.73	296.76	503.70
Kathua	28.10	369.18	278.76	250.45	926.49
Kishtwar	337.11	753.62	580.67	27.34	1,698.74
Kulgam	46.32	133.12	20.98	10.59	211.01
Kupwara	370.34	714.26	205.66	14.29	1,304.55
Mirpur	0.00	4.49	2.31	0.06	6.86
Muzaffarabad	14.11	24.79	5.51	0.25	44.66
Pulwama	68.37	68.91	26.87	58.31	222.46
Punch	71.95	382.57	69.19	2.48	526.19
Rajauri	17.01	401.69	509.34	54.31	982.35
Ramban	32.57	462.86	50.40	3.37	549.20
Reasi	43.29	393.63	323.87	82.03	842.82
Samba	0.00	27.58	56.60	188.61	272.79
Shupiyan	23.32	61.59	13.12	6.38	104.41
Srinagar	0.01	0.07	0.02	1.28	1.38
Udhampur	55.49	502.09	422.53	27.46	1,007.57
Total	1,997.07	6,672.94	3,359.67	1,218.34	13,248.02

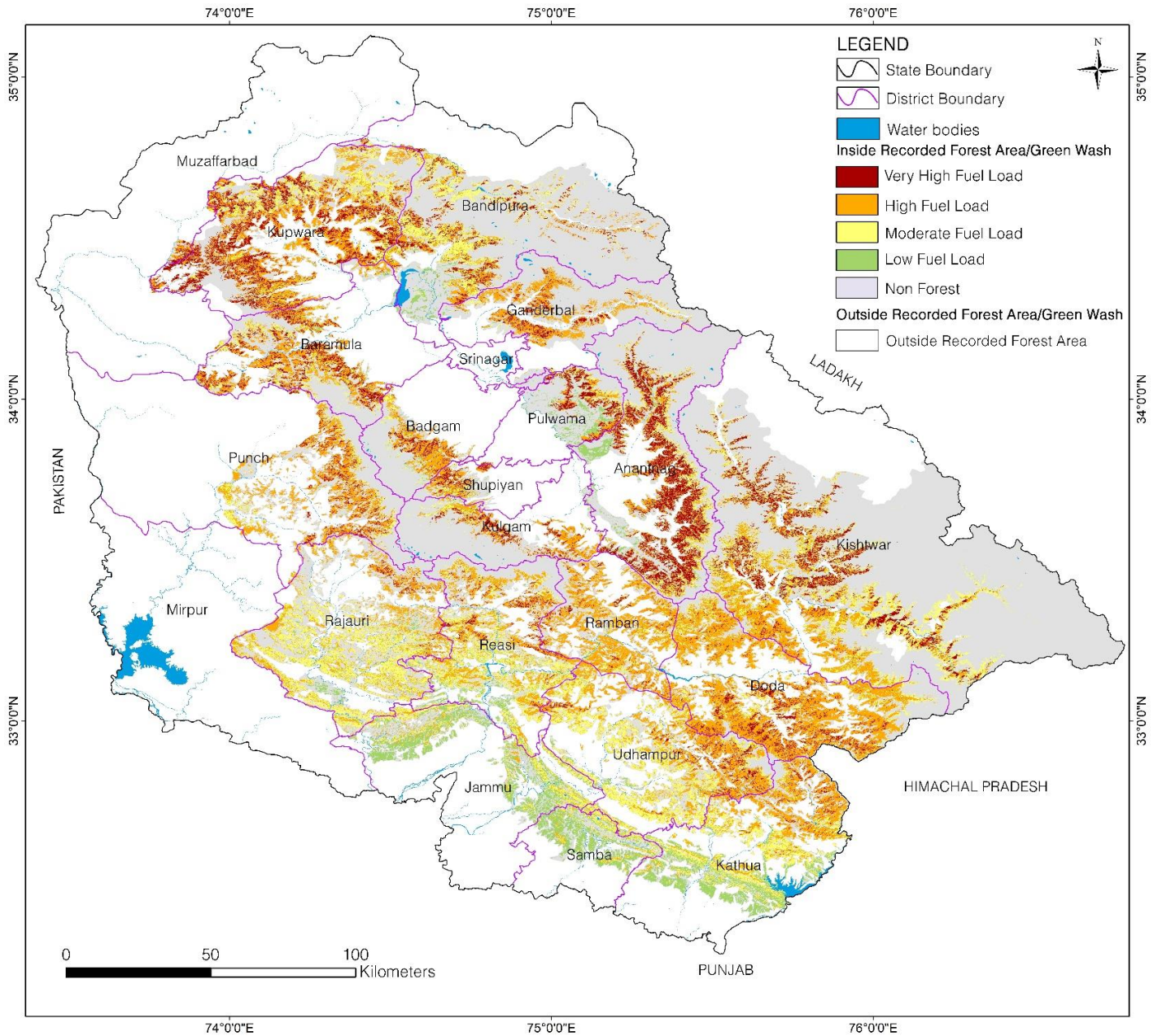


Figure 2.33.1 Surface fuel load map of Jammu & Kashmir

2.33.2 Results and Analysis

Accumulation of high to moderate fuel load has been observed in Anantnag followed by Kupwara and Kishtwar districts. This area is dominated by species *Parthenium hysterophorus*, *Ageratum conyzoides*, *Ipomoea fistulosa* and *Solanum viarum*. Around 36.21% of the forest cover inside RFA falls under high to moderate fuel load class.

2.34 Ladakh

2.34.1 Surface Fuel Load

Different surface fuel load classes inside GW is shown in the Table 2.34.1. From the table, it can be inferred that 0.94% of the total GW area falls under very high fuel load class, 4.5% under high fuel load class, 21.08% under moderate fuel load class and 0.75% under low fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the UT in Figure 2.34.1.

Table 2.34.1 District-wise RFA/GW Area in different fuel load classes in Ladakh

District	Surface Fuel Load Class				Area in km ²
	Very High	High	Moderate	Low	Total
Kargil	0.00	0.00	0.00	0.00	0.00
Leh	29.86	143.33	671.36	23.83	868.38
Total	29.86	143.33	671.36	23.83	868.38

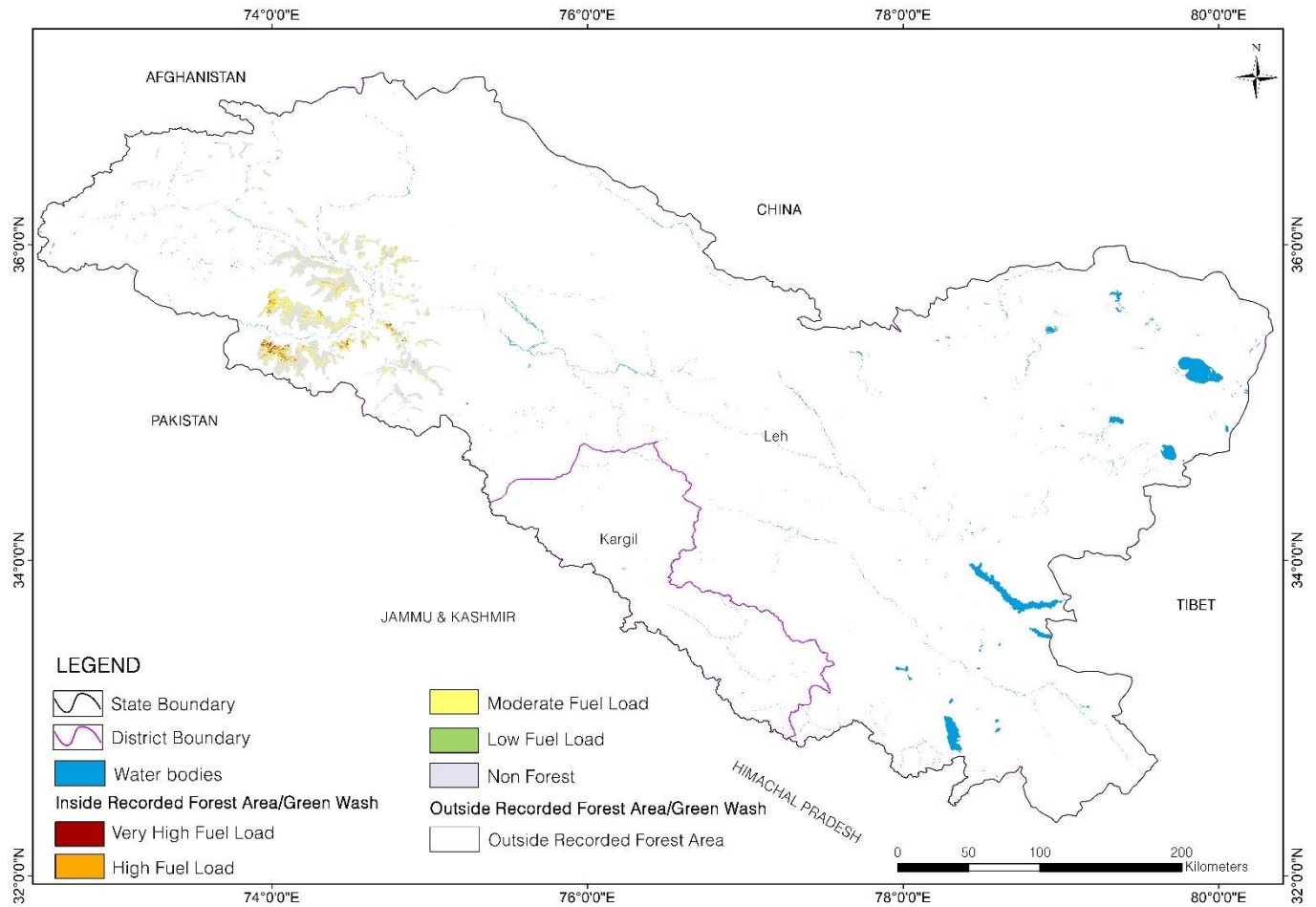


Figure 2.34.1 Surface fuel load map of Ladakh

2.34.2 Results and Analysis

Accumulation of high to moderate load has been observed in UT. This area is dominated by species *Deodar*, *Olive* and *Pinus gerardiana*. Around 25.58% of the forest cover inside GW falls under high to moderate fuel load class.

2.35 Lakshadweep

2.35.1 Surface Fuel Load

The UT does not have RFA/GW boundary. Therefore, surface fuel load assessment has been carried out based on forest cover in the UT. Different surface fuel load classes is shown in the Table 2.35.1. From the table, it can be inferred that 100% of the forest cover fall under low fuel load class. No forest cover has been observed in the very high fuel load, high fuel load and moderate fuel load class. Spatial distribution of surface fuel load map classes is shown in the map of the UT in Figure 2.35.1.

Table 2.35.1 District-wise Forest Cover in different fuel load classes in Lakshadweep
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Lakshadweep	0.00	0.00	0.00	27.06	27.06
Total	0.00	0.00	0.00	27.06	27.06

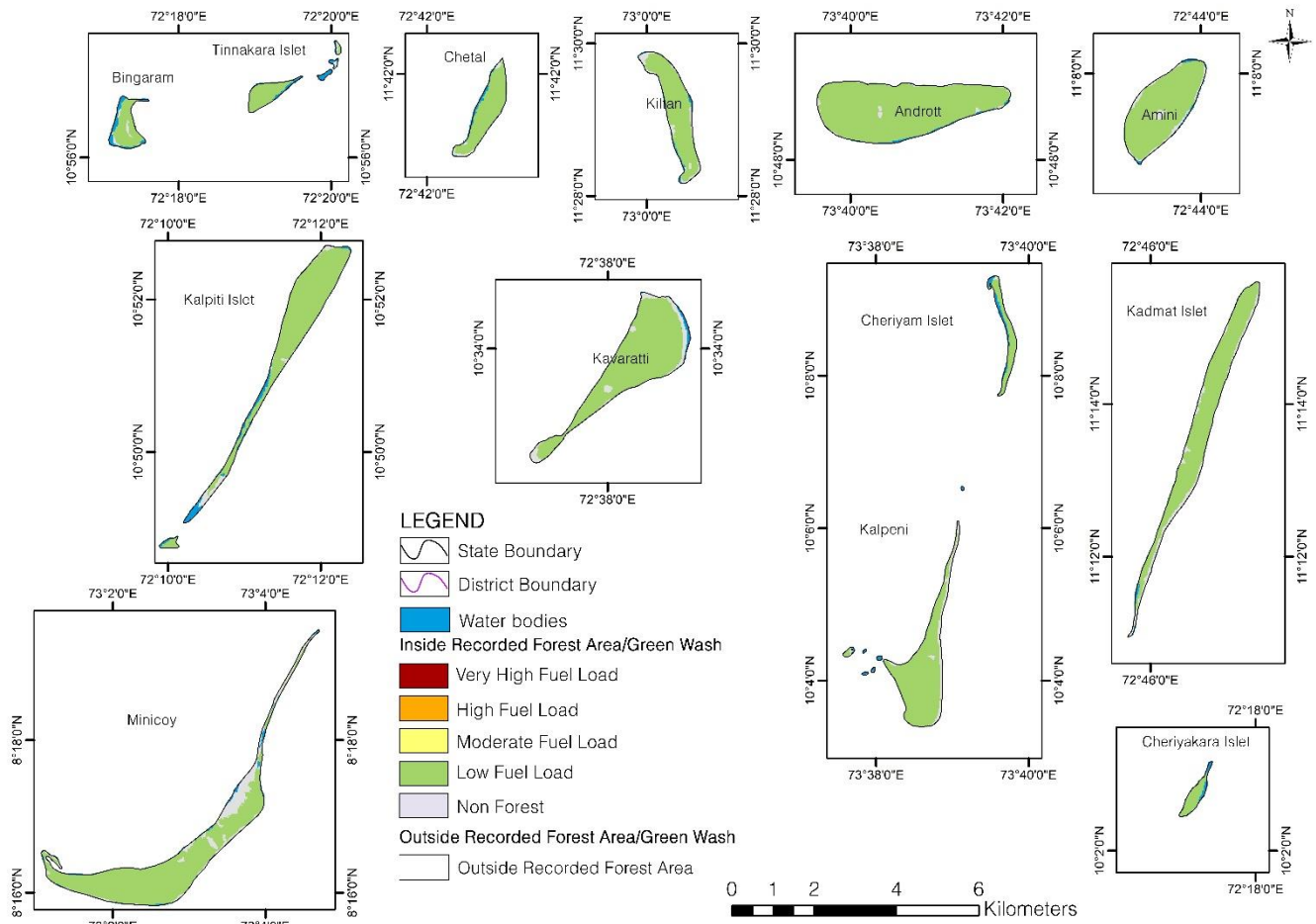


Figure 2.35.1 Surface fuel load map of Lakshadweep

2.35.2 Results and Analysis

As the UT does not have any reported RFA, the forest cover in the UT is mainly under ToF/Plantation. The area is dominated by *Cocos nucifera*, *Thespesia populnea*, *Artocarpus spp.* etc. tree species.

2.36 Puducherry

2.36.1 Surface Fuel Load

Different surface fuel load classes inside RFA is shown in the Table 2.36.1. From the table, it can be inferred that 33.02% of the total RFA area falls under low fuel load class. No area inside RFA has been observed in the very high fuel load, high fuel load and moderate fuel load class. Spatial distribution of surface fuel load classes is shown in the map of the UT in Figure 2.36.1.

Table 2.36.1 District-wise RFA/GW Area in different fuel load classes in Puducherry
Area in km²

District	Surface Fuel Load Class				Total
	Very High	High	Moderate	Low	
Karaikal	0.00	0.00	0.00	0.00	0.00
Mahe	0.00	0.00	0.00	0.00	0.00
Puducherry	0.00	0.00	0.00	0.00	0.00
Yanam	0.00	0.00	0.00	3.14	3.14
Total	0.00	0.00	0.00	3.14	3.14

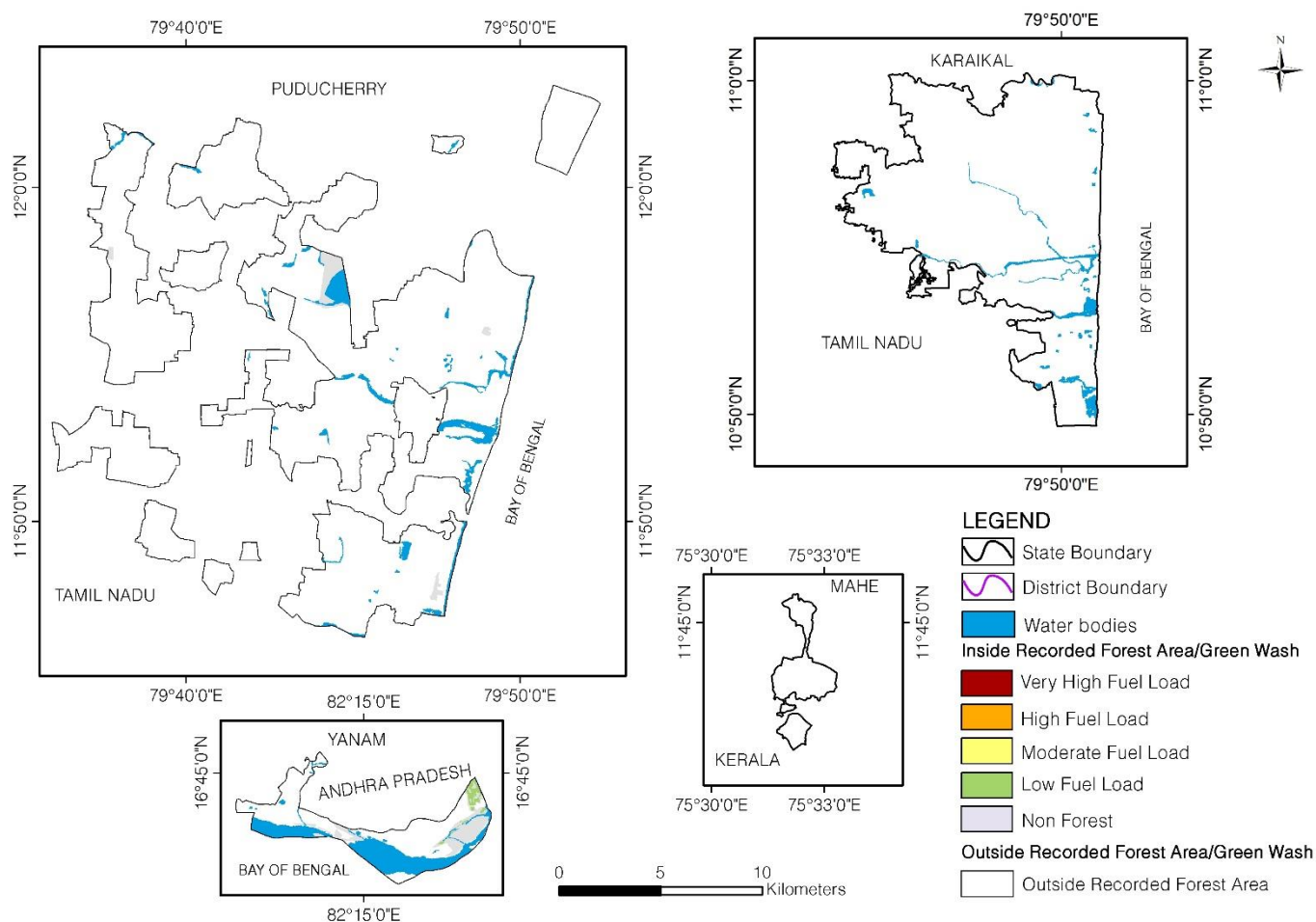
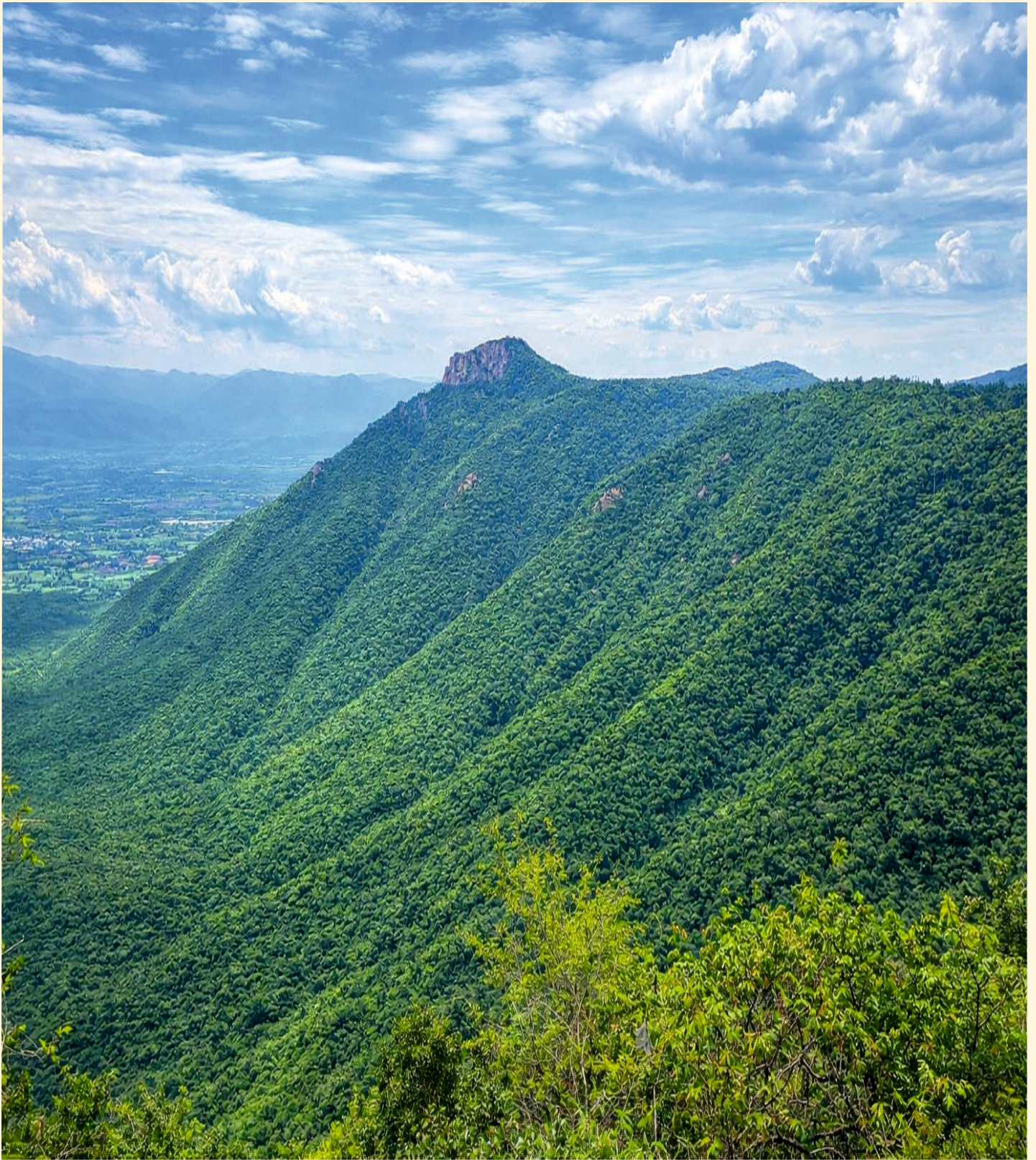


Figure 2.36.1 Surface fuel load map of Puducherry

2.36.2 Results and Analysis

Around 33.02% of the forest cover inside RFA falls under the low fuel load class. The UT is dominated by *Prosopis juliflora*/*Neltuma juliflora*, *Cocos nucifera*, *Azadirachta indica* etc. forest species.



भारतीय वन सर्वेक्षण Forest Survey of India

Ministry of Environment, Forest & Climate Change
Government of India Dehradun-248195