

Temporal Change in Tree Species Composition in Palampur Forest Division of Dharamshala Forest Circle, Himachal Pradesh

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Introduction

The Himalayas cover a vast expanse of 595,000 square kilometers with 2,400 km of parallel mountain ranges encompassing parts of India, Pakistan, Afghanistan, China, Bhutan, Nepal, and Tibet. Situated between 72°- 91° E Longitudes and 27°- 36° N Latitudes, the Himalayas separate the alluvial plains of Indian subcontinent on the south from the Plateau of Tibet to the north; and connects the mountains of near East and Central Asia with those in the East Asia. Further, the Himalayan landscape is characterized with a unique geographic and ecological profile and serves as a home to an array of rivers such as Yangtze Ganga, Brahmaputra, Ganga, Indus, Yarlung, Yangtze, Yellow, Mekong, and Nujiang, which serve as a critical water source for Asian countries.

The Himalayan ecological diversity is altitude dependent where climatic and topographic effects on ecosystems and biota become more pronounced with increasing gradient. Further, there exist stark differences between the eastern and the western Himalayas in altitude, precipitation, and vegetation patterns. The eastern Himalayas are four-times wetter than the western Himalayas with higher snowline, and rich biodiversity. Meanwhile, the western Himalayan ranges are farther apart from the plains with precipitous landscape and colder-drier climate. The altitude gradient and climatic conditions play a decisive role in determining the vegetative pattern in the bio-diverse rich ecology of the Himalayas. At the mountain foothills, there are tropical and sub-tropical broadleaf forests; temperate broadleaf mixed forests with a dominant canopy of oak and maple at the middle; and coniferous, sub-alpine, and alpine vegetation at the higher altitudes adorned with pine, hemlock, spruce, and fir conifers. Areas under inaccessible landscapes are characterized with alpine grasslands, high-altitude meadows, scrubland which is followed by snowline.

The Indian Himalayan Region (IHR) is home to over 72 million people living in over 10 states covering 95 districts in a total geographic area of 5 lacs square km. With its foot-hills in Shivalik at the south, the vast Himalayan region expands

to the Tibetan Plateau on the north, thus, serving as a natural northern boundary for India. According to the State Forest Report, 2011, around 42 per cent of the total IHR area is covered under forests (one-third of the total forest area in India) offering invaluable ecological security and resources to the country. As per the State of Forest Report 2017, around 22 per cent of India’s total geographical area was found to be under forest cover, of which 2.99 per cent was under Very Dense Forest, 9.38 per cent under Moderately Dense Forest, and 9.18 per cent under Open Forest Area.

Forests of Himachal Pradesh

Himachal Pradesh is a mountainous state in the northernmost part of India, situated in the western Himalayas between latitude 30° 22’ 40” N to 33° 12’ 40” N and longitude 75° 45’ 55” E to 79° 04’ 20” E. Two-thirds of Himachal Pradesh’s area (55,673 square km) comes under recorded forest area, however, only 27.12 per cent of this area is accounted under forest and tree cover. One-third of the state’s geographic area remains permanently under snow glaciers and inaccessible cold deserts, thus is permanently beyond the tree line. Administratively, the forests are classified as Reserved (5.13 per cent), Protected (89.46 per cent), and Un-classed forest (5.41 per cent), within which certain areas are categorized for specific wildlife, flora, and natural ecosystem protection.

Forest Type	Altitude	Rainfall	Dominant Forests
Tropical Dry Deciduous Forests	>1000 m above mean sea level	100-150 cm/annum	<i>Shorea robusta</i> and other associates such as <i>Acacia catechu</i> , <i>Aegle marmelos</i> , <i>Feronia limonia</i> , <i>Anogeissus latifolia</i> , <i>Buchanania lanzan</i> , <i>Woodfordia fruitcosa</i> , <i>Indigofera pulchella</i> , <i>Eulaliopsis binata</i>
Tropical Moist Deciduous forests	>1000 m above mean sea level	100-200 cm/annum	<i>Olea cuspidate</i> , <i>Acacia modesta</i> and other associates such as <i>Pyrus pashia</i> , <i>Coriaria nepalensis</i> , <i>Rhus continus</i> , <i>Indigofera gerardiana</i> , <i>Prinsepia utilis</i>

Subtropical Pine Forests	1000-1800m above mean sea level	90-250 cm/annum	<i>Pinus roxburghii</i> and other associates such as <i>Terminalia chebula</i> , <i>Mallotus philippensis</i> , <i>Pyrus pashia</i> , <i>Syzygium cumini</i> , <i>Albizia chinensis</i> , <i>Emblica sp.</i> , <i>Acacia catechu</i> , <i>Murraya spp.</i> , <i>Rosa moschata</i>
Himalayan Moist Temperate Forests	1500-3300m above mean sea level	150-250 cm/annum	Chief Oaks - <i>Quercus leucotrichophora</i> , <i>Q. dilatata</i> other associates such as <i>Rhododendron</i> , <i>Acer</i> , <i>Aesculus</i> , <i>Cedrus deodara</i>
Himalayan Dry Temperate Forests	>1,700m above mean sea level	< 100 cm/annum	<i>Conifers</i> - <i>Cedrus deodara</i> , <i>Pinus gerardiana</i> , <i>Junipers</i> , <i>Abies</i> , <i>Pinus wallichiana</i> . <i>Broad-leaved</i> – <i>Acer</i> , <i>Quercus</i>
Sub-Alpine Forests	2,900-3,500m above mean sea level		<i>Conifers</i> – <i>Abies</i> , <i>Pinus wallichiana</i> , <i>Deciduous trees</i> – <i>Betula utilis</i> , <i>Quercus semecarpifolia</i> , <i>Rhododendron</i>
Moist Alpine Scrub	>3,350 m above mean sea level		<i>Betula utilis</i> , <i>Berberis</i> , <i>Salix</i> , <i>Rosa</i> , <i>Aconitum</i> , <i>Lonicera</i>
Dry Alpine Scrub	>6,000 m above mean sea level		<i>Juniperus</i> , <i>Artemisia</i> , <i>Lonicera</i> , <i>Salix</i> , <i>Myricaria</i>

Table 1: Forest Classifications for Himachal Pradesh

Himachal Pradesh is blessed with a rich biodiversity adorned with diverse natural ecosystems comprising 8 forest types, 38 sub-types, which are home to 3,295 plant species of the 45,000 found in India. 95 per cent of these species are endemic to the State and only 5 per cent known as exotic species have been introduced in the last 150 years. The state's forest ecosystem offers critical ecological, environmental, economic, and social support to the populace serving as a primary source of food, fuel, fodder, timber, and other non-timber forest produce for both urban and rural population. However, these forest resources are currently experiencing greater stress with increasing pressure from burgeoning population and rising impact of anthropogenic activities. This temporal study was designed to get a

preliminary insight into the current status of vegetation viz. species composition in Palampur Forest Division under the Dharamshala Forest Circle.

The next section outlines the details on study area and the adopted methodology with information on data sources and applied techniques of assessments. Following which, the section on Results and Findings discusses the outcomes for Palampur Forest division. The report concludes with a categorized and consolidated snapshot of species composition in the Palampur Forest Division. There are three forest divisions namely Nurpur Forest Division, Dharamshala Forest Division and Palampur Forest Division of Dharamshala Forest Circle which covers the entire Kangra district of Himachal Pradesh.

Study area and method

District Kangra – A Background

The entire area of the Kangra district is traversed by the varying altitude of the Shivaliks, Dhauladhar and the Himalayas from north-west to south-east. The altitude varies from 500 meters above mean sea level (amsl) to around 5000 meters amsl. It is encapsulated in the north by the districts of Chamba and Lahaul and Spiti, in the south by Hamirpur and Una, in the east by Mandi and in the west by Gurdaspur district of Punjab.

The present Kangra district came into existence on the 1st September, 1972 consequent upon the re-organization of districts by the Government of Himachal Pradesh. It was the largest district of the composite Punjab in terms of area till it was transferred to Himachal Pradesh on the 1st November, 1966 and had six tehsils namely Nurpur, Kangra, Palampur, Dehragopipur, Hamirpur and Una. Kullu was also a tehsil of Kangra district up to 1962 and Lahaul & Spiti which also formed a part of Kangra was carved out as a separate district in 1960. On the reorganization of composite Punjab on the 1st November, 1966 the area constituting Kangra district were transferred to Himachal Pradesh along with the districts of Shimla, Kullu and Lahaul and Spiti and tehsils of Una and Nalagarh and three villages of Gurdaspur district.

Kangra district derives its name from Kangra town that was known as Nagarkot in ancient times. Kangra proper originally was a part of the ancient Trigarta (Jullundur), which comprises of the area lying between the river "Shatadroo" (probably Sutlej) and Ravi. A tract of land to the east of Sutlej that probably is the area of Sirhind in Punjab also formed a part of Trigrata. Trigrata had two provinces one in the plains with headquarters at Jullundur and other in the hills with headquarters at Dhar amshala (the present Kangra).

Location & Geographical Area

Kangra district is situated in Western Himalayas between 31°2 to 32°5 N and 75° to 77°45 E. The district has a geographical area of 5,739 km. which constitutes 10.31 % of geographical area of the State. The district is bounded by Chamba to the north, Lahul and Spiti to the northeast, Kullu to the east, Mandi to the southeast, and Hamirpur and Una to the south. The district shares a border with the states of Punjab on the southwest, and Jammu and Kashmir on the northwest. Due to the hilly terrain, not very much of the land is cultivated. The region is covered with uniform patches of barren land, as well as small forests. There is a reasonably good network of roads across the district.

Palampur Forest Division- Forest Profile

Name and Situation:-

The Palampur forest division comprises of three territorial ranges viz. Baijnath, Droh and Palampur forest range. The Uhl range as a whole has been declared as **"Dhauladhar Wildlife Sanctuary"** and stands transferred to wildlife wing of H.P. Forest Department. The headquarters of the division is located at Palampur (1272 msl), district Kangra. The forest lies in Palampur, Baijnath and Jaisinghpur Tehsils. The total geographical area of the track is 929.60 square kilometer and total forest area is 388.05 square kilometer.

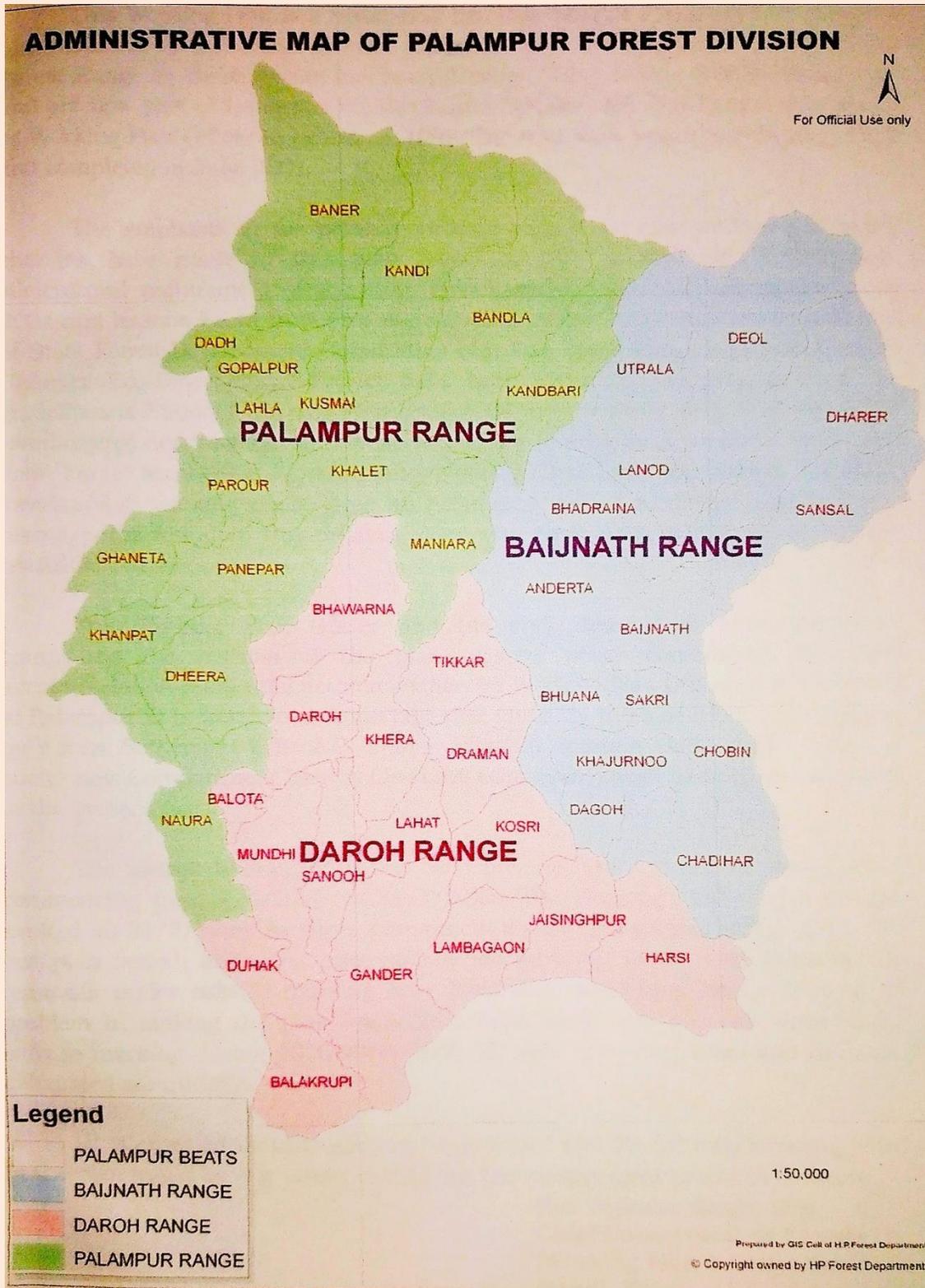


Figure 1 Administrative map of Palampur Forest Division showing forest ranges/compartments

The main valley lies at the foothills of Dhauladhar. It is bounded in the South by a mass of rugged and broken hills as Changer and in the Southwest by Amburai-Gaggal ridge, which enters this division near Mallan and traversing in Southeast direction terminates near Balakrupi. The administrative boundaries are bounded in the North by Chamba district; in the East by Mandi district; in the South by Hamirpur district (Beas River) and in the West by Dehra and Kangra Tehsils. The boundaries in terms of forest division are in Bharmour in the North, Joginder Nagar in the East, Hamirpur in the South and Dharamshala/Dehra in the West. The tract lies between latitudes 31^o50 minutes to 32^o14 minutes North and Longitudes 76^o25 minutes to 77^o45 minutes East. The statistics of Palampur Forest Division is given in Table 1 below:

Sr. No. 1	Total geographical area of the division 929.60 Km²	
2.	Division is bounded between: a) Longitudes 76 ^o 25' & 77 ^o 45' b) Latitudes 31 ^o 50' & 32 ^o 14'	
3.	Category wise forest area	Area (ha)
	(i) Delimited Protected Forests	10620.45
	(ii) Un-delimited Protected Forests	7932.16
	(iii) Un-classed Forests	18077.59
	(iv) Co-operative Society Forests	2175.31
4.	Per capita Forest area of the division	0.12 ha
5.	Area by Working Circles	(ha)
	(i) Chil Working Circle	3976.60
	(ii) Ban-Oak Working Circle	3509.28
	(iii) Plantation Working Circle	9480.84
	(iv) Protection Working Circle	21838.79
6.	Dhauladhar Wildlife Sanctuary	982.86 ha

Table 2 Palampur Forest Division- Statistics at a Glance

Geology:

The whole tract forms a part of the Kangra District and lies in the Shiwalik Lesser Himalayan Zone and its topographic is defined by a series of almost parallel hill ranges

separated by longitudinal valleys. The hill ranges rise in height towards North. The higher reaches of Dhauladhar range and upper part of area are snow covered for most of the year.

Soil:

The parent rock exerts a great influence on soil formation, because soil inherits some of its important properties from parent rock. Though climate effects certain changes in the soil derived from a given yet the physical and chemical properties are largely governed by the parent rock. The Shiwalik system rocks yield soil of sandy to loam texture and support low chil and scrub forests in Droh and lower area of Palampur range. These soils are generally dry and deficient in organic matter.

The gneiss, schist, carbonaceous slates and quartzite etc. of the Jotogh formation give rise to fairly deep and fertile loam to clay loam, which bears the Fir/Spruce and Oak Forests of this division. The boulders of these rocks have been carried down into the lower valleys by the glacial action and the same type of soil is found in patches in the lower valleys near Andretta and Ghadoral, where Oak forests are present at such lower elevation.

Quartzite rocks of salooni formations are noticed in traces form in Baijnath range, where Deodar occurs sporadically such as U. 24 B. Sibbar Nal and U. 33 B Tatwani. It is worth noticing that Deodar does not occur indigenously on the main ridge of Dhauladhar, where strata are mainly composed of slates and shale, instead Oaks and miscellaneous broad leaved species are found. The hard sandstone of Lower and Upper Dharamshala formations yields deep fertile sandy loam on which chil, mixed with oak and chil forests of the division thrives, such as P.11 Sansal, U. 4 B Lanod and U. 23 B Kharas - Karot etc in the Baijnath range.

The Northwestern slopes have clays alternate with sandstone, when exposed to sun, dried up and fails to support good vegetation. Moreover in certain situations where clay proportion increases, it is liable to water logging it becomes the origin of serious landslips. Alluvial deposits along the stream and river have deep fertile, sandy loam to clayey loam soil where species like Khair, Shisham etc. flourishes. Such forests occur in Jaisinghpur area of Droh forest range.

Climate:

Due to variation in elevation and configuration, the region experiences a diverse type of climate ranging from subtropical at lower elevation in Jaisinghpur and Alampur area of Droh range to temperate in upper reaches of Palampur and Baijnath ranges. The semi-arctic conditions prevail along the main Dhauladhar during winter months. March, April and October, November months are cool and bright, occasional snowfall occurs in inner valleys. December to February months are very cold and mostly snowfall occurs on higher elevations during these months. May and June are hot and wind laden with dust from plains is normal feature. The change over from winter to summer is gradual. The temperature begins to raise middle to April to last week of June or first week of July, when monsoon break in. The area receives bulk of annual precipitation from Southeast monsoon, beginning by the end of June and lasting till mid September. Drought occurs both in the pre and post monsoon period. Winter rains occur from December to February. Occasional hailstorms from April to June are common. The forest working is not possible during winter months in higher reaches.

Climate exercises a powerful influence in the distribution and growth of species. Moisture and temperature are, by far, the most important site factors for plant growth. For better management of forests, knowledge of rainfall pattern and temperature variation is essential. Meteorological stations are meager in this division.

Rainfall:

Monsoon continues till the end of August or middle of September. During these months rainfall is heavy and climate is moist. These months receive bulk of precipitation in the form of rainfall, which are heavy on the Southern slop of the "Dhauladhars" and progressively decrease southwards in the valley. At higher elevations and in inner valleys, precipitation is more in the form of sleet and snow. Winter rainfall is lighter in extent and intensity. Drought conditions prolonged and severe droughts are common in Changer areas, which have diverse effect on the establishment and growth of regeneration.

Temperature:

Temperature varies widely due to great variability in altitude and physical land features. March, April and October, November months are cool and bright, occasional snowfall occurs in inner valleys during these months. The temperature in the Himalayan zone is milder during summer but the winters are very cold.

Distribution and Area:

The gross geographical area of the division is 929.60 square kilometers. Forests canopy an area of 388.05 square kilometers i.e. 41.74% of geographical area. The forests do not form a continuous and compact belt but are generally scattered. The Delimited Protected Forests are mainly confined to the main valley. However, the Un-classed forests are generally located in a compact block on the high hills between Palampur and Deol/Sansal. The Class wise details are given below:

Sr. No.	Legal Classification	Area (ha.)			
		Baijnath Range	Droh Range	Palampur Range	Total
1	Delimited Protected Forest	1828.37	1028.77	7763.31	10620.45
2	Un delimited Protected Forest	1421.05	3920.18	2590.93	7932.16
3	Un Classed Forests	11327.09	---	6750.50	18077.59
4	Co-operative Society Forest	---	874.34	1300.97	2175.31
	Total	14576.51	5823.29	18405.71	38805.51

Table 3 Legal Classification and Range wise distribution of forests

The category -wise and Range- wise forest area in Palampur Forest Division is represented in pie diagram as under in figure 2 and 3 respectively.

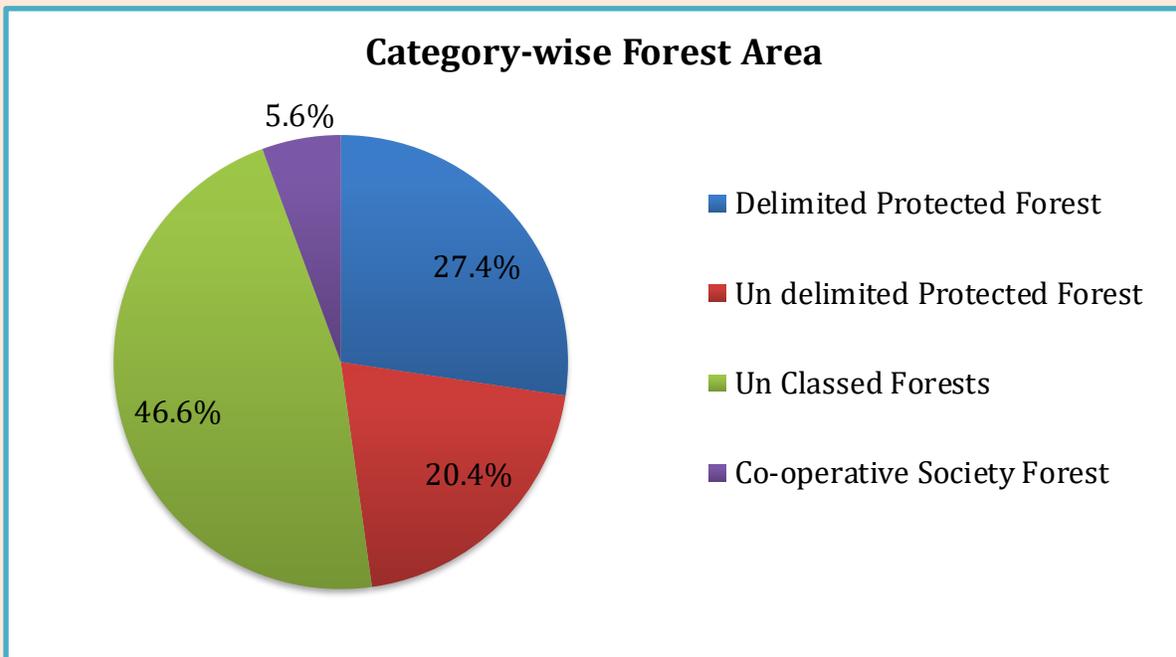


Figure 2 Category wise (Delimited Protected Forest, Un-delimited Protected Forest, Un- classed Forest and Co-operative Forest) forest area of Palampur Forest Division

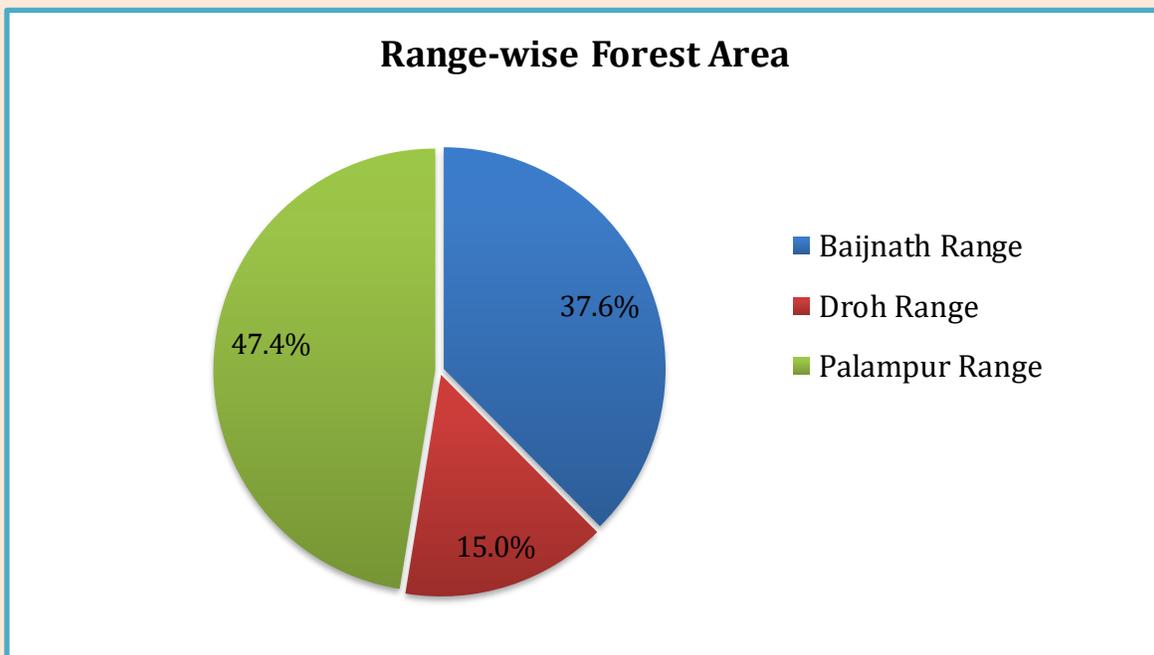


Figure 3 Range wise (Baijnath Range, Droh Range and Palampur Range) forest area of Palampur Forest Division

Forest Flora

The forests of this division are scattered over a large tract vastly varying in various locality factors. The vegetation therefore varies from dry scrub forests at the lower altitude to alpine-pastures at the higher elevations. In these two extremities, occur distinct vegetation zones of **Chil**, **Ban oak**, mixed conifers (Mainly **Kail**, **Fir** and **Spruce**) and **Kharshu oak** forests. The present condition of these forests is as a result of extremely heavy burden of numerous loosely defined rights of user groups and very heavy incidence of grazing, especially in the Un-delimited and Un-classed forests.

The naturally occurring forests of this division are of large number of forest types ranging from Dry Tropical Forests to Moist Alpine Scrub. The forests in Palampur Forest Division stretch from the bank of Beas to the tops and slopes of lofty ranges of Dhauladhar, which separate the Bharmour Forest Division. These present a large variety of different features and a great diversity of climate and vegetation. The altitude difference of 590 meters near Alampur to 5200 meters on the main ridge coupled with aspect and biotic influence results in a diversified and rich forest flora started with river bank species like **Shisham**, **Khair**, **Kamal** and ending with **Spruce**, **Fir** and **temperate pastures**. The riparian species are replaced by Dry Mixed Deciduous Forest above the bank of river, streams and continue up to elevations of 1000 meters where the ground is taken over by **Chil** which extends up to about 1900 meters beyond which there are stretches of **Ban**, **Kail** and very few **Deodar** providing ground to **Spruce**, **Fir** and **Kahrshu. Oak** and **Brass** are found both as under-story (in **Kail**, **Spruce** and **Fir** forests) and as pure crop in temperate zone. Walnut, Horse Chestnut, Maple and Bird cherry etc. are found scattered in temperate zone and in glades in the depression.

Data Sources and Techniques:

Working plans from the Himachal Pradesh Forest Department were consulted and the species composition change during the successive working plans was analyzed for the said forest division.

Palampur Forest Division: 1981-82 to 1995-96 and 2010-11 to 2024-25

Respective data were collected from the State Forest Library of Himachal Pradesh (Mist Chamber). Based on the information from the Working Plans for the Palampur Forests, tree communities/working circles were identified however, the forests/compartments under particular working circles are pure forests (composed of one species e.g. Chil working circle). For every forests, tree density (Ind/ha) were calculated for *Pinus roxburghii* and Ban Oak to observe the change between different years of enumeration (1981 to 2025).

Working plan is a written scheme of management that aims to ensure continuity of policy action, and controlled treatment of a forest. Within a working plan, Forest Division is the basic unit. This document is utilized to evaluate status of forests and the biodiversity resources within a particular division.

S.N.	Tree species community/Working Circle	No. of Forest/Compartment	Area (ha)	Forest Ranges
1	<i>Pinus roxburghii</i>	173	2396.18	Baijnath, Droh and Palampur
2	Ban Oak	17	465.07	Baijnath
	Total	190	2861.25	3

Table 4 Details on species community, Forest Compartments and area assessed under Palampur Forest Division

Assessment techniques

Tree Community-based Variations

The forest division constitutes different tree communities where dominant species is identified based on its relative density (more than 50 per cent categorized as dominant community). However, most of the forests of Palampur Forest Division consist of pure communities or working circles where single species is dominant. For each of the identified pure species in Solan Forest Division, variations in density were determined for the two time periods i.e. 1983 and 2017.

Results & Findings

This section presents the findings from the assessment of the tree communities or working circle and diameter class wise species composition for Palampur Forest Divisions. The compartments with *Pinus roxburghii* composition, density was calculated for different year of enumerations. The results from different species are explained species wise below:

Key Terminologies

Tree community: Group or association of populations of two or more different tree species that occupy the same geographical area at a particular time period

Forest compartment: A section of forest with homogeneous growth conditions and tree species

Pinus roxburghii community:

According to Sir Harry G. Champion and S.K. Seth (1962), Chil Pine occurs in three types of forests viz. **Sub-Tropical Pine Forest, Type 9/C1a: Lower Shiwalik Chil Pine Forests and Type 9/C1b: Upper or Himalayan Chil Pine Forests.** The Sub-tropical chil pine forest occurs between altitudes of 800 meters to 1800 meters. The main species is *Pinus roxburghii* which occurs in pure forest in this tract. The best growth of chil in this tract is found between 1200 meters to 1700 meters elevation on loose, sandy loam soils derived from hard sand stones.

The lower Shiwalik Chil Pine Forests occurs on steep dry slopes below 1000 meters elevation mainly on Shiwalik conglomerates and sand stones. This type is mainly confined to Droh and Panaper Block of Palampur range. The common associates of Chil in this sub-type are *Terminalia chebula*, *T. Belerica*, *Mallotus phillippinensis*, *Pyrus pashia*, *Syzygium cumini*, *Phyllanthus emblica*, *Albizzia*. The under growth of *Carrisa opaca*, *C. spinarum*, *Dodonaea viscosa*, *Flacourtia sp*, *Rubus sp*, *Murraya Koenigii* is moderately thick with grass growth of *Heteropogon contortus*, *Cymbopogon martini*, *Chrysopogon*, *Montana* and *Themeda anthera* etc.

The third sub-type occurs mainly between 1200 meters to 1800 meters and is found mainly in Palampur and Baijnath ranges. The majority of Chil forests of this division belong to this sub-type. This sub-type is characterized by more or less pure crop of Chil with a light mixture of *Quercus leucotrichophora*, *Rhododendron arboretum*, *Pyrus pashia* and *Lyonia ovalifolia* etc. towards the upper limits and *Albizia sp*, *Syzygium cuminii*, *Ficus sp*, *Terminalia chabula*, *T. Belerica* and *Bauhinia sp*. towards lower limits. The under growth of *Lantana camara*, *Pogstemon Plactranthoides*, *Myrsine Africana*, *Berberis sp*, *Rubus sp*, *Murraya koenigii*, *Woodfordia fruticosa* and *Carissa sp* is generally scanty.

Pinus roxburghii community is also known as Chil working circle as per the enumeration records. This working circle comprises of all such forests where chil is found either pure or in fair proportion and are considered suitable for application of the system of concentrated regeneration fellings. Under this working circle, 173 forests compartments were assessed and analysed covering an area of 2396.18 ha. All the compartments of this working circle or community are composed of *Pinus roxburghii* which fall in all three forests ranges (Baijnath, Droh and Palampur) of Palampur Forest Division.

Results revealed that *Pinus roxburghii* is increased from 215.3 to 284.9 Ind/ha (form enumeration year 1981 to 2010 respectively) showed in Figure 4. Finding from Diameter classes showed that the number of *Pinus Roxburghii* sapling is more in diameter classes from 10-20 cm to 30-40 cm which is increased as compared to previous year. The above diameter classes from 40-50 cm showed decreased and density of the same species as showed in Figure 5. The remarkable feature of *Pinus roxburghii* is fire hardy, highly adaptable to climate and high regeneration rate, this feature can be seen in 1st two diameter classes of Figure 5.

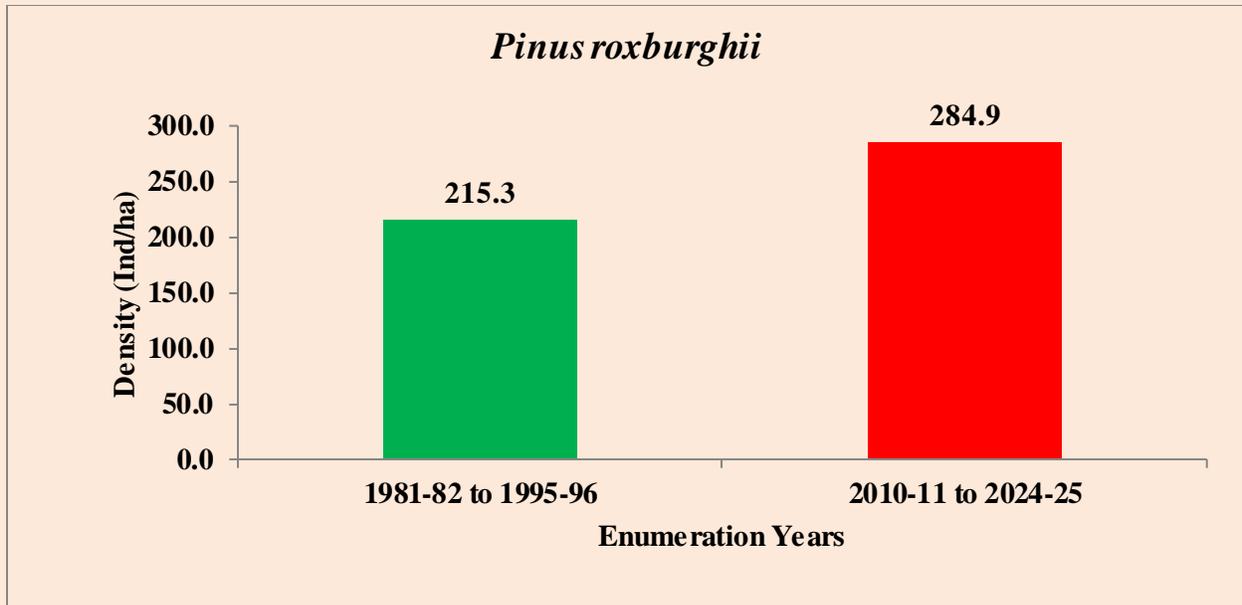


Figure 4 Density variations in *Pinus roxburghii* community, Palampur Forest Division, 1981-82 to 1995-96 and 2010-11 to 2024-25

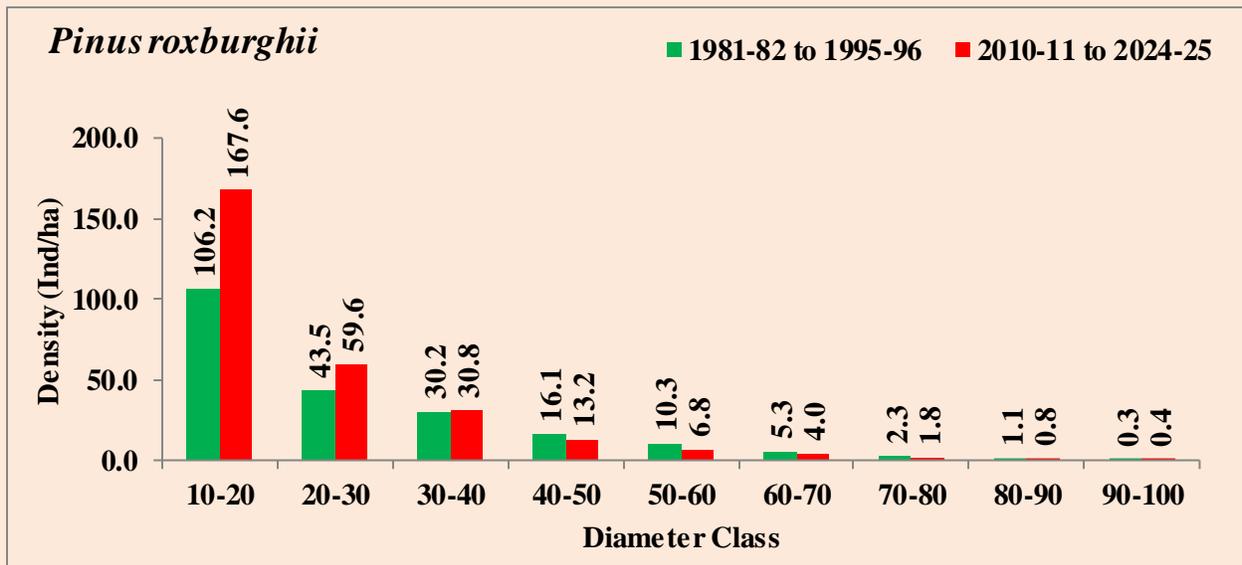


Figure 5 Diameter class wise variations in tree density of *Pinus roxburghii* of Palampur Forest Division, 1981-82 to 1995-96 and 2010-11 to 2024-25

Ban Oak Community:

The Ban Oak (or *Quercus leucotrichophora*) species of Palampur Forest Division occurs in **Type 12/C1a: Ban Oak Forest of 9 Group 12: Himalayan Moist Temperate Forest**. The altitude of this tract is between 1500 meters to 3300 meters, the limits varying with aspects and configuration. This sub-type confined to the elevation range of 1600 meters to 2300 meters (Palampur and Baijnath forest ranges of Palampur Forest Division). The Ban Oak crop is generally pure, open canopied and of short bole. The average top height of ban trees in these forests is 21 meters to 22 meters. On the cooler favourable sites there is an appreciable mixture of *Rhododendron arboretum*, *Pieris ovalifolia*, *Pyrus pashia*, *Litsea umbrosa* and *Cedrella serrata* etc. The undergrowth of *Berberis aristata*, *Indigofera sp*, *Sarcococca saligna*, *Dephne cannabina*, *Arundinaria falcate*, *Rubus sp* and **ferns** is moderate to dense depending upon the incidence of grazing.

Ban oak community or Ban oak working circle represent the *Quercus leucotrichophora* as a dominant species. There were 17 compartments which were assessed and analyzed have an area of 465.07 ha in the Baijnath forest range of Palampur Forest Division. Observation showed that the density of *Quercus leucotrichophora* is significantly decreased from 92.8 to 54.9 Ind/ha for two enumeration year as shown in Figure 6.

Diameter class wise observation showed a gradual decrease in density from diameter class 10-20 cm to 90-100 cm. The bars on Figure 7 showed maximum number of small trees in lower diameter classes which showed decreasing trends in population in larger diameter classes. However, the density of larger trees above 50-60 cm diameter class were good in year 1981-82 but is now decreased in recent year of enumeration i.e. 2010-11 to 2024-25.

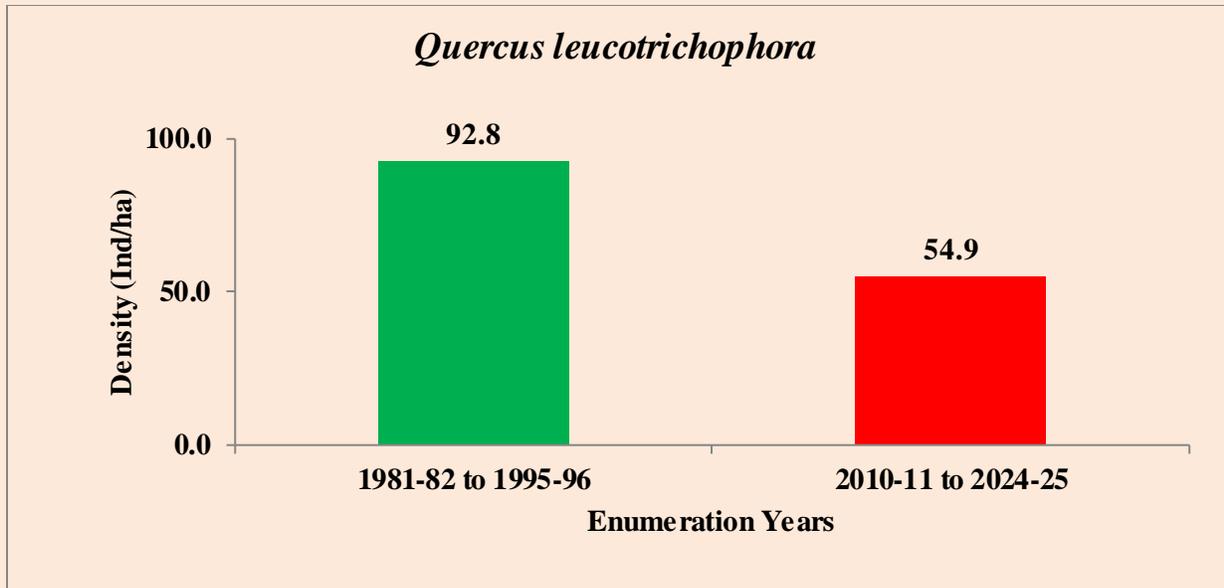


Figure 6 Density variations in *Quercus leucotrichophora* community, Palampur Forest Division, 1981-82 to 1995-96 and 2010-11 to 2024-25

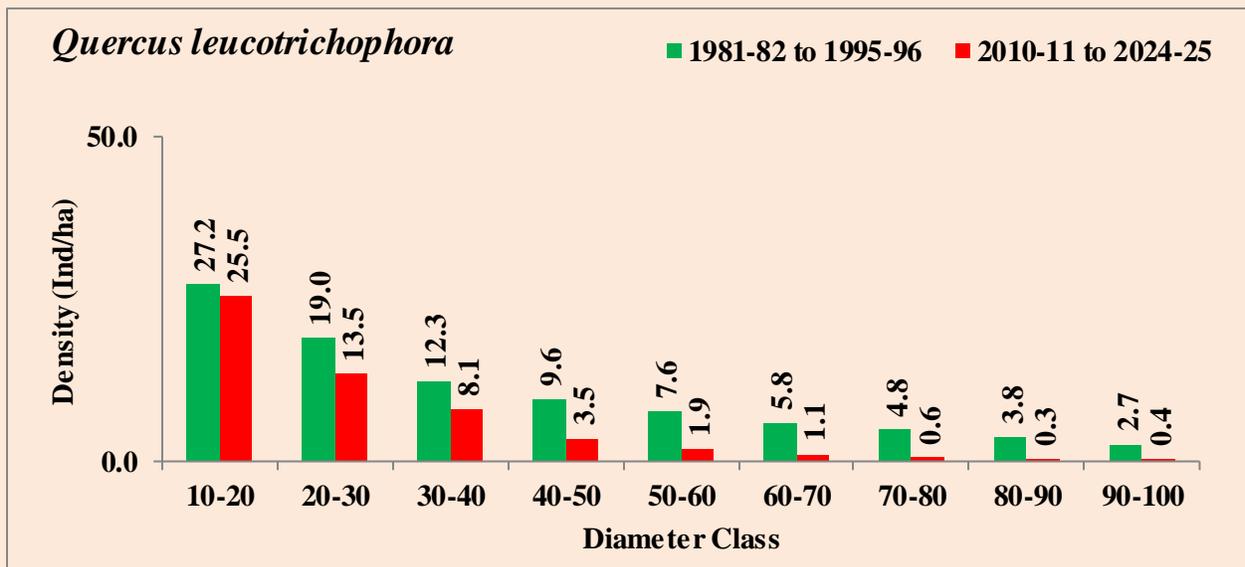


Figure 7 Diameter class wise variations in tree density of *Quercus leucotrichophora* of Palampur Forest Division, 1981-82 to 1995-96 and 2010-11 to 2024-25

Conclusion

The present study was done to analyse the temporal change in tree species composition of Palampur Forest Division based on the Forest working plans of Himachal Pradesh. The study encompasses the temporal change in tree species only (as forest working plans systematically enumerates only tree species). The present study revealed the status of change in tree species present in communities and working circle of the forest division.

There are 190 compartments which were studied and analyzed to get the status of species and their fluctuations in the Palampur Forest Division. These forest compartments belong to three forest ranges namely Droh, Baijnath and Palampur forest range with a total area of 2861.25 ha. Only two forest working circle were found in Palampur Forest Division i.e. Chil Working circle (having *Pinus Roxburghii* as dominant species) and Ban oak Working circle (with *Quercus leucotrichophora* as dominant species).

Finding revealed that *Pinus roxburghii* of Chil Working Circle is increased from 215 to 285 Ind/ha in the two different years of assessment. As mentioned above that most of the Chil forests belong to Type 9/C1b: Upper or Himalayan Chil Pine Forests in Palampur and Baijnath ranges. The reason behind its increase may be due to Natural regeneration which is normally abundant and get easily established if protection against grazing and fire is ensured. At the higher reaches, occasional fire is normal which is not much harmful for Chil but help in elimination of other moisture loving broad-leaved species.

However, Ban Oak (*Quercus leucotrichophora*) of Palampur forest division is decreased from 93 Ind/ha to 55 Ind/ha from year 1981-82 to 1995-96 and 2010-11 to 2024-25 respectively. This change in density were observed in compartments of Andretta, Bhagpur and Kandbari forests, of which 17 compartments were assessed with an area of 465.07 ha of Baijnath range only. Most of these compartments are situated near habitations are much exposed to damage by heavy lopping for fodder and hacking for fuel. Natural regeneration is satisfactory but is mainly affected by grazing, fire and maltreatment by

local inhabitants. In some degraded ban oak forests on the warmer aspects and towards ridge it is being replaced by Chil.

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