

HIMACHAL PRADESH GOVERNMENT FOREST DEPARTMENT

WORKING PLAN FOR THE FORESTS OF PARVATI FOREST DIVISION

**VOLUME-1
(2020-21 TO 2030-31)**

BY

Smt. Meera Sharma, (IFS)

Sh. Sandeep Sharma, (IFS)

Sh. Hira Lal Rana, (HPFS)

Dr. Kirupasankar M., (IFS)

Sh. Angel Chauhan, (HPFS)

Sh. Aishwarya Raj, (IFS)

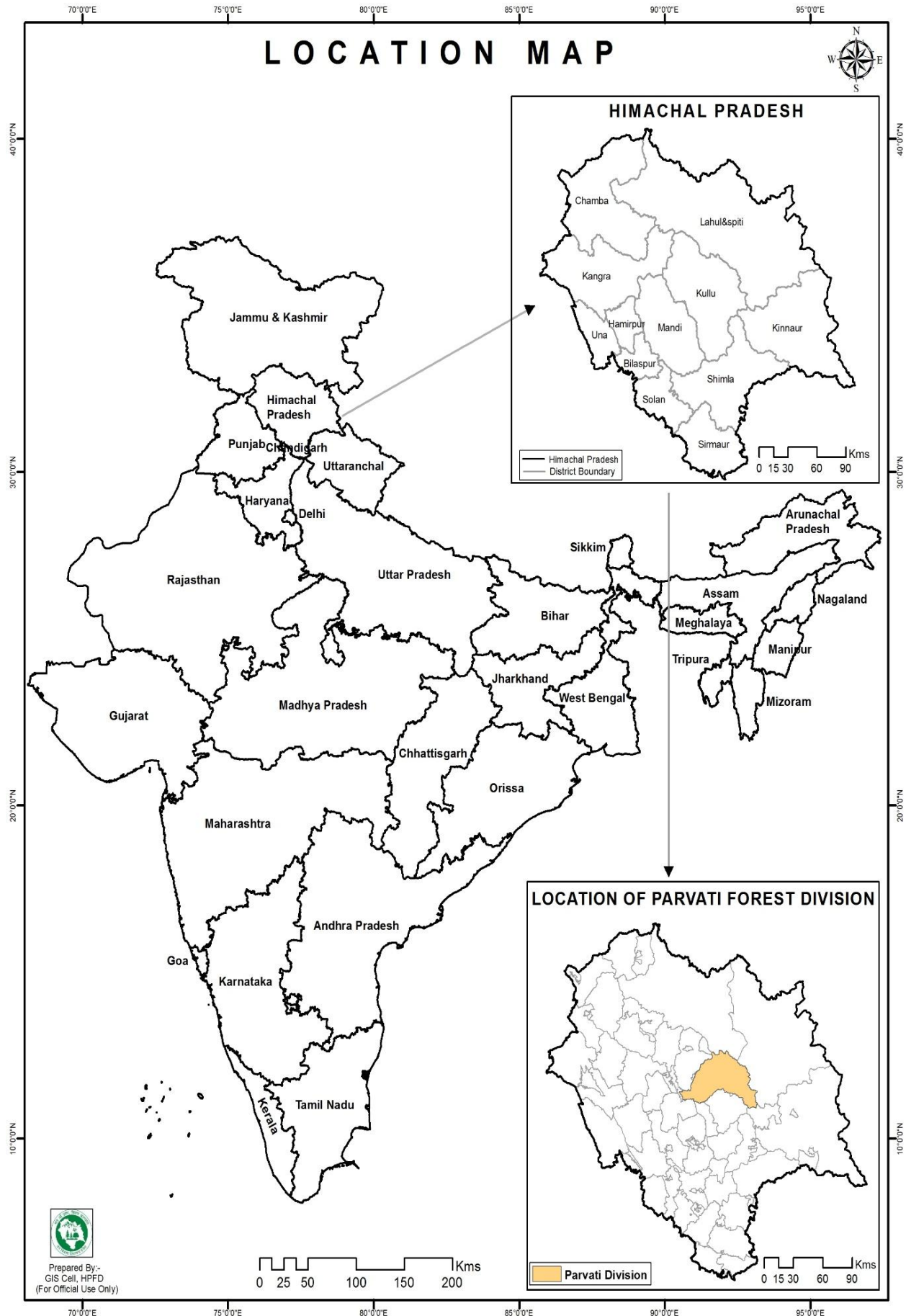
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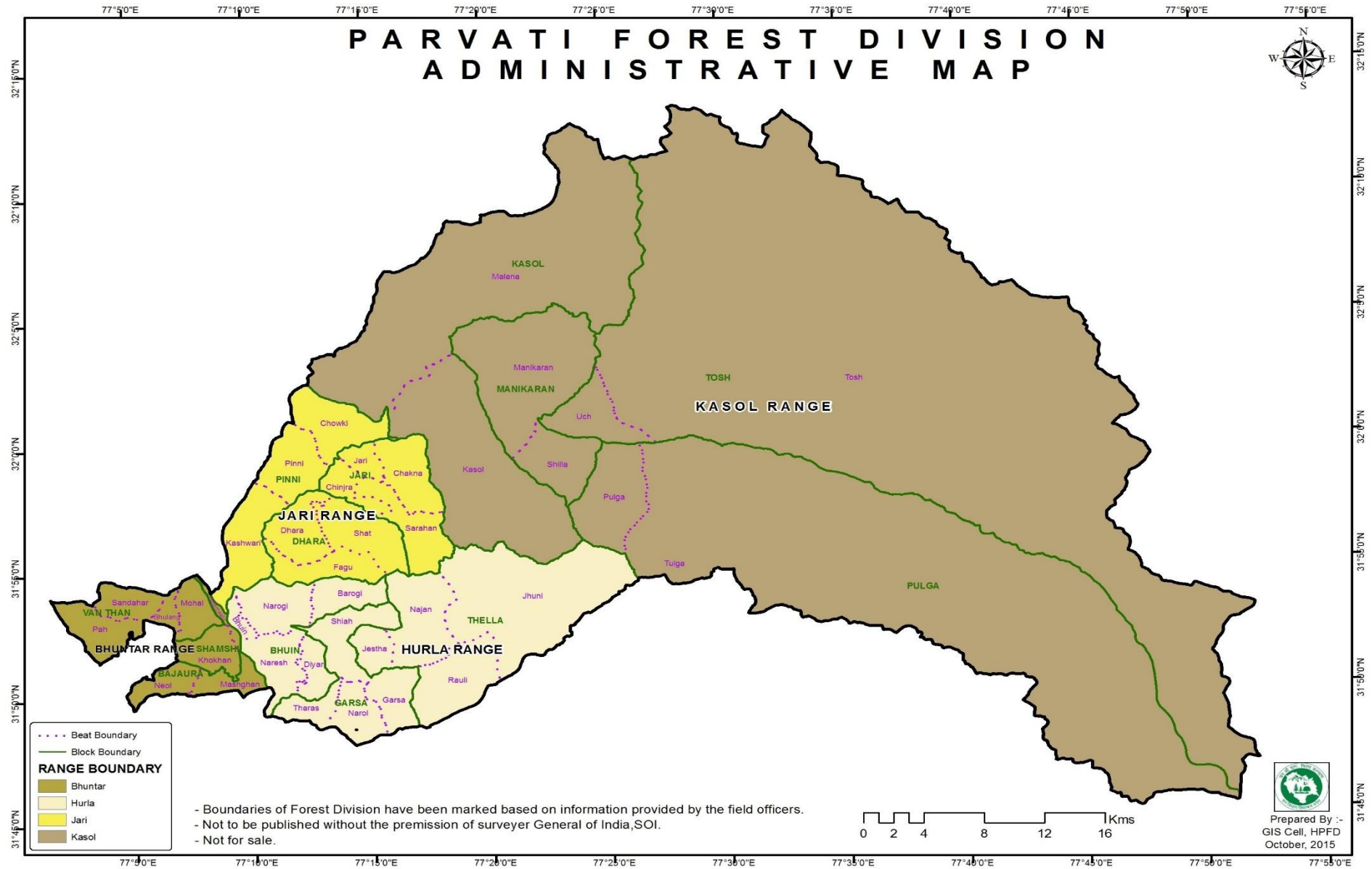
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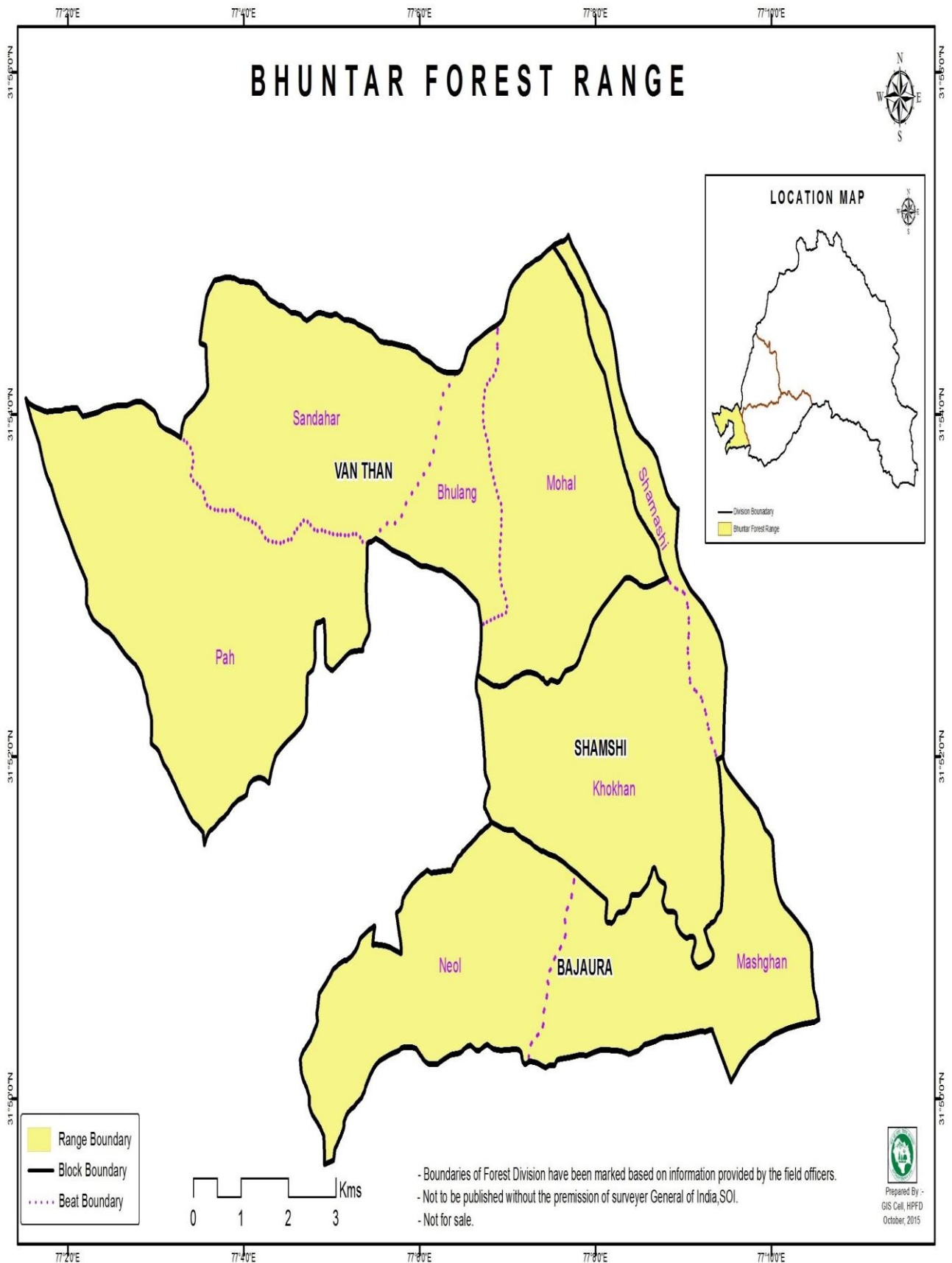
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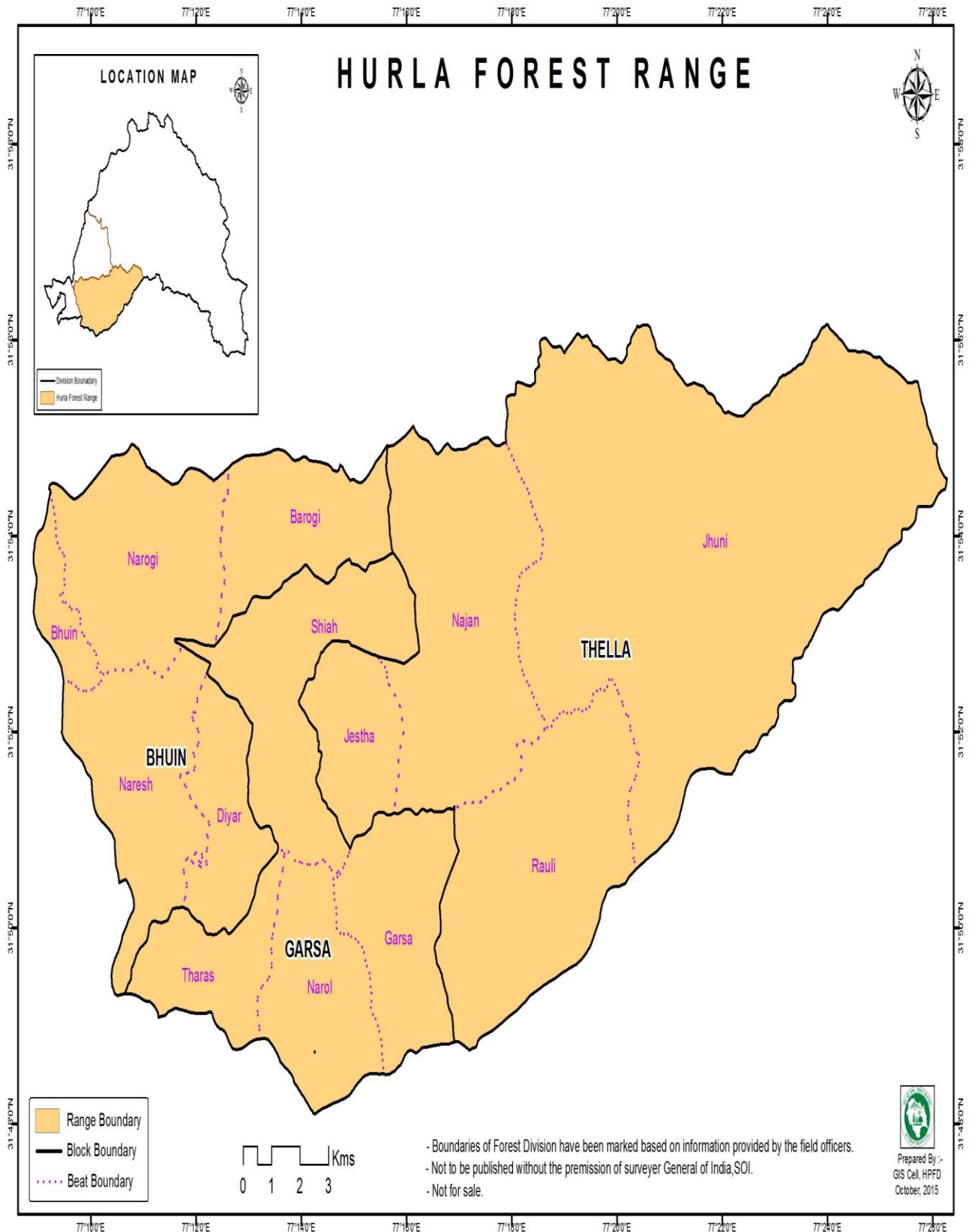
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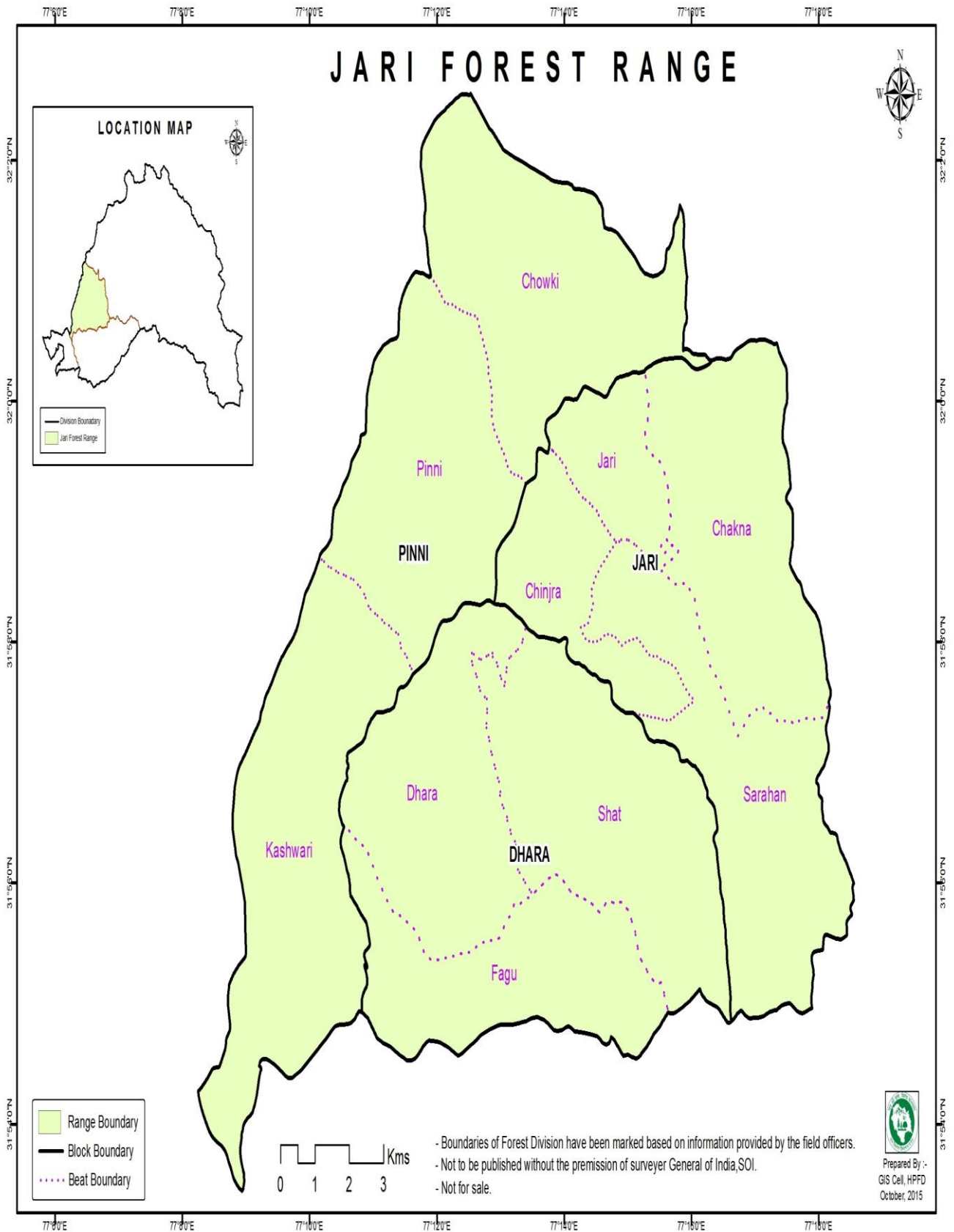
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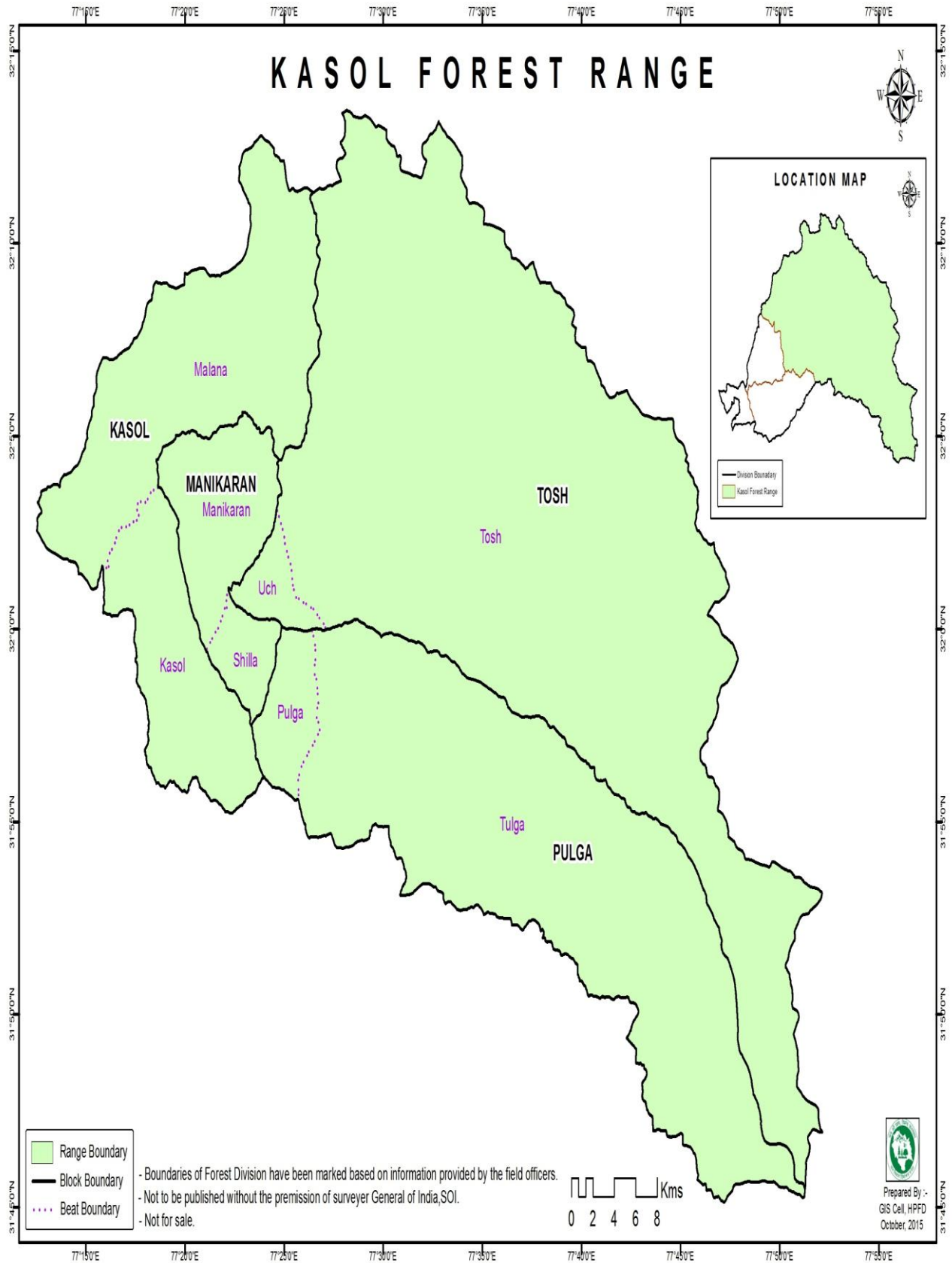












INTRODUCTION

This working plan is a revision of Sh. J.S. Walia's Plan (1994-95 to 2009-10) but includes only the tracts falling in jurisdiction of Parvati Forest Division. The wild life sanctuary areas of Khokhan and Kanawar Wild Life sanctuaries not included. Smt. Meera Sharma was assigned the work of writing Working Plan along with her duties as DFO (T) Parvati. After that the Working Plan writing work was further carried out by Sh. Sandeep Sharma and then Sh. Hira Lal Rana alongwith their duties as DFO (T) Parvati. The field work began in October 2012 and Final draft copy was submitted in April, 2018. For the first time the enumeration was conducted by using Grid System based technology in Parvati Tract on Pilot basis. The WPO and entire field staff was new to this technology. The enumeration data was further to be analyzed by FSI. Hence there was delay in submission of final draft of working plan.

The emphasis in the present working plan is on conservation and changes that occurred over a period of time have been incorporated in this plan based on the present crop constitution, silvicultural requirement of the crop, guidelines of National Working Plan code 2004 and lessons learnt from past management, Accordingly chapters on activities of State Forest Development Corporation Ltd, Five year plans and Overlapping Working Circles for Wild Life Management, Participatory Forest Management and Non Timber Forest Produce have been included in this plan.

The Working Plan Officer and his staff have made very exhaustive effort and hence deserve all appreciation for having completed Revision of Working Plan in spite of all constraints.

The revised Working Plan has been written for a period of fifteen years commencing from 01.04.2018 to 31.03.2032. The working plan under revision expired on 31.03.2010. The working plan prescriptions were not particularly followed as there was complete ban on green felling in the state and only salvage removals were done, therefore there is no problem in making this plan operative prospectively from 01.04.2018. It is expected that the information provided and the prescriptions suggested in the plan would be very useful in deciding the management practices in the future.

Sh. P.L. Chauhan, IFS
Add.PCCF (Working Plan & Settlement) Mandi, HP

ACKNOWLEDGEMENT

Revision of Working Plan of Parvati Forest Division has been a great learning experience. This was a challenge to accomplish the task along with a very busy schedule of territorial division like Parvati. It required Planning, execution in field, collection and compilation of various important data from different sources and computer work. It has been a team effort and was impossible to be achieved single handedly without the support of the field and ministerial staff posted in the Parvati Forest Division.

Special thanks are due to Sh. G.S. Goraya, IFS ret'd. Pr, CCF, HP, Dr. Savita IFS, Pr CCF (HoFF), Sh. Sanjeeva Pandey, IFS Pr. CCF (Working Plan), Sh. Tejinder Singh IFS Adll, Pr. CCF (Working Plan & Settlement) then Sh. P.L. Chauhan, IFS Adll, Pr. CCF (Working Plan & Settlement) Mandi, Sh. K.D. Sharma, IFS, CCF (Working Plan & Settlement) Mandi, Sh. HV Kathuria, IFS, CCF (WP&S) Mandi for their guidance, encouragement and help during the final drafting of the Working Plan.

Sh.G.C.Hosur,IFS,CF, Kullu (T) provided the necessary platform to build up this plan on his PWPR. Then Sh.B.L.Negi, IFS,CF Kullu (T) and Sh. Anil Sharma, IFS, CF Kullu(T) helped in final drafting of the Working Plan.

The contribution and guidelines of FSI Dehradun and Regional Office of FSI at Shimla were of great use for completion of Working Plan. Regional Office, provided all necessary help by imparting training to the field staff, helped a lot in compilation of data in desired format and then got the enumeration data analysed from FSI Dehradun. Hence special thanks to Sh. B.D. Sayal, IFS, Regional Director, FSI (North Zone) Shimla and his team.

Smt. Meera Sharma IFS, Sh. Sandeep Sharma IFS, Sh. Hiralal Rana, HPFS and Dr. Kirupashankar M. IFS provided valuable contribution to the making of the Working plan with their deep insights on the subject of forestry and people management. Sh. Kamal Jaswal, HPFS, ACF Parvati provided the necessary momentum to the completion of field work, Working Plan writing and compilation after he assumed charge of Parvati Division as Assistant Conservator of Forest. His contribution is highly appreciated and acknowledged.

Special Thanks to Sh. Ishan Sharma, MCA, and running private computer centre at Bhunter. He has typed all the Working Plan Chapters, Compartment History Files and prepared all the Tables and Annexures and Maps.

The ministerial staff of DFO Parvati especially Ms. Tanzin Palmo, Pushpa & Tikam Singh merit special mention for their whole hearted co-operation in helping out during the field work and making available data from time to time for compilation/updating in this Working Plan in addition to their heavy work load. I would like to acknowledge the valuable contribution made by the then R.O Kasol, Sh. Tejsvi Ram, R.O Jari, Sh. Rajeev Sharma, R.O FWS Beena Devi, Fgd Shalini Negi, Sanjay Thakur, Fgd. Disha Fgd. Manmohan Sharma and all field staff of Parvati Division.

Aishwarya Raj

DFO cum Working Plan Officer, Parvati (HP)

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EXECUTIVE SUMMAR

PARVATI FOREST DIVISION

Kullu District also called the ‘heavenly abode of Gods’, is predominantly a hilly tract where Forests have a significant role with respect to tree cover, soil and water conservation, watershed values as well as aesthetic values which make it a tourist hub.

The history of forest management in Kullu is traced back to 1881 when Kullu Forest Division (then Parvati Forest Division being part of Kullu Forest Division) came into being. It was only during the middle of 19th century, when princely states transferred to the crown, the forests of Kullu started being managed scientifically. Departmental fellings done by the government were used on mere rough estimate of yields, as no proper working plan/ scheme existed. In the first Working Plan, an attempt to secure regular sustained yield, came about, only after CP Fisher took the task of preparing the first working plan in 1894. Value was only given to Deodar, while other species were considered inferior and their felling was considered only with reference to right holders demand. Deodar yield calculations were done separately for each range and working circle. The annual yield was fixed by the number of ‘1’ Class trees. Considerable attention was paid to improvement felling and thinning which results in establishment of fairly large area of even aged young crop of Deodar and Kail. Second Working Plan written by Sir, E.G.Trevor, came into operation from 1919-20 adopted the Uniform System. He placed all the forests except the most precipitous ones, into four working circle, so that definite forest areas could be closed and regenerated during fixed period of years.

Since then it is 8th working plan of Parvati Forest Division. From Management point of view following work circles is constituted:

1. Deodar-Kail Working Circle.
2. Fir Working Circle.
3. Protection Working Circle.
4. Grazing and Improvement Working Circle.
5. Broad Leaved Over-lapping Working Circle.
6. Wild Life (Overlapping) Working Circle.
7. Plantation (Overlapping) Working Circle.
8. Participatory Forest Management (Overlapping) Working Circle.
9. Non Timber Forest Produce (Overlapping) Working Circle.

There are four ranges namely Bhunter, Jari, Hurla and Kasol. Parvati and Beas Rivers are the Major Rivers that flow throughout the length of the division. Due to existence of many perennial rivulets, there are any Hydro Electric Projects coming up in the division and are no causing heavy damage to forests an eco-system. Total Geographical area of Parvati Division is 201133.83 Ha out of which total Forest area is 169778.79 Ha. The location of the Division lies at Longitudes-76°59’ & 77°50’ East and Latitudes- 31°41’ & 32°26’ North. The detail of the forest area is as under:

A.	Category wise Forest area	Area (Ha)
i	RF	4303.71
ii	1 st Class DPF	13142.62
iii	2 nd Class DPF	133287.69
iv	New DPF	-
v	UPF below 3000m elevation	19044.79
B.	Area by Working Circle	Area (Ha)
i	Deo/Kail Woking Circle	6647.07
ii	Fir Woking Circle	6710.27
Iii	Improvement Woking Circle	-
iv	Protection Woking Circle	135705.25
v	Broad Leaved Woking Circle	1672.09

Enumeration has been carried out in the Workable Sample Plots supplied by FSI Dehradun. Whole the tract of Division was divided by FSI by using grid system into 1518 Nos Sample IDs. Out of this 489 Nos Sample Plots were workable and were enumerated. The enumeration data of 489 Nos Sample Plots was analysed by FSI Dehradun. The per Ha stems and volume data was thereafter extrapolated to assess the growing stock. The annual yield for each working circle for major species is calculated by different formulas and is prescribed on safer side (around 50% of Mean Annual Increment) in Deodar Kail Working Circle and Fir/Spruce Working Circle. The abstract of prescriptions is as under:

Name of W.C.	Silviculture System	Rotation Period in yrs	Exploitable Diameter at dbh	Regeneration Period in yrs	Annual Yield Prescribed in cum			
					Species	PB I	PB III	PB IV
Deodar & Kail WC	Punjab Shelterwood System	120 years	60 cms	30	Deodar	1500	250	200
					Kail	1600	290	200
					Rai/Fir	2000	350	250
Fir WC	--do--	120 years	60 cms	30	Rai/Fir	6400	-	-

The Kanawar Wildlife Sanctuary falls inside the Division and its area has been excluded from management point of view. Khokhan and Nargu Wildlife Sanctuaries are located adjoining Bhunter Range of this Division. After rationalization of these Wildlife Sanctuaries the transfer and receipt of areas has been undertaken between this Division and Wildlife Division Kullu. As a result the total forest area including UPFs of Parvati Division is 169778.79 Ha. Govt has also issued Intension Notification for constitution of one National Park (Khirganga National Park) in Kasol Range of this Division.

The major problems of the area rampant encroachments particularly in IIIrd class forests where boundaries of forest are not clear and areas are interspersed with habitation. Other problems of the area are illicit fellings, illegal mining, lack of natural regeneration, stray cattles, overgrazing, soil erosion, very heavy tourism pressure and heavy demand of forest land diversion for hydroelectric projects, roads, infrastructure and military establishments etc.

A comprehensive study of the Beas Catchment was got conducted by the department through Neril. This shall be a very handy tool for planning Catchment Area Treatments as well as other interventions in the divisions.

There is no record of 3rd class forests at all available with Forest Department. Therefore it is expedient that record of all 3rd class forests be procured from Revenue Department as a special drive by engaging revenue staff ad made available to all field functionaries for better management and control.

Vision statement:

To bring in elaborate scientific management systems in to the working of our rich floral and faunal diversity and maintain a systematic and sustainable working mechanism for all our forests.

Goal :

The major goal of this working plan is to ensure healthy and sustainable ecosystems, to provide multiple benefits for people within the capability of sustainable ecosystem and to ensure effective public service through organizational effectiveness and scientific forest management.

Objectives:

The objectives of this working Plan are:

- Conservation of forest and reduction of forest degradation ,
- Enhancement of the sustainable management of forest and biodiversity,
- Achieving sustainable yield and maintaining the flow of ecosystem services,
- Fulfilling the increasing demand of local people through forests in a win-win scenario viz conservation and sustainable development.

We expect to get a document which will be a guiding Bible for all coming sustainable management of forests in Parvati division. It will help amalgamate all the best practices into one unique document for best results in all our management practices.

List of trees, shrubs, climbers and herbs commonly found in Parvati Forest Division.

Botanical Name	Family	Local Name	English Name
TREES			
<i>Abies pindrow</i>	Pinaceae	Tosh	Silver fir
<i>Acer caesium</i>	Aceraceae	Mandur	Bluish Grey Maple
<i>Acer oblongum</i>	Aceraceae	-do-	Himalayan Maple
<i>Acer villosum</i>	Aceraceae	-do-	Maple
<i>Aesculus indica</i>	Hippocastinaceae	Khanor	Wild Walnut
<i>Albizzia stipulate</i> (A. <i>chinensis</i>)	Mimosaceae	Ohi	Chinese Albizia
<i>Albizzia julibrissin</i>	Mimosaceae	Siris	Silk Tree Mimosa
<i>Albizzia procera</i>	Mimosaceae	Safed Siris	White Siris
<i>Albizzia odoratissima</i>	Mimosaceae	Kala Siris	Black Siris
<i>Alnus nitida</i>	Betulaceae	Kosh	West Himalayan Alder
<i>Betula alnoides</i>	Betulaceae	-	Birch
<i>Betula utilis</i>	Betulaceae	Bhojpatra	Birch
<i>Buxus sempervirens</i>	Euphorbiaceae	Shamshad	Box wood
<i>Carpinus viminea</i>	Betulaceae	Khirk	Hornbeam
<i>Cedrella serrata</i>	Meliaceae	Darl	Hill toon
<i>Cedrella toona</i> (Toona <i>ciliata</i>)	Meliaceae	Tun	Toon
<i>Cedrus deodara</i>	Pinaceae	Dyar, Kelo	Deodar
<i>Celtis australis</i>	Ulmaceae	Khirk	Nettle tree
<i>Cornus capitata</i>	Cornaceae	Karchhan	Evergreen Dog wood
<i>Cornus macrophylla</i>	Cornaceae	-do-	Big-leaf Dogwood
<i>Corylus colurna</i>	Betulaceae	Sharol	Hazel nut
<i>Coriaria nepalensis</i>	Coriariaceae	Manshura	Masuri Berry
<i>Cupressus sempervirens</i>	Cupressaceae	Saru	Italian Cypress
<i>Cupressus torulosa</i>	Cupressaceae	Devidiar	Himalayan Cypress

<i>Dalbergia sissoo</i>	Fabaceae	Shisham, Tali	Sissoo
<i>Ehretia laevis</i>	Boraginaceae	Chamror	-
<i>Eucalyptus globulus</i>	Myrtaceae	Safeda	Blue Gum
<i>Eucalyptus citriodora</i>	Myrtaceae	Safeda	Lemon Scented Gum
<i>Euonymus tingens</i>	Celastraceae	Kala Chindwara	Purple Veined Spindle Tree
<i>Euonymus hamiltonianus</i>	Celastraceae	-do-	Himalayan Spindle Tree
<i>Ficus palmata</i>	Moraceae	Fegra	Wild Fig
<i>Ficus hispida</i>	Moraceae	-	Hairy Fig
<i>Ficus religiosa</i>	Moraceae	Peepal	-
<i>Ficus auriculata</i>	Moraceae	Tirmal	Elephant Ear Fig
<i>Fraxinus floribunda</i>	Oleaceae	Angu	Himalayan Ash
<i>Grewia optiva</i>	Tiliaceae	Bihul	-
<i>Grewia elastica</i>	Tiliaceae	-	-
<i>Hex dipyrena</i>	Illicaceae	Kanderu	Himalyan Holly
<i>Jacaranda mimosifolia</i>	Bignoniaceae	Neela Gulmohar	Jacaranda
<i>Juglans regia</i>	Juglandaceae	Khor, Akhrot	Walnut
<i>Lagerstroemia indica</i>	Lythraceae	Harshingar	Common Crape Tree
<i>Lannea grandis</i>	Anacardiaceae	Salambra	Indian Ash Tree
<i>Litsea umbrosa</i>	Lauraceae	Paror/ chirnid	Laurel
<i>Litsea chinensis</i>	Lauraceae	-do-	-do-
<i>Litsea polyantha</i>	Lauraceae	-do-	-do-
<i>Machilus odoratissimus</i>	Lauraceae	Dodru	Fragrant Bay Tree
<i>Machilus duthiei</i>	Lauraceae	-do-	-
<i>Melia azedarach</i>	Meliaceae	Darek	Persian Liliac
<i>Morus serrata</i>	Moraceae	Pahari Tut	Hill Mulberry
<i>Olea cuspidata</i>	Oleaceae	Kahu	Indian Olive tree
<i>Picea smithiana</i>	Pinaceae	Rai	Himalayan Spruce

<i>Pieris ovalifolia</i>	Ericaceae	Bheral/ Ehlan	Himalayan Pieris
<i>Pinus roxburghii</i>	Pinaceae	Chil	Long Needle Pine
<i>Pinus wallichiana</i>	Pinaceae	Kail	Blue Pine
<i>Pistacia integerrima</i>	Anacardiaceae	Kakkar	-
<i>Populus ciliata</i>	Salicaceae	Poplar	Himalayan Poplar
<i>Prunus cerasoides</i>	Rosaceae	Pajja	Wild cherry
<i>Prunus padum</i>	Rosaceae	Jammu	Bird cherry
<i>Prunus armeniaca</i>	Rosaceae	Chulli	Apricot
<i>Punica granatum</i>	Punicaceae	Dorn	Pomegranate
<i>Pyrus pashia</i>	Rosaceae	Shegal	Kainth
<i>Quercus dilatata</i>	Fagaceae	Mohru	Green Oak
<i>Quercus glauca</i>	Fagaceae	Banni	-
<i>Quercus leucotrichophora</i>	Fagaceae	Ban	Black-jack Oak
<i>Quercus semecarpifolia</i>	Fagaceae	Kharsu	-
<i>Rhododendron arboreum</i>	Ericaceae	Brah	Red Rhododendron
<i>Robinia pseudacacia</i>	Fabaceae	Robinia	White Locust Tree
<i>Rhus punjabensis</i>	Anacardiaceae	Titri	-
<i>Rhus semialata</i>	Anacardiaceae	Arkhal	Smallpox tree
<i>Salix babylonica</i>	Salicaceae	Majnu	Weeping Willow
<i>Salix elegans</i>	Salicaceae	Beuns	Elegant Willow
<i>Salix tetrasperma</i>	Salicaceae	-do-	Indian Willow
<i>Salmalia malabarica</i>	Malvaceae	Semal	Silk Cotton tree
<i>Sapindus mukorossi</i>	Sapindaceae	Reetha	Soapnut tree
<i>Taxus baccata</i>	Pinaceae	Barmi/ Rakhal	Yew
<i>Ulmus wallichiana</i>	Ulmaceae	Marinu	Big Leaf Elm
<i>Ulmus leavigata</i>	Ulmaceae	-do-	Small Leaf Elm
Shrubs			
<i>Adhatoda vasica</i>	Acanthaceae	Basuti	Malabar Nut

<i>Artemisia vulgaris</i>	Asteraceae	Drubsha	Mugwort
<i>Artemisia vestita</i>	Asteraceae	Drubsha	Russian Wormwood
<i>Berberis aristata</i>	Berberidaceae	Daruhaldi	Chitra
<i>Berberis chitria</i>	Berberidaceae	Daruharidra	Chitra
<i>Berberis lycium</i>	Berberidaceae	Kashmal	Indian Barberry
<i>Buddleja paniculata</i>	Scrophulariaceae	Safed chindua	Butterfly Bush
<i>Cocculus laurifolius</i>	Menispermaceae	-	Laurel Leaved Snail Tree
<i>Colebrookea oppositifolia</i>	Lamiaceae	Bansa	Indian Squirrel Tail
<i>Cotoneaster acuminatus</i>	Rosaceae	Riunsh	-
<i>Cotoneaster bacillaris</i>	Rosaceae	Riunsh	-
<i>Cotoneaster microphyllus</i>	Rosaceae	-	Rockspray Cotoneaster
<i>Daphne papyracea</i>	Thymelaeaceae	Gandiri	Indian Paper Plant
<i>Desmodium sambuense</i>	Fabaceae	Safed Kathi	Many Flowered Desmodium
<i>Desmodium tenuifolium</i>	Fabaceae	-do-	Slimleaf Tictrefoil
<i>Deutzia corymbosa</i>	Hydrangeaceae	Chururu	-
<i>Deutzia staminea</i>	Hydrangeaceae	-do-	Long Stamen Deutzia
<i>Elsholtzia polystachya</i>	Lamiaceae	Pothi,Jaunkra	Shrubby Mint
<i>Euphorbia royleana</i>	Euphorbiaceae	Thor	Danda Thor
<i>Euphorbia prolifera</i>	Euphorbiaceae	-	-
<i>Euphorbia tirucalli</i>	Euphorbiaceae	-	-
<i>Euonymus lacerus</i>	Celastraceae	-	-
<i>Ficus hispida</i>	Moraceae	Dagre	Hairy Fig
<i>Indigofera gerardiana</i>	Fabaceae	Kathi	-
<i>Indigofera hebepetala</i>	Fabaceae	-	Fuzzy Petal Indigo
<i>Indigofera heterantha</i>	Fabaceae	-	Himalayan Indigo
<i>Indigofera pulchella</i>	Fabaceae	Kaali Kathi	Cassia Indigo

<i>Inula cappa</i>	Asteraceae	-	-
<i>Inula grandiflora</i>	Asteraceae	-	Showy Inula
<i>Ipomoea species</i>	Convolvulaceae	-	-
<i>Jatropha curcas</i>	Euphorbiaceae	Japhlota	Physic Nut
<i>Juniperus communis</i>	Cupressaceae	-	Common Juniper
<i>Lonicera angustifolia</i>	Caprifoliaceae	Changari	-
<i>Lonicera parvifolia</i>	Caprifoliaceae	-	Blueberry Honeysuckle
<i>Lonicera quinquelocularis</i>	Caprifoliaceae	Changari	-
<i>Myrsine Africana</i>	Myrsinaceae	Kanaru/ bandraru	Cape Myrtle
<i>Nerium odorum</i>	Apocynaceae	-	Oleander
<i>Plectranthus rugosus</i>	Lamiaceae	Chichri	-
<i>Plectranthus coetsa</i>	Lamiaceae	Bangra	-
<i>Potentilla fruticosa</i>	Rosaceae	-	Shrubby Cinquefoil
<i>Potentilla rigida</i>	Rosaceae	-	-
<i>Prinsepia utilis</i>	Rosaceae	Bekhal	-
<i>Prunus persica</i>	Rosaceae	Aru	Peach
<i>Rhus continus</i>	Anacardiaceae	Rikhal	-
<i>Rhus punjabensis</i>	Anacardiaceae	-do-	-
<i>Rhus semialata</i>	Anacardiaceae	-do-	-
<i>Rhododendron campanulatum</i>	Ericaceae	Kashmiri patha	Pink Rhododendron
<i>Rubus biflorus</i>	Rosaceae	Kala akha	-
<i>Rubus ellipticus</i>	Rosaceae	Kala akha	Yellow Himalayan Raspberry
<i>Rubus lasiocarpus</i>	Rosaceae	-do-	-
<i>Rubus paniculatus</i>	Rosaceae	-do-	Heart Leaf Raspberry
<i>Salix hastate</i>	Salicaceae	Buens	-
<i>Salix denticulata</i>	Salicaceae	Buens	Elegant Willow

<i>Salix daphnoides</i>	Salicaceae	Bueus	-
<i>Sarcococca saligna</i>	Euphorbiaceae	Charabri	-
<i>Skimmia laureola</i>	Rutaceae	Nayr	Kasturi Patra
<i>Spiraea canescens</i>	Rosaceae	Chaku, khusti	Grey Stem Spiraea
<i>Spiraea bella</i>	Rosaceae	-	Pretty Spiraea
<i>Spiraea lindlayana</i>	Rosaceae	Kaltiri	-
<i>Spiraea vestita</i>	Rosaceae	-	-
<i>Solanum verbascifolium</i>	Solanaceae	Ban tamakhu	Tree Tobacco
<i>Symplocos crataegoides</i>	Symplocaceae	-	-
<i>Syringa emodi</i>	Oleaceae	-	Himalayan Lilac
<i>Tamarix gallica</i>	Tamaricaceae	Jhao	Indian Tamarisk
<i>Viburnum coriaceum</i>	Caprifoliaceae	Diha	-
<i>Viburnum cotinifolium</i>	Caprifoliaceae	Dab	Smoketree Leaved Viburnum
<i>Viburnum stellulatum</i>	Caprifoliaceae	-	-
<i>Viburnum nervosum</i>	Caprifoliaceae	Tilenal	-
<i>Vitex negundo</i>	Verbenaceae	Bana	Chaste Tree
<i>Woodfordia fruticosa</i>	Lythraceae	Dhai	Fire Flame Bush
Herbs			
<i>Aconitum heterophyllum</i>	Ranunculaceae	Patish, Atish	Indian Atish
<i>Acorus calamus</i>	Araceae	Bare, Bach	Sweep Flag
<i>Ainsliaea aptera</i>	Asteraceae	Durwa	Wingless Ainsliaea
<i>Ajuga parviflora</i>	Lamiaceae	Darpatre	Small Flowered Bugleweed
<i>Anaphalis contorta</i>	Asteraceae	-	Eared Leaf Pearly Everlasting
<i>Anaphalis triplinervis</i>	Asteraceae	-	Wooly Pearly Everlasting
<i>Androsace lanuginosa</i>	Primulaceae	-	Wooly Rock Jasmine
<i>Androsace rotundifolia</i>	Primulaceae	-	Round Leaf Rock Jasmine
<i>Anemone obtusiloba</i>	Ranunculaceae	-	Himalayan

			Thimbleweed
<i>Anemone rivularis</i>	Ranunculaceae	Carbine, Mamiri	River Anemone
<i>Aquilegia pubiflora</i>	Ranunculaceae	-	Himalayan Columbine
<i>Aralia cachemirica</i>	Araliaceae	-	Kashmir Aralia
<i>Argemone mexicana</i>	Papaveraceae	Satyanashi	Mexican Prickly Poppy
<i>Arisaema intermedium</i>	Araceae	-	-
<i>Arisaema helleborifolium</i>	Araceae	-	-
<i>Arisaema wallichianum</i>	Araceae	-	Wallich's Cobra Lily
<i>Asparagus adscendens</i>	Liliaceae	Sahasimuli	Shatavar
<i>Aster molliusculus</i>	Asteraceae	-	Swaying Himalayan Aster
<i>Aster asperulus</i>	Asteraceae	-	-
<i>Atropa belladonna</i>	Solanaceae	Saagugur	Belladonna
<i>Boenninghausenia albiflora</i>	Rutaceae	Pessumar	White Himalayan Rue
<i>Bupleurum tenue</i>	Apiaceae	Ban Jwain	-
<i>Caltha palustris</i>	Ranunculaceae	-	Marsh Marigold
<i>Cannabis sativa</i>	Urtricaceae	Bhang	Hemp
<i>Carum copticum</i>	Apiaceae	Ajwain, Jawain	Bishop's Weed
<i>Datura stramonium</i>	Solanaceae	Datura	Jimson Weed
<i>Delphinium elatum</i>	Ranunculaceae	-	-
<i>Delphinium vestitum</i>	Ranunculaceae	Kalulu	Clothed Delphinium
<i>Dicliptera bupleuroides</i>	Acanthaceae	-	Roxburgh's Foldwing
<i>Dipsacus inermis</i>	Dipsacaceae	Tori	Himalayan Teasel
<i>Elsholtzia incise</i>	Lamiaceae	Banjwana	-
<i>Fragaria vesca</i>	Rosaceae	-	Strawberry
<i>Gallium spp.</i>	Rubiaceae	-	-
<i>Gentiana kurroo</i>	Gentianaceae	Karu	Himalayan Gentian

<i>Geranium nepalense</i>	Geraniaceae	Tirahni	Nepal Geranium
<i>Geranium ocellatum</i>	Geraniaceae	-	Black Eyed Geranium
<i>Geranium robertianum</i>	Geraniaceae	-	Herb Robert
<i>Geranium wallichianum</i>	Geraniaceae	Chowhri	Wallich Geranium
<i>Gerbera lanuginosa</i>	Asteraceae	Opra	-
<i>Geum urbanum</i>	Rosaceae	Chandana	-
<i>Girardinia heterophylla</i> (<i>Urtica dioica</i>)	Urticaceae	Bichhubuti	Stinging Nettle
<i>Gnaphalium luteoalbum</i>	Asteraceae	-	-
<i>Impatiens scabrida</i>	Balsaminaceae	-	Rugged Yellow Balsam
<i>Impatiens amphorata</i>	Balsaminaceae	-	Amphora Balsam
<i>Impatiens roylei</i>	Balsaminaceae	-	Himalayan Balsam
<i>Impatiens thomsonii</i>	Balsaminaceae	-	Thomson's Balsam
<i>Iris nepalensis</i>	Iridaceae	Kharera/ Brechra	-
<i>Lespedeza floribunda</i>	Fabaceae	-	-
<i>Lilium giganteum</i>	Liliaceae	-	-
<i>Lilium thomsonianum</i>	Liliaceae	-	Rosy Himalayan Lily
<i>Mentha spicata</i>	Lamiaceae	Pudina	-
<i>Micromeria biflora</i>	Lamiaceae	-	Lemon Savory
<i>Nepeta elliptica</i>	Lamiaceae	-	Elliptic Leaved Catmint
<i>Nepeta ciliaris</i>	Lamiaceae	-	-
<i>Origanum vulgare</i>	Lamiaceae	-	Oregano
<i>Parnassia nubicola</i>	Saxifragaceae	-	Himalayan Bog Star
<i>Pedicularis megalantha</i>	Scrophulariaceae	-	-
<i>Podophyllum hexandrum</i>	Berberidaceae	Bankakri	Himalayan May Apple
<i>Polygonatum verticillatum</i>	Liliaceae	Salam mishri	Whorled Solomon's Seal

<i>Polygonum alatum</i>	Polygonaceae	Malora	-
<i>Polygonum capitatum</i>	Polygonaceae	-	-
<i>Potentilla argrophylla</i>	Rosaceae	-	Silver Leaved Cinquefoil
<i>Potentilla fulgens</i>	Rosaceae	-	-
<i>Potentilla nepalensis</i>	Rosaceae	Dora	Nepal Cinquefoil
<i>Potentilla sibbaldi</i>	Rosaceae	-	-
<i>Primula denticulata</i>	Primulaceae	-	Drumstick Primrose
<i>Primula petiolaris</i>	Primulaceae	Kauri	-
<i>Ranunculus arvensis</i>	Ranunculaceae	-	Buttercup
<i>Reinwardtia trigyna</i>	Linaceae	Piyan	Yellow Flax
<i>Rumex hastatus</i>	Polygonaceae	Jangli Palak	Arrow-leaf Dock
<i>Rumex nepalensis</i>	Polygonaceae	-	Nepal Dock
<i>Salvia glutinosa</i>	Lamiaceae	Gwadra	-
<i>Salvia lanata</i>	Lamiaceae	-	Woolly Sage
<i>Satyrium nepalense</i>	Orchidaceae	-	Nepal Satyrium
<i>Saxifraga diversifolia</i>	Saxifragaceae	-	-
<i>Senecio chrysanthemoides</i>	Asteraceae	-	Cheerful Senecio
<i>Stellaria latifolia</i>	Caryophyllaceae	-	-
<i>Strobilanthes angustifrons</i>	Acanthaceae	Mashna	-
<i>Strobilanthes glutinosus</i>	Acanthaceae	-	Sticky Ruellia
<i>Strobilanthes dalhousieanus</i>	Acanthaceae	-	Dalhousie Blue Bells
<i>Swertia chirayita</i>	Gentianaceae	Chiraita	-
<i>Swertia cordata</i>	Gentianaceae	-do-	Heart Leaf Swertia
<i>Swertia paniculata</i>	Gentianaceae	-do-	Panicled Swertia
<i>Thalictrum chelidonii</i>	Ranunculaceae	-	-
<i>Thalictrum foliolosum</i>	Ranunculaceae	Mamiri, Peelijari	Leafy Meadow Rue
<i>Thalictrum javanicum</i>	Ranunculaceae	--	-

<i>Thalictrum neurocarpum</i>	Ranunculaceae	Barmot	-
<i>Thermopsis barbata</i>	Fabaceae	Kala Mattar	Black Pea
<i>Thymus serpyllum</i>	Lamiaceae	Ban-ajwayan	Himalayan Thyme
<i>Valeriana hardwickii</i>	Valerianaceae	Nihani	-
<i>Valeriana pyrolaefolia</i>	Valerianaceae	-	-
<i>Valeriana wallichii</i>	Valerianaceae	Mushkbala	-
<i>Viola patrinii</i>	Violaceae	Banaksha	Violet
<i>Viola serpens</i>	Violaceae	Banaksha	Indian Violet
Climbers			
<i>Clematis connata</i>	Ranunculaceae	-	Himalayan Clematis
<i>Clematis grata</i>	Ranunculaceae	-	Charming Clematis
<i>Clematis gouriana</i>	Ranunculaceae	Belkangu, Chabru	Gourian Clematis
<i>Clematis montana</i>	Ranunculaceae	-	Anemone Clematis
<i>Cuscuta reflexa</i>	Convolvulaceae	Akash bel	Dodder
<i>Dioscorea bulbifera</i>	Dioscoreaceae	Ratalu	Air Yam
<i>Dioscorea belophylla</i>	Dioscoreaceae	Tardi	Spear Leaved Yam
<i>Dioscorea deltoidea</i>	Dioscoreaceae	Singli Mingli	Nepal Yam
<i>Hedera helix</i>	Araliaceae	Grumru	Ivy
<i>Jasminum humile</i>	Oleaceae	-	Yellow Jasmine
<i>Jasminum officinale</i>	Oleaceae	Banmalti	Common Jasmine
<i>Jasminum pubescens</i>	Oleaceae	Dure	Kunda
<i>Rosa macrophylla</i>	Rosaceae	Kuja	Himalayan Rose
<i>Rosa moschata</i>	Rosaceae	Jungli Gulab	Musk Rose
<i>Vitis semicordata</i>	Vitaceae	Mizao	-
Grass and bamboos			
<i>Andropogon halepensis</i>	Poaceae	Phulna	Johnson Grass
<i>Arundinaria falcata</i>	Poaceae	Nirgal	Himalayan Bamboo
<i>Arundinaria spathiflora</i>	Poaceae	Gari, Ringal	-

<i>Cynodon dactylon</i>	Poaceae	Dub	Bermuda Grass
<i>Dendrocalamus strictus</i>	Poaceae	Lakar Bans	Calcutta Bamboo
<i>Eriophorum comosum</i>	Cyperaceae	Ghor bagar	Hairy Cotton Grass
<i>Ischaemum angustifolium</i>	Poaceae	Baggar	-

List of common Wild Animals in Parvati Forest Division

S.No.	Common Name	Zoological Name
	<i>Mammals</i>	
1	Snow Leopard	<i>Panthera uncia</i>
2	Leopard	<i>Panthera pardus</i>
3	Leopard Cat	<i>Felis benghalensis</i>
4	Jungle Cat	<i>F. chaus</i>
5	Himalayan Civet	<i>Pagomalarvata</i>
6	Himalayan Yellow Throated Marten	<i>Martes flavigula</i>
7	Brown Bear	<i>Ursus arctus</i>
8	Black Bear	<i>Selenarctus thibetanus</i>
9	Porcupine	<i>Hystrix indica</i>
10	Flying Squirrel	<i>Petauristapetaurista</i>
11	Monkey	<i>Macaca mulatto</i>
12	Langoor	<i>Presbytis entellus</i>
13	Himalayan Tahr	<i>Hemitragusjemlehicus</i>
14	Goral	<i>Nemorhaedus goral</i>
15	Barking Deer	<i>Muntiacus muntjac</i>
16	Serow	<i>Capricornicussumatrensis</i>
17	Blue Sheep	<i>Pseudonisayaur</i>
18	Musk Deer	<i>Moschus moschatus</i>
19	Vole	<i>Alticola roylei</i>
20	Red Fox	<i>Vulpes vulpes</i>
21	Jackal	<i>Canis aureus</i>
22	Fruit Bat	<i>Pteropodidae</i>
	<i>Fish</i>	
1	Snow trout	<i>Schizothorax richardsonii</i>
2	Brown trout	<i>Salmon trutta</i>
3	Rainbow trout	<i>Oncorhynchus nykiss</i>
4	Mahsheer	<i>Tor putitora</i>
	<i>Reptiles</i>	
1	Indian rat Snake	<i>Ptyas mucosa</i>
2	Himalayan keel back	<i>HerpetoreasPlatyceps</i>
3	Himalayan Pit viper	<i>Gloydiushimalayanus</i>
4	Kashmir rock	<i>Laudakiatuberculataaguma</i>

5	Himalayan Ground	<i>Scincellahimalayanus skink</i>
	<i>Insects (Butterflies)</i>	
1	Chocolate Pansy	<i>Junoniaiphita</i>
2	Common Mormon	<i>Papiliopolytes</i>
3	Blue Pansy	<i>Junoniaorithya</i>
4	Common tiger	<i>Danaus genutia</i>
5	Common Sailor	<i>Neptishylas</i>
6	Red Admiral	<i>Vanessa atalanta</i>
7	Glassy Tiger	<i>Paranticaaglea</i>
8	Indian tortoise shell	<i>Aglaiscaschmirenses</i>
9	Common crow	<i>Euploea core</i>
10	Common jezebel	<i>Delias eucharis</i>
11	Plain tiger	<i>Danaus chrysippus</i>

List of common Birds in Parvati Forest Division

S. No.	Name of Bird	Zoological Name
1	Greywinged Black Bird	<i>Tords bouboul</i>
2	White collared Black Bird	<i>T. albocinus</i>
3	Black bulbul	<i>Hypsipetes madagascariensis</i>
4	White Cheeked Bulbul	<i>Pycnonotus lencoyenys</i>
5	Bullfinch Brown	<i>Pyrrhula nepalensis</i>
6	Red Headed Bullfinch	<i>P. crythrocephala</i>
7	Rock Bunting	<i>Emberiza cia</i>
8	Dark Grey Bush Chat	<i>Saxicol ferrea</i>
9	Red Billed Chough	<i>Pyrrhocarax</i>
10	Himalayan Tree Creeper	<i>Certhia himalayana</i>
11	Jungle Crow	<i>Corvus splendens</i>
12	Brow Dipper	<i>Cinclus pallasis</i>
13	Rufous Jrtle Dore	<i>Streptopelia orientalles</i>
14	Spotted Dove	<i>S. chinensis</i>
15	Black Drengo	<i>Dicrurus adsimilis</i>
16	Golden Eagle	<i>Aquila chrysaetos</i>
17	Red Browed Finch	<i>Callacanthia burtoni</i>
18	Fire Breasted Flower Pecker	<i>Dicaeum ignipectus</i>
19	Grey Headed Flycatcher	<i>Culicapa ceylonensis</i>
20	Rufous Tailed Flycatcher	<i>Muscicapa ruficauda</i>

21	Sooty Flycatcher	<i>M. sibirica</i>
22	Verditer Flycatcher	<i>M. tholassina</i>
23	White Browed Blue Flycatcher	<i>M. dupercilaris</i>
24	Spotted Forktail	<i>Encurus maculates</i>
25	Gold Crest	<i>Regulus regulus</i>
26	Hodsons Grandala	<i>Gandala codicolor</i>
27	Black and Yellow Grosbeak	<i>Coccothraustes iceroides</i>
28	Hobby	<i>Falco bubbuteo</i>
29	Hoopoe	<i>Upepa epops</i>
30	Kestrel	<i>Falco tinnunculus</i>
31	Black Winged Kite	<i>Elanus caeruleus</i>
32	House Marten	<i>Delichon urbica</i>
33	Long Tailed Marten	<i>Pericro coctus ethologus</i>
34	Indian Jungle Night Jar	<i>Caprimugulus indicus</i>
35	Rufous Bellied Niltava	<i>Muscicapa sundara</i>
36	Spotted Scops Owl	<i>Otus spilocephhalus</i>
37	Slaty Headed Parakeet	<i>Psittacula himalayana</i>
38	Black Partridge	<i>Francolinus francolinus</i>
39	Chukor Partridge	<i>Alectoris chukor</i>
40	Chir Pheasant	<i>Catreus wallichii</i>
41	Kalij Pheasant	<i>Lophura leucomelana</i>
42	Koklas Pheasant	<i>Pucrasia macrolopha</i>
43	Monal Pheasant	<i>Lophophorus impejanus</i>
44	Ashywood Pigeon	<i>Columba pulchrocollis</i>

45	Speckled Wood Pigeon	<i>C. bodgsanis</i>
46	Upland Pipit	<i>Anthus sylvanus</i>
47	Plumbeous Redstart	<i>Rhyaconis fuliginosus</i>
48	Guldenstadi's Redstart	<i>R. fuliginosus</i>
49	White Capped Redstart	<i>Chaimawonis leucocepholus</i>
50	Pink Browed Rosed Finch	<i>Carpodacus rhodochrous</i>
51	Rufous Backed Shrike	<i>Lanius schach</i>
52	Black Capped Sibia	<i>Heterophasia capistrata</i>
53	Barthroated Sivia	<i>Minla strigala</i>
54	Himalayan Snow Cock	<i>Tetrargallus himalayensis</i>
55	Cinnamon Tree Sparrow	<i>Passer rutilanis</i>
56	House Sparrow	<i>Passer domesticus</i>
57	Himalayan Swiftlet	<i>Collocalia brevirostris</i>
58	Large Brown Thrush	<i>Zoothera monticola</i>
59	Plain Backed Mountain Thrush	<i>Z. mollissima</i>
60	Red Headed Laughing Thrush	<i>Garrulax erythrocephallus</i>
61	Streaked Laughing Thrush	<i>G. lineatus</i>
62	Variegated Laughing Thrush	<i>G. variegates</i>
63	Brown Crested Jit	<i>Parus dichrouw</i>
64	Black Crested Jit	<i>P. melanolophus</i>
65	Green Backed Jit	<i>P. monticolus</i>
66	Grey Jit	<i>P. major</i>
67	Western Tragopan	<i>Tragopan melanocephalus</i>
68	Bearded Vulture	<i>Gypactus barbatus</i>

69	Grey Wagtail	<i>Motacilla cinerea</i>
70	White Wagtail	<i>Malba</i>
71	Brown Hill Warbler	<i>Prinia criniger</i>
72	Brown Leaf Warbler	<i>Phylloscopus collybita</i>
73	Grey Faced Leaf Warbler	<i>P. maculipennis</i>
74	Large Crowned Leaf Warbler	<i>P. occipitalis</i>
75	Rufous Capped Bush Warbler	<i>Cettia brunnifrons</i>
76	Wood Cock	<i>Scolopax rusticola</i>
77	Scaly Bellied Green Woodpecker	<i>Picus squamatus</i>
78	Wren	<i>Troglodytes troglodytes</i>
79	Yellow Naped Yuhina	<i>Yuhina flavicollis</i>
80	Yellow Billed Blue Magpie	<i>Cissa flavirostris</i>
81	Snow Pigeon	<i>Columba lenconta</i>

PART-I

SUMMARY OF FACTS ON WHICH PROPOSALS ARE BASED CHAPTER-I

THE TRACT DEALT WITH.

1.1 Name and situation:

The current working Plan will be called as “Parvati Working Plan”. It is a revision of Shri J.S. Walia’s Working Plan (1994-95 to 2009 -10). Earlier Working Plan was a joint working plan of Kullu and Parvati Forest Division. This time separate plan for both divisions is prepared. So it is categorically pointed out that this working plan is prescription for Parvati Forest Division.

The area taken for Parvati Forest Division in J.S. Walia’s Plan (1994-95 to 2009-10) is not co-terminus with the present Working Plan. In J.S. Walia’s Working Plan, the total area of Parvati Forest Division was shown as 1,71,662.13 ha (which include 1,57,095.74 ha of Reserved Forest, DPF Ist class and DPF IInd class and 14566.39 ha of IIIrd class forest) (Page No. 7 & 143 of J.S. Walia’s Working Plan (1994-95 to 2009-10)).

The net area of Parvati Forest Division has decreased due to the rationalization of Khokhan, Nargu and Kanawar Wildlife Sanctuaries. In the process of rationalization 7482.30 Ha area has been transferred to Wildlife Division Kullu and 1871.15 Ha area has been received from Wildlife Division Kullu. In previous working plan the area of approximately 3500 Ha of Nagar-IIIrd class forest has not been accounted for and 227.82 Ha short area has been calculated which has also been included in the present working plan. Hence the total area (RF,DPFs and UPFs) comes out to be 169778.79 Ha and the total geographical area of the Division is 201133.83 Ha.

Government has notified Vide Notification No. FFE-B-F(6)11/2005 dated 28 July 2010 its intension to declare Khirganga N.P by excluding area from Kasol Range. It is proposed that an area of 710 Sq km will be excluded from the Kasol Range of the Parvati Forest Division. Hence after creation of proposed National Park the total area of Division will be 987.79 Sq km. But the area of 169778.79 Ha (1697.79 Sq Km) has been considered from management point of view in the current working plan. The whole area of the Parvati Forest Division falls in catchment of Parvati, Hurla Khad and Beas River.

The kullu and Parvati tract lies between North Latitude 31°41’N and 32°26’ and Longitude 76-59’ and 77°50’E. It covers mountain range of varying height of Kullu district. On North East front it touches with Lahaul Forest Division whereas Eastern Boundary adjoin Seraj Forest Division and small portion in South-Western corner touches with Mandi Forest Division. To the West lies Khokhan, Nargu Wildlife Sanctuaries and then Kullu Forest Division.

Presently Parvati Forest Division comprises of Four Territorial Ranges and one Furniture Workshop (FWS) Range at Shamshi. The ranges are

- (i) Kasol
- (ii) Bhunter
- (iii) Hurla
- (iv) Jari
- (v) Furniture Workshop range Shamshi

The Block wise and Beat wise detail of the Division is labulated as below: -

(Table 1)

Range		Block		Beat	
Sr. No	Name	Sr. No	Name	Sr. No	Name
1	Kasol	(i)	Kasol	(i) (ii) (iii)	Kasol Malana Graham (Newly Created)
		(ii)	Manikaran	(i) (ii)	Manikaran Shilla
		(iii)	Tosh	(i) (ii)	Tosh Uch
		(iv)	Pulga	(i) (ii)	Pulga Tulga
2	Hurla	(i)	Thela	(i) (ii) (iii) (iv)	Jhuni Rauli Najan Jaishtha
		(ii)	Bhuin	(i) (ii) (iii) (iv) (v)	Bhuin Naresh Diyar Narogi Barogi
		(iii)	Garsa	(i) (ii) (iii) (iv)	Narol Garsa Tharas Shiah
3	Jari	(i)	Jari	(i) (ii) (iii) (iv)	Chhinjra Sarahan Jari Chakna
		(ii)	Pini	(i) (ii) (iii)	Kashawari Pini Chowki
		(iii)	Dhara	(i) (ii)	Dhara Shat

				(iii)	Phagu
4	Bhunter	(i)	Bajoura	(i) (ii) (iii)	Neul Khokhan Mashgan
		(ii)	Shamshi	(i) (ii)	Mohal Bhulang
		(iii)	Dohranala	(i) (ii)	Sandhar Pah

In addition to above establishment there are 3 check posts at Garsa, Bajoura and Neulkandi (Bajoura-Katola Road).

1.2 Configuration of the ground:

Tract lies in between 950 to 6000 meters, above the mean sea level however entire Kullu district form transitional zone between lesser and great Himalaya and is characterized by high NW-SE trending ridges giving rise to deeper valleys and very steep and high ridges. The Manikaran and Malana area have very steep slopes which turn precipitous at many places. The valley become open towards Bhunter and slopes are steep to gentle. The lower most point is near Bajaura. The Forests in Kasol ranges lie on steep to precipitous slopes whereas the forest of jari, Hurla generally lies in moderate to steep slope and Bhunter range gentle to steep.

1.3 Geology, Rock and Soil:

The Kullu District forms a transitional Zone between the lesser and Greater Himalaya and is characterized by high NW-SE trending ridges and deep river valleys, a number of which in their upper reaches bear imprints of glacial activity in the near past. The altitudes vary from 950 m to 6000 m. The area in general represents young, immature topography, controlled both by the structure and lithology of the underlying rocks. The weathering resistant rocks, like the dolomite of the Aut Formation and Quartzite of the Manikaran Formation, form cliffs and escarpments, while the slate, phyllite and schist of different formations form gentle to moderately steep slopes. The Parvati and Hurla river forming tributaries to the Beas Rivers are the major river draining the area. These have cut valleys across general strike of rocks and as such are possible antecedent. The rivers together with their tributaries, define a sub-dendritic to sub-trellis drainage pattern.

1.3.1 Rocks: -

The rock types found in the district are classified into various formations which can be summarized as follows: -

(Table 2)

Group	Formation	Lithology	Age
	Hanuman Tibba	Granit, gneiss, muscovite	Lower Palaeozoic
	Granitoids	Biotite granite, occasional porphyritic	

	Katarigali	Carbonaceous slate, Phyllite, Quartzite, subordinate limestone.	Late Proterozoic
	Manjir	Pebbly slate, gritty Quartzite, phyllite.	
Larji	Aut	Grey stromatolitic/charty dolomite, pink and grey limestone	Middle to late proterozoic
	Hurla	White, grey quartzite, shale.	
	Naraul	Slate, Phyllite, siltstone, Quartzite and basic flows.	Middle Proterozoic
Kullu	Khokhan	Schist, Phyllite, Quartzite	Middle Proterozoic
	Gahr	Streaky-banded gneiss, augen gneiss, quartzite	
	Khamrada	Carbonaceous Phyllite, Schist, Quartzite, grey Phyllite, Subordinate limestone.	
Rampur	Manikaran	White, greenish white, sericitic quartzite	• Late Archean to Early Proterozoic.
	Green Bed	Schistose basic Volcanics, green phyllite.	•
	Bhallan	Phyllite, slate, quartzite, Few basic flows .	•
Vaikrita	B-formation	Quartzite, Phyllite, slate, schist, thin bands of gneiss, hornblende, garben schiefer.	• Late Archaean to Early Proterozoic
	A-formation	Gneiss, schist, Phyllite, quartzite, Migmatite and pegmatite	•
Bandal		Gneiss, Biotite/muscovite granite,	• Archaean
Gneissic		migmatite, schist Phyllite, quartzite.	•

Bandal Gneissic complex: Bandal gneissic complex with its RB-Sr age of 2700 Ma represents the oldest stratigraphic unit of the area and occur in the eastern part of the area overlain by the Manikaran quartzite (Rampur group). It comprises porphyro blastic gneiss, granitic, streaky banded gneiss, foliated Biotite-muscovite granite and migmatite.

Vaikrita Group: The Vaikrita Group represents the second oldest stratigraphic unit of the area and is divisible into two formations viz.: - Formation-A and Formation-B.

Formation-A: The lowermost Formation-A of this group is represented by interbanded sequence of porphyroblastic/augen gneiss, granitic gneiss, migmatite, kyanite gneiss, garnetiferous Biotite schist, kyanite-staurolite schist.

Formation-B: It comprises interstratified sequence of grey, medium to thick bedded, fine grained micaceous schistose quartzite, garnet-quartz-biotite schist, and thin bands of porphyroblastic/streaky gneiss, occasional thin bands of horn-blende garden schiefer are also present.

Rampur Group: The vast area southeast of Kullu is covered by the rocks of Rampur Group consists of massive, white quartzite, grey/green phyllite, schist, white to grey thin, even parallel bedded fine grained quartzite and subordinate light to dark grey slate.

Green Bed Formation: It comprises dark green schistose, basic flows interstratified with subordinate quartzite and phyllite.

Manikaran Formation: The Manikaran Formation constitute the youngest strati-graphic unit of the Rampur Group and is represented by white, greenish white, thin to medium, even parallel bedded, fine grained schistose quartzite with stringers and pockets of fuchsite and a few thin basic volcanic rocks. The volcanic inter-stratified with the Manikaran Formation according to Nd-Sm isochron age are 2500 Ma old.

Kullu Group: Lithologically, the Kullu Group has been divided into three formations viz. – Khamrada, Gahr and Khokhan Formations.

Khamrada Formation: It comprises carbonaceous phyllite, fine grained schistose quartzite and grey thin bedded platy limestone coating.

Gahr Formation: The Gahr Formation is dominantly represented by quartzose, streaky to banded paragneiss interbedded with a few grey, thin to medium bedded, fine grained quartzite. The Gahr gneiss has yielded on age of 1430(+) 150Ma.

Khokhan Formation: It consists of interbanded sequence of green puckered chlorite schist, green shiny phyllite and grey medium to thick bedded fine grained micaceous schistose quartzite.

Larji Group: The Larji Group is represented by the orthoquartzite- carbonate suite of rocks and has been divided into two formations viz. Hurla and Aut Formations.

Hurla Formation: The Hurla Formation is predominantly an arenaceous unit consisting of white, pink, grey coloured thin to medium, even parallel bedded, fine grained quartzite with partings of thick horizon (upto15m) of purple, grey shale.

Aut Formation: It comprises grey to bluish grey, fine grained, stromatolitic occasionally cherty dolomite, interbedded with white, medium to thick, even parallel bedded, fine grained quartzite, grey purple shale and pink coloured, thinly bedded fine grained limestone.

Naraul Formation: The Naraul Formation is represented by grey, green purple shale, slate, phyllite, siltstone, quartzite and a few thin beds of volcanic tuff basis volcanic sparsely amygdaloidal and lenticular beds of limestone.

Manjir Formation: In the present area. The Manjir Formation is represented by greenish grey schistose quartzite, which occasionally is gritty or contains pebbles or boulders of grey quartzite and phyllite. The clast/matrix-ratio varies from 15:85 to 40:60 and the maximum size of the clast recorded is 1.18mx5.5cm.

Katarigali Formation: The Katarigali Formation covered a major part of the area West of Kullu and consists of carbonaceous phyllite; light to dark grey thinly laminated slate, dark grey siltstone, greenish grey to grey, thinly bedded fine grained limestone. The rocks show profuse development of pyrite, the leaching of which gives brownish surface colour to the rocks.

1.3.2 Soils: - The soils in the Himalaya change frequently, depending upon the underlying rocks and the effect of various agencies from time to time. Though, no specific soil survey has been carried out by the Geological Survey of India, yet, few generalizations can be made about the formation of soil. The lateritic soils, rich in iron and alumina, can be found as cover over the

gneissic rocks, whereas red soil forms on the granite and gneisses. The red soils are deficient, in phosphorus, lime and nitrogen. These also occur over the rocks of green bed formation (Basic rocks). The sandstone, siltstone, quartzite yield sandy soil, while the area underlain by limestone and shale yield loamy soil. In the valley portions, both transported as well as in situ, alluvial soils reworked by water, can be found.

1.3.3 General effect on forest vegetation: - The composition of the forest vegetation and its evolution is influenced by the character of the rocks/soil under lying. Disintegrated quartzite supports superior quality chir, but is detrimental to Deodar. Gneiss and schists break up to give rise to loamy clay loams conducive to the growth and development, of both Deodar and Kail. Superior quality Deodar forests of Pulga are testimony to the fact that the characters of underlying rocks do influence the composition of the forest vegetation. On heavy clay soils though, the natural regeneration of Deodar is profuse while the quality remains moderate. On higher elevations, the forest soil is thick with the undecomposed, acidic humus (low rate of decomposition and deficiency of broad leaved trees). The undecomposed soil creates problems in Spruce and Silver Fir forests, as natural regeneration is hampered, since the seed does not reach the soil. Forests which adjoin villages are observed to have deteriorated soils, on account of incessant removal of litter from it. The soils in bials are found to contain calcium carbonate and are generally alluvial, basic or neutral in reaction. By and large however, forest soils in Parvati tract are clayey loam, fertile, rich in organic matter and conducive to the tree growth.

1.3.4 Surface drainage: - Drainage is on the whole good. There are only on few patches where internal drainage is poor and water is found to stagnate. Soils, in which drainage is poor and impeded, thwart natural regeneration of conifer. However these soils favour Iris, Balsam and Strobilanthes.

Erosional hazards are common-both gravitational and glacial erosion existing in the tracts. Erosion is frequent over steep lands that lack vegetative cover and unchecked grazing accelerate slips. Unchecked breaking of lands for agriculture, horticulture and road making intensify Erosional hazards. Large number of hydel project construction in the Parvati valley had also contributes to increase in erosion.

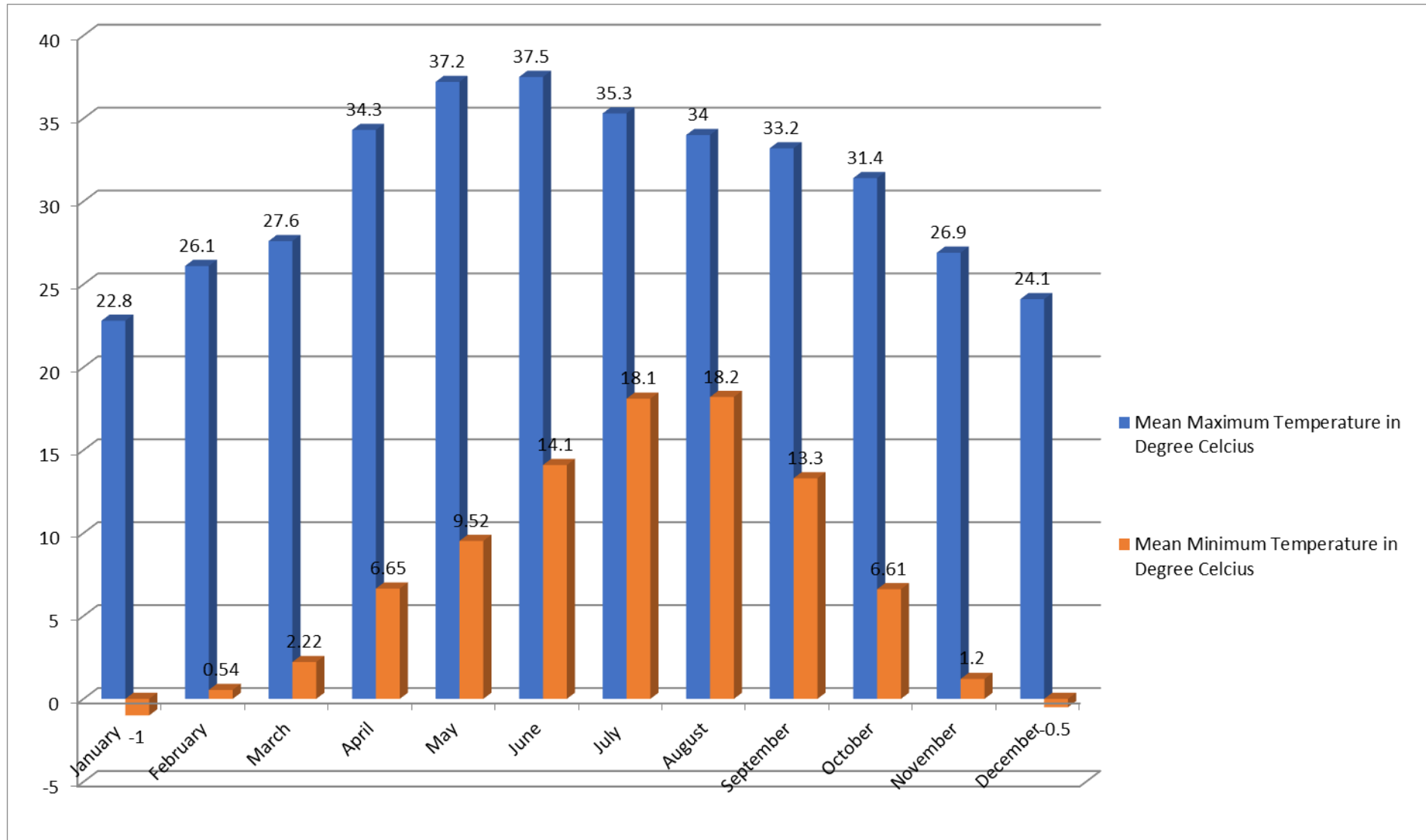
1.4 Climate: - The climate is typical of the temperate Zone at higher altitude, above 1000 meters and subtropical at lower elevations. Plant succession and distribution are affected by varying climate conditions, especially temperature variations and patterns of rainfall. Generally April to June, October to November as dry months.

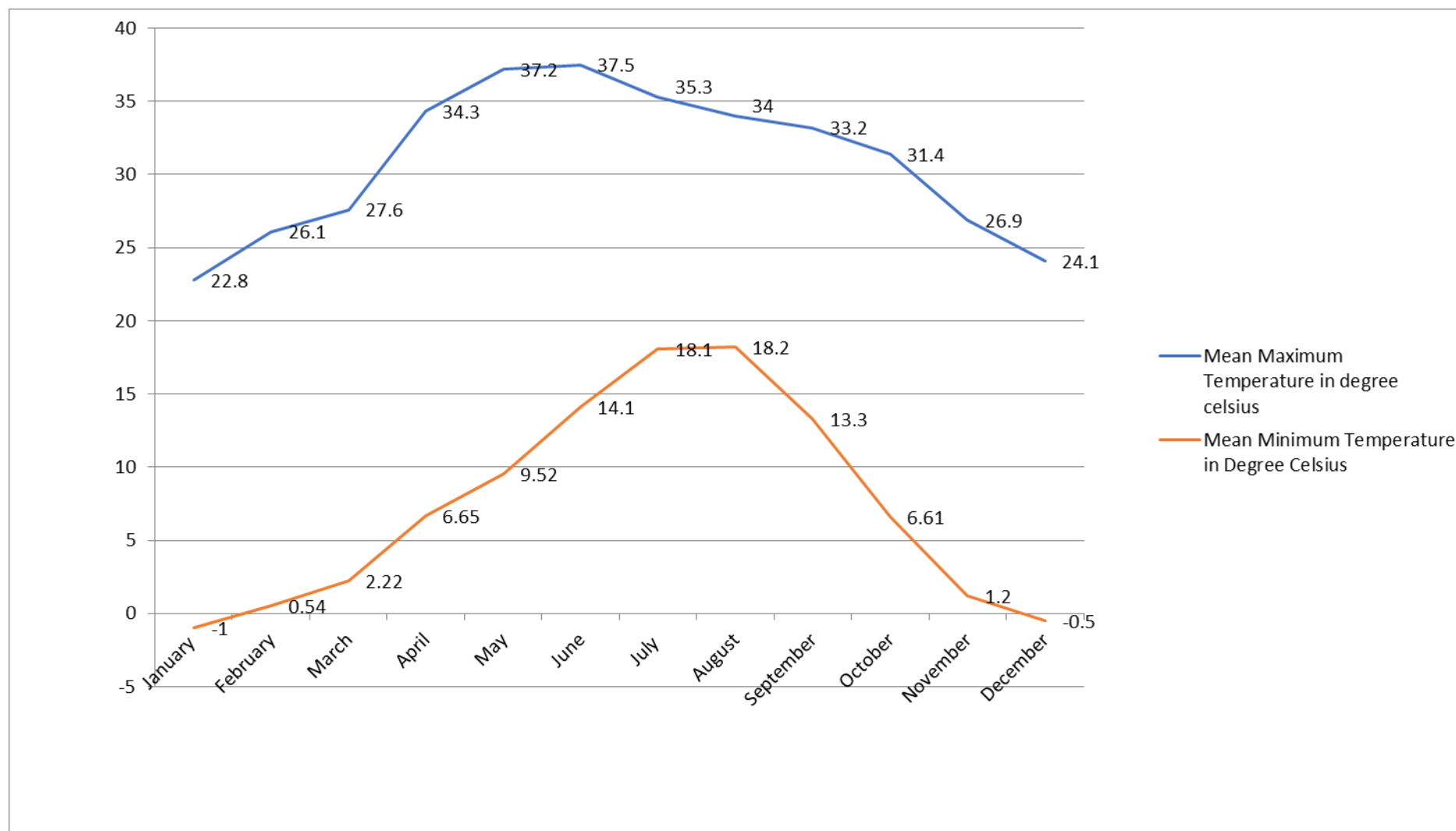
1.4.1 Temperature: - Average temperature data of Parvati tracts w.e.f. 2003-2013 is (in degrees)

Temperature (°C) of station G.B Pant institute of Himalayan Environment and Development, Himachal unit																								
Year	January		February		March		April		May		June		July		August		September		October		November		December	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2003	0	0	0	0	0	0	36.4	7.2	39.1	7	40.9	14.2	37.5	20	35.4	22	35.5	12.9	33.6	7	30	0.3	27.4	-0.1
2004	25.2	-0.3	28.4	-0.4	36.2	3.7	38.6	8.4	43.4	7.7	39.4	13.1	40	15	37.9	18	0	0	0	0	0	0	0	0
2005	24	-1.1	27.4	-0.5	30.8	4.3	36.3	4	38.3	8.9	43.4	10.6	37.9	17.9	37.9	14.9	39.4	12.5	33.8	5.5	29.8	0	26.4	-2.5
2006	27	-1.5	29.9	2.5	30.4	0.5	33.5	5.3	34.9	9.8	35	11.2	34.5	18	33.3	19.9	31.4	13.2	30.5	7.5	27.7	0.6	21.6	-0.3
2007	23.8	-2.4	23.6	1.5	31.3	1.2	33.9	8.7	32.5	10.3	36.9	13	33.7	18	32.2	19.2	32.4	12.9	30.7	6.3	26.8	1.0	26.9	-0.4
2008	18.6	-1.6	26.9	-1.1	28.3	4.4	32.7	5.2	34.9	10	33.7	14.8	32.3	19	32	16.4	31.6	10.8	30.4	6.3	26.8	1.0	26.9	-0.4
2009	24.7	0.07	25.2	1.78	29.6	2.37	0	0	0	0	40	19.5	35.6	13.9	34.7	16.5	31.9	12.9	32.6	4.77	27.3	1.3	23.8	-0
2010	23.6	-0	21.4	0.46	0	0	40	9.16	37.6	11.4	35.8	12.5	32.4	17.2	31.9	17.6	32.1	12.2	30.6	6.4	26.8	2.5	21.5	-1.2
2011	19.8	-1.1	32.3	0.9	31.1	2.6	32.3	4	34.9	10.4	33.4	12.6	33.8	19.4	33.1	16.3	32.8	13.5	30.8	7.1	26.9	0.9	23.2	-2.1
2012	19	-1.5	22.3	0	30.9	0.6	30.2	7.1	38.1	6.7	38.1	13.3	37.1	18.6	33.4	18.1	32.6	12	30.5	7.5	19.7	2.3	22.1	1.5
2013	22.1	-1	23.9	0.3	27.6	2.5	28.9	7.4	38.5	13	35.4	20.5	33.6	22.5	32.2	21.6	32.4	20.1	30.8	7.7	26.9	2.1	21.2	0.2
	22.8	-1	26.1	0.54	27.6	2.22	34.3	6.65	37.2	9.52	37.5	14.1	35.3	18.1	34	18.2	33.2	13.3	31.4	6.61	26.9	1.2	24.1	-0.5

(Table 3)

THE TRACT DEALT WITH



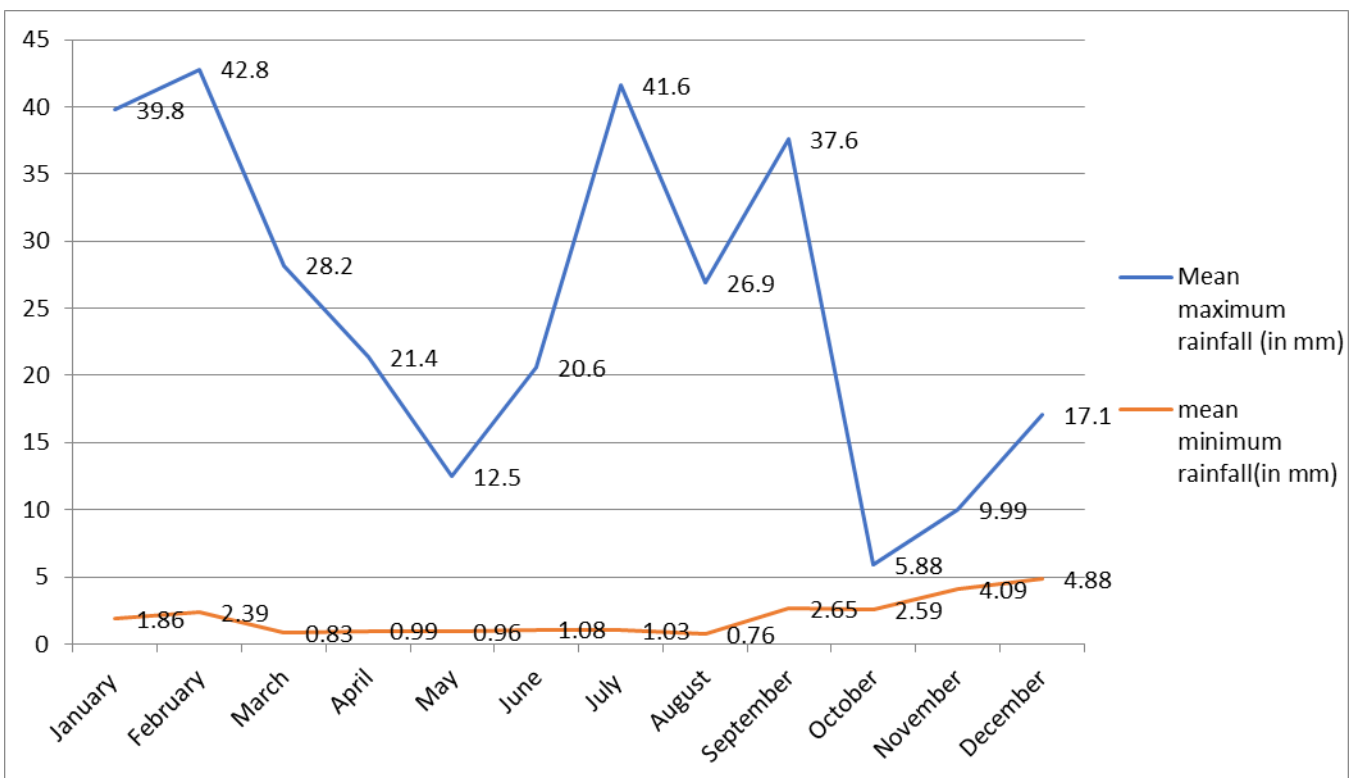
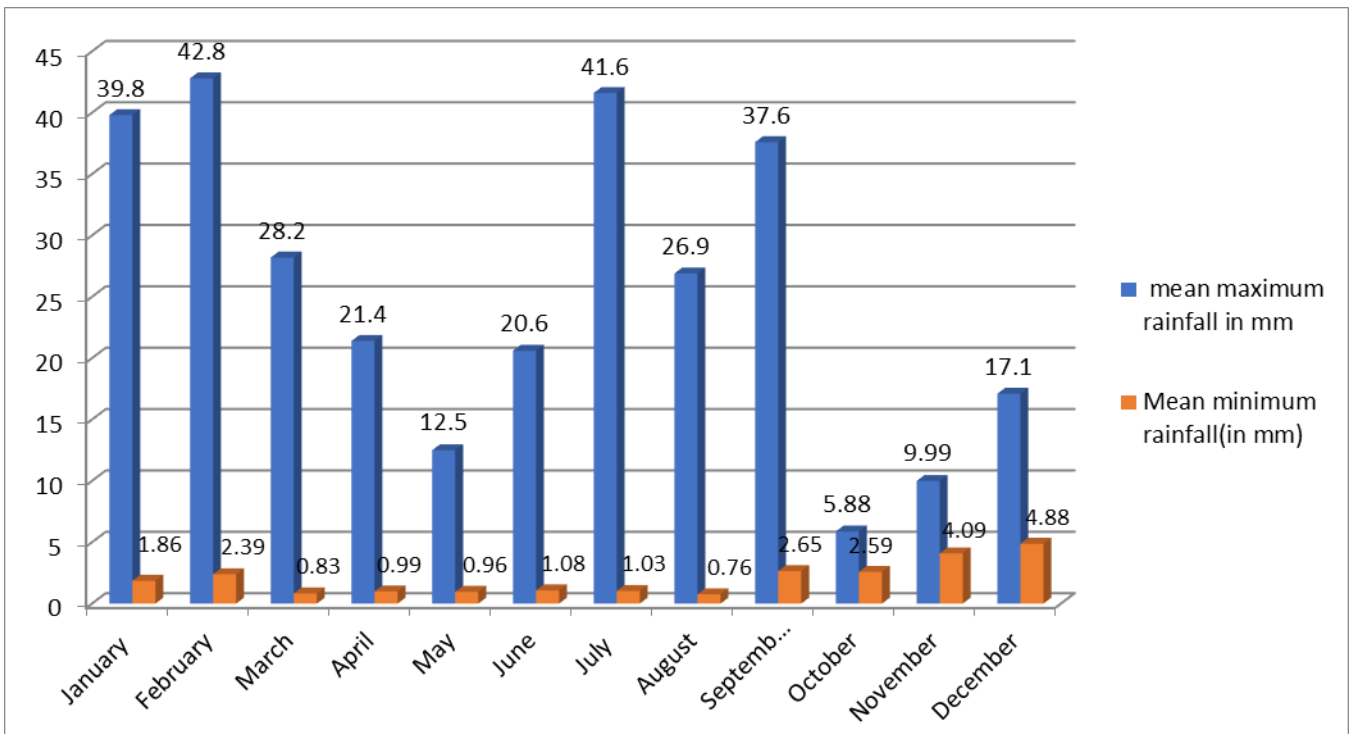


1.4.2 Rainfall Data: - follows (In millimeters).

The average rainfall data for different stations in Parvati division for the period from 2005-06 to 2012-13 is as follows (In millimeters).

Rainfall (mm) of station G.B Pant institute of Himalayan Environment and Development, Himachal unit																								
Year	January		February		March		April		May		June		July		August		September		October		November		December	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
2006	75.6	7.2	69.8	11.6	37.8	1.7	19.2	0.9	15.4	0.8	6.7	0.6	48.3	0.4	22.0	0.8	54.7	0.2	6.1	6.1	10.3	8.8	25.6	0.6
2007	0	0	105	0.7	49.3	1.5	5.2	0.6	26.5	0.3	18.0	0.3	105	0.2	35.8	1.0	19.2	0.3	1.0	1.0	0	0	14.5	2.3
2008	57.7	0.6	20.2	0.5	4.7	0.3	18.6	0.6	12.1	1.1	19.4	0.8	13.1	2.4	28.0	0.8	67.4	9.4	12.3	0.6	3.2	3.2	22.9	20.6
2009	5.2	1.1	9.7	0.3	12.9	0.1	26.8	0.4	5.3	0.2	6.1	0.2	23.7	0.3	22.5	0.5	34.4	1.4	1.1	1.0	31.6	1.3	0.3	0.2
2010	18.5	0.1	38.3	1.8	23.7	0.4	27.1	0.5	14.9	4.1	44.1	1.5	44.5	0.5	15.8	1.4	47.3	2.5	20.3	3.2	4.5	3.2	37.0	4.1
2011	13.8	2.7	24.8	1.4	24.8	1.4	42.2	3.6	9.5	0.6	33.8	2.3	37.0	2.3	55.9	0.5	12.2	6.3	0	0	2.0	2.0	3.2	3.2
2012	49.6	0.2	14.4	0.5	28.2	0.8	22.3	0.7	10.1	0.1	4.1	2.7	20.7	0.6	23.4	0.9	40.6	0.9	2.3	2.3	10.1	3.2	9.7	4.5
2013	58.5	1.1	60.1	2.3	44.4	0.4	10.1	0.6	5.9	0.5	32.5	0.2	40.8	1.5	11.9	0.2	25.1	0.2	3.9	3.9	8.2	6.9	23.5	3.5
	39.8	1.86	42.8	2.39	28.2	0.83	21.4	0.99	12.5	0.96	20.6	1.08	41.6	1.03	26.9	0.76	37.6	2.65	5.88	2.59	9.99	4.09	17.1	4.88

(Table 4)

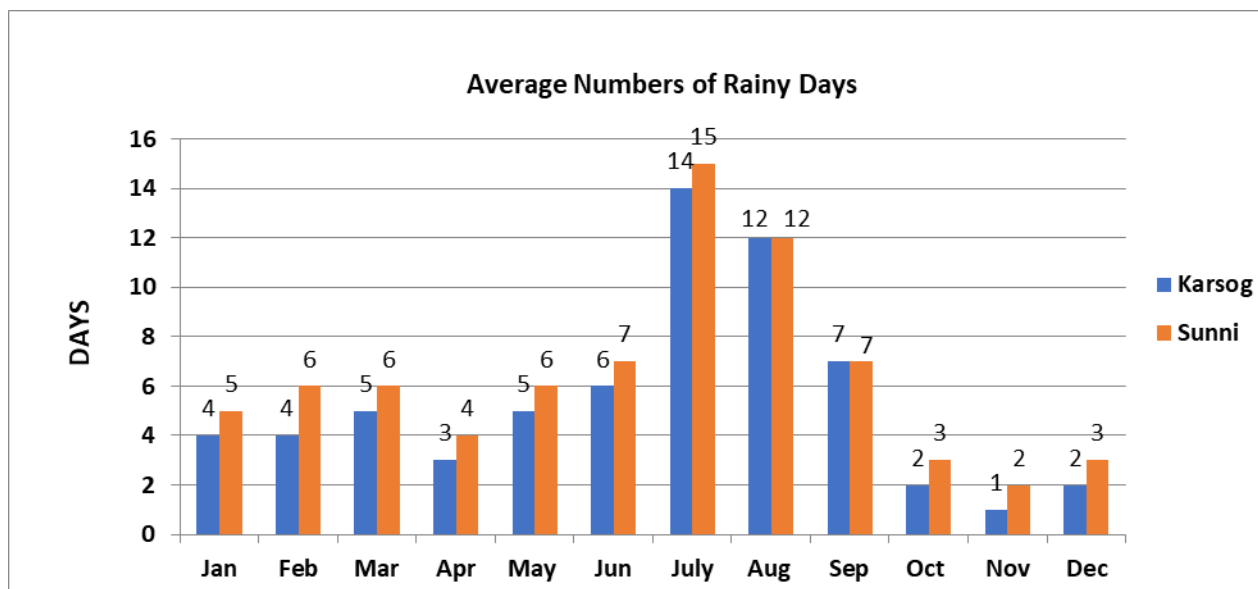


(Source: Deptt. of Meteorology, Shimla)

Table 1.4.3 AVERAGE NUMBERS OF RAINY DAYS IN DIFFERENT MONTHS**(Table 5)**

Station	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
Karsog	4	4	5	3	5	6	14	12	7	2	1	2	65
Sunni	5	6	6	4	6	7	15	12	7	3	2	3	76

(Source: Deptt. of Meteorology, Shimla)



The above table highlights the fact that 50% of rainfall is received during the monsoons i.e. July to September, while the remaining precipitation falls during January to March, as winter rains. The two dry spells namely pre-monsoon (May-June) and post-monsoon (Oct-Nov) are specific and particular to the area. These spells affect plant growth and planting operations.

1.4.4 Snowfall: - Northern slopes receive heavy snowfall. Snow is found down to 1500 meters; though Bajaura, at 1200 meters, does receive only occasionally a fall. Snow above 2200 meters is long lasting and work at this height during winters is not possible. Snow plays important role in distribution of vegetation.

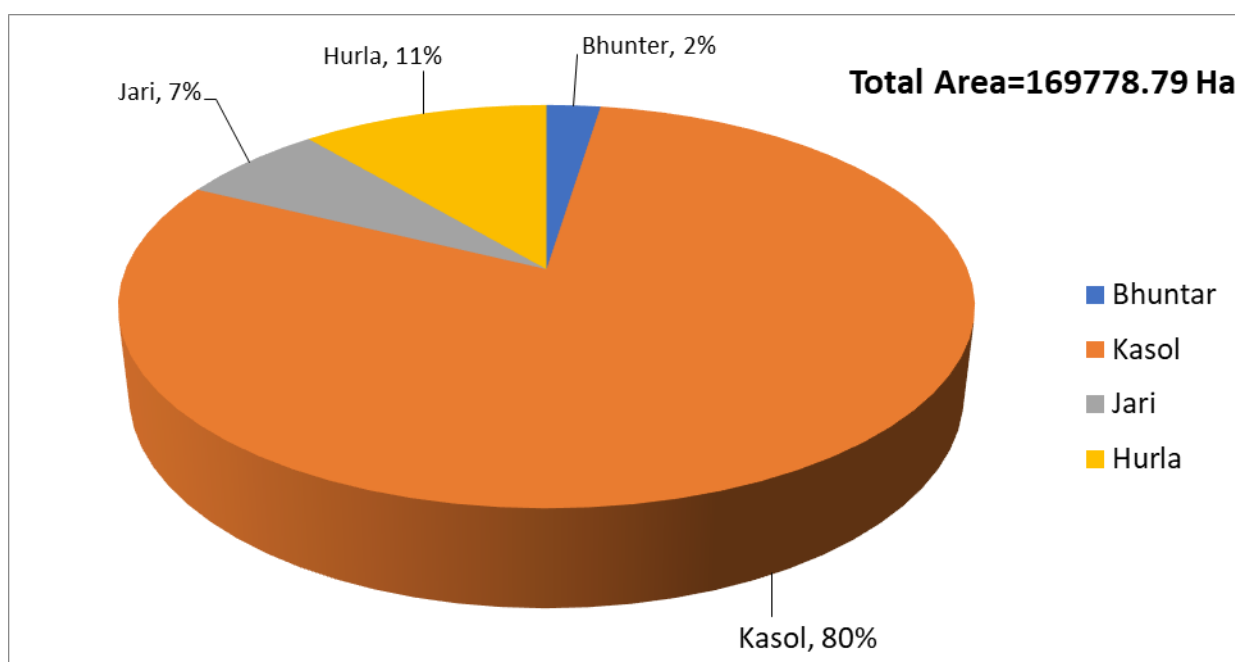
1.5 Water Supply: - The tract embraces the catchment of Beas River. Rivers, rivulets, natural springs and other sources of water are plentiful. Drinking water is abundant. Melting of snow provides for the gurgling streams, which meander over the area. It is only during summer that some natural springs, located on exposed ridges at low elevations, dry up. During winter too, flow is reduced. However most of the rivers and rivulets, which flow through the area, are largely perennial.

1.6 Distribution and area: - Total geographical area of the tract is 201133.83 Ha. The area of forests according to their classification is given below range wise: -

Parvati Forest Division

(Table 6)

Rangewise and Forestwise area statement of Parvati Forest Division						
Area statement (in Ha.) (Present Working Plan)						
Range	Reserve Forest	Ist class DPF	2nd class DPF	New DPF	UPF	Total
Kasol	932.41	4808.6	124566.70	0	5246.64	135554.35
Jari	251.0	2855.30	2475.90	0	5531.0	11113.2
Hurla	3060.41	4806.96	6245.09	0	4857.20	18969.66
Bhunter	59.89	671.76	0	0	3409.93	4141.58
	4303.71	13142.62	133287.69	0	19044.77	169778.79



Total Area of Parvati Forest Division

The approximate area of un-demarcated protected forests (IIIrd class) is 19044.77 hectares.

i) **Reserve Forest: -** The reserve forests situated in far flung areas, lie on steep and precipitous areas and have myths attached to them i.e. Devtas of evil spirits are said to reign there. This helps the areas to remain protected. Since biotic pressure is low, these reserve forests retain their glory and tranquil environment. There are some groves of mature trees considered sacred with reference to local deities, lying in the vicinity of villages. These groves of Deodar, made right free, comprise the other type of reserve forests. A good number of these groves had been included in the regeneration areas in Trevor's Plan. In the present, these are beautiful, even aged stands of good density and quality.

ii) **First class demarcated protected forests: -** These forests are found all over the tract. These exist at medium height, near the zone of human habitation and are honey-combed with cultivation. There is excess biotic pressure in them for fuel-wood, timber and minor forest produce and these also suffer from heavy pressure of timber distribution demand of the local

population. Deodar is the prominent species and thus these forests, are valuable both to the local inhabitants and also to the forester. In the lower elevations DPF Ist Class have Kail and Deodar, while the upper elevation forests, in cooler and damper aspects, contain Fir, spruce and broad leaved species. The Garsa valley has pure Ban Oak. These forests have well defined boundaries and their management is oriented towards increasing the area under Deodar. Such conversions from Chil and Kail to Deodar is observed in 1/26 Shilanda C-II, 1/44 Kawaragahar C-IIIa. 1/14 Rajthati C-Ia and C-Ib, 1/21 Khoruthach C-IIa, 1/9 Khobus C-IIa and 1/34 Khajiari Kalon etc. In Kasol, we observe Deodar below, while Kail and Chil are at the top zone. This change in species zonation is due to micro-climatic factors and also on account of the soil conditions.

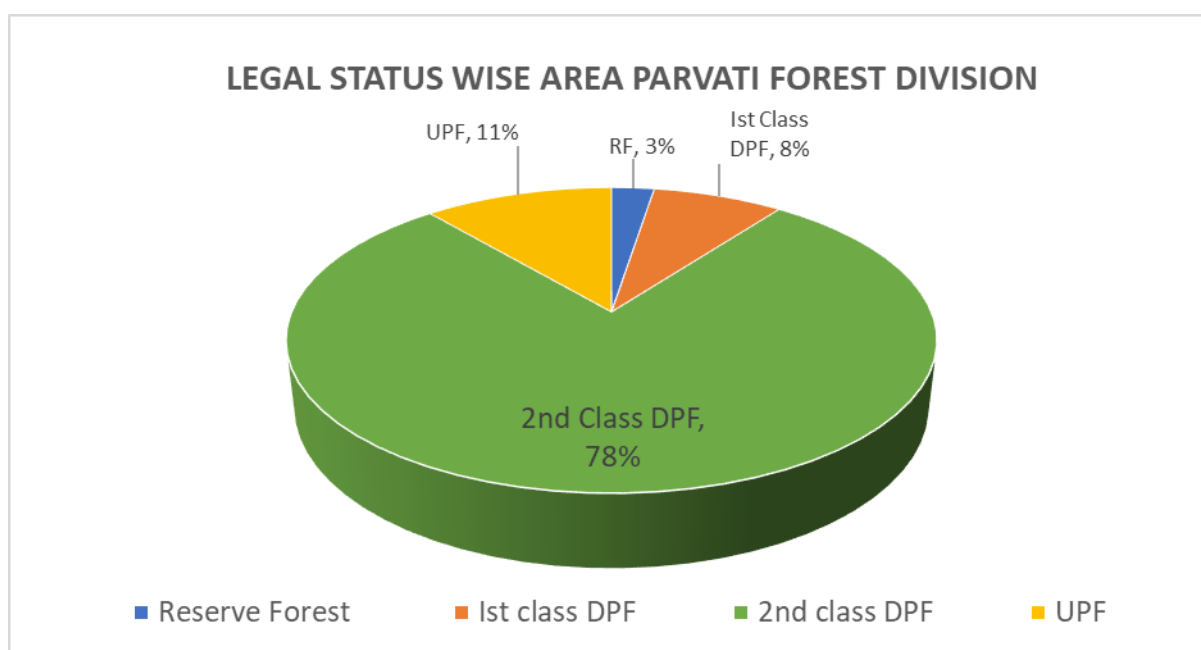
iii) Second class protected forests: - These forests lie above the first class forests and are remote and away from habitation and lie at higher elevations. Fir and spruce are the prominent species. Above these forests lie the alpine and grassy meadows, which are so very important for the shepherds. In the past there was excess pressure on these forests for meeting fruit packing cases demand and this has resulted in depleted stock. Good mature, middle aged trees were marked and felled to the remote saw millers leaving behind over mature, hollow and diseased stock. Natural regeneration too, of the fir and spruce is very poor, because of excess biotic pressure and also grazing pressure. Erosional hazards have been noticed in these forests. Among the broad leaved species found are Aesculus indica, juglans regia, Rhododendron spp., ulmus wallichiana, Taxus baccata, Betula spp., Kharsu Oak, Celtis australis etc. It is observed that the lower level of the forests have been demarcated. The IInd class protected forests usually extend upto the tree growth limit. In Hurla and Parvati Ranges, the forest boundary is along the main ridge and contains vast areas of massive rocks, snow and ice. Half of these forests contain, a rugged, rough terrain, devoid of valuable forest vegetation but facilitating pastorage. These thaches are burdened with excessive grazing beyond their carrying capacity. Soil erosion/denudation has resulted in various places being bereft of soil cover. Oaks are found to be heavily lopped. Damage to these forests, is prominent on account of buffalo grazing. 2/6 Bhandag C-I and C-II continue under PB-I for last 60 years. Similar is the fate of 2/7 Tilalotan C-I in Parvati Valley. One point which needs highlighting is the excess unscientific exploitation of medicinal herbs from the thaches, which need to be checked.

iv) The un-demarcated or IIIrd Class forests: - Orchards and an excess rise in land prices have resulted in large scale encroachments in the IIIrd class forests. Nautor sanction too, was rampant in these forests, in the past. Since these forests lie near habitation, there is maximum pressure for TD and fuel-wood and grazing. Thus, the biotic pressure from the local people is severe. Revenue authorities shy away from recording them as forest area. Since the forests are un-demarcated, only an approximate idea is there regarding their extent. The forest settlement wing has been busy converting and notifying many of the forested IIIrd class forests into demarcated protected forests. This would lead in the future to public resentment as consequently grazing areas reduction will be the outcome. Further great afforestation drive has been launched in these forests and good Chil forests in Hurla are testimony to this. Social Forestry drive was also concentrated here.

Many of the IIIrd class forests lie along narrow belts, strips and are honey-combed with chaks (cultivation). Chaks foster encroachments and seriously jeopardize scientific management.

Assessed as 91.87 hectares, no serious efforts were made to acquire them. During the 2nd World War excess pressure for ballies was met from the IIIrd class forests

Where ever protection from fire and grazing is there, natural regeneration has come-up. Rotational grazing must be implemented to check arbitrary grazing. Preparation of closure cases before taking up afforestation drive in the IIIrd class forests is also a must. Lot of ambiguity occurs regarding boundary of a 3rd class forest. The boundaries are not clear in Forest as well as Revenue records. It is worth mentioning that most of the encroachments are in these forests. It is high time to demarcate all 3rd class forests immediately. In this regard stepwise procedure can be followed. In the 1st phase all boundaries near habitation/ Village should be recorded and marked on the ground and in second phase the left over area can be taken. The area which is already encroached can be added later on once the eviction proceeding is completed. If it is not done at the earliest then these 3rd class forests are bound to be encroached. In absence of the proper boundaries, in all such areas it is hard time for the field officers. Besides encroachers enjoy and get safe passage. The details of IIIrd class forest are in Volume-II, Appendix-XI, Page No. 104-105.



1.7 State of Boundaries: - By and large, boundary registers showing the description, distance, forward bearing and backward bearing of boundary pillars are available in each range. Efforts to totally complete the work, to have an authentic record matching ground reality must be taken up on priority. Boundary pillars are in a dilapidated state in the field. Maintenance should be given priority and the number along with direction of next boundary pillars should be etched out in them. Many of the boundary pillars have been shifted, washed away or removed from their original position. This should be looked into on priority. The forestwise details of boundary pillars are in Volume-II, Appendix-X, Page No. 101-103. Under the ODA Programme, stress on maintenance of boundary pillars was given. It is important to note that included cultivation, in the demarcated protected forests have not been delineated properly by boundary pillars and proper record of such lands, have not been maintained by the forest department. These cultivations have slowly increases in area

through encroachments and trees adjoining have been removed through girdling and consequent drying. Since boundaries of the private lands trespass into government lands, there is an urgent need for proper delineation. Programme of boundary pillar maintenance is not being adhered to and needs to be strictly followed. The field staff is also not conversant with boundaries, especially in the Fir Zone. During frequent transfers, no one bothers to actually handover charge in the field. Many of the forest guards thus, have no knowledge of their area boundaries, boundary pillars etc. This is urgent need to digitize the location of existing boundary pillars the work need to be started in phased manner. In first phase all boundary pillars near to habitation, i.e. village need to digitized with differential GPS and they should be regularly checked by the visiting officers in the area. In the second phase the whole area to be taken there is huge ambiguity over the boundary of IIIrd class forest. No staff knows where the IIIrd class forest boundary begins or culminate. Most of IIIrd class forests are honey comber with private areas and absence of proper boundary it becomes difficult for forest officers to check encroachment.

1.8 Legal Position: - The Settlement began in 1866 and carried on more or less regularly. The Forest Act was passed in 1878. By that time 11,000 acres were demarcated and rules were drawn up by Mr. Duff, the forester stationed in Kullu, under the provisions of the rules of 1855, which were then in force. The first notification with a view to effecting the settlement of the forests under Chapter-II of the Act was issued in July 1880. Punjab Govt. vide letter No. 511 dated 28.11.1883 ordered that the bulk of the forests, were to be treated as “Protected” with only some small and special areas being constituted as “reserves”. Soon after the issue of the orders, work was commenced by Mr. Alexander Anderson, the Assistant Commissioner, assisted by Mr. Gisborne Smith, the local forester. Settlement report was submitted in June, 1886. The complication of the great dependence of the people on the forests was not sorted out. With the appointment of Sir Dennis Fitzpatrick as lieutenant governor in 1892, the proposed “reserves” were gazette as such in 1895. The protected forests were notified in 1896, after considerable alterations had been made in the record of rights and in their proposed rules. In Kullu, government is recorded as owner of the waste land had a free hand than in Kangra. The bulk of the wasteland in Kullu has therefore been declared to be protected forest, under one of three kinds: -

- First class demarcated protected forest.
- Second class demarcated protected forest.
- Un-demarcated protected forest.

The extent of rights of the user and the amount of regulation necessary, differ for different classes. The notifications declaring these three classes of forests protected are nos. 280,281 & 282 of Ist June, 1896. There are ancillary notifications under sections 29, 31, 51 & 75 (c) of Act-VII of 1878. The final result of the settlement was the placing of the “reserves” under chapter-II of the Forest Act, while the others were placed under Chapter-IV. In the first class DPFs, the rights of the users are less extensive and more clearly defined as compared to rights in the second class DPFs. The IInd class forests differ from the IIIrd class forests, in having the grazing rights in them more clearly defined, and also in being intended to be preserved from being broken up for cultivation.

1.9 Rights & Concession:- The forest settlement has linked/appended all rights of concession to owners of agricultural lands and kept bereft of any rights, those that have no agricultural lands. Government, on receipt of the Garbett Enquiry report, experimented with

a changed definition of the right holder, from the one given under the Andersons Settlement report. However, realizing the perils it contained for the very existence of the forests, the government has in the present stuck to the original definition of a right holder, under notification No. 4117 dated 26th April, 1948. The condition No. 10 of the general conditions prescribed in this behalf, expresses the desired concern and restricts the great advantage enjoyed by such agricultural land owners, who merely owned only small bits of land but enjoyed all the rights, to the extent that the existence of the forests were threatened. It goes as follows-“All rights admitted are subject to the limitation that they may not be exercised to an extent that may endanger the existence of the forest over which the rights are admitted. If the exercise of rights as admitted would endanger the existence of the forest, a limitation must be placed on the exercise of those rights, and in that case, the extent of the rights of right holders interest, shall be proportionate to the revenue assessed in respect of the land to which the right is appendant”.

1.9.1 Timber: - Timber is supplied to right holders at concessional rates for the construction and repair of their houses and also for buildings meant for non-commercial purpose. Fallen/uprooted trees of Kail, Fir and Chil can be removed free of charge. The timber must not be disposed off to any one and must be used in the Kothi in which the right holder pays the land revenue except under the express orders of the Divisional Forest Officer, on merits, as provided under government orders on the Garbett Report.

A right holder is as per Kullu Settlement. “a person to whom right has been admitted in the records of rights on any forests.” In Kullu, only Salam-Khata’ holder is entitled for timber distribution and not persons with fractional holdings known as ‘min khata’ holds. The grant is not tenable for construction of palatial houses disproportionate to the land holdings, commercial purposes and property for hire etc. The rights are to be exercised only for bonafide, domestic and agricultural purposes of the right holders. As per Para-137 of the Kullu Settlement, Deodar is to be supplied only for doors and windows according to the prevailing style. The right holders however manage to obtain Deodar for the entire buildings in contravention of govt. order and instructions. Broad leaved trees, except walnut, box wood and ash are granted free to the right holders.

Timber distribution rights have become most contentious. Demand has increased manifold for timber, primarily Deodar, because of fragmentation of estates, and consequently of rights, through partition at inheritance. Joint families are giving way to nuclear families who want to stay in separate houses. Further the land prices have risen sharply: which too in its wake, brought about breaking up of land holding and rights. Increasing prosperity in the region can be seen in the large, well timbered houses and construction of hotels for the expanding tourism industry. Thus there has been a significant demand for timber, for construction. What has become obscured is the enlightened and humane view of timber distribution, meeting the basic requirement of the local people. Many locals are covertly selling all or part of the timber allocated, rather than using it for what it is intended. This way they supplement household incomes. There is thus always the temptation to fell and remove more trees than authorized. It must be realized, that the TD distribution system has become a great strain on the already dwindling forest resources. The applications go on pouring in with no reference to time or season and a bee-line of the applicants are lined up daily before the DFO, ready to jostle him into sanctioning maximum number of trees, previously, applications from right holders for trees in each Kothi were dealt with only on fixed days, by the DFO/authorized revenue authority once in a year. Timber distribution sanction was completed by May and marking were completed within three months. No

system operates now. TD markings are usually done by the block officers though the range officers were also tried for some time. In case of natural calamities i.e. fire, flood and landslides etc. trees are granted free to the sufferers as and when required. TD Distribution Rights were suspended from 2006 to 2010 owing to Hon'ble High Court order. Later, on the order of Hon'ble High Court, Govt. of HP notified new TD policy and H.P. Forest (Timber Distribution to Right Holders) Rules, 2010 for the rationalization of grant of timber. However TD policy - 2010 and rules were changed again in 2013 and then in 2016 with few amendments. The new policy was notified vide **Notification No. FFE-B-E(3)-43/2006 Vol II dated 26.12.2013 and amended Notification No. FFE-B-A (3) 4/2015 dated 26.02.2016** which are appended in Volume-II, Appendix -XX, Page No. 145-159. The detailed procedure regarding grant of timber as TD is in Appendix XX. However, it should be clearly understood that all trees felled from a particular forest, whether as TD grants or as illicit fallings are to appear in the respective TD and damage register. In case of natural calamities like fire, floods etc. special grants for TD may be made expeditiously. It has been observed that people belonging to lower strata of the society are generally denied TD and they are made to run after forest functionaries repeatedly. Their demand should be considered with special consideration. Special care should be taken to see that the grants under TD do not exceed the prescribed yield in any working circle, at any time. This is the personal responsibility of the DFO to ensure that grants are made in such a way, so as not to upset the prescriptions of the working plan. In tribal area, Range Officers are authorized to sanction upto three trees under exceptional circumstances. The timber granted in a revenue estate can be used within the same estate and no permission is required for the movement of such timber within the revenue estate. It will be necessary to record the timber extracted, from the trees so granted, on the back of the permit, so that an account of the timber is maintained. The timber to be exported will be hammer marked, before it is allowed to be moved out. Maximum period, keeping in view the terrain of the area, should be allowed. The export movement permit should not remain in force longer than absolutely essential. CFs may make necessary amendments where ever considered feasible to suit the local conditions but under intimation to direction office.

Government has decided in case of Kullu and Chamba District as under: -

- i) Min-Khata holders of Kullu who have acquired ownership of land under Land Tenancy Act or under any other provisions of Land Reforms Act or any government scheme and who are provided land, will enjoy the concessions of getting timber for their bonafide domestic use.
- ii) Tribal min-Khata holders of Himachal Pradesh, settled in Kullu, will get the concession on timber for the bonafide domestic use at one place of their choice, including Kullu District after getting their rights of getting TD in other districts extinguished. Intimation about the extinction of rights in other districts/area will be communicated by the DFO of the area, where such rights are exercised, to other DFOs.
- iii) Tribals will be allowed to enjoy this right/concession once in seven years at one place starting from the latest grant in any area. Accordingly to the executive instructions of CCF/HP vide memo. No. Ft. 29-93/63 (M) dated 08.09.1993 ROs can grant upto 5 trees, preferably dry, fallen and show damaged trees, out of which not more than one trees is Ist class and one IInd class, in case of damage by fire, or flood etc.

Market rates for 2017-18 for Deodar, Kail and Other Species are given below: -

(Table 7)

Spp.	Deodar	Kail	Rai/Fir	Chil	Walnut	Sal	Shisham /Tun	Sain	Other B/L (Kokath)
Per M ²	55904	40126	22437	21117	37300	15190	37800	17195	5476

1.9.2 Grazing: - Along with the timber rights the other rights allowed under the Anderson Settlement Report are the following: -

- 1) Grazing of cattle, sheep and goats.
- 2) Grass and leaves for fodder.
- 3) Manure.
- 4) Agricultural and domestic implements.
- 5) Fuel torches, charcoal and wood for cremation.

A Lack of improved grassland management makes the problem of grazing very important to tackle. Anderson while recording grazing rights did not do so lucidly. According to L.Dane quoted in Anderson, the following statement was made about the effects of livestock on natural regeneration “Grazing does not do much harm as it is generally supposed to do. Throughout the valley where felling has been put to a stop and the situation is in any way favorable, the young growth of Kail especially, is coming up freely and many places which have now been left out of the demarcation will in few years be promising forests. And this occurs too, where the most extensive grazing rights exist. I would not go so far as to say that grazing does no harm to the forest, but what I do say is that the trees come up, notwithstanding the grazing and that grazing by cows and bullocks, at any rate in moderation does no great damage. These animals do not touch the trees, if there is anything else for them to eat and by the time the grass has been grazed off or has died out, the trees are too large to be much damaged”.

The Settlement considers that a right holder may graze the number of cattle, sheep and goats necessary for his bonafide agricultural and domestic requirements. Right-holders however, keep very large flocks of cattle, much more than the actual requirement. Increased heavy incidence of grazing is thus a serve strain the forest. Amount the most important forest grazing resources are, high altitudes Spruce and Silver Fir areas, with relatively open stands of mature trees. The under storey vegetation includes some temperate grasslands, though often invaded with Iris, Ferns and other herbaceous vegetation i.e. Polygonum spp. The natural regeneration is being adversely affected because of heavy grazing intensity. Incidence of grazing is highest over the IIIrd class forests, near the villages, and thus has led to great degradation. With increase in forest areas through creation of new demarcated protected forests, increased cultivation, stress on horticulture etc, the grazing area has decreased. The alpine pastures /thaches have thus come under terrible strain both the local and the migratory grazer.

We must also appreciate that in the high lying Fir forest. Having thick layer of undecomposed humus, light grazing can be beneficial for natural regeneration.

Sheep and goats grazing: Sheep and goats are kept for both meat and fiber production. The goats are also milked. Wool is used domestically for local spinning and weaving, for clothing, shawls, carpets etc. Goat hair is used weaving, commonly for heavy clothing, bags and rugs. There are two types of graziers that graze their flocks on the higher level, pastures/thaches and forests of KULLU/Parvati Divisions.

1) Local inhabitants

2) Migratory graziers who come during summer and leave before the onset of winter.

Routes of entry are fixed and these graziers are permitted to enter Kullu via Sainj, Bhallan and Dukhi passes along Raghupur rider. They are not allowed to enter before 28th May and stay beyond 5th October (Para 176 of the Settlement). The migratory graziers cannot halt for more than one night at one place and travel less than 8 Km per day. They are not allowed to graze their flock in the closed areas enroute.

Rates for grazing are-

a) For local inhabitants in their own Kothi:-

Sheep @ Rs.3/12 per hundred.

Goat @ Rs.4/69 per hundred.

b) For local inhabitants grazing outside their own Kothi:-Rs. 3/12 per hundred extra in addition

to (a) above both for sheep and goat.

c) For outside grazing sheep @ 0.19 paise per head, goat @ 0.37 per head.

Right holder keeps very large flock of cattle, much more than the actual requirement. Increased heavy incidence of grazing is thus a severe strain on the forest. Cattle, buffaloes, sheep and goats together constitute over 95% of the livestock unit population in Kullu district. Ratio of sheep to goats is nearly 2:1. However, it must be noted that there has been a slight decline in the cattle population in the Kullu district since 1972. It is estimated that probably half of the sheep and goats move seasonally to find grazing. Migration patterns vary, depending on the home base location of the flock. Some graziers have rights to local grazing, while others without rights, obtain

Permits from the Forest Department as well as obtaining agreement of local communities and paying local grazing fees on village or private grazing land. Migration routes and camping places are regulated by the forest department. Complaints from local land owner, urban communities and road users in the town along the routes are increasing due to the following reasons:-

i) With inorganic fertilizers readily available, a benefit of grazing livestock on croplands for manure is outdated.

ii) Year round cropping is practiced.

A survey of records from a limited number of check points, observed in May/June 1989, suggests that perhaps 1,00,000 goats and 1,40,000 sheep move to summer grazing in Lauhal and Sipiti on the routes through Kullu and Routing Pass.

Buffalo grazing:- Migratory buffaloes are herded by the gujjars who follow seasonal patterns of movement. These animals would number 1500 to 2000 as indicated by the records of permits and fee paid to the forest department. Migration into Kullu was first observed in 1870 and has been permitted by the forest department since 1940, though buffalo grazing is not permitted in the settlement. The DFO, at his own discretion used to allow a certain number of buffaloes to graze on permits in the un-demarcated protected forest/third class forest where they could do little damage. During summer time a limited number were allowed to graze in the thaches of the IInd class forest. Grazing of 55 buffaloes was allowed by issuing a notification no. 912/Ft. dated 29.3.1940 and out of this, 30 buffaloes were permitted in main Beas valley forests and 25 buffaloes in Rupi Waziri. The numbers kept increasing over the years, remaining steady at 85 from 1954 to 1970. During 1971, at the instance of the Hon'ble

Forest Minister, regular permits started being issued to the rah Dari gujjars for such forest which could withstand the buffalo grazing. During 1971-72, only 250 buffaloes were recorded. This rose to 2020 buffaloes during 1978-79. It must also be noted that the local people / Panchayat are in league with migratory grazing for pecuniary benefits. They charge grazing fee for excess animals/buffaloes from the gujjars and if checked, declare the excess numbers as their own.

Grazing fee charged is Rs8 to 10/-per buffalo from migratory gujjars while Rs.1/-per buffalo is charged from the locals. The Deputy Commissioner too under rule 8.1 of the Punjab Forest Manual (Forest Rules of Kullu) can allow gujjars and their buffaloes into Kullu district. This was called rah Dari and it is not covered under any statutory powers. This was primarily have reduced, illicit grazing in government forest/ thaches continue under rah deri permit in connivance with local Panchayat and laxity on the part of the forest department officials to check them. Many Migratory gujjars have settled in Hurla and Lower Kullu and such have acquired rights.

1.9.3 Rights of the Rai of Rupī:- The Rai who is a Jagirdar (Rai Jagir was granted to Rai Bhagwant) has recorder special rights in Rupī Forest. The rights extend to free timber, charcoal, grass, stores etc. For personal use and also free permit for grazing buffaloes in Khirganga and Tosnal forest. The Jagirdar could realize grazing fee from sheep and goat grazer. The rights given to Rai Bhagwant Singh passed on to the son. The H.P. Governor vide no.11-2/1973 has withdrawn the right of Rai of Rupī, including ownership of soil in the undemarcated forest of Rupī Waziri.

1.9.4 Lopping:- Leaving aside Walnut, Box-wood and Ash, all other broad leaved trees are allowed to be lopped for fodder, manure, fuel and manufacture of charcoal. In the IIIrd class forest, Kail lopping is permissible while the lopping of spruce and Silver Fir permissible in all the forest for the maintenance of cattle. Oaks are lopped without restriction. Shisham and Alder are lopped for manure only. Ruthless lopping has done considerable damage to the forest. What is noticed is that evergreen fodder trees i.e. Quercus species are lopped for winter fodder at mid altitude zone, while deciduous trees like Robinia pseudocasia, Celtis australis, Grewia optivas, Morus and some Ficus, Albizzia etc. near villages and IIIrd class forest are lopped for spring and autumn fodder. Damaging pressure on the Spruce and Silver Fir is on the rise and these trees are lopped to the extent of removal of all lateral branches, upto the top 1-2 meters of the trees. This effects the timber quality.

1.9.5 Fruit packing cases:- Horticulture has flourished both in Kullu and Parvati tracts. Prior to 1982-83 standing trees were marked to the saw millers for conversion into packing cases, for future sale to the orchardists from 1982-83 onward trees were marked and handed over to the HPSFC. For conversion into geltus and supply to the saw –millers from their depots for further conversion into packing cases and supply to the fruit growers. Next to T.D. the demand of timber for packing cases has put additional burden on the forest. Now no trees are marked for fruit packing cases. Wooden packing has been replaced by carton/corrugated packing cases. These packing cases are liked by the purchasers as they give fancy look.

1.9.6 Charcoal:- Some malformed and diseased trees and felling refuse can be granted free to the right holders for making charcoal.

1.9.7 Slate quarries: - There are some quarries recorded in the revenue records and from here the right holders can remove stones and slates free of charges for the construction and repair of their houses. The non –right holders can obtain the stone and slates against the fee prescribed. Territorial DFOs must look into the slate quarry issue from the point of view of the provisions of the Forest Conservation Act, 1980. The slate quarries had turned into high commercial value in Thella/Garsa valley. Field staff has to keep regular control and check through exit points so that smuggling of Gadsa stone can be checked efficiently.

1.9.8 Leaf Mould: - leaf mould called ‘Suhr’ can be collected by the right holders locally from the forest except those forests that are under regeneration. The practice of removal of Suhr can be harmful to the forest vegetation, on account of the continual removal of soil cover, as leaf mould is scrapped with an iron prong. Aggarwal in his Working Plan has mentioned that the increment of trees may be reduced up to 53%.

1.9.9 Phat Burning: - Phats or grazing ground is burnt annually during winter. This is done on the false belief of the people, that it would help the productivity and quality of the grass. It is felt that old woods and litter will get burnt and later new young grass growth would be stimulated. What really happens is that the inferior quality grasses, multiply and eliminate the tender and nutritious grasses. Phats are to be burnt in the presence of the local forest guard, during the months of January and February. In practice however, there is no adherence to any rules and this phat burning is done as and when the villagers decide. The result is that unchecked burning continuously poses a fire hazard to the adjoining forest and many times great devastation results. The forest Department that is empowered to regulate the said practice is not able to control it. Controlled burning if done scientifically can check summer fires, control bush growth and help maintain grasslands. Uncontrolled and at times deliberate burning can be quite harmful to our pine plantation. Farmers and livestock people however feel that the extent, frequency and intensity of phat burning has reduced as compared to the past, perhaps due to a reduced accumulation of material to burn under, heavier grazing pressures. The only rationalization for the continuance of phat burning is the requirement of controlling undesirable woody vegetation. Phat burning should thus be combined with agreed seasonal closure and rotational grazing.

1.10 Minor Forest Produce: - The right holders are allowed to remove roots, flower grass etc. free from the forest, wherein right have been recorded. Right to grass in the DPFs. Is subjected to control if it is felt that the same is detrimental to forest vegetation. Chapter-IX of Part-II of Volume-I gives a detailed discussion regarding Non-timber forest produce earlier called minor forest produce. Earlier Panchayat Pradhans were given the power to issue permits for collection and export of certain medicinal plants. In this drive panchayat Pradhans issued permits very casually and never bothered to check how much revenue is being generated from permit fee and royalty. This also caused damage to the existing resource base and on the other hand forest officials are not able to keep control and check the outturn from medicinal plant collection. Panchayat Pradhans, out of ignorance had also started issuing permits for the banned species too. In this regard proper orientation of PRI members is required to be ensured prior to giving any powers for regulations of MFP's.

1.11 Nautor: - Nautor granted in the past have caused great problems to the department as they have encouraged encroachments of government land. Nautors were sanctioned by the Deputy Commissioner, through issue of a Patta in the IIIrd class forest if a person is resident. Many people are in possession of land which they term as Nautor even though regular Patta has not been given to them. There are many other who have encroached upon prime government land through “transfer” of their original Nautor site. The situation is chaotic and it is felt that land settlement would redeem the situation.

CHAPTER-II

FLORA AND FAUNA

CHAPTER-IIA (FOREST FLORA)

2.1 TREES: The important tree species occurring in Parvati Forest Division are Deodar (*Cedrus deodara*), Kail (*Pinus wallichiana*), Spruce (*Picea smithiana*), Fir (*Abies pindrow*), Ban Oak (*Quercus leucotrichophora*), Mohru Oak (*Quercus dilatata*), Kharshu oak (*Quercus semecarpifolia*), Rakhal (*Taxus wallichiana*). Besides a number of other trees are found in the tract, list of which is given in glossary of Botanical names in Volume II Appendix III, Page No. 66-75. A brief summary of description, composition and condition of these important species is given here under:-

1. **Deodar (*Cedrus deodara*):** Deodar is found mostly mixed with Kail in this division. The mixture crop is dominated by Kail (40:60). Regeneration is moderate due to biotic factors. The overall site quality of Deodar trees is I/II in this division. The quality of deodar is very well with clear bole and prominent crown. In northern aspect it is very well grown and reaches to its largest dimension. In kasol area chil is available above deodar. Grazing, fire and human interference is failure of regeneration. The quality of deodar tree is very well in Parvati division with clear bole and prominent crown. In northern aspect it is very well grown and reaches to its largest dimension. (Pulga, Kasol, Jari, Dhara). Near kasol Chil is available above deodar. Grazing, fire and human interference is failure of regeneration.
2. **Kail (*Pinus wallichiana*):** Also called as Blue pine. It is found in mixture with Deodar as explained above. The overall site quality of Kail trees is I/II in this division. Due to selective cutting of deodar for TD, proportion of Kail species has increased. It is used as timber. It is fast growing pine. No artificial regeneration is carried out for this species it is all natural regeneration. It is also called as blue pine. It is mostly associated with deodar, not pure stand. It is used as timber. It is fast growing pine. No artificial regeneration is carried out for this species in Parvati division it is all natural regenerated.
3. **Fir (*Abies pindrow*):** It is found in mixture with Spruce with rarely pure stands of Fir. It generally occurs on higher elevations on moist locations and along Nalas. Silver Fir predominates in higher reaches/ moist localities whereas Spruce is available lower down. In cooler localities and depressions, Silver Fir descends down to 2500 meters whereas along spurs and warmer regions, Spruce penetrates higher ups. It avoids dry, shallow soil therefore sometime found on top of ridges it is usually stunted in growth. Its root system is not very massive so many tree falls due to heavy wind and snowfall. It avoids dry, shallow soil therefore sometimes found on the top of ridges it is usually in stunted in growth. Its root system is superficial and not very massive so many tree falls due to heavy wind and heavy snowfall.
4. **Spruce (*Picea smithiana*):** It occurs in mixture with Fir as explained above. It is managed under Fir/spruce Working Circle. Both Fir and spruce were recklessly cut for meeting demand

for packing cases before 1990 and scar of those fellings are still evident in these forests. Natural regeneration is very less due to low germinative capacity of seed and infrequent seed year. Heavy grazing is also a factor for failure of natural regeneration. Natural regeneration of spruce is very less in Parvati valley due low germinative capacity of seed and infrequent seed year. Heavy grazing is also a factor for failure of natural regeneration.

5. **Ban Oak (*Quercus leucotrichophora*):** It is a protected species of the state and no green felling is allowed and is subject to heavy lopping near habitations. Amongst the broadleaved species, Ban Oak is most common. Regeneration of Ban oak is a problem. It is managed under Broad leaf working circle. It is used as fodder and charcoal making by local people. Heavy snowfall is harmful for Ban oak. It is used as fodder and charcoal making by local people. Heavy snowfall is harmful for ban oak.
6. **Mohru oak (*Quercus dilatata*):** It is evergreen tree with straight bole and dense crown. It is an associate of Deodar-Kail and Spruce forests and is found in lesser proportion in the forests. Like Ban Oak, it is also a protected species. It is a very good fodder and local people use and manage these trees near the habitations. It is evergreen tree with straight bole and dense crown.
7. **Kharshu oak (*Quercus semecarpifolia*):** This oak is found at very high elevation confining to the upper reaches. It is a protected species and is being maintained as such as natural reserve. It is found on deep rich moist soil. Heavy grazing prevents its reproduction. - It is found both on deep rich moist soil. Heavy grazing prevents its reproduction
8. **Rakhal (*Taxus wallichiana*):** This is commonly called yew, occurs as short, gnarled, swiftly - tapering tree with height less than 40 ft. – 50 ft. It is found scattered through some of the Fir/Spruce forests. Its leaves are highly valued for taxol content. Govt. has completely banned its felling and extraction of leaves. Presently it is reported that leaves are being used as part of ‘Havan’ material. There are certain private firms in Parvati Division which grow taxus and take this raw material for pharmacentral uses.

2.2 Composition and Condition of the crop:-

The Forests of Parvati Division lie in a terrain which in general, varies from being moderately steep to precipitous, except from some of the flatter bench land and adjacent hills in the main Beas River Valley and its larger tributaries. The main forests lie between the elevations of about 5000 feet to 10500 feet above mean sea level. Varied configuration of the group, varied climate and vegetation characterize it. A striking feature of this terrain is that there is a very marked relationship between the human habitation and the forests. The main area of forests occur on the slopes with northerly aspect, where the climate is moist and cool, while the human habitation mainly occurs along the valley bottoms on the bench lands or up the mountain sides, which have a South-Eastern aspect, where the climate is relatively warm and dry, favorable for crops, the two pines, Kail (*Pinus wallichiana*) and Chil (*Pinus roxburghii*) and the hardwood, Kharshu Oak (*Quercus semecarpifolia*) are the main species favoring the warmer slopes with a Southern aspect.. The overall pattern is like a complex patchwork quilt made up of smaller blocks of Fir, Spruce, Kail (*Pinus wallichiana*) or Chil (*Pinus roxburghii*) Forests and their admixtures. Between 7000 feet to 8000 feet above mean sea level is called the “Tension Belt”, a zone where Deodar, Kail, Fir and Spruce compete for survival. Interspersed between these smaller blocks of forests, are many areas of cultivation on productive forest areas and patches of hardwoods.

The forest boundaries which were fairly straight and regular are now being rapidly pushed back on account of two main reasons. At the lower altitude, the villages and their cultivated areas are expanding into the adjacent forests (both in protected and unprotected forests) through lopping of Fir, Spruce and Kail trees, next to the villages. This eventually causes dying of these lopped trees. The second reason which is producing an overall shrinkage in the forest area is the disastrous effect of uncontrolled grazing of a huge number of cows, sheep and goats in the coniferous forests, which eliminates any new coniferous regeneration of the forest's flora, as the grazing herds move upwards through the forests to the alpine pastures. The forests on the higher ridges and adjoining alpine pastures are also being subjected to indiscriminate lopping and serious on reversible action of hundreds of animal hoofs which harden the once porous soil to hard water –resistant surface, causing fast run-off of water during heavy rains. This, in turn, brings about severe soil erosion lower down the slopes. There is a need for retrospection and immediate firm action, if the present forest area is to be protected/ maintained.

Table.2.2.1 The distribution of several coniferous species found in the tract, conform (to a few exceptions), to fairly regular altitudinal stratifications:

(Table 1)

Botanical Name	Common Name	Approx.Altitudinal Range (in Feet above M.S.L.)
1. <i>Pinus roxburghii</i>	Chir or Chil	3000 ft. -7000 ft.
2. <i>Cedrus deodara</i>	Deodar	6000 ft- 8500 ft.
3. <i>Pinus wallichiana</i>	Kail	6000 ft.-10000 ft.
4. <i>Picea smithiana</i>	Spruce	7500ft.- 10500 ft.
5. <i>Abies pindrow</i>	Silver Fir	7500 ft.- 11000 ft.

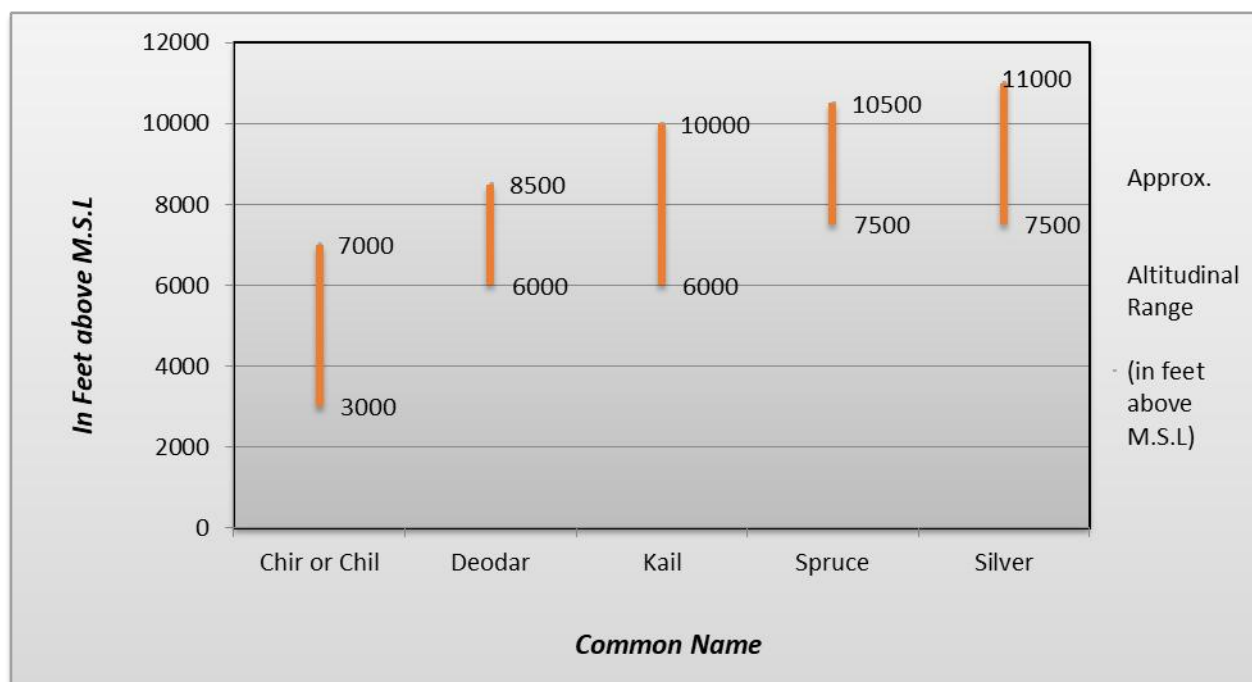
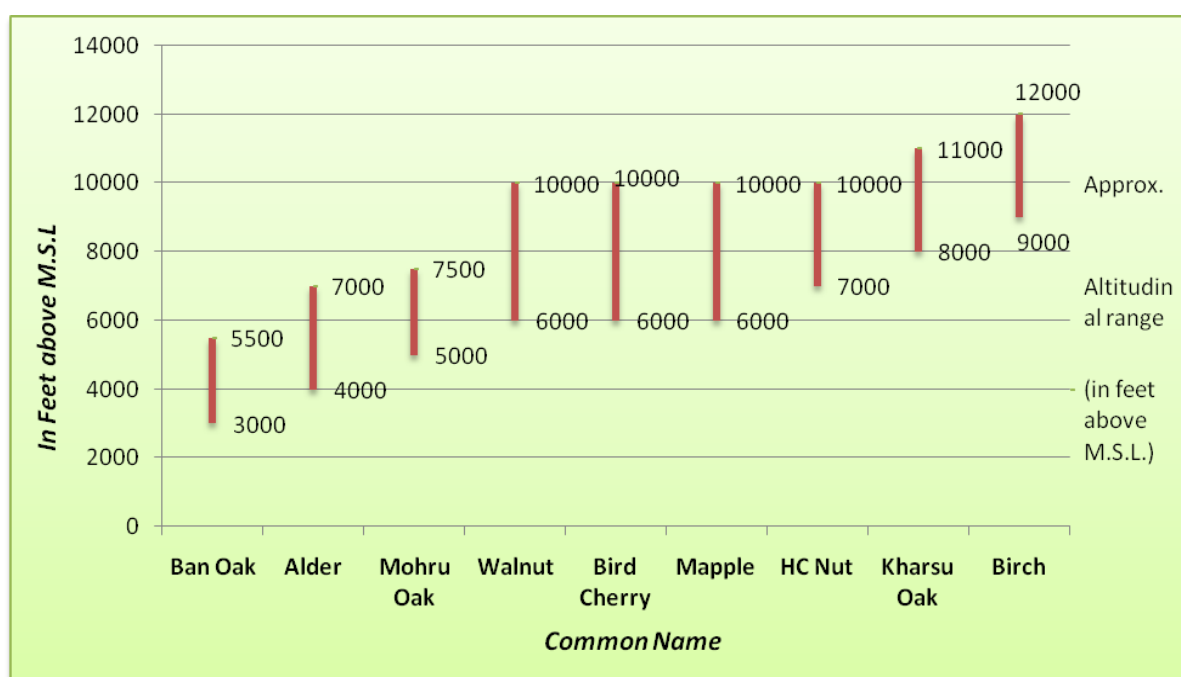


Table.2.2.2 The common and important hardwoods found in the Parvati Forest Division are as follows:-

(Table 2)

Botanical Name	Common Name	Approx. Altitudinal Range (Feet above M.S.L.)
1. <i>Aesculus indica</i>	Horse Chestnut	7000 ft. - 10000 ft.
2. <i>Quercus leucotrichophora</i>	Ban Oak	3000 ft. – 5500 ft.
3. <i>Quercus dilatata</i>	Mohru Oak	5000 ft. - 7500 ft.
4. <i>Quercus semecarpifolia</i>	Kharshu Oak	8000 ft. – 11000 ft.
5. <i>Betula utilis</i>	Birch	9000 ft. – 12000 ft.
6. <i>Juglans regia</i>	Walnut	6000 ft. – 10000 ft.
7. <i>Prunus padus</i>	Bird-Cherry	6000 ft. – 10000 ft.
8. <i>Acer caesium</i>	Maple	6000 ft. – 10000 ft.
9. <i>Alnus nitida</i>	Alder	4000 ft. – 7000 ft.



At 7000 ft. – 8000 ft. there is a competition for dominance between Fir, Spruce, Deodar and Kail. Both pure and mixed stand of coniferous species exist. Chir and Kail are more light demanders than Fir and Spruce and lie on the slopes with southerly exposures. Chir Pine which is an intense light demander is invariably found growing on other aspects as well. Deodar normally grows on soil, containing granite, gneiss, or shale and avoids badly drained soils and stiff clays. Pure Deodar stands are found, also as mixture with Blue Pine, Spruce and Silver Fir. Kharshu Oak found in Fir/ Spruce forest is an important firewood species. Pure Kharshu Oak stands are almost invariably found on the slopes with southerly exposure, although Kharshu Oak is commonly found mixed with Fir/Spruce on the northern slopes, where it often attains a good height and a clear bole. Birch exists at highest altitude,

while Walnut, Horse chestnut, Bird Cherry and Maples are found scattered through the forest. Homogeneous stands are not there. The species are normally found in or close to the damp nallas or stream beds. The Alder occurs in pure stands in some of the river beds, especially in the river bed from Pulga to Bhunter.

Flowers brighten up the landscape. Primulas, Balsams, Anemones, Poppies, *Ranunculus*, Wild Strawberry, *Geranium*, *Potentilla* bloom and in Parvati Valley are prominent

.The Forests of this division can be classified into the following types, as per “a Revised Survey of the forest types of India” by H.G. Champion and Seth, 1964 : -

Champion’s classification of Forest types

2.2.1 GROUP 9 – Sub Tropical Pine Forest:

- (i) 9/C.1. b Himalayan Chil Pine Forests.
- (ii) 9/C.1. /D.S.I. Himalayan Sub-Tropical Scrub Forests.
- (iii) 9/C.1. /D.S.2: Sub Tropical Euphorbia Scrub Forests.

2.2.2 GROUP 10-Sub Tropical Dry Evergreen Forests:-

(i) 10/C.1.a *Olea cuspidata* Scrub Forests: - Along the banks of Parvati and Beas rivers and along Hurla stream, *Olea cuspidata* exists natural as the main species, occurring in grove. *Punica granatum* is an associate.

2.2.3 GROUP 12- Himalayan Moist Temperate Forests:-

- (i) 12/C.1.a Ban Oak Forests.
- (ii) 12/C.1.b. Mohru Oak (*Quercus himalayana*) Forests.
- (iii) 12/C1.c. Moist Deodar Forest.
- (iv) 12/C.1.d. Western Mixed Coniferous Forests.
- (v) 12/C i.e. Moist Temperate Deciduous Forests.
- (vi) 12/C.1.f Low level Blue Pine Forests.
- (vii) 12/C.2.a Kharshu Oak Forests.
- (viii) 12/C.2.b Western Himalayan Upper Oak Forests.
- (ix) 12/D.S.1. Montane Bamboo brakes.
- (x) 12/D.S.2. Himalayan Temperate Park Lands.
- (xi) 12/ D.S.3. Himalayan Temperate pastures.
- (xii) 12/S.1. Alder (*Alnus nitida*) Forests.

2.2.4 GROUP-14-Sub-Alpine forests:-

- i. 14/C.1.a Western Himalayan Sub-Alpine Fir Forests.
- ii. 14/C.1.b Western Himalayan Sub-Alpine Birch Fir Forests.
- iii. 14/D.S.1 Sub-Alpine pastures.

2.2.5 GROUP-15-Moist Alpine Scrub:-

- i. 15/C.1. Birch Rhododendron Scrub Forests.
- ii. 15/E/1. Dwarf Rhododendron Scrub Forests.
- iii. 15/E.2. Dwarf Juniper Scrubs.
- iv. 15/C.3. Alpine pastures.

Champion's classification of Forest types

2.2.1 GROUP 9- sub Tropical Pine Forests:

(i) 9/C.1 B Himalayan Chil Pine Forests: - This type exists in Parvati valley and also in Mohal and Bajaura Khad. Along Parvati River, Chir accrues on both rights up to Manikaran. The crop is irregular and patchy. Deodar and Kail regeneration is coming up, replacing Chir, since aspect is northerly. This can be seen in Soma-chalon and Kasol forests, while in Dunkra-mul forests, Chir is doing well on quartzite. Chir is ideal for dry and rocky soils and extends right upto 2150 meters, in Parvati range. In the middle canopy are found Cornus capitata, Rhodo - dendron ardoreum, Pistacia integerrima, Lyonia valifoia, Symplocos crataegoides and Albizzia julibrissin. The undergrowth comprises Rhus Parvifoia, Berberis aristata, Principia utiles, Rubus ellipticus, Zanthoym alatum, Rosa moschata, Caesalpinieae sepiaria, Nerium oborum, Plectranthus species, Anaphalis and Corns capitata are also found.

(ii) 9/C.1. /D.S.I. Himalayan Sub. Tropical Scrub Forests: - Under this type come the extensive grassy areas which server as pasture land and are scattered within the Chil areas. Fires are responsible for making the soil shallow and dry. A few Chil trees along with some broad leaved trees exist in these forests, while in the undergrowth are found Berberis spp., Rubus spp. and Plectranthus rugosus.

(iii) 9/C.1./D.S.2 Sub-Tropical Euphorbia Scrup Forests: - This type exists only in Hurla Range and is confined to southern and western slopes which are dry and rocky. Except for some Bauhinia and Ficus, the main species in this area is Euphorbia spp.

2.2.2 Group 10- Sub Tropical Dry Evergreen Forest:-

(i) 10/C.1. A Olea cuspidata Scrub Forest: - Along the banks of Parvati and Beas rivers and along Hurla stream, Olea cuspidata exists natural as the main species, occurring in grove. Punica granatum is an associate.

2.2.3 Group 12- Himalayan Moist Temperate Forests:-

(i) 12 / C.1. A Ban Oak Forests :- Quercus Leucotrichophora exists in abundance confined to Hurla Range between 1500 meters to 2300 meters elevation; otherwise it lies in patches scattered all over the track. Good plantation of Deodar was raised in Hurla Range artificially. Ban Oak is a climax type of vegetation. Associates are Rhododendron Arboreum and Lyonea ovalifolia. Moist areas consists of Litsea umbrosa, Cinnamomum tamala, Aesculus indica while the under-growth consists of Berberis, Lycium, Desmodium tiliaefolium, Rubus Ellipticus, Rubus Niveus, Lonicera, Quinqueloclaris, Viburnum Cotifolium, Myrsine africana, Plectranthus strictus, Salvia Glutinosa and various grasses and ferns. Climbers such as Vitis Himalayan, Rosa, Hedera and Smilax Parvifolia are also there. Forests occurring in the type are generally mature and devoid of natural regeneration.

(ii) 12/C.1.B. Mohru Oak (Quercus Himalayana) Forests: - Pure forests of (Quercus Himalayana) do not exists in this division. The species occurs in patches in the deodar zone, unevenaged. Natural regeneration is observed at some places. Mohru Oak is heavily lopped for fuel wood / charcoal and fodder. Associate are Spruce, Deodar and Kail. Undergrowth consists of Rosa macrophylla, Rubus spp; Berberis aristata, Indigoera rerardiana, Daphne cannabina, Geranium, Thalictrum, Galium aparine and various ferns.

(iii) 12/C.1. Moist Deodar Forests: - This type of forest lies at an elevation of 1500 meters and 2630 meters. On northern slopes, it goes even lower, while on the hotter southern slopes, it reaches higher along the spurs. Soil formed on account of disintegration of granite is ideally suited for Deodar, as can be seen at Pulga. Pure Deodar crop exists all over the tract. In the lower zone, while the upper reaches contain Deodar, in mixture with Kail and Spruce. 1/35 and R/4 Kasol C III of Parvati range contain scattered Cupressus torulosa on limestone formation. The under storey comprises Quercus Himalayana, Quercus Leucotrichophora, Rhododendron arboreum, Lonicera parvifolia, Populus ciliata, Carpinus faginea, Ulmus wallichiana, Cedrela serrata, Juglans regia, Aesculus indica, Celtis australis, Cornus macrophylla, Prunus padus, Pyrus pashia, Buxus sempervirens etc. in the undergrowth are found Indigofera spp., Desmodium, Virburnum, Lonicera, Rubus, Berberis and Spiraea spp., Rosa moschata, Wikstroemia canescens and Elaeagnus umbellata, Fragaria, Viola, Anaphalis, Geranium spp., Galium spp., Salvia Glutinosa, Ainsliaea aptera, Thymus serpyllum etc. beautify the ground flora. Main climbers are Vitis semicordata, Hedera helix and Clematis Montana. Leaving aside artificial plantations, the crop is uneven aged with preponderance of pole to middle aged trees. The altitudinal zone a suit Deodar the natural regeneration is poorer the biotic pressure and local demand renders the forest under stocked. Quality is 1/II.

(iv) 12/C.1.d. Western Mixed Conifers: - This is a common type in the tract. Though pure stands of Spruce also exist, this species is found in mixture with Deodar, Kail and Silver Fir. These type of forest lie at an elevation of 2300 to 3200 meter above the Deodar zone. In the lower reaches, Spruce predominated, associated with Deodar on spurs and steep ground. Kail is confined to hot southern slopes and ridges with shallow slopes. In the central portion of the zone, pure stands of Spruce with Silver Fir, occupying the upper moist parts, can be seen. In the topmost portion Silver Fir dominate, relegating Spruce to the second place, along with kharsu Oak. Kail occurs in mixture in Parvati tract in Tosnal, Khirganga, Nakas and Kalga. Upto 2770 meters elevation, Deodar has gained ground because of forest fires. The broadleaved species found are Oaks, (i.e., Quercus Leucotrichophora, Quercus Himalayana) while the species found in depressions and along nallahs are Prunus padus, Acer spp., Aesculus indica, Juglans regia, Corylus colurna etc. In Matikochar forests, in Lower Kullu range, Taxus baccata forms a dense under storey. Undergrowth comprise Viburnum spp; Cotoneaster bacillaris, Ilax diphyrena, Staphylea emodi, Lonicera spp; Deutzia corymbosa, Berberis, Indigofera spp; Arundinaria and Sarcococca spp; Strobilanthes, Impatiens and Dipsacus, polygonatum spp; Valeriana, Fragaria, Anemone, ferns and grasses. This zone contains irregular crop having middle-aged to mature trees. Except for the regeneration in Fir is scanty and deficient.

(v) 12 /C i.e. Moist Temperate Deciduous Forests: These type of forests are found at elevations ranging from 1800 meters to 3200 meters. They are distributed all over the track, confined to moist and damp locations along nallahs and depressions, unsuitable for conifers. Top canopy consist of Aesculus indica, Acer caesium, Acer pictum, Carpinus spp., Ulmus wallichiana, Betula spp., Juglans regia, Prunus padus, Celtis australis, Fraxinus floribunda, Morus serrata and Populus ciliate. The under storey has Corylus colurna, Rhus punjabensis, Taxus baccata, Euonymus lacerus, Lyonia ovalifolia etc. The species are found singly or in groups and very often in groves. Under growth and ground flora is like type 12 / C.1. d and

12/ C.1.e. Under the broad leaved, at places some natural regeneration of Spruce and Fir is coming up. Lopping in broad leaved is a menace. Irreparable damage is done to Juglans regia when its bark is extracted illicitly.

(vi) 12 /C.1. Flow level Blue Pine Forest: - With Pinus wallichiana as the principal species, this type is found all over the tract, at elevations ranging from 1540 mtr to 2630 meters. Kail the prolific colonizer, invaded those areas where fires had destroyed the pre-existing species or where blanks were created by avalanches and landslides. Crop is comparatively even aged and ranges from pole to middle aged trees. Tonal forests in Parvati track have been affected by fires. Natural succession is clearly visible, as Deodar has started replacing Kail in the lower portion, while Spruce and Fir are coming up in the higher reaches of the zone. Under storey is similar to that found under 12/ C.1.c. Moist Deodar Forests.

(vii) 12/C.2.a Kharsu Oak Forests:- These occur Parvati tract, in elevations ranging from 2700 to 3500 meters. On the colder, moist, northern, Kharsu is found low down, in mixture with Silver Fir Spruce, forming an understorey while in upper reaches it is found in mixture with the Rhododendrons and Betulas. Natural regeneration is proper and all age classes are represented. In the central portion of this type of forest, Kharsu Oak occurs pure. Lopping of Kharsu by migratory graziers is very common. Understorey comprises. Taxus baccata, Rhododendron arboreum, Cotoneaster bacillaris, Viburnum cotinifolium, Skimmia laureola, Prunus padus, Betula alonides, Salix spp; Rosa macrophylla etc. Ground flora consists of Fragaria vesca, Primulas, Anemones and Polygonum spp., ferns and grasses.

(viii) 12/C.2.b/ Western Himalaya Upper Oak Forests: - This is quite a unique, two – storeyed high forest which occurs in all ranges at elevation ranging from 2890meters to 3400meters. Silver Fir occurs over Quercus semecarpifolia and other evergreen and deciduous tree i.e. Rhododendron spp., Cotoneaster bacillari, Pyrus spp, Prunus padus, Salix elegans and Rosa macrophylla. Middle canopy has Betula utilis, Corylus colurna and Acer spp.

(ix) 12/D .S.1. Montane Bamboo brakes: Arundinaria falcata is confined to lower zone and Arundinaria spathiflora which exists higher up in the zone, occur growth in the mixed coniferous, moist Deodar and Ban Oak forests. The two bamboo species of great utility to villagers occupy moist location on northern aspects forming thickets and not allowing any other species to come up under it. These types of forests occur in all ranges, especially so in Parvati and Hurla ranges.

(x)12/D.S.2. Himalayan Temperate Park Lands: - This type of grass glade lies confined to the altitudinal zone of Silver (Abies Pindrow), Oak Fir and (Quercus semecarpifolia). Along with the grass lie sporadic trees of Silver Fir, Prunus padus, Acer spp., Quercus semecarpifolia. Clumps of Cotoneaster bacillaris, Viburnum cotinifolium and Berberis species are also found. The growths of various flowers add real beauty to such thatches. Ground flora consists of Anemone Potentilla, Fragaria viola, Delphinium, Primula, Anaphilis, Trifolium, Ranunculus spp., Balsam, Dipsacus polygounm and Rumex Nepalensis.

(xi) 12 /D.S.3. Himalayan Temperate pastures:- This type only comprises grassy pastures devoid of tree growth. Such pastures are found in all ranges in the zone of Silver Fir and Quercus semecarpifolia, Festuca spp., Calamagrostis spp., Agrostis spp., Dactylis Glomerata, Bromus spp. and Danthomia spp.. In the lower reaches species like Thameda, Heteropogen

and Chrysogon etc. make their appearance . Grazing has reached alarming levels, much beyond the carrying capacity of the pastures.

(xii) 12/ S.1. Alder (Alnus Nitida) Forests: - All over the divisions, banks of rivers and streams

(I . e. Beas river and its tributaries like Gadsa) consist of this type , Alnus Nitida grows wall on fresh alluvial deposits . Regeneration is good and various places contain all the age classes. The crop that came up after the 1947 floods is evenaged and is in the pole stage. Species found in association are Alnus Nepalensis , Celtis spp., Cedrela toona and Dalbergia sissoo, Spiraea spp. and Nerium Odorum, Undergrowth consists of Plectranthus , Berberis and Prinsepia, Rumex Nepalensis, Polygonum, Ranunculus heterophylla. Great damage is done to these trees by the villagers who cut the trees mercilessly for fuel wood, even though these trees act as natural spurs/barriers reducing the cutting power of the river.

2.2.4 GROUP -14- SUP –Alpine Forests:-

(i) 14 /C.1. A Western Himalayan Sub -Alpine Fir Forests:- this type exists above 3000meters altitude . Silver Fir is the principal species found in admixture with Betula spp. and Quercus semecarpifolia. In the understorey we find Rhododendron companulatum, axus baccata, Prunus padus etc. while the ground flora is the same as 12 / C. 2 a forests.

(ii) 14/ C.1. B. Western Himalayan Sub - Alpine Birch Fir Forests:- Above 3000 meters this type occurs in the inner parts of the division . Top canopy consist of scattered Silver Fir and Betula Alnoides. Quercus Semecarpifolia and Rhododendron companulatum are met with in the understorey. Ground flora consist of Cotoneaster bacillaris, Lonicera and Primulas, Anemone, Caltha spp.; Potentilla and Ranunculus spp.

(iii) 14 / D.S.1 Sup- Alpine pastures :- These type are basically pastures which server as summer grazing , Grasses growing are Agropyron longearstaum, Asemicostalum, Brachypodium Sylvaticum, Dactylis spp., Danthonia and Festuca spp. and some stunted Rhododendron spp.

2.2.5 GROUP- 15 – Moist Alpine Scrub:-

(i) 15/C.1. Birch Rhododendron Scrub Forests: - This type is a low evergreen forest having Rhododendron companulatum as the main species with some Betula utilis and Quercus semecarpifolia dotting the landscape in the understorey . We have Viburum nervosum and Cotoneaster spp., Lonicera spp., Berberis spp. and Polygonum vacinifolium forming the undergrowth.

(ii) 15 /E/1. Dwarf Rhododendron Scrub:- This type exists on elevations varying from 3200meters to 3800meters and contains stunted Rhododendron species . Ground flora is the same as that found in 15/ C.1. Birch Rhododendron Scrub Forests.

(iii) 15/E.2 Dwarf Juniper Scrub: - This type occurs at elevation from 3200 meters to 4200 meters having Juniperus recurva as the main species in stunted form. Undergrowth and ground flora is the same in dwarf Rhododendron scrub Forests.

(iv) 15/C.3 Alpine pastures :- These are extensive grasslands above the tree line and below snowline, which occur practically in all ranges , During summer ,grazing is very common . Medicinal plants are found in are exported /marketed from here. Along with grass are found occasional bushes i. e Juniperus recurva and Rhododendron spp. Ground flora is rich and contains Meconopsis, Delphinium, Aconitum heterophyllum, Borago, Potentilla Caltha, Seecio, Primula, Podophyllum, Jurinea macrocephala and Gentiana Karooa.

2.3 Locality Factors: Aspect and slope exercise strong influence on the condition and composition of the crop. To a keen observer, it reveals that Deodar can be found regenerating even in lower reaches, down to Chil zone, when the region is the cooler, northern aspect. At higher elevation, Deodar is found on regeneration on southern warmer aspect, whereas the northern, cooler aspects now give way to Spruce and Fir. Both aspect and slope affect temperature and moisture condition in any particular tract. In the field it is observed, that normally as much as 308 meters difference exists between the elevations, up to which particular floristic association occurs, on the northern and southern sides of spurs without any marked difference in rainfall. As a rule, difference is directly proportional to the gradient, with the difference becoming greater as the gradient become steeper. On warmer slopes, Kail extends up to Fir zone and on the cooler northern and north-eastern slopes, Fir descends down to Kail zone. Quality of crop at certain elevation is also influenced by the aspect. On the northern aspect because of adequate moisture level, the crop is of a higher quality (clear bole and majestic heights) than in the southern hot slopes at the same altitudes. The forester needs to understand the play of edaphic factors of the nature, whereby succession is being achieved. This helps him to recommend the proper treatment.

2.4 INJURIES TO WHICH CROP IS LIABLE: - The trees liable to injuries are due to following causes: -

- (a) Natural/Climatic factors
- (b) Damage by Fire
- (c) Damage by Man
- (d) Damage by Wild animals and Birds
- (e) Damage by Insect and Fungi.
- (f) Nuisance caused by climbers, bushes and weeds

2.4.1 NATURAL CAUSES/Climatic factors: - These factors are discussed as under:

- a) **Storms and hail:** - Wind damage in the trees, as and when there is storm is not significant. Hailstorms do maximum damage to young seedlings in the nurseries and also to the plantations.
- b) **Rain and snow:** - Kullu valley is said to be a rain shadow area. Even then, there are frequent heavy showers. Floods in 1993 rains destroyed valuable forest lands through erosion. Massive tree damage was noticed as huge trees were plucked far down from their roots and taken along torrents. Occasional cloudburst wrecks maximum damage to the forest crop. Erosion hazards come about as torrents in their wake causing land slips/ landslides, trees get uprooted and young seedlings/saplings get buried under mud debris. The upper reaches experience snow. Wherever the crop is congested and even aged,

damage on account of bending of trees under weight of snow, uprooting/breaking comes about. Young poles, especially of Deodar and Kail get skewed/ bent and this deformity persists till maturity. Valuable portion of bole is rendered useless. Snow chokes young seedlings. Avalanches in upper reaches wreck havoc as they take soil cover and vegetation in their stride. Lightening damage is sporadic and occasional which can be witnessed in various coniferous stands. Trees get split, top damaged or permanently scratched.

- c) **Frost:** - Frost lifting and consequent death in the nurseries/plantations especially of Spruce/Deodar and Silver Fir seedling is not uncommon. Forest protection measures are warranted in the nurseries i.e. leaves, grasses or polythene coverings.
- d) **Drought:** - During some years, the month of May, June, October and November are drought periods. Moisture shortage through prolonged droughts stifles and wilts quite a lot of forest vegetation. The dry conditions also bring about hazards.
- e) **Lightning:** - This type of injury is common in high mountain trees, which is mostly struck by lightning, splits damage and die.
- f) **Damage due to Erosion:** - Excess damage to forest crop comes about on account of land slips/landslides. Meandering of rivers and streams also cause excess damage to prime forest land. Construction activity, especially road constructions disturbs the fragile strata. Deodar, especially, has very shallow roots because of which its soil holding capacity is low. Reduction of forest cover by illicit felling and unsystematic management practice i.e. mining, etc. increase erosion hazards. Heavy and continuous grazing loosens the soil, hence forming rills and gullies and destroying important soil cover.

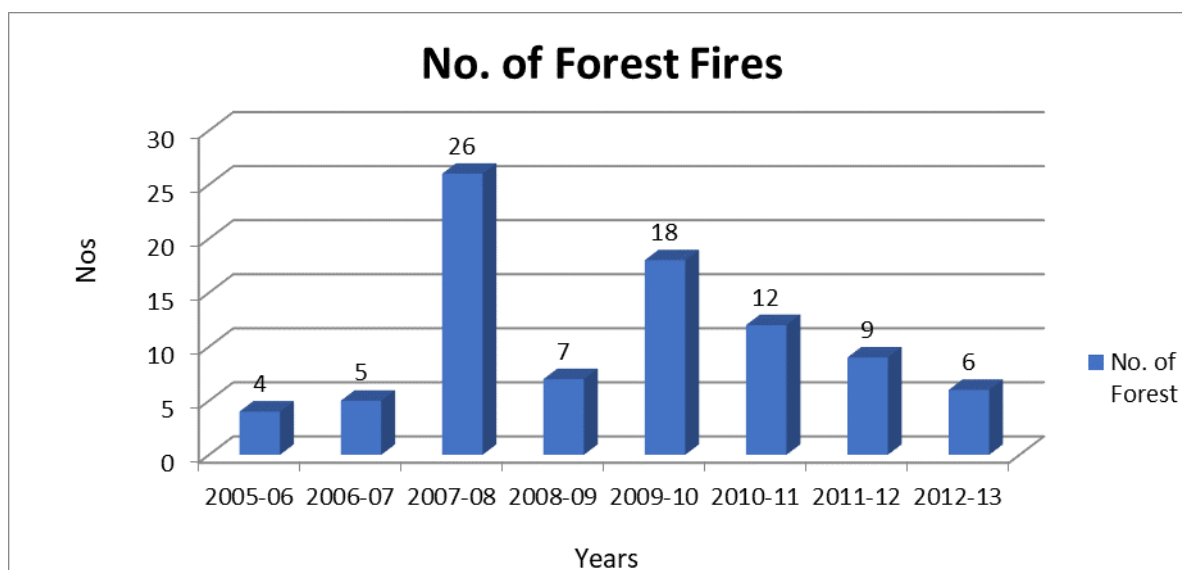
2.4.2 Damage by Fires:-

The occurrence of forest fires has become an annual feature during summer months of April to June and also during drought periods, between October and December. Great damage is consequently caused on the forest crop. Severe forest fires have been recorded during 1910-11, 1915-16, 1921-22, 1929-30, 1931-32, 1946-47, 1952-53, 1965-66, 1969-70, 1970-71. 1921-22 year was said to have been really bad when Fir Forest also caught fire. The intensity and extent was so high that incalculable damage was done. The details of fire incidences are in Volume-II, Appendix-XVII, Page No. 133-138.

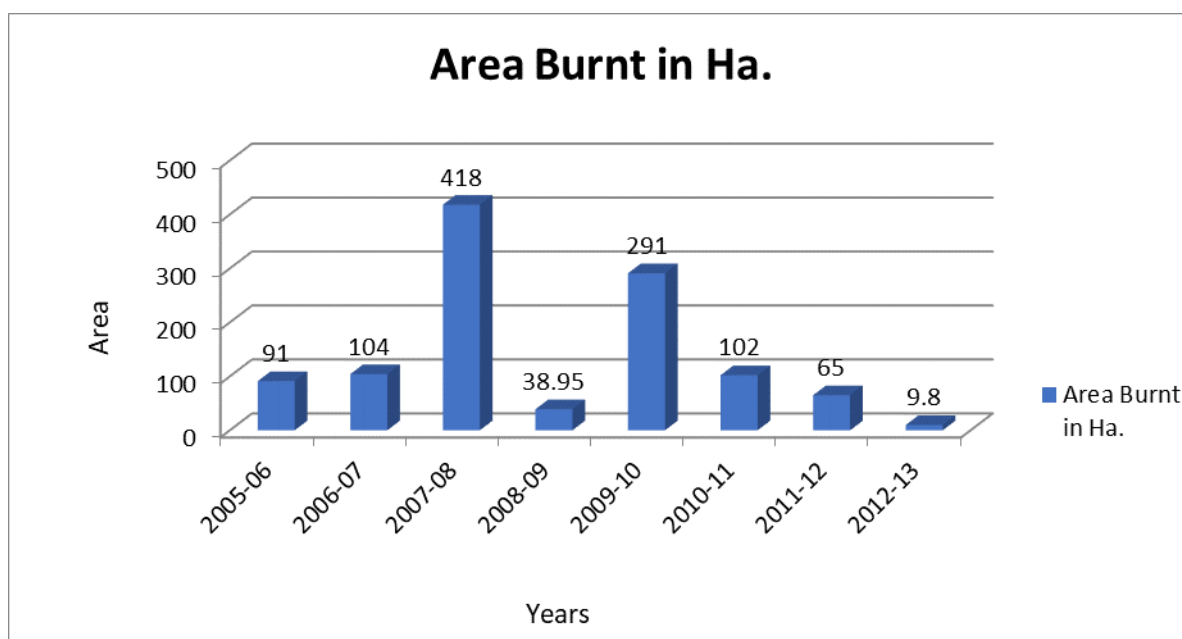
Table 2.4.2 Forest fires and area burnt in hectare in respect of Parvati Forest Division is as under:-

(Table 3)

Year	No. of Forest Fires	Area burnt in ha.
2005-2006	4	91
2006-2007	5	104
2007-2008	26	418
2008-2009	7	38.95
2009-2010	18	291
2010-2011	12	102
2011-2012	9	65
2012-2013	6	9.8



No. of Forest Fires



Area Burnt in Ha.

The brochure on Forest of H.P. published during 1993, lists the cause adequately and also recommends remedies as under:

Impact of fire

The incidence of fire at particular locality is detrimental to flora and fauna of the area. The incidences of fire seriously affected the several herbal species, micro flora and fauna, apart from decrease in biodiversity value, exposure of soil and degradation of habitat etc. The fire accelerates the soil erosion and silting of water shed apart from accumulation of a large amount of debris in the stream.

Objectives of forest fire protection.

- 1) To protect rare and endangered species of animal and plant from fire.
- 2) To protect the degradation of habitat due to fires so that ample cover and fodder of the animals is left intact.
- 3) To control soil erosion
- 4) To involve local people in fire management by constituting village fire protection committee
- 5) Forming strong monitoring regime to construct data base

Causes are:-

- Lack of regular control burning which brings about increased weed growth and accumulation of excessive humus. Felling refuses and debris also results in decrease of regeneration, increased fire hazards.
- Mischief's by people i.e. careless stubble burning, throwing of bididi/cigarette, careless handling of torches, etc.
- Belief among people that fire helps in more grass production. Further, fires are caused by people to drive away bears and leopards.
- Natural Causes i.e. lightning or flint caused by rolling stones.

Preventive measures & remedies Suggested:

1. On the basis of previous year's fire data the entire Forest area be divided into two parts - most sensitive and less sensitive areas .
2. Fire lines should be cleaned properly. Priorities to be given to the areas which are adjoining to the villages and are highly sensitive to fire incidence.
3. The existing inspection path/bridal Paths to be treated as fire lines. The area up to 2 meters each on both sides of these paths to be cleared.
4. Extra staff/fire watcher to be engaged in the fire season.
5. Proper patrolling schedule of fire watcher to be in place well before the fire season.
6. When there is no incidence of fire the services of fire watchers can be taken to clear of the bushes up to 2 meter along the path. Regular control and slash burning
7. Watch towers and better communication network is need of the hour.
8. Establishment of control stations at division and range level to be established.
9. Participation of the local villagers to be ensured. Earlier Timber distribution systems use to be the driving force for local villagers. In present circumstances the TD policy of the government has turned to be more of conservative nature. It is less lucrative for the villagers. In such scenario it is difficult to drive people to jump for the help in the eventuality of fire. An incentive regime to the helpers/informers will be helpful

10. Public awareness of fire hazards through education, persuasion and perseverance. Rights should be linked to duties and responsibilities.

11. Village forest protection committees to be formed in fire season & the existing JFMCs and VFDS should be utilized properly. A particular forest area to be awarded to each VFPC. This committees to be ranked after each fire season based on their ranking they should be given incentives in a public function (van mahatsav etc) to recognize their efforts in protection.

12. Small and handy fire extinguisher to be given to each firewatcher for their personal security.

13. Water holes to be constructed in high fire prone areas. Their construction is to be in such a way that it can also act as a water source to wildlife.

14. Flying squad to be formed and are to be stationed at Gadsa, Pulga, Shat, Pini, Jari and Bhunter, so that on receiving any information they can reach the site of incidence.

15. The names and telephone numbers of the staff to be notified and given wide publicity in the villages adjoining the sensitive forests.

16. Strict vigil and timely action will serve as a deterrent too.

17. Fire lines to be created all along the fences in plantation done in fire sensitive areas. This should be part of plantation norms and needs to be inspected by visiting officials.

Fire suppression

Timely action on the fire incidence is the key to best fire control with least damage. It requires effective communication network and strict vigil.

Post Fire Management

This should include all measure which will help in the recovery of ecosystem. An assessment of loss of vegetation to be made at range level. This assessment should be carried out after first shower of rain. The area to reforested with suitable native and hardy species in such a way that boundary of plantation area is planted with fire resistant species

Training of staff on Forest Fire:

There should be proper coordinated training for the staff and local villagers. This should include different effective methods to control the fire in hilly areas. More emphasis to be on personal safety of the staff and local people who will be engaged in the work of fire protection.

What the forester has to really watch are the fire caused accidentally or deliberately. The extent of destruction caused by the fires varies with the condition and composition of the crop, aspect under growth, presence of felling refuse. Stand which are properly thinned and

also those which are heavily grazed are damaged less by fire, provided felling refuse is cleaned regularly. Chil(*Pinus roxburghii*), except when it is very young is relatively fire hardy. Kail(*Pinus wallichiana*) is extremely sensitive to fire and gets charred beyond recovery. In general, pure Deodar(*Cedrus deodara*) stands, Spruce(*Picea smithiana*) and Fir(*Abies pindrow*) are less prone to fires. However, once fire occurs the damage is excessive. A mixed crop of Kail(*Pinus wallichiana*) and Deodar(*Cedrus deodara*) is favored as these are less prone to fire hazard.

The Forest Beats are divided into very sensitive, Medium and low prone to fire. This classification done based on past experience of occurrence of forest fires in the division.

(Table 4)

Categorization of Fire prone beats

Ranges		Beats		
S.No	Name of Range	Very high	Medium	Low
1	Bhunter	Khokhan	Mashgan, Bulang, Mohal	Shamshi, Neul, Sandhar, Pah
2	Hurla	Bhuin, Naresh, Diyar, Shiah, Tharas	Jhuni, Rauli, Gadsa, Jestha	Narogi, Barogi, Najan, Narol
3	Jari	Kashwari, Pini	Chakna, Shat, Chowki, Fagu	Dhara, Chinjra, Sarhan, Jari
4	Kasol	-	Shilla, Tosh, Manikaran	Kasol, Uch, Tulga, Pulga

2.4.3 Damage by man:-

Forests fire occurrence are much higher where forests are located near habitation lending credence to the belief that deliberate incendiarism is the major reason for them. Along with fire, the other ways in which man causes injuries to forest crop are:-

- i. **Lopping:** Looping of tree is resorted to by people for fodder, fuel, manure and animal beddings. When this practice becomes arbitrary, irreparable damage is done to trees. Heavy lopping of Kail(*Pinus wallichiana*) increases the susceptibility to the attack of *Trametes pinii*. Trees frequently lopped are Ban (*Quercus leucotrichophora*) and Mohru(*Quercus dilatata*), Maple(*Acer spp.*), *Celtis*, *Robinia*(*Robinia pseudacacia*), Spruce(*Picea smithiana*) and Chil(*Pinus roxburghii*), Kharshu (*Quercus semecarpifolia*) is also lopped by graziers.
- ii. **Illicit Felling:** Increased motorable roads and increased population growth has resulted in an increase in illicit felling. Deodar(*Cedrus deodara*) and Kail(*Pinus wallichiana*) are felled for timber while Spruce(*Picea smithiana*) is felled for fuelwood and packing cases. Broad leaved are axed for firewood and agricultural implements. A greater vigilance is required. Mushrooming to tourist resorts/hotels has given a spurt of illicit felling.

- iii. **Torch wood extraction:** Considerable damage is done to Chil(*Pinus roxburghii*) and Kail(*Pinus wallichiana*) trees by villager, in forest located near habitations, when they are cut deep to extract resinous wood from the basal portion of the stem for torch wood. Tree damages are much more vulnerable to increase fungal attack, and prone to breakage during storms.
- iv. **Debarking:** Ban Oak(*Quercus leucotrichophora*), Spruce(*Picea smithiana*) and Chil(*Pinus roxburghii*) tree are debarked for tan, roofing material and sheds and for charcoal. Walnut(*Juglans regia*) roots are extracted to make 'dandasa' which is used in brushing teeth. Many times, encroachment of land, especially by fruit growers, comes through debarking, girdling and consequent death of tree in adjoining forest land to private areas.
- v. **Non removal of felling refuse:** It is of prime importance to remove the debris or felling refuse lying in the forest. It is a fire hazard and it also hinders natural's regenerations. There are many other activities which are ruinous to forest crop. Removal of leaf mould can have bad effects on growth of trees and soil fertility. Quarrying and unsystematic mining, encroachment, disposal of industrial and human waste in forest etc., faulty agricultural practices on marginal slopes which accelerate soil erosion processes, can all contribute to damage forest crop.
- vi. **Encroachment:** This is a serious and contagious issue. A sizeable chunk of forest land is encroached most commonly adjoining private land holdings. The detail of encroachments which are recorded, is in volume II.
- vii. **Damage by Grazing:-** Controlled and light grazing can be beneficial, whereas heavy grazing can be disastrous. In Fir forest, where there is heavy weed growth and thick humus layer, light grazing rakes up humus and keeps down weeds. Further, light grazing eliminates inflammable grass and herbage and thus checks fire damage, and in IIIrd class forests, regeneration is fostered and weeds smothered. Heavy grazing however is ruinous, as seeding get browsed by sheep and goats. Soil gets hardened and infertile. Natural regeneration is hampered. In alpine pasture, heavy and continuous grazing erodes soil. Soil is loosened forming rills and gullies and consequently, fertile soil cover is lost. Regulated grazing and effective closures is must for protecting our forests. Large flocks of cattle, more than actual requirement are kept by the right holders, causing great nuisance to forest activities. Menace of 'Gujjars' and their buffaloes is severe in Parvati Valley, because of unregulated entry and loose control. Causes of uncontrolled and unsustainable grazing are aptly summarized in the brochure in the Forest of H.P.

Reasons pointed are:-

- Excessive livestock
- Nomadic grazing.
- Unscientific grass land management
- Non-availability of data on grasslands

The Remedies suggested are:-

- Concentrated effort to bring about reduction of scrub cattle
- Encouraging stall feeding practices
- Settling nomadic graziers
- Assessment of carrying capacity of pasture
- Introduction of improved variety of grasses
- Grass nurseries, establishment of grass demonstration plots.
- Rotational grazing practice can be started by involving locals. It is high time to close some area and open other. A serious and committed approach by forest staff is need of the hour to implement this process.

2.4.4 Damage by Wild Animal and Birds:-

Though wild animals and birds damage to forest crop, yet the damage is not so severe. Debarking of Deodar, Kail, Spruce by Wild Bear is observed. Permanent damage results when debarking is there to girdling stage. Fruit growing broad leaved tree and Oak are damaged by Wild Bear who dig out the root when there is shortage of roots. Flying squirrels consume unripe cones of Deodar, Kail and Chil, whereby a sizeable quantity of seed is destroyed. Birds gnaw away at young seedlings and destroy lots of seeds by eating fruit. In standing trees, holes are bored by woodpeckers.

2.4.5 Damage by Insect and Fungi:-

Damage to Deodar is there through the defoliator, *Ectropia deodara*. Deodar cones are destroyed by *Euzophera cedrella* while its young seedling is attacked by *Melolontha* (cook chafer) and *Elater* (wire worn). *Agrotis ypsilon* also cuts young seedlings. *Brachyxytus subsignatus* harms new shoots of Silver Fir, which consequently turn yellow and orange, withering and finally dropping away. Attack on Deodar and Spruce is low. Polyphagus species destroy Kail cones and occasionally Chil and Spruce cones. *Chlorophorous strobilicola* attack Chil cones. *Chermes abietispiceae* causes galls on Spruce while *Photophagus chalcid* causes galls on Deodar needles and Spruce. Among the fungi, *Trametes pinni* preys on Kail, as also Chil Spruce, rendering tree useless, infecting heartwood. Looping of trees during monsoon is very harmful since it allows the said fungi to work on the cut portion. *Fusarium species* and *Fomes annous* attacks root of the young plants of Deodar on damp and badly drained soil causing drying and consequent death. *Perdermium cedrie* affect leading shoots of Deodar tree.

The fungus causes witches broom' in the crown which should be cut, to minimize the check of localized damage. *Perdermium campanulatum* and *Peridermium brevius* attach Chil and Kail needle. However, their damage is not significant. The typical orange tessels frequently seen in spring, in Spruce, emitting bad odor is a result of attack of *Barclayella deforman* fungi. In current year shoots of cones of Spruce, diseased shoots gets stunned and densely covered with curved needle, on which the mass of orange and teletiospores appears. Attack is not so menacing. Poor aeration of soil, water logging, humus and acidity are principle causes for attack of fungi.

2.4.6 Nuisance caused by climbers, bushes and weeds: - *Vitis semicordata*, *Hedera helix* and *Rosa moschata* coil up on young poles and sapling, devouring vital nutrients and

moisture and strangulating plants. *Loranthus* and *Vicum* parasites affect Ban Oak and other broad leaved species. Natural reproduction is inhibited, and food, moisture and sun shine is limited for our economic species by numerous seeds and bushes i.e. *Strobilanthus*, *Balsm*, *Dipsacus*, *Polygonum*, *Iris*, *Arundinaria*, *Rubus*, *Viburnum* and *Indigofera spp.* Cultural operations i.e. climber cutting and removal of weeds/bushes is a must if healthy regeneration is to be fostered.

CHAPTER-II B

FOREST FAUNA

A varied fauna characterizes the Parvati Valley. Diversity is due to a great variation in altitudes, topography, climates and vegetation. Wild animals and birds capable of thriving under different climatic conditions, ranging from sub tropical to arctic and from densely wooded areas to sparse tree growth are found here.

2.5.1 IMPORTANT ANIMALS FOUND ARE:-

a) *Panthera pardus*: - The leopard/panthers are sleek animal which is found at isolated rocky hills. It stealthily enters habitations, to steal dogs, calves and goats. The animal breeds all the year round and it is primarily gunned for its skin in/fur, which is of rufous fawn color with dark rosettes. The tail of Leopard is more or less ringed. The weight varies from 40 to 65 kg.

b) *Panthera uncia*: - The snow leopard has a relatively long tail, has short muzzle, high forehead and vertical chin. The color of its coat is soft grey with pale to pure white on the underside. Spots are unbroken and distinct on the head, nape and lower parts of the limbs. On the body, they break into larger, paler rosettes. The snow leopard inhabits elevation above 3500 meters. A rare animal, it has been placed in Schedule-I, as it is poached for its magnificent creamy gray fur. It frequents rocky ground, killing Bharal, Thar, domestic sheep, goats and dogs. It is the state animal of Himachal Pradesh.

c) *Selenarctos thibetanus*: - The Himalayan Black Bear is a big animal and is quite commonly found in the tract at an elevation ranging from 1500 meters to 3000 meters. It is all black except for a V shaped or horse-shoe white mark on the chest. The male is huge, weighing up to 44 lbs, while females are little smaller and lighter. Bears hibernate during winters, tending to come down to lower elevations, when it snows on the higher elevations. It prefers Oak stands inhabiting coniferous forests also. Black Bear causes maximum damage to crop, when they come near habitations. It is normally vegetarian and survives on wild fruits, flower roots and honey. Sometimes, it eats insects and flesh too. It peels off the Deodar bark and pine saplings during springs and early summers to get the sap and also breaks the bough of Walnut and other trees. The bear, especially female is furious and dangerous when provoked.

d) *Ursus arctus*: -Himalayan Brown Bear is found at an elevation above 3500 meters and is of moderate build with brown fur with white on the chest. It feeds on fruit, acorns, etc. and occasionally sheep and goat when food is less. The Bear is somewhat sluggish and remains in the state of semi-torpidity. Mating takes place during autumn and

young ones are born in February and March. It is poached for its skin and has been found in Solang Nalla.

e) *Moschus moschatus*: The Musk Deer or Kastura is found at an elevation above 2500 meters. It is agile and has been placed in Schedule –I, hunted primarily for its musk. It is protected by law. The Musk Deer holds a place between a deer and antelope. The absence of horns is compensated by great development of canine teeth, particularly in the male. The Musk Deer lives singly or in pairs and is generally met above the zone in pines. The food consists of grass, lichens and flowers. The breeding season is in January and young one is produced in June.

f) *Muntiacus muntjak*: - The Kakkar or Barking Deer is found upto 2500 meters all over the tract. It prefers thick jungles and is a solitary animal, unmatched in flexibility and process. Mating season is winter months and the off-spring comes in spring. The Deer is poached in winter when it comes down to habitations.

g) *Nemorhaedus bubalinus*: - Aimu or the Himalayan Goat or serrow is found in the same zone as the Kastura. It is relatively big with ears resembling a mule and has tough meat.

h) *Capra ibex siberica*: - The Himalayan Ibex is found in high altitudes, near the snow line. It is an agile, timid, graceful animal with lots of endurance. The male and female generally lives in separate flocks. Mating is in October, while the young ones are delivered in May-June. The horns of the ibex are loner and more abruptly curved and tapering then the European Ibex.

i) *Pseudois nayaur*: - The Blue Mountain Sheep, also called Bharal has a habitat same as that of the Ibex and it has habits between goat and sheep. Bharal lives in flocks and prefers grassy slopes and rocky grounds. The animal is timid and ever watchful. Offspring is delivered in June-July.

j) *Hemitragus jemlahicus*: - The Thar is a big goat, having a finally round head, narrow erect ears, heavy body and longer robust limbs. Its horns are much shorter than that of the Ibex. Thar inhabits precipitous, rocky, inaccessible areas of high elevations, generally above 2500 meters, coming down during winter. It feeds on grasses growing between rocks. Thar lives in herds and its meat is much sought after.

k) *Martes flavigula*: - The Himalayan Pine Martin is found upto 2500 meters elevation and thrives on birds, mice, squirrels and other small animals. It moves in pairs and it is also sought for its fur.

Other animals found are Langoor, Monkey, Jackal, Foxes and Hares, which are found all over the tract.

2.5.2 BIRDS

a) Chakor (*Alectoris gracea*):- This mountain partridge is much sought after for its meat. It inhabits areas lying between 1500-3000 meters, but descends down to lower elevations during winter. It is in flocks and feeds on grains, tender shoots of grasses, food crops and insects. Nesting season ranges between April to June and 8-12 eggs are laid at a time.

b) Common hill partridge (*Arbosophieo torqueola*):- This bird is found all over the tract up to an elevation of 2000 meters. It prefers bushy areas, Oak forests and dense coniferous stands, living in small flocks and roosting.

c) White crested Kalij Pheasant (*Lophura leucomelanos*):- This pheasant is found all over the tract between 700-3500 meters. Nesting is from March to June under thick shrubs. The pheasants usually live in pairs or family flocks

d) Cheer Pheasant (*Catreus wallichi*):- This pheasant has a special preference for bushy areas and open forests.

e) Monal Pheasant (*Lophophorus imejanus*):- This pheasant has a habitat among coniferous forests and grassy glades, at high elevations above 2500 meters, extending up to snow line during summer and lower down during winter. This bird is hardly found above the tree line. The male is a moderate sized pheasant with short, broad and square out tail, brilliant metallic green head, a glistening purple upper part, cinnamon colored tail, velvety black breast and a crest of beautiful feathers. The female is plain looking, mottled and streaked, dark and pale with a white throat and short crest of normal feathers. Monal is found in plenty in Matikochar Valley. Breeding is during May-June. The bird feeds on tubers, seeds, grubs, maggots, roots and young shoots of various shrubs and grasses, corns and berries. Though protected, it is poached for its beautiful dark green plume.

f) Koklas pheasant (*Pucrasia macrolopha*):- This pheasant occurs at elevation ranging from 2000 meters to 3500 meters, all over the tract especially in the coniferous forest. It feeds on leaves and buds. The male has dark green head with the central crest of fawn colour, and a white spot on each side of the neck. Breast and belly are the chestnut coloured while the rest of the body is streaked with black and grey. Breeding season is from April-June. This pheasant is killed for its meat.

g) The Western Horned Tragopan (*Tragopan melanocephalus*):- A high elevation bird, it remains near the snow lines during summers, but descends down to lower elevations during winter. Breeding is from April-July. Food consists of root, buds, insects, leaves etc. This pheasant is quite beautiful as its neck, the top of the crest and the band of the wings are red. Its bill is blackish and its eyebrow and face bright red. The female is paler and grey. It is the State Bird of Himachal Pradesh.

h) The Snowcock: - This is a big bird and is an excellent table bird. It is protected and is found at higher elevations near snow line. It comes down during winters. In appearance, it resembles a chakor and it thrives on tubers, tender shoots and grass.

The Parvati tract have numerous species of other birds i.e. Ring Dove, Spotted Dove, Shikara, Parrots, Tawny Eagle, Falcon, Pigeon, Gritton Vulture, Tits, Nutcrackers, Pies, Woodpeckers, Himalayan Fly Catchers, etc.

2.5.3 FISH: - The tract has abundant fish in various rivers and streams. Trout is found in cold water while Mahaseer is found in Beas. Black fish is met with in all streams. Illicit angling explosives cause irreparable damage.

List of common Wild Animals in Parvati Forest Division**Table-5**

S.No.	Common Name	Zoological Name
	<i>Mammals</i>	
1	Snow Leopard	<i>Panthera uncia</i>
2	Leopard	<i>Panthera pardus</i>
3	Leopard Cat	<i>Felis benghalensis</i>
4	Jungle Cat	<i>F. chaus</i>
5	Himalayan Civet	<i>Pagomalarvata</i>
6	Himalayan Yellow Throated Marten	<i>Martes flavigula</i>
7	Brown Bear	<i>Ursus arctus</i>
8	Black Bear	<i>Selenarctus thibetanus</i>
9	Porcupine	<i>Hystrix indica</i>
10	Flying Squirrel	<i>Petauristapetaurista</i>
11	Monkey	<i>Macaca mulatto</i>
12	Langoor	<i>Presbytis entellus</i>
13	Himalayan Tahr	<i>Hemitragusjemlehicus</i>
14	Goral	<i>Nemorhaedus goral</i>
15	Barking Deer	<i>Muntiacus muntjac</i>
16	Serow	<i>Capricornicussumatrensis</i>
17	Blue Sheep	<i>Psedudoisnayaaur</i>
18	Musk Deer	<i>Moschus moschatus</i>
19	Vole	<i>Alticola roylei</i>
20	Red Fox	<i>Vulpes vulpes</i>
21	Jackal	<i>Canis aureus</i>
22	Fruit Bat	<i>Pteropodidae</i>
	<i>Fish</i>	
1	Snow trout	<i>Schizothoraxrichardsonii</i>
2	Brown trout	<i>Salmon trutta</i>
3	Rainbow trout	<i>Oncorhynchus nykiss</i>
4	Mahsheer	<i>Tor putitora</i>
	<i>Reptiles</i>	
1	Indian rat Snake	<i>Ptyas mucosa</i>

2	Himalayan keel back	HerpetoreasPlatyceps
3	Himalayan Pit viper	Gloydiushimalayanus

4	Kashmir rock	Laudakiatuberculataaguma
5	Himalayan Ground	Scincellahimalayanus skink
<i>Insects (Butterflies)</i>		
1	Chocolate Pansy	Junoniaiphita
2	Common Mormon	Papiliopolytes
3	Blue Pansy	Junoniaorithya
4	Common tiger	Danaus genutia
5	Common Sailor	Neptishylas
6	Red Admiral	Vanessa atalanta
7	Glassy Tiger	Paranticaaglea
8	Indian tortoise shell	Aglaiscaschmirenses
9	Common crow	Euploea core
10	Common jezebel	Delias eucharis
11	Plain tiger	Danaus chrysippus

List of common Birds in Parvati Forest Division

(Table 6)

S. No.	Name of Bird	Zoological Name
1	Greywinged Black Bird	<i>Turdus boulboul</i>
2	White collared Black Bird	<i>T. albocinus</i>
3	Black bulbul	<i>Hypsipetes madagascariensis</i>
4	White Cheeked Bulbul	<i>Pycnonotus lencoyenys</i>
5	Bullfinch Brown	<i>Pyrrhula nepalensis</i>
6	Red Headed Bullfinch	<i>P. crythrocephala</i>
7	Rock Bunting	<i>Emberiza cia</i>
8	Dark Grey Bush Chat	<i>Saxicol ferrea</i>
9	Red Billed Chough	<i>Pyrrhocarax</i>
10	Himalayan Tree Creeper	<i>Certhia himalayana</i>
11	Jungle Crow	<i>Corvus splendens</i>
12	Brow Dipper	<i>Cinclus pallasis</i>
13	Rufous Jrtle Dore	<i>Streptopelia orientalles</i>
14	Spotted Dove	<i>S. chinensis</i>
15	Black Drengo	<i>Dicrurus adsimilis</i>
16	Golden Eagle	<i>Aquila chrysaetos</i>
17	Red Browed Finch	<i>Callacanthis burtoni</i>
18	Fire Breasted Flower Pecker	<i>Dicaeum ignipectus</i>
19	Grey Headed Flycatcher	<i>Culicapa ceylonesis</i>
20	Rufous Tailed Flycatcher	<i>Musicapa ruficauda</i>
21	Sooty Flycatcher	<i>M. sibirica</i>
22	Verditer Flycatcher	<i>M. tholassina</i>
23	White Browed Blue Flycatcher	<i>M. dupercilaris</i>
24	Spotted Forktail	<i>Encurus maculatus</i>
25	Gold Crest	<i>Regulus regulus</i>
26	Hodsons Grandala	<i>Gandala codicolor</i>
27	Black and Yellow Grosbeak	<i>Coccothraustes icterioides</i>

28	Hobby	<i>Falco bubbuteo</i>
29	Hoopoe	<i>Upupa epops</i>
30	Kestrel	<i>Falco tinnunculus</i>
31	Black Winged Kite	<i>Elanus caeruleus</i>
32	House Marten	<i>Delichon urbica</i>
33	Long Tailed Marten	<i>Pericro coctus ethologus</i>
34	Indian Jungle Night Jar	<i>Caprimugulus indicus</i>
35	Rufous Bellied Niltava	<i>Muscicapa sundara</i>
36	Spotted Scops Owl	<i>Otus spilocephhalus</i>
37	Slaty Headed Parakeet	<i>Psittacula himalayana</i>
38	Black Partridge	<i>Francolinus francolinus</i>
39	Chukor Partridge	<i>Alectoris chukor</i>
40	Chir Pheasant	<i>Catreus wallichii</i>
41	Kalij Pheasant	<i>Lophura leucomelana</i>
42	Koklas Pheasant	<i>Pucrasia macrolopha</i>
43	Monal Pheasant	<i>Lophophorus impejanus</i>
44	Ashywood Pigeon	<i>Columba pulchrocollis</i>
45	Speckled Wood Pigeon	<i>C. bodgsanis</i>
46	Upland Pipit	<i>Anthus sylvanus</i>
47	Plumbeous Redstart	<i>Rhyaconis fuliginosus</i>
48	Guldenstadi's Redstart	<i>R. fuliginosus</i>
49	White Capped Redstart	<i>Chaimawonis leucocepholus</i>
50	Pink Browed Rosed Finch	<i>Carpodacus rhodochrous</i>
51	Rufous Backed Shrike	<i>Lanius schach</i>
52	Black Capped Sibia	<i>Heterophasia capistrata</i>
53	Barthroated Sivia	<i>Minla strigala</i>
54	Himalayan Snow Cock	<i>Tetrargallus himalayensis</i>
55	Cinnamon Tree Sparrow	<i>Passer rutilanis</i>
56	House Sparrow	<i>Passer domesticus</i>
57	Himalayan Swiftlet	<i>Collocalia brevirostris</i>
58	Large Brown Thrush	<i>Zoothera monticola</i>
59	Plain Backed Mountain Thrush	<i>Z. mollissima</i>
60	Red Headed Laughing Thrush	<i>Garrulax erythrocephallus</i>

61	Streaked Laughing Thrush	<i>G. lineatus</i>
62	Variegated Laughing Thrush	<i>G. variegates</i>
63	Brown Crested Jit	<i>Parus dichrouw</i>
64	Black Crested Jit	<i>P. melanolophus</i>
65	Green Backed Jit	<i>P. monticolus</i>
66	Grey Jit	<i>P. major</i>
67	Western Tragopan	<i>Tragopan melanocephalus</i>
68	Bearded Vulture	<i>Gypactus barbatus</i>
69	Grey Wagtail	<i>Motacilla cinerea</i>
70	White Wagtail	<i>Malba</i>
71	Brown Hill Warbler	<i>Prinia criniger</i>
72	Brown Leaf Warbler	<i>Phylloscopus collybita</i>
73	Grey Faced Leaf Warbler	<i>P. maculipennis</i>
74	Large Crowned Leaf Warbler	<i>P. occipitalis</i>
75	Rufous Capped Bush Warbler	<i>Cettia brunnifrons</i>
76	Wood Cock	<i>Scolopax rusticola</i>
77	Scaly Bellied Green Woodpecker	<i>Picus squamatus</i>
78	Wren	<i>Troglodytes troglodytes</i>
79	Yellow Naped Yuhina	<i>Yuhina flavicollis</i>
80	Yellow Billed Blue Magpie	<i>Cissa flavirostris</i>
81	Snow Pigeon	<i>Columba leucotis</i>
List of fishes		
1	Snow trout	<i>Schizothorax richardsonii</i>
2	Brown trout	<i>Salmon trutta</i>
3	Rainbow trout	<i>Oncorhynchus mykiss</i>

2.6 Sanctuaries/ National Park: -

There are 3 wild life sanctuaries existing and one proposed National park with in Parvati tract.

- (1) Kanawar Wildlife Sanctuary
- (2) Khokhan Wildlife Sanctuary
- (3) Kias Wildlife Sanctuary
- (4) Khirganga National Park (Proposed National Park)

KANAWAR SANCTUARY

(i) Notification No. date : No. FFE-B-F (6)-11/2005 dated 28th july, 2010

- (ii) Boundaries : **N-** Boundary Starts from Jail Nal & moves along boundary of R/4 Kasol. C-VI-b and C-I upto 1800 meters, Contour line and then moves along 1800 mtrs. Contour line up to Grahan Gad and then moves upstream the Gad along the boundary of R/4 Kasol and moves along the boundary of Reona PF's C-IIb, C-IIa, CIId to separating the cultivation land of Garahan village then follows the boundary of Tilalotan PF via SOI bench mark 4056 mtrs, then downstream a tributary flowing to Dudhikhhol Nal upto near SOI bench mark 2838 mtrs.
- E-** Boundary starts from confluence of tributary in Dhudhikhhol Nal and then boundary moves upstream with other tributary flowing to Dudhi Khol then downstream along a tributary flowing Barthi Nal and boundary follows a path to Ujll Runi Thach and follows the ridge via SOI bench mark 4817 mtrs upto Phanchi Galu 4636 mtrs. along path.
- S-** Boundary starts from Phanchi Galu 4636 mtrs. moves along the ridge Ori dhar Rohni Dhar to SOI bench mark 4658 mtrs. then moves downstream a tributary that join Hamkha Nal Near Beghlo Thach. Then it moves upstream with small tributary to SOI 4330 mtrs. then it goes along southern boundary of Reona PF SOI bench mark 3610 mtrs, Khauli Galu, 3715 mtrs southern boundary of Kasol RF, SOI bench mark 4046 mtrs, 3889 mtrs, 4097 mtrs., Tiri Thunth, southern boundary of Muri PF.
- W-** Boundary starts from SOI bench mark 3674 mtrs and moves down stream with a Nala flowing to Jaram nal, SOI bench mark 1895 mtrs then boundary moves along the forest boundary of Muri PF, SOI bench mark 3286 mtrs then moves down stream along with the Jail Nal upto the R/4 Kasol C-VI-b starting point of northern boundary.
- (iii) Compartment and Area :
- (iv) Elevation : 1534 meters to 4833 meters above sea- level.
- (v) Aspect :
- (vi) Flora : Spruce, Deodar, Kail Prinsepia, Sarcococca, Berberis, Ros, Viburnum Rumex, Fragria, Plectranthus, Rubus, Ploygonum, Ferns.
- (vii) Detail of Wildlife : Black bear, Leopard, Ghoral, Barking deer, Monal, Kalij, Koklash and Chokor.

KHOKHAN SANCTUARY

- (i) Notification No. and date : No. FFE-B-F (6)- 11/2005 dated 28th July 2010
- (ii) Boundaries : **N:** The boundary starts from eastern boundary of Rajgiri PF then boundary moves with northern boundary of Oriban PF upwards with Tichi Nalla northern boundary of Nagni PF upto point Nagni Dhar above Shanghli.
- E:** The boundary starts from Nagni Dhar moves via Survey of India Bench Mark 2594 mtr., 2614 mtr., boundary then moves along with Nagni PF and then Join Dukan RF boundary upto Ganogi.
- S:** The boundary starts from Dukan RF Ganogi and moves along forest boundary Survey of India. B.m. 2010 mtr., 2659 mtr., 2622 mtr., upto Survey of India Bench Mark 2787 mtr on District boundary of Kullu and Mandi.
- W:** The boundary starts from Survey of India.B.M. 2787 mtr., along with the Munjka PF boundary and Niarag RF boundary upto eastern boundary of Rajgiri PF on District boundary of Kullu and Mandi and via 2328 mtr. upto the starting point of northern boundary.
- (iii) Compartment and Area :
- (iv) Elevation : 2000 meters to 4500 meters above sea-level.
- (v) Aspect : Western
- (vi) Flora : Kharsu Oak, Spruce, Silver Fir, Deodar, Kail and Broad leaved Species. Ground covers Prinsepia, Sarcococca, Berberis, Rosa, Viburnum, Rumex, Polygonum, Ferns, and Salix elegans.
- (vii) Detail of Wildlife : Black bear, Musk deer, Ghoral and Barking deer, Monal, Kalij and Koklash Pheasant, Chakor.

KAIS WILDLIFE SANCTUARY

- Notifications No. and date : No. FFE-B-F(6)-11/2005-II/Kais dt. 07/06/2013
- Situations : To the South 2/27 Padra Rias.
- Boundaries : **North** -From Bastak Thatch along demarcated line separating 2/32 Matikochhar and 2/27 Padra Rias and 2/26 Marhauri and Kais Nalla upto Janiyal Thatch.

East - From Janiyal thatch along Ridge separating Catchment of Beas and Parvati rivers then Rumtu Dhar upto Jalada Thatch point 3481 mtr.

South – From Jalada Thatch point 3481 mtr. on the ridge separating Matikochhar PF and Pinsu PF boundaries and 2/32 Matikochhar CVIb, CV and spur descending from dhara to Kais Nalla upto peak at origin of nalla flowing to Beas River.

West – Along forest boundary Matikochhar and nalla downstream upto turning point to west on nalla along forest boundary and to Rauns thatch and forest boundary Matikochhar and then along road upto Bastak thatch.

Total area of Sanctuary 12.61Sq. Km.

Location North (Lat32°03'10"Long 77°12'32")

East (Lat32°02'42"Long 77°12'32")

South (Lat31°59'38"Long 77°10'17")

West (Lat32°00'23"Long 77°09'19")

Falls on Survey of India toposheet No. 53E/I & 52H/4 scale 1:50000

KHIRGANGA NATIONAL PARK

(i) Notification No. and date : No. FFE-B-F (6) - 11/2005 dated 28th July 2010

This is intention notification for Khirganga National Park. It is intended that part of KhirgangaPF and RatiruniPF of Kasol Range will be marked and converted into Khirganga National Park. The map of Khirganga NP is prepared on 1:50000 survey sheet in which following forests and compartments fall under the boundary of proposed National Park:

(Table 7)

Sr. No	Name of Forest	Comptt No./ Sub Comptt No.	Area (in ha)
1	Rata Runi	C5	26930
		Total	26930
2	2/5 Khirganga	C6b	67.08
		C7a	52.75
		C7b	65.5
		C7c	27.44
		C7d	39.25
		C8	140.02
		C9	106.83
		C10	45681
		Total	46179.87

	Grand Total	73109.87
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As per intention notification 710Sqkm. Area is brought under the boundary of Khirganga National Park whereas Compartment wise total area comes out to be 731.10 Sqkm (73109.87 Hac). This difference in area will be clarified in final notification of National Park. For the purpose of this working plan 731.10 Sqkm. (73109.87 Hac) i.e. total of all compartments and sub-compartments is considered as part of intended National Park. The final notification will be issued once the rights in the area are settled.

- (ii) Boundaries : **N:** From the Sara Umga Pass on the district boundary of Kullu and Lahul & Spiti, the boundary follows SOI benchmark 5575m, 6260m, 6440m, 6420m, 5940m, Shigrila 6230m, 5980m, 5620m, 5845m, 5505m, 5990m, 5855m, 5635m, 6015m, 5870m, 5795m, 6395m, 5995m, 5875m, and 6632m to join the western boundary of the Pin Valley National Park.
- E:** The boundary starts from near the SOI benchmark 6632m of the Pin Valley National Park and moves along the western boundary of this National Park upto the SOI 5741m which is also meeting point of the Great Himalayan National Park.
- S:** The boundary begins from the meeting point SOI 5741m of Pin Valley NP and the Great Himalayan National Park and follows the existing northern boundary of Great Himalayan National Park upto Survey of India benchmark 5238m at Baskinag.
- W:** The Boundary starts from Baskinag 5238m (on Phangchi Dhar) located on the northern boundary of the Great Himalayan National Park. It moves along the forest boundary to the SOI.
- (iii) Compartment and Area :
- (iv) Elevation : 2000 meters to 4500 meters above sea-level.
- (v) Aspect : Western
- (vi) Flora : Kharsu Oak, Spruce, Silver Fir, Deodar, Kail and Broad leaved Species. Ground covers Prinsepia, Sarcococca, Berberis, Rosa, Viburnum, Rumex, Polygonum, Ferns, and Salix elegans.
- (vii) Detail of Wildlife : Black bear, Musk deer, Ghoral and Barking deer, Monal, Kalij and Koklash Pheasant, Chakor, snow leopard, leopard.

2.7 Wild Life Management:-

Wild life if scientifically managed and preserved can attract sustained revenue in Eco tourism Wild life can be an important component. The diversity of Wild life found in the tract requires to be given special focus. Poaching requires to be thwarted. Opening up of the area through motor roads and paths has increased menace. Grant of arm license under the pretext of crop protection must be very sparingly judiciously given. The following measures are suggested to minimize poaching.

1. Adequate staffing for Wild life Wing and enforcing of rules as per Wild Life act, 1972
2. Appointment of Rakhas on part time to assist the Wild life staff in detecting and apprehending poaches in areas of sanctuary and national park in the field properly through prominent sign boards, notices and display of rules.
3. List of proclaimed poachers and the get given license cancelled from the competent authority.
4. Strictly regulate crop protection license.
5. Resort of wide publicity through pamphlet, lectures and JFM activity.
6. Reward informer who helps apprehending poachers.
7. Proper database of poachers to be maintained both at Range level and Division level.
8. Section-17 of the Wild Life Protection Act, 1972 which deals with restriction hunting is highlighted below:-

17(1) No person shall:-

- a) Hunt any wild animal, from or by means of, a wheeled or a mechanically propelled vehicle on water, or by aircraft;
- b) Use aircraft, motor vehicle or launch for the purpose of driving or stamping any wild animal;
- c) Hunt any wild with chemicals, explosives, nets, pitfalls, poisons, poisoned weapons, snares and traps, excepts in so far as they relate to the capture of wild animals under the Wild Life Animal trapping license;
- d) Hunt any special games or big game other then rifle, unless specially authorized by license to hunt with a shot gun using single-slug bullets;
- e) Fir the purpose of hunting, set fire at any vegetation;
- f) Use any artificial light for the purpose of hunting except when specially authorized to do so under a license in case of carnivore over a kill;
- g) Hunt any wild animal during the hours of night that is say, between sun-set and sun-rise, except when specially authorized to do so under a license in a care of carnivore over a kill;
- h) Hunt any wild animal on the salt lick or water hole or other drinking place or approach to the same, except sand grouse and water-birds;

- i) Hunt any wild animal on land not owned by Government without the consent of the owner or his agent or the lawful occupier or such and;
- j) Notwithstanding that he holds a license for the purpose, hunt any wild animal during the closed time referred to in section 16;
- k) Hunt, with the help of dogs, and wild animal except water birds, chakor, partridge or quail;

Wild life Management calls for a Comprehensive study of animal breeding habits, population density, life span, feeding habits, cruising roads and tolerance of environment. Animal ecology has an important bearing of Wild Life Management. The surrounding habitat which includes factors like climate, light, oxygen, soil, topography and other environmental factors like shelter, food and water need to be studied.

CHAPTER III

UTILIZATION OF THE PRODUCE

3.1 Agricultural customs and wants of the population: -

Traditionally people of Parvati valley are agriculturalists mostly dependent on the adjoining forests but there happens very rapid economic and social changes. The apple and pomegranate cultivation and the fast growing tourism Industry have brought significant changes in the living standards of the people. Entire valley is blooming and booming with apple orchards. Along with off season vegetables auger well for the economic revolution and transformation of the living standard of the rural population. In spite of all this, there is still heavy day to day dependence on the forests for fuel wood, timber, medicinal plants and fodder/ grazing. A large number of developmental activities viz, construction of roads, provision of water supply system in the villages and opening up of new schools for education of children are going around with great speed. The tract is quite densely populated. Based on 2011 census the population density of Kullu district is 79 persons per square km. against 123 persons per square km. for Himachal Pradesh. Parvati Forest Division falls under two main revenue Tehsil i.e. Kullu & Bhunter. Bhunter Tehsil is carved out in 2013 from existing Kullu & Manali Tehsil so the data for discussion in the WP is taken for Kullu & Manali Tehsil. The statistics of human population for the tract since last decade census is shown in Table 3.1.

Table 3.1: - Human Population figures for the Kullu and Manali tehsil:

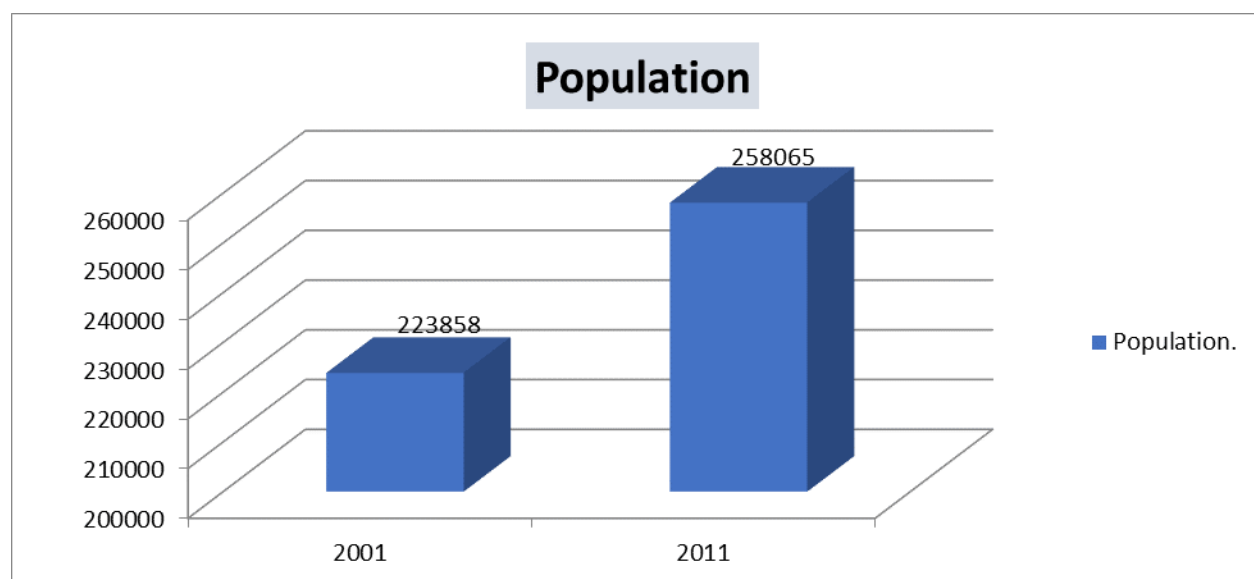
(Table 1)

Sr. No.	Census Year.	Population.
1.	2001	223858
2.	2011	258065

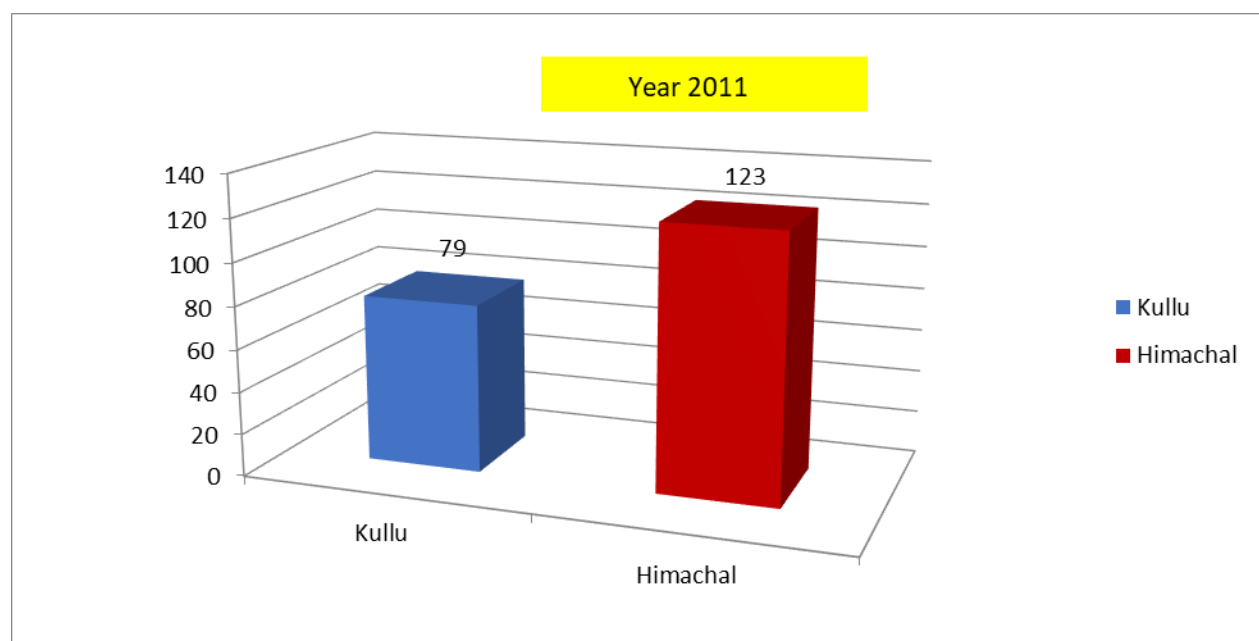
Population Density table of Kullu District in comparison to H.P

(Table 2)

Year of Census	Kullu (Nos of People / sq km)	Himachal nos of people / sq km
2011	79/sq km	123/ sq km



Human Population figures for the Kullu and Manali tehsil:



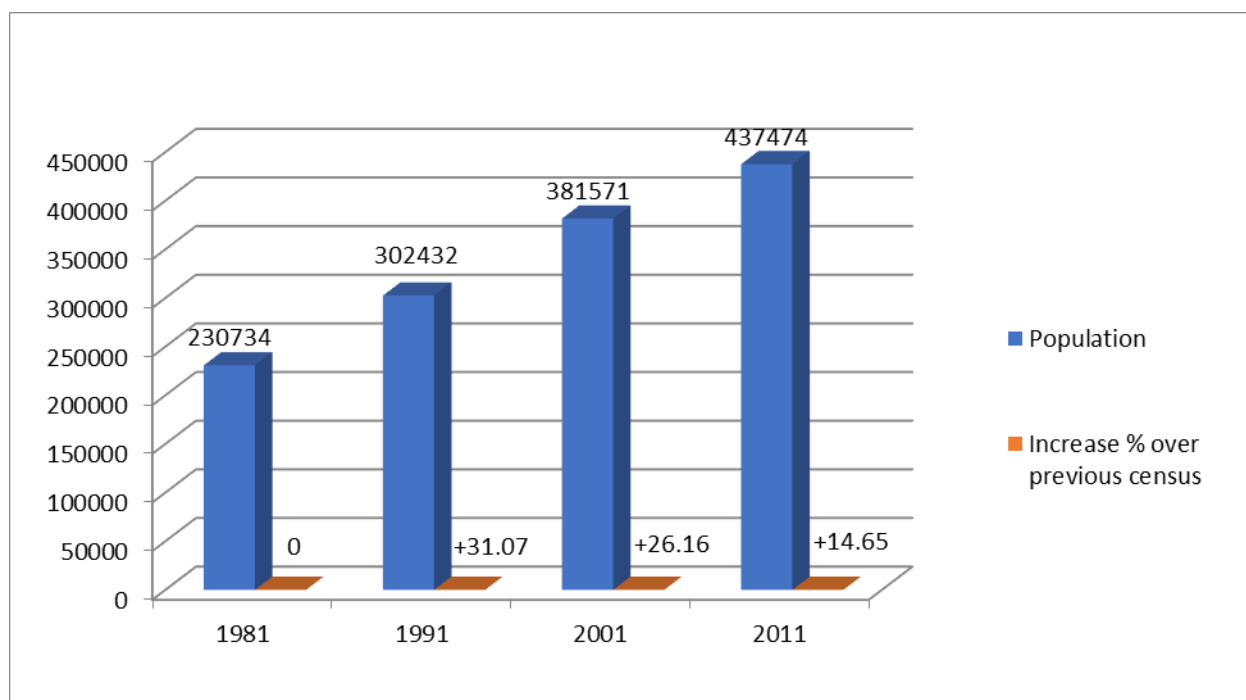
Population Density table of Kullu District in comparison to H.P

The human population of the entire district since 1981 Census is tabulated as under in Table 3.2 along with increase in percentage over previous census.

Table 3.2: - Human Population of the entire District since 1981 Census.

(Table 3)

Sr. No.	Census Year	Population	Increase % over previous census
1	2	3	4
1	1981	230734	Not evaluated
2	1991	302432	+31.07
3	2001	381571	+26.16
4	2011	437474	+14.65



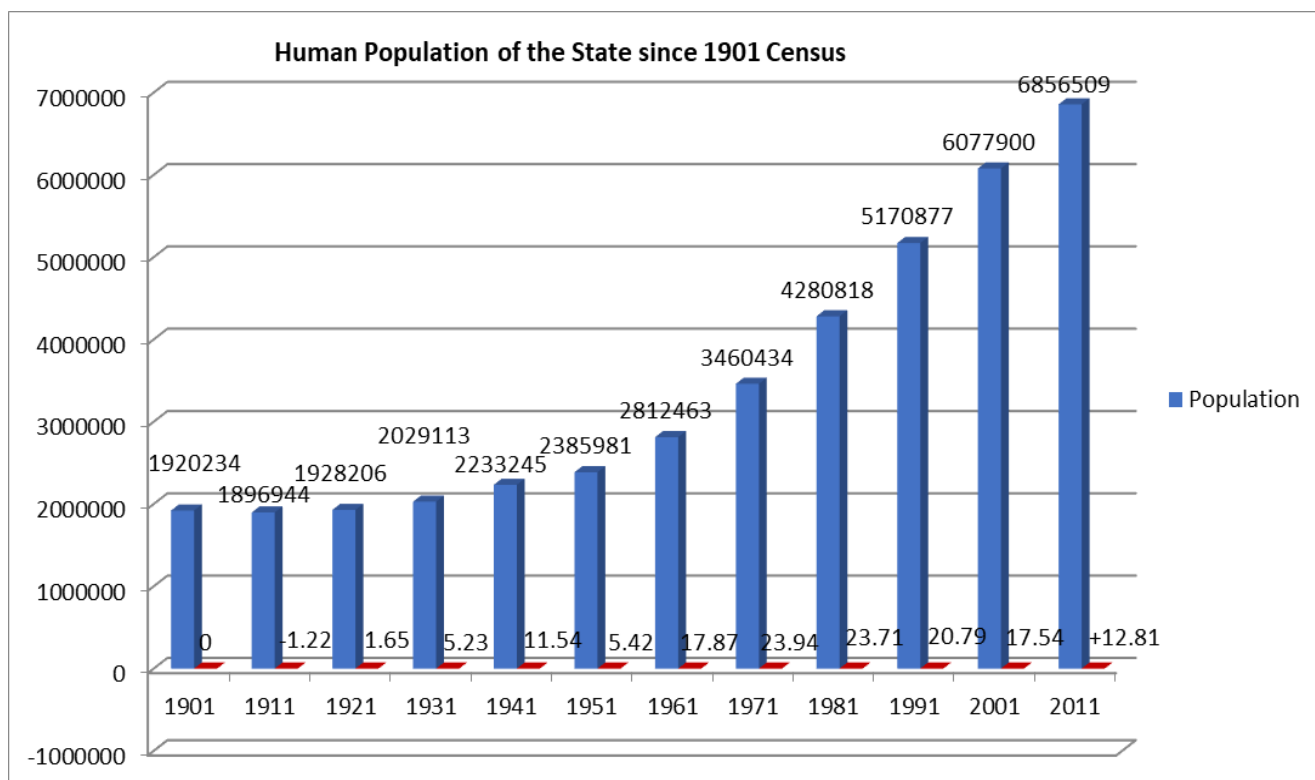
Human population of the State since 1901 census is tabulated in Table 3.3 along with increase in percentage over previous census.

Table 3.3: Human Population of the State since 1901 Census.

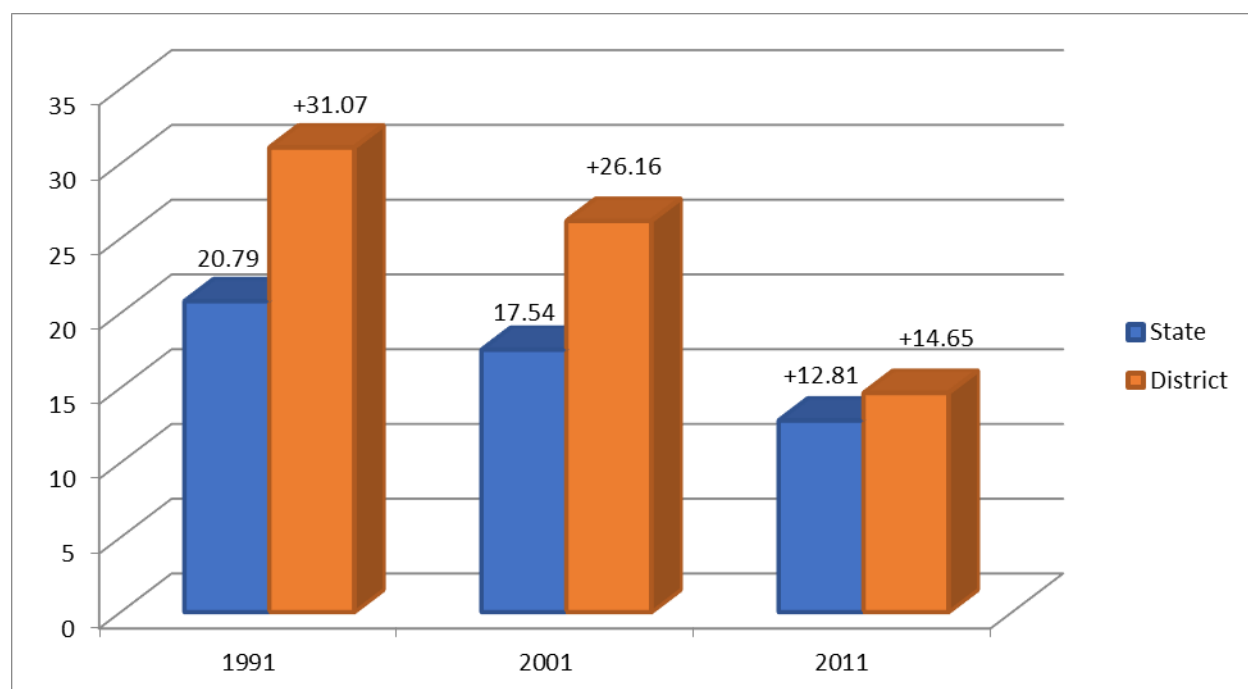
(Table 4)

Sr. No.	Census Year.	Population.	Increase % over previous census.
1	1901	19,20,234	-
2	1911	18,96,944	(-) 1.22
3	1921	19,28,206	1.65
4	1931	20,29,113	5.23

5	1941	22,33,245	11.54
6	1951	23,85,981	5.42
7	1961	28,12,463	17.87
8	1971	34,60,434	23.94
9	1981	42,80,818	23.71
10	1991	51,70,877	20.79
11	2001	60,77,900	17.54
12	2011	68,56,509	+12.81



Comparative population percentage diagram of state v/s Kullu District for 1991, 2001 and 2011.



The above table clearly shows that the decadal population growth in Kullu is higher than the state as a whole for last three decades which obviously puts pressure on the resources of the district.

The population of the track is mainly rural and mostly depends on agriculture and horticulture. But, nowadays, due to the tourist inflow, most of the local people have engaged themselves in the tourism activities. A good number of them earn their livelihood by rearing flocks of sheep and goats. The rural population is also dependent on the forests for many of daily usual requirements. The main requirements from Government forests are: timber for house construction, fuel-wood and charcoal, wood for agricultural implements, grass and fodder for the live-stock, leaves for manure, herbs for medicinal uses, etc. The forest settlement makes ample provisions to meet these requirements, either free of cost or at very concessional rates. The pressure of these rights or requirements on the forests is very high and is increasing steadily.

Table 3.4: Break up of population as per 2011 census.

(Table 5)

Sr. No.	Item.	Kullu and Manali Tehsil	Distt. Kullu.	H. P. State.
1	2	3	4	5
1.	Total population.	258065	437474	6856509
2.	Rural population.	218220	396216	6,167,805

3.	Urban population.	39845	41258	688,704
5.	Density of population.	-	79	123
6.	Literacy rate.	81.07	80.14	83.78

Settlement report of Alex Anderson published in 1886 provides for complete account of rights to local people regarding fuel wood, grazing rights, and timber distribution. Land has come to be recognized as a prime resource.

Table 3.5-Area, statement for Kullu District under different land use is given as per the following table:-

(Table 6)

Area	As per 1981 report	As per 1991 report	As per Statistical Deptt.
Total Geographical area	5503 Kms ²	5503 Sq. Km	5503 Sq. Km
Total Agriculture land.	55600 hectares	64047 hectares	60948 hectares (2007-08)
Area under Horticulture	10590 hectares	16058 hectares	27826 hectares (2009-10)

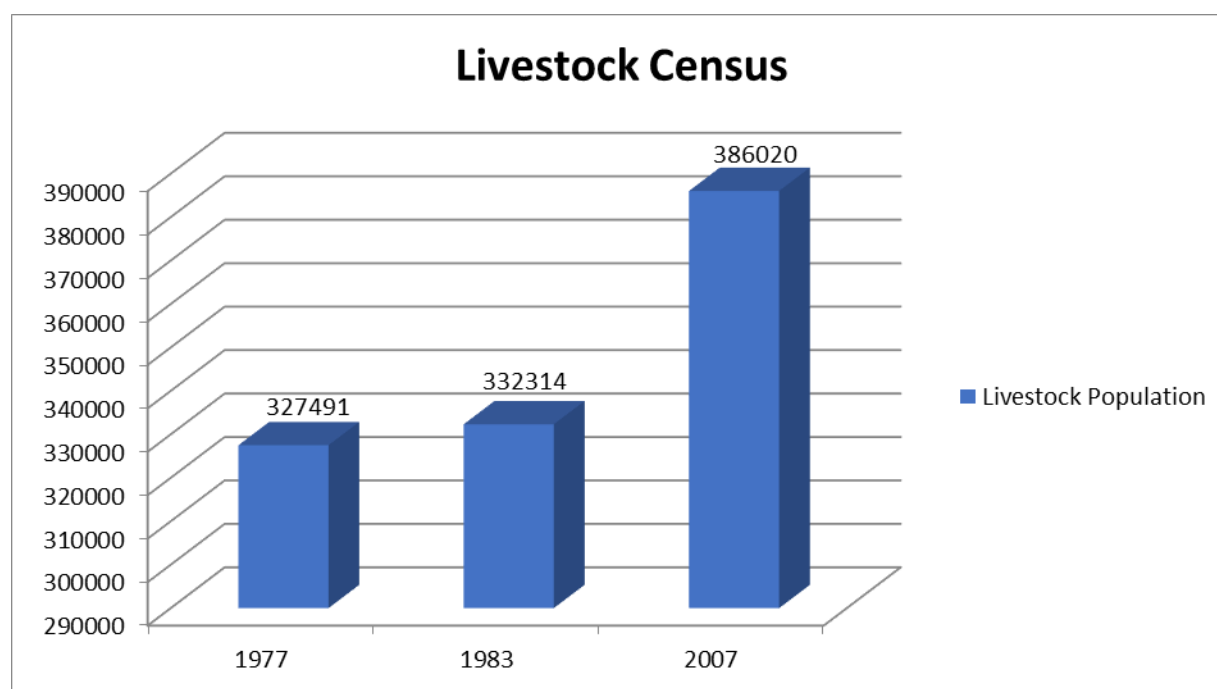
The explosive increase in the area under apple occurred in last 25 years. Apple orchards have spread, into mixed agricultural lands and up the mountain slopes. The allocation of nautors to the landless has reduced the forest area, leading to an increased pressure on the remaining area for grazing and tree forage resources.

3.2 LIVESTOCK: -

The people rear cattle and flocks of sheep and goats to supplement their agricultural income. The villagers depend on forest and wastelands for grazing their animals throughout the year. The bullocks and dry cows are left in the forests for months together. The grazing grounds are exhausted and the harmful effects of overgrazing are apparent. The pressure of grazing per unit area is beyond the carrying capacity of the pastures and forests. Grazing in forests is practiced all over in an unrestricted manner. Alpine pastures and Dhars are very heavily grazed by flocks of sheep and goats belonging to local and migratory graziers, so much that many of these are deteriorating. People are in the habit of rearing cattle far in excess of their actual requirements. The pressure is still higher near the thickly populated villages. Forest trees mainly Ban, Mohru, Kharshu, *Robinia*, Khirak, *Ulmus*, etc. are lopped for fodder especially during winters. Heavy lopping is also done in conifer trees for its leaves being used traditionally for making bed for animals. The livestock population in the Kullu district is given in Table 3.6

Table: 3.6- Livestock Census of Kullu District:**(Table 7)**

S. No.	Census Year	Livestock Population
1	1977	327491
2	1983	332314
3	2007	386020

**Table: 3.7. Tehsil-wise Livestock Population of Kullu District as per 18th All India Livestock Census-2007:**

	Total Cattle	Total Buffalo	Total Sheep	Goat	Total Horse	Remarks
Kullu Tehsil	74549	540	60910	26639	863	Detail of other Miscellaneous species not given
Manali Tehsil	11293	7	11102	3124	655	
Total of Kullu & Manali Tehsil	85842	547	72012	29763	1518	
Kullu District Total	169019	872	114942	69535	1634	

(Table 8)

Above figures shows that Livestock population is continuously increasing in the area. The higher population of sheep and goats is a threat to natural regeneration in forest.

3.3 Timber:

Demand for building timber and fuel wood has increased manifold, with the result that the forest have come under severe strain. The hotel industry has really grown with its demand for timber seriously affecting and jeopardizing forest resources. The sale of timber and firewood is handled through the Himachal Pradesh Forest Development Corporation through its depots at Shamshi. From 1990, the supply of timber for manufacturing packing cases has been stopped giving some respite to forests. The timber to right holders has been provided under timber distribution (TD) rules. Detail of T.D and fee grant are tabulated below.

T.D Granted of Right Holders w.e.f 1994 to 2006

(Table 9)

Sr. No	Range	Year	Species	Volume in m ³
1	Kasol	1994	Kail	166.7
			Deo	72.6
			Rai	101.88
		1995	Kail	127.8
			Deo	74.4
			Rai	3.11
			Chil	3.9
		1996	Kail	18.6
			Deo	13.8
		1997	Kail	339.9
			Deo	208.1
			Rai	268.78
			Tosh	117.9
		1998	Kail	455.6
			Deo	284.8
			Rai	40.77
			Fir	7.08
		1999	Kail	239.1
			Deo	265.2
		2000	Kail	453
			Deo	125.7
			Rai	78.48
			Tosh	5.1
		2001	Kail	502.1

UTILIZATION OF THE PRODUCE

			Deo	210.9
			Rai	194.57
		2002	Kail	808
			Deo	239.8
			Rai	135.42
		2003	Kail	49.2
			Deo	32.1
			Rai	5.1
			Tosh	109.36
		2004	Kail	32.1
			Deo	16.8
			Tosh	90.05
		2005	Kail	55.5
			Deo	20.7
			Tosh	6.22
			Rai	42.78
		2006		0
			Total	6023.00
2	Jari	1994	Deo	1152.3
			Kail	284.1
		1995	Deo	730.8
			Kail	272.1
			Rai	10.2
		1996	Deo	317.9
			Kail	199.6
			Rai	52.5
		1997	Deo	1286.7
			Kail	420.4
		1998	Deo	1125.8
			Kail	249.7
		1999	Deo	1551.7
			Kail	475.2
			Rai	5.1
		2000	Deo	87.2
			Kail	241.5
			Tosh	7.08
			Rai	39.72

UTILIZATION OF THE PRODUCE

		2001	Deo	676.7
			Kail	395.4
			Rai	78.08
		2002	Deo	272.9
			Kail	142.5
			Rai	16.98
		2003	Deo	31.9
			Kail	65.7
			Rai	29.34
		2004	Deo	260.7
			Kail	180
			Rai	69.9
		2005	Deo	127.8
			Kail	74.5
			Rai	29.46
		2006	Deo	52.2
			Kail	16.9
			Total	11030.56
3	Bhunter	1994	Deo	872.92
			Kail	781.65
		1995	Deo	256.62
			Kail	358.46
		1996	Deo	274.48
			Kail	258.15
		1997	Deo	368.02
			Kail	318.06
		1998	Deo	470.12
			Kail	472.1
		1999	Deo	631.09
			Kail	540.32
		2000	Deo	724.22
			Kail	443.34
		2001	Deo	656.86
			Kail	488.04
		2002	Deo	262.12
			Kail	195.605
		2003	Deo	181.33
			Kail	180.61
		2004	Deo	198.43

UTILIZATION OF THE PRODUCE

			Kail	125.22
		2005	Deo	72.33
			Kail	72.1
		2006	Deo	47.1
			Kail	49.46
			Total	9298.76
4	Hurla	1994	Deo	770.4
			Kail	55.5
			Tosh	26.21
		1995	Deo	575.7
			Kail	554.11
			Tosh	6.22
			Rai	5.1
		1996	Deo	345.9
			Kail	238.7
			Tosh	9
		1997	Deo	1065.2
			Kail	998.7
			Tosh	19.2
		1998	Deo	1225.3
			Kail	1133.2
			Fir	3.9
			Tosh	20.4
			Rai	3.9
		1999	Deo	1142.7
			Kail	1222.2
			Rai	42.77
			Tosh	45.9
		2000	Deo	713.3
			Kail	790.8
		2001	Deo	1002.2
			Kail	764.5
			Ash	6.04
			Rai	7.08
			Fir	25.47
			Tosh	7.08
		2002	Deo	193.2
			Kail	170.2
			Fir	8.49

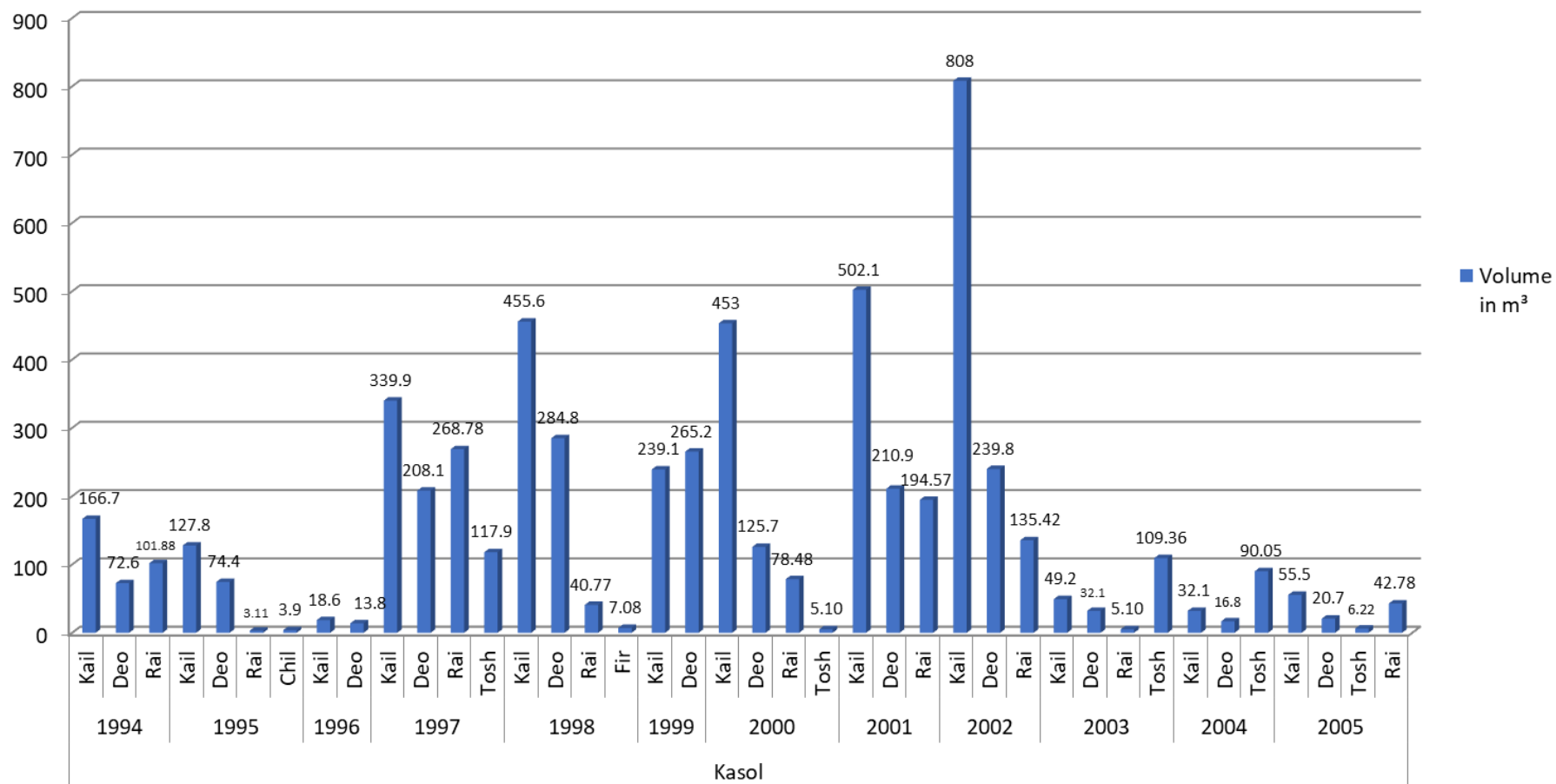
UTILIZATION OF THE PRODUCE

			Ash	2.02
		2003	Deo	108.3
			Kail	192.2
		2004	Deo	157.1
			Kail	96.6
			Ash	3
		2005	Deo	329
			Kail	188
		2006	Deo	54.3
			Kail	44.5
			Total	14373.59
		Grand Total		40725.91

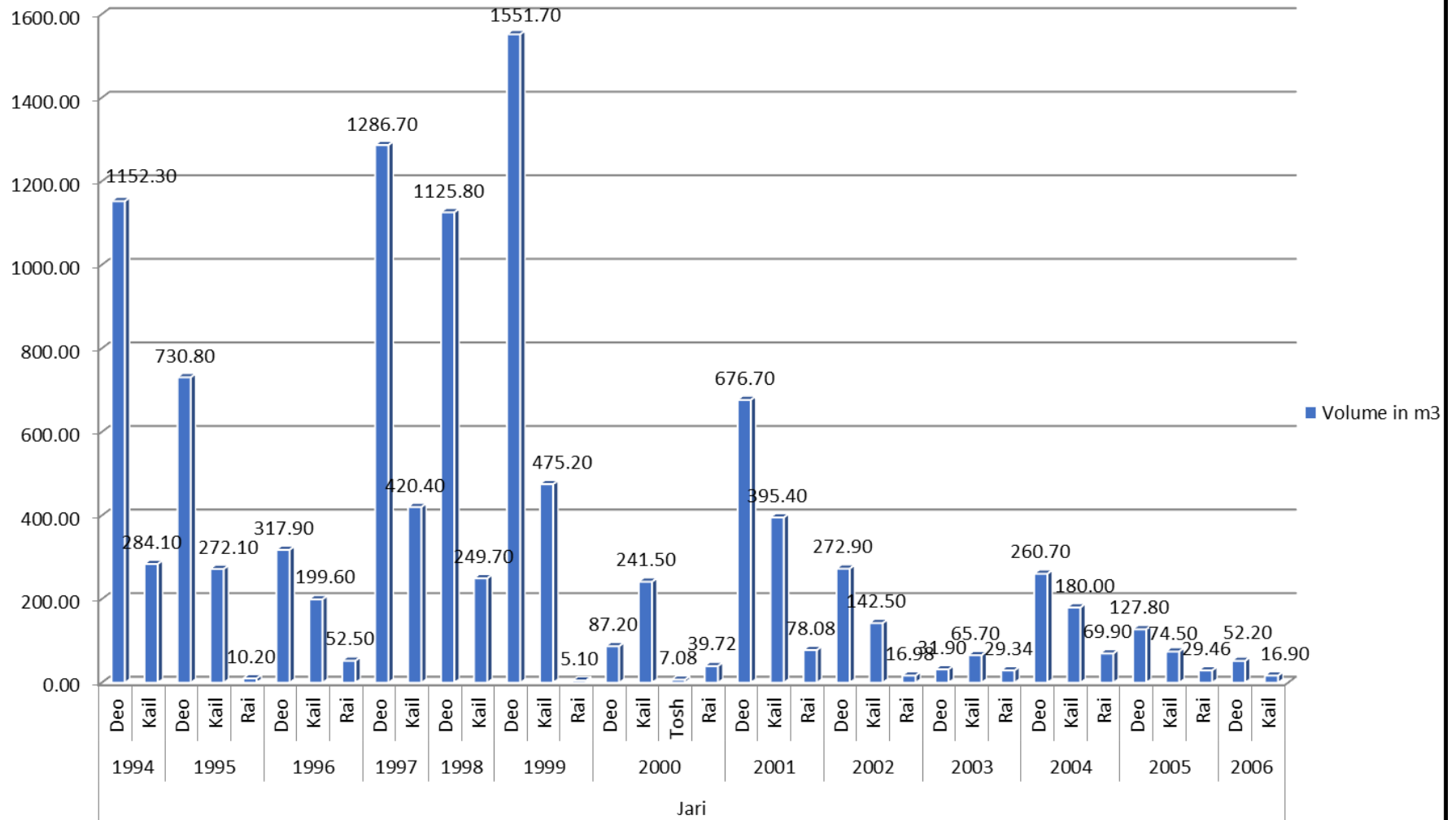
(The T.D distribution rights were suspended w.e.f. from 2006 to 2010 owing to Hon'ble High Court order, hence no T.D was granted during these years to the right holders in the Parvati Forest Division.)

Later, on the order of Hon'ble High Court, Govt. of HP notified new TD policy and H.P. Forest (Timber Distribution to Right Holders) Rules, 2010 for the rationalization of grant of timber. However TD policy - 2010 and rules were changed again in 2013 and new policy was notified vide. **Notification No. FFE-B-E (3)-43/2006 dated 26.12.2013 with some modifications on dated 26.02.2016.** The details are in **Volume-II, Appendix-XX, Page No 145-159.**

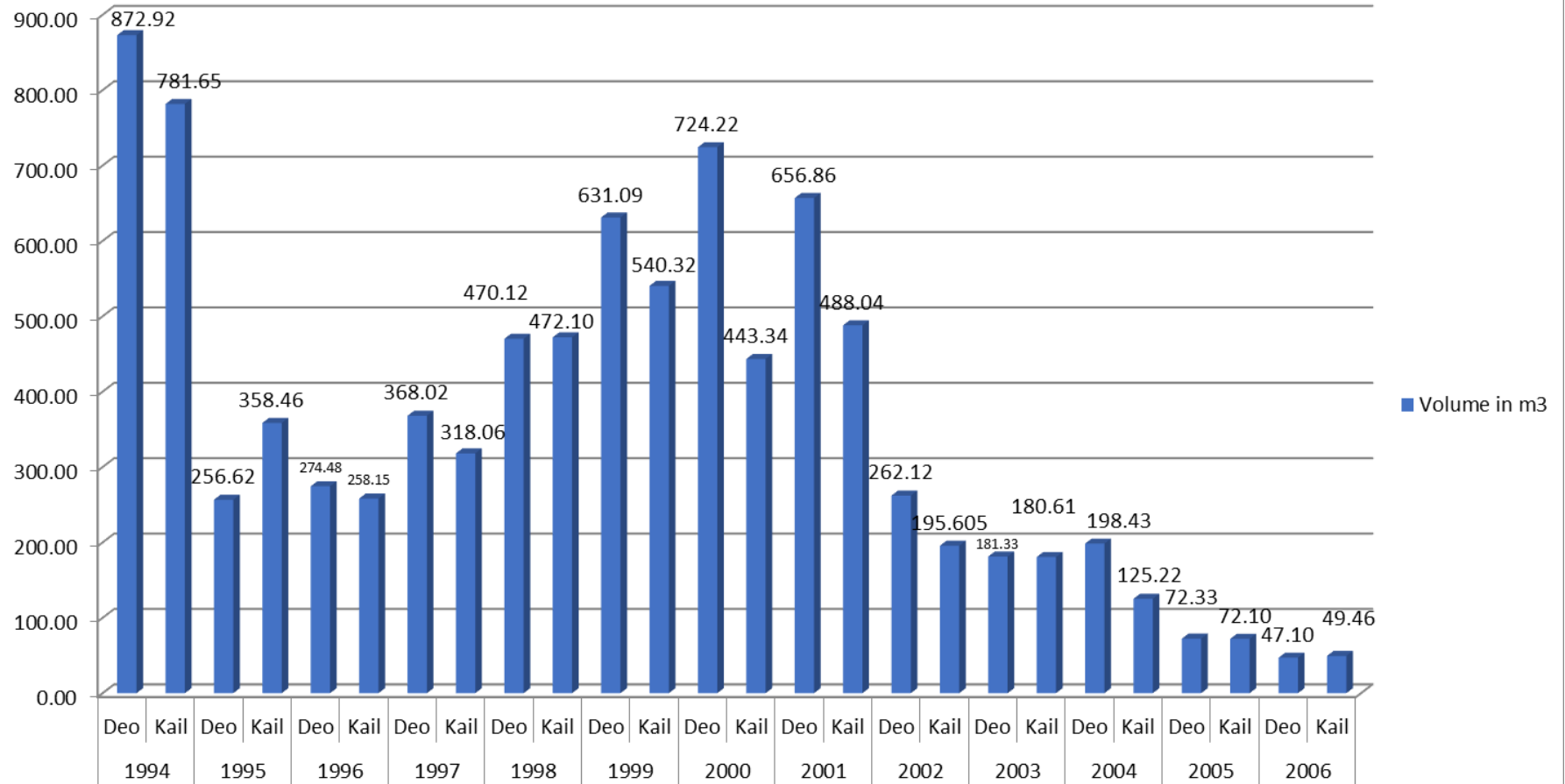
T.D Grant of Right Holder of Kasol Range (1994 to 2006)



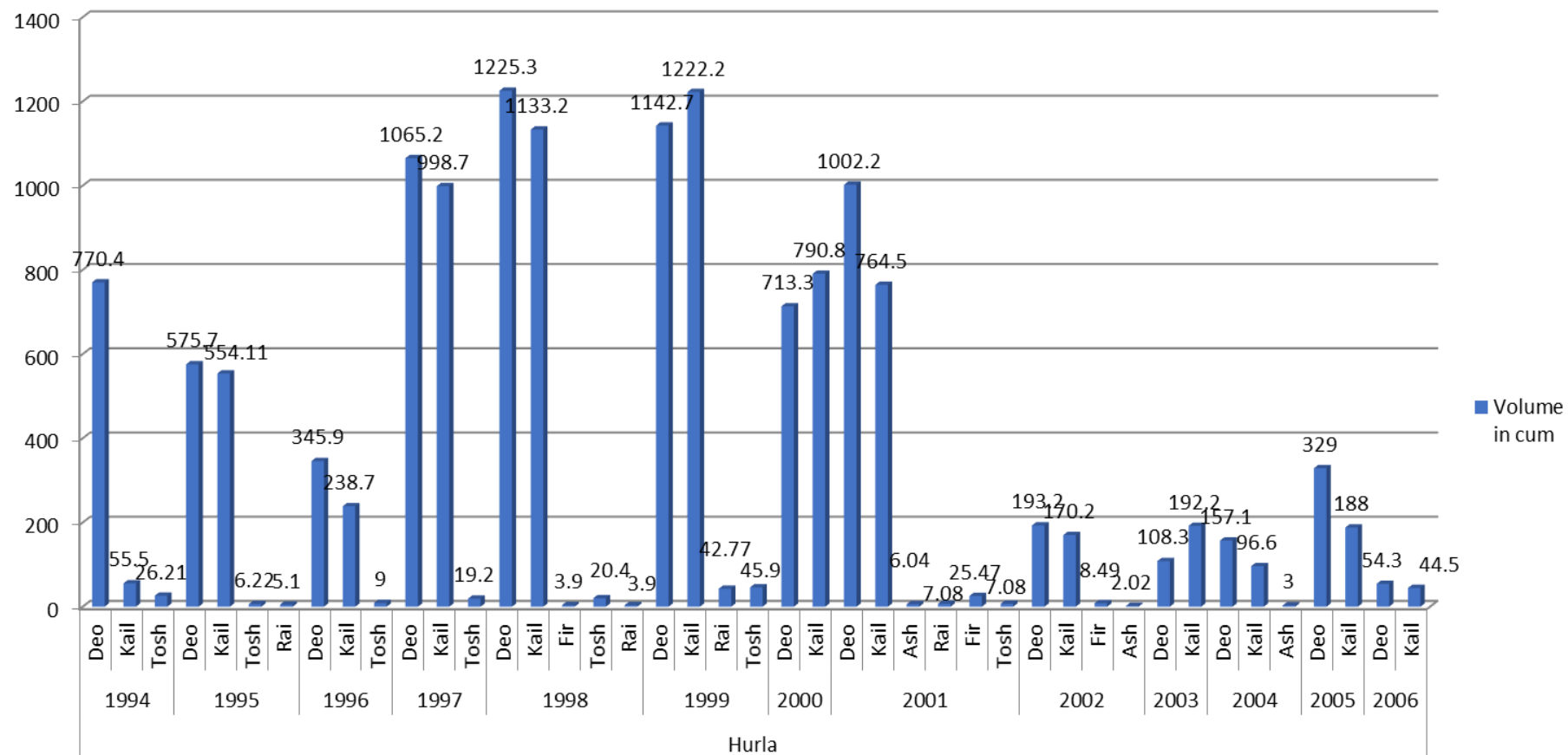
T.D Grant of Right Holder of Jari Range (1994 to 2006)



T.D Grant of Right Holder of Bhunter Range (1994 to 2006)



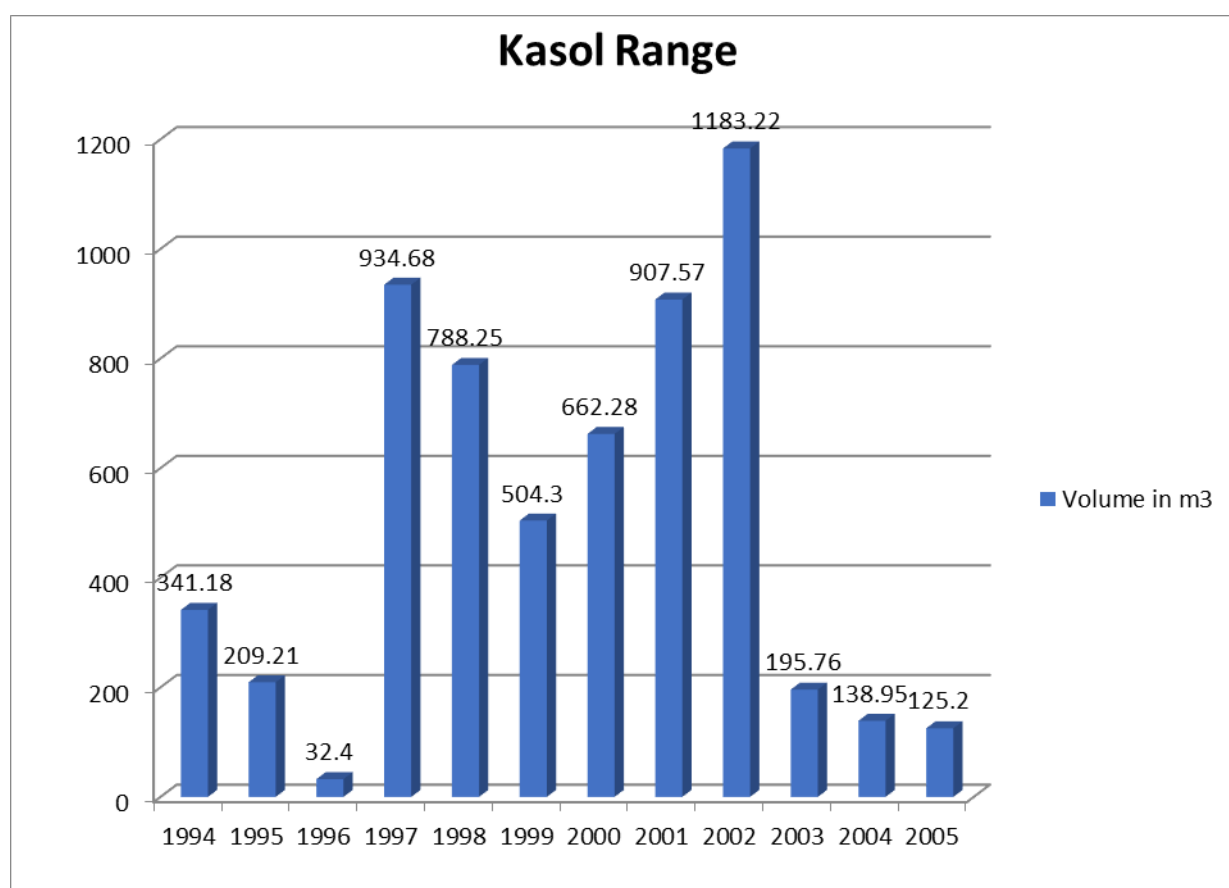
T.D Grant of Right Holders of Hurla Range (1994 to 2006)



T.D Grant of Right Holder of Kasol Range

(Table 10)

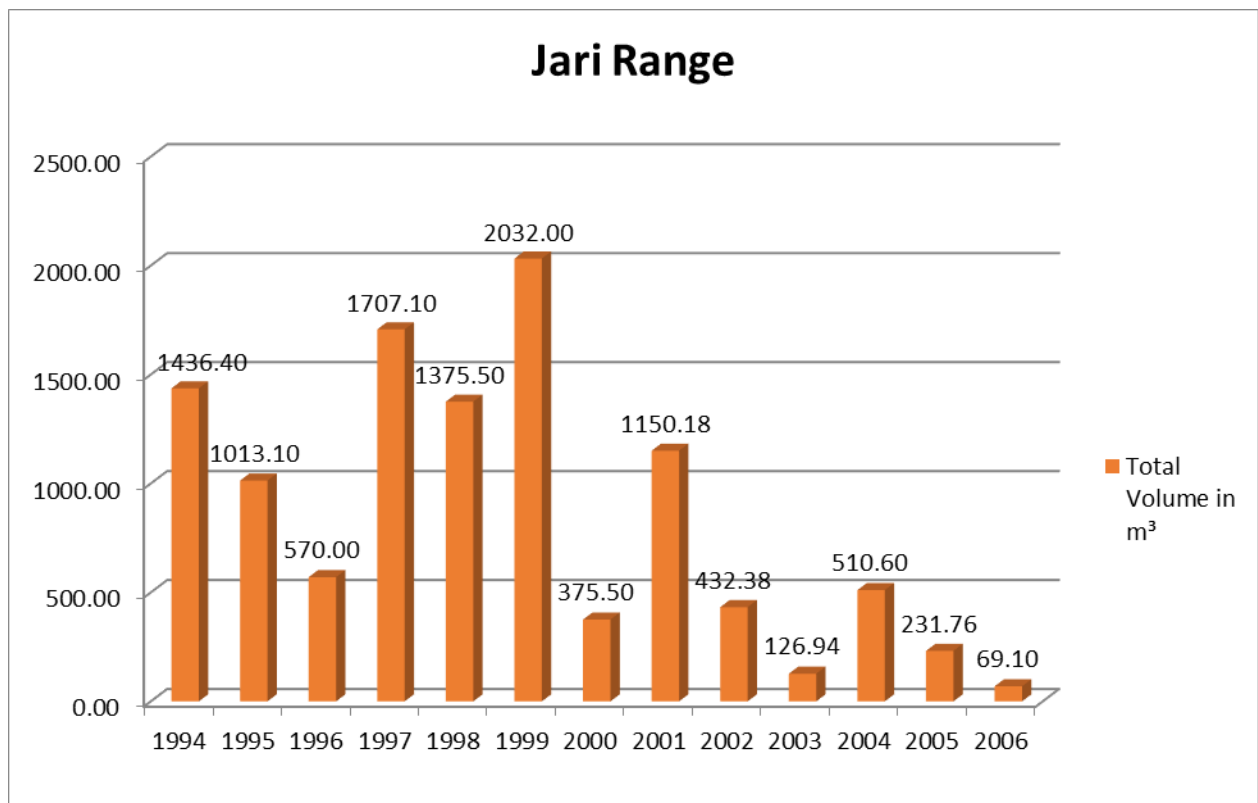
Range	Year	Total Volume in m ³
Kasol	1994	341.18
	1995	209.21
	1996	32.4
	1997	934.68
	1998	788.25
	1999	504.3
	2000	662.28
	2001	907.57
	2002	1183.22
	2003	195.76
	2004	138.95
	2005	125.2
	Total	6023



T.D Grant of Right Holder of Jari Range

(Table 11)

Range	Year	Total Volume in m ³
Jari	1994	1436.40
	1995	1013.10
	1996	570.00
	1997	1707.10
	1998	1375.50
	1999	2032.00
	2000	375.50
	2001	1150.18
	2002	432.38
	2003	126.94
	2004	510.60
	2005	231.76
	2006	69.10
	Total	11030.56



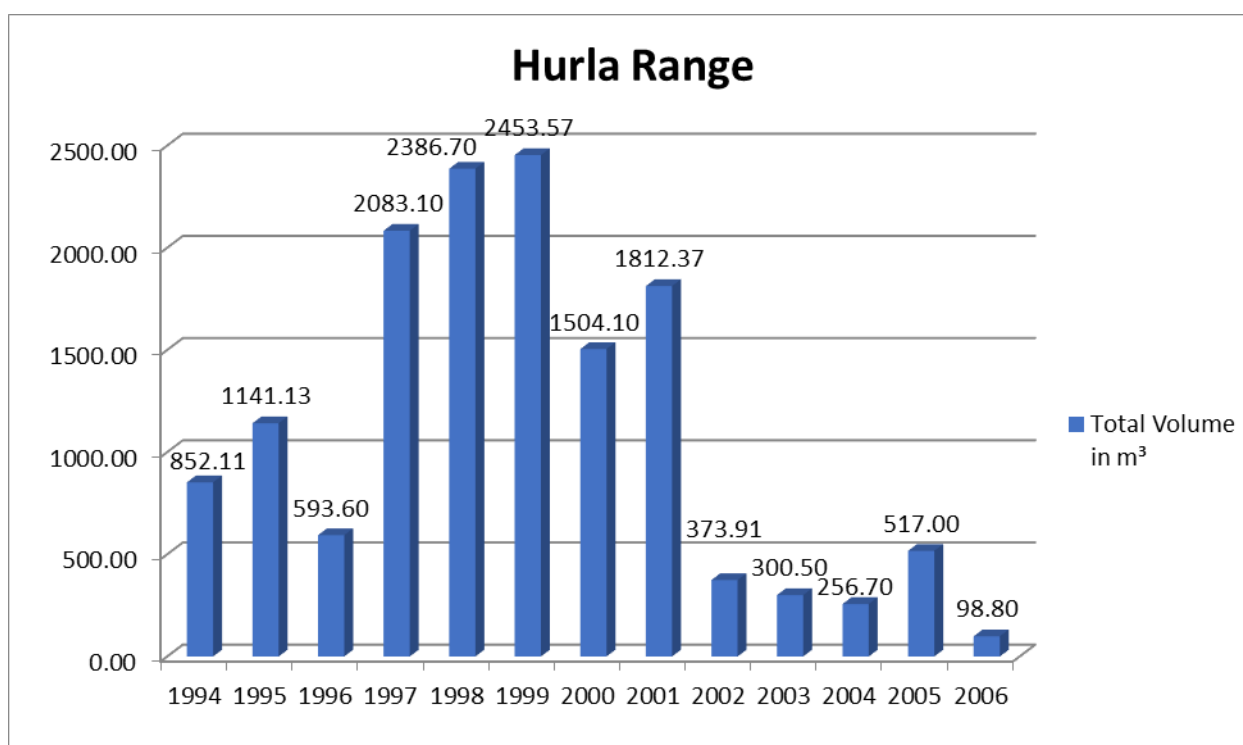
T.D Grant of Right Holder of Hurla Range

(Table 12)

Range	Year	Total Volume in m ³
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UTILIZATION OF THE PRODUCE

Hurla	1994	852.11
	1995	1141.13
	1996	593.60
	1997	2083.10
	1998	2386.70
	1999	2453.57
	2000	1504.10
	2001	1812.37
	2002	373.91
	2003	300.50
	2004	256.70
	2005	517.00
	2006	98.80
	Total	14373.59

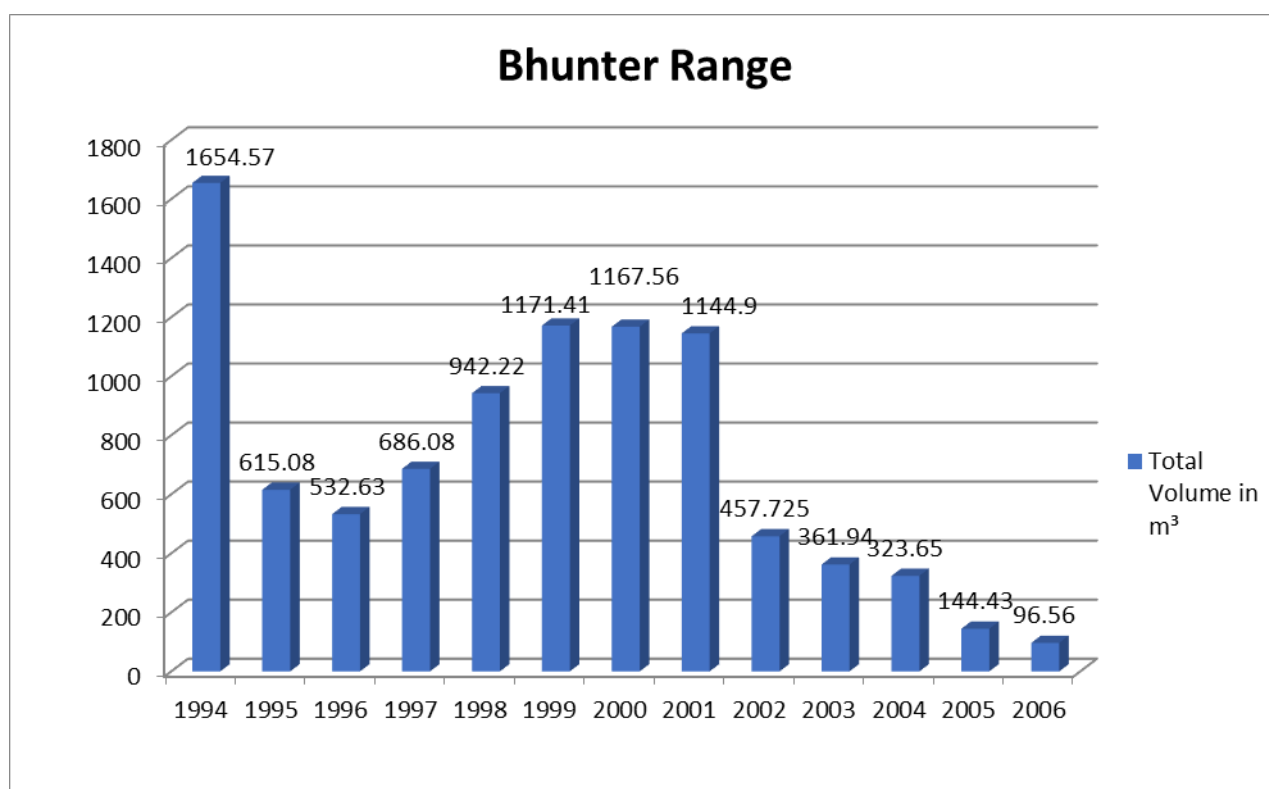


T.D Grant of Right Holder of Bhunter Range

(Table 13)

Range	Year	Total Volume in m³
Bhunter	1994	1654.57
	1995	615.08
	1996	532.63
	1997	686.08
	1998	942.22
	1999	1171.41
	2000	1167.56

	2001	1144.9
	2002	457.725
	2003	361.94
	2004	323.65
	2005	144.43
	2006	96.56
	Total	9298.755

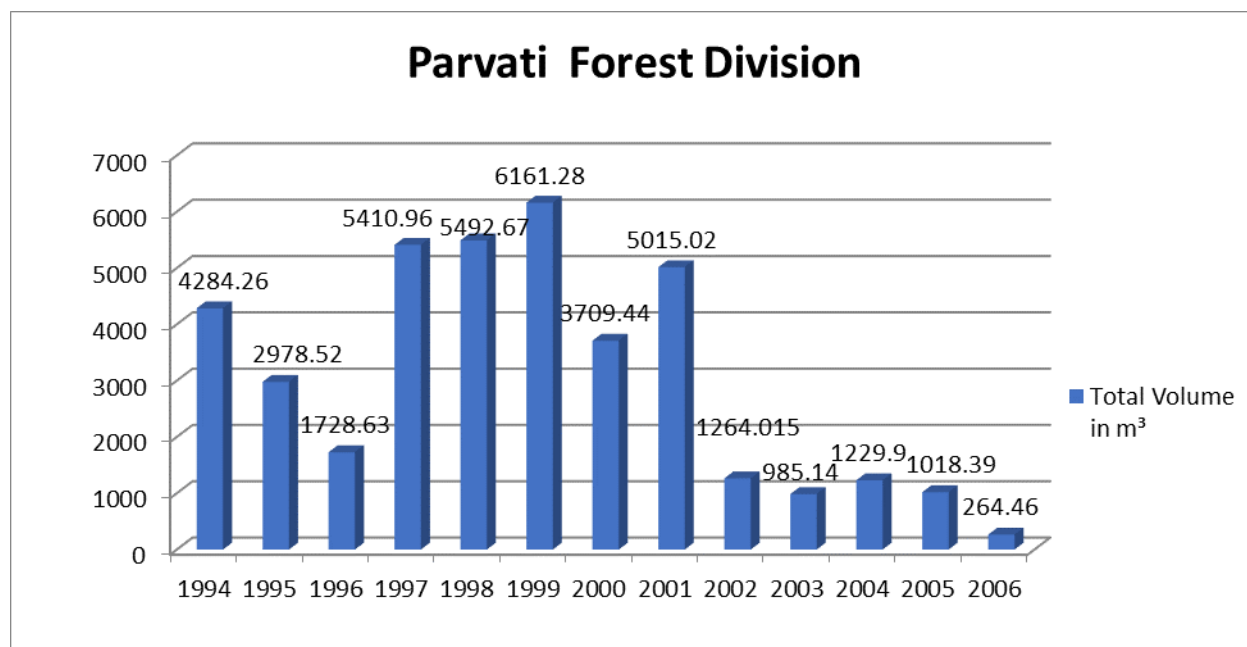


T.D. Grant of right holder of Parvati Forest Division

(Table 14)

Range	Year	Total Volume in m³
Hurla, Jari, Kasol and Bhunter	1994	4284.26
	1995	2978.52
	1996	1728.63
	1997	5410.96
	1998	5492.67
	1999	6161.28
	2000	3709.44
	2001	5015.02
	2002	1264.015
	2003	985.14

	2004	1229.9
	2005	1018.39
	2006	264.46
	Total	39542.685



T. D Grant of Right Holders w.e.f 2011 to 2015

(Table 15)

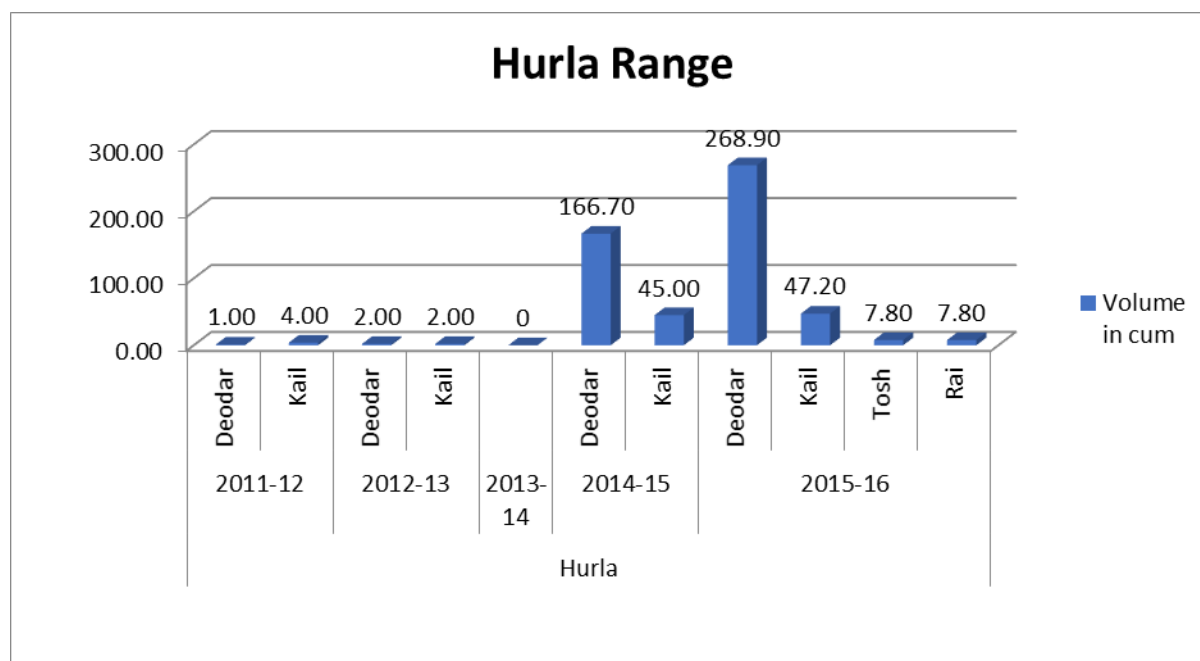
Sr.No	Range	Year	Species	Volume in m ³
1	Hurli	2011-12	Deodar	1.00
			Kail	4.00
		2012-13	Deodar	2.00
			Kail	2.00
		2013-14		0
		2014-15	Deodar	166.70
			Kail	45.00
		2015-16	Deodar	268.90
			Kail	47.20
			Tosh	7.80
			Rai	7.80
2	Bhunter	2011-12	Kail	1.00
		2012-13	Deodar	5.00
			Kail	1.00
		2013-14	Deodar	9.90
		2014-15	Deodar	146.80
			Kail	87.10
		2015-16	Deodar	182.30
			Kail	31.50
			Chil	2.90
3	Jari	2011-12		0

		2012-13		0
		2013-14		0
		2014-15	Deodar	16.90
			Kail	10.80
		2015-16	Deodar	135.00
			Kail	15.90
4	Kasol	2011-12		0
		2012-13		0
		2013-14		0
		2014-15		0
		2015-16	Deodar	60.90
			Kail	12.90

T.D Grant of Right Holders in Hurla Range w.e.f 2011-2015

(Table 16)

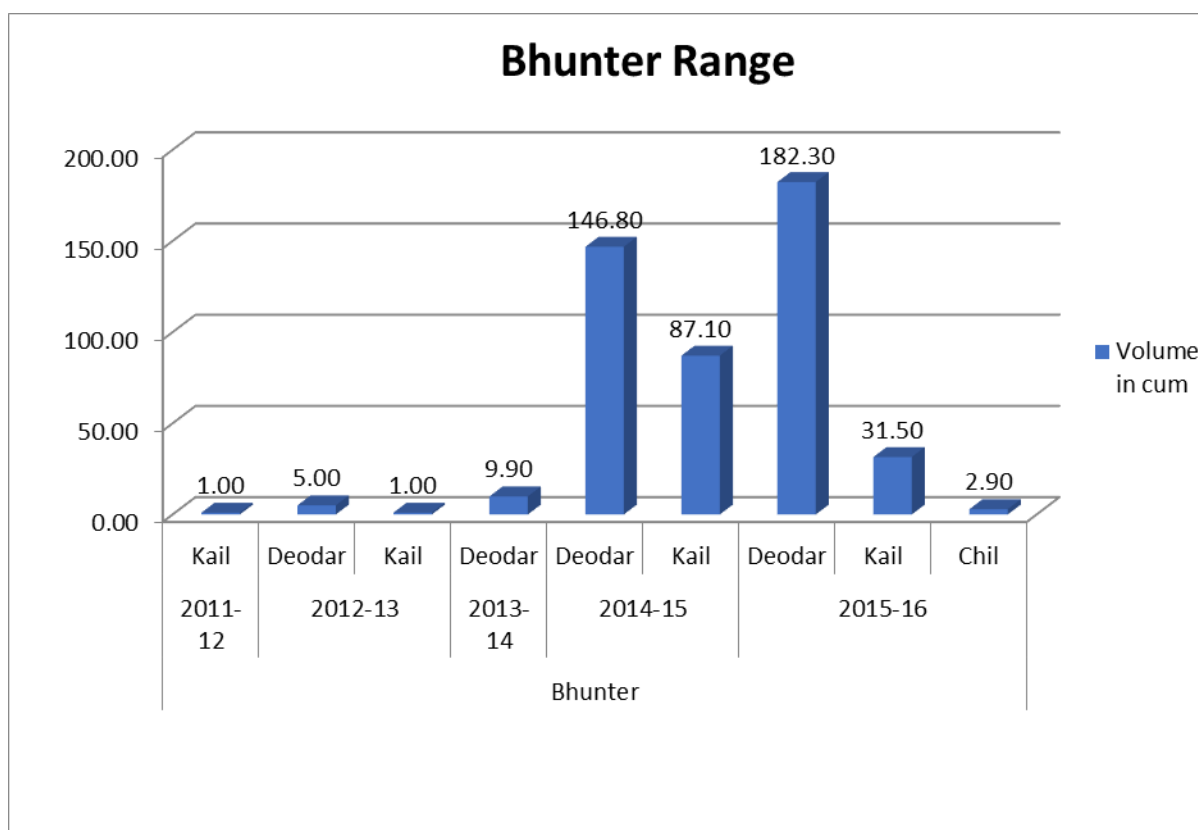
Range	Year	Total Volume in cum
Hurla	2011-12	5.00
	2012-13	4.00
	2013-14	0
	2014-15	211.70
	2015-16	331.70
	Total	552.40



T.D Grant of Right Holders in Bhunter Range w.e.f 2011-2015

(Table 17)

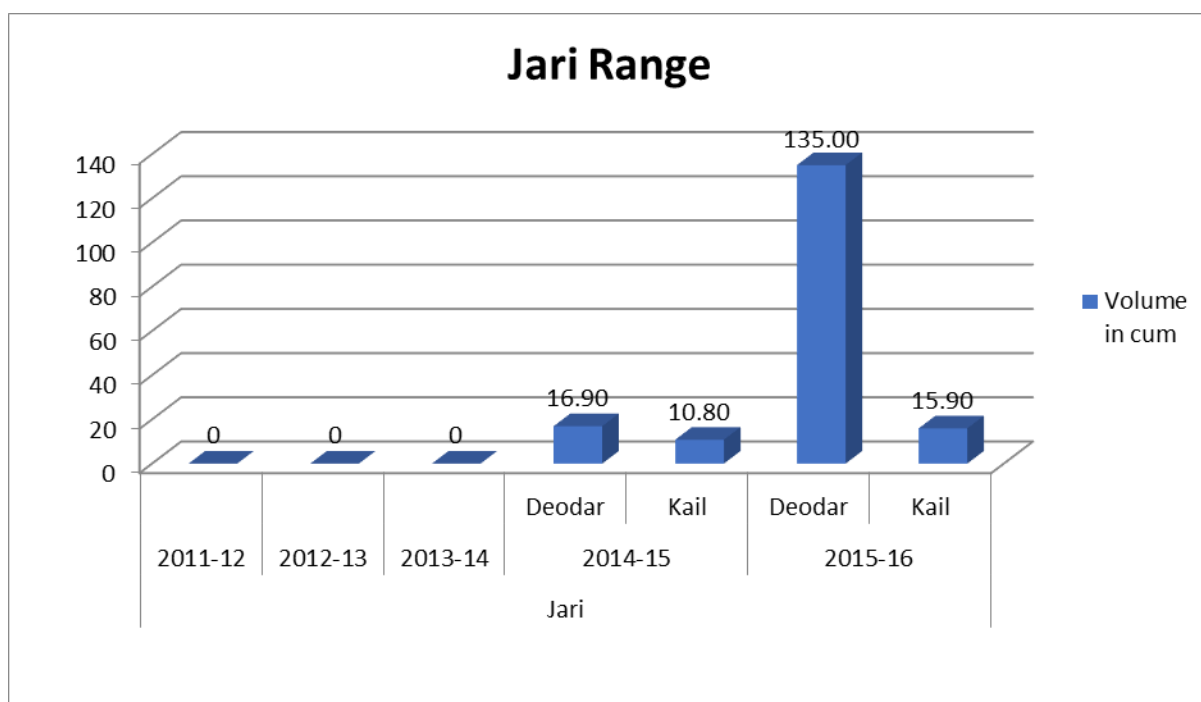
Range	Year	Total Volume in cum
Bhunter	2011-12	1.00
	2012-13	6.00
	2013-14	9.90
	2014-15	233.90
	2015-16	216.70



T.D Grant of Right Holders in Jari Range w.e.f 2011-2015

(Table 18)

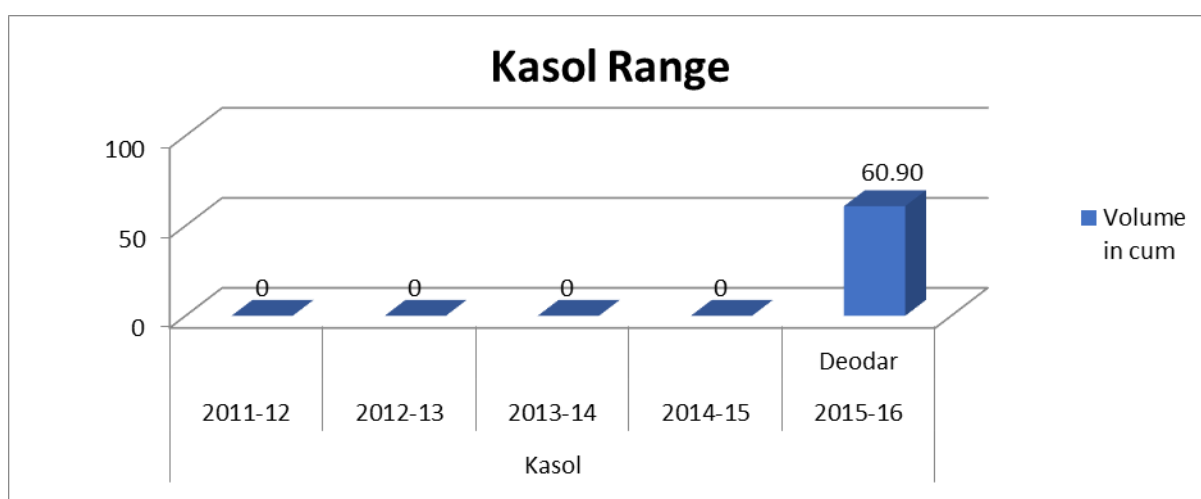
Range	Year	Total Volume in cum
Jari	2011-12	0
	2012-13	0
	2013-14	0
	2014-15	28
	2015-16	151



T.D Grant of Right Holders in Kasol Range w.e.f 2011-2015

(Table 19)

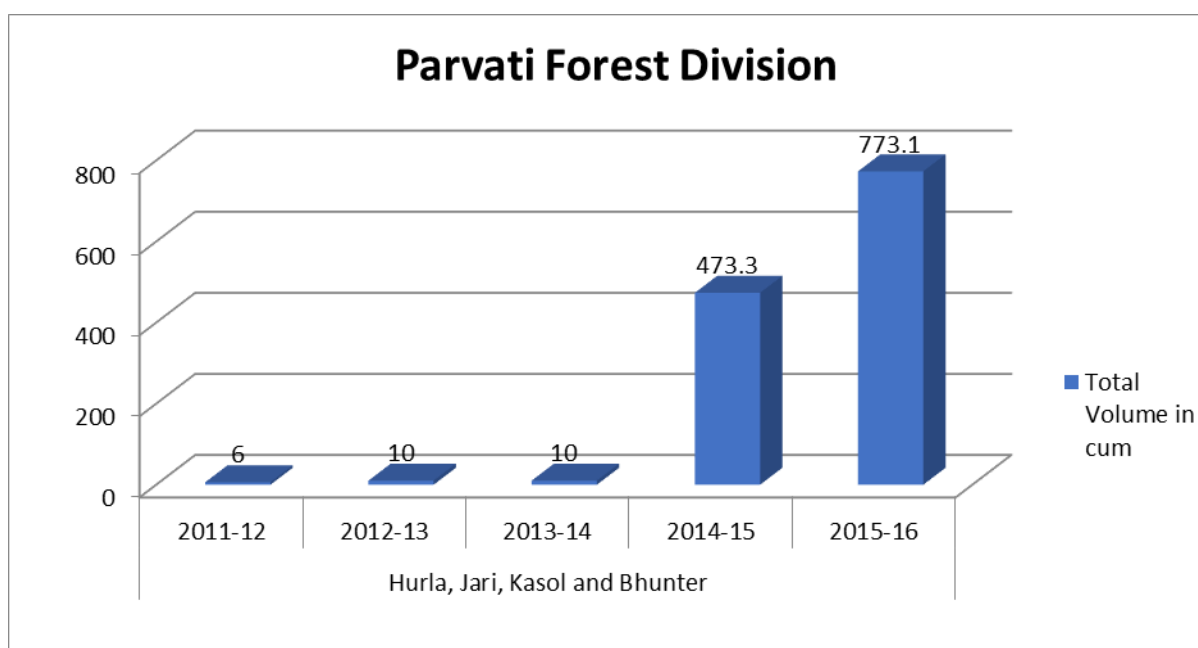
Range	Year	Total Volume in cum
Kasol	2011-12	0
	2012-13	0
	2013-14	0
	2014-15	0
	2015-16	73.80



T.D Grant of Right Holders in Parvati Forest Division w.e.f 2011-2015

(Table 20)

Range	Year	Total Volume in Cum
Hurla, Jari, Kasol and Bhunter	2011-12	6
	2012-13	10
	2013-14	10
	2014-15	473.3
	2015-16	773.1
	Total	1272.4



3.4 Market and Marketable Products:

The Forests of Parvati Forest Division have commercial conifer species like Deodar, Kail, Rai and Fir beside important Broad Leaves species like Walnut, Ash, Angu, Oaks, etc. Parvati Forest Division provides a number of valuable products like timber, fuelwood, charcoal, medicinal herbs, and other minor produce like Cedar oil, cones of conifers and *Alnus nitida* for decorative purposes. Prior to World War-II, an overall depression kept timber prices low. However, this changed after World War II when the prices spiraled up and showed a steep rise. Further, the improvement in economic conditions, development of tourism industry and migration of people to towns put an excess demand of timber and other forest resources. The demand has increased manifold. Presently, extraction and marketing is being done by HP State Forest Development Corporation.

The network of roads in the valley has facilitated economic development of local markets for broad leaved species such as Walnut, Maple, Bird Cherry, Horse chestnut and Oaks. There is also a great demand for medicinal herbs extracted from the valley. Earlier, the Gram Panchayats were allowed to issue export permit to local collectors by charging nominal rates which are based on market values of the forest produce. There is complete ban on export of *Taxus baccata* leaves.

Table showing list of species for which Panchayat Pradhan was given power to issue permits.

(Table 21)

Sr. No	Scientific Name	Common/ Local Name	Part of Trees	Permit fees (Rs)/ Qtl.
1	<i>Abies spectabilis</i>	Talis Patra	Needles/ leaves	85
2	<i>Acorus calamus</i>	Buch/ Bare/ Barian	Rhizomes	130
3	<i>Adiantum lunulatum</i>	Damtuli/ Hansraj	Fronds/ Whole Plant	80
4	<i>Ainselia aptera</i>	Sathjalori	Roots	50
5	<i>Alnus nitida</i>	Birch Pine/ Kush Cones	Dry Cones	150
6	<i>Angelica glauca</i>	Chora	Roots	125
7	<i>Bunium persicum</i>	Kala Zira	Fruits	2,000
8	<i>Cedrus deodara</i>	Deodar Rosette	Dry Cone part	150
9	<i>Colebrookia oppositifolia</i>	Bindi Phool	Dried Flowers	50
10	<i>Coleus aromaticus</i>	Pathan Bel	Leaves	30
11	<i>Curcuma spp.</i>	Ban Haldi	Rhizomes	50
12	<i>Dactylorhiza hatageria</i>	Salam Panja	Rhizomes	6,000
13	<i>Gerardiana diversifolia</i> = <i>G. heterophylla</i>	Bichhu Buti	Roots	150
14	<i>Hedychium acuminatum</i>	Kapur Kachri	Roots	70
15	<i>Heracleum candicans</i> / <i>H. lanatum</i>	Patishan/ Patrala	Roots	25
16	<i>Hypericum patulum</i> / <i>H. perforatum</i>	Khaarera/ Basanti	Whole Plant	250
17	<i>Juniperus recurva</i>	Bether Patta	Leaves	100
18	<i>Jurinea macrocephala</i> = <i>J. dolomoea</i>	Dhoop	Roots	500
19	<i>Lichens</i>	Chalora	Thallus	225
20	<i>Lichens and Mosses</i>	Green Moss Ghas	Thallus	250
21	<i>Morchela esculents</i>	Guchhi	Fruiting Body	10,000
22	<i>Picrorhiza kurroa</i>	Karu/ Kutki	Rhizomes	540
23	<i>Pinus roxburghii</i>	Pine Needles	Dry Needles	5
24	<i>Pinus wallichiana</i>	Kail Cones	Cones	1,000
25	<i>Pistacia integerrima</i>	Kakarsingi	Leaf Galls	1,000
26	<i>Polygonatum verticellatum</i> / <i>P. cirrhifolium</i> / <i>P. multiflorum</i>	Salam Mishri/ Meda/ Mahameda	Rhizomes	1,000
27	<i>Potentilla nepalensis</i>	Dori Ghas	Roots	40
28	<i>Pyrus pashia</i>	Kainth	Fruits	30
29	<i>Rhododendron arboreum</i>	Brash/ Brah	Flowers	150
30	<i>Salvia moorcroftiana</i>	Thuth	Roots	180

31	<i>Selinum vaginatum/ S. tenuifolium</i>	Bhutkesi	Roots	400
32	<i>Thalictrum foliolosum</i>	Mamiri	Roots	335
33	<i>Thymus serpyllum</i>	Banajwain	Aerial Parts (Herbs)	100
34	<i>Tinospora cordifolia</i>	Gloe/ Gulje	Stems	100
35	<i>Toona ciliate = Cedrela toona</i>	Bari phool	Dried fruits	60
36	<i>Valeriana hardwickii</i>	Tagar/ Nihani	Roots	600
37	<i>Valeriana jatamansi = V. wallichii</i>	Mushakbala	Roots	600
38	<i>Viola spp (v. pilosa; V. canescens, etc.)</i>	Banafsha	Flowers/ aerial parts	2,250

(Table 22)

Sr. No	Botanical Name	Local/ Trade Name	Plant Part	Permit/ Pass Fee
1	<i>Abies spectabilis/ A.pindrow</i>	Talis Patra	Needles/ leaves	125
2	<i>Acacia cotetchu</i>	Khair	a)Heartwood/chips b)Khair billet (with	250 175
3	<i>Aconitum dienorrhizum</i>	Vatsnabh/ Mohra	Tubers	7,500
4	<i>Aconitum heterophyllum</i>	Atis/ Patis/ Karvi Patis	Tubers	5,000
5	<i>Aconitum violaceum</i>	Mitha Telia/ Mitha Patis	Tubers	1,000
6	<i>Acorus calamus</i>	Bach/ Bare/ Ghor bach	Rhizomes	150
7	<i>Adhatoda zeylanica/A.vasica</i>	Basuti/ Bansa	Leaves	125
8	<i>Adiantum lunulatum</i>	Dungtuli/ Hansraj	Fronds/ Whole Plant	125
9	<i>Aegle marmelos</i>	Bilgiri	Fruits	500
10	<i>Aesculus indica</i>	Khanor	Fruits/ Seeds	150
11	<i>Ainsliae aptera</i>	Sathjalori	Roots	150
12	<i>Ajuga beacteosa</i>	Neelkanthi	Leaves	125
13	<i>Alnus nitida</i>	Kosh Cones	Dry Cones	150
14	<i>Angelica glauca</i>	Chora	Roots	150
15	<i>Arctium lappa</i>	Jangli Kuth	Roots	125
16	<i>Arnebia euchroma/</i>	Ratanjot	Roots	200
17	<i>Artemisia brevifolia</i>	Seski	Flowering shoots	125
18	<i>Asparagus adscendens</i>	Shatavari/ Sanspai/Safed Musali	Root tubers	200
19	<i>Atropa acuminata</i>	Belladona/ Jharka	Leaves	125
20	<i>Berberis spp</i>	Kashmal/ Daruhaldi	Roots/ Stems	200
21	<i>Bergenia ciliata/ B.stracheyi</i>	Pasahnbed/ Patharchat	Roots	150
22	<i>Betula utilis</i>	Bhoj Pattar /Birch pine	Bark	500
23	<i>Bunium persicum</i>	Kala Zira	Fruits	2,000

24	<i>Carum.carvi</i>	Shingu Zira	Fruits	1,000
25	<i>Cedrus deodara</i>	Deodar Rosette	Dry Cone part	150
26	<i>Cinnamomum tamala</i>	Tejpatra	Leaves	500
27	<i>Colebrookia</i>	Bindi, Phool	Leaves/ Roots	125
28	<i>Coleus aromaticus</i>	Pathan Bail	Leaves, seeds	30
29	<i>Curcuma angustifolia</i>	Ban Haldi	Rhizomes	150
30	<i>Dactylorhiza hatageria</i>	Salam Panja/ Hath Panja	Root tubers	6,000
31	<i>Dioscorea deltoidea</i>	Singli Mingli/Kins	Roots	900
32	<i>Emblica officinalis</i>	Amla	Fruits	150
33	<i>Ephedra gerardiana</i>	Somlata	Twigs	200
34	<i>Fritillaria roylei</i>	Ban Lehsun/ Mushtanda	Bulb	10,000
35	<i>Geranium nepalense</i>	Laljari/ Raktjari	Roots	125
36	<i>Girardiana diversifolia</i>	Bichhu Buti	Roots	150
37	<i>Hedychium acuminatum</i>	Kapur Kachri/ Kachur/ Van Haldi	Roots	100
38	<i>Heracleum spp (H. candicans; H lanatum)</i>	Patishan/ Patrala	Roots	100
39	<i>Hyocymus niger</i>	Khurasani Ajwain	Seeds/ Leaves	150
40	<i>Hypericum patulum/H.perforatum</i>	Khaarera/ Basant	Whole Plant	250
41	<i>Hyssopus officinalis</i>	Juffa	Flowering Twigs	500
42	<i>Iris germanica</i>	Safed Bach	Rhizomes	125
43	<i>Juglans regia</i>	Akhrot/ Khod	Bark	1000
44	<i>Juniperus communis</i>	Hauber	Berries	250
45	<i>Juniperus recurva/ J. macropoda</i>	Bether Patta	Leaves	150
46	<i>Jurinea macrocephala =J. dolomoea</i>	Dhoop/ Guggal dhoop	Roots	500
47	<i>Lichens</i>	Chalora/ Chharila/ Jhula/ Mehndi/ Stone flower	Thallus	500
48	<i>Mentha longifolia</i>	Jangli Pudina	Leaves	125
49	<i>Morchella esculenta</i>	Guchhi/ Cheun	Fruiting Body	10,000
50	<i>Mosses</i>	Green Moss Ghas	Thallus	250
51	<i>Murraya koenigii</i>	Mitthi Nim	Leaves	150
52	<i>Myrica esculenta</i>	Kaphal	Bark	200
53	<i>Nardostachys grandiflora</i>	Jatamansi	Roots	1,000
54	<i>Origanum vulgare</i>	Ban Tulasi	Leaves	150
55	<i>Oroxylum indicum</i>	Shyonak, Tatpalanga	Bark, Pod	125
56	<i>Paris polyphylla</i>	Dudhia bach/ Satva	Rhizomes	200
57	<i>Picrorhiza kurroa</i>	Karoo/ Kutici	Rhizomes	1,000
58	<i>Pinus gerardiana</i>	Chilgoza/ Neoza	Seeds	1,000
59	<i>Pinus roxburghii</i>	Chil Cones	Dry Cones Dry needles	1000 5
60	<i>Pinus wallichiana</i>	Kail Cones	Dry Cones	1,000
61	<i>Pistacia integerrima</i>	Kakarsingi	Leaf Galls	1,000
62	<i>Podophyllum hexandrum =P. emodi</i>	Bankakri	Fruits Roots	250 450
63	<i>Polygonatum spp.</i>	Salam MishrVeda/ Mahameda	Rhizomes	1,000
64	<i>Potentilla nepalensis</i>	Dori Ghas	Roots	125

65	<i>Prunus cerasoides</i>	Pajja/ Padam/ Padmakasht	Wood	125
66	<i>Punica granatum</i>	Daru/ Anar	Fruits/ Seeds	500
67	<i>Pyrus pashia</i>	Kainth/ Shegal,	Fruits	125
68	<i>Rauvolfia serpentina</i>	Sarpagandha	Roots	500
69	<i>Rheum spp. (R. austral = R. emodi/ R. speciforme)</i>	Revandchini	Roots	200
70	<i>Rhododendron anthopogon</i>	Talis patra	Leaves	125
71	<i>Rhododendron arboreum</i>	Brash/ Burah	Flowers	150
72	<i>Rhododendron campanulatum</i>	Kashmiri Patta	Leaves	150
73	<i>Salvia moorcroftiana</i>	Thuth	Roots	200
74	<i>Sapindus mukorossi</i>	Ritha/ Dodde	Fruits	150
75	<i>Saussurea costus/S.lappa</i>	Kuth	Roots	300
76	<i>Selinuin spp. (S: vaginatum/ S. tenuifolium)</i>	Bhutkesi	Roots	400
77	<i>Swertia spp</i>	Chirata	Whole Plant	700
78	<i>Taraxacum officinale</i>	Dhudhi/ Dandelion	Roots	125
79	<i>Taxus wallichiana =T. baccata</i>	Birmi/ Thuna/ Rakhal	Needles	600
80	<i>Terminalia bellirica</i>	Bahera	Fruits	300
81	<i>Terminalia chebula</i>	Harar	Fruits	500
82	<i>Thalictrum foliolosum</i>	Mamiri	Roots	350
83	<i>Thymus serpyllum</i>	Banajwain	Aerial Parts(Herb)	125
84	<i>Tinospora cordifolia</i>	Giloe/ Guduchi	Stems	125
85	<i>Toona ciliata/Cedrela</i>	Bari phool	Dried fruits	125
86	<i>Trillidium govanianum</i>	Nag Chhatra	Roots/ Rhizomes	8000
87	<i>Valeriana spp.</i>	Mushakbala/ Tagar/ Nihanu	Roots/ Rhizomes	600
88	<i>Viola spp</i>	Banafsha	Flowers/ aerial parts	2,250
89	<i>Withania somnifera</i>	Ashvagandha	Roots	200
90	<i>Woodfordia fruticosa</i>	Dhatki/ Dhari	Flowers	150
91	<i>Zanthoxylum armatum</i>	Tirmir	Fruits/ seeds	250
	<i>All other Non-Timber Forest Produce(NTFP) not listed above</i>			100

Further vide GoHP notification No. FFE-B-A(3)-1/2017 dated 20/04/2017 restriction on felling of 23 Nos. species on private land has been lifted provided tree felling is for domestic and self-use. The detailed notification is in Volume-II, Appendix-XXI, Page No. 160-162. Further vide notification No. FFE-B-A(3)-4/2016 dated 20/04/2017, 24 Nos. plant species growing on private land have been exempted from the requirement of transit pass. The detailed notification is in Volume-II, Appendix-XXII, Page No. 163-165.

3.5 Method of harvesting and their cost:

Rivers of Kullu district are most suited for floating of scantling than logs, especially of larger dimensions. Historically, Logs floated in 1923 in moderate numbers, under Talwara saw mill scheme, proved to be a failure and since then, no such work was contemplated

future. During 1925-26 and 1926-27 small log of Kail for matchwood at the rate of Rs. 3.69/m³ were exported. During World war-II, as many as 4, 66,179 ballies equal to 17000m³ were extracted and floated in two years 1942-43 and 1943-44. The Method of extraction of timber in the form of scantlings has been standardized, after studying local condition over the years, and is incorporated in the Punjab Forests leaflet number 9.

Timber extraction division came into existence during 1961-62 and carried out extraction /exploitation works upto 1976. Extraction of timber by modern method of logging was introduced in 2/11 Kothi Tich, 2/12 Mathiban forest of Manali Range and 2/32 Matikochar of Kullu Range. A central saw-mill with workshop complex for industrial use of wood was set up at Shamshi in year 1961-62. Logs were transported to the saw mill and converted into sleepers and other sizes. Cost statement compared for different items of departmental extraction up to depot at Nangal, came out to Rs. 365/96 per m³ by conventional method as against Rs. 442/80m³ in 1978-79. Cost of extraction of timber by mechanical method is very high. However, at the same time, outturn of sawn volume is high, upto 30% in form of logs and 60-70% in case of Fir in form of scantlings. With the demand for broadleaved species during sixties extraction of these species become economical on account of the network of the roads and introduction of the mechanical logging methods. Logs of broad leaved species were supplied to the wood-based industries Division, Shamshi for manufacturing of rifle half-wrought, shuttle and bobbin blocks, furniture etc.

H.P. State Forest Corporation Limited came into existence w.e.f. 25/03/1974, registered under The Companies Act, 1956. Now with the complete nationalization of forest with effect from 25/01/1983, the entire timber extraction work is being done by Forest Corporation. Exploitation work is being done through conventional methods. Mechanized logging cannot be adopted, as the volume handed over is not in sizeable quantity. There is a complete ban on commercial green felling in the state and only salvage markings are being carried out.

3.6 Minor Forest Produce: -Detailed discussion on Minor Forests Produce is at Part-II, Chapter No. IX.

3.6.1 Medicinal Herbs: - Recorded settlement rights authorize the right holder to collect barter or sell medicinal herbs, roots, flowers, fruits and aromatic plants from the forests. The modus operandus prescribed is that the local right holder must collect the medicinal herbs on his own without deploying labour for extraction. He then sells it to the middleman, who in turn exports the herbs outside the state. Amritsar has come as the principal market dealing in medicinal herbs.

The local panchayats were provided the necessary authorization to release the royalty for the medicinal herbs and to utilize the same for the general welfare of the rural folk of the Panchayats. The extraction is regulated by way of 4 year extraction cycle. The extraction cycle for Parvati Forest Division is as under:-

(Table 23)

Calendar year of working	Name of Division	Name of Range
2013	Parvati	Kasol

2014	Parvati	Hurla
2015	Parvati	Jari
2016	Parvati	Bhunter

Huge demand for Nagchhatri (*Trillidium govanianum*) roots has been observed from 2010 onward. It is supposed that it is sold in international markets at very high prices. Export permits for most of medicinal plants are issued by the panchayats, no mechanism has been developed to keep record of medicinal herbs actually extracted and exported out of the division.

3.6.2 Resin Tapping: - Resin tapping is being done in the Chil Forest of Parvati Forest Division. It was started in 1971-72. Resin extraction work was transferred to the corporation during 1975-76. Number of blazes tapped and yield obtained during previous working plan period is given below:

(Table 24)

Year	No. of blazes	Extracted resin in quintal	Yield obtained Per Sec. in quintal	Ext. Cost per Quintal
1984-93	169278	6178.79	285.38	1797
1994	22843	---		
1995	23295	--		
1996	19405	838		
1997	19405	838		1009
1998	9000	405		746
1999	2650	139		528.48
2000 to 2014	nil	nil	nil	nil

The number of resin blazes handed over to Corporation reduced year by year and ultimately no blazes for resin extraction were handed over to the HPSFDC wef 2000 to 2014. The reason being the Non Availability of the space for marking/setting of blazes.

3.6 WOOD BASED INDUSTRY, SHAMSHI:

Wood based Industry Division Shamshi was created with effect from April 1, 1968. Object was to increase utilization percentages of coniferous species and marketing of unconventional broad leaved species etc. The Division was supplied timber from Timber Extraction Division, Kullu and earned revenue from the sale of rifle wrought, shuttle and bobbin blocks, furniture, firewood etc. thus both the division worked in close liaison.

The Timber Extrication Division, Kullu was transferred to the H.P. State Forest Corporation Limited, with effect from June 8, 1978. This resulted in a setback in receipts of timber and also reduction of work load in the Wood based Industry. Consequently the Division had to be wound up on May 1, 1984, where after it existed only as a range. The level of production of industrial goods and furniture declined, mainly since the required species was available in small quantity scale. The result is that the range has become uneconomic. To infuse fresh blood, requirement is to increase production of furniture. Augmentation and replacement of old machinery is required. Vide office order number 886/

1993 dated 19/ 5/ 1993 the range has been designated as a Furniture Workshop Range and will meet the requirement of the entire department and other/ interested departments at a no profit no loss basis.

Main Challenge this FWS faces is regular staff and none availability of a species like Acer, Shisham, Walnut etc. In absence of these species the quality of furniture do not compete with local market. In this regard standing instruction had been issued by PCCf (HP) in which all Divisions of HP had been directed to supply all confiscated timber of Acer, Shisham & Walnut to WBI Shamshi and in turn the cost of timber shall be deposited as revenue in the treasury.

3.7 Timber exploitation by HPSFC. : Rates for different items of extraction of timber by HPSFC division Kullu per m3 upto sale depot is as under:-

Past and current Prices:-

i) Market rates of the timber for non-right holders for the year 2013-14

(Table 25)

Species	Market Rate in Rs. Per M ³ for standing green trees for 2014-15	Market Rate in Rs. Per M ³ for standing green trees for 2017-18
Deodar	55904	55904
Kail	38044	40126
Rai/Fir	22437	22437
Chil	21117	21117
Sain	14849	17195
Sal	14957	15190
ShishamTun	-	37800
Walnut	-	37300
Other BL (Kokath)	3882	5476

ii) Market rates of timber for supply to other Departments :-

(Rate fixed per m3 in Rs.)

(Table 26)

<u>Size</u>	<u>Species</u>	<u>Grade-1</u>	<u>Grade-11</u>
300*25*13 cm & above	Deodar	63900	57510
	Kail	57500	51750
	Fir	29700	26730
	Chil	14200	12780
240*20*10 cm & above	Deodar	61000	54900
	Kail	51000	45900
	Fir	28300	25470
	Chil	13600	12240
240*16*10 cm & above	Deodar	28700	25830
	Kail	26400	23760

	Fir	12700	11430
	Chil	5100	4590

iii) **Rate fixed for sale of Fuel wood for the year 2013-14**

FUELWOOD (Rates in Rs. per quintal)	
Category	Retail Sale Depots
	BroadLeaved/ Coniferous Species
General Public	454/-
Govt. Departement/ Commerical Organization	828/-

CHAPTER-IV

ACTIVITIES OF HP STATE FOREST DEVELOPMENT CORPORATION LTD. IN HARVESTING AND MARKETING OF FOREST PRODUCE

4.1 GENERAL: - H.P. State Forest Corporation Limited is an undertaking of the HP Govt. which came into existence on the 25th of March, 1974 with a view to eliminate contractors/ leases from working in the forest. However, as per the policy of the Govt., timber extraction works were transferred to the Corporation in a phased manner and the Corporation took over the complete working of the Govt. forests w.e.f. 25.01.1983.

This Corporation deals with the extraction and marketing of mainly Timber, fuel wood, pulpwood, bamboos, Khair, rosin, turpentine oil, subsidiary products (viz., phenyl, varnish, black Japan). In addition, a Fiber Board Factory at Bajnath and Timber Treatment Plant at Hamirpur, are presently in timber chemical treatment and timber seasoning for Government as well as private timber. In addition, HPSFDC Ltd is also venturing into eco-tourism activities so as to tap huge tourism potential of Himachal Pradesh. Recently HPSFC has also volunteered into wooden tile and furniture making.

Objectives: -

1. To carry out the extraction of timber and resin on scientific lines by adopting suitable modern techniques.
2. To eliminate the Contractor's agency in respect of works of timber extraction and resin tapping.
3. To minimize the chances of illicit felling of trees, illicit tapping of resin and other malpractices.
4. To work the forests on commercial lines by recycling of funds for works and also by raising funds from financial institutions as per requirements.

4.2 The Organization:-

The Chairman of the Board of director's organization is Ex officio Forest Minister and vice chairman is nominated by the Govt. The board of director comprised of Forest Minister H.P., Vice Chairman Forest Corporation, Secretary Finance, Secretary Forest, P.C.C.F., Managing Director HPSFDC, Shimla & Non official members.

Secretary (Forest) is administrative head and Managing Director is the head of the Organization. There are three Directorates viz. Director (Marketing), Director (North), and Director (South). Presently, there are 15 Forest Working Divisions, 7 Himkath Sale Depots and, Two Resin and Turpentine factories at Bilaspur and Nahan. As on today, all ministerial staff and field functionaries upto office Manager are permanent employees of the Corporation

whereas SDM, DM and above are the officers of Forest Department deployed on secondment basis.

4.3 Expertise: -

4.3.1 TIMBER OPERATIONS:

The Corporation has a long experience of timber harvesting and extraction operations. It carry out timber extraction process as per demand of the market, Grading and marketing are mastered by Corporation over a period of time. There is complete ban on the green felling of the trees. The State Corporation is only getting salvage trees for exploitation comprising of dry, diseased, uprooted and damaged trees, handed over to it by the HP Forest Department for working. On an average, approx. 3.00 Lac m³ standing volume is being felled and converted every year by the Corporation, which is sold in auction at the Sale Depots and also supplied to the Govt. Departments, non-right-holders, small scale industries etc. The different kind of timber available is Beams, Geltu, Dimdima, Sleeper, Scantlings, Karries, Side slab, Round Ballies, Hakkaries etc. The most of the timber of Parvati forest Division is sold at Shamshi/ Dhanotu.

Table 4.2: Weighted average sale price of timber at HSD Dhanotu: -

(Table 1)

Spp.	2009-10	2010-11	2011-12	2012-13
Deodar	22179	25014	29225	38941
Kail	21177	16279	19639	25255
Fir	7726	8668	10372	13125
Chil	6392	0	8783	9349
B.L.	11440	6123	5273	-

4.3.2 RESIN TAPPING:

Since, the entire resin tapping work is being done by the Corporation, it has developed modern techniques of resin tapping and expertise in this respect is available.

4.3.3 RESIN PROCESSING: -

With the two rosin factories working for more than three decades, the Corporation has fully trained staff for this work and expertise in this respect is available for the purpose of resin processing.

4.4. HARVESTING / EXPLOITATION OF TIMBER: -

Due to nationalization of forest exploitation and ban on green felling imposed by HP Government, only dry and fallen trees referred to as salvage are handed over to Divisional Manager, HPSFDC Ltd. Kullu for harvesting/ exploitation who has jurisdiction over this division. Timber of Deodar, Kail, Fir/Spruce and other Broad Leaved spp. are exported from this Division. The timber is sold by open auction at H.P. State Forest Development

Corporation depots at Bhadroya, Nurpur, Dhanotu, Swarghat, Shamshi and subsequently exported out of the state. The position of trees handed-over to Divisional Manager Kullu for the last plan period is given in following Table 4.3.

Table 4.3: Position of year wise trees/ Volume handed over by Parvati Forest Division to DM Kullu during the previous Plan period.

(Table 2)

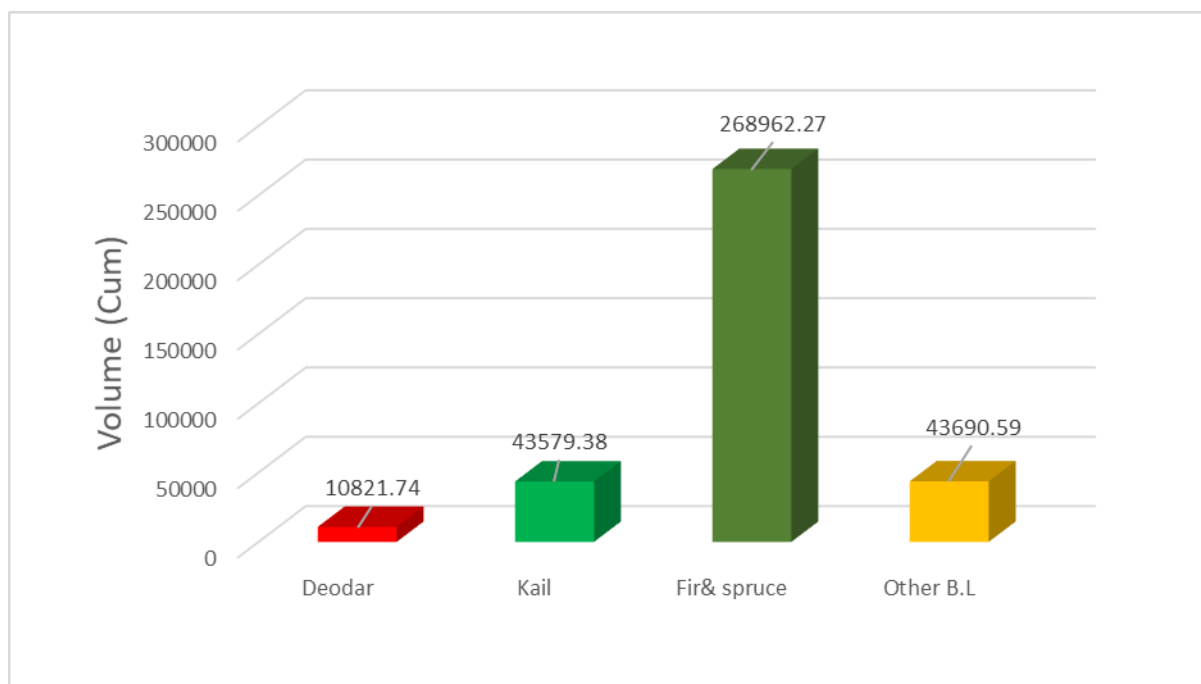
Year	Name of Marking	Deodar No./Vol. in m ³	Kail No./ Vol in m ³	Fir& spruce No./Vol. in m ³	Other B.L No/vol in m ³	Total No./ Vol in m ³
1993-94	Salvage	-	538/1547.3	5407/22910.66	-	5945/24457.96
1994-95	-do-	-	23/73.90	178/693.28	-	201/767.18
1995-96	-do-	/197.8	/13922.27	/26739.21	-	/40859.28
1996-97	-do-	-	-	-	-	-
1997-98	-do-	1686/955.80	248/690.21	2448/12734.37	-	4382/14380.38
1998-99	-do-	67/155.4	789/3437.7	5188/31077.87	-	6044/34670.97
99-2000	-do-	-	74/245.90	818/3164.38	-	892/3410.28
2000-01	-do-	223/697.4	662/1475.7	5752/26023.52	-	6637/28196.62
2001-02	-do-	286/757.5	661/2116	6761/23699.49	-	7708/26572.99
2002-03	-do-	293/781.20	747/2286.00	7884/27933.41	845/2864.1	9769/33864.71
2003-04	-do-	596/1652.2	316/614.80	1181/5203.46	857/1319.4	2950/8789.86
2004-05	-do-	187/505.9	1515/4821.8	3809/12957.79	43/76.70	5554/18362.19
2005-06	-do-	78/199.00	1154/3372.75	2509/8518.21	509/866.2	4250/12956.16
2006-07	-do-	418/832.00	562/1260.1	3602/12976.11	352/1076.2	4934/16144.45
2007-08	-do-	157/316.10	825/2248.75	6351/22383.75	2425/6418.74	9758/31367.34
2008-09	-do-	-	477/128.30	-	164/95.57	641/223.87
2009-10	-do	439/1245.60	507/1381.0	1140/5526.87	3174/6801.83	5260/14955.3
2010-11	-do-	1/0.10	91/41.90	-	13/4.20	105/46.20
2011-12	-do-	66/111.20	573/1751.4	1121/3482.88	2/1.20	1762/5346.68
2012-13	-do-	179/352.60	114/165.60	1139/2742.88	-	1432/3261.08
2013-14	-do-	202/423.60	306/420.20	2419/7758.00	4732/9632.91	7659/18234.71
2014-15	-do-	106/275.54	369/945.90	459/1357.40	609/1323.64	1543/3902.48
2015-16	-do-	36/156.70	138/391.50	692/3428.47	1684/3986.90	2550/7963.57
2016-17	-do-	-	-	136/53.36	377/66.50	513/119.86
2017-18	-do-	816/1206.10	73/240.40	1515/7596.90	3899/9156.50	6303/18199.90

The details of species wise total volume handed over to HPSFDC (1993-94 to 2017-18) are as under:

(Table 3)

Species	Deodar	Kail	Fir& spruce	Other B.L	Total
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Volume (Cum)	10821.74	43579.38	268962.27	43690.59	367053.98
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The HPSFDC Ltd gets the exploitation work executed through Labour Supply Mates (LSMs). The employment to skilled, semi-skilled and unskilled Labour is provided almost throughout the year except in winter months. On an average 2.7 man days per cum of standing volume handed over to forest corporation are generated.

4.4.1 Royalty rates charged from HPSFDC:

The royalty rates are charged for salvage lots handed over to corporation for which a fixed time schedule is adhered to which, for one year lots is as under:-

For High lying lots ½ royalty by 30th November.

 ½ royalty by 20th March.

For Chil Lots 1/3 royalty by 15th January

 1/3 royalty by 20th March

 1/3 royalty by 15th June.

The royalty is fixed on advalorem basis on the market rates achieved during previous year.

The royalty rates for the year 2016-17 were as under:-

(Table 4)

S. No.	Species	Rate/m ³ of Standing Volume (Rs)	
		For State	For the remote and special hill tracts
1	Deodar	6120	2448
2	Kail	3218	1287
3	Fir/spruce	1045	418
4	Chil	535	214

5	Eucalyptus	2656	NA
6	Shisham & Tun	3119	NA
7	Sain	2114	NA
8	Sal	1356	NA
9	Khair MG	1781	NA
10	Other B.L	459	184

4.5 FUELWOOD AND CHARCOAL: - Forest working Division Kullu is major supplier of fuelwood to tribal areas of Lahul and Pangi sub divisions besides meeting local requirement. The requirement is fulfilled from the salvage Broad leaved and conifer trees handed over as part of salvage lots. In addition, green trees are also marked in land diversion cases where approval from Govt. of India is received. However, extraction of charcoal is no more done now. There is one major timber sale depot which caters the need of timber & fuelwood at Shamshi.

Shamshi Himkath sale depot had started functioning in 2014. The fuelwood sold form retail sale depot Shamshi is as follow: -

Table 4.4: Fuel wood Sold at Retail Sale Depots:

(Table 5)

Year	Name of Depot	Total Sale (In qtls.)
2007-08	Bhootnath, Kullu	3116.16
2008-09		3003.74
2009-10		4602.34
2010-11		3805.29
2011-12		4076.83
2012-13		3925.4
2007-08	Manali	3919.00
2008-09		4682.00
2009-10		5328.00
2010-11		3087.00
2011-12		5012.09
2012-13		3994.29
2007-08	Patlikuhah	1364.97
2008-09		1156.55
2009-10		1370.71
2010-11		843.50
2011-12		724.12
2012-13		851.99
2007-08	Shamshi	3742.37
2008-09		2672.00
2009-10		4393.51
2010-11		3001.17
2011-12		2222.91
2012-13		2929.75

In addition, Kullu Forest Working Division also supplies huge quantity of fuelwood to tribal areas of Pangi, Spiti and Lahul Forest Divisions. The quantity supplied during last three years is depicted below to show the trends:

(Table 6)

Demand of Fuel wood to Tribal Areas w.e.f.2009-10 to 2011-12

Year	Name of Forest Division	Total Demand of Fuel wood		
2009-10	Lahual	Hard	11700.00	
		Soft	2200.00	
		Total:-	13900.00	
2010-11		Hard	12200.00	
		Soft	4600.00	
		Total:-	16600.00	
2011-12		Hard	13500.00	
		Soft	4300.00	
		Total:-	13900.00	
2012-13		Hard	15366	
		Soft	1258	
		Total	16624	
2009-10	Pangi	Hard	2500.00	
		Soft	0.000	
		Total:-	2500.00	
2010-11		Hard	1000.00	
		Soft	2507.00	
		Total:-	3507.00	
2011-12		Hard	2500.00	
		Soft	0.000	
		Total:-	2500.00	
2012-13		Hard	2496	
2009-10		Kaza	Nil	
2010-11			Hard	18600.00
	Soft		0.000	
	Total:-		18600.00	
2011-12	Nil			
2012-13	0			

4.6 PULPWOOD: -

Rai/ Fir and Kail pulpwood from the small-wood up to a minimum diameter of 20 cm. Under- bark is extracted from lops and tops and put to auction at Shamshi. The pulp wood is in great demand and fetches good market rate.

4.7 PRIVATE SALE LOTS:-

Trees existing in private lands, particularly nationalized species are also extracted by the Forest Corporation as private sale lots. The application for felling of trees is moved by the Special Power of Attorney (SPA) on behalf of the land owners along with their affidavits to

Divisional Manager in the beginning of the year in which the area is open for felling under 10 year felling program who further sends the case to DFO concerned after verifying the documents. The marking / demarcation is done by Forest, Revenue and Corporation staff jointly in the presence of SPA and felling order is issued by the DFO. This process should be completed in the same financial year in which the area is open for felling if it is not completed in that year then deviation permission is required. PCCF can issue deviation up to one year and another one year deviation can be granted by Govt., no further deviation is permissible. The working period of the private lots as per Govt. notification is 2 years for high lying lots and 1 year for low lying lots. The land owner/ SPA have option to choose the way to proceed sale is given. The prices and instructions in this regard are given by departmental notification from time to time. The last notification in this regard has fixed royalty rates for the year 2011-12 for Parvati Division as under:-

Table 4.6: Royalty rates for the year 2011-12:

(Table 7)

S. No.	Species	Rates/Cum (in Rs.) 2011-12	Rates/Cum (in Rs.) 2012-13
1	Deodar	5903	5357
2	Kail	3098	3096
3	Fir	1030	1123
4	Chil	704	739
5.	Eucalyptus	1099	1416
6.	Shisham/Tun	2949	2928
7.	Sain	1976	2006
8.	Sal	1390	1467
9.	Khair MG	811	794
10.	Other B.L	371	300

I. Royalty basis.

In this regard the payment of price shall be made in the following manner:

- (a) 50% of price shall be paid after the forest produce, reaches at Road Side.
- (b) Balance price shall be payable immediately after final sale.

II. Sale price linked.

The Seller /Owners shall have an option to opt for price of forest produce linked with its actual sale realization. The process and method for determining the price of forest

produce linked with sale, hereinafter known as "Sale Linked Price" shall be calculated by deducting actual direct expenses with interest and handling charges from the actual sale realization of the produce in the market, as under:-

- A) Final sale realization (including of forfeiture of securities and earnest money, Insurance claim, if any) of the forest produce.
- B) Actual direct expenses on felling, conversion, carriage, transportation, loading, unloading, stacking, insurance, road tax etc.
- C) Interest on investment i.e. on item No. (B) ibid. at the borrowing rate of interest, prevalent on 1st April of each year, plus (+) 1% extra.
- D) Handling Charges @ 18% on sale realization i.e. on item No. (A)
- E) Price of the produce = A - (B+C+D)
- F) Advances paid to the seller/ owners
- G) Interest on the advances, if any, taken by the seller/owner till its recovery at the borrowing rate of interest, prevalent on 1st April of each year, plus 1% extra.
- H) Interest payable to the seller/ owner at the borrowing rate of interest, prevalent on 1st April of the year in which final sale made, if balance amount is delayed beyond two months after the final sale.
- I) Balance payable = (E+H)-(F+G)

Advances to the seller/ owner of the forest produce under the "Sale Linked Price" shall be made on request as below, by taking into account the expected yield to be obtained, likely expenditure and expected sale to be applied as per parameters stated above on tentative basis: -

(i) 25% after handing over the possession of forest produce and execution of the Sale Deed;

(ii) 25% on extraction of entire forest produce from forest and its carriage to Road Side; and

(vi) Balance after completion of sale and finalization of accounts, to be paid within two months of having recovered all dues including advances paid to the seller/owners. However, if final sale realization is delayed in that case till final sale realization, part payment of the sold produce may be considered by the HPSFC to the following extent:-

“If entire extracted timber has reached at Sale Depot and out of that 70% or more has been sold and sale proceeds realized, the seller shall be given one opportunity for getting advance payment to the extent of 80% of the sale proceeds realized of his timber after adjusting 2 installments and all deductions of the amount spent on his total timber by the Corporation, interest, handling charges etc. The sellers shall not be entitled to this advance payment as a matter of right and applications shall be considered on merit to avoid hardship.”

Table 4.7: Market rates of timber for right holders/ commercial (Govt. Departments) in Corporation Depots:

(Table 8)

CLASS: A

Species /size	300*25*13 cm & above (in Rs.)	240*20*10 cm & above (in Rs.)	
Deodar	63,900	61,000	
Kail	57,500	51,000	
Fir/Rai	29,700	28,300	
Chil	14,200	13,600	
1. SAWN SIZES			
Species /size	183x21x10, 244x16x10 to 366x16x10		
Deodar	28,700		
Kail	26,400		
Fir/Rai	12,700		
Chil	5,100		
2. AXE HEWN			
Species /size	305x366x13x13-16 & up	183-244x13x13-16x16 & up	
Deodar	38,500	30,800	
Kail	30,400	23,500	
Fir/Rai	17,700	13,600	
Chil	7,400	6,500	
3. DIM DIMAS			
Species /size	All Sizes		
Deodar	35,200		
Kail	27,500		
Fir/Rai	12,700		
Chil	7,900		
4. HAKRIES			
Species /size	85 Cms & above	Below 85 Cms	
Deodar	25,100	15,400	
Kail	21,700	12,900	
Fir/Rai	15,200	11,800	
Chil	3,300	3,000	
5. LOGS			
Species /size	275 Cms & above length	Below 275 Cms Length	
Deodar	31,500	23,300	
Kail	17,000	20,600	
Fir/Rai	14,300	11,000	
Chil	11,300	10,500	
6. SIDE SLABS			
Species /size	All Sizes		
Deodar	27,500		
Kail	23,000		
Fir/Rai	13,000		

Chil	5,100		
7. ROUND BALLIES			
Species / Size	31 to 40 (mean 35)	41 to 50 (mean 45)	51 to 60 (mean 55)
Deodar	350	550	800
Kail	250	350	550
Fir/Rai	200	300	400
Chil	90	150	210

CLASS B

Species /size	300*25*13 cm &above(in Rs.	240*20*10 cm & above (in Rs.)	
Deodar	57510	54900	
Kail	51750	45900	
Fir/Rai	26730	25470	
Chil	12780	12240	
1. SAWN SIZES			
Species /size	183x21x10, 244x16x10 to 366x16x10		
Deodar	25830		
Kail	23760		
Fir/Rai	11430		
Chil	4590		
2. AXE HEWN			
Species /size	305x366x13x13-16 up	183-244x13x13-16x16 & up	
Deodar	34650	27720	
Kail	27360	21150	
Fir/Rai	15930	12240	
Chil	6660	5850	
3. DIM DIMAS			
Species /size	All Sizes		
Deodar	31680		
Kail	24750		
Fir/Rai	11430		
Chil	7110		
4. HAKRIES			
Species /size	85 Cms & above	Below 85 Cms	
Deodar	22590	13860	
Kail	19530	11610	
Fir/Rai	13680	10620	
Chil	2970	2700	
5. LOGS			
Species /size	275 Cms & above length	Below 275 Cms Length	
Deodar	28350	20970	
Kail	15300	18540	
Fir/Rai	12870	9900	
Chil	10170	9450	
6. SIDE SLABS			

Species /size	All Sizes		
Deodar	24750		
Kail	20700		
Fir/Rai	11700		
Chil	4590		
7. ROUND BALLIES			
Species / Size	31 to 40 (mean 35)	41 to 50 (mean 45)	51 to 60 (mean 55)
Deodar	315	495	720
Kail	225	315	495
Fir/Rai	180	270	360
Chil	80	135	190

Table 4.8: Market rates of fuel wood for right holders commercial (Govt. Departments) in Corporation depots:

(Table 9)

Rates of Fuel wood for Public & Govt. Departments for 2011-12 (Rates per qtls)			
Year	Spp.	Public	Govt.
2009	Coni.	300	534
	B.L.	360	616
2010	Coni.	340	610
	B.L.	410	710
2011	Coni.	340	610
	B.L.	410	710
2012	Coni.	360	640
	B.L.	430	740

CHAPTER-V

FIVE YEAR PLANS

5.1. GENERAL: The economy of India is based on planning through its five-year plans, which are developed, executed and monitored by the Planning commission of India. The tenth plan completed its term in March 2007 and the eleventh plan is currently underway. Prior to the fourth plan, the allocation of state resources was based on schematic patterns rather than a transparent and objective mechanism, which led to the adoption of the Gadgil formula in 1969. Revised versions of the formula have been used since then to determine the allocation of central assistance for state plans. In the past, forests were source of revenue generation with very little spending on the resource development.

The forests of the division have been managed for getting sustainable yield through various Working Plans. The silvicultural fellings were mainly aimed at making the forest uniform and the regeneration achieved through natural means. Till the early seventies, the emphasis was on planting commercially important species such as Deodar, Kail, Chil, etc. The increasing demands of forest produce in the state especially that of timber and fuel-wood resulted in focus on large scale plantations of commercially important species. Although the plantation programme started from Ist Five Year Plan but it gained momentum from IIIrd Plan onwards. The Plan wise management of forests and expenditure is as under:

5.2. FIRST FIVE YEAR PLAN (1951-56):- The national emphasis during this plan was on agriculture, Irrigations and building of dams.

During Ist Five Year Plan the forests of this division were managed under Shri. K.L. Aggarwal's working plan which came into being from 01/04/1949 and was covering period up to 1963-64. The forests of the tract were exploited commercially to meet the timber and fuel-wood requirements. There were four working circles namely Regular WC, Fir WC, Selection WC and Protection WC constituted and worked. The main emphasis was on prescription of yield which was prescribed on very high side in Fir and selection working Circles. There is very less emphasis on subsidiary silvicultural operations and regeneration. Protection of steeper areas was given priority but from these areas also yield was prescribed. The demand of local people for fuel and fodder was also taken care of. The Regular and Fir working circles were managed under "Punjab Shelterwood System" with aim to make advance growth up to pole stage as part of future crop.

5.3. SECOND FIVE YEAR PLAN (1956-61):- The second five year plan focused on industry, especially heavy industry. The plan attempted to determine the optimal allocation of investment between productive sectors in order to maximize long-run economic growth.

During 2nd Five Year Plan the forests of this division were managed under Shri. K.L. Aggarwal's working plan which came into being from 01/04/1949 and was covering period up to 1963-64. The forests of the tract were exploited commercially to meet the timber and fuel-wood requirements. There were four working circles namely Regular WC, Fir WC, Selection WC and Protection WC constituted and worked. The main emphasis was on prescription of yield which was prescribed on very high side in Fir and selection working Circles.

There is very less emphasis on subsidiary silvicultural operations and regeneration. Protection of steeper areas was given priority but from these areas also yield was prescribed. The demand of local people for fuel and fodder was also taken care of. The Regular and Fir working circles were managed under “Punjab Shelterwood System” with aim to make advance growth up to pole stage as part of future crop.

5.4. THIRD FIVE YEAR PLAN (1961-66):- The third five year plan stressed on agriculture and improvement in the production of wheat, but the brief Sino Indian war of 1962 exposed weaknesses in the economy and shifted the focus towards the Defence industry. The 1965 war led to inflation and the priority was shifted to the construction of dams, cement and fertilizer plants etc.

During 3rd Five Year Plan the forests of this division were continued to be managed under Shri. K.L Aggarwal’s Working Plan. Revision of plan was although started but could not be completed during this 5 year plan and forest continued to be managed as explained above.

5.5. FOURTH FIVE YEAR PLAN (1969-74):- At this time government nationalized 14 major Indian banks and the Green Revolution advanced agriculture in India.

During this period also the working plan prescriptions of KL Agarwal’s WP continued. D.P. Kapoor’s working plan came in to existence only in 1972-73.

5.6. FIFTH FIVE YEAR PLAN (1974-79):- Stress was laid on employment, poverty alleviation, and justice. The plan also focused on self-reliance in agricultural production and defence.

During this period, Shri Kapoor’s draft plan was proposals were submitted in 1972-73 but this WP was not approved, as he accounted for the period 1964-65 to 1978-79 with remaining five years effective period of the plan. Through Kapoor’s draft plan was not formally put into any operation, it continued to be followed. Four Working Circles were constituted as per the draft:-

1. Regular Working Circles.
2. Fir Working Circles.
3. Protection Working Circles.
4. Broad-Leaved (Over-lapping) Working Circles.

Selection Working Circle of Aggarwal’s plan was abolished and the forests were transferred to four Working Circles of the composition of crop and configuration of the ground.

5.7. SIXTH FIVE YEAR PLAN (1980-85): - The sixth year plan also marked the beginning of economic liberalization.

During this plan period Shri J.C. Sharma’s Working Plan for Kullu And Parvati tract was operated from 1979-80 to 1993-94. The following working circles were constituted:-

- i) Deodar /Kail Working Circle.
- ii) Fir Working Circle.
- iii) Protection Working Circle.
- iv) Broad Leaved Overlapping Circle.
- v) Improvement Working Circle.

During this plan period complete ban on felling of green trees was imposed in the state and accordingly prescriptions of working plan for regulating felling were not implemented.

Revenue and Expenditure during VIth Five Year Plan
(Table 1)

Year	Revenue in Rs.	Expenditure in Rs.	Surplus/Deficit in Rs. (+)/(-)
1980-81	2107540	4178850	-2071310
1981-82	2582545	5191040	-2608495
1982-83	3413478	5753621	-2340143
1983-84	14660758	6084488	8576270
1984-85	1588543.70	5664433.90	-4075890.20

Source: Kullu & Parvati Working Plan by J.S. Walia.

5.8. SEVENTH FIVE YEAR PLAN (1985-90): - The Seventh Five Year Plan laid stress on improving the productivity level of industries by upgrading of technology and to establish growth in areas of increasing economic productivity, production of food grains, and generating employment.

During this plan period also, Shri J.C. Sharma's Working Plan for Kullu and Parvati tract was operated from 1979-80 to 1993-94. The following working circles were constituted:-

- i) Deodar /Kail Working Circle.
- ii) Fir Working Circle.
- iii) Protection Working Circle.
- iv) Broad Leaved Overlapping Circle.
- v) Grazing & Improvement Working Circle.

Complete ban on felling of green trees was imposed in the state during this plan and accordingly prescriptions of working plan for regulating felling were not implemented. The social forestry umbrella project was launched and social forestry works were in full swing, main emphasis being on raising fuel, fodder, small timber and grasses to meet the increasing domestic needs of rural communities. The figures of revenue and expenditure during VIIth Five Plan of Parvati Forest Division are tabulated as under in Table:

Revenue and Expenditure during VIIth Five Year Plan
(Table 2)

Year	Revenue in Rs.	Expenditure in Rs.	Surplus/Deficit in Rs. (+)/(-)
1985-86	751244.48	10200926.0	-9449681.52
1986-87	1507731.80	7916122.80	-6408391.0
1987-88	996850.35	1364504.0	-367653.65
1988-89	1063657.0	1335907.0	-272250.0
1989-90	671638.0	658658.0	+12980

Source: Kullu & Parvati Working Plan by JS Walia.

5.9. EIGHTH FIVE YEAR PLAN (1992-97): - 1989-91 was a period of economic instability in India and hence no five year plan was implemented. Between 1990 and 1992, there were only Annual Plans. In 1991, India faced a crisis in foreign exchange (Forex) reserves. At that time India's free market reforms were launched that brought the nearly bankrupt nation back from the edge. It was the beginning of privatization and liberalization in India. The major objectives included, controlling population growth, poverty reduction, employment generation, strengthening the infrastructure, institutional building, tourism management, Human Resource Development, involvement of Panchayat Raj, Nagar Palikas, N.G.O'S and Decentralization and people's participation.

During this plan period Shri J.C. Sharma's Working Plan for Kullu And Parvati tract was operated for first two years with following working circles:-

- i) Deodar /Kail Working Circle.
- ii) Fir Working Circle.
- iii) Protection Working Circle.
- iv) Broad Leaved Overlapping W. Circle.
- v) Grazing & Improvement Working Circle.

For remaining period Sh. JS Walia's WP (1994-95) was in operation with following working circles:-

- i) Deodar /Kail Working Circle.
- ii) Fir Working Circle.
- iii) Protection Working Circle.
- iv) Broad Leaved Overlapping Circle.
- v) Improvement Working Circle.

During this period, The JFM approach also started in the division and the forestry activities were implemented under departmental schemes. Due to ban on green felling, the objective of management includes conservation and improvement of existing forests, prevention of denudation and erosion of hill slopes, meeting legitimate and bonafide domestic and agricultural requirements and adoption of Joint Forest Management approach. The constitution of forest development committees and their participation in planning and implementation was sought. The figures of revenue and expenditure during VIIIth Five Plan of Parvati Forest Division are tabulated as under:-

Revenue and Expenditure during 8TH Five Year Plan

(Table 3)

Year	Revenue in Rs.	Expenditure in Rs.	Surplus/Deficit in Rs. (+)/(-)
1992-93	51343.0	12597112.0	-12545769.0
1993-94	405242.0	11685025.0	-11279783.0
1994-95	578877.0	13045328.0	-12466451.0
1995-96	-	-	-
1996-97	574419.0	17649307.0	-17074888.0

5.10. NINTH FIVE YEAR PLAN (1997-2002):- Ninth Five Year Plan mainly aimed at attaining objectives like speedy industrialization, human development, full-scale employment, poverty reduction, and self-reliance on domestic resources.

During this plan period, Sh. JS Walia's WP (1994-95 to 2009-10) was in operation with following working circles:-.

- i) Deodar /Kail Working Circle.
- ii) Fir Working Circle.
- iii) Protection Working Circle.
- iv) Broad Leaved Overlapping Circle.
- V) Improvement Working Circle.

The JFM activities continued in this period and due to ban on green felling, the objective was mainly on afforesting denuded/degraded forests. The works of afforestation, soil conservation, entry point activity started by the VFDCs and microplan process learnt and executed. Sanjhi Van Yojna started on the principles of JFPM. Here again the focus remained on restocking/regeneration of degraded forests with the help of local people. Requirement of local people was given due emphasis particularly for selection of area and species. The figures of revenue and expenditure during IXth Five Plan of Parvati Forest Division are tabulated as under in

Revenue and Expenditure during Ninth Five Year Plan
(Table 4)

Year	Revenue in Rs.	Expenditure in Rs.	Surplus
1997-98	577291.0	20054060.0	-19476769.0
1998-99	4829487.0	31744761.0	-26915274.0
1999-2000	854115.0	34876539.0	-34022424.0
2000-01	2136157.0	24753222.0	-22617065.0
2001-2002	0	23054230.0	-23054230.0

5.11. TENTH FIVE YEAR PLAN (2002-2007): - The main aims of this plan was to attain 8% GDP growth per year, reduction of poverty, providing gainful and high-quality employment and reduction in gender gaps in literacy and wage rates. 20 point program was introduced.

During this plan period, Sh. JS Walia's WP (1994-95 to 2009-10) was in operation with following working circles:-.

- i) Deodar /Kail Working Circle.
- ii) Fir Working Circle.
- iii) Protection Working Circle.
- iv) Broad Leaved Overlapping Circle.
- V) Improvement Working Circle.

The JFM activities continued in this period and Due to ban on green felling, the objective was mainly on afforesting denuded/degraded forests. The works of afforestation, soil conservation, entry point activity started by the VFDCs and micro plan process learnt and executed. Sanjhi Van Yojna started on the principles of JFPM. Here again the focus remained on restocking/regeneration of degraded forests with the help of local people. Requirement of local people was given due emphasis particularly for selection of area and species. Due to intervention of the Hon'ble high court, ban on grant of timber distribution was imposed till department come out with new TD Policy on 2 June, 2006.

The figures of revenue and expenditure during Tenth Five Plan of Parvati Forest Division are tabulated as under:-

**Year-wise Revenue & Expenditure during plan period
(Table 5)**

Year	Revenue in Rs.	Expenditure in Rs.	Surplus
2002-03	22120592.0	19958916.0	+2161676.0
2003-04	118862321.0	26711720.0	+92150601.0
2004-05	135390262.0	26686165.0	+108704097.0
2005-06	69105503.0	38446471.0	+36059032.0
2006-07	4181721.0	42760554.0	-38578833.0

5.12. ELEVENTH FIVE YEAR PLAN (2007-2012): - The eleventh five year plan has objectives like accelerate GDP growth, create new work opportunities, reduce educated unemployment, increase literacy rate, ensure electricity connection to all villages, ensure all-weather road connection to all habitation with population 1000 and above (500 in hilly and tribal areas). Beside this emphasis was also given on following environmental issues

- Increase forest and tree cover by 5 percentage points.
- Attain WHO standards of air quality in all major cities by 2011–12.
- Treat all urban waste water by 2011–12 to clean river waters.
- Increase energy efficiency by 20 %

The forests continued to be managed under JS Walia's working plan. New TD policy came in to picture on 13 Oct 2009 with major changes. Forest Development Agencies are created and strengthened wherein funds under FDA are spent through Joint Forest Management Committees. National Medicinal Plant Board project was launched in Kullu and Chamba district wherein planting of medicinal herbs, shrubs and trees incorporated. Since road connectivity was one of the aims of the plan, therefore land diversion cases increased and forest land diverted under FCA for non-forestry activities.

**Year-wise Revenue & Expenditure during plan period
(Table 6)**

Year	Revenue in Rs.	Expenditure in Rs.	Surplus
2007-08	15906043.0	42609102.0	-26703059.0
2008-09	129398326.0	49674601.0	+79723725.0
2009-10	4824157.0	42530053.0	-37705896.0
2010-11	5397187.0	59415841.0	-54018654.0
2011-12	13402808.0	55939896.0	-42537088.0

5.13. TWELVTH FIVE YEAR PLAN (2012-2017): - The twelvth five year plan has objectives like Enhancing the Capacity for Growth, Enhancing Skills and Faster Generation of Employment, Managing the Environment, Markets for Efficiency and Inclusion, Decentralisation, Empowerment and Information, Technology and Innovation, Securing the Energy Future for India, Accelerated Development of Transport Infrastructure, Rural Transformation and Sustained Growth of Agriculture, Managing Urbanization, Improved Access to Quality Education and Better Preventive and Curative Health Care.

The forests continued to be managed under JS Walia's working plan. New revised TD policy came into picture on 26th December 2013 with certain modifications on dated 26th February 2016. The details of revenue and expenditure during the 12th Five Year Plan in respect of Parvati Forest Division are as under:

**Year-wise Revenue & Expenditure during plan period
(Table 7)**

Year	Revenue in Rs.	Expenditure in Rs.	Surplus
2012-13	15061868.0	62005750.0	-46943882.0
2013-14	3877964.0	69143254.0	-65265290.0
2014-15	2897894.0	82301561.0	-79403667.0
2015-16	25333891.0	91593584.0	-66259693.0
2016-17	4021995.0	91882132.0	-87860137.0

CHAPTER – VI

STAFF AND LABOUR SUPPLY

6.1 Staff: - The following statement shows the strength of Parvati Forest Division as on 1/4/2018 is given in Table.

(Table 1)

<u>Designation</u>	<u>Number of posts</u>	<u>Existing.</u>
i) <u>Gazetted</u>		
a) Division Forest office / Deputy Conservator of Forest.	1	1
b) Attached Officer / Assistant Conservator of Forest.	1	1
c) Range Forest Officers	6	6
ii) Non – gazetted (Executive)		
d) Deputy Ranger	18	16
e) Forest Guards.	48	51
f) Forest Kanungo	-	-
g) Patwari	-	-
iii) Non – gazetted (Ministerial)		
h) Superintendent –Gr. II	1	1
i) Senior Assistants	3	2
j) Junior Assistants.	6	3
k) Typist.	-	-
l) Carpenter.	1	1
m) Driver.	1	2
n) Peons	7	5
o) Malis	3	4
p) Sweepers	1	-
q) Dak – runner.	-	-
r) Syse / Muleteer	-	-
s) Timber Watcher	-	-
t) Chowkidars	10	9

6.2 Executive Charges: - There are Four Ranges in Parvati Forest Division. The list of the Ranges Blocks and Beats in the division, as on 01/04/2018 are given as follows:-

(Table 2)

<u>Name of Division</u>	<u>Name of Range</u>	<u>Name of Block</u>	<u>Name of Beat</u>
II. Parvati Forest Division	i) Bhuntar	i) Dohranal	i) Sandhar ii) Pah
		ii) Bajaura	i) Neul ii) Khokhan iii) Mashgan
		iii) Shamshi	i) Shamshi (Nursery)

			ii) Mohal iii) Bhullang
	iii) Hurla	i) Thela	i) Jhuni ii) Rauli iii) Najan iv) Jasta
		ii) Bhuin	i) Bhuin ii) Naresh iii) Barogi iv) Dyar v) Narogi
		iii) Gadsa	i) Narol ii) Gadsa iii) Tharas iv) Siah
	iv) Jari	i) Jari	i) Chhinjra ii) Jari iii) Sarahan iv) Chhakna
		ii) Pini	i) Kashavri ii) Pini iii) Chowki
		iv) Dhara	i) Dhara ii) Shat iii) Fagu
	iv) Kasol	i) Kasol	i) Kasol ii) Malana iii) Grahana
		iv) Manikarn	i) Manikarn ii) Shilla
		iii) Tosh	i) Tosh ii) Uch
		iii) Pulga	i) Pulga ii) Tulga

There are Check Posts at Bajaura, Gadsa and Kandi. There is Wood Based Industry (FWS) Range at Shamshi.

6.3 Labour Supply:- With the present rate of Rs. 210/- for unskilled labour, it does become very difficult to engage labour during fruit growing seasons, especially during the apple season, when labour get plentiful employment with very high wages. Availability of Gorkha labour is scarce now due to improving conditions in Nepal and so is the migrant labour thanks to MNREGA. Local labour for various forestry works is not readily available and during plantation season labour is imported from outside the area. However A common schedule of rates has been prepared covering the full state with the Conservator of forests responsible to

remove local variation. Labour rates which are effective from 1st May 2017 in Rs. are as under in table 6.3:

Table: 6.3. Daily Labour Basic Rates**(Table 3)**

Sr. No.	Category of Daily Labour.	Unit	Rate in Rs.
A.	Beldar (Mazdoor)/Casual Labour	Per day.	210.00
	Mate	-do-	210.00
	Cook	-do-	210.00
	Mali	-do-	210.00
	Chowkidar	-do-	210.00
	Helper	-do-	210.00
	Khalasi	-do-	210.00
	Peon	-do-	210.00
	Chainman	-do-	210.00
	Unskilled Labour	-do-	210.00
	Assistant Saw mill operator	-do-	210.00
	Feller (Garani)	-do-	210.00
	Logger Dresser (Pachani)	-do-	210.00
	Climber (Looper)	-do-	210.00
	Zoo animal attendant	-do-	210.00
	Fire Watcher	-do-	210.00
	Miscellaneous Labour	-do-	210.00
B.	Bar Binder	-do-	225.00
	Sawyer (Charani)	-do-	225.00
C.	Fitter Grade-I,II	-do-	252.00
	Plumber Grade -I,II	-do-	252.00
	Mason Grade-II,III	-do-	252.00
	Earth work Mistry	-do-	252.00
	Forest Guard	-do-	252.00
	Electrician	-do-	252.00
	Work Supervisor	-do-	252.00
	Store clerk/Keeper	-do-	252.00
	Patwari	-do-	252.00
	Plumber	-do-	252.00
	Clerk	-do-	252.00
	Assistant Store Keeper	-do-	252.00
D.	Driver(Tractor,Jeep/Car/Truck)	-do-	265.00
E.	Junior Draftsman	-do-	331.00
F.	Hydrogeologist	-do-	480.00

Source: - Parvati Forest Division.

6.4 Labour for Timber Extraction operation:-Timber extraction work is mostly done by the Forest Corporation which floats tenders for extraction works. Labour engaged in timber extraction operation consists of (i) Felling labour (ii) Sawing labour (iii) land carriage labour (iv) Rope -way labour (v) Floating-cum-Rafting labour. Due to lack of skilled labour in timer extraction works and involvement of people in Horticulture and Tourism, labour is mostly imported from different part of Pradesh through contractors and labour supply mates, who are paid commission on the earning of their labour. However for petty departmental extraction works, local labour is engaged. Since the local people are getting handsome wages in

horticulture, off season vegetable and tourism activities, it is not possible to get labour for this arduous work particularly with the existing schedule of rates.

(Table 4)

Sr.No	Particulars	Detail of work done
1.	Felling Labour	Skilled felling labour is imported from Mandi District, Seraj area of Kullu District and a very few of them locally.
2.	Sawing Labour	Sawyers are imported from Mandi Distt.
3.	Land Carriage Labour	This work is generally done by Gorkhas (Nepali) and Garwali labour.
4.	Rope way labour	Roping down of timber from forest to launching depots is done by the labour of Lag Valley (Distt. Kullu) which is considered the most skilled labour in whole of H.P. as well as in U.P. & J&K.
5.	Floating –cum- Rafting	Ghall labour is imported from Sarkaghat and Joginder Naggar (Distt.Labour Mandi) and from Bilaspur Distt. The Professional Darai, Tarus and Dabarus are also employed by the Ghall contractors from Unna Distt. Of H.P.
6.	Supply of Ration for the Labour	No ration is being supplied to the labour at Present.
7.	Mate Commission	Commission is paid on the earnings of out turn obtained. Rate of commission for different works is as under :- i) Felling :-12 to 15% ii) Conversion:-15% if advance taken. 20%i if advance not taken. iii) Mule carriage :- 12& ½ iv) Roping:-12& ½ v) Floating :-12&1/2

6.5 Resin tapping Labour:- Labour for resin tapping work is imported from Distt. Mandi and Kangra. Local labour is also engaged .

CHAPTER - VII

PAST SYSTEM OF MANAGEMENT

7.1 General History:- It was only during the middle of the 19th Century, when princely states were transferred to the crown that the forest of Kullu started being managed scenically. Departmental felling done by the government was based on mere rough estimates of yields, as no proper working plan /scheme existed. Overfilling could not be ruled out. Deodar however was recognized as a valuable species even then. **In the past, common management system was proposed for Parvati and Kullu Forest Divisions. Hence past management system of both the Divisions has been discussed below.**

7.2 The First Working Plan:- An attempt to secure a regular sustained yield came about, only after Mr. C.P. Fisher took up the task of preparing the Ist Working plan. In 1894 (till 1897), value was only given to Deodar, while other species were considered inferior; their felling was considered only with reference to right holders demands. Deodar yield calculation was done separately for each range and working circle. The annual yield was fixed by the number of 'I' Class tress. Felling prescriptions were followed and only estimated export removed. Considerable attention was paid to improvement felling and thinning which resulted in establishment of fairly large areas of even aged young crop of Deodar and Kail thinning which system did not work well, as areas having older crop, could not be closed satisfactorily, after selection felling for concentrated regeneration. This affected adversely the plan objectives. Without effective closure, grazing was singularly responsible, for failure of regeneration, which would otherwise have been expected to come up after the felling.

7.3 The Second Working Plan:- Sir E.G. Trevor during 1915 took up the task of preparing the 2nd Working Plan (i.e. after 25 years), which came into operation from 1919-20. Sir Trevor's study, field experience and pragmatic approach could be seen from the fact that the devised and adopted a closure scheme to help regenerate heavily grazed areas. Adopting the Uniform System, he placed all forests except the most precipitous one, into four working circles, so that definite forest areas could be closed and regenerated during fixed period of years. This was without giving hardship to the villages near forests, whose rights of grazing and ready access to mature timber within reasonable distance was recognized. Closure of compartments gave minimum possible inconvenience to right holders. The four working circles formed were:-

7.3.1 The Regular Working Circle:- This consisted of all the Deodar, Kail, Chil and Oak Forests which were located on ground, easy to be worked under the Uniform System. Four periodic blocks and a rotation of 120 years were adopted. However, PBI was kept at 25 years instead of 30 years, on the basis that a good deal of regeneration, which already existed in the block, could be completed at the earliest. Yield of 55,158.22 cum. was calculated on the basis of total enumeration carried down to 30 cm. diameter in the blocks plus half of the increment, divided by 25 years of the yield. Deodar constituted 13%, Kail 20%, Fir 64% and Chil 3%. A deficit was however observed at the end of the plan period whereby Deodar was 39%, Kail 61%, Fir 77% and Chir 31%. Silviculturally the plan was sound, as excellent plantations of Deodar bear testimony to this. However, a great deal of discretion with the D.F.O resulted in the prescribed yield not being obtained and neither being sustained. Artificial regeneration was obtained to a great proportion with Kullu filling up the intervening blanks. Restocking of

fire-burnt areas of 1921-22, especially in the upper portions of the compartments, where Fir was the main crop, was inadequate. Closure, removal of humus and weeds, carried out in subsequent years fostered natural regeneration. The good results can be seen in the Fir forests of Kalga and Badang (Pulga area).

7.3.2 Fir Working Circle: - This consisted of all the pure Fir forests which would suitably be worked under the Uniform System. 30 years periodic block and a rotation of 150 years were adopted. Annual yield of 65, 286, 70 cm was arrived at. However this could not be worked, for lack of proper market. Experimental regeneration fellings. Such as those in Pulga block forest and departmental felling for Railways, board gauge sleepers, were undertaken on a limited scale. Deficit ran as high as 97%. Meeting right holders demand was bad, for Upper Kullu Range forests of Fir, which as such had an open crop. Effective closure to initiate regeneration was not done. Devastating fires of 1921-22, made yield calculations unreliable for future work. Revision of the yield calculations also was not done.

7.3.3 The Selection Working Circle: - In this circle were placed, such Deodar, Chil and Fir areas, whose ground configuration was such that Uniform System could not work and only Selection System could be adopted. A rotation of 120 years was fixed. Yield for Deodar was calculated according to Hufnagel's formulas and fixed at 128.92 cft. annually. A deficit yield of 38% was observed until the end of 1933-34. The yield calculated was very much over assessed as Hufnagel's formula presumes existence of normal distribution of all age gradations. This is fallacious for Kullu, where younger age classes are very much deficient. Further even IIInd class trees were deficient. In practice, yield based on IIInd & III rd class trees was obtained from Ist class trees leading to over felling. Moreover the fires of 1921-22 afflicted heavy damage to many portions of the circle, necessitating their working. These factors resulted in depletion of the growing stock of the forests. Inadequate regeneration added to the woes, with the result that the removal of remaining over wood could not be allowed, for many years to come.

7.3.4 The Unregulated Working Circle: - In this circle were put such remote areas which were not possible to be worked for export and also such areas that were true protection forests.

7.4 The Third Working Plan: - Mr. W.H.G Samler took up the revision of Trevor's plan from 1930 to 1934. His plan came up in operation from 1-4-1934 and was merely a continuation of Trevor's plan. The same four working circle, constituted earlier, were kept, except that a considerable area containing pure (or predominantly so) Fir of the Regular Working Circle, was transferred to the Fir Working Circle.

A. Periodic Block: PB is defined as part or part of Forest set aside to be regenerated or otherwise treated, during specified period.

The regenerated block is called 'floating' or 'single' when it is the only P.B allotted at each W.P revision.

When all PB's are allotted and retained their territorial identify at W.P revisions, they are termed "Fixed" or permanent.

Working Circle: - A forest area (forming the whole or part of a Working Plan area) organized with a particular object and subject to one and same silvicultural system and same set of W.P prescription.

In certain circumstance the W.C may overlap.

7.4.1 The Regular Working Circle: - Rotation was increased from 120 years to 150 years to 150 years, and 5 periodic books each of 30 years were constituted. Increased was excluded from yield calculations. Preparatory felling was prescribed in PB-II and the yield was combined with the yield obtained from PBI and PBV. There was no justification for this, especially since both were regenerated in two different periods. While PB-I was being regenerated, PB-II was to be treated in almost the same manner as the rest of the intermediate block. Prescription of PB-II felling was most unfortunate as it led to heavy removals and reduction if yields in the next 30 years, when these forests passed on to PB-I. Upto the end of 1947-48 the extent of removals in Kullu Forest Division was:-

(Table 1)

	Deodar(in cum)	Kail (in cum.)	Chil (in cum.)
PB I	13516	24853	1354
PB II	4747	18971	321
PB V	1530	2947	1771

The yield was of two types-final and intermediate. The final consisted of all trees, 60 cm and over in diameter and the latter of 2nd class trees, 40cm to 60 cm. Over assessed yield of the plan, adversely affected facetted future yield, considerably. World War II called for enormous demand for timber, resulting in Working Plan program estimates and forest management being upset. Independent triennial felling programmed was taken up, with the result that at the end of the plan in 1947-48, the felling in case of Kail and Chil were considerably in excess. Easily accessible forests were overworked and intermediate blocks were opened. In the later years of the War, young pole crop in PBI were hacked. Fortunately however, the Deodar felling remained in deficit.

7.4.2 Fir Working Circle:-Rotation was kept at 150 years. Trevor's enumeration in PBI was used to calculate yield. Increment was excluded and for yield calculation, trees 60 cm and over in diameter was considered. It was never anticipated that the War would put so much of strain on the Fir trees. Enumeration thus was limited to a few PBI areas, while the other forest allotted to this circle, was left under scribed or was not inspected. Felling excess to PBI, but were frequently carried out in other areas easily accessible. Maple and Walnut were much sought after, for rifle and gun half wrought. In Kullu Division, from 1942-43 to 1947-48, 2951 Maple and 266 Walnut trees were sold to purchasers. On the whole, regeneration in the Fir Forests remained / neglected. It was only in some experimental plots, where the Research Division carried out systematic cultural works, that the regeneration was satisfactory. In Pulga, Kalga and Nakas Forests of Parvati Division, where Uniform System was adopted from 1915 to 1918, and debris burning, weed control, soil working and protection against grazing was undertaken, natural regeneration could establish. The war ravages were also felt, in the accessible 3rd class forest, in which heavy felling, ignoring plan protection (Para 219 of the plan) were done. The felling for 10 years, ending 1947-48 was as follows:-

(Table 2)

<u>Species</u>	<u>Number of Scantling</u>	<u>Volume in cum.</u>
Deodar	66,717	4,872
Kail	1,90,706	13,564
Chil	15,918	1,145
Fir	17,861	1,307
Total	2,98,202	20,8888

The repeated severe felling seriously jeopardized legitimate right holder demands.

7.5 The Fourth Working Plan: - Shri K.L. Aggarwal started revision work between 1947-49 and his plan came into being from 1/4/1949. Yet again like Samler's plan, four working circles were constituted-

7.5.1 Regular Working circle: - This comprised the valuable and important, easily accessible, Deodar/ Kail forest, with some Fir and Spruce located in the upper reaches and little Chil in the lower parts of Hurla, Parvati and Lower Kullu Ranges. Oak of Hurla valley was also included. This working circle remained almost the same as in the previous plan, except that some steep and precipitous area were transferred to Selection Working Circle, while compact, large portions, containing predominantly pure Fir, were placed in the Fir Working Circle. Thus, the Working Circle comprised, large proportion of 1st class Forests, many reserved forests and a few 2nd Class Forests. Complete enumeration down to 20 cm diameter, in 10 cm diameter classes were carried out. Stock maps in 4" = mile scale, showing different species, were prepared for all the compartments and area under different species calculated. Rotation was fixed at 150 years and exploitable diameter kept at 30 cm dbh. Punjab Shelter wood System was adopted, as it provided for felling as per terrain condition and retention of compact groups of poles, as part of future crop. Future, only selection felling in the system were to be done on steep ground. Five periodic blocks of 30 years each, (in which PBI, PBII and PB V were definitely allotted, while the remaining two periodic blocks were grouped as PB Inter) were constituted. A 30 year period was considered suitable for regeneration. For calculation of yield, the final yield was from volume of 1st and IInd Class trees, in PBI and PB V. As a factor of safety against natural calamities such as fires, floods, land – slides etc., increment was excluded from yield. Yield estimates were based on field observations. Punjab Shelter wood system was kept for compact pole groups, which were to be retained as advance growth, or trees allowed to stand in blanks, where regeneration had not established or on broken ground, where entire over wood could not be removed for silvicultural reasons. Formula for yield calculations from PBI was:-

$$Y = \frac{C1 V1 + C2 V2}{P}$$

V1= Volume of Ist class trees standing in PBI

V2= Volume of II class trees standing in PBI

P=Length of the period i.e. years.

C1 was assessed as 0.6 for Deodar, 0.8 for Kail and Chil and 0.7 for Spruce and Fir. The value of C2 was estimated at 0.3 for Deodar, 0.5 for Kail, Fir and Chil. For calculating yield from PB V areas, it was felt that such over wood which does not suppress regeneration, be left. Estimate was that 50% of the young crop, during the first 15 years of the plan. Formula for yield calculation from PBV was:-

$$Y = \frac{1}{2} \frac{(C_1 V_2 + C_2 V_1)}{P}$$

C₁=0.8 for 1st class trees for Deodar/ Fir, C₁=0.9 for Kail/ Chil; for 2nd Class trees, C₂ for Deodar /Chil is 0.3 and C₂ for Kail/ Fir is 0.5. For yield from PB Inter, the yield from over mature stock i.e. IB and over, was designated as final yield and was calculated by volume, with the estimate that 40% of the over mature trees of Deodar and Chil and 60% of Kail and Fir, would be available for felling, during the plan period. Intermediate yield from PB Inter was controlled by area rather than volume. Thinning on silvicultural premeditate were undertaken. In PB II, no export was to be allowed. Only dead, dry uprooted trees were to be felled for grants to right holders etc. and counted towards yield. Yield by species was shown and provision was there, to adjust this yield between different species, at the end of 3 to 5 years, when it should not be in excess by more than 10% of the combined yield of Deodar, Kail and Chil. Summing up the result management, it can be seen that though prescriptions of the Working Plan were carried out, yet subsidiary silvicultural operations were not paid attention. Out of 2,155 hectares area under PB I, only 1235.62 hectares were prescribed for seeding felling. Regeneration, which progressed well with Kail filling up the blanks. Where regeneration did not come up, the reason was repeated fires. Under PB II, no felling for export was prescribed. However, to exercise cheek, it was prescribed that all IST class trees, removed for what so ever reason. Should count to words prescribed yield. Though only damaged / dead trees were permitted to be felled, yet some contravention i. e. thinning in R/4 Kasol C-II (Parvati Range), R/7 Diyar (Hurla Range) did come about. In PB Inter forests. Which as such were already open, thinning – cum- improvement felling were undertaken. In PB V, young crop was tended and over wood removed sequentially, except that here too, some variance from prescription came about. Yield was prescribed for tree, 40 cm d. b. h. and above, in PB I and PB V and 60 cm d.b.h. And above, In PB I and PB V and 60 cm d. b. h. and above, in PB Inter. At the end of 15 years however, felling were 3250 cum in excess for Deodar, 8,690 cum in excess for Kail, 23,685 cum deficit for Fir and 156 cm excess for Chill. Prescribed yield as per the plan was 2350.26 cum for Deodar, 1491.66 cum for Kail, 141.58 for Chil and 6711 cum for Fir. Yield control for valuable species was not done. Fir remained in deficit because yield estimate for it were on the higher side.

7.5.2 Fir Working Circle: - Except that some more Fir dominated areas were transferred to this Working Circle, the constitution of this Working Circle, remained the same as in the previous plan. Further, areas dominated by Deodar and Kail, were taken out from this circle and included in either the Regular Working Circle or Selection Working Circle. This Working Circle now consisted of, mature, over- mature Fir and Spruce, open and under stocked. Enumeration down to 20cm d. b. h. was carried out to 10 cm diameter classes. Rotation kept was for 180 years with 6 periodic blocks and exploitable diameter was kept as 80 cm d. b. h. management of this Working Circle, was though the Punjab Shelter wood system. Stress on regenerating Fir / Spruce in the areas in the Working Circle was undertaken with valuable broadleaved species i.e. Ash, Maple, Walnut etc. which were propagated on moist and dump localities. Presenting final yield was 19,538.44 cum, with 5889.85 cum from PB I and PB IV and 13,648.59 cum from the other PBs. Final yield from PB I, was based on the volume of trees of 60 cm d. b. h. and over, while for the other PBs only volume of IC and ID trees were taken into account. Increment was ignored for reasons of safety against natural calamities i.e. Fires, floods, glacier damage etc. Yield estimates were based on field observation, whereby 10% of volume of IA trees of Fir and Spruce, and 30% of the volume of

IC and ID trees of Fir / Spruce, could be removed. The volume of Deodar, Kail and Chil was ignored, being negligible. Prescriptions of the Working Plan were followed, by and large, except that due attention was not paid to subsidiary silvicultural operations. Fencing, followed by sowing and planting works, carried out in the instance, remained unattended subsequently, in later years. Protection against grazing and browsing was not enforced. Improvement –cum-selection felling was undertaken, in the other PB's. At the end of 15 years, the result of felling was arrears in Fir and Spruce, upto 8315 cum. It cannot be ruled out the yield was somewhat over assessed.

7.5.3 Selection Working Circle: - Irregular mixed forests, on steep and broken ground were allotted to this Working Circle. Considerable area of the working circle was taken up by rocky and inaccessible terrain, with upper limits containing Kharsu, some Deodar and Fir/ Spruce or alpine pastures. Enumeration of the conifers was done, down to 20cm d. b. h. in 10cm diameter classes, wherever possible. Forests were maintained on irregular steep ground, but elsewhere on easier ground, the technique of regeneration felling was followed, just like in Regular Working Circle. Exploitable diameter was kept at 70 cm d. b. h, like in Regular Working Circle. Exploitable diameter was kept at 70 cm d. b. h. and rotation was fixed at 210 years with felling cycle of 30 years. Higher rotation was justified on the basis that in Selection forests, growth was admittedly slower, than in forests of Regular Working Circle. Annual yield was prescribed as 1019 cum for Deodar, 906 cum for Kail, 87 cum for Chil and 8892 for Spruce/ Fir. At of 15 years, the results of felling were, Deodar: - 2988 cum deficit and Kail: - 373 cum deficit, Fir/ Spruce: - 41,802 cum deficit and Chil: - 231 cum deficit which was approximately equal to 3 years prescription in case of Deodar, 4 1/2 Years prescription of Fir and 3 years prescription in case of Chil. The above data shows that except for Kail, the yield for other species, was not silviculturally available and must therefore have been over – assessed. Regeneration works were not carried out systematically and did not progress well.

7.5.4 Protection Working Circle: - The balance DPFs and RFs. Which had not been allotted to any of the other Working Circle was placed here. These Forests were inaccessible and remote and of low economic value. Their value was however, from the soil and water conservation point of view, as they occurred at the head of streams. Except for meeting minor right holder demands, these forests were kept at rest. Some Selection fellings of Kharu Oak was prescribed when maturity was reached. Some more steep and in accessible / precipitous areas, from other Working Circle, were transferred to this Working Circle. Further all the IInd class forests were included in this Working Circle. The DPFs by and large did not undergo major felling. In IIIrd class forests. Rotational closure for 10 to 15 years at the most, taking not more than 1/4th of the area at a time, under proper scheme, was suggested. However, by and large, IIIrd class forests remained heavily grazed, burdened with rights of grazing, timber and nautors etc. Closures followed by planting of blank areas did not give much success.

7.6 Fifth draft Working Plan by Mr. D. P. Kapoor: - Sh. K. L. Aggarwal, whose plan ended on 1963-64, had recommended an intermediate revision. With the coming into being of the National Forest Policy in 1952, thinking underwent a drastic change. Both extrinsic and intrinsic benefits of forests were stressed. Where conservation of soil and water and eco-development was stressed, the importance of forests in economic terms was realized, in the development of agriculture, industry and communication. The spurt in industrial activity had

to lean heavily on forest produce. Spruce and Fir were seen as raw ingredient for newsprint factories; Himalayan Maple and Bird cherry were in demand in the textile industry: the sports industry required Willow, while the match and plywood industries required Chil and Fir. Large areas came under horticulture and with the propagation of apple and stone fruit industry, many sawmills mushroomed to produce packing cases. To meet the new situation arising out of post-independence development and reconstruction activity, revision of Sh. Aggarwal's plan was ordered. In 1961, Sh. V.P. Bajaj was posted as WPO. He was replaced by Sh. S.S. Chahal, in 1963. In 1966-67, Shri D.P. Kapoor joined and continued the completion of plan in 1972. Shri Kapoor's draft plan was not approved, as (he accounted for the period 1964-65 to 1978-79 submitting his proposals in 1972-73) the remaining five years affective period of the plan was considered too short for the plan. Though Kapoor's draft plan was not formally put into operation, it continued to be followed. Four Working Circle was constituted as per the draft:-

1. Regular Working Circle.
2. Fir Working Circle.
3. Protection Working Circle.
4. Broad- Leaved (Over-Lapping) Working Circle.

Selection Working Circle of Aggarwal's plan was abolished and the forests were transferred to the four working circle according to the composition of crop and configuration of the ground. The Selection Working Circle had failed, since forests under it could not be worked effectively under the selection criterion, on account of steep and remote terrain. Regeneration too, was thwarted, on account of heavy grazing and browsing. Steady increase in demand for Walnut, Maple, Bird Cherry and Kharsu warranted need for Broad- Leaved (Over-Lapping) Working Circle.

7.6.1 Regular Working Circle: - General constitution of the working circle remained the same as in Aggarwal plan. Deodar, Kail, Chil and Oak, whether pure or mixed and on proper easy terrain, were worked under this working circle, under Punjab Shelter wood system. Forests containing Fir predominantly were transferred to Fir Working Circle, while such forests, where Kail or Deodar was principal species, were allotted to this Working Circle. Manali R/1 to R/4 were transferred and kept in the Protection Working Circle for tourism purposes. Analysis and valuation of the crop was done, using figures of Aggarwal's plan. Aerial survey of Mr. G.A. Jones, a Canadian during 1962-64 was found unreliable. Management was under the Punjab Shelter wood System, which provided that compact groups of poles, up to 30 cm d. b. h. and 0.2 hectare or over in extent, were retained as future crop in PB I areas. Selection marking on steep and precipitous area was resorted, to avoid soil erosion, Deodar being a valuable species was given maximum stress, while on dry hot southern slopes, where Deodar could not come up, Kail was preferred. In moist damp localities, broad leaved species i. e. Walnut, Bird Cherry, Poplar etc. were propagated. Rotation kept was for 150 years and exploitable diameter was 60 cm d. b. h. Since the existing uneven aged forests were in the course of conversion, rotation was only of academic interest. Five periodic blocks were constituted. PB III and PB IV were clubbed together as PB inter. Regeneration period was kept at 30 years. PB I blocks contained the previous plan PB I areas, which had not fully regenerated or where regeneration fellings were not carried out. Some PB II and other areas, considered mature enough and suitable for working under concentrated regeneration fellings, were allotted to PB I. Similarly PB II contained PB II areas of previous plan with a few transfers to this circle, from other circles. The PB V areas

of last plan and some of the fully regenerated PB I areas were allotted to this block. Yield was calculated by volume, for each periodic block. PB I and PB V yield, constituted final yield while PB Inter was intermediate yield. No yield removal was to be made from PB II. Increment was not taken into account, to safeguard against natural calamities like fires, floods and glaciers damage etc. For final yield from PB I 60% of the growing stock of trees 30 cm d. b. h. and above were estimate available for felling during next 30 years, as also 20% of total volume of trees below 30 cm d. b. h., which would be available by way of thinning and cleanings. Restrictions were, retention of compact area pole groups upto 30 cm d. b. h., seed bearer retention and selection felling in steep area pole group upto 30cm d.b.h. seed bearer retention and selection felling in steep areas. In PB II was estimate that 10% of the total growing stock, would be available by way of removal of dead, uprooted, fire burnt, snow uprooted / Damaged trees during next 30 years. In PB V, observational estimation pointed out, that 40% of the volume of trees of 40 cm d. b. h. and above, will be available for felling during next 30 years, as also 20% volume of the trees below 40 cm d. b. h, which would be available for felling from thinning and removals of dry/ uprooted trees. Under PB Inter, thinning-cum- improvement fellings would yield, 10% of the total growing stock. Prescribed yield from different PB's would yield, 4400 cum for Deodar, 4800 cum for Kail, 4800 cum for Spruce / Fir and 390 cum. for Chir. It was laid down that fellings, whether for export or for right holders, would count towards prescribed yield. Further, deviation was not being more than 10% of combined yield of Deodar, Kail, Fir and Chil at the end of 15 years. Felling was carried out, as per prescription on the Working Plan. Biotic pressure and fires, combined however, to suppress natural regeneration by and large. At the end of 15 years, i. e. period ending 1978-79, yield was in deficit for all the four species. Arrears were 10,294 cum for Deodar, 4649 cum for Kail, 26310 cum for Fir and 3848 cum for Chil. Since markings and felling were according to rules laid down in the draft plan, it went to show that yield estimates, were slightly on the higher side. Chief Conservator of Forests, HP, issued instructions that yield prescriptions of Aggarwal's plan, be adopted for yield control. Comparing actual removals during Kapoor 's draft plan, with yield prescriptions of Aggarwal 's, it was found that there was excess removal to the extent of 17,839 cum in case of Deodar, 4,391 cum, in case of Kail and 239 cum in case of Chil. Only Fir and Spruce were in arrears to the extent of 54,997.

7.6.2 Fir Working Circle: - This Working Circle remained the same as in Aggarwal's plan. Since Fir and Spruce were the principal species, some which could be worked under concentrated regeneration fellings, were transferred to this circle, while forests containing Kail/ Deodar, previously in this circle, were transferred out to the Regular Working Circle, as also steep and precipitous areas, which went now to this Protection Working Circle. Enumerations were carried out only in PB I. Mr. G. A. Jone's data was used for calculating growing stock estimation. Three felling series were constituted:-

- a) Newsprint felling series, which comprised Upper Kullu and Parvati Ranges.
- b) Departmental felling series, comprising lower Kullu and Hurla Ranges.
- C) Packing cases felling series, which comprised selected forests of Upper Kullu, Lower Kullu and Parvati Ranges.

The Silvicultural system adopted was Clear Felling System, with provision to retain advance growth occurring singularly or in groups, up to 40 cm d. b. h. and carrying out selection marking on steep and broken grounds in PB I, and selection –cum- improvement

felling in other PBs. Regeneration was to be artificially induced. Silver Fir and Spruce were the species propagated, though Deodar was recommended in the lower parts, in the 'tension belt'. Sites where broad leaved species existed were to be left as such and conifers were not to be forced in here. Thus Acer, Walnut, Bird cherry, Ash and Poplars were raised on such sites. The knowledge that for Fir, C. A. I. And M. A. I. crossed at 90 years was used to kept conversion period at 90 years. 30 years was considered ideal for regeneration. Three periodic blocks were thus framed. Regarding estimation of yield, it was noted that 90% of the volume of growing stock, above 40 cm d. b. h. In PB I, would be available for felling as also 10% of the growing stock below 40 cm d. b. h. In PB II, only sanitary felling (10% of stock), while in PB III, thinning –cum- improvement felling (10% of stock), while in PB III thinning –cum- improvement felling (20% of stock) were resorted to. This removal was counted towards yield and deviation was kept, within 10% table giving annual prescribed yield in cubic meters, from different PBs, Fir and Spruce (ignoring Deodar and Kail, the yield of which was negligible) is as follow :-

(Table 3)

	<u>PB I</u>	<u>PB II</u>	<u>PB III</u>	<u>Total</u>
Newsprint felling series.	37,100	4,100	6,300	49,500
Departmental felling series.	15,200	1,500	3,200	19,900
Packing cases felling series.	23,100	-	2,000	25,100
G. total:	75,400	5,600	11,500	92,500

The above table shows that PB I and PB III yield unreasonably high.

The results of management are important. All the forests prescribed for felling were not felled. System clear felling was ignored in 1974-75, as regeneration did not keep pace with felling. Subsidiary silvicultural operation was ignored, by and large. Many forests allotted to PB I were not worked, on account of various reasons (only 2049 hectares were worked out of 4004 hectares prescribed). Since the Newsprint Factory Project was not finalized, many forests prescribed for felling newsprint, were not worked. Inadequate staff and funding also deferred working in forests prescribed for department working. Mechanical logging did not allow sanitary felling in PB II, and only thinning –cum-improvement felling was done in PB III. In PB II, only 254 hectares of 3460 hectares prescribed were felled / worked while in PB III, of 4113 hectares, only a marginal area was taken up for working. Only such forests which were easily accessible, were worked, as saw millers and fruit growers were not prepared to get their demand fulfilled from remote areas, on account of high extraction costs. At the end of 15 years, against 13,87,500 cum of prescribed yield, only 3,08,340 cum of Fir was removed. Deficit thus was of 10, 79,160 cum. Adopting Aggarwal's yield as basis however, showed excess Fir felling to the tune of 15,222.43 cum. Regeneration efforts by and large, where taken, were inadequate, as effective closure combined with planting with good stock, was amiss. This can be observed in 2/11 Kothi Tich C1, 2/12 Nathi Ban CI, CII, CIII, CIV V, CVI, 1/43 Nagni CIIa and CIII a of Lower Kullu range.

7.6.3 Protection Working Circle: - Demarcated protected forests and Reserved forests in steep, inaccessible areas were allotted to this circle. Alpine areas and rocky tracts, containing Kharsu Oak with scattered Fir and Birch, were placed here, as also the undermarked Class-III forests. A further chunk of area came to this working circle, on abolishing of Selection

Working Circle. No enumerations and analysis were carried out in these forests. Only the demand of right holders was met from the III class forests otherwise forests allotted to this circle, served primarily to meet soil and water conservation criterion. III Class forests have suffered on account of heavy timber distribution demand, grazing, lopping and also encroachments, as their boundaries were not fixed.

7.6.4 Broad Leaved (Over Lapping) Working Circle: - This was an overlapping working circle which was spread over the reserve, demarcated and undemarcated forests. Compact groups of broad leaved species, of one hectare and above, were included, whether they occurred in Regular, Fir and Protection Working Circle. Enumeration of 23 broad leaved species was done, down to 20 cm in compact block. Clear felling system, with a provision to retain compact groups of advanced growth, up to 40 cm d. b. h., was followed. Rotation was kept at 100 years. Yield was estimate at 50% of the growing stock. UPFs were excluded from felling and yield calculations, keeping them reserved for right holders. The forests were categorized into 3 priority classes. Priority one being, where motorable roads existed, priority two where roads needed improvement and extension; and priority three were those where roads were non-existent, with no possibility of construction in the reasonable future . Exploitation in the beginning was recommended only in priority one and two areas. Yield was combined for all species. During the plan period ending 1978-79, the following removals were there: - Maple: 2384 cum, Bird Cherry: 21 cum, Horse chestnut: 432 cum; Broadleaved (miscellaneous) 12156 cum. regarding regeneration, nothing tangible was done to replenish the growing stock of broad leaved species. Prescription that all the felled areas, falling outside the PB I area, under regeneration felling shall be closed and planted with broad leave species has not been followed. This thus defeated the purpose for creating this Broad Leaved Working Circle.

7.7 The Sixth Working Plan by Shri J.C. Sharma: - Shri J. S. Walia undertook revision work of the Working Plan for Kullu and Parvati tract and his plan was operative from 1979-80 to 1993-94. The following working circles were constituted:-

- i) Deodar/Kail Working Circle.
- ii) Fir Working Circle.
- iii) Protection Working Circle.
- iv) Broad leaved over lapping Circle.
- v) Improvement Working Circle.

7.7.1 Deodar / Kail Working Circle: - In this Circle were placed the really important and valuable forests of Deodar and Kail, lying in the tract, which were situated on comparatively easy slopes. A small proportion of Silver Fir and Spruce in upper reaches and a little CI, in lower part, were also placed in this Working Circle. Areas regenerated during the last 60 years are more or less unevenaged. Otherwise, the forests in this working circle are evenaged, containing all age classes intimately mixed. In PB IV or PB III, were placed the more or less evenaged crop, prescribed to be properly tended along scientific lines. This Working Circle covered an area of 10,205.33 hectares, of which 109.43 hectares was reserve forests and 8596.10 hectares was placed in DPFs. Stock maps on 4"=1 mile scale were prepared. Complete enumerations were carried out, in usual 10 cm diameter classes, down to 10 cm d. b. h. in all the periodic blocks. Exploitable diameter for Deodar, Kail and Chil was kept 60 cm d. b. h.

System of Management: - Punjab Shelter wood System adopted as the system permitted felling according to the configuration of the ground and retention of compact pole crop as advance growth.

Rotation: - Rotation was kept at 120 years, with four periodic blocks with regeneration period of 30 years.

Periodic Blocks: - Periodic Block I consisted of two groups A and B blocks. Under group "A" were placed such areas, which are unfilled PBI areas of the previous plan and some PB II areas, which were best available as far as the maturity of the crop was concerned. 759.69 hectare area was placed under this group. In group "B" 1749.88 hectare area was placed. This group consisted of such PBI areas, which were felled during the previous plan and where regeneration was still progressing. Forests, which had been badly burnt by frequent fires, or those that were exhausted by T.D. markings and required immediate attention, were also included in this group, to rehabilitate the same immediately. Forests which had a preponderance of maturing age classes were allotted to PB II. Most of the PB Inter areas of Aggarwal's / Kapoor's (draft) plan and those transferred from PB last, had been allotted to PB III. The crop was mostly pole to middle aged, with scattered mature tree. Aggarwal's / Kapoor's (draft) plan and the other forests having young crop, were allotted to PB IV.

Yield: - The yield was calculated by volume, separately for PB I (Group A), PB IV and PB III on the basis of enumeration results. Increment was ignored for reasons of safety against fire and other natural calamities, and also to serve as emergency reserve. The species which were suited to the locality were favored and preferred over the other species. Deodar and Kail were the important species growing side by side. Kail is much more susceptible to fire damage, heavy lopping and attack by the fungus *Trametes pinni*.

Results: - The objects of management prescribed in the Working Plan, were followed by and large and quite a few areas were successfully regenerated under this working circle. The removals of areas could not be marked for felling despite prescriptions in plan.

7.7.2 Fir Working Circle: - Such forests which predominantly contained Silver Fir and Spruce and which were considered suitable for working under concentrated regeneration fellings were allotted to this circle. Total area under this working circle was 20,818.17 hectares, of which 1243.55 hectares was Reserved Forests and 19,574.62 hectares was DPFs. Stock maps of Aggarwal's plan were checked and corrected up to date. Total enumerations, down to 10 cm d. b. h. and in 10cm diameter classes, were carried out in the periodic blocks. Exploitable diameter was kept at 60 cm d. b. h. Rotation was kept at 120 years and 4 periodic blocks, each of 30 years were framed. A regeneration period of 30 years was found proper. PB I contained Group A areas, which included many unfelled PB I portions and Group B areas which had been felled during the period of Kapoor's draft plan; and also some forests of Aggarwal's plan, that remained unregenerate and where the regeneration was either still progressing or had not come up at all. Total area under Group A was 2529.60 hectares and under Group B was 2593.08 hectare. Under PB II were kept such forests, which had a preponderance of maturing trees. Areas under PB IV were negligible, because practically nothing had been done to restock the PB I areas of this circle. Under PB III were kept the remaining forests, not allotted to any of the PBs. Punjab Shelter wood system was the silvicultural system adopted. The system of clear

felling adopted under Kapoor's draft plan, was abandoned. Under Punjab Shelter wood System, all healthy advances growth was retained to form future crop. In blank felled areas of PB I, efforts to bring about a fast green mantle in the shortest possible time was aimed at, through valuable broadleaved species planting i.e. planting of Maple and Walnut. Depletion was quite distinct in many places, as excess removals were undertaken to meet the special objective of meeting the demand of packing cases, in all the compartments and forests. The result is that there is hardly any scope for further felling in these forests.

7.7.3 Protection Working Circle: - The object of management under this working circle was protection of hill slopes from denudation and erosion by preserving the forest cover. Effective soil conservation were to be undertaken; forests were to be protected from indiscriminate felling and lopping, near the villages; and good grazing grounds were to be provided to local and migratory graziers. This circle contained all DPFs not included in any of the previous working circle, being either inaccessible due to rocky, steep and precipitous terrain or those that were situated in the vicinity of famous tourist centers, like Manali and sacred shrines i.e. Bijli Mahadev, etc. Total area of this Working Circle was 1, 74,766.89 hectares. Almost every type of vegetation, typical to this tract, is met with in the forests allotted to this Working Circle, as varied type of area are included and distributed, scattered over the tract. Most of the DOFs are reserved forests, except those around Manali. Others are either rocky, steep and unworkable areas, or are high lying alpine pastures, rocky and snow covered area which are forests, in name only. Accounting for the nature of the terrain of these forests and the special objects of management, no enumeration and stock mapping had been carried out in the forests, which were previously in Regular or Fir Working Circle. The compartment history files however contain, the aerial stock maps prepared by Mr. Jones. Except for the rich forests around Manali, this Working Circle's growing stock comprised of scattered and unmanaged crop of conifers and broad leaved species, occurring on rocky or in bands between grassy blanks and rocks. The chief objective of, management in this Working Circle was the soil and water conservation criterion. Hill slopes had to be prevented from Erosional hazards/ denudation; permanent flow of water in streams and rivers was to be maintained and tourist spots of scenic splendor had to be preserved. No commercial fellings were prescribed and contemplated in this Working Circle. 1/32 Kandi CIII, 2/24 Parol C III, and Reserved / DPFs in and around Manali were kept sacrosanct; otherwise a provision to mark trees to bonafide right holders was incorporated. Great depletion in the forests (except in reserved forests) resulted, on account of TD marking, exposing in the denudation. The suggestion of opening up of a departmental sale depot, in Manali, to regulate TD and supply timber to right holders, at concessional rates was sound. However, this was not implemented. Grazing right as provided in the settlement rates could not be interfered with; however, regeneration required temporary closure of some forests. Those prescribed for immediate closure were-

(Table 4)

<u>Forests</u>	<u>Compartment</u>	<u>Area (Hectares)</u>
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1/1 Bajrundi	CIa	45.32
1/1 Bajrundi	CIIa	29.54
1/1 Bajrundi	CII Ia	18.61
¼ Bajrundi	C II b	16.76
1/6 Aleo Behal	CI	14.16
2/24 Parol	CIV	316.05

Mr. J. C. Sharma's plan, prescribed various soil and water conservation measures for the tract, which however could not be followed strictly, because of limited finances.

7.7.4 Broad –leaved (Over-Lapping) Working Circle: -This working circle was constituted overlapping other working circle. Need was felt to do so, since a great number of important broadleaved species lie scattered all over the tract. The importance is primarily for their value as raw material, for a number of woods based and also since they have fuel and fodder value. The forests included in this working circle, conform to Champion and Seth's classification type 12/C i.e., 12/C Ia. The crop available is generally unevenaged and natural regeneration of the valuable species is deficient. Special objects of management are protection and conservation of these valuable forests of broadleaved species. It was found necessary to improve the stocking of valuable species, i.e. Acers, Walnut, Carpinus etc. by bringing them under systematic and scientific management and to meet the requirement of fuel and charcoal of the people. Stock maps were prepared no 1: 15,840 scales, for the working circle and the areas occupied by broadleaved species, in conformity with the species objects of management which were mooted. The two felling series were:

- Industrial felling series.
- Charcoal felling series.

7.7.4 (A) - Industrial Felling Series: - All the valuable broad leaved trees were enumerated in 10 cm diameter classes, down to 10 cm d. b. h. Management system adopted was the Selection System. Trees of exploitable diameter were to be removed and thinning –cum – improvement felling was prescribed in the rest of the crop, to favour natural regeneration and growth of young crop of valuable species. Wherever natural regeneration did not work, artificial regeneration was resorted, to fill up blank patches with valuable species. Broadleaved species such as Walnut, Maple, Bird Cherry, Carpinus, Horse chestnut etc. were to be preferred. Exploitable diameter of 40 cm was fixed in case of Maple, Bird cherry and Carpinus while in case of other species, including Walnut, it was kept at 50 cm d. b. h. A felling cycle of 15 years was adopted, coinciding with the period of plan. Rotation was kept at 45 years for coppice and 90 years for standings.

7.7.4 (B) - Charcoal Felling Series: - In this felling series the forest of Ban Oak of Garsa valley were included. Enumeration in 10 cm diameter classes, down to 10 cm d. b. h. was carried out in all the forests. Coppice with stranded system was adopted. Rotation of 45 years for coppice and 90 years for standards was kept. As per yield tables, average crop diameter at the age of 45 years, was estimated to be 22 cm and at the age of 90 years to about 35 cm. This was considered suitable for producing charcoal, as well as timber required for agriculture implements, by the local people. A felling cycle of 45 years was fixed, corresponding to the rotation of coppice. The Ban Oak forests, felled during the past generally, could not be

satisfactorily regenerated. However, Deodar planting done in some of the forests was fairly successful.

7.7.5- Improvement Working Circle: - This working circle had two parts, one dealing with alpine pastures and the other with IIIrd Class forests, situated in the vicinity of villages. There are extensive areas above the line to tree growth in all the ranges of this division. More than half of the area in the alpine zone consists of massive rocks, i.e. and snow; while between the lines of tree growth and perpetual snow stretch, there exists the extensive areas of alpine pastures. The second part, consisted of the undermarked protected forests, known as IIIrd class forests, that lie below IIrd Class forests and extend up to the river bed. Various types of areas are included, scattered all over the tract. Almost every type of vegetation, typical to the forest division, is met with in the areas.

Special management objective was as under: -To assess the grazing capacity of alpine pasture, in order to regulate the grazing, goats and sheep and to improve the stocking of grasses requirement for local and migratory graziers and to plantations of timber and fodder species, for meeting the requirement of local people. The estimated area of alpine pasture is 71,523 hectares and 1, 00,142 hectares was estimated to be available for grazing in DPFs or UPFs below alpine zone. These areas were, by and large, overgrazed. Various suggestions and prescriptions were given in the plan, to reduce the cattle and livestock population in the area which could not be implemented. Chemical manuring of the pastures could not be done, on account of limited finances. Though some areas were taken up, and legumes and other grasses were introduced, yet this was very less as compared to the total degraded areas. Grazing lands, by and large, were rendered useless and were exposed to soil denudation.

7.8-Seventh Working Plan of Sh. J.S.Walia:- Sh. J.S. Walia undertook the revision work of Sh. J.C. Sharma Working Plan and the J.S. Walia, working plan was operative from 1994-95 to 2009-10. In this W.P, Working Circles have been constituted on the basis of classification of forests i.e. protection forests, National Forests and village forests. The working Circles constituted were:

1. Deodar-Kail Working Circle
2. Fir Working Circles.
3. Protection Working Circle.
4. Broadleaved over-lapping Working Circle.
5. Grazing and improvement Working Circle.

7.8.1 Deodar/Kail Working Circle: - In this WC were placed the forests of Deodar and Kail, which have significant importance as regards their economical value. These forests lie on comparatively easy terrain. The small portion of Fir and Spruce present in the upper reaches and chil present in the lower parts is also placed in this working circle. A more or less intimate mixture of all age classes are present. It is only the forest areas regenerated around 95 years which are more or less even aged. The said area stands allotted to PBIV or PB III. The total area allotted to this working circle was 6793.33 Ha. Of which 1253.71 Ha was to reserve forests, 4468.84 was Ist Class DPF's and 1070.78 was 2nd class DPFs. Complete enumeration was carried out in usual 10 cm diameter classes, down to 10 cm d.b.h. in PB I and PB IV and partial sampling was resorted to through releaskopic methodology in PB-II & PB III. Exploitable diameter was fixed at 60 cm d.b.h, being economically viable.

7.8.2 System of Management: - Punjab Shelter wood System adopted as the system permitted felling according to the configuration of the ground and retention of compact pole crop as advance growth. The Punjab Shelter wood System helps avoid unnecessary sacrifice of immature pole crop and protects area from soil denudation, as it does not allow for felling of trees in steep and precipitous terrain.

7.8.3 Rotation: - Rotation was kept at 120 years, with four periodic blocks with regeneration period of 30 years.

7.8.4 Periodic Blocks: - Periodic Block-I consisted of two groups A and B blocks. Under group "A" were placed such areas, which were unfelled PBI areas of the previous plan and some PB II areas, which were best available as far as the maturity of the crop was concerned. 874.52 hectare area was placed under this group. In group "B", 1200.57 hectare area was placed. This group consisted of such PBI areas, which were felled during the previous plan and where regeneration was still progressing. Forests, which had been badly burnt by frequent fires, or those that were exhausted by T.D. markings and required immediate attention, were also included in this group, to rehabilitate the same immediately. Forests which had a preponderance of maturing age classes were allotted to PB II. The areas having crop mostly pole to middle aged with scattered mature which occur in varying proportion were allotted to PB III. The areas having crop sapling to young pole stage with scattered mother tress retained as part of future crop were allotted to PB IV.

Yield: - The yield calculations were just for academic interest as there was total ban on green felling. The yield was calculated by volume, separately for PB I (Group A), PB IV and PB III on the basis of enumeration results. Increment was ignored for reasons of safety against fire and other natural calamities, and also to serve as emergency reserve. Yield prescribed for this Working Circle was 309000 cum. Yield removed 21396.61 cum.

Results: - The objects of management prescribed in the Working Plan, were followed by and large and quite a few areas were successfully regenerated under this working circle. The removals of areas could not be marked for felling despite prescriptions in plan.

7.9 Fir Working Circle: - Such forests which predominantly contained Silver Fir and Spruce and which were considered suitable for working under concentrated regeneration fellings were allotted to this working circle. Total area under this working circle was 7290.89 hectares. Total enumerations, down to 10 cm d. b. h. and in 10cm diameter classes, were carried out in the PB I and in other Periodic Blocks only partial enumeration through releskope was done. Exploitable diameter was kept at 60 cm d. b. h. Rotation was kept at 120 years and 4 periodic blocks, each of 30 years were framed. A regeneration period of 30 years was followed in this Working Plan. PB I contained Group A areas, which included many unfelled PB I portions and Group B areas which had been felled during the period of Kapoor's draft plan; and also some forests of Aggarwal's plan, that remained unregenerated and where the regeneration was either still progressing or had not come up at all. Total area under Group A was 343.06 hectares and under Group B was 1019.27 hectare. Under PB II were kept such forests, which had a preponderance of maturing trees. Areas under PB IV were negligible, because practically nothing had been done to restock the PB I areas of this circle. Under PB III were kept the remaining forests, not allotted to any of the PBs. Punjab Shelter wood system was the silvicultural system adopted. The system of clear felling adopted under Kapoor's draft plan, was abandoned. Under Punjab Shelter wood System, all

healthy advance growth was retained to form future crop. The trend towards removing sound poles and retaining unsound, diseased trees as seed bearers was reversed. Only salvage trees were proposed for removal. Yield prescribed for this Working Circle was 135000 cum. Yield removed 10700 cum.

7.10 Protection Working Circle: - The inaccessible areas, aesthetic areas under DPF's and RFs were considered for management under this working circle. The main object of management under this working circle was protection of hill slopes from denudation and erosion by preserving the forest cover. Effective soil conservation were to be undertaken; forests were to be protected from indiscriminate felling and lopping, near the villages; and good grazing grounds were to be provided to local and migratory graziers. The principles of sound silviculture were proposed to the demand of right holders for timber and fuelwood. Total area of this Working Circle was 140781.58 hectares, out of which 139475.97 hectares is DPF areas and 1305.61 is RF areas. Almost every type of vegetation, typical to this tract, is met with in the forests allotted to this Working Circle, as varied type of areas are included and distributed, scattered over the tract. Accounting for the nature of the terrain of these forests and the special objects of management, no enumeration and stock mapping had been carried out in the forests, which were previously in Regular or Fir Working Circle. The chief objective of, management in this Working Circle was the soil and water conservation criterion. Hill slopes had to be prevented from Erosional hazards/ denudation; permanent flow of water in streams and rivers was to be maintained and tourist spots of scenic splendor had to be preserved. No commercial fellings were prescribed and contemplated in this Working Circle. Grazing right as provided in the settlement rates could not be interfered with; however, regeneration required temporary closure of some forests.

7.11 Broad-leaved (Over-Lapping) Working Circle: - This working circle was constituted overlapping other working circle. Need was felt to do so, since a great number of important broadleaved species lie scattered all over the tract. The importance is primarily for their value as raw material, for a number of woods based and also since they have fuel and fodder value. The forests included in this working circle, conform to Champion and Seth's classification type 12/C i.e., 12/C Ia. The forests covered under this working circle were (A) Pure Kharsu Oak, Mohru Oak, Ban Oak and the Birch forests. (B) Mixed Oaks and Birch forests in Deodar/ Kail and fir/ Spruce forests. (C) Mixed forests of Maple, Birdcherry, Walnut, Hill Poplar, Horse chestnut, Hill Toon etc in Deodar/ Kail and Fir/Spruce forests. The crop available is generally unevenaged and natural regeneration of the valuable species is deficient. Special objects of management are protection and conservation of these valuable forests of broadleaved species. It was found necessary to improve the stocking of valuable species, i.e. Oaks, Birch, Acers, Walnut, Carpinus etc. by bringing them under systematic and scientific management and to meet the requirement of fuel and charcoal of the people. Stock maps were prepared no 1: 15,840 scales, for the working circle and the areas occupied by broadleaved species, in conformity with the species objects of management which were mooted. No felling series were proposed in this working plan. Partial sampling through releskope was done in this working plan. No silvicultural system has been proposed in this working plan as no yield was proposed from this working circle.

7.12- Grazing and Improvement Working Circle: - This working circle constitutes the alpine pastures and the IIIrd class forests. The alpine pastures exist mostly, above the line of

tree growth and were quite extensive in area. More than half of the area in the alpine zone, consist of massive rocks, snow and ice and lie between the line of tree growth and perpetual snow stretch, existing as alpine pastures. In this working circle were also placed the newly notified DPFs, which essentially were plantations, primarily of Chir. The second part, consisted of the undermarked protected forests, knows as IIIrd class forests, that lie below IInd Class forests and extend up to the river bed. Varied type of areas were included, scattered all over the tract. Almost every type of vegetation, typical to the forest division, was met with in the areas.

7.12.1 Special management objective was as under: -To assess the grazing capacity of alpine pasture, in order regulate the grazing, goats and sheep and to improve the stocking of grasses requirement for local and migratory graziers and to plantations of timber and fodder species, for meeting the requirement of local people. The estimated area of alpine pasture was 104433 hectares and 45628 hectares was estimated to be available for grazing in DPFs or UPFs below alpine zone. These areas were, by and large, overgrazed. Various suggestions and prescriptions were given in the plan, to reduce the cattle and livestock population in the area which could not be implemented. Chemical manuring of the pastures could not be done on account of limited finances. Though some areas were taken up, and legumes and other grasses were introduced, yet this was very less as compared to the total degraded areas. Grazing lands, by and large, were rendered useless and were exposed to soil denudation.

CHAPTER VIII

STATISTICS OF GROWTH AND YIELD

8.1 General: - For growth and yield, following records come in handy and useful-

1. *Cedrus deodara* (Deodar), multiple yield tables for Deodar (*Cedrus deodara*) by Mr. H.G. Champion and Mr. I.D. Mahendru, Indian forest Records, Volumes XV, Part-VIII, Silviculture Series-1993.

2. *Pinus wallichiana* (*Pinus excelsa*- Blue Pine) by Mr. H.G. Champion, Mr. P.N. Suri and Mr. I.D. Mahendru, Indian Forest Records, Volume XIII, Part-X, Silviculture series-1929.

3. Growth and yield statistics of Common Indian Timber Species (Himalayan Region), compiled by Director of forest Education F.R.I, 1967.

8.2 Volume Tables:- The volume tables adopted by Sh. J.C. Sharma which were the average of quality I and II volume tables, compiled by F.R.I. for Deodar, were used by previous working plan can be adopted for this working plan also. This is so because, average quality Deodar in Parvati tract conform to F.R.I. quality I and II. Many of the sample plots laid out by F.R.I. were situated in Kullu, Parvati and Seraj areas, which goes to justify this decision. Total tree volume consisting of stem timber and small wood is to be considered, considering the small wood also economically a saleable commodity. Perusing through “Growth and Yield Statics of Common Indian Timber Species” (Himalayan Region Volume-I) at page 8 give us the following data:

For Deodar, Kail and Chil species:-

(Since there is no appreciable-difference between the figures for the Deodar, Kail and Chil, the same were adopted for the three species)-

Volume tables prescribed to be adopted for the plan, for Deodar, Kail and Chil would continue to be the ones in use by Sh. J.C.Sharma which is as under:-

(Table 1)

Diameter class in cm.	FRI/Q-I Cft.	FRI/Q-II Cft.	Average (I/II) Cft.	Volume of the table adopted for plan in m³
10-20	8	8	8	0.100
20-30	17	17	17	0.400
30-40	37	37	37	1.00
40-50	72.5	64.5	68.5	1.90
50-60	118	95	106.5	3.00
60-70	158	124	141	3.90
70-80	208	157	182.5	5.10
80-90	258.5	190	224.25	6.30
90 & above	314.5	-	314.5	8.80

For Fir and Spruce Species:-

For Fir and Spruce, Sh. J.C. Sharma adopted 0.6 m³ for 10-20 cm class and 0.14 m³ for 20-30 cm diameter class; for 90 cm diameter class or for a tree ID and over volume prescribed was 9.34 m³. The volume tables were prepared by Trevor for Silver Fir and Spruce, based on actual outturn of trees. This matched well with the work done by the erstwhile Punjab Silvicultural Research Division and Sh. K.L. Aggarwal and is in conformity with Para -30 of the H.P. Forest Department Technical Order No. 11. The volume table prescribed for Fir and spruce species is as follows:-

(Table 2)

Class	Diameter (in cm)	Fir Spruce (Q-I/II) (in m ³)
V	10-20	0.06
IV	20-30	0.14
III	30-40	0.85
IIA	40-50	1.70
IIB	50-60	3.11
IA	60-70	5.10
IB	70-80	7.08
IC	80-90	8.49
ID	90 & above	9.34

For Broad Leaved species:-

The local volume tables, for commercial timber, in respect of broad leaved species, were compiled by Mr. D.P. Kapoor below 20 cm. d.b.h. including branches. The same would hold good and are adopted for this plan. These are as follows:-

(Table 3)

Species	IV 20-30	III 30-40	IIA 40-50	IIB 50- 60	IA 60-70	IB 70-80	IC 80-90	ID 90-100	Over ID 100+
<i>Quercus semecarpifolia</i>	0.3	1.0	1.8	3.0	4.6	6.4	8.0	9.6	12.2
<i>Aesculus indica</i>	0.3	0.8	1.7	2.7	3.9	5.6	7.1	9.0	12.0
<i>Juglans regia</i>	0.2	0.8	1.5	2.5	3.8	5.1	7.2	8.9	11.3
<i>Acer spp.</i>	0.2	0.7	1.3	2.1	3.3	5.1	6.9	8.5	11.2
<i>Prunus padus</i>	0.1	0.7	1.4	2.2	3.2	4.3	5.6	6.9	9.6
<i>Betula alnoides</i>	0.3	0.9	1.6	2.3	3.3	4.4	5.4	6.6	7.8
<i>Carpinus spp.</i>	0.3	0.9	1.5	2.3	4.0	6.0	7.8	9.7	12.6
<i>Populus ciliata</i>	0.3	0.7	1.4	2.8	4.9	6.8	9.0	11.1	14.5
<i>Cedrella serrata</i>	0.5	1.0	1.8	2.8	4.4	6.0	8.0	9.0	13.3
<i>Rhus spp.</i>	0.3	0.7	1.4	2.0	2.9	4.0	5.1	7.0	10.1
<i>Celtis australis</i>	0.3	0.7	1.3	2.2	3.3	4.6	6.3	8.0	11.1
<i>Alnus nitida</i>	0.3	0.8	1.5	2.2	3.2	4.3	5.7	7.8	11.0
<i>Salix spp.</i>	0.4	0.8	1.5	2.4	3.1	3.9	-	-	-

<i>Robinia pseudoacacia</i>	0.3	0.6	1.0	1.4	1.7	2.0	-	-	-
<i>Buxus sempervirens</i>	0.1	0.2	-	-	-	-	-	-	-

- However for V class trees volume shall be ½ of IV class trees.

8.3 Age-Diameter Relation: - Multiple yield tables for Deodar are available. Trevor during the course of operation of his working plan ascertained the growth of the outturn of Deodar after ring counting over more than 1200 trees. F.R.I. sample plots also existed both in Kullu, Parvati and Seraj Division. Thus F.R.I. figures correspond very well with the terrain, available. The average quality of Deodar in Parvati confirms to I/II. Irregularity in terrain, aspect and soil considerations can thus be ignored. It must however be noted that diameter growth varies with treatment given i.e. grade of thinning. Figures for F.R.I. match with that of Trevor for quality I/II Deodar with E grade thinning. Comparison is given below:-

(Table 4)

Diameter at breast height	Age as per Trevor	Age as per F.R.I. figures.
35 cms(14")	65 Years	64 Years
45 cms (18")	80 Years	90 Years
55 cms (22")	100 Years	124 Years
65 cms (26")	120 Years	160 Years
75 cms (30")	155 Years	212 Years

Figures for different species as worked out by Trevor, without any standardization of crops in quality classes having been done, are given below:-

(Table 5)

Diameter at breast height	Ages in year				
	Deodar	Kail	Chil	Silver Fir	Spruce
35 cms (14")	65	50	60	84	65
45 cms (18")	80	63	85	104	80
55 cms (22").	100	82	109	130	100
65 cms (26")	120	104	143	150	115
75 cms (30")	155	132	NA	180	135
85 cms (34")	-	-	-	-	-

For the current working plan, for Deodar (Quality) I/II according to table 6 on page 30-31 multiple yield tables are given below:-

(Table 6)

Diameter (in cm)	Age (in Year)
10	22
15	30
20	37

25	45
30	64
35	65
40	75
45	90
50	106
55	123
60	140
65	160
70	180

For Silver Fir and Spruce average of data collected by different parties i.e. by Swaran Singh and by ACF research etc. as compiled by Kapoor in his draft working plan is adopted.

(Table 7)

Diameter (cm)	Age (years) Spruce	Age (years) Silver Fir
5	14	23
10	24	40
15	35	57
20	58	94
25	58	94
30	71	109
35	84	124
40	101	142
45	114	162
50	114	180
55	134	200
60	151	221
65	179	-

Data collected by Kapoor for Kharshu and Maple is as follow:-

(Table 8)

Age in years	Diameter in (cm)	
	Kharshu	Maple
10	2	3
20	6	8
30	9	13
40	12	28
50	15	23
60	19	28

70	22	33
80	25	38
90	29	43
100	32	47
110	36	51
120	39	54
130	49	57
140	46	60
150	49	62
160	52	-
170	55	-
180	59	-
190	62	-
200	65	-

For growth of high level broad-leaved species, reliable data is not available. An idea was mooted by Dr. R.V. Singh in his Working Plan for Mandi and Nachan. The same is elaborated below- Let “Z” be the mortality % from approach class to exploitable size and “T” the time taken by approach class to grow to exploitable size, then for different species, the comparison between “T” and ”Z” is as follows:-

(Table 9)

Species	“T” years	“Z”%
<i>Acer spp.</i>	40	40%
<i>Aesculus indica</i>	25	25%
<i>Alnus nitida</i>	25	25%
<i>Betula alnoides</i>	40	40%
<i>Buxus spp.</i>	25	25%
<i>Carpinus spp.</i>	25	25%
<i>Corylus colurna</i>	25	25%
<i>Juglans regia</i>	25	25%
<i>Prunus padus</i>	25	25%
<i>Populus spp.</i>	25	25%

8.4 Quality class assessment: - The quality of Deodar in Parvati conforms to F.R.I. quality class I/II. This figure can be used for Kail and Chil too.

8.5 Density: - Ocular estimate of density has been made and incorporated in each compartment.

8.6 Enumeration: - The enumeration was carried out on the grid system bases in the Sample IDs (Plots) of size 0.1 Ha each. The whole of the area of the Parvati Forest Division was divided into grids and total 1518 Nos. Sample plots were supplied by the Forest Survey of India through Forest Survey of India North Zone at Shimla. Out of these 1518 Nos. Sample plots 20 Nos. Sample plots were located out of Parvati Forest Division. Out of remaining

1497 Nos. Sample plots 489 Nos. were found workable and rest 1008 Nos. were found Non-workable being steep slopes, above 4000 meter elevation, water bodies, agriculture land etc. The enumeration was carried out with the help of GPS 72, Compass, Haga Altimeter and Callipers. The enumerated data was entered in the Plot Enumeration Form and the description of the plot was entered in Plot Description Form (Appendix Page No. 19-23). The enumerated data was submitted to FSI Dehradun for Analysis. The Working Circle wise analyzed data was received in two forms viz i) Land use class (closed, dense, open and scrub). ii) Irrespective of land use class. The land use class wise analyzed data (Stems Per Ha and Volume Per Ha) was then extrapolated to assess the growing stock of Deodar-Kail WC, Fir WC, Protection WC and Broad-Leaved working circle. Total 187 Nos. Sample plots pertaining to these working circles were enumerated. The enumeration has been carried out irrespective of periodic blocks. For the first time the growing stock of IIIrd class forest (UPFs) was also assessed on the basis of Grid System.

8.7 Increment: - Mr. J.C.Sharma in his Working Plan for Deodar/ Kail Working Circle, calculated increment for Deodar as 1.75%, Kail as 1.08%, Fir/Spruce as 1.26%, Chil as 1.86% and other species combined as 1.36%. For Fir Working Circle, the figure was 1.36% for Silver Fir and Spruce. These figures match the annual volume increment percentage, obtained by Forest Survey of India, Shimla for different species of the crop, over entire area covering Kullu-Seraj and Kotgarh Forest Division. The increment % for Deodar is 1.74%, Kail is 1.58%, Chil is 2.16%, and Silver Fir is 1.06% while the Spruce the figure is 1.20%. The said figures are used in the context of the present plan.

8.8 Stock Maps: - Stock maps are prepared for each compartment/sub-compartment on the scale of 1:15,000. Further a management map, on a scale of 1:50,000,

8.9 Growing Stock: -The position of growing stocks, in respect of Mr. J.S Walia's working Plan and current plan, which shows species wise and class wise number of trees of 10 cm and above per hectares and volume per hectares in Deodar/Kail WC, Fir WC, Protection WC and Broad Leaved WC is depicted below:-

(Table 10)

Working Circle	Previous Plan		Current Plan	
	No. per ha	Vol. per ha	No. per ha	Vol. per ha
Deodar /Kail WC	146.274	180.83	243.33	386.19
Fir WC	75.120	172.36	218.18	331.0
Broad Leaved WC	62.040	33.10	246.67	232.99
Protection WC	52.920	178.66	254.25	375.02

From the above, it is observed that there is improvement in growing stock in all working circles. The reason for this improvement can be attributed to ban on green felling during whole plan period coupled with ban on timber distribution from 2006 onward till 2010. Even in 2010-11 and 2011-12 hardly any tree is removed for meeting demand under TD. The growing stock as assessed in the current working plan is realistic one as it has been obtained

with the use of sound technique (Grid System based Sample Plots). The growing stock figures have been calculated differently in both working plans and thus are not exactly comparable.

8.10 Outturn of Sawn Timber: - The conversion % of different species as fixed vide Chapter-XII, Para 123(c) of Punjab Forest Manual:-

(Table 11)

Species	Percentage
Deodar	49%
Kail	40%
Chil	45%
Fir/Spruce	30%

The conversion % as per HPSFC Working Division Kullu is as follows:-

(Table 12)

Species	Percentage
Deodar	55%
Kail	50%
Chil	35%
Fir/Spruce	45%

In order to minimize wastage, fuel wood and pulpwood are also being extracted from the waste wood in Forest Working Division Kullu.

Chapter IX

ESTIMATE OF CAPITAL VALUE OF FORESTS

9.1 Volume and Value of standing trees enumerated: The enumeration has been carried out in 1518 Nos. Sample Plots of size 0.1 Ha each, as provided by FSI. The data was then compiled in the office of Regional Director, MoEF, FSI Shimla and then analyzed by FSI Dehradun. The working circle wise analyzed data was then extrapolated to assess the growing stock of the Parvati Tract. Thus, on the basis of enumerations carried out, total volume of standing trees has been tabulated as under:-

(Table 1)

Species	Deo/Kail WC	Fir WC	Broad Leaved WC	Protection WC	Total	Rate Per cum (Rs.)	Value (in Rs.)
Deodar							
Number	224983	123022	3716	860879	1212600		
Vol.	485236.11	190598.51	2683.59	1675964.50	2354482.71	55904	131625001419
Kail							
Number	306796	102687	29725	3295937	3735146		
Vol.	631857.18	233369.77	138406.47	5374344.50	6377977.92	40126	255922742017
Fir/Spruce							
Number	460183	463619	3716	597696	6904478		
Vol.	974354.11	1232549.10	1486.43	15218077.30	17426466.94	22437	390997638732
Broad Leaved							
Number	625649	774731	375275	12691819	14467474		
Vol.	475597.86	564669.22	247002.50	11400203.58	12687473.16	5476	69476603024
Total Nos.	1617611	1464059	412431	22825596	26319699		
Total Volume	2567045.26	2221186.60	389578.99	33668589.90	38846400.73	Total Value	848021985192

Volume and Value of growing stock assessed in IIIrd class forests:

(Table 2)

Species	Deodar	Kail	Chil	Fir/Spruce	Broad Leaved	Total
Number	69255	1973673	1194644	138509	328960	3705041
Vol.	27459.5	1596200.3	509316.6	127290.2	121057.3	2381323.8
Rate	55904	40126	21117	22437	5476	
Value (Rs)	1535095888	64049133238	10755238642	2856010217	662909774	79858387760

* The rates applied for calculation of value are as per PCCF HP letter No. Ft. 21-700/82(S) Vol. VIII dated 17.08.2017 for the year 2017-18.

9.2 Value of Forest land: - Under different working circles, Range-wise area, in hectares, is tabulated as under:-

Rangewise and Forestwise area statement of Parvati Forest Division (Area in Ha)
(Table 3)

Range	Reserve Forest	Ist class DPF	2nd class DPF	New DPF	UPF	Total
Kasol	932.41	4808.6	124566.70	0	5246.64	135554.35
Jari	251.0	2855.30	2475.90	0	5531.0	11113.2
Hurla	3060.41	4806.96	6245.09	0	4857.20	18969.66
Bhunter	59.89	671.76	0	0	3409.93	4141.58
	4303.71	13142.62	133287.69	0	19044.77	169778.79

For assessment of the total value of the land, the value of land as applicable in FCA cases which was approved by Supreme Court of India can safely be applied. The rate applicable for the Parvati tract is Rs. 699000 and same rate is applied here to calculate the value of land. The total value of land is thus:

$$169778.79 \text{ ha} \times \text{Rs. } 699000 = \text{Rs. } 1,18,67,53,74,210$$

The value of NTFP and grass production is not assessed and is therefore ignored.

The total value of Forests of Parvati Forest Division is assessed as:

$$(848021985192 + 79858387760 + 118675374210) = \text{Rs. } 10,46,55,57,47,162 \text{ only}$$

PART-II

FUTURE MANAGEMENT DISCUSSED AND PRESCRIBED

PART II

CHAPTER I

BASIS OF PROPOSALS

1.1 General Information:-

Himachal Pradesh is predominantly a hilly state. Forests have a significant role with respect to tree cover, soil and water conservation, watershed values as well as aesthetic value which make it a tourist hub. Forests cushion rain and storms discipline the rivers, control floods and ensure equitable and all weather flow of water in rivers and streams. Also called the 'heavenly abode of Gods,' Himachal has started drawing centre stage attention, of all those that are genuinely concerned with the preservation of the Himalayan Eco-System. Through its forests, Himachal had played a stellar role in the economic development of the vast Satluj-Ganga basin and in particular the Indo-Gangetic plains. Environmental and productive services are provided, as also livelihood to the people living in and around the forest. However, the Himalayas are one of the youngest mountain regions of the world, where the land mass has yet to take the final form, its eco-system is most fragile, sensitive and susceptible. Since Himachal form the catchment of the main rivers of North India, thus management of these watersheds have its effect on the flow of water and transport of sediments into the river and reservoirs of Indo-Gangetic plains, which are grainary of India and the very basis of the country's rural economy. Scientific management of forest of Himachal Pradesh must however account for the fact that Himachal is characterized by the diverse physio-climate, which is further rendered distinct by the high gradient and high relative relief variation.

1.2 Forest Policy and Legislation:-

National Forest Policy: The first National Forest Policy was enunciated by the Government of India in 1894. This policy forms the basis of future management strategies of forest in India. In 1904, special rule known as Shimla Forest Conservancy Rule were introduced by the Government of Punjab, under the policy laid down in 1894. By enlarging the scope of the 1894 Forest Policy, a new National Forest Policy was formulated in 1952, which inter alia prescribed the maintenance of forest cover 60% of geographical area, in order to prevent soil erosion and land degradation and to ensure the stability of fragile eco-system of hilly states.

In 1988 the Government of India revised the National Forest Policy, keeping present day requirement. The salient features are:-

- Two third of the area under forest cover in hilly state.
- Environmental stability and maintenance of ecological balance.
- Creating massive people's movement and involvement of women.
- Modification of land laws.
- Alternative avenues of income, suitably harmonized with the right land use practices.
- Strengthening of scientific forestry research and education.
- Relation of right concession to the carrying capacity of forests.
- Protection, improvement and enhanced production of minor forest produce.
- Wild life and biological diversity conservation.
- Establishing a strong data base.
- Use of modern methods to control forest fires.

- Public awareness.
- Strict control on diversion of forest lands for non-forest purpose.

Since forestry is enunciated by the Government of Himachal Pradesh in 1988. The salient features are-

- Settlement of two-thirds of undemarcated and unclassed forests by proper demarcation and settlement in 10 years.
- Game development and preservation to be accorded high priority.
- People's participation in afforestation programmes.
- Attitudinal change in the forest personal and guideline for posting and transfers.
- Mandatory field inspection by forest personal.
- Control on felling strictly in accordance with the prescription of sanctioned working plans.
- Rationalization of provision of rights and concession and their codification.
- Discouraging agriculture on marginal lands.
- Proper watershed management.

Similarly specific guidelines of fruit packing cases, sawmills, grazing, private sales, construction of roads, tourism, minerals etc. were issued.

1.3 GENERAL OBJECTS OF MANAGEMENT: the general objects of management of forests are as under.

- Conservation and improvement of the existing forest cover, prevention of denudation and erosion of hilly slopes. Promotion of appropriate vegetative cover of trees, shrubs, bushes and grass, as the case may be, especially on degraded slopes and land slips. Maintaining of equitable flow of water in streams/rivers and preservation of natural eco-system.
- To improve the stocking of the forests and orientation towards bringing a normal forest condition i.e. a normal distribution of all age classes with normal regeneration, increment and optimum density.
- Meeting legitimate and bonafide domestic and agricultural requirements and needs of local populace for timber, fire wood, grazing, and other forest produce.
- Adoption of participatory management approach.
- Restocking of the Fir forests felled earlier, under concentrated regeneration fellings and supplementing less valuable broadleaved species with healthy useful broadleaved species i.e. Acer, Oaks, Birch, Walnut, Bird cherry, Ash and Horse chest nut etc.
- Improvement of grazing meadows, thatches, 3rd class forests lying near villages to provide quality/quantity grasses and fodder.
- Increasing area under valuable species in all the localities suited to their growth with emphasis on fast growing species.
- Improvement/increase of the minor forest produce base.
- Utilization of salvage trees (dry, dead & fallen/uprooted trees) for economic value through Himachal Pradesh Forest Corporation.
- To maintain and improve the aesthetic beauty of tourist complex areas.
- To maintain ecological balance for the protection, preservation and improvement of wildlife.

1.4 Constitution of Working Circle:-

The National Commission on Agriculture has classified forests into three types, to focus attention on the kind and object of management, necessary in each case.

- Protection forests i.e. such forest that must be preserved or created for physical or climate consideration.

- National forests i.e. those which have to be maintained and managed to meet national/state needs of defense, communication industry and other general purpose of public interest.
- Village forest which cater to the needs of the local for fuel, fodder and timber.

The constitution of Working Circle is based on the silvicultural treatment and laid down general object of management. The Forests of this division have been classified on the above lines as under:-

- a) Protection Forest - Forest allotted to Protection Working Circle (PWC).
- b) National Forests – allotted to the :
 - Deo-Kail Working Circle
 - Fir Working Circle
 - B/L Overlapping Working Circle.
- c) Village forest – All IIIrd class forests (UPF) included in the Grazing and Improvement Working Circle. Thus the following 5 Working Circles are constituted:-
 1. Deodar-Kail Working Circle.
 2. Fir Working Circle.
 3. Protection Working Circle.
 4. Grazing and Improvement Working Circle.
 5. Broad leaved (Overlapping) Working Circle.

In addition following four overlapping working circles are also constituted:-

1. Wild Life (Overlapping) Working Circle.
2. Plantation (Overlapping) Working Circle.
3. Participatory Forest Management (overlapping) Working Circle.
4. Non Timber Forest Produce (Overlapping) Working Circle.

The Working Circle wise allotment of area is given in Volume II Appendix I (Page 1 -18).

1.4.1 Deodar & Kail Working Circle: - This working circle assumes significant importance, considering that it deals with two important economic species, namely Deodar and Kail. The forest of Deodar and Kail lie on comparatively easier terrain, with Silver Fir and Spruce present in the upper reaches and a little Chil present in the lower parts. A more or less intimate mixture of all age classes is present. It is only the forest areas regenerated under shelterwood system in the past which are more or less even aged. The said areas stand allotted to PB-IV or PB-III. The objective to convert uneven aged irregular forest into regular, even aged forest would continue in spite of ban on felling. The Punjab Shelterwood silvicultural system is most appropriate and shall be continued. Aim is to manage each forest so as to contain a complete series from PBI to remaining PBs in itself. Regeneration of PBI is to be given a high priority. Green felling has been banned by the Government and new TD policy shall hopefully regulate felling for timber distribution in more scientific and effective way with lesser TD pressure. This will certainly be going to improve health of the forests in the PBI areas. Natural regeneration must be adequately supplemented with artificial regeneration through

sowing and planting. Management must be geared to follow guidance provided by the nature. Though Deodar is to be favored, it has not to be forced in areas, where only Kail would grow best or where excellent growth of Silver Fir and Spruce exist.

Comparative chart for comparison of present prescription with previous WP:

1. Deo/ Kail working circle								
	Previous Working Plan				Current Working Plan			
Silvicultural system	Punjab Shelterwood System in which natural regeneration will be supplemented with artificial regeneration				Punjab Shelterwood System in which natural regeneration will be supplemented with artificial regeneration.			
Rotation (Exploitable diameter conversion period)	Exploitable diameter is 60cm d.b.h and rotation has been fixed as 120 years				Exploitable diameter is 60cm d.b.h and rotation has been fixed as 120 years.			
Regeneration period	30 years				30 years			
Division into periodic blocks	Four periodic blocks have been formed				Four periodic blocks have been formed			
Calculation of yield	Yield has been calculated by volume for P.B.I (A group), P.B.IV and P.B. III				Yield has been calculated by volume for P.B.I , P.B.IV and P.B. III.			
Prescribed annual yield	The prescribed annual yield in m ³ is as under:				The prescribed annual yield in m ³ is as under:			
Species	Final yield in m³		Inter yield in m³		Final yield in m³		Inter yield in m³	
	P.B.I	P.B.IV	P.B.III	Total	P.B.I	P.B.IV	P.B.III	Total
Deodar	4300	1900	1600	7800	1500	250	200	1950
Kail	3400	2400	600	6400	1600	290	200	2090
Fir/spruce	3100	3100	200	6400	2000	350	250	2600
Chil	38	20	200	258				
Total	10888	7420	2600	20858	5100	890	650	6640
Table of felling.	Felling programme has been laid				Felling programme has been laid.			
Method of executing felling in P.B.I	General principles laid down				General principles laid down.			
Method of executing felling in P.B.III	General principles lay downwith thinningprescribed				General principles lay downwith thinningprescribed.			
Method of executing felling in P.B.IV	General principles laid down				General principles laid down.			
Control of yield	Control of yield for a period of 5 years and plan period to be +/- 10%.				Control of yield for a period of 5 years and plan period to be +/- 10%.			
Subsidiary silvicultural operations in P.B.I	Works as per general principles				Works as per general principles.			
Artificial regeneration in P.B.I	Carried out to supplementnatural regeneration				Carried out to supplement natural regeneration.			
Miscellaneous regulations.	Effective closure of all P.B.I areas prescribed				Effective closure of all P.B.I areas prescribed.			
Right holder requirements	Requirements to meet with as per settlement				Requirements to meet with as per settlement			

Fir Working Circle: - Forest allotted to this Working Circle predominantly, contain Silver Fir and Spruce. However, concentrated regeneration felling, heavy marking to saw millers and Rampant opening up of the areas during 2nd World War, has left these forest in quite a bad shape. Adequate attention thereof has not been given. Many forests continue in a bad shape and have to be kept in PBI, until some amount of regeneration success is achieved. Again like in the Deodar & Kail Working Circle, in each forest, a complete series in itself has been aimed at, for effective scientific management. Management under Punjab Shelterwood System continues. Along nallahs and depressions, *Acer caesium*, *Juglans regia*, Ash, *Prunus padus*, etc. shall be propagated. Artificial regeneration of PBI areas must be given high priority.

Comparative chart for comparison of present prescription with previous WP:

2. FIR WORKING CIRCLE						
	Previous Working Plan			Current Working Plan		
Silvicultural system	Punjab Shelterwood System in which natural regeneration is to be supplemented with artificial regeneration			Punjab Shelterwood System in which natural regeneration is to be supplemented with artificial regeneration		
Rotation (Exploitable diameter conversion period)	Exploitable diameter is 60cm d.b.h. and rotation has been fixed as 120 years			Exploitable diameter is 60cm d.b.h. and rotation has been fixed as 120 years.		
Regeneration period	30 years			30 years		
Division into periodic blocks	Four periodic blocks have been formed			Four periodic blocks have been formed.		
Calculation of yield	Yield has been calculated by volume for P.B.I			Yield has been calculated by volume for P.B.I		
Prescribed annual yield	The prescribed annual yield in m ³ is as under			The prescribed annual yield in m ³ is as under:		
Species	PB-I	PB-IV	Total	P.B.I	P.B.IV	Total
Fir/spruce	9000 cum	1700 cum	10700cum	6400 cum	0	6400 cum
Control of yield	Control of yield for a period of 5 years and plan period to be +/- 10%.			Control of yield for a period of 5 years and plan period to be +/- 10%.		
Felling programme.	Felling programme has been laid			Felling programme has been laid.		
Method of executing felling.	General principles laid down			General principles laid down.		
Subsidiary silvicultural operations in P.B.I	Works as per general principles			Works as per general principles.		
Planting programme and artificial re-generation	Not prescribed			Carried out to supplement natural regeneration.		
Statement showing areas requiring immediate attention.	Spp. Wise detail incorporated.			List of areas to be treated.		

Miscellaneous regulations.	Effective closure	Effective closure of all P.B.areas prescribed.
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1.4.3 Protection Working Circle: - Inaccessible areas under DPFs and RFs are included under this working circle. The forest lie in difficult terrain and stretch beyond the limit of tree growth; they lie at the head of the valleys and streams and are extremely important vis'a vis' soil conservation. Denudation and erosion in these forests have long lasting ill effect in the plains. Silting up of reservoirs/dams, floods, erosion of vulnerable areas causes extreme havoc. The vegetal cover in the forest under Protection Working Circle is required to prevent soil erosion and denudation of hill slopes. Thus essentially, the following types of areas would constitute this working circle –

- a) Predominating steep and precipitous sloped forest areas.
- b) Areas susceptible to soil erosion, owing to the geo-edaphic factors and those that need greater protection of green covers &

Comparative chart for comparison of present prescription with previous WP:

3.PROTECTION WORKING CIRCLE		
	Previous Working Plan	Current Working Plan
Method of treatment	Prescribe to Open department sale depot to fulfill local demand for timber and fuel wood at concession rate and also to restrict felling pressure on the protected forests	The forest must be protected from the point of view of soil conservation; no felling of any sort must be done
Grazing	Grazing, grass cutting and marking of trees must be followed as prescribed as settlement	Grazing, grass cutting and marking of trees must be followed as prescribed as settlement
Fire protection	Engagement of fire watcher and local people, path cleaning, collection of debris and needles, control burning.	Engagement fire watcher and local people, path cleaning, collection of debris and needles, control burning.
Miscellaneous regulations	Closures suggested for carrying out sowing/planting in degraded areas	Closures suggested for carrying out sowing/planting in degraded areas.

1.4.4 Grazing and Improvement Working Circle: - This Working Circle comprises the following types of area.

- a) The alpine pasture
- b) The IIIrd class forests areas-situated in the vicinity of habitations, as these are important.
- c) The potential grazing land scattered all over the tract.

The alpine grazing pastures are urgently required to be made productive. Overall improvement of the quality/quantity of timber, grasses and fodder species in this working circle is to be aimed at.

Comparative chart for comparison of present prescription with previous WP:

4. Grazing and improvement working circle.		
Previous Working Plan	Current Working Plan	Comments
Constitution of new DPFs	<ul style="list-style-type: none"> ❖ Constitution of new DPFs to follow proper management practices to improve the condition of forest which is degrading due to lack of proper management. ❖ Through participation of local people management will be easy and effective. 	New working plan focuses on management of third class forest to improve the condition of degraded forest along with constitution of new DPF to restrict encroachment and also highlights local people participation to resolve issues of grazing routes.

1.4.5 Broad Leaved (Over Lapping) Working Circle: - Existence of Broad leaved species in the forest is of utmost importance and a healthy proportion of these species is to be maintained. Various broadleaved species i.e. *Juglans regia*, *Acer caesium*, *Prunus padus*, *Aesculus indica*, *Fraxinus floribunda*, *Carpinus spp.*, *Celtis australis* etc. are not only commercially important but also add aesthetic, environmental and social value to the forests. Moreover dependence of local people on broad leaved species is much high and accordingly programs like Social Forestry, Joint Forest Management etc advocated introduction of broad leaved species. Since these species found in a varying proportion and varying patch sizes in Deodar & Kail as well as Fir working circles, thus necessitating an overlapping working circle. Pure patches of broadleaved are observed in nalas and depression, where soil depth is more and moisture is present. Intimate mixture with conifers is also there. Economical significance is being attributed to broadleaved species, necessitating scientific management of present resources and propagation in future, through extensive afforestation drives. Two broad classifications are required and not felling series, considering ban on felling. One group should consist of only pure stands of Oak while the other group should consist of other broadleaved species.

Comparative chart for comparison of present prescription with previous WP:

5. Broad Leave(overlapping) working circle		
Previous Working Plan	Current Working Plan	Comments
<ul style="list-style-type: none"> ❖ Closing of artificial regenerated area must be close at least for 15 years ❖ Artificial regeneration of oak must be carried out through nursery plants rather than coppicing ❖ Lopping must be checked 	<ul style="list-style-type: none"> ❖ Introduction of fruit bearing and medicinal plant should be encouraged ❖ No B/L trees felling should be resorted. ❖ New plantation should be carried out ❖ Efforts to enhance B/L trees in forest should be carried out. ❖ Special effort needs to plant kharshu, Oak ❖ Planning of rehabilitation and management is need to be done as biotic pressure is very heavy 	<p>New working plan focuses on planting B/L spp. Especially kharshu oak in high altitude and kosh and popular in bihal (banks of river and its tributaries) for stability and biovegetative measures and shall also facilitate need of right holders and increase aesthetic value of forest.</p>

1.4.6 Plantation (Overlapping) WC: - This overlapping WC is created for rehabilitation of degraded areas in and around vicinity of the villages by involving local people under the ambit of Participatory Forest Management rules so as to address their day to day demands of fuel, fodder and timber on the one hand and ensure environmental stability and ecological balance.

1.4.7 Wild Life (Overlapping) WC: -This Working Circle is constituted for emphasizing the necessity of conservation of wildlife and collection of information for better management of wild life. The whole tract has a variety of wild animals and birds since the forests are distributed from low elevation to the high snow bound areas. Therefore, this working circle overlaps all other working circles. There is Kanawar Wildlife Sanctuary inside Parvati Forest Division and Khokhan and Nargu Wildlife Sanctuaries adjoining this Forest Division which are administered by the Divisional Forest Officer Wildlife at Kullu. In addition, govt. has notified its intentions to create a new National Park named Khirganga National Park comprising areas of Kasol and Jari Ranges.

1.4.8 Participatory Forest Management (overlapping) WC: -The framework for JFM in HP is provided by the Government of HP Order of 12 May 1993, which followed the June 1990 Government of India (JFM) Circular enabling the spread of JFM. The concept of Joint or Participatory Forest Management is an intervention to evolve organized and collective thinking on the issues of forest management keeping in view the fact that the forest resources are limited and the claim over these are varied, no single solution can satisfy the needs of all.

The philosophy aims at involving all the stakeholders in resource generation activities through motivation, active involvement in the process of management and sharing of benefits through adequate institutional arrangements.

The Govt. of HP has notified Himachal Pradesh Participatory Forest Management Regulations, 2001 and the Sanjhi Van Yojna Scheme, 2001 which have strengthened the JFM approach to a great extent. Constitution, strengthening and involving JFMC's in whole tract so as to ensure proper protection and conservation of forests is aimed at through this working circle.

1.4.9 Non Timber Forest Produce (Overlapping) WC: -This would be an overlapping working circle covering the entire working circle and is constituted to ensure systematic development and exploitation of non-timber forest produce species that occur in the division. The main non timber forest produce found/extracted in the division are Medicinal plants, Cedar wood oil, minor minerals and grasses. The main emphasis/focus would be on medicinal plants its management, extraction cycle and conservation efforts.

1.5 Blocks and Compartment:- The rule followed is to keep forest and compartments as small units of roughly around 40 hectares. Natural features i.e. nalas, ridges/dhars, paths etc. have been kept as boundaries. Composition of the crop has also been kept in account while framing compartments. In only a few cases where natural feature absent, arbitrary lines from boundary pillar have been specified. However in forests which are inaccessible, precipitous, and rocky with unculturable terrain area of forest remained more than 40 ha. Detail of forest and compartments would feature in the concerned working circle.

1.6 Working Circles, their areas and distribution: - There are 5 main working circles where area allotment has been done and others are overlapping working circles. The details of area allotted is in Volume II Appendix –I (page- 1-18)

Area details Range-wise, Working Circle wise is as per table given below (ha):

Area distribution: Rangewise and Working Circlewise							
Sr. No.	Name of Range	Deodar/Kail W.C.	Fir Working Circle	B/L	Improv.	Protection	Total
1	Bhunter	664.07	67.58	0	0	0	731.65
2	Hurla	2268.11	1910.17	1629.79	0	8304.39	14112.46
3	Jari	1577.09	821.51	0	0	3183.66	5582.26
4	Kasol	2137.8	3911.01	42.30	0	124217.20	130308.3
	Total	6647.07	6710.27	1672.09	0	135705.25	150734.68

1.7 The Period of Plan: The period of plan shall be 15 years with effect from 01.04.2018 to 31.03.2033. Midterm review of the Working Plan will be taken up on the expiry of 5th year of the plan i.e. in the year 2023-24.

1.8 Distribution of the area: Total geographical area of the tract is 201133.83 ha. The area of the forests according to their classification is given below Range wise:

Rangewise and Forestwise area statement of Parvati Forest Division						
Area statement (in Ha.) (Present Working Plan)						
Range	Reserve Forest	Ist class DPF	2nd class DPF	New DPF	UPF	Total
Kasol	932.41	4808.6	124566.70	0	5246.64	135554.35
Jari	251.0	2855.30	2475.90	0	5531.0	11113.2
Hurla	3060.41	4806.96	6245.09	0	4857.20	18969.66
Bhunter	59.89	671.76	0	0	3409.93	4141.58
	4303.71	13142.62	133287.69	0	19044.77	169778.79

Intermediate revision of Working Plan to be carried out as per guidelines issued by government from time to time. This working plan needs to be reviewed after 5 year. Working plan revision is necessary periodically so as to respond to any unforeseen changes as requirements in future from managerial/ technical point of view.

CHAPTER –II

DEODAR & KAIL WORKING CIRCLE

2.1- General Constitution: Deodar-Kail Working Circle, the name given to the Regular Working circle of Aggarwal, Kapoor, J.C.Sharma and J.S. Walia Working plan is being continued. It includes all the reserved & demarcated protected forests situated on comparatively moderate & gentle terrain, which has Deodar & Kail as principle species. Essentially the forests remain as grouped together under J.C.Sharma's plan. Exercise to shift oak forests to Broad Leaved Working Circle and transfer of important aesthetic & religious consideration forests of Kasol & Jari and some forests having steep/ precipitous, terrain to Protection working circle has already been done. In this plan some forests areas stand transferred to the Wild Life Wing and these need to be excluded from this Working Circle. The following forests stand excluded:-

2.1.1 Statement showing areas transferred from and received by Deodar/ Kail Working Circle (as per previous working plan)

(Table –1)

Area transferred to D&K WC from						
Division	Range	PWC	WL Division	Total	Net +/-	Area of circle (ha)
Parvati	Kasol	101.25	412.38	513.63	(-) 513.63	1888.07
	Jari	-	-	-	-	1571.72
	Hurla	-	-	-	-	2267.65
	Bhunter	-	419.94	419.94	(-) 419.94	1065.89
	Total	101.25	832.32	933.57	(-) 933.57	6793.33

2.1.2 Statement showing areas transferred from and received by Deodar/ Kail Working Circle (during current working plan)

(Table 2)

Area transferred to D&K WC from						
Division	Range	PWC	WL Division	Total	Net +/-	Area of circle (ha)
Parvati	Kasol	-	249.80	249.80	+249.80	2137.87
	Jari	-	-	-	-	1577.09
	Hurla	-	-	-	-	2268.11
	Bhunter	-	401.82	401.82	(-) 401.82	664.07
					Total	6647.07

2.1.3 List of forests of Deodar/ Kail Working Circle handed over to Wild Life Division as per previous working plan are given below-

(Table-3)

Name of Range	Name of Forests	Area (ha)
Bhunter Range	R/10 Niaraghar C-Ia	34.00
	R/10 Niaraghar C-Ib	25.25
	R/10 Niaraghar C-Ic	35.75
	R/10 Niaraghar C-Id	33.99
	1/43 Nagni C-Ia	22.50
	1/43 Nagni C-Ib	38.85
	1/43 Nagni C-Ic	25.66
	1/43 Nagni C-IIb	12.95
	1/43 Nagni C-IIb	36.42
	1/43 Nagni C-IVa	23.06
	1/43 Nagni C-IVb	13.35
	2/65 Auriban C-I	19.02
	2/65 Auriban C-II	30.35
	2/66 Lot Banog C-I	34.80
	2/66 Lot Banog C-II	33.99
Kasol Range	R/4 Kasol C-IIa	33.19
	R/4 Kasol C-IIb	121.41
	R/4 Kasol C-IIc	41.68
	1/9 Khobas C-Ia	33.59
	1/9 Khobas C-Ib	26.71
	1/9 Khobas C-Ic	30.35
	1/9 Khobas C-IIc	125.45
	Total	832.32

2.1.4 List of forests of Deodar/ Kail Working Circle handed over to Wild Life Division during current working plan are given below-

(Table 4)

Name of Range	Name of Forests	Area (ha)
Bhunter	R/9 Rajgiri C-Ia	29.18
	R/9 Rajgiri C-Ib	47.08
	R/9 Rajgiri C-Ic	29.38
	R/9 Rajgiri C-IIa	70.8
	R/11 Dukam C-I	31.16
	R/11 Dukam C-III	46.54
	1/46 Dukam C-Ia	40.47
	1/46 Dukam C-Ib	24.28
	1/46 Dukam C-IIa	28.75
	1/46 Dukam C-IIb	19.81
	1/46 Dukam C-III	34.39
	Total	401.84

2.1.5 Statement showing forest received by Deodar/ Kail Working Circle from WL Division.

(Table 5)

Sr. No	Name of Forest	Compartment	Area (Ha)	PB
1	R/4 Kasol	CIIa	33.7	I
2	1/9 Khobas, Ist Class DPF	CIa	33.59	II
		CIb	26.71	III
		CIc	30.35	I
		CIHc	125.45	III
		Total	249.8	

2.2 General character of the vegetation: - The Forests in this Circle contain a large proportion of Ist class forests, which lie at low altitudes and near the vicinity of villages. Economically these forests are significant as they deal primarily with Deodar & Kail. Forests confirm to 12/C-Ie (Himalayan moist temperate forests), 12/C-If (Low level Blue Pine forests) of H.G. Champion & Seth (Revised Survey of the forest Types of India-1964). Forests mentioned have also been described in Chapter 2 of Part I. The forest crop is mainly Deodar & Kail which occur either gregariously, or in mixture of varying proportions. In the mixed stands, the mixture is by groups as well as by single species. Upper reaches and nalas of the forests contain a mixture of Deodar and Kail with Silver Fir and Spruce. Poles and saplings of Spruce form an understorey in some of the forests, especially on cooler northern aspects. In lower altitudinal zone, spurs and warmer aspects, Chil is contained. Depressions and nalas contain various broad leaved species i.e. Oaks, *Aesculus indica*, *Juglans regia*, *Acer caesium*, *Prunus padus* etc. Heavy lopping of Oak is witnessed. Deodar is confined to cooler aspects and depressions with the crop generally being irregular. The older plantations however have an even-aged crop. Preponderance of poles and middle aged classes is there, with mature Deodar trees lying scattered mostly. Stocking has been rendered poor near villages, due to heavy timber distribution marking. Stocking is also poor on southern slopes or on steep ground. Quality I/II Deodar and Kail trees are found in the tracts. Natural regeneration of Deodar is observed on cooler aspects while it is inadequate on southern dry aspects. Kail colonizes blanks and exposed spurs and shows increased proneness to fire and attack by *Trametes pinii*.

2.3 Block and compartments: - Mr. J.C. Sharma subdivided the compartments in such a way, that area of each does not go more than 40 hectares for intensive and scientific management. The composition of the crop and the configuration of the terrain have been kept in view. The three compartments (C-I, C-II and C-III) in 1/22 Salas Gahar Forest have been merged as a Whole compartment for management purpose. Natural features have been kept as boundaries of the compartments. Boundary pillars, especially intermediate boundary pillars must be given due attention.

2.4 Felling series: - Only one felling series is prescribed.

2.5 Special objects of management: - Special objectives of management consistent with the general objectives are elaborated below –

1. To preserve and protect the forests in consonance and in conformity with the policy of H.P. State Government. The objective being to maintain a healthy

ecosystem and pristine beauty of the forests so as to develop this area as major eco-tourism hub.

2. To meet the legitimate and genuine demands of local people for timber fuelwood etc as per policy of the govt.
3. Gradual conversion of irregular crop into normal even aged crops.
4. Restocking of the PBI areas in a planned, organized manner through resorting to artificial regeneration.
5. To obtain progressive yield in perpetuity.
6. To avoid sacrifice of immature stock, by retaining compact well grown groups of poles as part of future crop.

2.6- Area and allotment: - Area as per the legal classification and range wise distribution of forests is given below –

(Table- 6)

Range	Reserve Forests	DPF Ist class	DPF IInd class	Total
Kasol	228.99	981.56	927.32	2137.87
Jari	251	1326.09	-	1577.09
Hurla	493.41	1630.78	143.92	2268.11
Bhunter	59.89	604.18	-	664.07
Total	1033.29	4537.24	1070.78	6647.07

2.6.1:- Statement of area as per Periodic Blocks (Rangewise): -

(Table-7)

Range	PBI	PBII	PBIII	PBIV	Total
Kasol	633.95	972.34	377.73	153.78	2137.8
Jari	581.79	609.72	333.78	51.80	1577.09
Hurla	808.21	1238.39	199.26	22.25	2268.11
Bhunter	179.17	330.84	77.17	76.89	664.07
Total Area	2203.12	3151.29	987.94	304.72	6647.07

2.6.2:- Statement showing area under different species (in ha):-

(Table 8)

Range	Deodar	Kail	Fir/ Spruce	B/L	Total
Kasol	297.33	405.45	608.17	826.84	2137.8
Jari	219.35	299.11	448.66	609.98	1577.09
Hurla	315.46	430.17	645.24	877.24	2268.11
Bhunter	92.36	125.95	188.92	256.84	664.07
Total	924.50	1260.68	1890.98	2570.91	6647.07

2.6.3:- Statement showing area under thaches, culturable /un-culturable blanks:-**(Table-9)**

Range	Culturable	Unculturable blank	Thaches blank	Mixed crop	Workable area	Total area
Kasol	99.26	117.59	232.08	0.50	1787.63	2137.8
Jari	80.76	34.63	16.87	0.75	1524.84	1577.09
Hurla	76.36	109.92	36.29	13.75	2108.15	2268.11
Bhunter	39.24	58.01	0	0	606.06	664.07
Total	295.62	320.15	285.24	15	6026.68	6647.07

2.7- Analysis and valuation of the crop: - The old stock maps of Walia's plan have been up dated giving different colours to different species as per the working plan code. The descriptions of the compartments and sub compartments have been rewritten, updated and posted in the respective compartment History files.

2.8- Site quality: - A compartment / sub compartment is assigned a quality class through ocular estimation of height and diameter of dominant trees. FRI multiple yield tables have been used and quality classes kept as I/II for deodar and Kail.

2.9- Density: - In the compartment History files have been placed, density estimates of the crop assessed ocularly. Average is 0.6(Range varying from 0.4 to 0.8).

2.10- Enumeration: - The enumeration was carried out on the grid system bases in the Sample IDs (Plots) of size 0.1 Ha each. The whole of the area of the Parvati Forest Division was divided into grids and total 1518 Nos. Sample plots were supplied by the Forest Survey of India through Forest Survey of India North Zone at Shimla. Out of these 1518 Nos. Sample plots 20 Nos. Sample plots were located out of Parvati Forest Division. Out of remaining 1497 Nos. Sample plots 489 Nos. were found workable and rest 1008 Nos. were found Non-workable being steep slopes, above 4000 meter elevation, water bodies, agriculture land etc. The enumeration was carried out with the help of GPS 72, Compass, Haga Altimeter and Callipers. The enumerated data was entered in the Plot Enumeration Form and the description of the plot was entered in Plot Description Form (Appendix Page No. 19-23). The enumerated data was submitted to FSI Dehradun for Analysis. The analyzed data was received in two forms viz i) Land use class (closed, dense, open and scrub). ii) Irrespective of land use class. The land use class wise analyzed data (Stems Per Ha and Volume Per Ha) was then extrapolated to assess the growing stock of this working circle. Total 39 Nos. Sample plots pertaining to this working circle were enumerated. The enumeration has been carried out irrespective of periodic blocks. The detailed forest wise enumeration results are in Volume-II, Appendix-III, Page No. 24-66.

2.10.1 Enumeration Results (Stems Per Ha) of Deodar/Kail Working Circle**(Table 10)**

Spp. Code	Species	Diameter Class (CM)							Total
		10-20	20-30	30-40	40-50	50-60	60-70	70+	
2	<i>Abies pindrow</i>	9.744	15.128	13.077	7.179	4.615	3.333	7.949	61.025
3	<i>Abies smithiana</i>	1.026	0.513	1.282	0.513	1.282	1.282	2.308	8.206
19	<i>Acer</i>	0.513	0.256	0.769	0.000	0.513	0.000	0.000	2.051

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	<i>acuminatum</i>								
25	<i>Acer species</i>	1.282	0.769	0.513	1.282	0.000	0.256	0.000	4.102
38	<i>Aesculus indica</i>	2.051	0.769	0.769	1.538	0.256	0.256	0.769	6.408
61	<i>Alnus nitida</i>	0.256	0.769	0.513	0.000	0.000	0.256	0.000	1.794
139	<i>Bauhinia purpurea</i>	1.026	0.769	0.769	0.256	0.000	0.000	0.000	2.820
141	<i>Bauhinia retusa</i>	0.256	0.000	0.513	0.000	0.000	0.000	0.000	0.769
153	<i>Betula alnoides</i>	0.256	0.000	0.000	0.000	0.000	0.000	0.000	0.256
155	<i>Betula utilis</i>	3.590	1.282	0.256	0.000	0.000	0.000	0.000	5.128
240	<i>Cedrela toona</i>	1.026	1.026	0.513	0.256	0.000	0.000	0.000	2.821
241	<i>Cedrus deodara</i>	4.872	4.103	6.154	7.436	2.821	2.564	5.897	33.847
243	<i>Celtis australis</i>	3.590	1.026	0.256	0.000	0.000	0.256	0.000	5.128
314	<i>Cupressus torulosa</i>	0.000	0.000	0.256	1.538	0.000	0.000	0.256	2.050
651	<i>Juglans regia</i>	0.000	0.513	0.000	0.513	0.513	0.000	0.513	2.052
926	<i>Pinus excelsa</i>	10.000	9.487	4.105	2.564	5.128	5.641	6.154	43.079
929	<i>Pinus roxburghii</i>	0.513	0.000	0.256	0.256	0.769	0.256	1.026	3.076
950	<i>Populus cillata</i>	0.000	0.000	0.000	0.256	0.000	0.000	0.000	0.256
965	<i>Prunus cornata</i>	3.077	1.282	0.513	0.256	0.000	0.000	0.000	5.128
969	<i>Prunus species</i>	0.000	0.000	0.000	0.256	0.000	0.000	0.000	0.256
992	<i>Pyrus pashia</i>	1.795	0.000	0.000	0.000	0.000	0.000	0.000	1.795
994	<i>Pyrus communis</i>	0.513	0.000	0.000	0.000	0.000	0.000	0.000	0.513
1004	<i>Quercus acutissima</i>	1.282	0.256	0.000	0.000	0.000	0.000	0.000	1.538
1006	<i>Quercus dilatata floribunda</i>	1.538	0.000	0.769	0.000	0.000	0.000	0.256	2.563
1014	<i>Quercus leucotrichophora</i>	0.256	0.769	2.308	0.256	0.000	0.000	1.538	5.127
1018	<i>Quercus semiserrata</i>	0.000	0.256	0.000	1.795	1.026	0.513	0.513	4.103
1038	<i>Rhododendron arboreum</i>	1.282	2.308	1.026	0.256	0.513	0.000	0.000	5.385
1045	<i>Rhus species</i>	0.256	0.000	0.000	0.000	0.000	0.000	0.000	0.256
1047	<i>Robinia pseudocacia</i>	1.282	0.000	0.000	0.000	0.000	0.000	0.000	1.282
1162	<i>Taxus baccata</i>	2.821	3.077	2.564	0.799	0.513	0.000	0.000	9.774
2000	<i>Rest Of Species</i>	9.744	7.436	1.282	1.538	0.000	0.000	0.769	20.769
	Total	63.847	51.794	38.463	28.743	17.949	14.613	27.948	243.357

2.10.2 Enumeration Results (Volume Per Ha) of Deodar/Kail Working Circle

(Table 11)

Spp. Code	Species	Diameter Class (CM)							
		10-20	20-30	30-40	40-50	50-60	60-70	70+	Total
2	<i>Abies pindrow</i>	1.462	7.516	12.037	11.57	10.709	10.729	52.698	106.721

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3	<i>Abies smithiana</i>	0.117	0.101	1.029	0.689	2.916	5.142	29.869	39.863
19	<i>Acer acuminatum</i>	0.044	0.109	0.620	0.000	1.281	0.000	0.000	2.054
25	<i>Acer species</i>	0.210	0.310	0.515	1.735	0.000	0.867	0.000	3.637
38	<i>Aesculus indica</i>	0.336	0.219	0.805	2.299	0.497	0.749	5.662	10.567
61	<i>Alnus nitida</i>	0.008	0.143	0.188	0.000	0.000	0.455	0.000	0.794
139	<i>Bauhinia purpurea</i>	0.056	0.089	0.287	0.158	0.000	0.000	0.000	0.590
141	<i>Bauhinia retusa</i>	0.012	0.000	0.159	0.000	0.000	0.000	0.000	0.171
153	<i>Betula alnoides</i>	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.010
155	<i>Betula utilis</i>	0.434	0.334	0.244	0.000	0.000	0.000	0.000	1.012
240	<i>Cedrela toona</i>	0.099	0.452	0.381	0.339	0.000	0.000	0.000	1.271
241	<i>Cedrus deodara</i>	0.511	1.459	4.779	11.127	6.556	8.324	40.244	73.00
243	<i>Celtis australis</i>	0.382	0.319	0.148	0.000	0.000	0.917	0.000	1.766
314	<i>Cupressus torulosa</i>	0.000	0.000	0.107	1.053	0.000	0.000	0.891	2.051
651	<i>Juglans regia</i>	0.000	0.202	0.000	0.710	1.157	0.000	3.852	5.921
926	<i>Pinus excelsa</i>	1.156	3.700	4.134	4.212	12.822	21.053	38.951	86.028
929	<i>Pinus roxburghii</i>	0.044	0.000	0.168	0.344	1.547	0.846	6.081	9.030
950	<i>Populus ciliata</i>	0.000	0.000	0.000	0.235	0.000	0.000	0.000	0.235
965	<i>Prunus cornata</i>	0.131	0.164	0.126	0.135	0.000	0.000	0.000	0.556
969	<i>Prunus species</i>	0.000	0.000	0.000	0.235	0.000	0.000	0.000	0.235
992	<i>Pyrus pashia</i>	0.066	0.000	0.000	0.000	0.000	0.000	0.000	0.066
994	<i>Pyrus communis</i>	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.021
1004	<i>Quercus acutissima</i>	0.082	0.029	0.000	0.000	0.000	0.000	0.000	0.111
1006	<i>Quercus dilatata floribunda</i>	0.135	0.000	0.619	0.000	0.000	0.000	2.794	3.548
1014	<i>Quercus leucotrichophora</i>	0.016	0.211	1.232	0.201	0.000	0.000	7.612	9.272
1018	<i>Quercus semiserrata</i>	0.000	0.068	0.000	1.41	1.276	1.053	1.804	5.611
1038	<i>Rhododendron arboreum</i>	0.111	0.515	0.530	0.234	0.969	0.000	0.000	2.359
1045	<i>Rhus species</i>	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.007
1047	<i>Robinia pseudocacia</i>	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.048

1162	<i>Taxus baccata</i>	0.283	0.677	1.715	0.817	0.985	0.000	0.000	4.477
2000	<i>Rest Of Species</i>	1.311	0.599	1.018	0.000	0.000	4.378	7.854	15.16
	Total	7.092	17.21	30.841	37.50	40.715	54.513	198.31	386.192
			6		3			2	

2.10.3 Extrapolated Enumeration Results of Deodar/Kail Working Circle

(Table 12)

Deo/Kail Working Circle (1)		39 Nos Sample IDs						Total Area of WC: 6647.07 Ha	
Species		Diameter Class (CM)							Total
		10-20 (V)	20-30 (IV)	30-40 (III)	40-50 (IIA)	50-60 (IIB)	60-70 (IA)	70+ (IB or above)	
Deodar	Number	32385	27273	40906	49428	18751	17043	39198	224983
	Volume (CM)	3397	9698	31766	73962	43578	55330	267505	485236
Kail	Number	69881	63061	28988	18745	39198	39198	47726	306796
	Volume (CM)	7976	24594	28596	30284	95512	145564	299331	631857
Fir/Spruce	Number	71589	103967	95445	51129	39198	30676	68179	460183
	Volume (CM)	10496	50631	86851	81486	90566	105496	548829	974354
Broad Leaved Species	Number	250541	149978	90327	71755	22161	10217	30670	625649
	Volume (CM)	25272	29513	57790	63553	40979	55962	202530	475598
	Total Number	424395.5	344279	255666	191057	119308	97134.1	185772.8	1617611
	Total Volume	47141.02	114436	205002	249285	270635	362352	1318194	2567045

2.11 Silvicultural System:- Silvicultural system adopted for this working circle is “Punjab Shelter-Wood System”. The said system permits felling according to the configuration of the ground and retention of immature growing stock as advance growth. Artificial regeneration is to be resorted to after 3 years of the seeding felling if the area has not been completely regenerated naturally. The Punjab Shelter-Wood system helps avoid unnecessary sacrifice of immature pole crop and protects area from soil denudation, as it does not allow for felling of trees in steep and precipitous terrain. Markings on selection fellings principles are proposed.

2.12 Choice of Species: - The principle should always be to favour such species that is ideally suited to a certain locality. In the Deo/Kail Working Circle, Deodar and Kail grow side by side in a mixture. It is only in plantations raised artificially, during the last 75-90 years, that deodar occurs pure. Kail comes up in the drier, sunny areas. Thus propagating Deodar on hot southern slopes and exposed ridges is not proper. These areas are ideal for Kail. Pockets containing Silver Fir and Spruce should be left as such and not felled to give way to Deodar planting. However to foster Deodar, preference to retain Deodar as seed bearer, instead of Kail or Spruce, is proper. Kail is susceptible to fire damage and attack by the fungus *Tremetes pinii*. Thus wherever site permits, Deodar should be propagated. Scientific cleanings, thinnings and improvement felling be resorted to favour this species.

Depressions, nalas, moist locations favour broad- leaved species and these must be retained and fostered. There are various broad- leaved species that are economically advantageous i.e. *Acer caesium*, *Juglans regia*, *Prunus padus*, *Aesculus indica* , Ash, *Carpinus*, Poplar, etc. One must never resort to violent transformations. Choice of species is ideally picked up, through lessons derived from nature which teaches us the best silviculture. Generally Deodar does well below 2500m, while spruce and Silver Fir grow well on higher altitudes. Susceptibility and treatment map for various sites should be well- planned and executed.

2.13 Rotation & conversion period:- Since the forests are under conversion, the rotation is merely of academic interest. Further due to complete ban on felling of green trees since 1980, the process of conversion to uniform has virtually terminated. However a conversion period of 120 years as proposed in previous Working Plan is thus adopted.

2.14 Exploitable Diameter: - Exploitable diameter is fixed at 60 cm d.b.h. This diameter is economically viable and corresponds to rotation kept.

2.15 Regeneration Period: - Looking to growth trend, the regeneration period is kept fixed at 30 years. It is estimated that in this period, the Deodar plants will have attained a stage of saplings to young pole crop. The period is suitable legally also, as it is maximum period for which a forest can be closed to grazing and other rights of villagers.

2.16 Division into periods: - With a rotation of 120 years and regeneration period of 30 years, the circle will be divided into four periodic blocks.

2.16.1 Periodic Block I: - The PB-I was divided into two groups in previous working plan namely group A –areas of un felled PB-I and some of the PB II areas being the best available as far as the maturity of the crop is concerned of JC Sharma's WP and Group B that include the felled PB-I areas of JC Sharma's WP where regeneration is still progressing. Since continuous ban on green felling continued from 1980 onwards and likely to extend further, therefore there is no justification to continue with two groups in PB-I.

In present working plan, forests having a preponderance of mature to over mature age classes have been allotted to this periodic block along with PB-I areas of WP under revision where regeneration has not come up . In some of the forests of this PB, sizeable openings have been created due to heavy marking under Timber distribution, salvage lots and forest fires. The objective is to restock and rehabilitate them progressively.

2.16.1.1 Areas under PB-I

(Table 13)

Range	Name of Forest	Compartment/Sub Compartment	Area(ha)	Total
Kasol	R/4 Kasol	C-IIa	33.7	633.95
	1/2 Reuni	C-IV	23.07	
	1/3 Bekhal Ser	C-II	6.47	
	1/4 Pajbanag	C-IIa	52.35	
	1/4 Pajbanag	C-IIb	40.12	
	1/8 Shathali Gahar	C-IIa	30.32	
	1/8 Shathali Gahar	C-IIb	34.43	
	1/9 Khobas	C-Ic	30.35	
	1/9 Khobas	C-IIIa	82.15	
	2/1 Surjani	C-Ia	48.97	

	2/1 Surjani	C-Ib	12.95	
	2/2 Nalchi	C-Ia	43.50	
	2/3 Toshnala	C-Vb	63.88	
	2/3 Toshnala	C-Vc	62.43	
	2/3 Toshnala	C-IXc	69.27	
Jari	R/5 Soma Chalon	C-Ib	5.26	
	R/6 Bindraban	C-IIa	22.58	
	1/10 Rani-Thati	C-II	64	
	1/11 Dunkramul	C-II	45.73	
	1/11 Dunkramul	C-IIIa	32.56	
	1/11 Dunkramul	C-IIIb	36.24	
	1/13 Rakotan	Whole	16.59	
	1/14 Oridhar	C-Ia	41.25	
	1/14 Oridhar	C-Ib	5.26	
	1/15 Jariban	C-I	17.4	
	1/15 Jariban	C-II	33.59	581.79
	1/18 Khanoru-Nal	C-Ia	16	
	1/18 Khanoru-Nal	C-Ib	21.08	
	1/18 Khanoru-Nal	C-Ic	50.33	
	1/18 Khanoru-Nal	C-IIIb	22.55	
	1/18 Khanoru-Nal	C-IIIe	35.37	
	1/19 Rajthati	C-IIIa	18.30	
	1/19 Rajthati	C-IIIb	30.25	
	1/19 Rajthati	C-IIIc	12.10	
	1/33 Shahita	C-Ia	40.75	
	1/35 Rasu	Whole	14.60	
Hurla	R/7 Diyar	Whole	28.73	
	R/12 Nihara-Gahar	C-IVa	81.80	
	R/12 Nihara-Gahar	C-IVb	46.98	
	R/12 Nihara-Gahar	C-VIa	39.00	
	1/20 Cheri-Thach	C-IIa	54.00	
	1/21 Khoru-Thach	C-IIb	25.70	
	1/21 Khoru -Thach	C-VIIb	33.94	
	1/25 Neri-Dhar	C-I	12.14	
	1/25 Neri-Dhar	C-II	10.12	
	1/26 Shilanda	C-I	16.10	808.21
	1/26 Shilanda	C-II	17.40	
	1/27 Sis Gahar	C-I	21.44	
	1/29 Gotich	C-II	41.30	
	1/29 Gotich	C-III	37.00	
	1/29 Gotich	C-IV	55.00	
	1/33 Juli Gahar	C-IIb	15.75	
	1/33 Juli Gahar	C-IIc	48.50	
	1/35 Illagahar	C-Ib	26.10	
	1/35 Illagahar	C-IIb	29.98	
	1/35 Illagahar	C-IIIa	34.90	
	1/40 Gobha	C-Ia	56.38	
	1/40 Gobha	C-Ib	52.88	

	2/16 Osan Banala	C-II	23.07	
Bhunter	R/8 Sandhar	C-II	35.61	179.17
	1/44 Kawara Gahar	C-Ia	42.39	
	1/44 Kawara Ghar	C-IIb	36.42	
	1/44 Kawara Ghar	C-IIIa	36.75	
	1/44 Kawara Ghar	C-IIIb	28.00	

2.16.1.2 Range wise areas in PB-I**(Table 14)**

Range	Forest area
Kasol	633.95
Jari	581.79
Hurla	808.21
Bhunter	179.17
Total	2203.12

2.16.2-Periodic Block II: - Those forests having a preponderance of maturing age classes have been allotted to this periodic block. The Rangewise area in PB-II is as under:

(Table 15)

Range	Forest area
Kasol	972.34
Jari	609.72
Hurla	1238.39
Bhunter	330.84
Total	3151.29

2.16.3- Periodic Block III: - The crop is mostly pole to middle-aged with scattered mature trees which occur in varying proportions. Mostly these forests are open and contain predominantly younger age classes. The Rangewise area in PB-III is as under:

(Table 16)

Range	Forest area
Kasol	377.73
Jari	333.78
Hurla	199.26
Bhunter	77.17
Total	987.94

2.16.4- Periodic Block IV: - The crop in this periodic block is sapling to young pole stage with scattered mother trees and groups of advance growth retained as part of future crop. The Rangewise area in PB-IV is as under:

(Table 17)

Range	Forest area
Kasol	153.78
Jari	51.80
Hurla	22.25
Bhunter	76.89
Total	304.72

2.17 Comparison of growing stock of present working plan and Mr.J.S Walia's plan:-**(Table-18)**

Number/Volume Per Ha	J.S Walia Working Plan	Current Plan
No of Trees Per Ha	124.67	243.33
Volume of Trees Per Ha	194.94	386.19

2.18:- Record of removals: - During the plan period, the moratorium on green felling continued and no green tree was felled for commercial felling. However, marking of green trees for timber distribution continued upto 2006, when Hon'ble High Court imposed ban on any type of extraction till finalization of new TD policy. The new TD policy was notified by the govt. in 2010 and then in 2016. Salvage removals, however, continued throughout the plan period, except for a short stint in 2006. The detail of removals during plan period is as under:

The details of felling / removals (Salvage and T.D.) during previous WP period are as under:-

(Table-19)

Species	PBI	PBII	PBIII	PBIV	Total
Deodar	135.1	215.6	2554.96	536.5	3442.16
Kail	2615.7	4700.8	4000.05	420.7	11737.25
Fir	465.73	514.97	12682.86	1144.3	14807.86
Rai	238.71	352.77	1848.05	321.49	2761.02
Tosh	4304.07	4.1	2098.43	7.93	6414.53
Kosh	0	7.2	0	0	7.2
Ban (dry)	0	0	31.6	0	31.6
Chil	0	31.8	94.4	2.9	129.1
Rakhal	0	0	0.6	0	0.6
Spruce	0	0	7330.73	0	7330.73
Mappel	0	0	22.4	0	22.4
Grand Total	7759.31	5827.24	30664.08	2433.82	46684.45

2.19- Calculation of Yield:- Although the yield calculations are redundant considering that there is a total ban on green felling, however just for academic interest yield calculations have been done for PBI, PBIV and PBIII on the basis of extrapolated enumeration results of working circle. Increment has been ignored for the reasons of safety against fire and other natural calamities and also to serve as emergency reserve. The yield we get from PBI and PBIV is designated as final yield while the yield from PBIII is called intermediate yield. Removals on account of TD must feature in the yield and must be strictly controlled.

2.19.1-Yield from PBI: - The enumeration of this working circle has been carried out in 39 Nos. sample plots of size 0.1 Ha each supplied by FSI. The Per Hectare Stems and Volume was then extrapolated to PB-I area (2203.12 Ha) to calculate the yield just for academic interest. Theoretically, leaving aside mother trees above 40cm in diameter, the entire growing stock should be considered for the plan period. However advance growth compact

groups, trees on broken ground, and trees under emergency reserve and fire insurance must also be retained. Trees standing on blanks or over patches where regeneration has not established must also not be made available.

Yield on the basis of silvicultural availability is calculated as under:-

$$Y = \frac{C1V1+C2V2+C3V3}{P}$$

Where V1, V2 and V3 are the volumes of Ist class, IInd class and IIIrd & IV class trees respectively, P is the length of plan i.e. 15 years and C1, C2 and C3 are constants which have been considered the same as in Mr. J.C.Sharma's plan as they are reliable and emerged after considering field conditions.

(Table 20)

Species	C1	C2	C3	
Deodar	0.5	0.5	0.5	% is lower for Deodar as these are to be retained
Kail	0.7	0.6	0.5	As seed bearers as far as possible in preference to Kail
Spruce/Fir	0.6	0.5	0.5	
Chil	0.6	0.6	0.5	

Calculations:-

Deodar- Total volume of Ist class trees = 107001

Total volume of IInd class trees = 38957

Total volume of IIIrd and IV class trees = 13743

Average Yield = $(107001 \times 0.5 + 38957 \times 0.5 + 13743 \times 0.5) / 15 = 5323 \text{ m}^3$ or say 5300 m^3

Kail - Total volume of Ist class trees = 147457

Total volume of IInd class trees = 41694

Total volume of IIIrd and IV class trees = 17629

Average Yield = $(147457 \times 0.7 + 41694 \times 0.6 + 17629 \times 0.5) / 15 = 9136 \text{ m}^3$ or say 9100 m^3

Spruce/Silver Fir: - Total volume of Ist class trees = 216870

Total volume of IInd class trees = 57025

Total volume of IIIrd and IV class trees = 45567

Average Yield = $(216870 \times 0.6 + 57025 \times 0.5 + 45567 \times 0.5) / 15 = 12094 \text{ m}^3$ or say 12000 m^3

However the total species wise increment for PB-I is calculated as under:-

PB-I		
Species	Total growing stock (Vol. in Cum)	Increment (Vol. in Cum)
Deodar	160828	2814
Kail	209424	3308
Fir/Spruce	322942	4069

Thus the yield (50 % of increment) of various species rounded off to nearest hundred is summarized as below: -

Deodar	= 1500 m³
Kail	= 1600 m³
Spruce/Silver Fir	= 2000 m³

2.19.2- Yield from PB-II: - No fellings are to be done in this block except removal of dead and uprooted trees only.

2.19.3- Intermediate yield from PBIII: - This block has an open crop which normally meets the ever rising requirement of TD for right holders. The annual increment put up on the growing stock existing in this block is as follows-

I) Deodar:

Total volume = 72120 cum, Annual increment = $(72120 \times 1.75) / 100 = 1262 \text{ m}^3$

II) Kail:

Total volume = 93912 cum, Annual increment = $(93912 \times 1.58) / 100 = 1483 \text{ m}^3$

III) Fir/Spruce:

Total volume = 144816 cum, Annual increment = $(144816 \times 1.26) / 100 = 1824 \text{ m}^3$

It is estimated that 20% of the annual increment will be available for felling. Hence the following yield is fixed for PBIII-

(Table 21)

Deodar	Kail	Spruce/Fir
252.4 m ³	296.6 m ³	364.8 m ³
Or say 250 m ³	Or say 290 m ³	Or say 350 m ³

2.19.4-Yield from PBIV

The Per Hectare Stems and Volume enumeration results of this working circle were extrapolated to PB-IV (304.72 Ha). Increment is ignored for calculating yield, which has been based on the total volume of trees in the periodic block. Removal of all Ist and IInd class trees cannot be done as we must retain trees standing on precipitous and broken ground, retain trees as fire insurance and national emergency reserves. Trees, i.e. IInd class trees standing amongst patches of advance growth are not to be felled. Thus we must continue to keep 25% of the Ist and IInd class trees under silvicultural criterion. Further 10% of trees under the 20cm to 40cm d.b.h class will be available for thinning. Formulae to calculate the annual yield

Annual Yield = $(V_1 \times 0.75 + V_2 \times 0.10) / P$ would have P being the plan period of 15 years while V I is the volume of Calculations-

I) Deodar:

Total volume of Ist and IInd class trees = 20188 m³

Total volume of IIIrd and IV th class trees = 1900 m³

$$AY = (20188 \times 0.75 + 1900 \times 0.1) / 15 = (15141 + 190) / 15 = 1022 \text{ m}^3 \text{ or say } 1000 \text{ m}^3$$

II) **Kail:**

Total volume of Ist and IInd class trees = 26162 m^3 ,

Total volume of IIIrd and IV th class trees = 2438 m^3 ,

$$AY = (26162 \times 0.75 + 2438 \times 0.10) / 15 = (19621 + 243) / 15 \text{ m}^3 = 1324 \text{ m}^3 \text{ or say } 1300 \text{ m}^3.$$

III) **Spruce/Silver Fir:**

Total volume of Ist and IInd class trees for fir/spruce = 37883 m^3

Total volume of IIIrd and IV th class trees of fir/ spruce = 4213 m^3 ,

$$AY = (37883 \times 0.75 + 4213 \times 0.10) / 15 = (28412 + 421) / 15 \text{ m}^3 = 1922 \text{ m}^3 \text{ or say } 1900 \text{ m}^3.$$

However the annual increment available from this PB is calculated as under:-

Species	Total growing stock in Cum	Increment in Cum
Deodar	22249	389
Kail	28966	457
Fir/Spruce	44667	562

Therefore the prescribed yield (50 % of increment) is as under:-

Deodar **200 m³**
Kail **200 m³**
Fir/Spruce **250 m³**

2.19.5-Total Prescribed Yield: -The prescribed annual yield is given below with the yield from PBIII not available for commercial sales.

(Table 22)
(Yield prescribed in m³)

Species	PBI	PBIII	PBIV	Total
Deodar	1500	250	200	1950
Kail	1600	290	200	2090
Spruce/Fir	2000	350	250	2600
Total	5100	890	650	6640

2.20-Table of fellings:

(Table 23)

YEAR	RANGE	FOREST	COMPTT.	AREA(ha)		
				P.B-I	PB III	PB-IV
2018-19	Hurla	R/7 Diyar	Whole	28.73	-	-
		1/27 Sis Gahar	C-I	21.44	-	-
			C-III	-	22.5	-
2019-20	Jari	R/5 Soma Chalon	C-Ib	5.26	-	-

			C-IIIa	-	22.53	-
			C-IIIb	-	58.00	-
		1/1 Gahar Nal	C-I	-	11.73	-
			C-II	-	-	14.57
2020-21	Hurla	1/20 Cherithach	C-IIa	54.00	-	-
	Hurla	R/12 Niahara Gahar	C-IVa	81.8	-	-
			C-IVb	46.98	-	-
			C-VIa	39.00	-	-
	Kasol	R/1 Pulga	C-I	-	35.04	-
		R/4 Kasol	C-Ic	-	26.96	-
			C-Id	-	19.92	-
			C-If	-	23.10	-
			C-IIa	33.7	-	-
2021-22	Jari	1/11 Dunkramul	C-II	45.73	-	-
			C-IIIa	32.56	-	-
			C-IIIb	36.24	-	-
		1/10 Rani Thati	C-II	64.00	-	-
	Hurla	1/21 Khoruthach	C-IIb	25.70	-	-
			C-IIc	-	36.02	-
			C-IVa	-	29.50	-
			C-IVd	-	31.20	-
			C-VIIb	33.94	-	-
2022-23	Bhunter	R/8 Sandhar	C-II	35.61	-	-
		1/42 Mulgthana	C-I	-	36.42	-
		1/45 Charawat	C-IIa	-	40.75	-
	Jari	R/6 Bindraban	C-IIa	22.58	-	-
		1/12 Sharan	C-Ia	-	36.42	-
		1/13 Rakotan	Whole	16.59	-	-
2023-24	Hurla	1/29 Gotich	C-II	41.30	-	-
			C-III	37.00	-	-
			C-IV	55.00	-	-
		2/16 Osan Banala	C-II	23.07	-	-
	Kasol	1/2 Reuni	C-IV	23.07	-	-
		1/3 Bekhal Ser	C-II	6.47	-	-
2024-25	Kasol	1/9 Khobas	C-Ic	30.35	-	-
			C-IIIa	82.15	-	-
		2/1 Surjani	C-Ia	48.97	-	-
			C-Ib	12.95	-	-
		2/2 Nalchi	C-Ia	43.50	-	-
	Jari	1/14 Oridhar	C-Ia	41.25	-	-
			C-Ib	5.26	-	-
		1/15 Jariban	C-I	17.40	-	-
			C-II	33.59	-	-
2025-26	Kasol	1/4 Pajbanag	C-IIa	52.35	-	-
			C-IIb	40.12	-	-
		1/8 Shathali Gahar	C-IIa	30.32	-	-

			C-IIb	34.43	-	-
	Bhunter	1/44 Kawara Gahar	C-Ia	42.39	-	-
			C-IIb	36.42	-	-
			C-IIIa	36.72	-	-
			C-IIIb	28.00	-	-
2026-27	Bhunter	1/44 Kawara Gahar	C-IVa	-	-	43.56
			C-IVb	-	-	33.33
	Hurla	1/33 Juli Gahar	C-IIb	15.75	-	-
			C-IIc	48.50	-	-
			C-IId	-	47.46	-
		1/26 Shilanda	C-I	16.10	-	-
			C-II	17.40	-	-
2027-28	Kasol	2/3 Tosh Nala	C-Ia	-	-	44.74
			C-Ib	-	-	109.03
			C-Va	-	51.75	-
			C-Vb	63.88	-	-
			C-Vc	62.43	-	-
			C-IXc	69.26	-	-
2028-29	Kasol	1/9 Khobas	C-IIc	-	125.45	-
	Jari	1/18 Khanoru Nal	C-Ia	16.00	-	-
			C-Ib	21.08	-	-
			C-Ic	50.33	-	-
			C-IIb	-	48.05	-
			C-IIIa	-	21.43	-
			C-IIIb	22.55	-	-
2029-30	Jari	1/18 Khanoru Nal	C-IIId	-	23.45	-
			C-IIIE	35.37	-	-
		1/9 Rajthati	C-IIIa	18.30	-	-
			C-IIIb	30.25	-	-
			C-IIIc	12.10	-	-
			C-IVa	-	42.00	-
	Hurla	1/35 Illagahar	C-Ib	26.10	-	-
			C-IIb	29.98	-	-
			C-IIIa	34.90	-	-
		1/25 Neri Dhar	C-I	12.14	-	-
			C-II	10.12	-	-
2030-31	Hurla	1/40 Gobha	C-Ia	56.38	-	-
			C-Ib	52.88	-	-
	Kasol	2/4 Rati Runi	C-I	-	68.80	-
	Jari	1/33 Shahita	C-Ia	40.75	-	-
			C-IIa	-	13.00	-
		1/35 Rasu	Whole	14.70	-	-
2031-32	Jari	1/34 Khajri Kalon	Whole	-	11.75	-

2.21.1-Method of executing fellings in PBI:- C.C.F's technical order No.2 of Punjab Forest Manual volume III elaborates the technique of regeneration markings . Pasting of a detailed treatment map of forest, indicating the types of marking carried out is required in the compartment history files. Aim must always be sustained yield. Natural regeneration must never be jeopardized. Herein lies the skill of the forester to successfully manipulate canopy and conserve all the favourable locality factors. On well-drained soil, Deodar must be preferred to Silver Fir and Spruce, in the course of artificial regeneration. On damp sites, favouring Silver Fir and Spruce, the opening should conform to the requirements of the species, aiming at maximum natural regeneration. In moist, damp areas, in depressions and nalas, broad-leaved species do very well naturally and should be preferred to remain as such. The following principles are however laid out:-

1. About 30 to 35 trees per hectare should be aimed at. Thus average distance of seed bearers shall be 16 to 18 meters in case of Deodar and 18 to 20 meters in case of Kail.
2. Seed bearers should be mature, well grown, healthy, tall and clean boled. Trees of IA & II should be selected. Lower branches of mother trees should be pruned to free the young plants from over-head shade.
3. After conforming with the distance criterion, as far as possible, seed bearers shall be left on spurs and ridges and not in depressions for better seed dispersal.
4. conforming to requisites of Punjab Shelter wood system, retain advance growth/future crop. These are groups of healthy poles up to 40 cm diameter (diameter at the time of first marking i.e. seeding felling), not less than 0.1 hectares in extent and having density 0.4. For retention of pole crop, the vigor and condition of the pole crop must be kept in mind. Pole crop retained are to be opened up for regeneration in subsequent years. No seed bearer will be retained in patches of advance growth, retained as part of future crop.
5. Selection criterion must hold on very steep, broken ground.
6. In mixed crops, Deodar is preferred to Kail.
7. Thinning in the groups of pole crop retained is required.
8. Valuable broad-leaved trees i.e. *Acer caesium*, *Juglans regia*, *Prunus padus*, *Celtis australis* and *Carpinus spp.* are to be preferred. Seed bearers should be spaced about 20 meters apart.

2.21.2-Method of fellings in PBII areas: No fellings are prescribed in this periodic block. Only dead, dying, diseased, moribund trees are to be marked and felled.

2.21.3- Method of fellings in PBIII areas: Felling in this block is meant for the improvement of crop. The rules are as follows-

1. Removals are aimed at improving the condition and composition of the crop. Thinning is to be favoured irrespective of vigorously growing trees.
2. No tree shall be marked to induce regeneration.
3. Dead, dying, diseased, moribund, stunted and unhealthy, wind damaged and fallen trees are to be marked.
4. No removals are to be done if the stocking is less than what normally can be expected as per yield table figures.

5. Remove mature trees that interfere with or suppress young, healthy crop and prefer valuable species to inferior ones. Broad – leaved species should not be cut unnecessarily on the pretext of improvement fellings.
6. All trees marked for any purpose shall be removed within a year. Thinning should conform to the principles laid down in Punjab Forest Leaflet numbers I and IA and well within yield table check.

2.21.4-Method of executing fellings in PBIV:- The marking should correspond to final removal of over wood which suppress and stand over the young crop. Thinning in patches of advance growth is also required. General principles laid down are-

1. Markings are not to obtain or induce regeneration. They are to free the established regeneration, through removal of the over wood i.e. class I and II trees.
2. All solitary II and III trees which stand amongst young crop and which would end up becoming wolf trees are to be removed.
3. Carry out thinning in groups of poles and patches of advance growth retained.
4. All marked trees likely to damage young crop underneath should first be lopped before felling.
5. Do not mark and fell broad – leaved species on the pretext of improvement fellings . Lop them where they are found to suppress the young crop.

2.22-Control of Yield:- It would not be prudent to assume that the removals of various species in a particular year would conform to or be equal to the prescribed yield for each species . Markings must be done only on silvicultural basis. Yield is to be shown species wise in control forms and deviation statement. It must be borne in mind that fellings must correspond to the progress of regeneration. This is very important as in the past; fellings did not correspond to the afforestation drive, with the result that quite a lot of pristine forests were rendered blanks. All removals down to 10cm d.b.h. in all the periodic blocks count towards prescribed yield. Progress of regeneration must always be the index to monitor fellings. The yield should not exceed the prescribed yield, by more than 15% during a particular year and cumulative be 10% over a period of 5 years. The TD removals constitute an important component of yield and must be strictly monitored, so that the limit prescribed for annual yield in a year is not exceeded. Territorial DFOs must be made accountable if the said limit is surpassed, as this is the prime reason for depletion in forest wealth.

2.23-Subsidiary Silvicultural Operations in PBI:-Green felling is at present banned in the state. However as and when fellings are done in PBI as per prescription, the subsidiary silvicultural operations are to be carried out immediately after felling.

- As per Punjab Forest Leaflet number 6 prescription, fellings refuse is to be disposed off. Felling debris removal is urgently required.
- To foster growth of young regeneration, remove inferior species which interfere with their healthy growth. Weeding and bush cutting is urgently required. Remove those trees that are damaged and those marked trees which continue to remain unfelled. Lop those broad – leaved trees which interfere with the growth of younger conifer crop.
- Cleaning operations and climber cutting be done to foster regeneration.
- Shrub cutting be done to provide a clean seed bed.

- Effective barbed wire closure is to be done to check grazing.
- Control burning be done to foster healthy growth.
- Mechanical thinning can be done in thickets.

2.24-Artificial regeneration in PBI area:-Effective closure coupled with judicious manipulation of the canopy is very important, to induce good natural regeneration. Considering that a good seed year may not synchronize with the year of fellings it is very important to go in for artificial regeneration immediately, otherwise there is risk of proliferation of weeds and bushes. Punjab leaflet number 3 and 4 lays down the required technique of artificial regeneration. It is of prime importance to raise temporary nurseries of conifers and broad-leaved species, at close proximity to the PBI, area well in advance of year of fellings. Planting must be done in the rainy season following the year of exploitation. Patch and line sowing of Deodar should be done very sparingly. Artificial regeneration should be done through planting with Deodar two and a half years old. Deodar plants of age one and a half year too would work in good Deodar zones provided nursery has been raised appropriately. Healthy plants should definitely be more than 25cms in height. On dry and exposed sites, Kail would be able to come up satisfactorily. Attempts to convert Spruce and Silver Fir forests into Deodar forests must be avoided. Only in degraded forests below 2400meters, Deodar artificial planting be done. Nalas and moist locations favour broad – leaved planting. Indicators of good Deodar sites are those where the following bushes grow, but do not form a dense cover i.e. *Sarcococca saligna*, Strawberry, *Viola*, Maiden hair fern, *Ainslaea*, etc. In such places natural regeneration would compliment artificial regeneration. However where weeds like Iris, Balsam, *Strobilanthes*, *Spiraea sorbifolia*, *Dipascus* and *Plectranthus* are dominant, there conditions are not suitable for natural regeneration of Deodar. In refractory areas suffering from heavy weed growth and overgrazing, artificial regeneration has to be tackled with real effort. It would always be economical to regenerate areas promptly after seeding fellings. Normally within 5-7 years of seeding fellings area should be regenerated.

Nature provides us the best approach regarding species vis'a vis' site. In thaches, phats, shallow rocky southern and south western slopes Kail should be the preferred species; otherwise grasslands should be enriched with nourishing grasses and kept as pastures. This would keep the local populace tuned to the forest department activities and would not antagonize them to resort to conflict situations.

Along with tackling normal regeneration operations in the PBI, areas there are certain problematic areas which require species attention. These are the degraded and depleted forests, as also the fire burnt areas. Artificial regeneration efforts taken in the past have been mixed. Adequate protection is must and maintenance should be regular and systematic. A list up to the areas is given below:-

2.24.1 Statement showing the areas requiring attention:

(Table 24)

Range	Forest	Comptt.	Area (Ha)	Area to be tackled	Species	Cultural Operations	Remarks
Bhunter	1/44 Kawara Gahar	C-Ia to C-IVb	399.82	399.82	Deodar/ Kail	Cleanings	Fire Hazards
	1/45 Charawat	C-Ia to C-IIb	136.38	136.38	Deodar/ Kail	Cleanings	Fire/ Soil Erosion
Hurla	1/23 Masu	C-Ia to C-III	195.45	195.45	Deodar/ Kail	-	Fire

	Dimkari						Hazards
	2/16 Osan Banala	C-I to C-IV	71.59	71.59	Deodar/ Kail	-	Fire Hazards
	1/26 Shilanda	C-I & C-II	33.50	33.50	Deodar/ Kail	Cleaning	Fire Hazards
	1/25 Neri Dhar	C-I & C-II	22.26	22.26	Deodar/ Kail	-	Fire Hazards
	1/22 Salas Gahar	Whole	68.00	68.00	Deodar/ Kail	-	-
Jari	1/19 Rajthathi	C-Ia to C-IVb	256.11	55.00	Deodar/Fir Spruce	Thinning/ Cleaning	Soil Erosion
	1/33 Shahita	C-Ia to C-III	171.55	75.00	Deodar/ Kail	-	Fire/ Soil Erosion
Kasol	1/2 Reuni	C-I to C-Va	277.21	150.00	Deodar/ Kail	-	Fire Hazards
	2/1 Surjani	C-I & C-II	61.92	61.92	Deodar/Kail/ Spruce	Cleaning	Grazing/ Fire

2.25- Miscellaneous Regulations:-

2.25.1 Closure: There is no denying the fact that effective closure is most essential for the success of a plantation. It is thus imperative to close a felled area from grazing, immediately after disposal of felling refuse. The closure must continue until the regeneration has established. Normally this would take 30 years. Issuance of government notification in this respect is very important to avoid legal complications.

2.25.2 Grazing: While taking up areas for regeneration and closure, a judicious mix must be kept vis'a vis' grazing rights as defined in the settlement report. This is a right which must be recognized, in case joint forest management is to be aimed at. Live hedge fencing should be done along with barbed wire fencing as it takes quite some time to establish.

2.25.3 Grass cutting: In areas which are not under regeneration, grass cutting should not be restricted. In PBI we must allow the plants to grow to a height of 1 meter, before we can allow grass cutting, under strict supervision of field staff, which must ensure that the plants are not cut along with the grass.

2.25.4 Right holder requirement: Demand of the right holders for TD timber is increasing day by day. However the DFO territorial must ensure that the annual yield prescribed must not be allowed to be surpassed. He must also ensure that TD is marked only in the approved Periodic Blocks prescribed. No trees are to be marked from PBI areas after seeding fellings have been done, till the regeneration is fully established. Marking and fellings must not be done for TD in PBII areas. From PBIII only such trees are to be removed that can be taken out on improvement fellings or in thinning. All the trees marked to the right holders shall count towards yield. Settlement must always be adhered to. IIIrd class forests are being ruined, primarily because the ownership vests with the Revenue Department while the management is through the forest Department. These forests are heavily burdened with rights of the local populace, plus there are blatant transgressions i.e. encroachments. Even in the DPF's excess and unsilvicultural TD markings have rendered areas to have permanent gaps in the canopy.

2.25.5 Fire protection: It is of prime importance to protect our forest from fires. Incendiary forest fires must be checked and controlled. Fire lines, inspection paths and bridle paths should be maintained and fire watchers, engaged during dry season, must ensure strict vigil. In case of fires, local help is a must and where ever this is not forthcoming,

curtailing of TD right must be strictly done. The forest floor must be kept clean of inflammable material such as debris, unwanted bushes, weeds, needles and grass.

2.25.6 Regeneration Survey: The regeneration survey of the felled PBI areas should be done as laid down under Para 57 of the Working Plan Code. Assessment of regeneration for effective planning is a must. Failures are to be effectively curtailed. Fellings are justified only when the success of regeneration is ensured.

2.25.7 Natural calamities: In case of natural calamities, the said area should be transferred as a PBI area.

CHAPTER III

FIR WORKING CIRCLE

3.1-General Constitution: - All such Reserve Forests and DPFs which predominately contain Silver Fir and Spruce are kept in this Working Circle. The few changes done in the area of this working circle are as under: -

3.1.1 Statement showing the area transferred from and received by the Fir Working Circle.

(Table 1)

Range	Area as per previous Working Plan	Area transferred to Wild Life	Area received from Wild Life	Change (+/-)	Area of Working Circle (Ha)
Kasol	3730.80	0	180.08	(+)180.08	3910.88
Jari	821.51	0	0	0	821.51
Hurla	1910.18	0	0	0	1910.18
Bhunter	828.40	760.80	0	(-)760.80	67.58
Total	7290.89	760.80	180.08	(-)580.72	6710.27

3.1.2 Range wise list of forests transferred to Wildlife Division from Fir working Circle (as per previous working plan)

(Table 2)

<u>Name of Range</u>	<u>Name of Forest</u>	<u>Compartment</u>	<u>Area in ha.</u>
Kasol Range	R/3 Grahana	Whole	3.23
	2/9 Raona	C-Ia	102.04
	2/9 Raona	C-Ib	78.04
	2/9 Raona	C-IIa	48.44
	2/9 Raona	C-IIb	59.62
	2/9 Raona	C-IIc	52.92
	2/9 Raona	C-IId	61.75
	2/9 Raona	C-IIe	33.29
	2/9 Raona	C-IIf	106.98
	2/9 Raona	C-IIIa	54.71
	2/9 Raona	C-IIIb	76.25
	2/9 Raona	C-IIIc	73.00
	2/9 Raona	C-VIb	65.55
	2/9 Raona	C-VIc	49.25
	2/9 Raona	C-VId	60.50
		Total	925.57
Bhunter Range	R/10 Niaragahar	C-IIa	78.50
	R/10 Niaragahar	C-IIb	38.75
	R/10 Niaragahar	C-IIc	44.67
	R/10 Niaragahar	C-IId	50.00

	R/10 Niaragahar	C-IIe	39.00
	1/43 Nagni	C-IIa	33.99
	1/43 Nagni	C-IIIa	14.16
		Total	299.07 ha.

3.1.3 Range wise list of forests transferred to Wildlife Division from Fir working Circle (Current Working Plan)

(Table 3)

<u>Name of Range</u>	<u>Name of Forest</u>	<u>Compartment</u>	<u>PB</u>	<u>Area in ha.</u>
Bhunter	R/9 Rajgiri	C-IIb	III	29.56
	2/63 Matiana	C-Ia	III	51.22
	2/63 Matiana	C-Ib	III	22.45
	2/63 Matiana	C-Ic	II	26.90
	2/63 Matiana	C-I d	III	63.38
	2/63 Matiana	C-Ie	III	69.30
	2/63 Matiana	C-I f	III	64.19
	2/63 Matiana	C-IIa	I	48.77
	2/63 Matiana	C-IIb	I	40.92
	2/63 Matiana	C-IIc	II	38.20
	2/63 Matiana	C-II d	II	39.60
	2/63 Matiana	C-IIe	III	43.00
	2/63 Matiana	C-II f	III	46.48
	2/63 Matiana	C-IIIa	III	52.16
	2/63 Matiana	C-IIIb	III	33.65
	2/63 Matiana	C-IIIc	III	38.04
	2/63 Matiana	C-IIId	III	53.00
		Total		760.80

3.1.4 Range wise list of forests received from Wildlife Division from Fir working Circle (included in current working plan)

(Table 4)

<u>Name of Range</u>	<u>Name of Forest</u>	<u>Compartment</u>	<u>P.B</u>	<u>Area in ha.</u>
Kasol Range	2/9 Riuna Ist class DPF	CIa	III	102.04
	2/9 Riuna Ist class DPF	CIb	III	78.04
		Total		180.08

3.2 General Character of the vegetation:- The forests types as per Champion and Seth's classification conform to 12/C-Id (Himalayan moist temperate mixed coniferous forests), 12/C-IIb (Western Himalayan Upper Oak- Fir forests), 12/C-Ie (Moist temperate deciduous forests) on moist location and along nalas. Silver Fir and Spruce are the main species, with the former predominating on the higher reaches and the latter available lower down. In cooler localities and depressions, Silver Fir descends down to 2500 meters whereas along spurs and warmer regions, Spruce penetrates higher up. Scattered Deodar is found on rocks and precipices while Kail may be observed on exposed spurs and ridges. Depressions, moist locations and nalas contain various broad-leaved species i.e. *Acer caesium*, *Prunus padus*, *Aesculus indica*, *Juglans regia*, *Corylus colorna*, *Carpinus spp.*, *Celtis australis*, *Betula alnoides* etc. Kharsu Oak is found mixed with Silver Fir or pure at the top belt. In the forests of Khirganga, Toshnala and Patalsu, *Betula alnoides* occurs pure along the tree line. *Taxus baccata* forms the understorey in some of the Silver Fir/Spruce forests. Because of excess demand for packing cases, pressure from remote saw-millers and excess marking after exaggerating yield, the Fir forests have been left understocked. A preponderance of mature and overmature stock is available, many of the overmature stock being hollow and unsound. Local, remote saw-millers have got away with the best boles, for manufacture of packing cases while the crop retained is unhealthy. Younger age classes, fair amount of advanced growth and poles, are also observed on sloping ground. Natural regeneration is observed in tracts with Open canopy & well drained soil, and where grazing is controlled and weed growth has been kept to a minimum, and in forests away from habitations.

3.3-Special Objects of Management: - Consistent with the general objects of management, the special objects of management are-

- A) To improve the existing stocking of the forests by supplementing natural regeneration of Silver Fir and Spruce with artificial regeneration.
- B) To continue the efforts towards conversion of irregular forests into regular forests.
- C) To avoid sacrifice of immature stock by retaining compact well grown groups of poles, as part of future crop.

3.4-Area statement: - The area statement by PBs according to the legal classification and Rangewise distribution of the forests is given below (in hectares)

Statement of Area and growing stock of current plan (PB-wise)

The details of area allotted is in Volume II Appendix –I (page 1-18)

(Table 5)

Range	PBI	PBII	PBIII	PBIV	Total area in hac
Kasol	1358.32	2197.61	280.72	74.30	3911.01
Jari	473.06	247.35	101.11	0	821.51
Hurla	744.00	1087.67	78.50	0	1910.17
Bhunter	46.54	0	21.04	0	67.58
Total	2621.92	3532.69	481.36	74.30	6710.27

Growing stock**Number trees Per Ha = 218.18****Volume Per Ha (m³) = 331.00****3.4.1** Statement showing area under different species (in hectares)**(Table 6)**

Range	Deodar	Kail	Fir/ Spruce	B/L	Total
Kasol	328.52	273.77	1238.23	2069.58	3910.10
Jari	69.01	57.51	260.09	434.71	821.32
Hurla	160.45	133.71	604.76	1010.80	1909.72
Bhunter	5.68	4.73	21.40	35.75	67.56
Total	563.66	469.72	2124.48	3550.84	6708.70

3.4.2 Different types of areas i.e whether culturable/ non –culturable, thach etc.**(Table 7)**

Range	Culturable area	Un-culturable area	Thach	Mixed crop	Workable area	Total area
Kasol	80.13	128.29	247.33	-	3535.39	3911.01
Jari	5.25	37.82	43.81	-	739.88	821.51
Hurla	41.00	242.99	5.79	-	1661.40	1910.17
Bhunter	8.31	30.75	14.03	-	22.80	67.58
Total	134.69	439.85	310.96	-	5959.47	6710.27

3.5-Blocks and Compartments:- Efforts had been made earlier to subdivide all such compartments, that were more than 40 hectares in area, into smaller units for the purpose of intensive and scientific management of forests, giving due consideration to the composition of the crop and configuration of the ground. Proper blazing rings on trees were done to facilitate enumeration work. The same blocks and compartments are continued in this working plan also.

3.6-Felling Series:- Only one felling series is made.

3.7-Analysis and valuation of the crop:-

3.7.1 Site quality:- The overall site quality is I/II.

3.7.2 Density:- Ocular estimates of density have been made and incorporated in the compartment history files. Average density varies from 0.3 to 0.6.

3.7.3 Enumerations:- The enumeration was carried out on the grid system bases in the Sample IDs (Plots) of size 0.1 Ha each. The whole of the area of the Parvati Forest Division was divided into grids and total 1518 Nos. Sample plots were supplied by the Forest Survey of India through Forest Survey of India North Zone at Shimla. Out of these 1518 Nos. Sample plots 20 Nos. Sample plots were located out of Parvati Forest Division. Out of remaining 1497 Nos. Sample plots 489 Nos. were found workable and rest 1008 Nos. were found Non-workable being steep slopes, above 4000 meter elevation, water bodies, agriculture land etc. The enumeration was carried out with the help of GPS 72, Compass, Haga Altimeter and Callipers. The enumerated data was entered in the Plot Enumeration Form and the description of the plot was entered in Plot Description Form (Appendix Page No. 19-23). The enumerated data was submitted to FSI Dehradun for Analysis. The analyzed

data was received in two forms viz i) Land use class (closed, dense, open and scrub). ii) Irrespective of land use class. The land use class wise analyzed data (Stems Per Ha and Volume Per Ha) was then extrapolated to assess the growing stock of this working circle. Total 66 Nos. Sample plots pertaining to this working circle were enumerated. The enumeration has been carried out irrespective of periodic blocks and only working circle wise data has been analyzed. The detailed forest wise enumeration results are in Volume-II, Appendix-III, Page No. 24-66.

3.7.4 Enumeration Results (Stems Per Ha) of Fir Working Circle

(Table-8)

Spp. Code	Species	Diameter Class (CM)							Total
		10-20	20-30	30-40	40-50	50-60	60-70	70+	
2	<i>Abies pindrow</i>	9.697	7.727	8.030	6.515	4.848	2.879	7.424	47.121
3	<i>Abies smithiana</i>	2.424	1.818	2.121	2.576	2.576	2.273	8.182	21.970
17	<i>Acacia tortolis</i>	0.303	0.152	0.455	0.303	0.152	0.000	0.000	1.364
19	<i>Acer acuminatum</i>	3.485	2.576	0.909	1.364	0.455	0.909	0.455	10.152
25	<i>Acer species</i>	1.364	0.152	0.152	0.000	0.000	0.000	0.909	2.576
38	<i>Aesculus indica</i>	0.303	0.152	0.455	0.152	0.000	0.000	0.455	1.515
153	<i>Betula alnoides</i>	1.364	1.515	0.303	0.000	0.000	0.000	0.000	3.182
155	<i>Betula utilis</i>	1.667	2.727	1.364	0.455	0.152	0.303	0.000	6.667
170	<i>Buchanania latifolia</i>	0.000	0.909	0.152	0.152	0.000	0.000	0.000	1.212
240	<i>Cedrela toona</i>	0.000	0.152	0.000	0.000	0.000	0.000	0.152	0.303
241	<i>Cedrus deodara</i>	5.303	3.788	2.273	0.758	3.030	0.758	2.424	18.333
243	<i>Celtis australis</i>	0.606	0.303	0.303	0.000	0.000	0.000	0.000	1.212
294	<i>Corylus colurna</i>	0.000	0.152	0.000	0.303	0.303	0.152	0.303	1.212
651	<i>Juglans regia</i>	0.303	0.000	0.303	0.152	0.455	0.606	0.152	1.970
822	<i>Morus species</i>	0.303	0.000	0.000	0.000	0.000	0.000	0.000	0.303
926	<i>Pinus excelsa</i>	3.788	2.424	1.818	1.364	0.909	1.212	3.333	14.848
929	<i>Pinus roxburghii</i>	0.000	0.000	0.455	0.000	0.000	0.000	0.000	0.455
951	<i>Populus species</i>	0.152	0.152	0.000	0.000	0.000	0.000	0.000	0.303
965	<i>Prunus cornata</i>	1.818	2.121	0.758	0.303	0.303	0.303	0.455	6.061
969	<i>Prunus species</i>	0.000	0.000	0.152	0.000	0.303	0.152	0.303	0.909
992	<i>Pyrus pashia</i>	0.152	0.606	0.152	0.000	0.000	0.000	0.000	0.909
996	<i>Prunus persica</i>	0.000	0.000	0.303	0.152	0.000	0.000	0.000	0.455
1004	<i>Quercus acutissima</i>	0.303	0.000	0.152	0.000	0.000	0.000	0.000	0.455
1006	<i>Quercus dilatata floribunda</i>	0.606	0.606	0.909	0.303	0.606	0.000	0.758	3.788
1014	<i>Quercus leucotrichophora</i>	1.667	1.212	1.212	0.303	0.000	0.152	0.000	4.545
1017	<i>Quercus semecarpifolia</i>	16.212	13.485	5.455	0.758	1.364	0.303	0.455	38.030
1018	<i>Quercus semiserrata</i>	0.000	0.000	0.000	0.000	0.152	0.000	0.000	0.152

1038	<i>Rhododendron arboreum</i>	0.758	0.455	0.455	0.303	0.000	0.000	0.000	1.970
1046	<i>Rhus succedanea</i>	0.000	0.152	0.000	0.000	0.000	0.000	0.000	0.152
1136	<i>Syzygium cumini</i>	0.152	2.121	1.364	0.000	0.000	0.000	0.000	3.636
1162	<i>Taxus baccata</i>	5.152	3.636	1.212	0.152	0.152	0.303	0.455	11.061
1163	<i>Tecomella undulata</i>	0.000	0.000	0.152	0.000	0.152	0.000	0.000	0.303
1201	<i>Ulmus integrifolia</i>	0.303	0.152	0.152	0.000	0.000	0.000	0.000	0.606
2000	<i>Rest Of Species</i>	2.273	3.030	2.576	1.515	0.455	0.303	0.303	10.455
Total		60.455	52.273	34.091	17.879	16.364	10.606	26.515	218.182

3.7.5 Enumeration Results (Volume Per Ha) of Fir Working Circle

(Table-9)

Spp Code	Species	Diameter Class (CM)							Total
		10-20	20-30	30-40	40-50	50-60	60-70	70+	
2	<i>Abies pindrow</i>	1.539	3.758	7.545	10.197	11.583	9.885	47.027	91.534
3	<i>Abies smithiana</i>	0.270	0.682	1.835	4.294	6.54	8.734	69.792	92.147
17	<i>Acacia tortolis</i>	0.024	0.023	0.170	0.176	0.154	0.000	0.000	0.547
19	<i>Acer acuminatum</i>	0.421	0.980	0.851	2.149	0.988	3.099	2.338	10.826
25	<i>Acer species</i>	0.159	0.058	0.106	0.000	0.000	0.000	6.415	6.738
38	<i>Aesculus indica</i>	0.055	0.052	0.351	0.178	0.000	0.000	2.983	3.619
153	<i>Betula alnoides</i>	0.089	0.223	0.121	0.000	0.000	0.000	0.000	0.433
155	<i>Betula utilis</i>	0.237	1.063	1.010	0.580	0.311	0.844	0.000	4.045
170	<i>Buchanania latifolia</i>	0.000	0.168	0.063	0.099	0.000	0.000	0.000	0.330
240	<i>Cedrela toona</i>	0.000	0.062	0.000	0.000	0.000	0.000	0.765	0.827
241	<i>Cedrus deodara</i>	0.694	1.228	1.920	1.161	7.265	2.472	13.664	28.404
243	<i>Ceitis australis</i>	0.064	0.125	0.199	0.000	0.000	0.000	0.000	0.388
294	<i>Corylus coiurna</i>	0.000	0.017	0.000	0.257	0.413	0.247	1.278	2.212
651	<i>Juglans regia</i>	0.007	0.000	0.272	0.278	1.097	2.099	0.65	4.403
822	<i>Morus species</i>	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.012
926	<i>Pinus excelsa</i>	0.443	1.001	1.733	2.324	2.486	4.522	21.872	34.381
929	<i>Pinus roxburghii</i>	0.000	0.000	0.397	0.000	0.000	0.000	0.000	0.397
951	<i>Populus species</i>	0.012	0.019	0.000	0.000	0.000	0.000	0.000	0.031
965	<i>Prunus cornata</i>	0.091	0.280	0.232	0.169	0.263	0.362	1.042	2.439
969	<i>Prunus species</i>	0.000	0.000	0.059	0.000	0.443	0.342	1.365	2.209
992	<i>Pyrus pashia</i>	0.012	0.090	0.042	0.000	0.000	0.000	0.000	0.144
996	<i>Prunus persica</i>	0.000	0.000	0.118	0.112	0.000	0.000	0.000	0.230
1004	<i>Quercus acutissima</i>	0.017	0.000	0.043	0.000	0.000	0.000	0.000	0.060
1006	<i>Quercus dilatata floribunda</i>	0.051	0.212	0.688	0.355	1.292	0.000	4.061	6.659
1014	<i>Quercus</i>	0.131	0.317	0.686	0.353	0.000	0.332	0.000	1.819

	<i>leucotrichophora</i>								
1017	<i>Quercus semecarpifolia</i>	1.545	4.112	3.961	0.986	2.928	1.097	3.083	17.712
1018	<i>Quercus semiserrata</i>	0.000	0.000	0.000	0.000	0.226	0.000	0.000	0.226
1038	<i>Rhododendron arboreum</i>	0.062	0.111	0.262	0.315	0.000	0.000	0.000	0.750
1046	<i>Rhus succedanea</i>	0.000	0.028	0.000	0.000	0.000	0.000	0.000	0.028
1136	<i>Syzygium cumini</i>	0.005	0.466	0.880	0.000	0.000	0.000	0.000	1.351
1162	<i>Taxus baccata</i>	0.367	0.857	0.643	0.130	0.277	0.765	2.152	5.191
1163	<i>Tecomella undulata</i>	0.000	0.000	0.068	0.000	0.171	0.000	0.000	0.239
1201	<i>Ulmus integrifolia</i>	0.024	0.031	0.063	0.000	0.000	0.000	0.000	0.118
2000	<i>Rest Of Species</i>	0.587	0.996	1.125	0.604	0.551	1.357	5.344	10.564
	Total	6.918	16.959	25.443	24.717	36.988	36.157	183.83	331.01

3.7.6 The abstract showing number and volume of trees in the Fir Working Circle is shown below:-

(Table-10)

Fir Working Circle (2)		Sample IDs No. 66 Nos.					Total Area of WC: 6710.27		
		Ha							
Species		Diameter Class (CM)							
		10-20 (V)	20-30 (IV)	30-40 (III)	40-50 (IIA)	50-60 (IIB)	60-70 (IA)	70+ (IB or above)	Total
Deodar	Number	35585	25418	15251	5084	20334	5084	16267	123022
	Volume (CM)	4657	8240	12884	7791	48750	16588	91689	190599
Kail	Number	25418	16267	15251	9150	6100	8134	22368	102687
	Volume (CM)	2973	6717	14293	15595	16682	30344	146767	233370
Fir/Spruce	Number	81337	64053	68119	61002	49819	34568	104721	463619
	Volume (CM)	12139	29794	62942	97239	121610	124939	783887	1232549
Broad Leaved Species	Number	263327	245027	130139	44735	33551	23384	34568	774731
	Volume (CM)	26653	69049	80610	45234	61157	70753	211212	564669
Total Number		405666	350764	228759	119971	109804	71169	177923	1464059
Total Volume		46421	113799	170729	165858	248199	242623	1233556	2221187

3.8 –Regeneration assessment:-

Natural regeneration has on the whole been quite low. The reason is excessive grazing pressure, heavy weed growth and at some places accumulation of deep humus. Fir and Spruce forests, which lie in the route of the migratory gujjars and gaddi suffer the most, on account of the excessive grazing pressure. Examples of this type of damage to forests can be seen in 1/6 Kalga & 2/5 Khir Ganga forests etc. Artificial regeneration endeavors too have not been serious. Considering that a Fir seedling is fit for planting after 4 & ½ years, while spruce is ready after 2 & ½ years nurseries for the same have by and large been ignored

The current trend towards fast growing species and annual targeted planting has done maximum damage to this aspect. Economically an artificial regeneration programme for Fir and Spruce requires money for nursery cost, removal and raking of the deep humus layer, collection and burning of felling refuse, combating and removal of the tall and thick weed growth, constant fencing and subsequent maintenance. Fencing is important as many of the fir and Spruce forests lie in the route of the gaddi sheep to the alpine pastures. Maximum damage to the Fir and Spruce forests has been caused by the remote saw-millers, who are again trying to come to the forefront through political mileage. It was these sawmillers who caused havoc to the Fir and Spruce forests. In the name of salvage removals middle-aged, healthy, green, clear bole trees of Fir were axed. The Forest Corporation too, can also be faulted for poor management and damage to these Fir/Spruce forests. The Fir and Spruce forests have also got a raw deal from the forester, whose obsession with Deodar led to his over-estimating the yield available. One has only to visit these remote Fir and Spruce forests to see for oneself, how poor forest management has led to total neglect and damage of this valuable resource. The Fir and Spruce forests are invaluable, as these lie on hill slopes of important water catchments and their ruin will spell disaster for people in the plains. Replenishment and rehabilitation must be given due attention and special projects be designed for their upkeep and good health.

3.9 Choice of Species: Silver Fir and Spruce are the main species to be propagated, though proportion of Deodar in artificial regeneration could be increased where suitable, between 2400 meters and 3000 meters, depending on aspect and other factors. In moist locations/depressions and nalas, favour broad- leaved species i.e walnut, Maple, Bird cherry and Poplar etc.

3.10-Silvicultural System:- Aggarwal's plan adopted the Punjab Shelterwood System, while during Kapoor's draft plan, rotation was reduced from 180 years to 90 years and mechanized felling, led to the clear felling system. The artificial regeneration efforts did not match the felling with the result that an excess number of Silver Fir and Spruce trees were felled and forests damaged. Forest eye sores led to criticisms and forester's folly was a label attached to the foresters then. System of clear felling was shelved as it was a failure. Mr.J.C.Sharma allotted this working Circle to the Punjab Shelterwood System (para30 of Punjab Forest Leaflet No.11). Retention of healthy advance growth as future crop, while selection principle marking on broken ground, forms the main criterion. With the present ban on green felling some relief would be provided. The trend towards removing sound boles and retaining unsound, diseased trees as seed bearers must be reversed. Only salvage trees should be removed i.e moribund, dry, uprooted & diseased trees. As and when green felling ban goes, then management should conform to the Punjab Shelterwood system. Creation of large scale nurseries near planting sites must also be attended to on priority.

3.11- Rotation: - Since the forests allotted to this circle are in the course of conversion, rotation in the true sense has no meaning. A conversion period of 120 years as kept in the last plan should be continued.

3.12-Exploitable Diameter: - An exploitable diameter of 60 cm d.b.h. is fixed. The existing cop has a large preponderance of over-mature stock, which also renders the exploitable diameter only of academic interest.

3.13 - Regeneration Period: - This is kept at 30 years as it is hoped that in this period the Fir/Spruce saplings would have reached a height of 4-5 feet and would be beyond the damage by cattle. Legally too the Indian Forest Act allows a maximum closure of 30 years.

3.14 – Division into periods: - Four periodic blocks are constituted, each of 30 years, considering 120 years rotation and regeneration period of 30 years.

3.14.1.1 – Periodic Block I: - The PB-I was divided in to two groups in previous working plan namely group A –areas of un felled PB-I and some of the PB II areas being the best available as far as the maturity of the crop is concerned of JC Sharma's WP and Group B that include the felled PB-I areas of JC Sharma's WP where regeneration is still progressing. Since continuous ban on green felling continued from 1980 onwards and likely to extend further, therefore there is no justification to continue with two groups in PB-I.

In present working plan, forests having a preponderance of mature to over mature age classes have been allotted to this periodic block along with PB-I areas of WP under revision where regeneration has not come up . In some of the forests of this PB, sizeable openings have been created due to heavy marking under salvage lots and forest fires. The objective is to restock and rehabilitate them progressively.

PBI areas are listed below:-

(Table 11)

PB I			
Range	Name of forest	Compartment	Area in ha
Kasol	R/2 Dudi-Khol	C1a	37.76
	R/2 Dudi-Khol	C-IIb	40.00
	1/4 Pajbanag	C-IIc	45.52
	1/6 Kalga	C2a	71.68
	1/6 Kalga	C2b	21.4
	1/6 Kalga	C3a	40.16
	1/7 Nakas	C3	51.8
	2/2 Nalchi	C2a	95
	2/3 Tosh Nala	C8c	12.00
	2/3 Tosh Nala	C9b	33.35
	2/5 Khirganga	C1a	56.60
	2/5 Khirganga	C-Ib	22.5
	2/5 Khirganga	C2a	70.19
	2/5 Khirganga	C2b	69.0
	2/5 Khirganga	C2c	21.06
	2/6 Bandag	C1	50.59
	2/6 Bandag	C2	83.77
	2/6 Bandag	C3a	43.71
	2/6 Bandag	C4a	86.46
	2/6 Bandag	C4b	88.77
	2/7 Tilalotan	C1	74.87
	2/7 Tilalotan	C3	42.49
	2/7 Tilalotan	C4a	42.12
	2/7 Tilalotan	C4b	62.4
	2/7 Tilalotan	C4c	44.00

	2/8 Shila Gahar	C3a	51.12
		Total	1358.32
Jari	1/11 Dunkra Mul	C4a	39.83
	1/12 Saran	C1b	42.9
	1/12 Saran	C2a	38.76
	1/12 Saran	C2b	43.79
	1/12 Saran	C3a	32.16
	1/12 Saran	C3b	30.2
	1/12 Saran	C3c	37.92
	1/12 Saran	C3d	35.04
	1/40 Oridhar	C1b	21.07
	1/19 Raj-Thati	C5a	32.75
	1/19 Raj-Thati	C5b	40.85
	1/19 Raj-Thati	C5c	20.95
	1/19 Raj-Thati	C5e	56.84
		Total	473.06
Hurla	R/10 Keloban	C2	33.87
	R/10 Keloban	C3	16.99
	R/12 Nihara-Gahar	C6d	26.33
	1/20 Cheri-Thach	C2c	98.79
	1/20 Cheri-Thach	C3a	66.75
	1/20 Cheri-Thach	C3b	66.5
	1/21 Khoru-Thach	C3b	22.29
	1/21 Khoru-Thach	C4b	51.00
	1/21 Khoru-Thach	C4c	29.94
	1/31 Katrani	CIa	52.00
	1/31 Katrani	CIb	20.44
	1/31 Katrani	C2b	52.61
	1/31 Katrani	C3a	45.80
	1/39 Tandi	C3a	22.22
	1/39 Tandi	C3b	33.22
	2/18 Sheran	C2a	45.25
	2/21 Hargrain	C1	60.00
		Total	744.00
Bhunter	1/42 Mulagthana	C4a	30.16
	1/42 Mulagthana	C4b	16.38
		Total	46.54
Total area under PBI under FIR WC= 2621.92 ha			

3.14.1.2 Rangewise areas in PB-I

(Table 12)

Range	Kasol	Jari	Hurla	Bhunter
Area (Ha)	1358.32	473.06	744.00	46.54

3.14.2.1- Periodic block II: - Those forests having a preponderance of maring ag classes have been allotted to this periodic block. The Rangewise area in PB-II is as under:

(Table 13)

Range	Kasol	Jari	Hurla	Bhunter
Area (Ha)	2197.67	247.35	1087.67	0

3.14.3.1- Periodic Block-III: - The crop is mostly pole to middle-aged with scattered mature trees which occur in varying proportions. Mostly these forests are open and contain predominantly younger age classes. The Rangewise area in PB-III is as under:

(Table 14)

Range	Kasol	Jari	Hurla	Bhunter
Area (Ha)	280.72	101.10	78.50	21.04

3.14.4.1- Periodic Block IV: - The crop in this periodic block is sapling to young pole stage with scattered mother trees and groups of advance growth retained as part of future crop. PB-IV comprises of the area 74.30 Ha only. Due to the ban of green felling the silvicultural felling operation could not be under taken since long back. As a result of this PB-I area has increased and area under PB-IV is negligible.

3.15:- Record of removals:- During the plan period, the moratorium on green felling continued and no green tree was felled for commercial felling. However, marking of green trees for timber distribution continued upto 2006, when Hon'ble High Court imposed ban on any type of extraction till finalization of new TD policy. The new TD policy was notified by the govt. in 2013. Salvage removals, however, continued throughout the plan period, except for a short stint in 2006. The detail of removals during plan period is as under:

Details of removals during previous Working plan period (T.D and Salvage)

(Table 15)

Species	PBI	PBII	PBIII	PBIV	Total
Deodar	39.8	167.1	636.94	0	843.84
Kail	869.84	1092.4	3013.7	183.23	5159.17
Rai	543.75	1393.09	868.2	0	2805.04
Tosh	3230.19	2559.7	2065.84	0	7855.73
Fir	10517.21	17967.57	19593.64	594.27	48672.69
Chil	0	2213.2	45.4	0	2258.6
Spruce	0	537.89	0	0	537.89
Shagru	0	18.2	20.6	0	38.8
Kharsu	0	4056.06	1574.7	0	5630.76
Mapel	0	61.9	0	0	61.9
Jamnu	1.4	181.3	0	0	182.7
HC nut	17.6	0	26.9	0	44.5
Grand Total	15219.79	30248.41	27845.92	777.5	74091.62

3.16- Calculation of Yield:- Considering the excess removals during the plan under revision, there is little scope for getting sufficient yield during the current plan. Further the ban on green felling also, restricts us from any fellings. Calculations of yield are thus theoretical. Further, it is observed that afforestation does not match the removals. This goes against the principle of sustained yield matched with planned afforestation. This too is a pointer that felling is to be seriously curtailed. Quite a lot of trees are available every year under salvage i.e uprooted, dry, half broken etc. This again leaves us with not much scope for felling.

3.16.1- Yield from PBI: - The enumeration of this working circle has been carried out in 66 Nos. sample plots of size 0.1 Ha each supplied by FSI. The Per Hectare Stems and Volume was then extrapolated to PB-I area (2621.92 Ha) to calculate the yield just for academic interest. Let VI be the volume of growing stock of Ist class trees and V2 be the volume of IInd class trees, V3 be the volume of both IIIrd class and IVth class trees. Let C1, C2 and C3 be constants representing percentage of Ist, IInd, and IIIrd/IVth class trees respectively, available for felling during the plan period. Values of C1, C2 and C3 are kept the same as in the previous plan i.e 0.4, 0.2 and 0.2. This tally with the field conditions. Theoretically, we need to consider all trees above 40cm d.b.h leaving aside mother trees, as growing stock available for felling. However, as prescribed in the Punjab Shelter-Wood system we need to retain all compact groups of poles as future crop. We must further ensure no marking is done on broken and precipitous ground, where at the most selection principles are to be adhered to, retain some Ist and IInd trees as emergency reserve and also plan for fire insurance. Trees standing on blanks or in such patches where regeneration has not established are also not to be considered.

Calculations:

Deodar: Total volume of IVth and IIIrd class trees =8253

Total volume of IInd class trees =22092

Total volume of Ist class trees=42307

Kail: Total volume of IVth and IIIrd class trees =8209

Total volume of IInd class trees =12611

Total volume of Ist class trees=69202

Fir/Spruce: Total volume of IVth and IIIrd class trees =36235

Total volume of IInd class trees =85511

Total volume of Ist class trees=355107

B/L: Total volume of IVth and IIIrd class trees =58476

Total volume of IInd class trees =41570

Total volume of Ist class trees=85173

VI= 355107

V2=85511

V3=36235

Annual yield (AY) for Fir/Spruce = $(VI \cdot C1 + V2 \cdot C2 + V3 \cdot C3)/P$, where P the plan period is 15 years.

Annual yield (AY) = $(355107 \times 0.4 + 85511 \times 0.2 + 36235 \times 0.2) / 15$

Annual yield (AY) = 11092.8 cum or say 11000 cum

However the total annual increment is worked out to be 6486 Cum. (1.36% of 476943). The prescribed yield is **6400 cum**.

3.16.2-Yield from PBIV: The enumeration of fir working circle has been carried out in 66 Nos. sample plots of size 0.1 Ha each supplied by FSI. The Per Hectare Stems and Volume was then extrapolated to PB-IV area (74.30 Ha) to calculate the yield.

Deodar: Total volume of IVth and IIIrd class trees = 234

Total volume of IInd class trees = 626

Total volume of Ist class trees = 1198

Kail: Total volume of IVth and IIIrd class trees = 232

Total volume of IInd class trees = 357

Total volume of Ist class trees = 1961

Fir/Spruce: Total volume of IVth and IIIrd class trees = 1026

Total volume of IInd class trees = 2423

Total volume of Ist class trees = 10063

B/L Total volume of IVth and IIIrd class trees = 16157

Total volume of IInd class trees = 1178

Total volume of Ist class trees = 3121

Around 75% trees can be taken in the Ist and IInd class while 25% trees are attributed to IVth and IIIrd class. Thus VI the volume of Ist and IInd class trees of Spruce and Silver Fir is $(0.75 \times [10063 + 2423]) = 12486 \times 0.75 = 9364.5$ cum while V2 the volume of IIIrd and IVth class trees is $= 0.25 \times 1026 = 256.5$ cum. Looking to field conditions we see that CI to be 0.50 and C2 as 0.1. Thus with P being 15 years, the annual yield AY is- $AY = (9364.5 \times 0.5 + 256.5 \times 0.1) / 15 = 313.86$ cum or say 300 cum.

Again, though theoretically all trees above 40 cm d.b.h. diameter must be felled if the regeneration has established. In fact, silvicultural criterion would not let this be possible. Trees alongside nalas, precipitous slopes, broken ground, and standing on the periphery of blanks are not to be felled. Further IInd class trees which stand amongst compact pole crop are not to be felled. This is why we have earlier assumed, that not more than 50% of the volume of Ist and IInd class trees, are available for felling during the period of the plan and further only 10% of the IVth and IIIrd class trees shall be available under thinning.

However the total annual increment is worked out to be 182 Cum (1.36% of 13512) and therefore the annual yield is restricted to 90 Cum (App.50%).

3.16.3 – Total Final Yield: Total final yield is calculated only from PBI and PBIV and that too only for Silver Fir and Spruce species. No yield is prescribed for other species.

(Table 10)

Species	PBI	PBIV	Total
Fir/Spruce	6400	0	6400 cum

The yield of both Deodar and Kail has been ignored as they are in negligible quantity in this working circle. Yield of Deodar and Kail if obtained on account of silvicultural markings, shall count towards the yield of Spruce and Silver Fir.

3.16.4 – Yield from PBII & PBIII: No yield is prescribed in these PBs as a safeguard to build-up growing stock.

3.16.5 – Control of Yield: All removals down to 10 cms d.b.h. shall account towards yield. Deviation at the end of 5 years and at the end of plan period shall not exceed 10% of the annual yield. Commercial fellings must be backed by adequate artificial afforestation with healthy plantation stock. Regeneration survey & assessment is a must.

3.17 – Felling Programme: The felling program is prescribed as under:

(Table 11)

YEAR	RANGE	FOREST	COMPTT.	AREA(ha)	
				P.B-I	PB-IV
2018-19	Hurla	R/10 Kelo-Ban	C-II	33.87	-
	Kasol	R/2 Dudi-Khol	C-Ia	37.76	-
		R/2 Dudi-Khol	C-IIb	40.00	-
2019-20	Jari	1/11 Dunkra Mul	C-IVa	39.83	-
		1/12 Sharan	C-Ib	42.9	-
	Kasol	1/4 Pajbanag	C-IIc	45.52	-
	Hurla	R/10 Kelo-Ban	C-III	16.99	-
2020-21	Hurla	R/12 Niahara Gahar	C-VIa	26.33	-
	Jari	1/12 Sharan	C-IIa	38.76	-
		1/12 Sharan	C-IIb	43.79	-
	Kasol	1/6 Kalga	C-IIa	71.68	-
2021-22	Jari	1/12 Sharan	C-IIIa	32.16	-
		1/12 Sharan	C-IIIb	30.20	-
	Hurla	1/20 Cheri-Thach	C-IIc	98.79	-
		1/20 Cheri-Thach	C-IIIa	66.75	-
	Kasol	1/6 Kalga	C-IIb	21.40	-
2022-23	Bhunter	1/42 Mulagthana	C-IVa	30.16	-
	Jari	1/12 Sharan	C-IIIc	37.92	-
		1/12 Sharan	C-IIId	35.04	-
	Hurla	1/20 Cheri Thach	C-IIIb	66.50	-
2023-24	Hurla	1/21 Khoru-Thach	C-IIIb	22.29	-
		1/21 Khoru-Thach	C-IVb	51.00	-
	Jari	1/14 Oridhar	C-Ib	21.07	-
	Kasol	1/6 Kalga	C-IIIa	40.16	-
		1/7 Nakas	C-III	51.80	-
2024-25	Kasol	2/2 Nalchi	C-IIa	95.00	-
		2/3 Tosh Nala	C-VIIIc	12.00	-
		2/3 Tosh Nala	C-IXb	33.35	-
	Hurla	1/21 Khoru-Thach	C-IVc	29.94	-
	Jari	1/19 Rajthati	C-Va	32.75	-
2025-26	Kasol	2/5 Khir Ganga	C-Ia	56.60	-
		2/5 Khir Ganga	C-Ib	22.50	-
		2/5 Khir Ganga	C-IIa	70.19	-

	Hurla	1/31 Katrani	C-Ia	52.00	-
		1/31 Katrani	C-IIb	20.44	-
	Jari	1/19 Rajthati	C-Vb	40.85	-
2026-27	Kasol	2/5 Khir Ganga	C-IIa	69.00	-
		2/5 Khir Ganga	C-IIc	21.06	-
	Hurla	1/31 Katrani	C-IIb	45.80	-
2027-28	Kasol	2/6 Bandag	C-I	50.59	-
		2/6 Bandag	C-II	83.77	-
	Hurla	1/39 Tandi	C-IIIa	22.22	-
2028-29	Kasol	2/6 Bandag	C-IIIa	43.71	-
		2/6 Bandag	C-IVa	86.46	-
	Hurla	1/39 Tandi	C-IIIb	33.22	-
	Jari	1/19 Rajthati	C-Vc	20.95	-
2029-30	Kasol	2/6 Bandag	C-IVb	88.77	-
		2/7 Tilalotan	C-I	74.87	-
	Jari	1/19 Rajthati	C-Ve	56.84	-
	Hurla	2/18 Sheran	C-IIa	45.25	-
2030-31	Kasol	2/7 Tilalotan	C-III	42.49	-
		2/7 Tilalotan	C-IVa	42.12	-
		2/7 Tilalotan	C-IVb	62.40	-
	Hurla	2/21 Hargrain	C-I	60.0	-
2031-32	Kasol	2/7 Tilalotan	C-IVc	44.00	-
		2/8 Shila Gahar	C-IIIa	51.12	-
	Bhunter	1/42 Mulagthana	C-IVb	16.38	-

3.18 – Method of executing fellings

3.18.1 Method of Executing fellings in PBI: - Technique of carrying out regeneration fellings is laid out in the Punjab Forest Leaflet number 2. Principles to be followed out are as follows –

1. Seed bearers of class I and II, should be mature, healthy, well developed, tall trees with clean boles.
2. The mother trees should be uniformly spaced. 30-35 trees should be there per hectare in case of Spruce and 40-45 trees in case of Silver Fir. For Deodar and Kail occurring on warmer slopes and in the lower belts, openings shall be created to an extent suitable for these species.
3. Retain seed bearers on ridges and spurs in order to have better dispersal of seed.
4. As defined by the Punjab Shelter wood system, all healthy advanced growth up to 40 cm d.b.h. covering not less than 0.1 hectares area shall be retained, as part of future crop. No seed bearers will be retained in patches of advance retained as part of the future crop.
5. Selection markings are required on steep and precipitous slopes.
6. Broad-leaved trees must be retained in the moist nallas and depressions. A little lopping would be warranted where overhead shade created, causes younger regeneration to be suppressed.

3.18.2 – Method of executing fellings in PBIV: - In this periodic block we are concerned with removal of over-wood which suppress and stand over the young crop. The felling would correspond to final felling. Attempt should never be to obtain or induce regeneration. Markings should aim at freeing the established regeneration, through removal of the over-wood. Marking of all those solitary trees which are likely to turn into wolf trees is required. Thinning in groups of poles and patches of advance growth are required to be carried out. Those trees which are marked and are likely to damage young crop need to be lopped before they are felled. On the pretext of improvement fellings, broadleaved trees are never to be marked unnecessarily. Some lopping may have to be done where the broadleaved trees suppress the young crop.

3.18.3 – Treatment to PBIII: - Only sanitary fellings consisting of the removal of dead and uprooted trees must be done, with all such removals counting as yield of the working circle. No commercial fellings are recommended. There is under-stocking in this block and younger age classes are deficient. The mature and over-mature trees cannot be removed as this would cause permanent openings and invasion by thick weeds and obnoxious weeds. Forests of this periodic block are generally under stocked. Thinning of any sort are not to be done.

3.18.4 – Treatment of PBII: - No major fellings are prescribed during the plan period. Only dead, up-rooted and dry trees are to be removed in salvage marking, which would count towards total yield of the working circle.

3.19-Fire Protection: Adequate measures should be taken to ensure that fire lines, inspection paths and bridle paths are maintained. Ground forest floor must be kept clean of debris, unwanted bushes, inflammable material etc. Fire watchers must patrol intensively during dry season.

3.20-Subsidiary silvicultural operations in PBI: Green felling is at present banned in the state. However as and when fellings are done, in PBI as per prescription, the subsidiary silvicultural operations are to be carried out immediately after felling.

- As per Punjab Forest Leaflet number 6 prescription, fellings refuse is to be disposed of. Felling debris removal is urgently required.
- To foster growth of young regeneration, remove inferior species which interfere with their healthy growth. Weeding and bush cutting is urgently required. Remove those trees that are damaged and those marked trees which continue to remain unfelled. Lop those broad-leaved trees which interfere with the growth of younger conifer crop.
- Cleaning operation and also climber cutting be done to foster regeneration.
- Shrub cutting be done to provide a clean seed bed.
- Effective barbed wire closure is to be done to check grazing.
- Control burning for fostering healthy growth.
- Mechanical thinning.

3.21.1-Planting programme and artificial regeneration: Forests under this working circle are quite denuded. Natural regeneration has by and large failed and an extensive artificial regeneration, programme has to be drawn up. The technique of raising nurseries and artificial regeneration features in detail in Chief Conservator of Forest Technical order number 3 and 4 of Punjab Forest Manual Volume III. Instructions contained in Chief Conservator of Himachal Pradesh letter number 401/PA (M) dated 8/3/1973 in respect of different operations to be carried out for raising a successful plantation may also be carefully studied. Silviculturally, we must realize that both Silver Fir and Spruce are very different species. Spruce requires almost as much light as Deodar, while Silver Fir requires fairly

heavy shade for regeneration. Fir has been failing to regenerate because of thick layer humus, dense weed growth, uncontrolled grazing, debris accumulation, bad drainage and infrequency of good seed year. Raw humus dries up during summer months, before the roots of the seedlings are able to reach the mineral soil for moisture. Dense root growth offers root competition and also suppresses the seedlings. Heavy grazing adversely affects regeneration, as the seedlings are killed by trampling. Spruce grows in the lower parts while Silver Fir occupies the upper portions. Silver Fir prefers cooler, moist and shady locations while Spruce occupies raised grounds and exposed spurs. Thus the practice of raising merely Silver Fir nurseries and planting the species, in sites which prefer Spruce, is not proper silviculture. We must appreciate the fact that Spruce seeds nearly every year in contrast to Silver Fir which seeds after 4-5 years. Raising spruce nurseries thus, would be advantageous. One and a half years plant of Spruce reach a height of 25 cms to 30 cms. Higher growth is there if the plants are raised in P/bags filled with mixed and manured soil from Fir zone. An increase is registered in the success percentage, if Spruce is raised in P/bags. This proposition is better than raising Silver Fir which taken 4 ½ years to propagate. Exorbitant weeding cost would also reduce. We would also reduce maintenance in beating up, bush cuttings etc. Broad leaved planting with *Juglans regia*, *Acer caesium*, *Prunus padus* and *Fraxinus spp.*, along with Spruce and Silver Fir planting, is helpful.

Experimental work (as per working plan in revision) has shown the following results with reference to Silver Fir-

- 1) Weeding helps establishment of Silver Fir and improves height growth.
- 2) To induce and establish natural regeneration, the canopy should not be opened wider than 11m x 11. Where wider gaps are made, weeding should not be done to provide shade to young seedlings.
- 3) Removal of raw humus helps natural regeneration.
- 4) Introduction of poplars and other broad-leaved species with Silver Fir helps reduce raw humus and induces natural regeneration of Silver Fir and Spruce.
- 5) Clear-felling in strips is not proper; shelter wood system helps natural regeneration. Silver Fir and Spruce seed ripen in September and October. During seed collection, it must be ensured that the trees from which the seed is collected are middle-aged, healthy, clear boled trees which also have a well-developed crown. Seeds of Silver Fir must not be collected from higher elevations because of free hybridization between *Abies pindrow* and *Abies spectabilis*. Such a seed source gives poor seedling growth in the nursery. Cones are collected during first fortnight of October, before their opening on the trees. Dry in the sun and also clear the seed of scales, wings and twigs. Storage in air tight containers, in a dry and cool place, must be done to ensure maximum viability. Nurseries must lie in the natural zone of Fir/Spruce, preferably towards the lower limit of the natural zone of the species. Exposed ridges, frost holes, natural blanks, badly drained pockets, steep slopes and southern slopes should be avoided. Choose areas having a moderate slope and near a water source. The soil should be deep, fertile, well drained and loamy. One pricking at the age of 1 ½ years has been found to be the best, both for optimum development of fibrous roots and proper height growth. There is no point in going for a second pricking at the age of 2 ½ years. It only retards height growth, with no extra advantage to the root system. Conditioning of plants, by cutting tap root is necessary for producing healthy plants with well-developed fibrous roots. Damping off be avoided,

through soil fumigation with Formalin, before sowing. Mycorrhizal association is necessary for healthy seedling. Sowing in beds is done in raised beds of 2m*1m size. Sowing is done in lines 8cms apart. Shading of germination beds is necessary as also proper weeding. Transplanting and grading is also required to be done systematically. For Silver Fir around 16500 seeds are available per kg while germination% is 30-40. Preferably, sowing should be done early in December, otherwise on the melting of snow. For Spruce we get on an average 60000 seeds per kg, germination% is 50-70 while sowing in the nursery is done in December or after snow fall has melted. A nursery area of about 100m² (5m² for germination beds + 95m² transplant beds) will be needed to produce 1000 plantable plants annually. During planting it must be ensured that the Silver Fir/spruce plants have a size >25-30 cms. Hoe planting is also cheap and successful. Here spacing is kept 2m*2m. Normally pit size be 30cm³ and plant to plant distance kept as 2.5cms*2.5cms. Only in rocky areas, pits could be of size be 45cm³. Monsoon planting is done in July-mid August. In moist locations and depressions, broad-leaved species i.e Ash, Walnut, Maple, Bird cherry, etc may be tried. For broad-leaved species planting, winter months are proper. Size of the broad-leaved species should be 45 cum -60cms, attainable after 1 ½ to 2 ½ years. Beating up should be done systematically. Failures are beaten up in July of the year following the year of planting.

The failure of natural regeneration in Kullu tract is attributed to –

- Felled areas could not be regeneration in the previous working plan period.
- Heavy expenditure required for weeding, bush cutting and removal of humus.
- Non –availability of funds.
- Cold desiccating winds.
- Limited growing season.
- Heavy grazing due to migratory/local graziers.
- Poor seed year at an interval of 4-5 years.
- Lack of sincerity to take up such planting with healthy seedlings.
- Lack of effective closure and poor protection.

Vast areas have been felled in the past without ensuring restocking.

3.21.2- Statement of area requiring immediate attention

(Table 12)

Name of Range	Name of Forest	Comptt.	Area	Species reqd.	Cultural Operations
Kasol	R/2 Dudhikhol	C.Ia	37.96	Fir/Spruce & B/L in Moist location	Weedings
		C-IIb	40.0	Fir & Spruce	Weeding/ Bush cutting
	1/4 Pajbanag	C-IIc	45.52	Fir & Spruce	Weeding/ Bush cutting
	1/6 Kalga	CIIa	71.68	Fir & Spruce	Weeding/ Bush cutting
		CIIb	21.40	Fir & Spruce	Weeding/ Bush cutting
		CIIIa	40.16	Fir & Spruce & Kail	Weeding/ Bush cutting
	1/7 Nakas	CIII	51.80	Fir & Spruce	-
	2/2 Nalchi	CIIa	95.00	Fir, Spruce and	-

				Acer, Walnut in moist locations	
	2/3 ToshNala	CVIIc	12.00	Fir & Spruce	-
		CIXb	33.35	Fir & Spruce	-
	2/5 Khirganga	C.Ia	56.60	Fir & Spruce	-
		C-Ib	22.5	Fir & Spruce	
		CIIa	70.19	Fir & Spruce	-
		C-IIb	69.0	Fir & Spruce	Weeding/ Bush cutting
		C-IIc	21.06	Fir & Spruce	Weeding/ Bush cutting
	2/6 Bandag	CI	50.59	Fir & Spruce	-
		CII	83.77	Fir & Spruce	-
		CIIIa	43.71	Fir & Spruce	-
		C-IVa	86.46	Fir & Spruce	Weeding/ Bush cutting
		C-IVb	88.77	Fir & Spruce	Weeding/ Bush cutting
	2/7 Tilalotan	CI	74.87	Fir & Spruce	-
		CII	42.49	Fir & Spruce	-
		C-IVa	42.12	Fir & Spruce	Weeding/ Bush cutting
		C-IVb	62.40	Fir & Spruce	Weeding/ Bush cutting
		C-IVc	44.00	Fir & Spruce	Weeding/ Bush cutting
	2/8 Shila Gahar	C-IIIa	51.12	Fir & Spruce	Weeding/ Bush cutting
Jari	1/11 Dunkramul	CIVa	39.83	Fir & Spruce	-
	1/12 Saran	CIb	42.90	Fir & Spruce	-
		CIIa	38.76	Fir & Spruce	-
		C-IIb	43.79	Fir & Spruce	Weeding/ Bush cutting
		C-IIIa	32.16	Fir & Spruce	Weeding/ Bush cutting
		C-IIIb	30.20	Fir & Spruce	Weeding/ Bush cutting
		C-IIIc	37.92	Fir & Spruce	Weeding/ Bush cutting
		C-IIId	35.04	Fir & Spruce	Weeding/ Bush cutting
	1/14 Oridhar	CIb	21.07	Fir & Spruce	-
	1/19 Rajthati	CVa	32.75	Fir & Spruce	-
		CVb	40.85	Fir & Spruce	Weeding/ Bush cutting
		CVC	20.95	Fir & Spruce	Weeding/ Bush cutting
		CVe	56.84	Fir & Spruce	-
Hurla	R/10 Keloban	C-II	33.87	Fir & Spruce	Weeding/ Bush cutting
		C-III	16.99	Fir & Spruce	Weeding/ Bush cutting
	R/12 Niharaghar	CVId	26.33	Fir & Spruce	-
	1/20 Cherithach	CIc	98.79	Fir & Spruce	Weeding/ Bush cutting
		CIIIa	66.75	Fir & Spruce	-
		CIIIb	66.50	Fir & Spruce	Weeding/ Bush cutting
	1/21 Khoruthach	C-IIIb	22.29	Fir & Spruce	Weeding/ Bush cutting
		CIVb	51.00	Fir & Spruce	-
		C-IVc	29.94	Fir & Spruce	Weeding/ Bush cutting
	1/31 Katrani	CIa	52.00	Fir & Spruce	-
		CIb	20.44	Fir & Spruce	-
		CIIb	52.61	Fir & Spruce	Weeding/ Bush cutting
		CIIIa	45.80	Fir & Spruce	Weeding/ Bush cutting
	1/39 Tandi	CIIIa	22.22	Fir & Spruce	-

		CIIIb	33.22	Fir & Spruce	Weeding/ Bush cutting
	2/18 Sheran	CIIa	45.25	Fir & Spruce	Weeding/ Bush cutting
	2/21 Hargrain	CI	60.00	Fir & Spruce	Weeding/ Bush cutting
Bhunter	1/42 Mulagthana	CVa	30.16	Fir & Spruce	Weeding/ Bush cutting
		CIVb	16.38	Fir & Spruce	-

3.22-Miscellaneous regulations:

- 1) **Closure-** Regeneration areas are required to be fenced and closed to grazing. Forests that lie en-route to Gaddis and Gujjars paths to their pastures need special care. Endeavour must be to foster goodwill and effective co-operation so that this enterprise is successful.
- 2) **Weeding-** For healthy growth, weeding and cleaning is a must. Growing season of Silver Fir is limited to the months of April, May and June when the plants must be kept free of weeds.
- 3) **Right holder requirements:** - Except for some marking in PBIII, there is not much of scope for marking to right holders. Dead, dying and uprooted trees should be used to fulfill urgent demand of right holders for genuine domestic and agricultural use.
- 4) **Fire protection:** - Precautionary measures should be taken to protect these forests from fire.
- 5) **Regeneration Survey:** - Standing instructions on the subject are to be followed. In case of natural calamity where a large number of trees are damaged/ uprooted etc, the area in question has to be brought in as a PBI area and an equivalent area from PBI, should be transferred to other PBs.

Chapter IV

Protection Working Circle

4.1 General Constitution of the Working Circle:-

Inaccessible areas mostly due to their being in rocky, steep and precipitous terrain and such forest that need to be protected for their aesthetic beauty or their important religious value constitute this working circle. The Protection Working Circle forests are of prime importance. Many of them lie at the head of the valleys and streams and stretch far beyond the tree growth limit. They are thus important from soil and water conservation point of view. Forests that were in moderately sloped areas and where forest working was possible were transferred to various working circles, by Sh. J.C. Sharma, in his working plan.

4.1.1:- The changes in this working circle are elaborated below:

The forests transferred from Deodar/ Kail Working Circle are 2/3 Toshnal C-IVc and C-IVd (Kasol Range) being rocky, steep and precipitous.

Details of forest transferred to Wild Life Division Kullu are as follows (as per previous working plan)-

(Table 1)

Name of Range	Forest	Comptt.	Area (Ha)
Bhunter	R/10 Niaragahar	C-III	167.94
	R/10 Niaragahar	C-IV	140.49
Kasol	2/64 Majig	Whole	129.50
	R/4 Kasol	C-III	226.22
	R/4 Kasol	C-IVb	140.40
	R/4 Kasol	C-Vb	35.10
	R/4 Kasol	C-VII	1823.11
	1/9 Khobas	C-Id	283.28
	1/9 Khobas	C-IIa	122.21
	1/9 Khobas	C-IIb	44.51
	1/9 Khobas	C-IId	169.97
	2/9 Raona	C-IVb	93.00
	2/9 Raona	C-Vb	62.48
	2/9 Raona	C-VII	128.81
Total			3567.02

Details of forest transferred to Wild Life Division Kullu and excluded from current working plan are as follows-

(Table 2)

Name of Range	Forest	Comptt.	Area (Ha)
Kasol	2/6 Bandag	CVI	650
	2/7 Tilalotan	CVI	1260
Jari	2/13 Muri	Whole	1268
	2/14 Chatni	CV	588

Hurla	2/18 Sharan	CIII	198
	2/19 Jaularang	Whole	466
	2/21 Hargrain	CIV	1500
Bhunter	R/11 Dukam	CII	70.01
	2/63 Matiana	CIV	157.01
	2/63 Matiana	CV	162.68
		Total	6319.70

Details of forest received from Wild Life Division Kullu and included in current working plan are as follows-

(Table 3)

Name of Range	Forest	Comptt.	Area (Ha)
Kasol	R/4 Kasol	CIII	24
	1/9 Khobas	CId	283.28
	1/9 Khobas	CIIa	122.21
	1/9 Khobas	CIIb	44.51
	1/9 Khobas	CIIId	169.97
		Total	643.97

4.1.2:- STATEMENT SHOWING AREA TRANSFERRED FROM AND RECEIVED BY PROTECTION WORKING CIRCLE:-

(TABLE 4)

Division	Range	Area of circle as per previous WP	Area transferred to WL Division	Area received from WL Division	Net +/-	Area of circle (ha)
Parvati	Kasol	125483.26	1910	643.97	(-)1266.03	124217.23
	Jari	5040.35	1856	-	(-) 1856	3183.66
	Hurla	10468.42	2164	-	(-) 2164	8304.42
	Bhunter	389.70	389.70	-	(-) 389.70	0
	Total	141381.73	6319.7	643.97	(-)5675.73	135705.31

4.2:- GENERAL CHARACTER OF THE VEGETATION: - We must appreciate that the scattered distribution of the forests of the working circle, throughout the tract, makes it possible for every type of vegetation typical to the Division, being found here. The forest types have been elaborated in Chapter 2 of part 1 of the Working Plan. The forest types found are:- 12/C-Ie (Himalayan Moist Temperate Deodar forests), 12/C-Id (Himalayan Moist Temperate Western Mixed Coniferous forests), 12/C-IIa (Kharshu Oak forests), 12/C-IIb (Western Himalayan Upper Oak forests), 12/D.S.2(Himalayan Temperate part lands), 12/DS3 (Himalayan Temperate Pasture), 12/SI(*Alnus nitida* forests), 14/C-Ia (Western Himalayan Sub Alpine Fir forests), 14/C-Ib (Western Himalayan Sub-Alpine Birch/Fir forests), 14/D.S.I(Sub Alpine Pasture), 15/E-I(Dwarf Rhododendron Scrub), 15/E.2(Dwarf Juniper Scrub), 15/C.3(Alpine Pastures).

4.3:- Special Objects of Management: - The special objects of management are-

1. Protection of inaccessible areas which are repository of snow and water resources by ensuring least disturbances.

2. Protection of hill slopes from denudation and erosion by preserving the forest cover and taking effective soil conservation measures where ever necessary.
3. To protect and preserve valuable forest wealth from indiscriminate fellings and lopping especially near the villages.
4. Consistent with the principles of sound silviculture, to meet the demand of right holders for timber, fuel wood and also fodder/grazing of local and migratory graziers.
5. To preserve the environment around tourist centers and religious places so as to maintain pristine beauty and landscape so that area continue to be most sought for tourist destination in the state.

4.4:- Blocks and Compartments: - No changes have been incorporated. The blocks and compartments remain the same as in the previous working plan.

4.5:- Area statement: - The total area of the working circle is 135705.31 hectares. The details of area allotted is in Volume II Appendix –I (page 1-18)

Range wise details for protection Working Circle are given as under-

(Table 5)

Range	RF	DPF Ist	DPF IInd	Total
Kasol	392.66	2878.29	120946.25	124217.20
Jari	-	707.80	2476.55	3184.35
Hurla	1604.26	908.79	5791.37	8304.42
Bhunter	-	-	-	-
G.Total	1996.92	4494.88	129214.17	135705.97

4.6:- Felling Series: - No felling series is constituted.

4.7:- Enumeration: - The enumeration was carried out on the grid system bases in the Sample IDs (Plots) of size 0.1 Ha each. The whole of the area of the Parvati Forest Division was divided into grids and total 1518 Nos. Sample plots were supplied by the Forest Survey of India through Forest Survey of India North Zone at Shimla. Out of these 1518 Nos. Sample plots 20 Nos. Sample plots were located out of Parvati Forest Division. Out of remaining 1497 Nos. Sample plots 489 Nos. were found workable and rest 1008 Nos. were found Non-workable being steep slopes, above 4000 meter elevation, water bodies, agriculture land etc. The enumeration was carried out with the help of GPS 72, Compass, Haga Altimeter and Callipers. The enumerated data was entered in the Plot Enumeration Form and the description of the plot was entered in Plot Description Form (Appendix Page No. 19-23). The enumerated data was submitted to FSI Dehradun for Analysis. The analyzed data was received in two forms viz i) Land use class (closed, dense, open and scrub). ii) Irrespective of land use class. The land use class wise analyzed data (Stems Per Ha and Volume Per Ha) was then extrapolated to assess the growing stock of this working circle. Total 73 Nos. Sample plots pertaining to this working circle were enumerated. The enumeration has been carried out irrespective of periodic blocks. The detailed forest wise enumeration results are in Volume-II, Appendix-III, Page No. 24-66.

(Table 6)

4.7.1 Enumeration Results (Stems Per Ha) of Protection Working Circle

Spp. Code	Species	Diameter Class (CM)							Total
		10-20	20-30	30-40	40-50	50-60	60-70	70+	
2	<i>Abies pindrow</i>	8.630	7.123	7.534	8.082	5.479	4.658	10.137	51.644
3	<i>Abies smithiana</i>	3.151	1.781	1.644	1.507	1.233	1.781	3.836	14.932
10	<i>Acacia latronum</i>	0.000	0.137	0.000	0.000	0.000	0.000	0.000	0.137
19	<i>Acer acuminatum</i>	6.712	5.342	1.644	0.685	0.411	0.685	0.822	16.301
25	<i>Acer species</i>	3.288	2.466	1.233	0.274	0.548	0.411	1.233	9.452
38	<i>Aesculus indica</i>	0.411	0.274	0.822	0.274	0.548	0.548	1.507	4.384
61	<i>Alnus nitida</i>	4.795	2.740	0.000	0.000	0.000	0.000	0.000	7.534
139	<i>Bauhinia purpurea</i>	1.507	1.233	0.685	0.137	0.137	0.000	0.000	3.699
153	<i>Betula alnoides</i>	0.548	2.466	1.096	1.096	0.411	0.548	0.274	6.438
241	<i>Cedrus deodara</i>	0.822	1.507	2.329	2.055	1.507	0.274	1.096	9.589
243	<i>Celtis australis</i>	0.137	0.137	0.137	0.000	0.000	0.000	0.000	0.411
293	<i>Cornus macrophylla</i>	0.548	0.000	0.137	0.000	0.000	0.000	0.000	0.685
294	<i>Corylus colurna</i>	0.411	1.370	0.274	0.274	0.137	0.000	0.137	2.603
651	<i>Juglans regia</i>	0.137	0.137	0.274	0.137	0.000	0.000	0.274	0.959
822	<i>Morus species</i>	0.274	0.000	0.000	0.137	0.000	0.000	0.000	0.411
921	<i>Picea smithiana</i>	0.000	0.000	0.000	0.137	0.137	0.000	0.137	0.411
926	<i>Pinus excelsa</i>	12.055	4.110	4.795	5.890	3.562	3.562	2.740	36.712
929	<i>Pinus roxburghii</i>	0.685	0.411	0.411	0.000	0.137	0.137	0.137	1.918
930	<i>Pistacia integerrima</i>	0.274	0.000	0.000	0.000	0.000	0.000	0.000	0.274
950	<i>Populus ciliata</i>	0.000	0.000	0.137	0.000	0.000	0.000	0.000	0.137
951	<i>Populus species</i>	1.918	0.685	0.000	0.000	0.000	0.000	0.000	2.603
962	<i>Protium caudatum</i>	0.000	0.000	0.000	0.000	0.000	0.137	0.000	0.137
965	<i>Prunus cornata</i>	5.753	6.027	2.877	0.274	0.685	0.137	0.000	15.753
969	<i>Prunus species</i>	0.000	0.000	0.137	0.000	0.000	0.000	0.000	0.137
992	<i>Pyrus pashia</i>	0.274	0.000	0.000	0.000	0.000	0.000	0.000	0.274
1006	<i>Quercus dilatata floribunda</i>	1.370	0.685	0.411	0.000	0.137	0.137	0.137	2.877
1014	<i>Quercus leucotrichophora</i>	2.329	2.740	1.370	1.370	0.548	0.822	1.644	10.822
1017	<i>Quercus semecarpifolia</i>	2.055	4.247	2.877	1.918	1.233	2.466	1.918	16.712
1020	<i>Quercus species</i>	0.274	0.000	0.000	0.137	0.000	0.000	0.000	0.411
1038	<i>Rhododendron arboreum</i>	1.644	1.781	0.685	0.137	0.137	0.137	0.137	4.658
1045	<i>Rhus species</i>	0.274	0.000	0.000	0.000	0.000	0.000	0.137	0.411
1046	<i>Rhus succedanea</i>	0.000	0.822	0.000	0.137	0.000	0.000	0.000	0.959
1136	<i>Syzygium cumini</i>	0.000	0.274	0.137	0.000	0.000	0.000	0.000	0.411
1162	<i>Taxus baccata</i>	1.781	1.507	0.822	0.137	0.000	0.000	0.000	4.247
1201	<i>Ulmus integrifolia</i>	0.137	0.137	0.000	0.137	0.000	0.274	0.274	0.959
1204	<i>Ulmus wallichiana</i>	0.000	0.000	0.000	0.000	0.274	0.274	0.000	0.548
2000	<i>Rest Of Species</i>	7.534	9.452	3.288	1.370	1.233	0.548	0.274	23.699

Total	69.726	59.589	35.753	26.301	18.493	17.534	26.849	254.24 7
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4.7.2 Enumeration Results (Stems Per Ha) of Protection Working Circle
(Table 7)

Spp. Code	Species	Diameter Class (CM)							Total
		10-20	20-30	30-40	40-50	50-60	60-70	70+	
2	<i>Abies pindrow</i>	1.373	3.382	6.921	12.621	12.832	15.295	58.299	110.723
3	<i>Abies smithiana</i>	0.349	0.667	1.462	2.293	3.291	7.058	42.501	57.621
10	<i>Acacia latronum</i>	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.019
19	<i>Acer acuminatum</i>	0.673	1.901	1.381	1.022	1.053	2.126	6.058	14.214
25	<i>Acer species</i>	0.392	0.967	0.992	0.397	1.320	1.377	7.700	13.145
38	<i>Aesculus indica</i>	0.072	0.070	0.651	0.431	1.266	1.924	14.585	18.999
61	<i>Alnus nitida</i>	0.307	0.371	0.000	0.000	0.000	0.000	0.000	0.678
139	<i>Bauhinia purpurea</i>	0.087	0.189	0.246	0.095	0.140	0.000	0.000	0.757
153	<i>Betula alnoides</i>	0.026	0.490	0.373	0.806	0.544	1.170	0.668	4.077
241	<i>Cedrus deodara</i>	0.111	0.554	2.183	3.103	3.439	1.037	8.241	18.668
243	<i>Celtis australis</i>	0.021	0.045	0.100	0.000	0.000	0.000	0.000	0.166
293	<i>Cornus macrophylla</i>	0.037	0.000	0.042	0.000	0.000	0.000	0.000	0.079
294	<i>Corylus colurna</i>	0.027	0.244	0.110	0.192	0.187	0.000	0.821	1.581
651	<i>Juglans regia</i>	0.006	0.031	0.214	0.184	0.000	0.000	1.783	2.218
822	<i>Morus species</i>	0.020	0.000	0.000	0.079	0.000	0.000	0.000	0.099
921	<i>Picea smithiana</i>	0.000	0	0.000	0.167	0.350	0.000	0.648	1.165
926	<i>Pinus excelsa</i>	0.973	1.867	4.531	9.726	9.003	13.270	18.460	57.830
929	<i>Pinus roxburghii</i>	0.053	0.148	0.321	0.000	0.263	0.419	0.829	2.033
930	<i>Pistacia integerrima</i>	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.010
950	<i>Populus ciliata</i>	0.000	0.000	0.065	0.000	0.000	0.000	0.000	0.065
951	<i>Populus species</i>	0.122	0.105	0.000	0.000	0.000	0.000	0.000	0.227
962	<i>Protium caudatum</i>	0.000	0.000	0.000	0.000	0.000	0.243	0.000	0.243
965	<i>Prunus cornata</i>	0.277	0.805	0.833	0.133	0.661	0.164	0.000	2.873
969	<i>Prunus species</i>	0.000	0.000	0.039	0.000	0.000	0.000	0.000	0.039
992	<i>Pyrus pasha</i>	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.014
1006	<i>Quercus dilatata floribunda</i>	0.157	0.22	0.342	0.000	0.279	0.417	0.637	2.052
1014	<i>Quercus leucotrichophora</i>	0.163	0.637	0.686	1.356	0.761	1.970	9.368	14.941
1017	<i>Quercus semecarpifolia</i>	0.223	1.321	2.076	2.515	2.684	7.934	9.927	26.680

1020	<i>Quercus species</i>	0.027	0.000	0.000	0.127	0.000	0.000	0.000	0.154
1038	<i>Rhododendron arboreum</i>	0.159	0.386	0.360	0.133	0.274	0.381	1.076	2.769
1045	<i>Rhus species</i>	0.026	0.000	0.000	0.000	0.000	0.000	1.777	1.803
1046	<i>Rhus succedanea</i>	0.000	0.160	0.000	0.090	0.000	0.000	0.000	0.250
1136	<i>Syzygium cumini</i>	0.000	0.094	0.058	0.000	0.000	0.000	0.000	0.152
1162	<i>Taxus baccata</i>	0.108	0.360	0.410	0.167	0.000	0.000	0.000	1.045
1201	<i>Ulmus integrifolia</i>	0.012	0.033	0.000	0.107	0.000	0.466	0.979	1.597
1204	<i>Ulmus wallichiana</i>	0.000	0.000	0.000	0.000	0.357	0.521	0.000	0.878
2000	<i>Rest Of Species</i>	1.652	1.213	1.018	1.415	0.995	1.026	7.840	15.159
	Total	7.477	16.279	25.414	37.159	39.699	56.798	192.197	375.023

4.7.3 Extrapolated Enumeration Results of Protection Working Circle

(Table-8)

Protection Working Circle (4) Ha		Total Area of WC: 135705.25 Ha				Enumeration Results Extrapolated:89777.40			
Species		Diameter Class (CM)							Total
		10-20 (V)	20-30 (IV)	30-40 (III)	40-50 (IIA)	50-60 (IIB)	60-70 (IA)	70+ (IB or above)	
Deodar	Number	73790	135281	209071	184474	135281	24597	98386	860879
	Volume (CM)	9965.291	49736.68	195984.1	278579.3	308744.5	93099.16	739855.5	1675965
Kail	Number	1082248	368948	430440	528826	319755	319755	245965	3295937
	Volume (CM)	92111.61	180901.5	435599.9	873175	831877.4	1228963	1731716.2	5374344
Fir/Spruce	Number	1057652	799388	823984	860879	602615	578019	1254424	5976961
	Volume (CM)	154596.7	363508.7	752603.9	1353933	1478903	2006794	9107737.6	15218077
Broad Leaved Species	Number	4046132	4046132	1746355	787090	602615	651809	811686	12691819
	Volume (CM)	414592	867339.5	897414.9	830351.2	944548	1770321	5675637.4	11400204
	Total Number	6259821	5349749	3209850	2361269	1660267	1574179	2410461.7	22825596
	Total Volume	671266	1461486	2281603	3336038	3564073	5099177	17254947	33668590

(Note: The C-VIII, C-IX and C-X Compartments of 2/5 Khirganga forest are not accounted for enumeration)

Growing Stock: Stems per Ha-254.247, Volume Per Ha-375.022

4.8:-Analysis and valuation of the crop:- The objective of management of these forests lie in their watershed values resulting in prevention of soil erosion and denudation of hill slopes, as also for maintaining the aesthetic and scenic beauty of the valley to develop tourism. Inaccessibility of most of the DPFs and RFs makes their landscape value most important. Forest working gives way to conservation and is as such limited, in this working

circle. These forests are particularly important to maintain equable flow of water in the rivers and streams and need urgent total protection; so that mountain faces do not start eroding and flood havoc is not observed. Excess erosion would silt up our reservoirs, reduce dam life, cause breakage of embankments, and ruin our roads and bridges and over-run habitations causing havoc all around. Except of aesthetic forests, most of the protection forests have a stock which is uneven-aged, and scattered, in between rocks and precipices. The stock maps prepared by Mr. Jones from aerial survey photographs are relevant.

4.9:-Method of Treatment: - The forests under this working circle shall be strictly protected and preserved. No felling, except salvage markings are to be done. We must appreciate that the chief value of these forests lie in prevention of erosion and denudation of hill slopes, maintenance of equable flow of water in streams and rivers and preservation of aesthetic appeal and scenic beauty of tourist Places. These forests need to be strictly protected and preserved. No commercial felling is to be done. For remote areas there would not be much of demand as the habitations lie far of. Inaccessibility makes timber and fuel extraction both difficult and uneconomic. In such forests, dry, dying and moribund trees can be marked only in case of salvage removals. However for the DPFs and RFs, which lie near habitation and which are protected for aesthetic and religious reasons must be protected from the point of view of soil conservation, no felling of any sort must be done.

4.10:- Grazing: - The grazing rights as given in the settlement cannot be interfered with. However the territorial DFOs must take effective steps to forbid the grazing in sensitively erodible areas. Such vulnerable places need to be given rest and a time to heal. Areas under regeneration also require special care.

4.11:- Fire protection:- Incendiary forests fires are very common as such proper maintenance of fire lines, inspection paths, bridle paths etc. are a must . Wherever necessary, during dry season, fire watchers are to be employed. The forests floor must be kept clean of inflammable material such as debris, unwanted bushes and weeds and grasses. Needles are a fire hazard and must not litter fire lines, inspection paths etc.

4.12:- Miscellaneous regulations:- Miscellaneous regulations such as grazing, grass cutting and marking of trees must be followed as prescribed in the settlement or as elaborated before. The nalas, moist locations etc need to be planted up with broad-leaved species. *Acer caesium*, *Juglans regia*, *Prunus padus*, *Celtis australis*, *Corylus colurna*, *Quercus semecarpifolia*, *Betula utilis*, etc are good for these regions. Fir and Spruce plantations need to be given special attention and good nursery stock must be raised and planted. Nursery of spruce should also be started. This aspect is not getting due attention. Regeneration areas are required to be fenced and closed to grazing. Forests that lie en-route to gaddi and gujjar paths to their pastures need special care. Endeavour must be to foster goodwill and effective co-operation so that this enterprise is successful. For healthy growth, weeding and cleaning is a must.

4.13:- Right holder requirements:- There is not much of scope for marking to right holders. However with change in TD policy, marking of dead, dying and uprooted trees

should be done to fulfill urgent demand of right holders for genuine domestic and agricultural use.

4.14:- Regeneration: - Standing instructions on the subject are to be followed . All these areas are lacking regeneration and thus sincere and earnest efforts need to be done. Special schemes should be made for ensuring regeneration of these inaccessible areas. In case of natural calamity where a large number of trees are damaged/uprooted etc., the area in question has to be immediately closed and planted up with suitable species.

Under protection WC specific interventions to be included:

A. Tending Operation should be carried out in protection working circle to generate healthy forest

1. **Improvement felling:-** felling of inferior and useless trees.
 - ◆ Improvement felling to maintain hygienic condition in the stand. Improvement felling to remove disease as well as dead or dying trees which are liable to insect attack. This will ensure production of disease free healthy stand. Also, Fire hazards will reduce.
2. **Pruning :-** to make stem knot free and defect. To increase height increment of the bole.
 - ◆ To produce knot free quality timber, branches may be removed from the major portion of the stem.
3. **Climber control:** Cutting of climber at two places, one near the base and other about a meter above it.

B. Fire control:-

1. **Preventive measures:** Control Burning, Fire line making, engagement of fire watcher, Awareness of local people.
2. **Law and regulations.**

CHAPTER-V**BROAD LEAVED (OVER-LAPPING)
WORKING CIRCLE****5.1 General constitution: -**

Broad leaved species plays a very important role in the Himalayan region where mainly conifers are predominant. These trees meet the requirement of fuel wood, fodder, fruits and ayurvedic medicine. Broad leaves are gaining quite a lot of prominence as raw material, for various wood based industries. Maple has gained prominence in the manufacture of bobbins and shuttles for the textile industry. Walnut, Bird cherry and Maple also find use in the manufacture of rifle half wrought. *Juglans regia* is an excellent species for furniture. Broad-leaved species help to neutralize the acidic soils below coniferous forests and also act as an important source of fodder and fuel to local populace. Broad-leaved species are mostly found scattered, as also in groups in the Deodar, Kail and fir forests. The broad leaves mostly grow in nala or damper places in Deodar & Kail WC and Fir WC and work as shelter belt/ wind break and help in protection against spread of forest fires. This working circle has been constituted as an over – lapping working circle so that prominence is given to the broad-leaved patches of significance. This being an overlapping WC, therefore the forests allotted to this working circle in previous working plan are allotted to different WC as under: -

5.1.1 -Range wise detail of forests transferred to Wild Life Division (as per pervious):-**(Table 1)**

Name of Range	Forest	Compartment	Area (ha)
Kasol	R/4 Kasol	C-IVa	32.80
	R/4 Kasol	C-Va	25.60
	2/9 Raona	C-IVa	43.78
	2/9 Raona	C-Va	48.50
	2/9 Raona	C-VIa	45.25
		Total	195.93

5.1.2 -Range wise detail of forests received from Wild Life Division (included in present Working Plan):-**(Table 2)**

Name of Range	Forest	Compartment	Area (ha)
Kasol	R/4 Kasol	C-IVa	25.6
		CVa	16.7
		Total	42.3

5.2 General Character of Vegetation:- The forests, included conform to Champion and Seth's following classification -12 /CIe (Moist temperate deciduous forests),12/CIa(Ban Oak forests), 12/C-2a (Kharshu Oak forests) and 14/C-Ib(Western Himalayan Sub- Alpine Birch- Fir

forests). Moist and cool locations, nala strips, banks of streams and rivers have *Juglans regia*, *Acer caesium*, *Prunus padus*, *Aesculus indica*, *Cornus spp*, *Rhus punjabensis*, *Carpinus spp.*, *Alnus nitida*, *Ulmus wallichiana*, etc. Upper reaches have Kharshu Oak which occurs pure and also mixed with Silver Fir. *Betula spp* is found in the top belt of IInd class forests. The crop in the broad-leaved forests is generally uneven aged and the natural regeneration is quite poor. Excess biotic pressure is the reason. A preponderance of over mature stock is found with respect to *Aesculus indica*.

5.3 Special Objects of Management: - The objects of management are-

- To protect, conserve and enhance the proportion of broad leaved forests so as to ensure increase watershed value of Himalayan region.
- To protect and conserve Oaks, Birches and other valuable broad-leaved forests by improving their stocking and by bringing them under systematic and scientific management.
- To rehabilitate the banks of river Beas and its tributaries (*Bihals*) by planting Kosh & Poplar for enhancing aesthetic beauty on one hand and for meeting demand of fuelwood particularly for cremation purpose.
- To ensure that right holders get fuel wood and fodder, on sustainable basis, in perpetuity from these broad-leaved stands.

5.4 Analysis and valuation of the crop: - On the stock maps prepared for the respective working circles, the areas under broad-leaved species have been indicated. Details of broad-leaved species in each WC are as under:-

(Table 3)

Name of WC	Area	B/L trees		B/L trees per ha	
		No.	Vol.(in m ³)	No.	Vol. (in m ³)
Deodar & Kail	6647.07	625649	475598	94.12	71.55
Fir WC	6710.27	774731	564669	115.45	84.15
Protection	135705.25	19184633	17232260	141.37	126.98
Broad Leaved	1672.02	375275	247002	224.44	147.73

5.5 Details of forests in Broad-Leaved working circle is as under: -

(Table 4)

Range	Forest	Compartment	Area	Species
Hurla	R/12 Niharagahar	C-Ia	33.25	Ban, Rhododendron, cedrella, Rhus, etc
	-do-	C-Ib	66.5	Ban, Celtis, Corylus, Rhododendron, Mohru etc.
	-do-	CIc	60.75	Ban, Cornus, Rhododendron, Mohru etc.
	-do-	C-IIa	31.56	Ban, Brass, Corylus, Carpinus Rhus, Walnut etc.
	-do-	C-IIb	51.25	Ban, Corylus, Brass, Carpinus, Rhus etc.

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	-do-	C-IIIId	67.75	Aesculus, Celtis, Acer, Ban, Cornus etc.
	-do-	C-Va	85.50	Alnus, Poplar, Cedrella, Ban, Mohru etc.
	-do-	CVb	54.25	Ban, Cedrella, Cornus, Rhus, Poplar etc.
	-do-	CVc	86.25	Kharsu, Acer, Cornus, Ban, Rhus Ulmus.
	-do-	CVIf	28.56	Aesculus, Ulmus, Walnut, Celtis, Acer etc.
	1/20 Cherithach	CIVc	200.16	Aesculus, Mohru, Prunus, Celtis, etc.
	1/21 Khoruthach	CVIb	27.11	Celtis, Ulmus, Cedrella, Alnus etc.
	1/24 Nirgaliban	Whole	23.47	Mohru, Walnut etc. Ulmus, celtis, Acer etc.
	1/32 Shilagahar	CIc	41.08	Ulmus, Celtis, Acer, Alnus Juglans etc.
	-do-	CIIa	27.98	Celtis, Carpinus, rhus, Alnus, Acer etc.
	-do-	CIIb	34.75	Ban, Aesculus, Alnus, Celtis, Cornus etc.
	1/34 Brionagahar	Whole	44.11	Ban, Rhododendron, Cornus, Juglans etc.
	1/36 Sawani	CIc	20.25	Rhus, Celtis, ban, Brass, Corylus, etc.
	-do-	CIIa	37.14	Ban, Brass, Corylus, Cedrella, Cornus etc.
	-do-	CIIb	43.39	Aesculus, Rhododendron, Prunus etc.
	1/37 Lichan	Whole	35.61	Ban, Corylus, Cornus, Rhododendron etc.
	1/38 Rajiara	CIb	32.37	Ban, Rhododendron, Carpinus, Corylus etc.
	-do-	CIIa	21.33	Ban, Brass, Aesculus, Carpinus etc.
	-do-	CIIb	43.33	Aesculus, Acer, Mohru, Ban, Brass etc.
	-do-	CIIc	25.58	Mohru, Ban, Brass, Aesculus, Acer etc.
	-do-	CIIIa	23.10	Brass, Ban, Carpinus, Cornus, Aesculus etc.
	-do-	CIIIb	39.63	Mohru, Brass, Ban, Acer, Prunus etc.
	-do-	CIV	33.18	Ban, Brass, Aesculus, Acer, Prunus etc.
	1/39 Tandi	CIc	35.03	Ban, Brass, Rhus, Corylus, Prunus, Acer etc.
	-do-	CIIa	45.75	Ban, Brass, Cornus, Corylus, Rhus, Aesculus etc.
	-do-	CIIb	53.40	Ban, Brass, Aesculus, Mohru, Cornus, Rhus, Acer etc.
	-do-	CIVa	34.57	Mohru, Brass, Acer, Aesculus, Ban, Juglans etc.
	-do-	CIVb	30.44	Ban, Brass, Cornus, Mohru, Acer, Rhus, Aesculus etc.
	-do-	CIVc	26.45	Ban, Brass, Betula, Cornus, Rhus, Aesculus etc.
	1/40 Gobha	CIIa	48.60	Ban, Cornus, Rhus, Brass, Aesculus, Prunus etc.
	-do-	CIIb	36.36	Ban, Rhus, Cornus, Cedrella, Aesculus, Albizzia.
Kasol	R/4 Kasol	CIVa	25.6	Cornus, Ban, Brass, , Mohru, Acer, Rhus, Aesculus etc.

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	-do-	CVa	16.7	Ban, Brass, Betula, Cornus, Rhus, Aesculus etc.
		Total	1672.09	

Felling Series: - No felling series is proposed for this working circle.

5.6:- Enumeration:- The enumeration was carried out on the grid system bases in the Sample IDs (Plots) of size 0.1 Ha each. The whole of the area of the Parvati Forest Division was divided into grids and total 1518 Nos. Sample plots were supplied by the Forest Survey of India through Forest Survey of India North Zone at Shimla. Out of these 1518 Nos. Sample plots 20 Nos. Sample plots were located out of Parvati Forest Division. Out of remaining 1497 Nos. Sample plots 489 Nos. were found workable and rest 1008 Nos. were found Non-workable being steep slopes, above 4000 meter elevation, water bodies, agriculture land etc. The enumeration was carried out with the help of GPS 72, Compass, Haga Altimeter and Callipers. The enumerated data was entered in the Plot Enumeration Form and the description of the plot was entered in Plot Description Form (Appendix Page No. 19-23). The enumerated data was submitted to FSI Dehradun for Analysis. The analyzed data was received in two forms viz i) Land use class (closed, dense, open and scrub). ii) Irrespective of land use class. The land use class wise analyzed data (Stems Per Ha and Volume Per Ha) was then extrapolated to assess the growing stock of this working circle. Total 09 Nos. Sample plots pertaining to this working circle were enumerated. The enumeration has been carried out irrespective of periodic blocks. The detailed forest wise enumeration results are in Volume-II, Appendix-III, Page No. 24-66.

5.6.1. Enumeration Results (Stems Per Ha) of Broad Leaved Working Circle

(Table 5)

Spp. Code	Species	Diameter Class (CM)							Total
		10-20	20-30	30-40	40-50	50-60	60-70	70+	
2	<i>Abies pindrow</i>	0.000	2.222	0.000	0.000	0.000	0.000	0.000	2.222
38	<i>Aesculus indica</i>	1.111	1.111	0.000	0.000	0.000	0.000	0.000	2.222
139	<i>Bauhinia purpurea</i>	3.333	2.222	0.000	0.000	0.000	0.000	0.000	5.556
239	<i>Cedrela febrifuga</i>	2.222	1.111	2.222	1.111	0.000	0.000	0.000	6.667
240	<i>Cedrela toona</i>	0.000	0.000	0.000	1.111	0.000	0.000	0.000	1.111
241	<i>Cedrus deodara</i>	0.000	1.111	0.000	1.111	0.000	0.000	0.000	2.222
293	<i>Cornus macrophylla</i>	1.111	3.333	1.111	0.000	0.000	0.000	0.000	5.556
651	<i>Juglans regia</i>	0.000	0.000	1.111	0.000	0.000	0.000	0.000	1.111
733	<i>Lyonia ovalifolia</i>	4.444	6.667	1.111	0.000	0.000	0.000	0.000	12.222
754	<i>Machilus odoratissima</i>	18.889	11.111	6.667	1.111	2.222	2.222	0.000	42.222
926	<i>Pinus excelsa</i>	0.000	1.111	4.444	1.111	1.111	1.111	8.889	17.778
969	<i>Prunus species</i>	0.000	0.000	1.111	0.000	0.000	0.000	0.000	1.111
1006	<i>Quercus dilatata floribunda</i>	7.778	1.111	5.556	2.222	0.000	p	0.000	17.778

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1007	<i>Quercus glauca</i>	0.000	1.111	0.000	0.000	0.000	0.000	0.000	1.111
1014	<i>Quercus leucotrichophora</i>	4.444	7.778	6.667	4.444	2.222	5.556	4.444	35.556
1017	<i>Quercus semecarpifolia</i>	8.889	17.778	12.222	5.556	4.444	3.333	2.222	54.444
1038	<i>Rhododendron arboreum</i>	5.556	1.111	1.111	0.000	0.000	0.000	0.000	7.778
1162	<i>Taxus baccata</i>	2.222	0.000	0.000	0.000	0.000	0.000	0.000	2.222
2000	<i>Rest Of Species</i>	15.556	10.000	0.000	1.111	1.111	0.000	0.000	27.778
Total		75.556	68.889	43.333	18.889	11.111	13.333	15.556	246.667

5.6.2. Enumeration Results (Volume Per Ha) of Broad Leaved Working Circle

(Table 6)

Spp. Code	Species	Diameter Class (CM)							
		10-20	20-30	30-40	40-50	50-60	60-70	70+	Total
2	Abies pindrow	0.000	0.889	0.000	0.000	0.000	0.000	0.000	0.889
38	Aesculus indica	0.228	0.314	0.000	0.000	0.000	0.000	0.000	0.542
139	Bauhinia purpurea	0.296	0.249	0.000	0.000	0.000	0.000	0.000	0.545
239	Cedrela febrifuga	0.094	0.207	1.031	0.729	0.000	0.000	0.000	2.061
240	Cedrela toona	0.000	0.000	0.000	1.147	0.000	0.000	0.000	1.147
241	Cedrus deodara	0.000	0.308	0.000	1.297	0.000	0.000	0.000	1.605
293	Cornus macrophylla	0.098	0.490	0.344	0.000	0.000	0.000	0.000	0.932
651	Juglans regia	0	0.000	0.773	0.000	0.000	0.000	0.000	0.773
733	Lyonia ovalifolia	0.269	1.151	0.347	0.000	0.000	0.000	0.000	1.767
754	Machilus odoratissirna	1.244	1.839	2.897	0.819	2.630	3.942	0.000	13.371
926	Pinus excelsa	0	0.297	5.121	1.5	2.557	4.031	69.272	82.778
969	Prunus species	0.000	0.000	0.319	0.000	0.000	0.000	0.000	0.319
1006	Quercus diatata floribunda	0.717	0.216	4.456	2.930	0.000	3.503	0.000	11.822
1007	Quercus glauca	0.000	0.297	0.000	0.000	0.000	0.000	0.000	0.297
1014	Quercus leucotrichophora	0.368	2.052	3.773	4.638	3.631	13.744	19.88	48.086
1017	Quercus semecarpifolia	0.938	5.680	9.848	7.610	9.169	10.399	12.911	56.555
1038	Rhododendron arboreum	0.389	0.167	0.459	0.000	0.000	0.000	0.000	1.015
1162	Taxus baccata	0.242	0.000	0.000	0.000	0.000	0.000	0.000	0.242
2000	Rest of Species	1.957	0.000	0.644	1.191	0.000	0.000	4.461	8.253

	Total	6.84	14.15	30.01	21.86	17.98	35.61	106.52	232.99
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5.6.3 Extrapolated Enumeration Results of Broad Leaved Working Circle

(Table-7)

Broad Leaved Working Cirlce (3)			Sample IDs: 9 Nos.					Total Area of WC:		
1672.02 Ha										
Sr. No	Species		Diameter Class (CM)							
			10-20 (V)	20-30 (IV)	30-40 (III)	40-50 (IIA)	50-60 (IIB)	60-70 (IA)	70+ (IB or above)	Total
1	Deodar	Number	0	1858	0	1858	0	0	0	3716
		Volume (CM)	0	515	0	2169	0	0	0	2684
2	Kail	Number	0	1858	7431	1858	1858	1858	14862	29725
		Volume (CM)	0	497	8562	2508	4275	6740	115824	138406
3	Fir/Spruce	Number	0	3716	0	0	0	0	0	3716
		Volume (CM)	0	1486	0	0	0	0	0	1486
4	Broad Leaved Species	Number	126330	107752	65023	27867	16720	20436	11147	375275
		Volume (CM)	11437	21171	41618	31875	25799	52816	62286	247002
		Total Number	126330.4	115183.6	72454.2	31582.6	18578	22293.41	26009.2	412431.4
		Total Volume	11437	23669	50181	36552	30075	59556	178110	389579

Growing Stock (Per Ha): Number- 246.66, Volume- 232.99

5.7 Silvicultural system: - Since no yield is prescribed, no silvicultural system is needed. Artificial regeneration of various valuable species must be done in moist areas and also in nalas/depressions.

5.8 Choice of Species: - Oaks and Birch forests shall be restocked with these species in their respective areas. Valuable broad-leaved species i.e. Walnut, Maple, Bird cherry, *Carpinus spp.* Horse Chestnut, *Salix*, Ash, *Corylus colurna spp.* etc will be encouraged in the mixed forests in depressions, nalas and other natural habitats. Where ever possible introduction of fruit bearing plants and medicinal plants should be encouraged in plantation program.

5.9 Treatment of area, artificial regeneration and nursery technique: - The broad leaved trees are very vital for conifer forests as these not only add to aesthetic beauty of the forests but also indicate different micro-climatic conditions. The broad leave trees are found scattered singly or in patches. In Deodar and Kail Working Circle and in Fir Working Circle these are mostly found in patches along the Nallahs or in saddles wherever the soil is comparatively richer and misture regime is better. Board leave patches also work as fire breaks in conifer

forests. These trees play a very vital role in enhancing water regime and controlling micro-climate. Therefore, it is prescribed that no broad leaf tree felling should be resorted to and in new plantations also and admixture of broad leaf species should be included so that the proportion of broad leaf trees in forest is increased.

Oaks: Oaks are very useful species found in Himalayas. There are three oaks namely Ban oak (*Quercus Luecoticophora*) Mohru/ green oak (*Quercus delitata*) and Kharshu oak (*Quercus Semicarpifolia*) occupying lower zone (1000 mt. to 1800 mt.), middle zone (1800 mt. to 2500 mt.) and higher zone (above 2500 mt.). These are widely lopped for fodder and also felled for fuelwood and charcoal (being having very high calorific value). These species plays very important role in forest management and needs full protection, and artificial planting. Special efforts need to plant Kharshu oaks as these occupy high altitude and have very high watershed values. So far no efforts have been done for planting Kharshu oaks and Birch in the upper zone near tree line where now some natural slips have started occurring. Therefore it is high time that introduction of these species in sub alpine zone is taken up in a big way.

In addition special efforts need to enhance broad leaf species as these meet the varied requirements of local people. Artificial regeneration along with effective protection is required to fill up the gaps. Large chunk of areas are available in the IIIrd class forests, where valuable Oaks can be grown. The areas of concern in lower zone are IIIrd class forests and banks of river Beas and its tributaries (*Bihals*). There is very heavy biotic pressure on these lands and their rehabilitation and management need to be properly planned and executed. The pressure on Kosh and Hill Pipal species found in Bihals is high near the crematoriums. The Joint participatory Forest Management is a key to success. Active involvement of community based organizations like Gram Panchayats, Mahila Mandals, Youth clubs, eco clubs in schools etc shall be a great help and must be involved in plantation programs Indiscriminate lopping is doing maximum damage and must be checked vigorously. Climbers and bush cutting must be done. Adequate fire protection must be ensured. Indiscriminate lopping of Ban Oak must be checked severely. The plantation techniques and nursery is dealt in Plantation WC in details.

Under Broad leaf overlapping working circle intervention to be undertakes need to be mentioned specifically

1. Introduction of fruit bearing and medicinal plant should be encouraged.
2. No B/L trees felling should be resorted to.
3. New plantation should be carried out. Planting of kosh and poplar in Bihals (riverine spaces) is must for enhancing aesthetic value of area as well as to fulfill the demand of fuel wood specially for cremation purpose.
4. Special effort needs to plant Oak (especially Kharshu oak as we knowit occupy high altitude and has very hight water shed value).
5. Planning of rehabilitation and management is need to be done as biotic pressure is very heavy.
6. Tending operation must be carried out.

CHAPTER VI

Grazing & Improvement Working Circle

6.1- General Constitution:-

Alpine pastures and IIIrd class forests constitute this working circle. The IIIrd class forests cover a major chunk of area adjoining the habitations and in the vicinity of villages. The alpine pastures exist mostly, above the line of tree growth and are quite extensive in area. More than half of the area in the alpine zone consists of massive rocks, snow and ice and lie between the line of tree growth and perpetual snow stretch and exists as alpine pastures.

6.2 General Character of the vegetation: - Forests of different types ranging from alpine to subtropical forests are included in this working circle, with scattered distribution throughout the tract. Almost every type of vegetation, typical of the territorial divisions, is met with in this working circle. The main forest types as per Champion and Seth's classification are – 14/DSI (Sub Alpine Pastures), 15/C-3 (Alpine Pastures), 9C-Ib (Himalayan Chir Pine), 12/C-Ia (Ban Oak Forests), 12/C-Ie (Moist Temperate Deciduous forests) and 12/C-If (Low level Blue Pine Forests).

6.3- Special objects of management:-

- A) To assess the grazing capacity of grazing alpine areas and to assess the extent of pasture lands available to both grazing grounds on lower slopes near the habitation and alpine pastures.
- B) To improve the stocking of grasses with better varieties, suitable to the localities.
- C) Consistent with erosion control, to provide for grazing requirements of local and migratory graziers.
- D) To protect the hills from denudation and erosion by preserving existing cover and by taking effective soil conservation measures.
- E) To raise plantations of timber and fodder species for meeting the requirements of local people in such a way that the primary objective of maintaining grasslands does not get jeopardized.

6.4- Animal Population: - Animal population livestock census of district Kullu as under—

6.4.1-Livestock Census of Kullu District:

(Table 1)

S. No.	Census Year	Livestock Population
1	1977	327491
2	1983	332314
3	2007	386020
4	2012	378974

6.4.2-Tehsil-wise Livestock Population of Kullu District as per 18th All India Livestock (Census-2007)

(Table 2)

Name of Block	Total Cattle	Total Buffalo	Total Sheep	Total Goat	Total Horse	Remarks
Kullu Tehsil	74549	540	60910	26639	863	Detail of
Manali Tehsil	11293	7	11102	3124	655	other
Total of Kullu & Manali Tehsils	85842	547	72012	29763	1518	Miscellaneous species not
Kullu District Total	169019	872	114942	69535	1634	given

Census-2007

6.4.3- Block-wise estimated livestock census (19th livestock census 2012)

(Table 3)

Name of block	Small Animals		Large Animals		Draft Animal (Buffalo/Yak/Bull/ Horse/ Any other (Nos.))
	Goats	Sheep	Total Cattle	Buffalo	
Kullu	16700	27470	28815	650	859
Nagggar	11850	23820	28781	50	1590
Total of Kullu and Nagggar Block	28550	51290	57596	700	2449
Banjar	15670	22950	43193	28	400
Anni	13223	25681	45208	0	150
Nirmand	11040	23990	36778	0	78
Grand Total	68483	123911	182775	728	3077

Census-2012

6.4.4-Detail of cattle head brought from outside the division, for summer grazing-

(List of graziers is in Vol-II Appendix- VI, Page 76-87)

(Table 4)

Type of animal	Number (Kullu)
Buffaloes	862
Horses/ Pony	60
Cow	4
Sheep and Goat	10961
Total	11887

Although no permit is issued for grazing of sheep and goats by migratory graziers yet there is Rahgir permit with migratory graziers and they camp in some particular forests enroute to Lahul and Spiti district. The higher population of sheep and goats is a threat to natural regeneration in forest in general and this working circle in particular.

6.4.5- Grazing requirement of the animal population: - The grazing requirement of animal has been determined in the grazing policy of Himachal Pradesh and the grazing units/ Animal units as per this policy, is taken as under:-

(Table 5)

Type of animal	# of units assigned to each
Sheep	1
Goat	1.5
Donkeys	3
Kine & Cattle	4
Mule	5
Buffalo	6

6.4.6- Area required:-The grazing area of 0.5 hectares per unit has been considered necessary as bare minimum, as per the grazing policy of Himachal Pradesh. Only a rough idea can be had regarding the total area required for the local cattle population and the migratory graziers.

(Table 6 a)

Name of animal	# of animal	Total units	Area reqd.
Kine and cattles	57596 X 4 =	230384	115192
Buffaloes	700 X 6=	4200	2100
Horses & Mules	2449X 5=	12245	6122.5
Sheep	51290 X 1=	51290	25645
Goats	28550 X 1.5 =	42825	21412.5
		340944 AU	170472 ha

Grazires:-

(Table 6 b)

Name of animal	# of animal	Total units	Area reqd.
Buffaloes	862 X 6 =	5172	2586
Sheep and Goats	10961X 1.25 =	13701.25	6850.60
		18873	9436 Ha.

6.5 – Area available for grazing:- The area as worked out in the previous working plan has been adopted for this working plan, since hardly any change has occurred. The area available for grazing has been worked out through the survey sheets for alpine areas. However for lower areas, by calculating the area of DPF's and UPFs and assuming that only 1/3rd area would be available for grazing, keeping a margin for regeneration and afforestation areas.

(Table 7)

Name of Range	Total area of alpine zone	Estimated area fit for grazing
Kasol	100665	44394
Jari	518	151
Hurla	3250	1083
Bhunter	-	-
Total	104433	45628

Below alpine pastures, total area of RF/DPF/UPF is around 93040 ha and area available for grazing shall be around 31010 ha. Thus total grazing area available would be around 76638 hectares as against 179908 ha required for the animal population in Parvati tract.

6.5.1- Incidence of grazing:- It is observed that the forests of the tract are over-aged. The incidence of grazing comes out to be 0.105 ha/AU. Conditions, thus, are very bad and urgent remedial steps are required to be taken up. The deterioration of forests and grazing land is inevitable with such incidence of grazing. Unfortunately, this aspect is not properly addressed in any of the govt. policy and no nodal department has been fixed to look after this aspect.

6.6- Method of Treatment:- Live stock is one of the chief source of livelihood of the local populace, next only to agriculture, in the hilly tract. Grazing is one of the principal right of rural folk that stands recognized in the settlement reports. We can ill afford to ignore it, as it would antagonize the local population. This will not brood well for the forestry activities envisaged. Wisdom and skill thus is in adjusting the requirement of the people with our forestry programmes.

Suggestions made in the last Working Plan, to control and regulate grazing and for the improvement of pastures still holds good. The suggestions are elaborated below –

- A) List up all grazing areas of both the territorial tracts and grazing capacity assessed at the rate of 0.5 hectares per unit. Strict control and check must be exercised and it must be ensured, that no further increase in the number of migratory cattle i.e. sheep, goats and buffaloes, who enter during summer, is allowed.
- B) Educate and persuade the migratory graziers to reduce their herds. Further, educate the local people, requesting them to keep a few cattle of superior breed. Local graziers should not be allowed to increase their flock and should be dissuaded for keeping non-working cattle for manure purposes only. Adoption of stall feeding should be encouraged. Grass cutting rather than grazing should be encouraged. Loan and subsidies should be provided to the needy person under pasture improvement scheme for purchase of feed.
- C) Provision of subsidy for vermi-compost and its use as manure is encouraged, so that dependence on cattle manure is reduced. The leaf litter of orchards can be best utilized for making vermi-compost.
- D) Suitable areas should be taken as demonstration plots and beneficial effects of rotational grazing and other improved applications are made known to the people. Rotational closures should be enforced to give rest to the pastures and increase productive capacity. Permanent or periodic closure should be encouraged, in areas under erosion, gully formations or slips.
- E) For erosion control afforestation, use fodder trees and shrubs rather than timber species. Suitable legumes like clovers etc should be introduced in the pastures to build

up the soil fertility and to increase the nutritive value of the pastures. Soil conservation measures must be taken to stabilize slopes.

- F) Fertilizers should be applied to grasses to get increased yields. Grass cutting in these plots, where fertilizer has been used, should be allowed in the month of October when seed has been shed.
- G) Obnoxious weeds and unpalatable grasses should be eradicated and more nutritive fodder grasses, suited to the locality, should be introduced in the pasture. Pastures which have deteriorated through over use, will be closed to grazing for 3 years and after removal of inedible herbs and some surface dressing will be sown with a mixture of white clover and nutritious grasses like prairie grass i.e. *Bromus unioloides*, Perennial ryegrass- *Lolium perenne*, orchard grass or cocksfoot, *Dactylis glomerata*, timothy, *Phleum pratense* and other grasses. Timothy in combination with white clover is most suitable for alpine pastures.
- H) Universities and institutions that have good experience of land management should be involved so as to get fruitful results.

6.7- Afforestation and rehabilitation of IIIrd class forests: - Undemarcated protected forests commonly known as IIIrd class forest, constitute a large chunk of area which is honeycombed in between cultivations, villages and other habitations. Encroachment, excess timber distribution pressure, excess grazing has rendered these areas barren with varying degree of deterioration. Excess afforestation drive is being done by the forest department without getting closure through notification. Further increase of forest lands, means decrease of pasture land. This means the conflict between the forest department and the local populace would increase. The result is that people are not spontaneously coming forth to give their consent for afforestation programmes. Any plantation effort in the IIIrd class forest will succeed, only if the local people are involved in planning, species selection and subsequent management. Instead of planting all areas with trees of high timber value, Forest department need to recognize grass lands as typical eco system which cater to different needs and have different role than forest eco system. Leave pasture as they are and only improve the composition and quality of the pastures, so that people get palatable and nutritious grass for their cattle. Fodder species would be acceptable to the local populace as that cater to their demand when no other green fodder is available. In pastures thus, only pasture improvement measures incorporating range management practices are to be undertaken.

Rehabilitation and Reafforestation of IIIrd class forest is a must, considering their nearness to local habitations.

6.7.1- Range wise area of IIIrd class forest, below meters 3000 meters elevation:-

(Table 8)

Range	Total area (in ha)
Kasol	5246.64
Jari	5531.0
Hurla	4857.20
Bhunter	3409.93
Total	19044.8

6.8:- Prescription for new DPFs:

In Parvati forest Division there is large area under IIIrd class forest category. These IIIrd class forest are very close to the habitation and area not in good shape. They have been deforested and ruined due to over use and lack of proper management practices. Being IIIrd class forests, forest officials are not aware about their extent. Some of these forests can be got notified as new DPFs from the Govt. and then proper management practices should be followed. In the remaining IIIrd class forests, management should be by involving local people by forming JFMCs. Large scale plantation drive of fodder species should be initiated. For domesticated cattle, tree species of fodder should be planted, so as to reduce pressure on grass species for conservation purpose.

CHAPTER- VII

WILD LIFE MANAGEMENT

7.1 GENERAL CONSTITUTION: The Parvati Forest division is a hub of Wildlife enthusiasts being highly rich in floral and faunal diversity. Diversity is due to a great variation in altitudes, topology, climates and vegetation. Wild animals and birds capable of thriving under different climatic conditions, ranging from sub-tropical to arctic and from densely wooded areas to sparse tree growth are found here. There are Kanawar, Khokhan and Kais Wildlife Sanctuaries in the tract of Parvati Forest Division which are administered by the Divisional Forest Officer Wildlife at Kullu. In addition, govt. has notified its intentions to create a new National park named Khirganga National Park from Kasol Range of this division. The presence of Three WL Sanctuaries and One National Park within the tract of this division is the clear indication of the rich Floral and Faunal diversity. Hence it is of utmost importance to constitute a new Working Circle to emphasize the necessity of conservation of wildlife and to collect the information for better management of wild life. The whole tract has a variety of wild animals and birds since the forests are distributed from low elevation to the high snow bound areas. Therefore, this working circle overlaps all other working circles.

7.2. IMPORTANCE OF WILDLIFE: The Parvati Forest Division extends from very low altitude of 950 meters to high snow bound areas of altitude 6000 meters. Therefore it has species assemblage of flora and fauna representative of front ranges of Western Himalayas to trans-Himalayas. The monsoon-affected forests and alpine meadows of the Himalayan inner ranges support a unique biota comprised of many distinct altitude-sensitive ecosystems and are home to many plants and animals. The Western Himalayas are considered an endemic bird area (EBA) by Birdlife International, supporting many restricted-range species, as well as a Conservation International Biodiversity Hotspot. This region as a whole has come under enormous pressure from human activities, both from the ongoing practice of traditional livelihoods, such as seasonal grazing, hunting and the collection of medicinal plants, as well as more recent developments such as the farming of temperate cash crops, commercial forestry, tourism and hydro-electric power development.

The following Engagement Activities can be conducted in future to bring closer the human-wildlife interaction in a positive manner:

- Sensitizing people especially locals towards wildlife, habitat management and contingency in terms of man-animal conflict.
- Assessing people's attitudes towards wildlife by conducting IEC activities.
- Engaging people of different groups. This can be done by organizing wildlife-week festivals, educational trekking tours, bird-watching and new sources of 'edutainment' via webinars.
- Involving local administration, judiciary, media, NGOs related to wildlife/biodiversity/conservation for awareness and building a general sense of empathy towards forests and wildlife.

7.3 PROTECTED AREAS

7.3.1 KAIS WILDLIFE SANCTUARY

Notifications No. and date	No. FFE-B-F(6)-11/2005-II/Kais dt. 07/06/2013
Situations	To the South 2/27 Padra Rias.
Boundaries	<p>North -From Bastak Thatch along demarcated line separating 2/32 Matikochhar and 2/27 Padra Rias and 2/26 Marhauri and Kais Nalla upto Janiyal Thatch.</p> <p>East - From Janiyal thatch along Ridge separating Catchment of Beas and Parvati rivers then Rumtu Dhar upto Jalada Thatch point 3481 mtr.</p> <p>South – From Jalada Thatch point 3481 mtr. on the ridge separating Matikochhar PF and Pinsu PF boundaries and 2/32 Matikochhar CVIb, CV and spur descending from dhara to Kais Nalla upto peak at origin of nalla flowing to Beas River.</p> <p>West – Along forest boundary Matikochhar and nalla downstream upto turning point to west on nalla along forest</p>

boundary and to Rauns thatch and forest boundary Matikochhar and then along road upto Bastak thatch.

Total area of Sanctuary

12.61Sq. Km.

Location

North (Lat32°03'10"Long 77°12'32")

East (Lat32°02'42"Long 77°12'32")

South (Lat31°59'38"Long 77°10'17")

West (Lat32°00'23"Long 77°09'19")

Falls on Survey of India Toposheet No. 53E/I & 52H/4 scale 1:50000

7.3.2 KANAWAR SANCTUARY

- (i) Notification No. date : No. FFE-B-F (6)-11/2005 dated 28th july, 2010
- (ii) Boundaries : **N-** Boundary Starts from Jail Nal & moves along boundary of R/4 Kasol. C-VI-b and C-I upto 1800 meters, Contour line and then moves along 1800 mtrs. Contour line up to Grahan Gad and then moves upstream the Gad along the boundary of R/4 Kasol and moves along the boundary of Reona PF's C-IIb, C-IIa, CIId to separating the cultivation land of Garahan village then follows the boundary of Tilalotan PF via SOI bench mark 4056 mtrs, then downstream a tributary flowing to Dudhikhhol Nal upto near SOI bench mark 2838 mtrs.
- E-** Boundary starts from confluence of tributary in Dhudhikhhol Nal and then boundary moves upstream with other tributary flowing to Dudhi Khol then downstream along a tributary flowing Barthi Nal and boundary follows a path to Ujll Runi Thach and follows the ridge via SOI bench mark 4817 mtrs upto Phanchi Galu 4636 mtrs. along path.

S- Boundary starts from Phanchi Galu 4636 mtrs. moves along the ridge Ori dhar Rohni Dhar to SOI bench mark 4658 mtrs. then moves downstream a tributary that join Hamkha Nal Near Beghlo Thach. Then it moves upstream with small tributary to SOI 4330 mtrs. then it goes along southern boundary of Reona PF SOI bench mark 3610 mtrs, Khauli Galu, 3715 mtrs southern boundary of Kasol RF, SOI bench mark 4046 mtrs, 3889 mtrs, 4097 mtrs., Tiri Thunth, southern boundary of Muri PF.

W- Boundary starts from SOI bench mark 3674 mtrs and moves down stream with a Nala flowing to Jaram nal, SOI bench mark 1895 mtrs then boundary moves along the forest boundary of Muri PF, SOI bench mark 3286 mtrs then moves down stream along with the Jail Nal upto the R/4 Kasol C-VI-b starting point of northern boundary.

- (iii) Compartment and Area : 107.29 Sq. Km.
- (iv) Elevation : 1534 meters to 4833 meters above sea- level.
- (v) Aspect :
- (vi) Flora : Spruce, Deodar, Kail Prinsepia, Sarcococca, Berberis, Ros, Viburnum Rumex, Fragria, Plectranthus, Rubus, Ploygonum, Ferns.
- (vii) Detail of Wildlife : Black bear, Leopard, Ghoral, Barking deer, Monal, Kalij, Koklash and Chokor.

7.3.3 KHOKHAN SANCTUARY

- (i) Notification No. and date : No. FFE-B-F (6)- 11/2005 dated 28th July 2010
- (ii) Boundaries : N: The boundary starts from eastern boundary of Rajgiri PF then boundary moves with northern

boundary of Oriban PF upwards with Tichi Nalla
northern boundary of Nagni PF upto point Nagni Dhar
above Shanghli.

E: The boundary starts from Nagni Dhar moves via
Survey of India Bench Mark 2594 mtr., 2614 mtr.,
boundary then moves along with Nagni PF and then
Join Dukan RF boundary upto Ganogi.

S: The boundary starts from Dukan RF Ganogi and
moves along forest boundary Survey of India. B.m.
2010 mtr., 2659 mtr., 2622 mtr., upto Survey of India
Bench Mark 2787 mtr on District boundary of
Kullu and Mandi.

W: The boundary starts from Survey of India.B.M.
2787 mtr., along with the Munjka PF boundary and
Niarag RF boundary upto eastern boundary of Rajgiri
PF on District boundary of Kullu and Mandi and via
2328 mtr. upto the starting point of northern boundary.

- (iii) Compartment and Area : 14.95 Sq. Km.
- (iv) Elevation : 2000 meters to 4500 meters above sea-level.
- (v) Aspect : Western
- (vi) Flora : Kharsu Oak, Spruce, Silver Fir, Deodar, Kail and
Broad leaved Species. Ground covers Prinsepia,
Sarcococca, Berberis, Rosa, Viburnum, Rumex,
Polygonum, Ferns, and Salix elegans.
- (vii) Detail of Wildlife : Black bear, Musk deer, Ghoral and Barking deer,
Monal, Kalij and Koklash Pheasant, Chakor

7.3.4 KHIRGANGA NATIONAL PARK (Intension Notification)

- (i) Notification No. and date : No. FFE-B-F (6) - 11/2005 dated 28th July 2010
- (ii) Boundaries : N: From the Sara Umga Pass on the district boundary
of Kullu and Lahul & Spiti, the boundary follows SOI

benchmark 5575m, 6260m, 6440m, 6420m, 5940m, Shigrila 6230m, 5980m, 5620m, 5845m, 5505m, 5990m, 5855m, 5635m, 6015m, 5870m, 5795m, 6395m, 5995m, 5875m, and 6632m to join the western boundary of the Pin Valley National Park.

E: The boundary starts from near the SOI benchmark 6632m of the Pin Valley National Park and moves along the western boundary of this National Park upto the SOI 5741m which is also meeting point of the Great Himalayan National Park.

S: The boundary begins from the meeting point SOI 5741m of Pin Valley NP and the Great Himalayan National Park and follows the existing northern boundary of Great Himalayan National Park upto Survey of India benchmark 5238m at Baskinag.

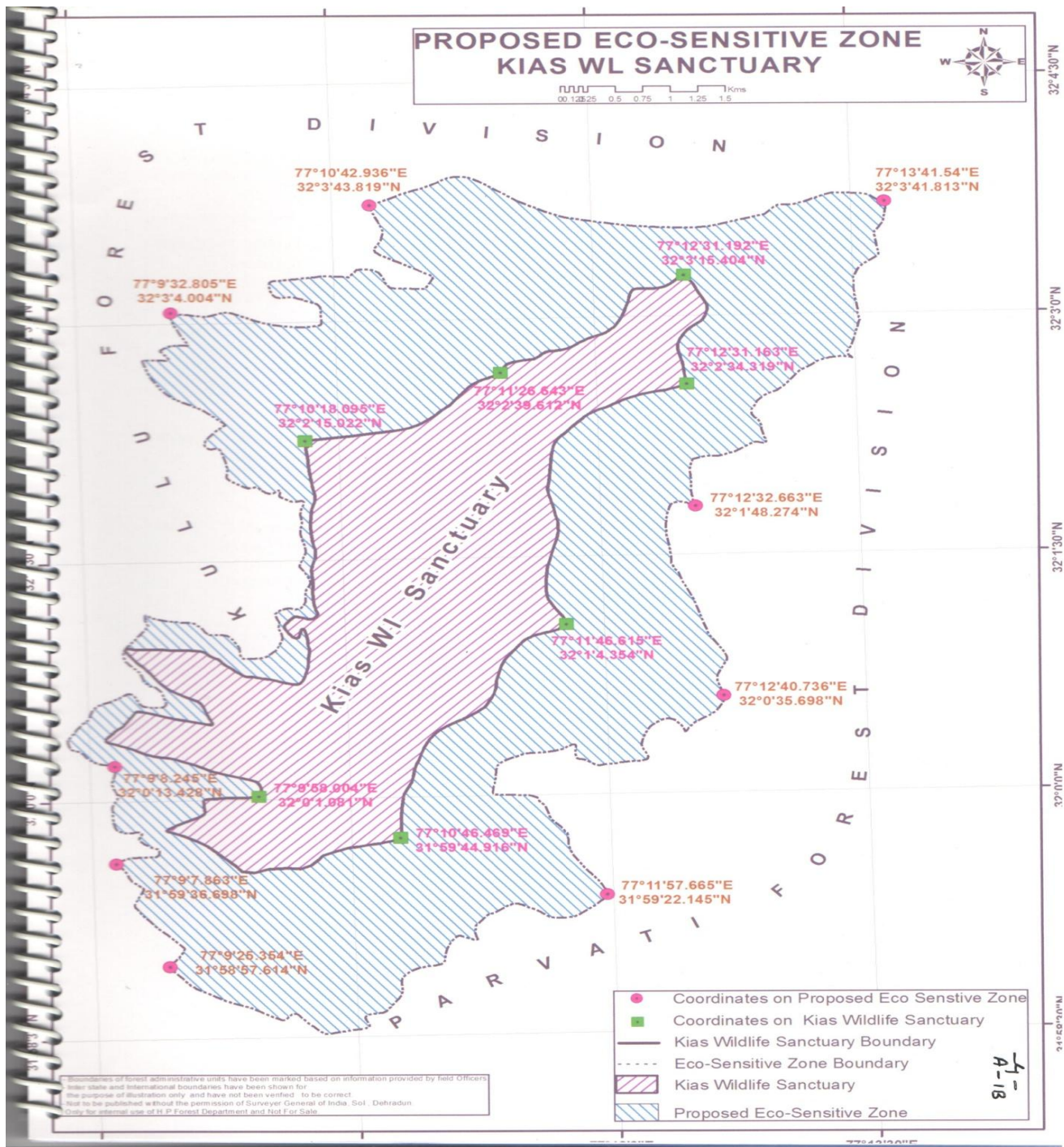
W: The Boundary starts from Baskinag 5238m (on Phangchi Dhar) located on the northern boundary of the Great Himalayan National Park. It moves along the forest boundary to the SOI.

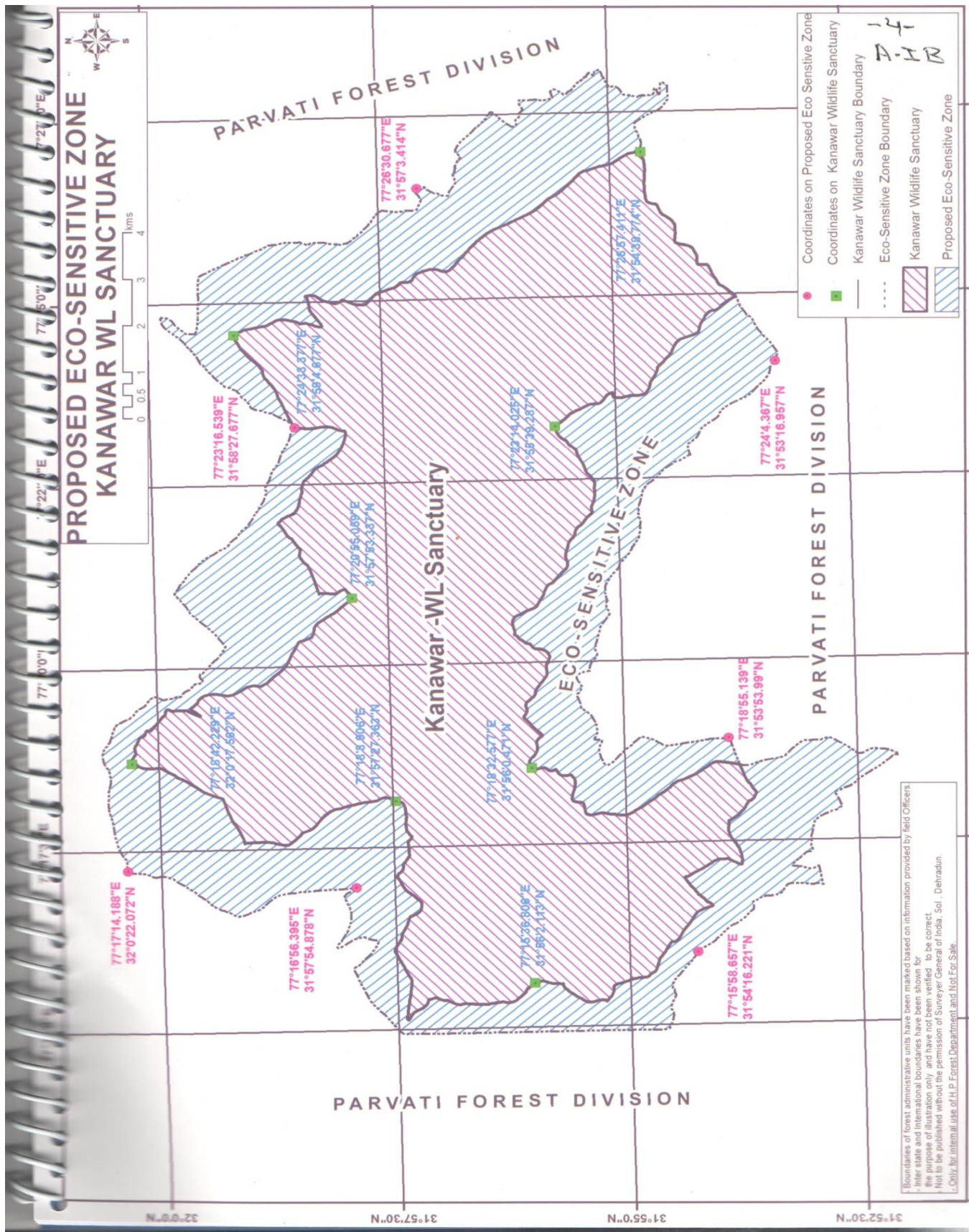
- | | |
|----------------------------|---|
| (iii) Compartment and Area | : 710 Sq. Km. |
| (iv) Elevation | : 2000 meters to 4500 meters above sea-level. |
| (v) Aspect | : Western |
| (vi) Flora | : Kharsu Oak, Spruce, Silver Fir, Deodar, Kail and Broad leaved Species. Ground covers <u>Prinsepia</u> , <u>Sarcococca</u> , <u>Berberis</u> , <u>Rosa</u> , <u>Viburnum</u> , <u>Rumex</u> , <u>Polygonum</u> , <u>Ferns</u> , and <u>Salix elegans</u> . |
| (vii) Detail of Wildlife | : Black bear, Musk deer, Ghoral and Barking deer, Monal, Kalij and Koklash Pheasant, Chakor. |

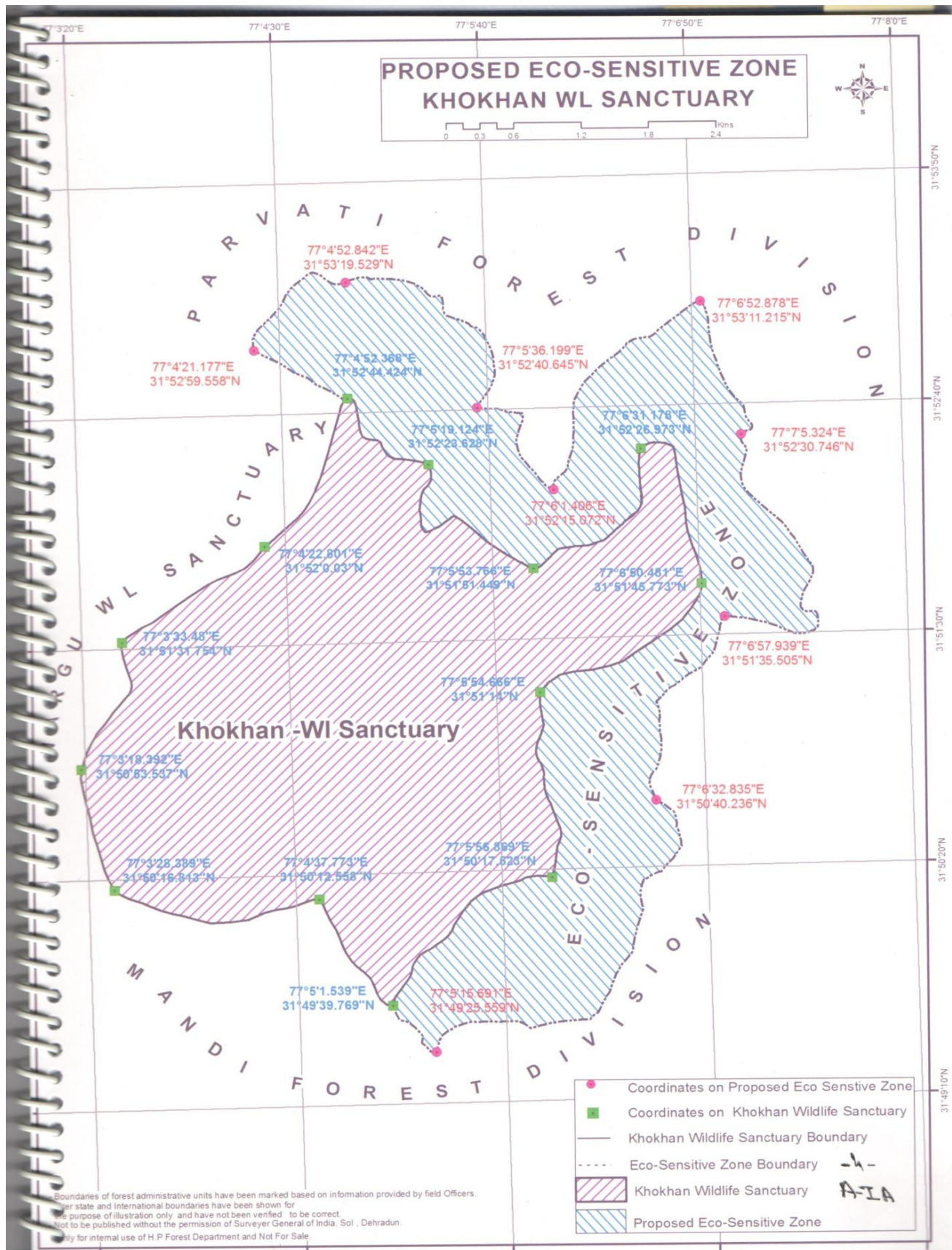
The areas adjoining these Wildlife Sanctuaries are equally important as they act as very good buffer for many important rare and endangered species. Also as the topography of the area is

such that it makes these areas ecologically sensitive. Furthermore, these areas act as buffer for protection, conservation of wildlife inhabiting wildlife sanctuaries and minimize commercial activities which pose threat to their habitat. Hence it is important to conserve and protect the areas around these sanctuaries from habitat management point of view, aiming at preserving the genetic resources of these Protected Areas. Keeping in view, the importance of these areas around Kais, Kanawar and Khokhan Wildlife Sanctuaries proposals have been prepared and submitted to GOI for declaring and notifying these areas as Eco-Sensitive Zones under Environment (Protection) Act, 1986.

The map of the area proposed as Eco-Sensitive Zones around Kias, Kanawar and Khokhan W.L. Sanctuaries and of WL Sanctuaries:







7.4 DISTRIBUTION OF WILDLIFE The distribution of wild life has been described in detail in Chapter IIB of Part-I of the plan.

7.5 SPECIAL OBJECTS OF MANAGEMENT

The primary goal of management of wildlife in Parvati Forest Division is to conserve wild life and its habitat, to mitigate human wildlife conflicts and to reduce poaching.

In order to achieve this goal, it is imperative to adopt multi-pronged strategy and integrate the functions, i.e.

- A. Working with the local communities to reduce their dependencies on the forests to minimize human-wildlife conflict.
- B. Interventions for habitat management.
- C. Interventions to manage monitor and protect wildlife.
- D. Take steps to reduce poaching by enhanced interface with local populace.

7.6 MANAGEMENT STRATEGY

The strategic approach of wildlife protection/conservation in the Parvati Forest Division aims at recognizing the fact that the wildlife conservation is possible only through active support of the local community. There is a need to gain a more informed understanding of the different stakeholder groups and the major influences that shape them.

Accordingly, management prescriptions for the objectives mentioned above are given as following:

7.6.1 Working with the local communities to reduce their dependencies on the forests to minimize human-wildlife conflict

- i) Help resolve man-animal conflict with emphasis on social and environmental justice for the poor people living in the Parvati Forest Division.
- ii) The officials of Parvati Forest Division should provide for resolving the man-animal conflict with emphasis on social and environmental backdrop of the poor people living close to the forests and development of a competence based training programme for the Parvati Forest Division staff and the local community.
- iii) Attitudinal change and increased sensitivity on part of field staff on the issues of wild life damages and more responsive and quicker actions.

7.6.1.1 Crop Depredation Historically, the villagers have been hunting the large bodied animals for meat and trophy (crest of a Monal, meat and horns of Ghoral, Thar, Blue sheep and Ibex) in whole of the forests of Parvati Forest Division. This was also a strategy to check the wild animal's populations from killing the livestock or damaging the crops.

The state govt. imposed ban on the hunting of wild animals (1986) and it is claimed that number of wild animals have shown increasing trend in the area although there is no proper study conducted. However the human- wildlife conflict is not very pronounced in Parvati Forest Division. Few incidences of cattle lifting/ killing by Leopard and bear are however reported.

This area is very rich in Horticulture crops with apple have lion's share beside peach, plums, apricot, Kiwi and pear. The wild animals such as monkey, Bats and parakeets do the maximum damage to these crops.

Monkey which were earlier unknown in these areas are now started creating menace and their population is increasing very fast as religious belief protects them.

7.6.1.2 LIVESTOCK DEPREDAATION Due to increasing population pressures and consequent degradation of forest habitat, the wild animals such as Himalayan Black Bear and leopards have become “refugees” in their own habitats. At the same time the rhesus macaque and langoors are able to adapt themselves to the human presence. It is a well-known fact that the wild animals avoid areas with disturbances. This means that when their habitat gets further restricted as a result, they venture into the human habitations. The wild animals also intrude into agriculture fields as the crops raised are more palatable, and they are located in easy locations. In addition to this the poor and marginal farmers in the villages keep livestock such as sheep and goats, which usually survive on grazing on the forest and pasture land. For wild carnivores, such domestic livestock are very easy prey. However, such incidences are only a few.

7.6.1.3 TIMING OF PREDATION BY THE WILDLIFE The timing of the predations by the wild animals is very crucial to understand human-animal conflict. The leopard killings are mostly in July to September; the Himalayan Black Bear made killings in almost same months. The wild carnivores remain active in the months of June to October when the livestock is in the forests/pastures of the forests.

7.7 COMPENSATION:- Human-wildlife conflicts have assumed different dimensions in terms of human casualties, livestock killings and agricultural and horticultural crop raiding at the interface of wildlife habitats and human use dominated landscape. Such a situation affects the diverse sections of the village society, differently. Those who live closer to the forest areas and away from the road-head are mostly poor and bear most of the burns of the human-wildlife conflict. The yearwise details of wildlife damage to domestic animals and human beings and compensation granted are tabulated as under:

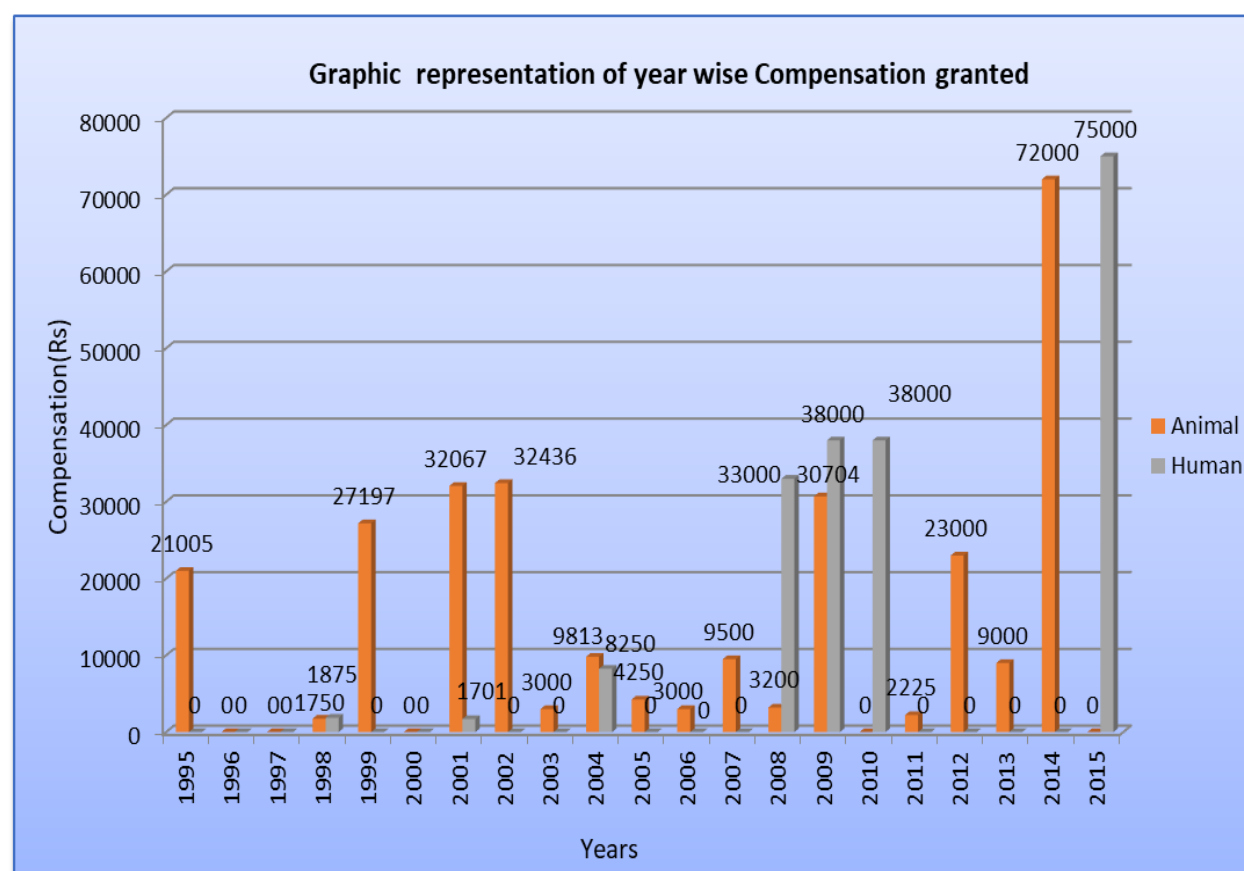
Wildlife Damage
(From Jan. 1995 to Dec 2015)
(Table1)

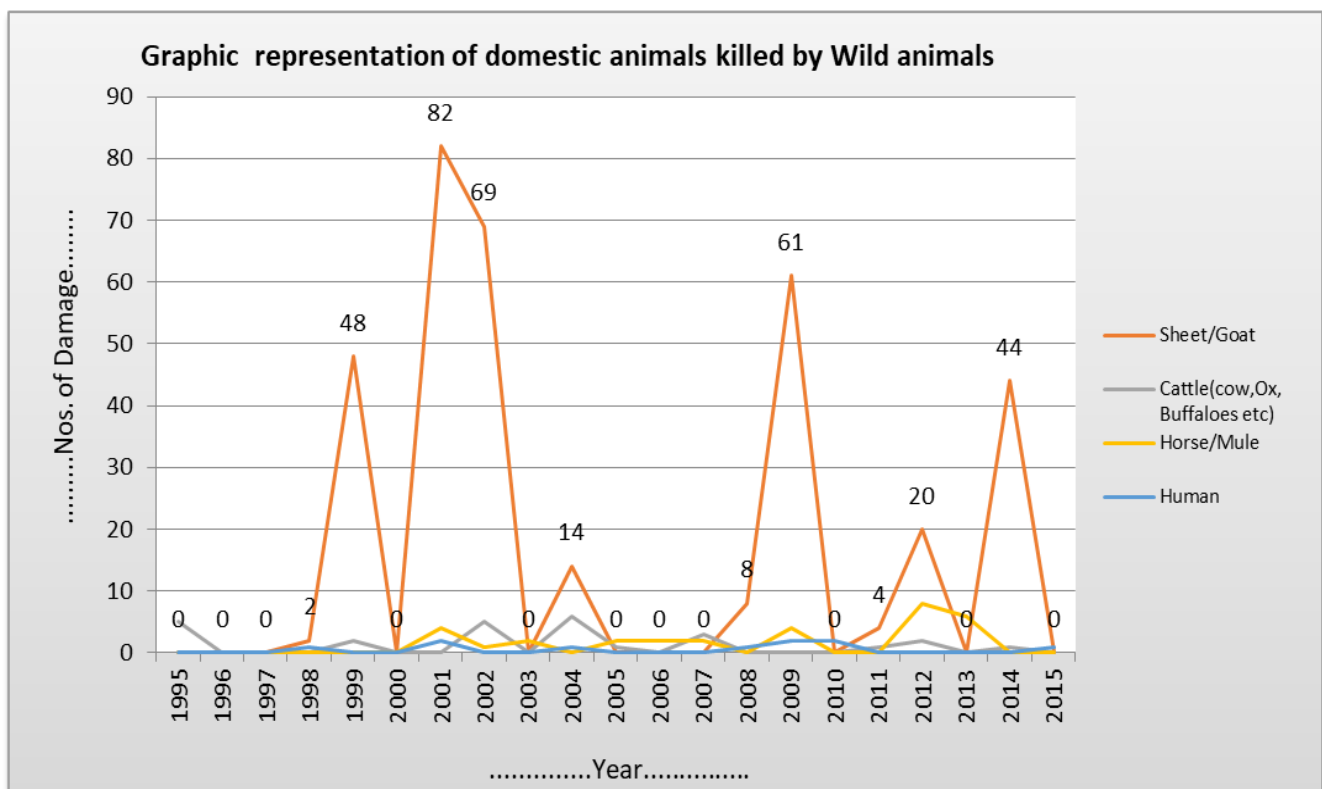
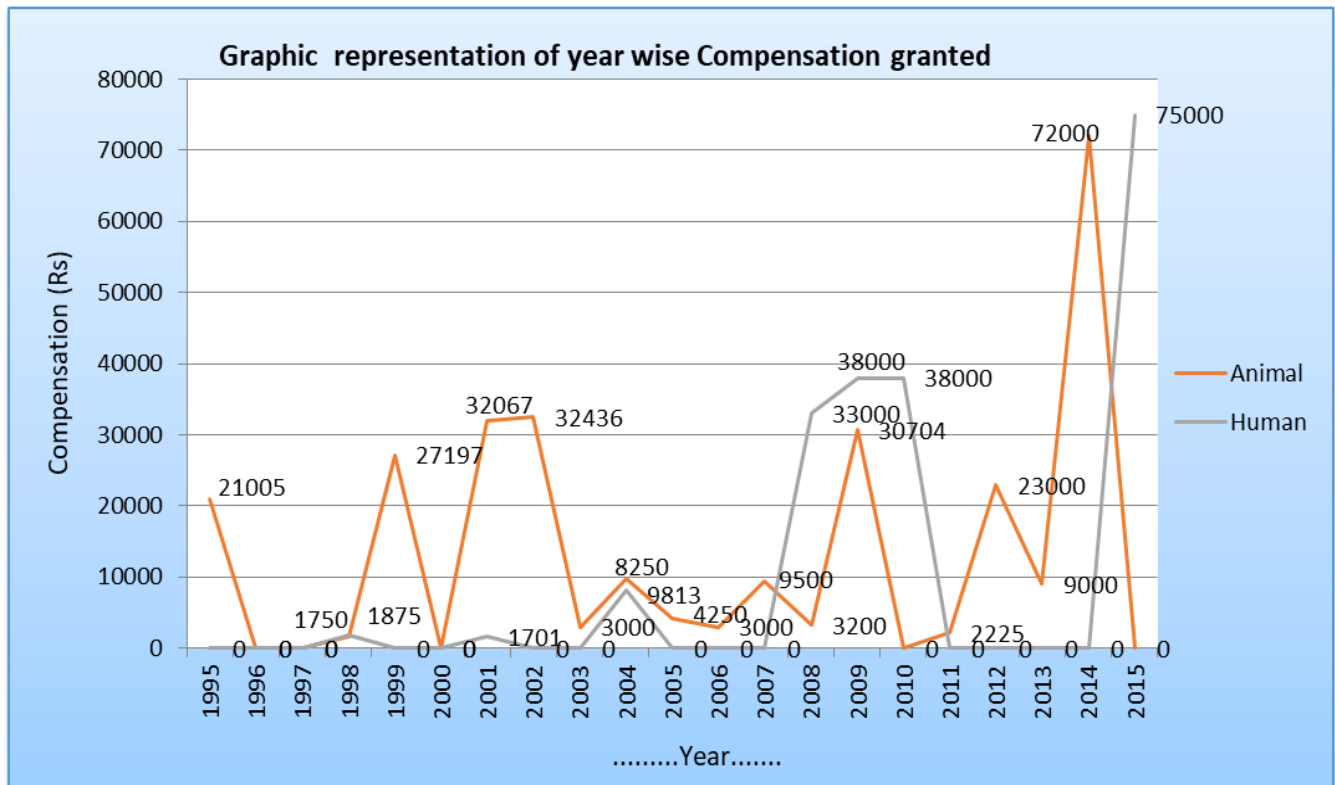
Year	Damage			Wild Animal	Comps (Rs.)	Human Being	Wild Animal	Comps. (Rs.)
	Sheep/ Goat	Cattle (Cow, Ox, Buffaloes etc)	Horse/ Mule					
1995	-	5	-	Leopard	21005	-	-	-
1996	-	-	-	-	-	-	-	-
1997	-	-	-	-	-	-	-	-
1998	2			Leopard	1750	1	Monkey	1875
1999	48	2	-	Leopard	27197	-	-	-
2000	-	-	-	-	-	-	-	-
2001	82	-	4	Leopard	32067	2	Bear	1701
2002	69	5	1	Leopard	32436	-	-	-
2003	-	-	2	Leopard	3000	-	-	-
2004	14	6	-	Leopard	9813	1	Bear	8250
2005		1	2	Leopard & Bear	4250	-	-	-

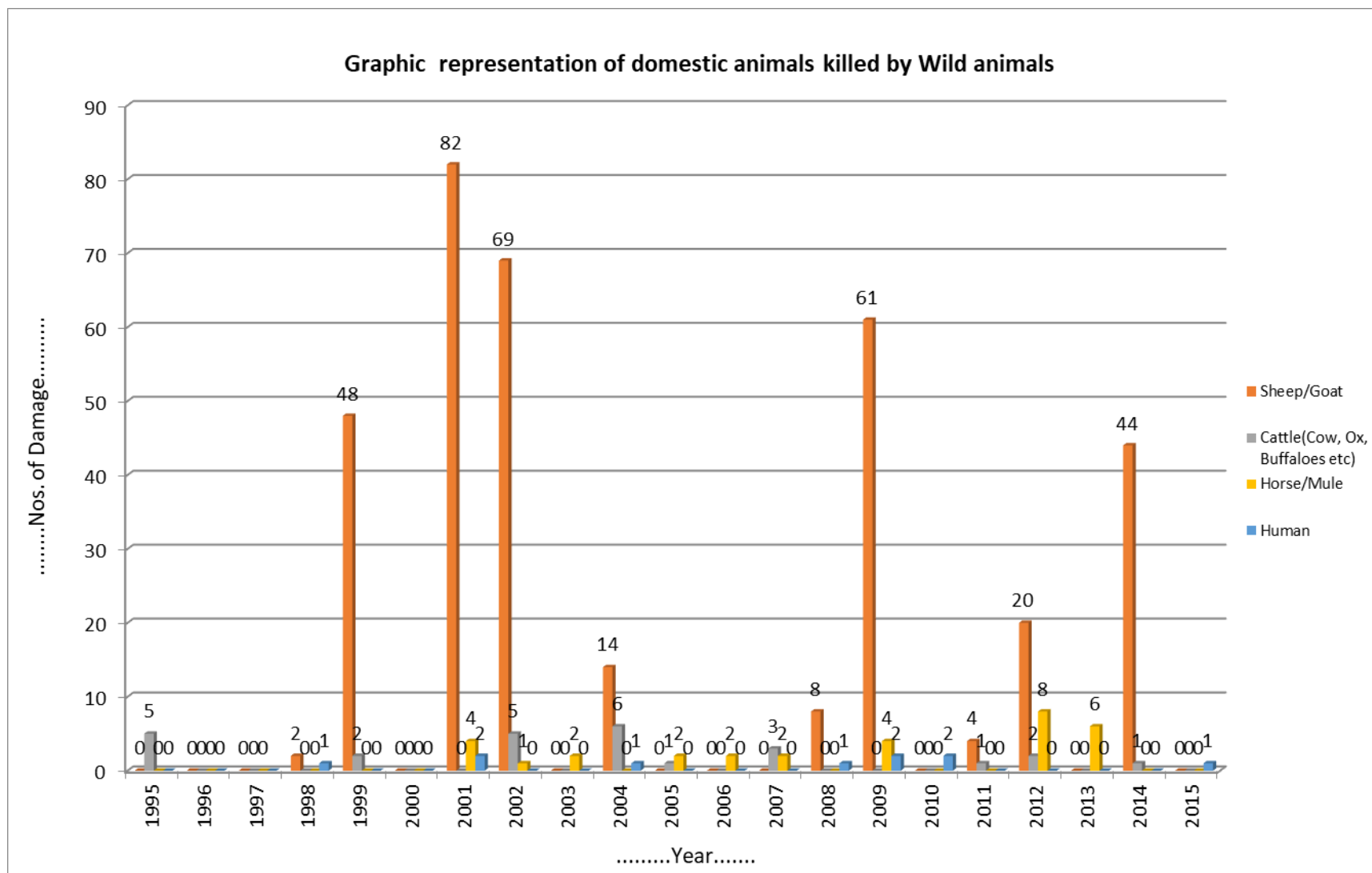
WILDLIFE MANAGEMENT

2006	-	-	2	Leopard	3000	-	-	-
2007	-	3	2	Leopard & Bear	9500	-	-	-
2008	8	-	-	Leopard	3200	1	Jackal	33000
2009	61	-	4	Leopard	30704	2	Bear	38000
2010	-	-	-	-	-	2	Bear	38000
2011	4	1	-	Leopard	2225	-	-	-
2012	20	2	8	Leopard	23000	-	-	-
2013	-	-	6	Leopard	9000	-	-	-
2014	44	1	-	Leopard	72000	-	-	-
2015	-	-	-	-	-	1	Bear	75000
Grand Total	352	26	31	-	284747	10	-	195826

(Note: Data Compiled from Division Record.)







The Himachal Pradesh Forest Department has a provision of providing compensation to the person whose sheep, goats or cattle have been killed by the wild animals. A close look at the Department's rules reveals their inadequacy with reference to the damage done by the wild animals in the field. The rules provide for postmortem report, and verification by the high authority in the villages such as Pradhan/up-Pradhan of Gram Panchayat/ and a forest official, not less than the rank of a Forest Ranger. For a poor person, it is difficult to approach these high authorities; as a result many cases went unreported. Moreover, most of the damage done relates to the crops and horticulture trees for which there is no provision of compensation.

Man-animal interface filter down to the base of the pyramid where the people are most directly affected by the depletion of physical resources, least able to fend off the ill-effects of man-animal conflict, and ill-equipped to take remedial action. Providing relief or compensation for damage to the crops and animals of the poor populations living close to the forests should become the priority for the Forest Officers.

Some of the suggested measures for the reduction in the conflict between man and animals:

PROACTIVE

- Constant interaction with the local people and to attend to problems faced by them on account of Man animal conflict.
- Educating and information sharing with local people regarding behavior, eating/ preying habits, timing and circumstances of attacking etc. of wild animals found in the area.
- The villagers are advised to use deterrents such as making sounds at night, beating drums, lighting a fire, or putting up a scarecrow in their fields.
- The Forest Officials need to take some proactive measures such as proper identification of the rogue animals, their tracking, and if needed "culling" or elimination.
- Feasibility of setting up of cages/radio collaring of the problem animals may be explored. The Forest Officials and the local villagers need to put up a combined defense against such animals.
- Training for capturing, tranquilizing and shooting of animals need to be imparted to 4-6 field officers in each division so that they can constitute a rescue team when ever required.
- There is a need of regular census of ungulates and carnivores in the forests. The prey-predator relationship needs to be studied and worked out for the mountain animals along with the carrying capacity of their habitats.
- The issue of crop insurance has a lot of promise to resolve the man-animal conflict for which forest department should take a lead by paying for small insurance premium.

REACTIVE

- However, once the damage is done, the provisions of compensation should be an easy and straightforward process so that the poor villagers are able to receive the compensation easily and without delay. Now under new rules, providing compensation in a time bound manner has been made "right to service". It will definitely going to help poor and marginal farmers.
- The compensation rates which are terribly low need realistic enhancement.
- In case of any animal becoming rogue, immediate remedial steps are required to be taken by forest department to capture or cull the same. The removal of problem animals may be considered after their properly identification.

In fact, the main solutions lie in awareness about the large-bodied animals, their ecology and behavior; at the same time recognition of the fact that these are the poor villagers showing

tolerance to the existence to the crop damaging bear or livestock lifting Leopard. This enhances the limits of human existence with the large carnivores. The future of man-animal conflict resolution lies as much in the involvement of the local communities in the wildlife habitat management, as in the measure that are taken to leave the wild habitats to the wild herbivores.

7.8 MANAGEMENT STRATEGY AGAINST POACHING/ HUNTING

Varied and valuable fauna of the area also attracts the attention of the poachers/hunters who kill animals for their meat, fur, horns, hides, musk and other animal products. There is very limited reporting on the wild life poaching although sporadic incidences do come in to light. The reason for low reporting may be disowning of wild life by territorial staff, lack of knowledge on wild life protection act at field level and mere complacency. Lack of reporting coupled with non-collection of census data may lead to loss of valuable faunal species and hence immediate steps need to be taken in this behalf. Govt should formulate species wise periodic census strategy. The following strategy may be followed against poaching/ hunting of wild animals:

- Constant interaction with the local people to educate them about the importance of wild life and also wild life protection acts.
- Wild life protection week celebration should have outreach in general house of Gram Panchayats and not merely concentrate on some program in schools only.
- Training of field staff about wild life management, habitat management and curbing human wild life conflicts.
- Proper training in dealing with wild life crimes, collection of samples and circumstantial evidences. These trainings should be followed by refresher courses after a fixed time period for the territorial staff particularly for the staff posted in wild life rich areas.
- Equipping the staff with proper man- force and weapons to deal with crimes.
- Organizing special nakas and trekking particularly during snow fall when wild animals descend down closure to habitation in search of food and shelter.
- Protection of animals during lean season near waterholes by keeping a constant watch on poachers/ hunters activities.
- To make an inventory of persons with poaching/ hunting history and keep a record of persons with weapons.
- Proper investigation of all cases that come in to knowledge.
- Better liaison between Territorial and wild life staff and create platform for sharing of knowledge and skill at field level.

7.9 DEALING WITH LEOPARDS: Although conflict with Leopard is non existing and there is hardly any incidence of human killing, however it is important that information on the largest cat of the area is incorporated in the working plan. Divisional Forest Officer shall follow following criteria to deal with capture of naturally free ranging leopards and eliminating man eaters if any incidence is reported.

- a) Mere sighting of leopards in the vicinity of a village or in inhabited area and ensuing political pressure, media attention does not qualify for its capture/elimination.
- b) When first human killing is reported, the concerned Wildlife Warden must study the reasons on these lines: Whether it was a chance encounter? Whether outright aggressiveness? Was it a female leopard merely protective of her cubs? Was the leopard injured and unable to hunt? Whether the victim entered the forest to cut grass or collect firewood or otherwise

and got killed when mistaken by leopard for its prey? How many times the leopard had mauled a man or killed a livestock in the past?

c) The Wildlife Warden should remember the underlying principle before declaring a leopard man-eater unless they actually consume the body of human killed. Jim Corbett, a renowned naturalist who had been dealing with man-eaters pointed out that *every human-killer is not a man-eater in the making*.

d) Shooting of leopards through identified shooters shall be considered only as a last resort once it is confirmed to be a man-eater after due observations and studies. Distinction between purposeful and accidental attack be made carefully. Purposeful attacks should always be dealt with immediately and the animal should be removed from the wild as soon as possible. In case of accidental attacks, the situation should be monitored.

e) No leopard captured as man-eater shall be released back into the wild and also should not be placed on display in a zoo. However, it can be kept in off-display facility in a zoo or rescue centre.

7.10 INTERVENTIONS TO MANAGE, MONITOR AND PROTECT THE NATURAL HABITATS AND RESOURCES.

1. Maintain and protect the natural vegetation communities (remove exotics and Invasive Alien Species), populations of large ungulates and pheasants.

One of the important indicators of the success of management practices for wildlife protection is the abundance of animals (pheasants, large mammals). The inventories of mammals, birds, reptiles, amphibians, annelids, and insects (mostly butterflies and moths) may be prepared with the help of experts in HPFD or reputed institutions. Similarly the angiosperms, Gymnosperms, ferns, bryophytes, mosses and lichens need to be documented.

- Services of institutions such as Wildlife Institute of India or NGOs of repute may be hired to train frontline staff including the Forest Guards, Forest Workers and wildlife watchers to measures abundance of species: absent, rare, occasional, common and abundant (first level).
- Conduct proper field trainings for the Forest Guards, Forest Workers and wildlife watchers for the next/second level of information collection on evidence of the animal's presence, such as tracks, droppings, calls, nests, feeding signs, etc.
- The advanced or third level of information collection is by determining the trends or indices of population growth and the actual population numbers/ density.

Control of Poaching and Illegal Trade in Wild animal and plant species is needed with the help of enforcement measures. Intelligence gathering needs to be undertaken by the forest officials in this regard.

2. Provide facilities and opportunities in natural areas for purposes of formal and informal education, research and the study

The training need analysis should clearly bring out all that is required (elements of competence) to help the target group to perform competently in the given area of the job/role. For agreed elements of competence it will be required that necessary performance criteria are generated which necessarily means that unless distinct performance criteria are developed for agreed elements of competences, there would always be an ambiguity with respect to what training be imparted to trainees. Once the performance criteria have been laid out, the mode of assessment becomes important. The assessment is about generating and collecting evidences that tell whether or not the trainee is able to perform as per the laid out standards.

3. Protect (with the consent of the local community) the cultural, historic sites such as Sacred Groves for research purposes as elements of the cultural heritage of the region.

The Western Himalayas are home for some of the globe's most intact and colourful indigenous and traditional cultures. The people are manifesting their traditional lifestyle in form of Sacred Groves (*Devban* or forests of Gods). These areas show how local villagers combine their beliefs and religion with natural resource management. The sacred groves have been instrumental in biodiversity conservation. They have a religious connotation and mostly located away from each other. Each Sacred Grove has its own devta (deity) mostly related to Hindu pantheon. A very distinct characteristic of these devtas are that they are treated as a corporal entity by the villagers. The Devtas own property in form of a forest which is locally known as Devban. Most of the Devbans are treated as sacred. Enumeration of such sacred groves must be given top priority. Communities must be encouraged to maintain these forests in perpetuity. Forest department should encourage proper protection and management of such sacred groves and try to enhance buffer forested area around these groves.

7.11 HUMAN RESOURCE DEVELOPMENT AND PERSONNEL PLANNING: - The challenging wildlife conservation requires committed wildlife managers who possess scientific competence and social awareness aided by communication.

7.12 SCIENTIFIC STUDY, RESEARCH AND DATA COLLECTION In order to avoid or reduce man-animal conflicts, the scientific study, data collection and possible local or expert aided solutions are required.

The wildlife damage related problems must be addressed on priority. The focus issues are:

7.13 MONKEY – HUMAN INTERACTION

Population surveys are of immense value in resolving man-animal conflict. For developing a conservation plan for a species such as monkey or leopard we need to answer several basic questions. Consider for example the *Rhesus macaque* (monkey), the common red-faced monkey of India. How many rhesus monkeys are in Parvati Forest Division? Where do they mostly live? What do they eat? What is happening to the habitat of these monkeys? How do rhesus monkeys interact with the human beings?

7.13.1 MONKEY SURVEYS

- Initially we need to identify different segments in the Core Area (places of monkey concentration in the Parvati Forest Division) where the survey will be conducted. In these segments, various vantage points will be identified to closely observe the monkeys without interference. If a particular segment is quite big this may be further sub-segmented under a person/forest guard/observer to observe the monkeys from a vantage observation point, in the morning between 7 and 8 AM when monkeys come out to forage. This should be ensured that monkey in line-of-sight of the observer are counted and there is no repetition of count of the same monkeys by the other observers.
- Location and identification of these observation points should be noted/plotted on a map of the area with number of monkey recorded. Data Sheets will be prepared on the performa given below. Information regarding age and sex of the monkeys, and food provisioning and garbage disposal at surveyed sites need to be kept.
- The survey/population estimation is to be conducted in such a manner that all the monkeys in every observer's domain are counted in a period of half an hour to one hour depending on size of the segment. The period of counting should be such that the level of error of number is avoided due to migration of the animals from one observation point to another.
- The monkey survey is to be conducted by involving various NGOs, professionals and other similar institutions involved with monkeys. Perhaps involvement of Eco-clubs,

schools/colleges in the vicinity of identified locations will be also a most desirable component

- The whole exercise is to be repeated during winter (January, March), Summer (May, July) and Autumn (September, November) at an interval of two months to know the standard variation and error if any.
- Once the results are obtained, the methodology may be improved and then approved to be replicated in different areas of the state to arrive at a figure of population of monkeys.
- A basic website/blog will be created to have an online access to the information to a wide user/stakeholder groups
- The lessons from this exercise will be integrated with the standard wild life surveys/population estimations of the Wildlife Wing of HPFD.

In the year 2012, Comprehensive monkey survey simultaneously in all parts of the state was done on a single day which rule out any possibility of double count. The preliminary Surveys were conducted wef 21 to 23rd February, 2012. The comprehensive survey was conducted at 8-9 AM simultaneously on 24/02/2012 at all strategic locations. The Range wise Abstract of Survey figures for Parvati Forest Division are as under:-

Name of Division: Parvati Forest Division.

Date: 24/02/2012

(Table 2)

Sr. No	Range	No. of Troop.	Adult	Infant	Total
1	Jari	10	189	112	301
2	Bhunter	12	239	76	315
3	Kasol	1	25	14	39
4	Hurla	23	497	281	778
Total Parvati Forest Division		46	950	483	1433

From the survey it is clear that the problem of Monkey Menace is more in all Ranges except Kasol Range. It can also be concluded from the data that the Adults are more in no. than Infants (approx. two times). The above estimation of population was also a part of the HP Govt. Monkey Sterilization programme announced during October, 2011. The aim was to sterilize 2 lakh Monkeys statewide by the end of June, 2013. In this innovative programme it was envisaged that the monkey capturing campaign will be undertaken throughout the state and the captured monkeys shall be sterilized at MSCs. Some incentives like Rs.500/- per captured monkey would be awarded to the person who will capture the monkeys. Forest Guards were also covered under this incentive based programme. Later the Wildlife Wing of HP Forest department announced the monkey population estimation surveys to be carried on 29th June 2013 & 30.06.2015 to 02.07.2015. This time in addition to Monkeys, Langur population was also estimated. The abstract(detailed survey details in appendix) of population survey June 2013 of Parvati Forest Division is as under:

Table No. 3

Date: 29/06/2013

Sr No.	Name of Range	No of troupes	Total No. Of Monkeys/Langur			
1	2	3	4			
			M	F	Y	T
1	Kasol	32/1	169/8	275/9	154/5	598/22

2	Jari	17	45	129	66	240
3	Bhuntar	16	62	205	95	362
4	Hurla	46	471	603	653	1727
	Total	111/1	747/8	1212/9	968/5	2927/22

Primate Census Data Recording (Rhesus Macaque & Langurs) w.e.f. **30.6.2015 to 2.7.2015**

Table-4

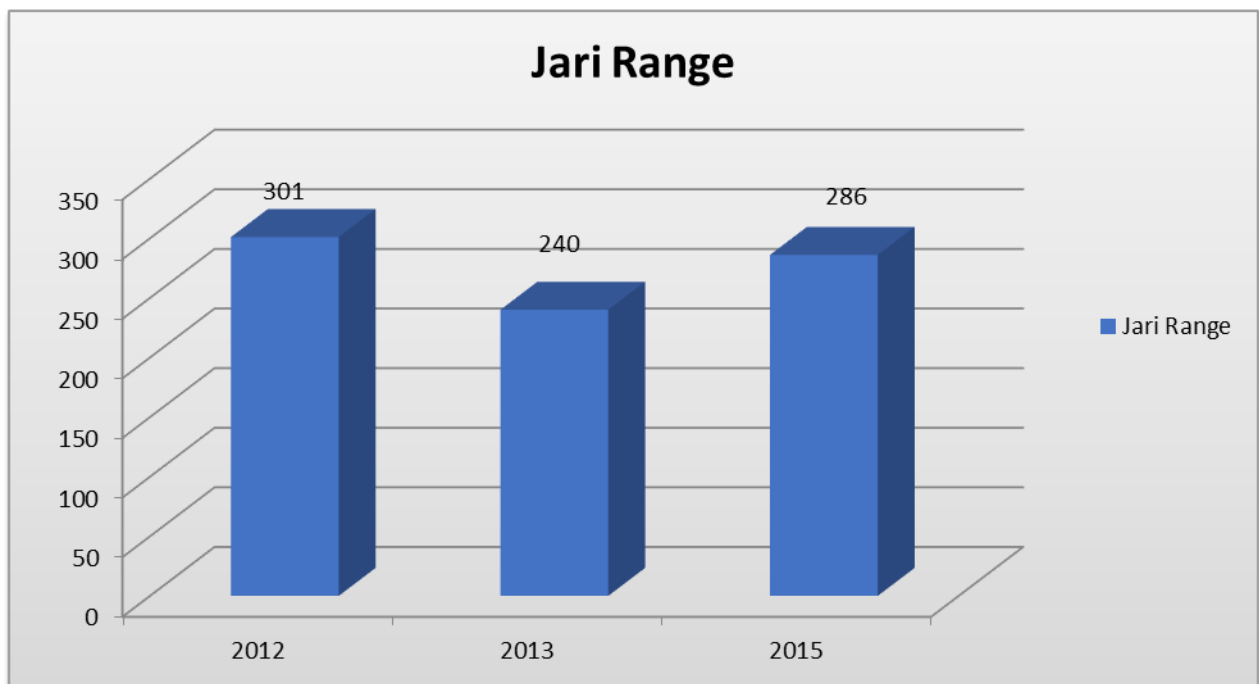
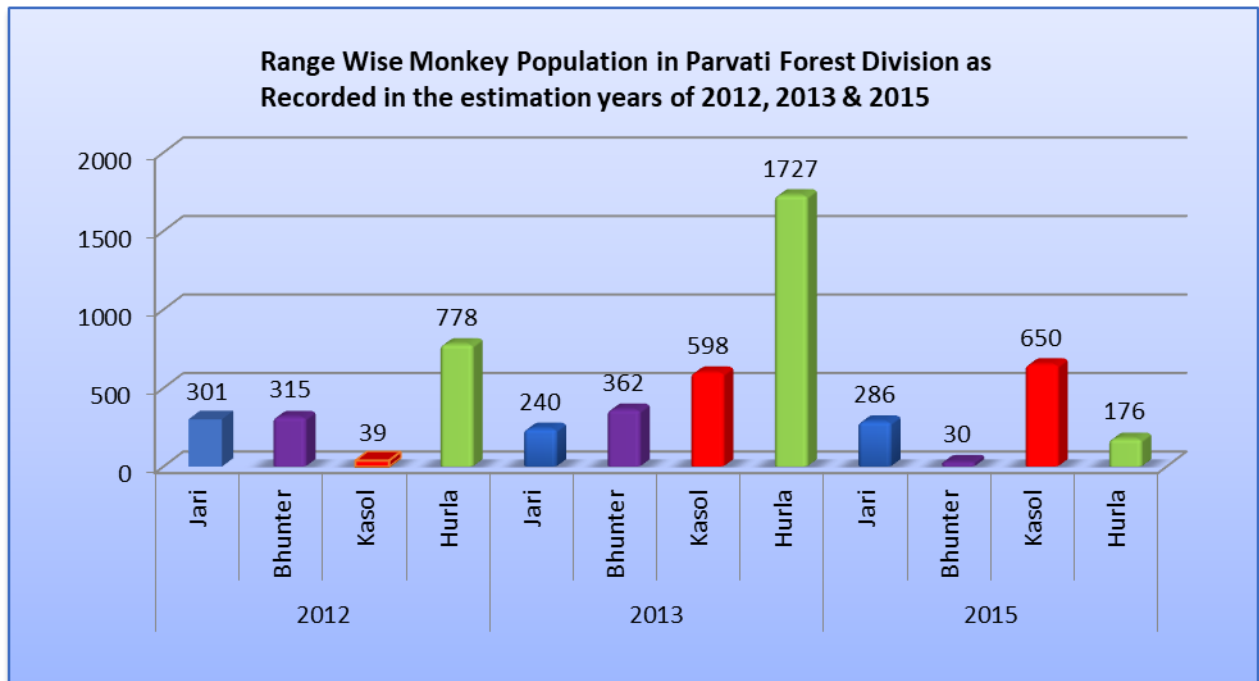
Sr.No	Range	Troop No.	Male	Female	Infants	Young	Unknown	Total
1	Bhunter	2	3	12	7	6	2	32
2	Jari	16	54	127	41	43	21	302
3	Hurla	17	22	37	17	33	67	193
4	Kasol	40	102	196	97	120	135	690
Grand Total		75	181	372	162	202	225	1217

From the table No.3 the outcome is that the Monkey population growth continued inspite of efforts of sterilization but as the efforts continued upto 2015, some decline in population as compared to the year 2012 survey was noticed (Table-4). This is the healthy sign as regards Monkey management. Although, there was hardly any population earlier in this area but now its number, area affected is at increase which is a cause of concern and therefore continuous efforts are to be needed to eradicate/ to minimize the problem. This area is fruit bowl of the state and increased monkey menace will have severe adverse effect on economy of rural masses if not checked at this stage.

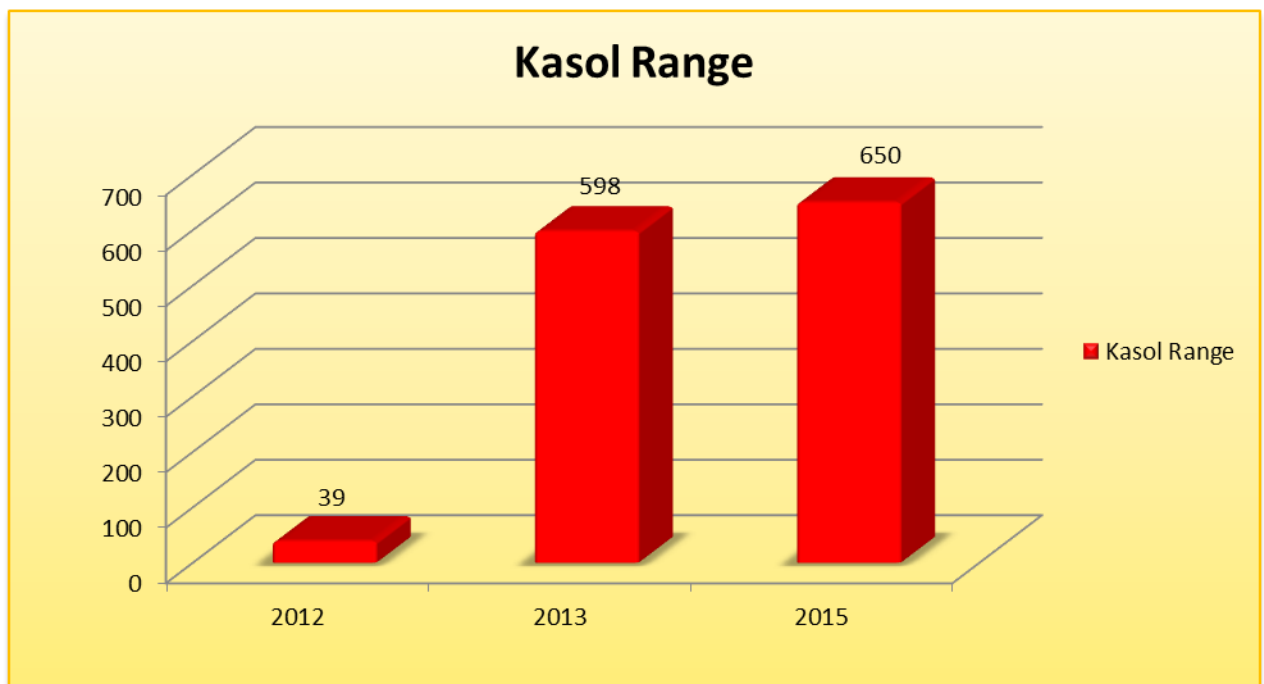
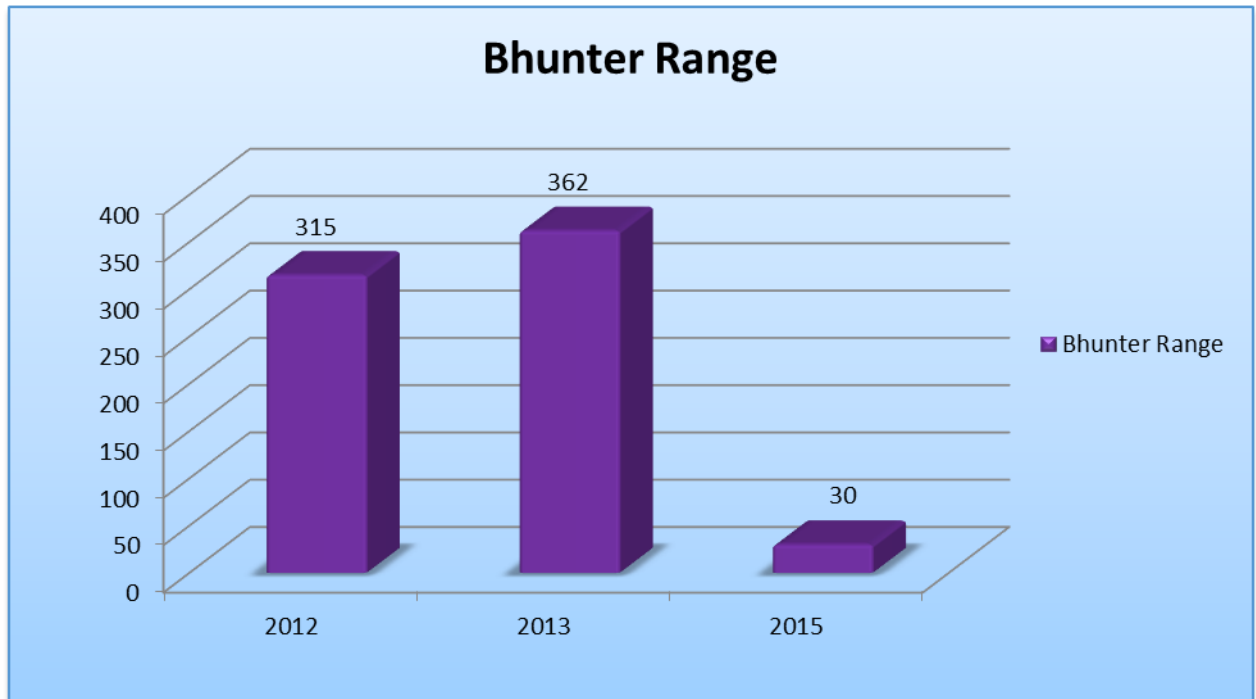
Range Wise Monkey Population in Parvati Forest Division as Recorded in the estimation years of 2012, 2013 & 2015

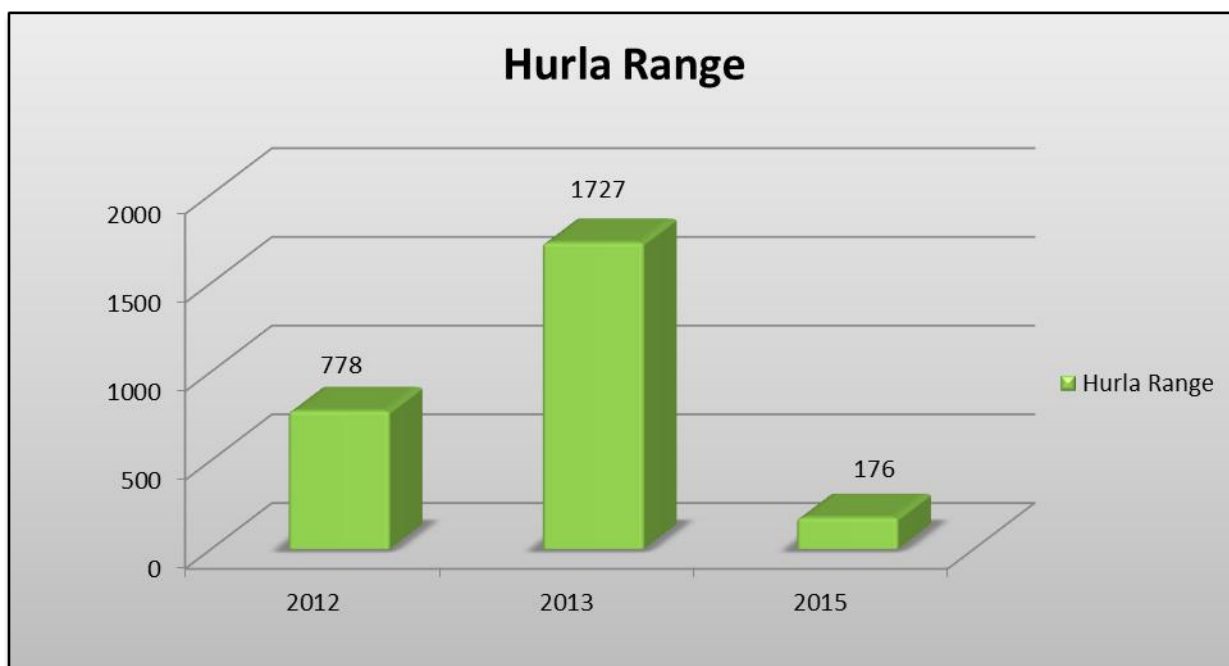
Table:-5

Year	Name of Range	Total Nos of Monkeys	Percentage
2012	Jari	301	21.00
	Bhunter	315	21.98
	Kasol	39	2.72
	Hurla	778	54.29
2013	Jari	240	8.20
	Bhunter	362	12.37
	Kasol	598	20.43
	Hurla	1727	59.00
2015	Jari	286	25.04
	Bhunter	30	2.63
	Kasol	650	56.92
	Hurla	176	15.41



h





7.14 PHEASANTS

The Parvati Forest Division has Monal (*Lophophorus impejanus*), Kaleej (*Lophura leucomelana*), Koklas (*Pucrasia macroplopha*) and Western Tragopan (*Tragopan melanocephalus*), Red Jungle Fowl (*Gallus gallus murghi*) can also be seen in the lower areas. These spectacular birds are known through their fragmented surveys done so far in different regions. The non-availability of information from other areas is perhaps for lack of attention by the forest officials. A species like Western Tragopan occurs in inaccessible areas which would make its survey rather difficult. Obtaining access to these areas make the job of their survey difficult. Similarly Cheer Pheasant are quite common in their grassland habitat, though a serious and systematic effort to collect baseline information about them is lacking.

7.14.1 PHEASANT CENSUS The following method is advised for Parvati staff to observe/record their pheasants observations, systematically.

7.14.2 CALL COUNT This method can be used for most of the pheasants which call during morning hours in their breeding season. The counts can be made from a strategic point in the habitat of the particular pheasant. The number obtained can be doubled for obtaining the estimate of breeding population (e.g., one male; one female). The following factors will influence observations.

1. SEASON OF THE YEAR

The count of calling males assumes that all the existing males in the area will call every morning. In the western Himalayas, the calling behavior of three species of pheasants during various months of the year is as following:

Koklas	:	January to June; September to December
Western Tragopan	:	April to June

2. TIME OF DAY

Most Koklas observations are made during a short period of early morning. The males usually call at dawn for 15 - 20 minutes. The Western Tragopan starts its song in early morning and continues intermittently throughout the day during breeding period.

3. POSITION OF CENSUS POINT

Surveys will be more successful if a strategic point is selected in the habitat of pheasant. This site should be identified on the day before the survey/census. The census point should allow the observer to hear the birds over as wide an area as possible. A point on a ridge usually allows the observer to listen to the pheasant calls on both the sides. It is possible to hear all the calling birds within a radius of 400 meters from the ridge; however, this can be reduced by the intervening ridges.

4. POSITION OF OBSERVERS

When there are multiple observers taking part in census operation of pheasants, they must be positioned at an interval of about 500m to 600m. All the observers must have visited their observation points on the previous evening of the census day. They should be in position well before dawn so that all the calling pheasants are counted.

5. RECORDING OF OBSERVATIONS

The observer should have good knowledge of identification of the calls of pheasants which s/he is likely to encounter in the field. The observers should practice counting the involved numbers of calling birds. An approximate range of each call and the direction of the call, must be anticipated. A compass can be used by the observer.

It is best to have similar formats for all the observers. These formats will have following details:

- Date of observation
- Time of start and end of observations

- Altitude of the observation point
- Major vegetation types within the sample area.
- Weather conditions on the day of observation including wind speed, precipitation, cloud cover, temperature etc.
- Marking of observation points on a large scale map of the area (marking of a conspicuous point such as a rock or a tree which can be located for subsequent census in the same area.)

7.15 FIELD CRAFT - HOW TO OBSERVE AND UNDERSTAND THE JUNGLE

(Adopted from an account by Dr. AJT John Singh of WII)

When guards/officers/others venture into the forest they should be equipped with certain indispensable articles: a small sharp knife, a compass, a lighter or a match-box (covered in a water-proof polythene bag), leech-proof socks (if it is a leech country), a small rope, rain-coat (if it is in the rainy season or in an area of high rainfall), a good pair of field shoes and field dress (olive green or khaki), which will merge with the background.

Animals such as Himalayan Black Bear, Brown Bear and Leopard can move much faster than humans. At the first close encounter they may snort, roar or scream. These sounds when heard in the setting of the jungle can frighten us terribly and only experienced lucky persons who have survived these encounters will be able to tell us how weak and wobbly their knees became after the first nerve-wracking encounter. We should not think that we can easily outrun and escape these animals which, as said earlier, are much faster than we are. Also the terrain on which we will have to run- with slope, many holes, and sharp wooden stumps, tangle of creepers, dense tall grass, logs, and rocks- is not an ideal place to outrun these beasts which run with four legs while we have only two teetering legs.

Therefore, go with caution in a forest where there are dangerous animals. Please follow the dictum "I should see these animals before they see me and should hear them before they hear me". Do not talk unnecessarily. Human voice can be heard, even from a long distance, by the jungle animals, in the "silence" of the forest. If there is a need to communicate, better whisper and signal. The objective of our visit to the forest is to see as many animals as possible and observe them. This can be accomplished only when we move as quietly as possible. We spend a fraction of our life looking for and observing animals in the forests. During this brief period, we should be as quiet as possible and observant of the events that happen around us. Silence is an essential part of jungle-craft.

In the jungle, smokers should become non-smokers. This is necessary for several reasons: by not smoking (i) the animals will not be alerted by the smell of the smoke, (ii) we avoid setting fire to the jungle, (iii) we show the utmost reverence to the jungle which we have resolutely determined to conserve. When we walk along a forest trail, particularly when the wind carries our smell down the trail, we should proceed with utmost caution. This is because animals like bear (particularly those which have had encounters with people earlier and therefore are not shy of people) can smell your approach and then either slink away or wait for your arrival. When the wind carries your smell down the path, walk slowly and silently, stop for a few seconds every 50-100 m, listen for sounds and then proceed. Most animals like bear make some sound and indicate their presence. All these can be heard if you walk silently.

FOREST RULES

- Never approach dangerous animals like black bear (particularly with the cubs) very close when they are in a flat terrain. With caution it is possible to approach them in a hilly or rocky terrain where the chances of escaping these animals are much greater.
- If there is a fresh blood trail on the path one should proceed carefully. A wounded animal (e.g. a bear wounded by a poacher) may be ahead of us and should turn aggressive if approached very close. The same is applicable to other potentially dangerous animals like the leopard.
- A leopard carrying its fresh kill may cause the fresh blood trail. Approaching a leopard on its fresh kill could be dangerous.
- While on a blood trail if there are alarm calls of monkeys, and birds ahead of us it could be an indication of the predator going ahead. Go with caution.
- If you are returning to your camp alone on foot late in the evening and if you see a dangerous animal (e.g. a bear with cubs), stop immediately. Stay at a safe distance. Hide behind a tree or rock, observe the animal and then by talking, by tapping on the tree with a stone or wood, or even by allowing the wind to carry your smell let the animal know that a human being is somewhere in the vicinity. The presence of the unseen human being makes most animals nervous and they make a slow but steady retreat away from your direction. Who will enter in to a patch of tall dense grass where you hear the hissing of a cobra but don't see the snake? We will move away from the area. The great naturalist Dr. George B. Schaller has successfully used the

above technique of remaining unseen and scaring away the Himalayan black bears in Dachigam National Park, Kashmir, India.

- Do not stumble through the forest without carefully looking at the path.
- Climbing a steep hill slope by clinging on to trees, climbers and rocks. Particularly in a tropical habitat, needs to be done with great caution. Before placing the palms, which like the feet are not protected, to hold on to something, watch carefully. There could be a scorpion, a nettle plant or a wasp nest nearby.
- People often fail to differentiate between chasing and charging by a bear. Charging may stop with a forward aggressive rush for 20-50 m but chasing can go much beyond that even for a few hundred meters which could be very dangerous. When chased by an animal throw a conspicuous object (e.g. a white hand-kerchief) on a bush and run down a slope or run zig-zagging among the bushes. Put up as much distance as possible between you and animal. While chased, do not crouch inside a bush hopping to hide.
- When chased by an animal, never try to climb a tree. A jungle- living tribal can do that but not a guard if he is recruited from a town or a Manager who is not used to tree-climbing. The fear would drain all the energy needed to climb.
- Sometimes you will be forced to walk through the forest at night. If you are in a group, stay together. As you walk along make some noise (talk, sing, or tap on a tree or rock at regular intervals). Don't surprise animals by walking in to them. Tap the ground periodically, as you walk along, either with your foot or a stick. The vibrations will keep the snakes away and most animals will also move away when they are warned from a distance.

7.16 The chapter was duly approved and vetted by PCCF (Wild Life) vide his letter No. Working Plan/WLM/180 dated 20.04.2016. The copy of letter is annexed at the end of Chapter.

HIMACHAL PRADESH FOREST DEPARTMENT
WILDLIFE WING

No. Working Plan/WLM/ 180
Dated, Shimla the 20-4-16

From: Pr. CCF (Wildlife) and
CWLW HP, Shimla-171001.

To: WPO cum DFO, Parvati,
District Kullu

Subject: Draft Wildlife Management chapter: vetting thereof.

Memo:

Reference your office memo No.5910 dated 23.01.2016 on the subject cited above.

2. Certain corrections have been carried out and incorporated in the document by the CF, NP, Shamshi and a copy of the Wildlife Chapter of the Working Plan of Parvati Forest Division has already been provided to your office together a soft copy by him. Therefore, the Wildlife Chapter of the Working Plan is hereby approved by the undersigned.

Pr. CCF (Wildlife) and
CWLW HP Shimla.

Endst. No. As above/ dated/

Copy is forwarded to CF, NP, Shamshi w.r.t. his office memo No. 14 dated 01.04.2016 for information please.

Pr. CCF (Wildlife) and
CWLW HP Shimla.

CHAPTER- VIII

PLANTATION (OVERLAPPING) WORKING CIRCLE

8.1 GENERAL CONSTITUTION: The main objective of forest management is no more managing the forests for economical timber harvests but has been change to environmental and social factors. The forests of Himalayas in general and this region in particular have very high watershed value owing to its strategic location, altitude and source of perennial water supply. Therefore, keeping importance of this area in mind, forest policy advocates at least 60 % area under forest. To achieve this target, a massive plantation drive was launched in the state which has yielded satisfactory results particularly in the presence of very heavy population and livestock pressure and huge infrastructure needs.

This working circle comprises such areas of all working circles which are devoid of tree growth/vegetation, carry open crop or have young plantations or crop which still need protection. Only such areas which have site factor favourable for raising plantations, where closure is possible in view of the fact that not more than one third area of a forest can be closed at a time and where the resultant plantations will be economically and socially viable. The areas adjacent to village habitations where the species of local requirement of fodder and fuel can be raised are also included in this working circle. Therefore all un-classed forests and culturable blanks are included in this working circle. Focus will be on restoring the species composition from timber centric to other useful species for fuel, fodder, NTFPs.

8.2 GENERAL CHARACTER OF THE VEGETATION: The forests of this working circle are located in different altitudinal zones, therefore, the vegetation varies. No specific forests are allotted to this working circle but the areas which are devoid of or have very scanty vegetation, areas which are infested by weeds, all areas along road side where strip plantation can be done to enhance the aesthetic beauty of the area are all constitute this working circle. The typical landscape of these areas have a few scattered trees of conifer/BL with local shrubs like *princeps utilis*, *Berberis*, *Rubus*, *Indigofera*, *Desmodium*, *Duetzia*, *Rhus*, *Sarcococca*, *spirea* etc infesting the area .

8.3 BLOCKS AND COMPARTMENTS: No specific compartments and sub compartments are chalked out for constituting this working circle. All un-class (3rd Class) forests and culturable blanks which are allotted to Grazing and Improvement working circle and are interspersed with habitation are also required to be regenerated through plantations with the species most suitable to local people as per their demand.

8.4 SPECIAL OBJECTS OF MANAGEMENT: The special objects of management are:-

1. To involve local people in planning, execution and management of plantation areas near habitation so as to have better survival rate and to develop sense of ownership and belongingness amongst the villagers.
2. To rehabilitate and manage degraded, poorly or sparsely stocked, blank forests on the principles of forest management by involving local communities so as to increase the area under forest cover, thereby, reducing the pressure on other forests.
3. To develop and augment forest resources of area in order to meet the demand of the locals for firewood, fodder and timber & NTFPs.
4. To replace gradually the inferior weed infested forests with more valuable commercial as

well as species most suited to local people.

5. To afforest the barren areas to preserve the soils in situ and conserve the moisture in the catchments.
6. To check denudation and soil erosion by massive vegetative measures.
7. To restock the blanks of roadside strips with species of aesthetic importance.

8.5 Plantation Series: There will be only one plantation series, the division being the unit of control.

8.6 ANALYSIS AND VALUATION OF CROP: The stock maps of all areas have been prepared on 1:15000 scale and placed in respective compartment history files. In order to cover the entire plantable area of the Division during the plan period, about 400 ha area annually is to be taken up for planting which is going well if the actual planting trend from 1994-95 to 2016-17 is visualized barring few years where the quantum of plantation has been high. The emphasis however, should be on proper selection of species, combination of species, reduction of mortality, post planting scenario and in this the JFM committees, PRIs and communities can play a very important role. The provision of PFM Rules can be made best use of by educating and sensitizing the communities.

Table 8.1 Year Wise area Planted in Parvati Forest Division (1994-95 to 2017-18)

(Table 1)

S.No.	Year of Plantation	Total area planted in ha.	S.No.	Year of Plantation	Total area planted in ha.
1	1994-95	616	13	2006-07	951
2	1995-96	485	14	2007-08	383
3	1996-97	623	15	2008-09	432
4	1997-98	729	16	2009-10	381
5	1998-99	962	17	2010-11	221
6	1999-2000	941	18	2011-12	298
7	2000-01	370	19	2012-13	314
8	2001-02	227	20	2013-14	461
9	2002-03	433	21	2014-15	324
10	2003-04	460	22	2015-16	448
11	2004-05	922	23	2016-17	348
12	2005-06	935	24	2017-18	298

8.7 STRATEGY TO REHABILITATE DEGRADED 3RD CLASS FORESTS

It is widely acknowledged that the Govt. and development agencies alone cannot solve the growing problem of degradation of forests and natural resource depletion.

The concept of Joint or Participatory Forest Management for evolving organizing and collective thinking on the issues of rehabilitation and management of degraded forest areas is the best tool presently available for seeking involvement of local people. The framework for JFM in HP as provided by the Government of HP Order of 12 May 1993, which followed the June 1990 Government of India (JFM) Circular enabling the spread of JFM. Participatory Forest Management (PFM) Rules were notified on 23 August 2001. These Rules make provision for increasing the institutional autonomy of Village Forest Development Committees (VFDCs) by registering them as Village Forest Development Societies (VFDSs) under the Societies Registration Act thereby attempting to link these bodies directly with the

panchayat structure with each elected Panch being on the executive committee of the VFDS, *ex officio*.

Strategically, the philosophy of Joint forest management for involving all the stakeholders in resource generation activities through motivation, active involvement in the process of management and sharing of benefits through adequate institutional arrangements should be made use of in big way. The capacities of the staff have been improved to certain extent in working with people but still much more effort is needed.

8.7.1 Village Forest Development Societies and User Groups: The village forest development societies are registered bodies that have already demonstrated better results in regenerating the degraded areas. A user group (may or may not within VFDS) is actually the primary stakeholders that are actually responsible for day to day use as well as management being residing very close to the area. Essentially a User Group or SHG comprises 10-15 local families/ women who are organized to protect the plantations and keep it free of grazing. This User Group is allowed to cut grass from the plantation area (which they divide amongst themselves at their own, department playing role of facilitator only) for self-use. The User Group can be further incentivized by making them take care of the plantation and funds earmarked for Maintenance are transferred to them. The practice of organizing local people in User Groups needs to be emphasized for any area taken up for plantation near the habitations. The choice of species is left to the user group so that they can plan as per their requirement. The User Group will be allowed to take grass from the area as long as feasible and thereafter be allowed to take firewood and fodder once the trees are bigger. An active User Group would be invaluable in keeping exotic weeds away and in preventing fires.

8.8 NURSERIES: - The degree of survival of plantations is directly linked to the quality of nursery stock raised in nurseries. More so, when we are faced with increasing swings in seasonal fluctuations, both in terms of erratic rainfall and rising temperatures. These recent changes in weather patterns exacerbate our historical woes of compacted soil, damage by fire and cattle and general lack of interest (and therefore concern) of local communities in our plantations. Vastly improved nursery stock can in a major way address most of these impediments coming in the way of establishing successful plantations in and outside forests. To ensure the quality stock in the nurseries, a long term advance planning has been chalked out by the department w.e.f 2016-17. The steps taken are as under:

1. Nursery component has been delinked from the plantation component.
2. It has been decided to reduce the number of nurseries to ensure quality rather than quantity.
3. Concept of raising tall plants in nurseries has been stressed upon.

In Parvati Division the number of nurseries has also been reduced to 10 from the existing 30 numbers nurseries. The Rangewise details of nurseries are as under:

**Nurseries in Parvati Forest Division
(Table 2)**

S.No.	Name of Range	Name of Nursery	Area (Ha)	Location	Remarks
1	Bhunter	Shamshi	1.0	N- 31°51'27.5" E- 077°8'32.8"	Permanent
2	Hurla	Chuttibihal	1.0	N- 31°50'3.90" E-077°10'7.01"	Permanent

		Garsa	0.5	N- 31°50'41.8" E-077°14'02.0"	Permanent
		Jhuni No.1	0.5	N-31°52'34.99" E-077°19'38.28"	Permanent
3	Jari	Dhunkhra	0.2	N-31°00'19.6" E-077°15'49.9"	Permanent
		Jari	0.2	N-31°59'44.4" E-077°14'37.2"	Permanent
		Dhara	1.5	N-31°56'16.6" E-077°12'12.3"	Permanent
4	Kasol	FRH Kasol	0.5	N-31°00'37.4" E-077°18'29.1"	Permanent
		1/6 Kalga	2.0	N-31°59'09.4" E-077°026'41.6"	Permanent
		Dudhi Khol	0.6	N-31°00'10.9" E-077°22'13.7"	Permanent

The permanent nursery at Shamshi, Bhunter Range has been declared as Central Nursery during the financial year 2016-17. The department has mandate for switching over to tall plantation strategy in some proportion. Hence due to its strategic location it has been declared as Central Nursery to meet with the plants requirement of all the Divisions in Kullu Forest Circle. The various infrastructural activities and works as proposed in the management plan of the Central Nursery should be completed on priority basis with adequate funds as proposed in the management plan.

Few important qualities of any good nurseries would include:

- It should be large in size (more than 0.5ha) so that it is cost effective and also proper infrastructure including water supply, germination chamber (poly-house), Mali-hut, soil mixing yard, vermin-compost pits etc can be developed.
- Adequately trained, dedicated staff should be available in each nursery. Mali and laboures should be trained and guided from time to time about raising of quality stock.
- Each nursery should specialize in 5-6 species suited to the area and have large stock of each species, which is graded from time to time so that only quality stock goes for planting.
- Every division should have one or two modern nurseries with all latest know how and there should be exclusive staff for such nurseries. Beside the species required by local people, a few seedlings of ornamental and flowering trees are also raised for roadside plantations and also to encourage people and institutions to plant such trees in their compounds/campuses.
- Soil mixture is most vital component for raising quality stock. Thus care must be taken not to compromise with quality of soil mixture (ideally 1:1:1 of soils, sands and vermin-compost).
- At least one tissue culture lab should be maintained by department may be involving local universities so that bulk production of quality seedlings is ensured.

The Poly house of the nursery should be used for germination of the seedlings wherein a mixture of sand and vermin-compost in the ratio 1:1 as germination medium. After germination the seedlings may be pricked into small P bags of size 4" X6" or in root trainers and kept in Poly house for some time in same soil medium. In the second year, the seedlings are transferred to bigger polythene bag of size 5"X9" with soil medium of earth, sand and

vermin-compost in equal proportion. For getting tall plants these are transferred to still bigger polythene bags of size 10”X18”. The black polythene bags should be preferred.

The most important aspect of nursery is the quality of seed which is generally ignored. The seed stands are not managed on scientific lines and seed from different areas are used without any consideration. Now this is high time that the quality seed is ensured for getting healthy future crop. Seed testing should be given its due emphasis. Help of State universities, ICFRE and HFRI can be sought.

Utmost care should be exercised in taking out the plants from nursery beds and this work should never be left to the labour. During these operations, it is absolutely necessary to ensure that the root system does not get damaged. Grading of stock is very essential and all unhealthy seedlings should be discarded. In planting, special care is required to avoid the curling of the tip of the root of seedlings.

8.8.1 TALL PLANTING One of the main reasons for failure of plantations along the roadsides and near habitations is grazing / trampling by cattle besides other reasons like drought, fires. Thus, to overcome pressure of grazing and drought, planting of tall plants (above grazing height) with well-developed root system and good collar girth is desirable. Such plants will be able to cope with droughts owing to their well-developed spread out root system, will be above grazing height and thus will survive grazing pressure and their good collar girth will help them withstand trampling. The establishment period of plantation is also lowered considerably. Tall plants have their own limitations as these cannot be carried over long distances, higher cost of raising, nursery beds remain occupied for longer durations, and cost is spread over different financial years. Due to geographical constraints it is not always possible to go for tall planting. However for the areas along the road sides, gentle slopes, areas prone to fire and near to habitation tall planting strategy should be adopted. In this way around 30-40 percentage plantation can be tall plantation.

8.8.2 Standard Operating Procedure (SOP) for Growing Tall Polybag Plants in Forest Nurseries :

I. Introduction

Plantation program of the State Forest Department involves plantations to improve the status of existing forests and also to bring new areas under tree cover through afforestation. Nursery has, thus, come to play a crucial part of this plantation program, and successful establishment of the plantations is critically dependent on the quality of planting stock used in this plantation program. It is, therefore, imperative that the planting stock to be used for raising plantations is of very high quality.

Raising nurseries was hitherto linked to the annual plantation norms usually resulting in use of small, less than one year old nursery stock in the plantation programs. This situation also saw use of a limited number of faster growing and non-fodder plant species for plantations, with less emphasis on locally useful native species. The success these plantations has not been commensurate to the efforts and inputs gone into raising these plantations. The survival percentage has been rather low. With the left over sites now available for plantations being very refractory and suffering from heavy biotic influences, the existing plantation practices need to be suitably modified to get optimum results for the efforts. One of the strategies is to use high quality stout planting stock to ensure quick establishment of plantations. Shift in the plantation strategy is also required to achieve the

stated objective under the Sustainable Development Goals to enhance the tree cover in the State from the present 26.4% to 30% by 2030.

With the objective of developing high quality stout planting stock, the Himachal Pradesh Government vide its Notification No. FFE-B-F(5)1/2017 dated 08.05.2017 has delinked the nursery component from the plantations. The intention of the delinking is that plants in the nursery can be retained for more than one year to develop these into sturdy and good quality planting stock.

Implementation of this new nursery regime has thrown up some technical and administrative issues; the prominent of these being —

- a) Parameter defining the tall plants,
- b) Nursery practices to raise tall plants, and
- c) Financial year-wise split of budget allocation as per norms.

These issues have been deliberated upon in detail at the Forest Headquarter and based on literature review, data collected from existing nurseries in the State, interaction with the field staff and scientists from local Research Institutes, and the practices being followed in the neighboring States, Standard Operating Procedure (SOP) for raising tall plants in nurseries located in different agro-climatic zones of the State have been developed and are laid down as under:

2. General Criteria to Define Tall Plants

A vast array of tree species is raised in nurseries across the State for planting in different agro-climatic zones in the State. This set of species can be broadly clubbed into -

- (i) species primarily grown in the temperate region, and
- (ii) the species primarily grown in the sub-tropical region.

Within this broad classification, there are conifers and broad-leaved species for both these regions. Whereas some of the native conifer, tree species like 'Fir' (*Abies pindrow* and *Aspectabilis*), 'Juniper' (*Juniperus macropoda*), and 'Thilgoza' (*Pinus gemrdiana*), and native broad-leaved tree species like 'Kate' (*Myrica esculenta*) and 'Trey' (*Quercus baloot*) are very slow growing and are difficult to develop as tall plants with the nursery technologies presently available, a large number of other conifer and broad-leaved tree species can be easily grown into tall plants in the nursery and used as stout planting stock under plantation program.

A 'tall' plant by definition means that it should have some minimum pre-decided height. In addition, it should have required sturdiness to withstand field conditions after planting out. Two- easy to use morphological attributes of seedlings, i.e. (a) seedling height, and (1)) collar diameter are usually employed as parameters to define 'tall plants' of different species. Whereas the height of seedling is considered to provide initial gain from the competing weeds/ brush wood in the field, the collar diameter provides the much needed sturdiness and root mass to the seedlings for their early establishment. Thus, every 'tall

seedling needs to have a pre-decided height and an appropriate seedling height : collar diameter ratio at the time of planting out. Different researchers have suggested different thumb rules for ascertaining this ratio for different species. A ratio of 1 : 1.25 between seedling height (in mtrs.) and collar diameter (in cms) is considered appropriate for 'tall' nursery plants for most of the species. Converted to centimeters, this seedling height and collar diameter ratio would be 80 cm : 1cm. It would mean that a nursery plant of 1.2 meter (120 cm) would need to have a minimum collar diameter of 1.5 cm.

3. Principals of Growing Tall Plants in Nurseries

Growing 'tall'-plants in nurseries is a highly cost intensive activity and utmost care and concern needs to be accorded at all levels of planning and implementation to ensure the best outputs. For this, the general principles listed below may be kept in view:

- (i) No filled Polybags should be Without Healthy Seedling: Most of the tree species have germination percent that is less than 100%. Thus, for every 100 seeds sown, some fail to germinate. Direct sowing in polybags is, therefore, likely to result in some polybags remaining empty, and requiring re-sowing after about two-three weeks. The seedlings emerging as a result of re-sowing usually fail to catch up with the growth of the initial seedlings and remain lanky. Many a times, more than one seed is sown in every polybag to ensure that at least one seedling germinates in every polybag. Firstly, this practice requires larger number of seeds that come at a cost. Secondly, it adds on another activity to remove extra seedlings from the polybags in which more than one seedling has germinated. In addition, in some species like 'Deodar' with good seed year occurring once a few years, seed availability is usually a limiting factor and wastage of seedlings cannot be worded: In some species, the seeds are very small and very difficult to sow directly in polybags.

The situation can be addressed by sowing the seeds of priority species and species with minute seeds first in specially prepared germination beds, and then pricking out healthy seedlings in 10cm x 22cm (4"x9") or 12cm x 22cm (5"x9") polybags at 2-leaved stage or even later depending upon the species.

Sowing of seeds in germination beds also allows for

- (a) intensive care during seed germination process,
- (b) more time for preparing proper soil mix and filling of polybags,
- (c) grading of seedlings at the time of pricking out in polybags, and
- (d) less time the polybags are required to be kept in nursery.

The shifting of seedlings from 10cm x 22cm (4"x9") or 12cm x 22 cm (5"x9") polybags to larger polybags, say in 25Cm x 45cm (10"x1 8"), to make these into tall plants will follow the standard nursery practice.

Always remember that no filled polybag should remain without a healthy seedling.

ii. Tall Seedlings should be Sturdy: Success of tall plants in the field depends upon their sturdiness. It is, thus, necessary that all tall plants are well developed and sturdy. Sturdy tall seedlings are characterized by the following —

- (a) **Balanced Shoot : Root Ratio**: For the species in the region, a shoot: root ratio of 3:1 seems to be appropriate. However, in no case this ratio should be more than 4:1. This shoot : root ratio forms the basis for deciding the size of polybags for raising tall plants. It means that to grow a tall sturdy seedling of a minimum height of 120 cm, a polybag of the length 45 cm would be required.
- (b) **Balanced Height : Collar Diameter Ratio**: For the species in the region, a ratio of 1:1.25 between height of seedling (in mtrs). and collar diameter (in cms) seems appropriate. Converted to centimeters, this height and collar diameter ratio would mean that to grow a nursery plant of 1.2 meter (120 cm) height would need to have a minimum collar diameter of 1.5 cm.

For growing tall plants, of the desired sturdiness, the following need to be ensured:

- polybag should be of appropriate size based on the sturdiness parameters given above.
- quality and thickness of larger polybags should be appropriate since these have to remain in the nursery for upto two years.
- only well-formed, healthy, and disease free initial nursery stock is selected for shifting into larger polybags for developing into tall plants.

It also needs to be always remembered that a good, balanced growing medium is a prerequisite for growing of tall, sturdy plants in nurseries. Thus, ensure that the pot mixture to be used for growing tall, sturdy plants is of very high quality.

4. Nursery Parameters for Tall Plants for Himachal Pradesh Based on the general criteria to define 'tall' plants. and the general principles for raising tall plants, the following parameters have been arrived at for raising polybag based tall nursery plants. These parameters have been correlated to the average age the seedlings are likely to take in nurseries. to attain these parameters. Data collected from. existing nurseries in respect of species for temperate and sub-tropical regions in the State, interaction with the field staff and Research Institutes, and the practices being followed in the neighboring States has been relied upon to arrive at species-specific parameters to define 'tall' plants proposed to be raised in the State.

(i) Species for the Temperate Zone:-

(Table 3)

S. No.	Species	Age (in years)	Min Height (in mtrs.)	Min. Collar Diameter (in cm.)	Season/ Month of Sowing
1	Deodar (<i>Cedrus deodara</i>)	3.5	0.90	1.1	Winters
2	Oaks (<i>Quercus</i> spp.) (Ban = <i>Q. Leucotrichophora</i> ,	3.5	1.2	1.5	-do-

3	Khanor (<i>Aesculus indica</i>)	2.5	1.2	1.5	-do-
4	Akhrot (<i>Juglans regia</i>)	2.5	1.2	1.5	-do-
5	Maple (<i>Acer caesium</i> / <i>A.</i>	2.5	1.2		-do-
6	Birdcherry (<i>Prunus cornuta</i>)	2.5	1.2		-do-
7	Chuli (<i>Prunus armeniaca</i>)	2.5	1.2		-do-
8	Behmi (<i>Prunus mera</i>)	2.5	1.2		-do-
9	Paja (<i>Prunus cerasoides</i>) ²	2.5	1.2		-do-
10	Pahari Peepal (<i>Populus ciliata</i>)	2.5	1.5		Root-shoot cuttings (2 year root/ 1 year shoot)
11	Robinia (<i>Robinia pseudoacacia</i>)	2.5	1.5		Root-shoot cuttings (2 year root/ 1 year shoot)

(ii) Species for the Sub-Tropical Zone: -**(Table 4)**

S. No	Species	Age (in years)	Min. Height (in mtrs.)	Min. Collar Diameter (in cm.)	Remarks
1	Chir (<i>Pinus roxburghii</i>)	2.5	1.2	1.5	Winter Sowing
2	Amla (<i>Phyllanthus emblica</i>)	2.5	1.2	1.5	Winter Sowing
3	Harar (<i>Terminalia chebula</i>)	2.5	1.2	1.5	Winter Sowing
4	Bahera (<i>Terminalia bellirica</i>)	2.5	1.2	1.5	Winter Sowing
5	Anar/ Daru (<i>Punica granatum</i>)	2.5	1.2	1.5	Winter Sowing
6	Beul (<i>Grewia optiva</i>)	2.5	1.2	1.5	Winter Sowing
7	Kachnar/ Karial (<i>Bauhinia variegata</i>)	2.5	1.2	1.5	Winter Sowing
8	Shahtoot/Chimu (<i>Morus alba</i> / <i>M. serrata</i>)	2.5	1.2	1.5	Winter Sowing
9	Shisham (<i>Dalbergia sisoo</i>)	2.5	1.2	1.5	Winter Sowing

10	Arjun (<i>Terminalia arjuna</i>)	2.5	1.2	1.5	Winter Sowing
11	Khair (<i>Acacia catechu</i>)	2.5	1.2	1.5	Winter Sowing
12	Mango (<i>Mangifera indica</i>)	2.5	1.2	1.5	Summer Sowing

Note: The parameters given above are for average altitudinal zones in the temperate (1800-2000 m) and sub-tropical regions (600-800 m) in the State. There is likely to be some variation in the growth of the species depending upon the change in altitude. A variation of upto (-) 10% from standard growth parameters given above for areas lying at altitudes higher than the average altitude is, thus, acceptable.

5. General Nursery Practices for Raising Tall Plants

Growing of nursery plants of forest species has been a regular activity of the Forest Department and the field staff is well aware of the processes involved in raising such nurseries. Growing of tall nursery seedlings is, however, a new activity and needs meticulous planning, use of high quality material, efficient implementation and good personal care.

(i) **Planning for Tall Plants:** Growing tall plants is different from conventional plants as these plants have to usually remain in the nursery for more than two physical years, spreading over more than three financial years. It, thus, requires detailed forward planning in terms of species to be raised, number of plants of each species, nursery space required, physical age till when the plants are required to be maintained in the nursery before planting out and the financial years it spreads over to attain the physical age. Thus, if a species takes 3.5 years in nursery for its seedling to be qualified as tall plant, the planning for its nursery would start four years before its field planting. Therefore, the starting point for such nursery planning is the detailed year-wise planting program for at least the next 5-years, which would need to be updated every year.

(ii) **Pot Mixture:** The usual pot mixture consists of soil, sand and organic matter (FYM, compost or vermi-compost). The ratio of these ingredients varies from site to site depending upon the type of soil used. In the conventional polybags based nursery, the plants are raised in small polybags of the size 10cm x 22cm (4"x9") or so. The requirement of soil being limited, it is usually collected locally from one corner of nursery or from around the nursery. However, in case of tall plants grown in larger polybags of the size 25cm x 45cm (10"x18") or so, the requirement of soil and other constituents of pot mixture is quite large and cannot be made good from the nursery. It requires importing soil and other ingredients from outside. The following need to be kept in mind for making pot mixture for raising tall plants

- The soil procured/ brought from outside should be from a good source and should be free from pebbles, weeds, etc.
- The soil should be thrashed to break lumps and sieved to make it powdery and free from pebbles, roots, etc.
- The powdered soil should be turned 2-3 times and exposed to sun to kill weed germplasm.
- The FYM/ vermi-compost should also be thrashed to break lumps and thoroughly sieved.

- Good potting mix should be light and appropriately porous for optimum growth of plants. The lighter the pot mixture, the better it is for growth of plants. A balanced mix of soil, sand and FYM/ vermi-compost in a ratio of 1:1:1 is usually adequate to get this type of light potting mix. Where the soil is heavy, addition of coco-peat is useful to make the pot mixture light. As a thumb rule, the weight of polybags of the size 10cm x 22cm (4"x9") , when filled to the rim with such pot mixture (sun dried), should be not more than 750 gms.
- Get the pot mixture tested in the laboratory for –

(a) pH ratio. Deodar and most other plants of the region prefer slightly acidic soils. Therefore, keep pH ratio between 5.5 and 6.5 by manipulating the proportion of ingredients.

(b) C:N ratio and other Nutrients to know deficiencies and correction regime.

- Deodar and most of other plants of the region require good inoculums of the associated ectomycorrhiza in the potting mix. This requirement can be fulfilled by adding some forest soil to the potting mix.

- The potting mix should be sieved again before filling in the polybags. It will ensure proper mixing of all ingredients and will sieve out any pebble, weed, etc. The pot mixture is the growing media on which the plants will grow. It should, thus, be of very high quality.

(iii) Sowing Seeds in Germination Beds/ Trays: Sowing seeds in germination beds/ trays provides an opportunity to accord focused attention to the seed germination. The germination beds can be prepared in a well-drained and shade free portion of the nursery. It is advisable to prepare base of these beds with a 5 cm thick layer of coarse sand to improve drainage and make lifting of seedlings easier. The layer of sand should be covered first with a 2-3 cm thick layer of fumigated soil and then with a 2-3 cm thick layer of a mixture of soil and coarse sand. Level and lightly compact each layer with a flat board. It is important to fumigate the soil well to avoid any chances of fungal infection seedlings/ damping off. All larger seeds can be sown in open germination beds.

The germination trays are useful for germinating minute seeds. The growing medium in this case consists of thoroughly washed coarse sand.

(iv) Pricking out Seedlings in Polybags: Shifting of seedlings grown in germination beds to polybags requires care and observance of the following -

- Pricking into polybags should be done in cool, cloudy weather or during evenings.
- Thoroughly water the filled polybags to settle the soil before pricking seedlings into these.
- Lift the seedlings from germination bed using a stick to prevent breaking of the roots.
- Make a hole deep enough to accommodate roots of seedlings in the polybags using a stick.
- Insert seedling in the hole and then lift the seedling slightly to open out the roots.
- When planting the seedling in polybags, make sure that the taproot is not bent.
- Irrigate the polybags well after planting seedlings.

Pricking of seedlings from germination beds to polybags provides the first opportunity towards grading and ensuring quality planting material. Thus,

- Select seedlings with a straight tap root. Discard seedlings with bent taproot root), or the ones with a few root hairs.
 - The seedlings should have straight and stout stem and well-formed apical bud.
 - Do not use diseased/ deformed seedlings. Such seedlings should be taken out from the nursery program and destroyed/ culled.
- (v) **Shifting of Plants and Root Pruning:** Polybags with seedlings are usually kept in nursery beds in rows. Keeping plants at one place for long is likely to results in their roots striking through the drainage holes of the polybag into the bed soil. Such outgrown roots, at the time of lifting of polybags for planting out, tend to break resulting in the plants suffering from shock, adversely affecting their survival in the field. The polybags, therefore, need to be periodically shifted and outgrown roots pruned to prevent roots from striking the bed soil.

At the time of shifting, always remember to,

- trim any roots that might have emerged out from the polybag at the time of shifting. This trimming should be done with sharp knife/ secateurs to avoid any injury to the plant.
- start lifting the polybags from one end of the bed. If roots have already struck the bed soil, don't pull the roots out. Rather tilt the polybag to one side and carefully cut the roots below the polybags by using trowel or sharp knife.
- hold the plant for pruning of roots in a way so as not to cause any disturbance to the root system in the polybag.

Root pruning also triggers growth of smaller roots in the polybags and helps plants gain better collar diameter and become sturdy. Such root pruning and shifting of polybags 1 to 2 months before planting out is highly recommended to prepare the plants for field conditions.

The best time for root pruning is just before the onset of monsoons and/ or in winters before the new flush of leaves starts emerging..

- (vi) **Grading Plants** : An associated activity with shifting of polybags is size-wise grading of plants. The plants kept in close rows tend to have fierce competition for sunlight making some plants to grow taller than others. Size-wise grading at the time of shifting helps the plants to have better exposure to sunlight for optimum growth of plants.
- (vii) **Spacing between Rows:** Filled polybags are usually arranged in close rows in the nursery beds with no space between the rows. This causes competition amongst plants for sunlight resulting in some plants growing taller than others. Whereas the shorter plants get smothered and remain undersized, the taller plants tend to become lanky, without the required sturdiness for successful planting out in the

field. The tall plants grown in larger polybags that need to be kept in nursery for 2-3 years, require appropriate space between rows for appropriate development of their collar diameter and to make these sturdy. As a thumb rule, during the first shifting of such polybags, a row to row gap equivalent to width of the polybag, viz. 25 cm for a polybag of 25cm x 45 cm, should be created. Depending upon the growth of plants, this spacing between—the rows could be increased during, the second shifting. Always remember to provide adequate side support to the polybags by raising soil along the sides.

Also remember that spacing between rows requires advance planning of nursery space. As example, 1000 'Deodar' seedlings pricked out into 10cm x 22cm (4"x9") polybags during monsoons of year-1, would require 10m² of nursery bed space. During year-2, these deodar seedlings would be transplanted into polybags of the size 25cm x 45cm (10" x 18") and the nursery bed space required would be 40m². During the year-3, the polybags would be subjected to shifting, grading and .spacing when inter-row gap would be provided, and the nursery bed space required at this would be 80m². Thus, raising 1000 tall plants of 'Deodar' in the nursery would require a nursery bed space of 80m² from year-3 onwards. It also means that to produce a stock of 1000 tall 'Deodar' plants in the nursery year after year, a bed space of 130 m² (10m² for first year plants + 40m² for two year plants + 80m² for three year plants) is required.

- (viii) **Weeding:** Despite all due care, some weeds do germinate in the polybags, and need to be removed to prevent these from adversely affecting the growth of seedlings. Always use good trowel of appropriate size (usually 2cm wide) for removing weeds from the polybags. Weeding also provides an opportunity to break the crust that tends to form on the top surface of soil in the polybags due to irrigation. This crust needs to be periodically broken to provide for aeration to the soil and for better percolation of water.

All care should. be exercised during weeding so as not to cause any damage to the collar of the seedlings.

- (ix) **Pruning of Branches:** Some seedlings develop side branches from the very beginning, affecting the shape of bole and height growth of the plants. These side branches, about one third of the height of the seedlings from the collar should be pruned to make the plants develop straight bole and attain faster height growth. Such pruning should be done very carefully with sharp blade/ knife/ secateurs close to the main stem in such a way so as to not cause any damage to the main stem.
- (x) **Elevated Platforms:** Plants raised in polybags tend to end up with coiled roots or their roots striking through the polybag into the nursery bed soil. This issue is usually addressed by repeated root pruning at the time of shifting and grading of plants in nursery beds or at the time of planting out. This situation can,- however, be better—addressed by keeping polybag plants on specially made elevated platforms made of bamboo or iron mesh. Keeping polybags on elevated platforms

provides for self-pruning of roots emerging out of polybags. This way the chances of roots getting coiled are also reduced.

We would need to gradually move towards developing elevated platforms for keeping polybags.

- (xi) **Root Trainers:** The root trainer technology has a widely accepted promise for raising high quality nursery plants as it allows for better root formation. Not much effort has been made towards using this technology in the State. This technology can be put to effective use in raising tall plants in the nurseries. For example, the seedlings of Deodar raised in germination beds can be first pricked out into root trainers of appropriate size, kept in these containers for one year and the one year old plug eventually transferred to polybags of 25x45 cm. This would result in dispensing with the practice of using polybags of the size 12x22 cm for the purpose.

The use of root trainers would require utmost care in respect of the following-

- Selection of root trainers of appropriate size for different species and in view of the time for which the plants are required to be maintained in the nursery. Root trainers—of 25-litre capacity would be appropriate for plants of most of the species to be kept in nursery for upto one year.
- Pot mixture to be used for root trainers should be very light and porous to allow for better aeration, better moisture retention and better root development. Very light organic materials like coco peat can be used in a ratio of 1:1:1 with soil/ sand, and vermi compost/ organic manure to make the potting mix porous and light.
- Getting elevated platforms in adequate numbers in place for keeping the filled root trainers.

- (xii) **Transportation of Tall Plants:** The nursery plants are liable to maximum damage,

during transportation from nursery to the planting site. Tall plants are quite heavy and utmost care needs to be exercised during their transportation so as to ensure that the ball of earth in the polybags is not disturbed and the plants are not damaged. The plants should not be lifted from the stems. Plants should not be dumped in the vehicles for transportation. Rather these should be neatly stacked in rows. If more than one row of plants needs to be carried in the same vehicle, then use wooden planks as segregator of rows. Specially designed wooden racks for carrying the plants on back - as being commonly used locally for carrying stones/ bricks - can be designed for carriage of plants to and from the vehicle.

6. Cautions in Tall Planting

Tall planting does provide an initial impetus for quick establishment of plantations. However, tall planting needs care in respect of the following —

- The site selected for tall planting should have good soil depth to enable digging of pits large enough to accommodate the tall seedlings with entire ball of earth.

- The tall plants raised in large polybags are quite heavy and need special care during transportation to the plantation site. It needs to be ensured that no damage is caused to either the plant or the ball of earth during transportation.
- Tall plants, after field planting, are likely to suffer from plantation shock needing watering. Therefore, tall planting should be carried out only during rainy season or at places where post planting irrigation facility is available.
- Growing tall plants in nurseries is time and cost intensive exercise. Utmost care needs to be taken in protecting the tall planting from damage due to grazing, fire, etc.

7. The Cost Norms — Financial Year-wise Split

The cost norms for raising tall and normal plants have already been conveyed vide Government Notification quoted supra. The SOP for allocation of financial year-wise budget (calculated at scheduled wage rate of Rs. 2101- per day for non-tribal areas) as per these norms will be as under:-

(Table 5)

S. No.	Name of species	Financial Year-wise Cost Norms (Rs.) Per Plant							
		Year I	Year II	Year III	Year IV	Year V	Year VI	Year VII	Total
1	Deodar (Tall)	1.41	9.91	35.58	9.90	3.04	-	-	59.84
2	Fir/Spruce (Tall)	1.37	9.91	35.59	9.90	5.05	5.05	3.04	69.90
3	Chil/B.L (Tall)	6.87	37.96	8.54	3.55	-	-	-	56.92
4	Deodar (Normal)	1.41	10.54	3.54	1.51	-	-	-	16.98
5	Fir/Spruce (Normal)	1.37	10.54	3.52	3.52	3.52	1.51	-	23.98
6	Chil/BL (Normal)	6.87	4.02	2.01	-	-	-	-	12.90

Table 8.2 Raising of Deodar (Normal and Tall Plants) in Nurseries

(Table 6)

Month	Year	Activities for Raising Deodar
Normal		
Nov-Dec	1 st	Sow seeds in germination beds after mixing of vermi compost. (1 kg deodar seed contains 8000-10000 seeds approximately)
March- April	2 nd	Prick and setting of seedlings in 5"x9" size P. bags. Shifting and grading of plants.
April-March	3 rd	Shifting, grading, weeding and hoeing of plants.
April-June	4 th	Shifting, grading, weeding and hoeing of plants.
July	4 th	Plant out these plants in pits of size 60x60x60cm
Tall Plants		

Nov-Dec	1 st	Sow seeds in germination beds after mixing of vermi compost. (1 kg deodar seed contains 8000-10000 seeds approximately)
April-March	2 nd	Prick and setting of seedlings in 4"x9" size P. bags. Shifting and grading of plants.
April-March	3 rd	Transplanting of plants grown in 4"x9" P. Bags into 10"x18" size P. bags including watering, weeding and hoeing.
April-March	4 th	Shifting, grading, weeding and hoeing of plants.
April-June	5 th	Shifting, grading, weeding and hoeing of plants.
July	5 th	Plant out these plants in plantation area.

(ii) Kail: - Direct sowing generally raises Kail. The seed is collected during September/October. About 15,000 seeds weighs a kg. Germination percentage is 70-95 %. Though a certain amount of seed is produced every year, but alternate year is a good seed year. Sowing in patches of 60cm. x 45cm. at spacing of 3m should be done just before the break of rains, i.e. end of June/First week of July. However, sowing in November before snowfall is also being recommended. About 15-20 seeds should be sown per patch. After sowing, the patches are covered by dry grass preferably thorny material. The germination is generally profuse and is completed in 15 days if rains are favorable. After germination the mulch should be removed. Kail being the pioneer species colonized the freshly exposed sites. It is strong light demander, and like chil requires no overhead shade. Tending of young regeneration is very important and should receive complete attention. Kail is among the conifers, most susceptible to fire damage. All new regeneration areas should, therefore be strictly protected against fire.

(iii) Fir/Spruce: - These are very important species and its plantation require advance planning as the seedling takes long time in nurseries. Nurseries of Fir/Spruce should be located in the natural altitude. The seed is collected in late September/October. About 60,000 seeds weight a kg. It is estimated that for a plantation of 1 ha at a spacing of 2.5m. x 2.5m. nursery of 150sq.m. (15 sq.m. for germination and 135sq.m. for transplant beds) is required.

Damping off takes place a heavy toll of spruce seedlings in the nurseries, which is most severe in excessively wet nursery soils. To avoid this, sowing should be done during spring and not during June. Soil fumigation with formalin, given about 15 days before sowing, helps in controlling damping off. A solution of 250 ml. of formalin in about 4 liters of water per square meter of the bed area is applied. After application, the beds should be immediately covered with polythene sheet that is removed after three days and the soil is raked to allow the fumes to escape. After the germination, the beds should be drenched with 0.25 % Blitox solution every fortnight for three months. Spring sowing coupled with soil fumigation has proved very effective in controlling damping off.

Sowing during spring is done in raised beds of 1-meter width. The seed is soaked in water for 24 hours before sowing. Sowing in 4cm. wide strips, 10 cm. apart gives better germination and growth than sowing in lines. Depth of sowing is normally 1 cm. and 40 gm. of seed with 80 % of germination is required per sq. meter of nursery area. Germination starts in about 15 days and is complete in 30 days. The weeding and watering of beds is done as required.

Raising of Fir/Spruce (Normal and Tall Plants) in Nurseries**(Table 7)**

Month	Year	Activities for Raising Fir/Spruce
Normal		
Nov-Dec	1 st	Sow seeds in germination beds after mixing of vermi compost. (1 kg deodar seed contains 60000 seeds approximately)
April- March	2 nd	Prick and setting of seedlings in 5"x9" size P. bags. Shifting and grading of plants. Shifting, grading, weeding and hoeing 4 times of plants.
April-March	3 rd	Shifting, grading, weeding and hoeing 4 times of plants.
April-March	4 th	Shifting, grading, weeding and hoeing 4 times of plants.
April-March	5 th	Shifting, grading, weeding and hoeing 4 times of plants.
April-June	6 th	Shifting, grading, weeding and hoeing 1 time of plants.
July	6 th	Plant the plants in plantation area.
Tall Plants		
Nov-Dec	1 st	Sow seeds in germination beds after mixing of vermi compost. (1 kg deodar seed contains 8000-10000 seeds approximately)
April-March	2 nd	Prick and setting of seedlings in 4"x9" size P. bags. Shifting and grading of plants. Weeding and hoeing 4 times of plants.
April-March	3 rd	Transplanting of plants grown in 4"x9" P. Bags into 10"x18" size P. bags including watering, weeding and hoeing (4 times).
April-March	4 th	Shifting and grading. Weeding and hoeing of plants (4 times).
April-March	5 th	Shifting and grading. Weeding and hoeing of plants (4 times).
April-March	6 th	Shifting and grading. Weeding and hoeing of plants (4 times).
April-June	7 th	Shifting and grading. Weeding and hoeing of plants (1 time).
July	7 th	Plant the plants in plantation area.

Raising of Chil/Broad Leaved/Oak in Nurseries**(Table 8)**

Month	Year	Activities for Raising Chil/Broad Leaved/Oak
Normal		
Seed sowing to March	1 st	Sowing of seeds in Polythin bags of size 4"x9" including resowing 20%
April- March	2 nd	Shifting and grading. Weeding and hoeing of plants (4 times).
April-June	3 rd	Shifting and grading. Weeding and hoeing of plants (1 time).
July/August and Dec/Jan	3 rd	Plant the plants in plantation area.
Tall Plants		
Seed sowing to March	1 st	Sowing of seeds in Polythin bags of size 4"x9" including resowing 20%
April-March	2 nd	Transplanting of plants grown in 4"x9" P. Bags into 10"x18" size P. bags including watering, weeding and hoeing (4 times).
April-March	3 rd	Shifting and grading. Weeding and hoeing of plants (4 times).
April-June	4 th	Shifting and grading. Weeding and hoeing of plants (1 time).
July/August and Dec/Jan	3 rd	Plant the plants in plantation area.

Parameters for some of the Broad Leaf species are as under:-

Table: 8.5 Variables regarding seed collection, seed weight and time of sowing.

(Table 9)

Sr. No.	Species	Seed collection	Seed weight in kg.	Pre-Treatment	Sowing in nursery beds	Germination %age	Period of germination in days
1	2	3	4	5	6	7	8
1	Kachnar	May-June	2,800-3,500	6-8 hours in water	May-June	85-90	15-20
2	Robinia	Sept.-Oct.	40,000	24 hours in water	Feb.-March	65-70	15-20
3	Khirk	Oct.-Nov.	4,000-5,000	24 hours in water	Feb.-March	50-60	28-30
6	Ritha	Oct.-Nov.	500-600	10-15 days in cow dung	Feb.-March	50-60	30-45
7	Siris	Oct.-Nov.	8,000	24 hours in water	Feb.-March	60-70	30-45
8	Drek	Feb.-Dec.	2,000 fruits	10 days in cow dung	Feb.-May	65-70	35-40
9	Ban-oak	Nov.-Dec.	400-600	24 hours in water	Feb.-March	50-60	30-45

(v) Walnut, Ash, Maple and other Broad-leaved species: - seed raises Most of the broad-leaved species; the technique is more or less similar with minor species specific variations. Two years old nursery raised entire plants will be planted at a spacing of 2.5 cm x 2.5 cm. These species are intended to be raised in damp localities at high altitudes. Aggressive broad-leaved weeds usually colonize these glades. It shall, therefore, be necessary to clear the bushes before planting work is taken in hand. Subsequent tending will be undertaken as long as the plants don't overtop the competing weeds.

SPECIES RAISED BY CUTTINGS: - The details of operations regarding preparation of beds, application of chemicals and fertilizers, watering, weeding and hoeing etc. remain generally the same as described above. The other details are given as under:

The cuttings, 25-30 cm. long and 2.5 cm. thick are prepared in January-February from vigorous shoots either from the trees or from plants already raised in nursery. The cuttings are planted in the nursery beds at a distance of 22.5 cm. in lines 30 cm. apart. After sprouting in March, singling of shoots is done and only one straight shoot is allowed to grow. The beds are watered, weeded and manured as per the practice prescribed above.

Planting in the field, of entire plants, which have attained a height of 2-2.5 meter is done during next January-February. The roots of plants are pruned and kept 25-30 cm. long; the shoot portion is not disturbed but only de-leaved. The smaller plants are planted again in the nursery beds. In case of Willow, the terminal bud dies at the end of growing season, therefore the side bud just below the terminal bud, is made as terminal bud by cutting out the shoot above it along-with the dead terminal bud. The root portion is dipped in Bevestin solution (1%) before packing / wrapping in wet gunny bags for transportation to the planting site. Planting in the pits (45 cm. x 45 cm. x 45 cm.) is done at a spacing of 3 m x 3 m.

It has been observed that two years old plants give the best results. Therefore, sometimes the shoot of one-year-old plants is cut into cuttings, which are raised in the nursery beds as described above. This gives straight, stout and healthy two years old plants for field planting.

8.9 NEW PLANTATIONS: - The technique of “Forestry Nursery works” and “Artificial Reproduction” in hills has been dealt with in the Technical Order no. 3 & 4 contained in the Punjab Forest Manual, Vol.-III. It is suggested that sufficient copies of these instructions incorporating the latest changes be supplied to the range officers for guidance of the field staff. The general principles to be followed for planting are detailed below:

Notification of closures: - Every area to be taken up for plantation should be notified for closure one year in advance. The period of closure may be 10-15 years. However for last many years no such notification has been done. The department need rethinking on this issue so that legal sanctity of these plantation areas can be kept intact.

Treatment Map: - Treatment map on 1:3,750 scale shall be prepared for each plantation area showing the plantable / unplantable locations, soil type, soil depth, drainage, slope and the species to be planted. This map shall be maintained in the compartment history file and one copy should be attached in the Plantation Journal.

Clearance of site: - The site will be cleared of bushes and other unwanted growth only to the extent absolutely necessary as shrubs & bushes help prevent soil erosion and add in moisture retention. However, if the area has exotic weeds/ aliens species like lantana, Parthenium etc. then these are to be removed. On warmer aspects, shrub growth if any should be retained to afford shade.

Fencing and Earth work: - After the site is cleared, the fencing and pit digging operations shall be done simultaneously. All plantation areas will be effectively fenced with at least four strands barbed wire. Fencing needs to be done around plantation sites only where it is necessary. Fencing along the steep slopes, cliffs etc. should be avoided where it serves no purpose. However, it is advisable to plant bio-engineering species suitable for the area along four strand barbed wire fencing especially in areas where grazing incidence is high. Fencing work should be taken up as advance work in March-april and live fence raised during the rainy season. If funds permit, on vulnerable and along roads, steel/cement poles should be used for fencing. Pits of standard sizes should be dug for conifers and broad-leaved species. Advance work of fencing and pit digging is prescribed. This helps in weathering and improvement of the soil.

8.10 Choice of Species The choice of species depends on various factors such as climatic, edaphic, topographic and biotic but the naturally growing indigenous species gives a clear indication of the most suitable species. Indigenous, fast growing, hardy species should be preferred which can survive under adverse conditions. Very sincere efforts should be made to bring the blank areas at lower elevation under forest cover. Efforts should be made to first afforest/ reforest areas near habitation with species of immediate use (mainly fuel, fodder) and then focus should be on blank areas away from habitation where economical consideration prevails for species selection. The local inhabitants should be given right to choose the species as per their need.

The species to be planted altitude-wise are suggested as under. However, Divisional Forest Officer is at liberty to change/add/raise new species suitable to a particular site.

Suggested list of species to be planted**(Table 10)**

Altitude	Species suggested for plantation
800to 1200 metres	Robinia, Bihul, Toon, Ritha, Kachnar, Willow, Daru, Poplar
1200 to 2200 metres	Deodar, Walnut, Hill Poplar, Willow, Robinia, Ban Oak, Horse Chestnut
2200 to 3000 metres	Silver Fir, Maple, Ash, Walnut, Moru Oak, Bird Cherry, Ash, Hill Poplar, Bhoj patar.

8.11 PLANTATION ADMIXTURE: Under the current departmental policy a mixture of species in departmental plantations is required in the following proportion:-

30% medicinal trees suitable for the area, 20% wild fruit trees suitable for the area and the remainder to be the main species of the forest type either conifers or broad leaved. It has, therefore, to be ensured that for plantation programmes sufficient diversity of tree species is grown and available in the nurseries. It is also prescribed that wherever deodar is being planted the plants should be atleast 2 and a half years old. Similarly broad leaved species should be at least 2 year old. Deciduous broad leaved species are to be planted during winter while conifers are to be planted during the rainy season.

8.12 PLANTATION JOURNALS: It is essential that whenever a site is selected for plantation a proper hard bound nursery journal is prepared for that site. The nursery journal must have a large sketch map of the area showing boundaries and other details like nallas, rocky out crops, existing patches of trees etc. It is important that GPS coordinates of atleast 6 to 8 points around plantations are recorded or tract around the area is recorded and digital map prepared should be pasted in the plantation journals. Details of all works carried out must be entered in the plantation journals and signed by the concerned officials showing date of signature. All inspecting officers are to record their visits and comments/observations in the plantation journals. Once a plantation journal is complete i.e. after fifth year of the plantation, it should be transferred to the range office and kept properly in record there.

8.13. MAINTENANCE AND AFTER-CARE:- The after-care and maintenance operations is of utmost importance, as most of the species to be raised are very palatable and may become the first target of cattle. Beating up of failures is to be carried out up to 3-4 years. Repeated bush cutting may have to be done in these areas up to 5-6 years. Repair to fencing should not be neglected as the areas are frequented by a large number of cattle. There is no necessity of cleanings and thinning in most of the existing young plantations at present. Pruning of chil plantations may be done as per existing instructions.

8.14 LAND BANK: - To carryout plantations under Compensatory Afforestation scheme, land banks are being created. The record of such land banks needs to be kept with digital map of the areas longitude and latitude for future monitoring. The details of the compensatory afforestation carried out in Parvati Division are in Volume-II, Appendix-XIX Page No. 143-144.

CHAPTER IX

NON TIMBER FOREST PRODUCE (OVERLAPPING)

WORKING CIRCLE

9.1 GENERAL CONSTITUTION This would be an overlapping working circle covering the entire working circle and is constituted to ensure systematic development and exploitation of non-timber forest produce species that occur in the division. The main non timber forest produce found/extracted in the division are Medicinal plants, Cedar wood oil, minor minerals and grasses. The main emphasis/focus would be on medicinal plants.

9.2 SPECIAL OBJECTS OF MANAGEMENT The State has formulated Himachal Pradesh Forestry Sector Medicinal Plants Policy, 2006 which is aimed at conserving and strengthening medicinal plant resource base in forest areas as well as outside for use towards enhancing health and livelihood security of the people of the State on sustainable basis. The special objects of management would be:-

- i) To conserve and augment existing non timber forest produce including medicinal plants resource in its natural habitat.
- ii) To encourage cultivation of commercially important species of medicinal plants on private lands
- iii) To develop a system of pricing the wild harvest so as to reflect both the conservation costs and the community benefits.
- iv) To encourage public-private-community partnership for building capacity for cultivation, value addition and processing of raw material before export from the state.
- v) To promote the use of commercially viable medicinal plants by the state owned and private pharmaceutical units and subsidiaries engaged in value addition.
- vi) To maximize yield of medicinal plants through sustainable natural and artificial regeneration and scientific exploitation.

9.3 BLOCKS AND COMPARTMENTS The entire tract of the division will be covered by taking beat as a unit.

9.4 AREA STATEMENT The working circle is overlapping, no area statement is required.

9.5 ANALYSIS AND VALUATION OF THE CROP The entire tract is very rich in many useful shrubs, herbs, fungi which have been exploited from time to time. The area produces large quantities of Karu, Patish, Van Kakadi, Guchhi, Rakhal, Lichens, Berberis roots, Reetha, Kakar Singhi, Jatamansi, etc. A list of commonly used or economically extracted medicinal herbs, plants occurring naturally are given in the Appendix.

9.6 STOCK MAPS As the medicinal plants are mostly herbs and shrubs found on annual or perennial basis, stock mapping is not possible.

9.7 ARTIFICIAL PROPAGATION AND CONSERVATION Keeping in view the economic importance and demand of medicinal herbs, it is desirable to encourage naturally occurring medicinal plants in suitable localities. The demand of medicinal plants has picked up with setting up of pharmaceutical industries in the state. The existing germplasm of different herbs needs to be conserved. Following measures are suggested for the conservation, protection and propagation of medicinal plants:-

- Systematic rotational collection should be followed strictly.
- Heavy grazing and destruction of medicinal herbs should be checked as these species do not produce sufficient seeds/vegetative form of regeneration.
- The raising of nurseries/herbal gardens, drug farms should be developed through various research institutes like HFRI, UHF Nauni, HPKVV Palampur, CSIR Palampur, Ayurveda Department who are engaged in medicinal and aromatic plants .
- Medicinal plant collectors should be educated and provided proper information or guidelines so that there is continuous regeneration of medicinal herbs.
- The community based organizations like panchayats, Mahila Mandals, Yuvak Mandals, VFDCs and other rural co-operatives should be involved in the development, protection, propagation and conservation of medicinal plants.

9.8 NMPB Project (Parvati Forest Division)

(Table 1)

YEAR	AREA PLANTED (in ha)	SPECIES PLANTED					
		TREES	NO.	SHRUBS	NO.	HERBS	NO.
2009-10	23	H.C. Nut	3000	Dhoop	24000	Karu	55000
		Chuli	1500	Bana	3000	Mathosal	20000
		Texas	9000	Basooti	5000	Nihanu	122005
		-	-	-	-	Tulsi	12900
		-	-	-	-	Ashwaganda	10000
		-	-	-	-	Salam Mishri	3000
		-	-	-	-	Padiyala	2000
		-	-	-	-	Ban Haldi	95
		Total	13500		32000		225000
2010-11	43	Ritha	3300	Banaha	8400	Patish	7500
		Walnut	3025	Basooti	9200	Doop	29000
		Daru	3500	Chora	4000	Karu	56800
		Texas	5500	Ashwganda	4600	Nihanu	122600
		Chulli	5575	Daiscoris	4600	Bankakri	5000
		-	-	-	-	Salam Mishri	3500
		Total	20900		30800		224400
2011-12	43	Ritha	4550	Doop	8100	Karu	15000
		H.C. Nut	3250	Banaha	6900	Nihanu	183700
		Walnut	5500	Basooti	8500	Basooti	700
		Daru	5950	Chora	4400	Daiscoris	25000
		Chulli	1650	Daiscoris	700	-	-
		Total	20900		28600		224400
2012-13	44	Walnut	4400	Willow	2040	Nihanu	184245
		Daru	5750	Vitex	4400	Karu	14000
		Ritha	5900	Basooti	13200	Ban Haldi	1155
		Chulli	1000	Ashwganda	2920	Daiscoris	25000
		H.C. Nut	4400	Chora	6600	-	-
		Total	21450		29160		224400
2013-14	-----Nil-----						
2014-15	40	Deodar	2000	Kathi	6600	Nihanu	158900

		H.C. Nut	9900	Chulli	6600	Daiscoris	48200
		Chulli	1500	Daiscoris	6600	Karu	1800
		Ritha	2600	Karu	6600	Ban Haldi	200
		Daru	3000	-	-	-	-
		Total	19000		26400		209100

9.9 NURSERY TECHNIQUE OF *Taxus wallichiana*

Selection of Stem cuttings

1. Fifteen to twenty centimeters long
2. Juvenile stem cuttings with leaves
3. Three – four nodes
4. About 1.0 cm in diameter
5. From old trees
6. During May- June

Too many leaves in the cutting give negative effect because of higher transpiration rate and water deficiency that cause leaf shedding. At the same time, cuttings without leaves root poorly.

Preparation of Stem cuttings

The cuttings are dipped in hormonal solution of 10,000 ppm IBA for 18 hours prior to planting. Commercial IBA is available as solvent or water soluble.

Preparation of 10,000 ppm IBA solution:

I. Solvent Soluble IBA: Dissolve 10 grams of IBA in few ml of alcohol (70 percent or more) or rubbing alcohol available in medical stores. Isopropyl alcohol is commonly known as rubbing alcohol and usually comes in 50% pure and 70% pure. Mix IBA powder with half teaspoon of alcohol and gently shake the container. After the powder has dissolved, do not add the water to the solution; instead, add the solution to distilled water (again available in medical stores) making it up to 1 litre.

II. Water Soluble IBA: It will dissolve directly in water.

[For Information: 1 ppm = 1 mg / 1 litre; 10 ppm = 10 mg / 1 litre; 100 ppm = 100 mg / 1 litre; 1000 ppm = 1000 mg or 1 g / 1 litre; 10,000 ppm = 10 g / 1 litre]

Nursery Techniques:

These cuttings are planted in the locally prepared beds in a slanting (45 degrees) position. The cuttings should be protected from direct sunlight and high humidity (70 percent) should be maintained by a thatch covering.

The roots normally appear in six to eight months. A few cuttings could give roots after one year.

9.10 THREATS TO *Taxus wallichiana*

1. LACK OF INVENTORISATION: We know next to nothing about the approximate number of trees of *Taxus wallichiana*, their regeneration status and their pockets of occurrence across the appropriate altitudinal zone in the division.

2. This tree, though on the List of THREATENED TREES (IUCN, RED LISTING FOR HP), is not enumerated as part of the enumeration done in forests. There appears to be no nursery stock grown nor are there any efforts for planting this species in appropriate locations.
3. Though collection and export of *Taxus* leaves has been banned since 1994 and still continues, there are reports of its illegal collection and export, either as it is or in the name of Talis patra (*Abies webbiana* leaves), which is permitted and under present regulations export of which can be allowed by the Panchayat Pradhan.
4. *Taxus wallichiana* is a very slow growing tree and unless successful plantations of it are raised annually, in the long term, this tree will eventually disappear.
5. Berberis as one can see is being extracted in huge quantity. It is not clear how this is done, but there must be implications for soil conservation?

9.11 URGENT ACTION ON *Taxus wallichiana*

1. There is an urgent need to locate pockets / distribution of this tree in the forests of Kullu, map these sites using GPS and inventory the trees, class wise.
2. A suitable nursery to be identified and stock of *Taxus wallichiana* raised from cuttings (done in February using rooting hormones). One lakh such cuttings to be raised in poly bags every year for the next 5 to 6 years. The nursery stock has to be retained for two and half to three and a half years in the nursery before planting out. Since this is a long term, cyclic affair with a long nursery period, it is important that cuttings are raised on the recommended scale annually.
3. If we have sufficient well grown stock of *Taxus*, it is feasible to grown live hedges of or with the species around our closed areas and also to encourage farmers to use this as a live hedge. A practice that can be incentivized in suitable areas through PES.
4. In view of 2 above, a planting schedule for *Taxus* can be developed after 3 to 4 years. But this must continue every year for a long time to come; across the next many future management plans.
5. In recent years, some private companies have introduced *Taxus* plants in Himachal imported from the North East. These are apparently being grown by farmers on their private land and then exported. It is important that this stock is not introduced in forests of the state, unknowingly or by design.

In order to avoid unrestricted heavy removal of leaves, the Govt. of HP has formulated policy regarding grant of permission for collection of *Taxus* leaves and export thereof vide letter No. FFE-B-F (13)-2/95 dated 4th June, 1996, which is reproduced as under:-

1. The export permission for each year outside the state (within country) for the export of *Taxus wallichiana* will be issued by the Govt. after proper scrutiny.
2. The collection permission of *Taxus wallichiana* leaves by the right holders will be allowed by the Principal Chief Conservator of Forests, HP after the prior approval of the Govt.
3. No collection of *Taxus wallichiana* be allowed in the forests where the right of collection of these leaves has not been admitted in the Forest Settlement and revenue records.
4. The leaves will be allowed to be collected only from trees with more than one metre girth at breast height and restricted to lower 1/3rd of the tree.
5. The collection of leaves will be allowed by plucking. In case a branch is cut on silvicultural consideration, it should not exceed a finger in thickness. No damage whatsoever be allowed to be caused to the trees. The privilege is not an absolute right and, therefore, may be withdrawn by the Govt. in the event of abuse.
6. The collection be allowed to the right holders in the presence of forest guard and the representative of traders and no labour be allowed to be engaged for the purpose.

7. The *Taxus wallichiana* leaves which are collected from the areas by plucking in a particular year are to be kept under reserve for four years and their next turn for collection of leaves will come in the fifth year.
8. Four years collection programme will be prepared for collection of these leaves and in case due to some reason the plucking is not done in fifth year, the deviation permission from the Govt. like 10 year felling programme is necessary.
9. The collection of *Taxus wallichiana* leaves will be allowed from April to December every year in accordance with 4 years cycle. The plucked material would then have to be disclosed by the parties and export permission sought from the Govt. from April to December and shall have to complete the export by 31st January next.
10. The storing of *Taxus wallichiana* leaves is to be allowed at a depot specified by the DFO.
11. No removal of leaves is to be allowed from the depot without valid permission for export and realization of export permit fee of Rs. 600/- per quintal fixed vide this department notification of even no dated 17.8.93. The movement within Divisions/Circles will be regulated under the relevant transit rules.
12. The right holders have tendency to remove bark which shall not be allowed.
13. Since the leaves are used for preparing medicine and the collection and sale is remunerative, it should be allowed in scientific manner. It should be ensured that no damage is caused in collection and also no illicit collection and its export be allowed to take place. Collection by right holders may be allowed with against permission and forests be inspected during collection as endeavor to ensure collection on scientific basis only.
14. The quantity extracted from the various forests be entered in compartment history files and details also furnished on the close of season in February to the Govt.

9.12 OTHER NON TIMBER FOREST PRODUCING PLANTS/PRODUCTS

9.12.1 GUCCHHI *Gucchhi* is a highly valued morel mushroom that grows over wide swathes of the countryside under deodar or mixed coniferous forests. It grows in March or early April (depending upon the altitude) and is collected by local people (men, women and children) as soon as one is spotted. This has led to heavy collection and consequently, *gucchhi* collections are said to be dwindling all over the state. Another reason for the decline is the manner in which the morel is collected. It is wrenched off the ground, possibly also yanking out the substrate mycelium as well. There is neither time nor patience to allow the mushroom to shed its spores. So the next crops are getting less and less.

If locals can be organised and trained to do two simple things, *gucchhi* might have a chance to bounce back. One, the species needs to be collected after it has shed its spores. This might vary according to weather and altitude, but the local people know when. Secondly, a simple training to get the collectors to use a blade to cut the mushroom stem (instead of yanking it out) is all that is needed to help the species recover. Of course to do this apparently simple job, there is a need to find out some good NGO or trainers who can take up this with the collectors (who are numerous) and sort of organise them into monitoring collection methods as well?

The royalty or export permit fee rate on *gucchhi* is high: Rs 10,000 per quintal. While a quintal of *gucchhi* is a lot and given the current market rates (between Rs 5 to 7000/kg), they might seem reasonable; but people are not tuned to paying such taxes on forest produce (agriculture income is tax free). This high rate is a reason why much of the *gucchhi* trade seems to have gone underground. There is, therefore, a need to review these export permit rates for *gucchhi* and bring about a more transparent system in its trade.

9.13 POLICY ON INTRODUCTION OF MEDICINAL TREES IN FORESTS It is now the state policy that in different plantations of the forest department about 30% of the trees being planted need to be of medicinal value and also native to the tract where plantation is being done. There is thus a need to identify and grow suitable medicinal trees for different altitude zones in a particular forest division. While most trees may be technically “medicinal”, it is important that species like Deodar, Khair, Chil, etc. which are normally grown in forest plantations are not reckoned as medicinal trees.

9.14 CEDAR OIL The cedar oil is extracted from old Deodar stumps and roots. The oil has multiple applications including, medicinal, cosmetic, insecticidal etc. The extraction of Cedar oil has been allowed by the Govt. to M/S Mediroma Nilgeritis since 1908-09. The detail of stumps handed over and oil extracted is given as under:-

Extraction of Cedar Oil from Parvati Forest Division

(Table 2)

Year	Weight (Qtls.)	Oil extracted (Kg)	Royalty per Qtls
1998-99 to 2007	0	0	130
2008	1800	1600	200
2009	2902.5	11400	200
2010	327.15	3230	200
2011	1069.15	2450	200
2012	2514.5	3500	220
2013	296	5358	242
2014	200	-	242
2015	-	1300	242

(The data in the above table is combined for Parvati and Kullu Forest Division)

9.15 CALCULATION OF YIELD No yield can be prescribed as the most NTFPs are extracted through right holders. However, proper record of all the NTFPs exported through Panchayats and the department, should be maintained annually and entered in respective compartment history files.

9.16 SUBSIDIARY SILVICULTURAL OPERATIONS As no silvicultural system is prescribed, no specific operations are proposed. However, when the medicinal plants are raised in the nurseries or plantations, the regular operations like closure, weeding, bush cutting, protection from fire, grazing etc. are to be carried as in case of tree species.

9.17 MISCELLANEOUS REGULATIONS

This includes extraction or collection and export of NTFP's. The collection of NTFPs is allowed strictly as per provisions of Settlement report. The export is allowed under HP Forest Produce Transit (Land Rout) Rules, 1978 against payment of specified export permit fee.

CHAPER-X

PARTICIPATORY FOREST MANAGEMENT

10.1 CONCEPT OF PARTICIPATORY FOREST MANAGEMENT The concept of Joint or Participatory Forest Management is an intervention to evolve organized and collective thinking on the issues of forest management keeping in view the fact that the forest resources are limited and the claim over these are varied, no single solution can satisfy the needs of all. The philosophy aims at involving all the stakeholders in resource generation activities through motivation, active involvement in the process of management and sharing of benefits through adequate institutional arrangements.

Joint management of forest lands is sharing of responsibilities, control, decision making authority and products over forest lands between Govt. and local user groups. The primary purpose of PFM is to create conditions at the local level which enable improvements in forest conditions and productivity. It is a movement towards a more democratic management of natural resources founded on the principle of equity, transparency and social justice.

It is widely acknowledged that the Govt. and development agencies alone cannot solve the growing problem of degradation of forests and natural resource depletion. The traditional approach to management worked satisfactorily in the past when the population was less but depleting natural resources have led to the concept and practice of participatory management.

10.2 SPECIAL OBJECTIVE OF MANAGEMENT: The basic objects of Joint or Participatory Forest Management are:-

- i) To evolve consensus on the basic issues for the conservation of forest resources including soil and water.
- ii) To empower the local communities to manage the forest resources with responsibility squarely lying on them for planning, execution and management of natural resources of their areas.
- ii) To provide an effective treatment for wastelands, degraded forests and forest lands situated near villages through protection, afforestation, pasture development, soil conservation by active participation of local people.
- iii) To maintain the environmental stability through preservation of natural resources through involvement of local people in management.
- iv) To augment fuel wood, fodder and small timber production for use by local people.
- v) To save the traditional forests from further deterioration through large scale planting of fuel and fodder species in buffer areas near to villages.
- vi) To ensure Gender Equality & equity by ensuring participation of Women and marginal & low income groups in consultaion and decision making on forest resource management.

The Govt. of HP has notified Himachal Pradesh Participatory Forest Management Regulations, 2001 and the Sanjhi Van Yojna Scheme, 2001 which have strengthened the JFM approach to a great extent.

10.3 HISTORY OF GROWTH OF PFM: Joint/Participatory Forest Management in Himachal Pradesh traces its history when social forestry was given impetus by National Social Forestry (Umbrella) Project in 1985. During this project period physical targets took precedence over participatory objectives and thus social & equity issues could not be addressed.

In the 1980s the World Bank-supported Social Forestry project (1984-92) and the Indo-German Integrated Dhauladhar project (1982-92) were taken up in HP. These projects were more participatory Umbrella Project.

The framework for PFM in HP is provided by the Government of HP Order of 12 May 1993, which followed the June 1990 Government of India (JFM) Circular enabling the spread of PFM.

The JFM Order coincided with the development of a donor-led (DFID) project for Mandi and Kullu districts, in which JFM was a key element. This Himachal Pradesh Forestry Project (HPFP) may be seen to have facilitated the introduction of JFM statewide. Donor support to Kullu district continued until March 2001.

Growth of JFM in Kullu District:

(Table 1)

Year	No. of VFDCs in Kullu District	Area (ha)
1995-96	4	1,870
1996-97	4	2,685
1997-98	12	8,930
1998-99	21	12,426
1999-00	14	7,000
Total	55	32,911

At the end of the second phase of the HP Forestry Project(DFID) in 2001, it was agreed that all the 55 VFDCs formed in Kullu would be taken over by the Sanjhi Van Yojna(SVY) and converted into societies. To support the state JFM Order, Participatory Forest Management (PFM) Rules were developed for HP, and notified on 23 August 2001. These Rules make provision for increasing the institutional autonomy of Village Forest Development Committees (VFDCs) by registering them as Village Forest Development Societies (VFDSs) under the Societies Registration Act. Importantly, the PFM Rules encourage VFDS formation at panchayat ward level wise thereby attempting to link these bodies directly with the panchayat structure with each elected Panch being on the executive committee of the VFDS, *ex officio*. . ‘Entry point activities’ – such as making pots, water taps, mending temples, small infrastructure developments; all designed to attract people to the project – were given a budget so that DFOs could be seen to be dispensing something worthwhile. However, the role of the VFDSs continues to be viewed narrowly, focusing mainly on helping the HPFD to police forests and on wage-based micro-plan activities This resulted in the announcement of ‘New SVY’ rules and guidelines by the GoHP in August 2001. They contain provisions for VFDSs to become, in legal terms ‘the forest officer’ (not notified) for levying fines etc, and for 100 per cent share in intermediate usufructs while on final harvest 75 per cent would go to the VFDS and 25 per cent to the panchayat. The GoHP agreed to completely forgo any share from JFM areas.

Under ‘New SVY’: entry point activities are abandoned but “income-generating activities” introduced; forest guards will not be the member secretary of the Executive Committee; but local organizers – usually led by a literate woman linked to a local community-based organization, helps mobilize towards a properly representative VFDS based on a panchayat ward. Several meetings are held before a micro plan is initiated – this shows VFDS maturity. The FD sends a cheque to a local bank account. The VFDS agrees with the FD to furnish a ‘utilization certificate’ which can be monitored and checked.

At the policy level the PFM Rules and SVY Rules and Guidelines of August 2001 are seen as a major step forward, laying the basis for uniformity in approach to community based forest management. It also makes JFM poverty focused and is targeted to the resource dependent.

In 2003, MoEF started the Forest Development Agencies (FDAs) at district level – with DFOs getting direct access to central funding – for forest and plantation work for employment generation objectives. This is an 100 per cent central sector scheme, created to reduce the multiplicity of schemes with similar objectives (it merges four existing central schemes), ensure uniformity in funding pattern and implementation mechanism, avoid delays in availability of funds to the field level and institutionalize peoples' participation in project formulation and implementation. FDAs will be constituted at the territorial/ wildlife forest division level, and JFM committees will be the implementing agencies at grassroots level. FDAs are to work through forest guards / deputy rangers- and thus appear to conflict with SVY rules which allow for the member secretary to be elected by the JFMC / VFDS.

The growth of FDAs and therefore of JFMCs since 2003 appears to be fluctuating as figures culled out from various departmental reports indicate. In March, 2003, 678 JFMCs were reported covering a forest area of about 1640 km² distributed in RFs, DPFs & UPFs. In March, 2005, 1690 JFMCs are reported covering a forest area of over 4200 km². As of December, 2008, 1381 JFMCs stand listed. However, as per field reports only 986 of these are said to be active. Area covered is not mentioned. In March, 2010, a total of 1109 JFMCs have been reported covering again an area of about 4200 km². In July, 2010, the total number of JFMCs has been pegged at 1270 but how much forest area they cover is not indicated.

10.4 THE LESSONS LEARNT The last three decades of dabbling with JFM / PFM under various EAPs and the homegrown SVY and now the centrally administered FDA, do hold some valuable lessons and insights for the future of participatory natural resource management in the state.

1. PFM should focus in and around pockets of poverty i.e. remote, forested areas (better forests) and where livelihood dependence on forests is high. This would entail several genuine joint management activities (other than plantation) like collective protection against illicit felling, fires, poaching and so forth. Issues of Rights, equity and benefit sharing are better addressed and conflicts resolved.
2. In participatory approaches, the process is more important than achieving targets. Choosing and regularly training the right persons for the job is therefore critical.
3. Sharing of removals, intermediate and salvage felling with VFDSs are necessary to establish long term stake of local communities in PFM.
4. Continual policy and Rules adjustment and calibration to promote better market returns for wood and non-wood based enterprises. Example, the recent decontrol of bamboo trade and transit. Next: efficient markets for value added products.
5. Local Leadership – Successful examples of JFM or CFM show that local leadership roles have been crucial in making the change. It could be an enlightened, accepted local person, an elected representative, a dedicated NGO/ CBO or even a committed forest officer. This is also important for sustainability of groups.

Why consolidate forest committees?

- Allow economies of scale to be applied, reducing the number of micro-plans to be established by one-quarter,
- More economical to produce field maps at a scale smaller than 1:20,000 and identifying all present land uses
- Development issues common to all villages could be addressed in a more efficient, coordinated and economic manner, including road upgrading, health and education, service delivery of agriculture and forestry extension, and minor irrigation,
- Facilitate dealing with common forestry problems
- Promote development of marketing cooperatives or federations, based on economies of scale for product sales, and improve market positions,
- Facilitate training for the communities by covering a larger, yet similar group,
- Support landscape-level forest planning that address conservation and economic goals,
- Allow scope for zoning community forests into areas conducive for timber and pole production, NTFPs, grazing and biodiversity conservation (with limited access).

Source: **Unlocking Opportunities for Forest Dependent People**,
World Bank, 2006

10.5 IMPLEMENTATION OF JFM IN PARVATI DIVISION The JFM approach has been implemented in the division through projects like Overseas Development Administration or DFID & Sanjhi Van Yojna. Total Thirty One JFMCs/VFDS have been constituted in the division so far. The micro plans were prepared in accordance with project philosophy and works executed by VFDC/JFMC. The activities like soil conservation, afforestation, village development activities, fire protection, grazing have been undertaken in the past but almost in all cases, the participation of locals remained upto fund flow only. Most of the committees are virtually inactive with few members taking the lead only when there is budget. Among the VFDCs, Jouli VFDC is quite active and most of other VFDCs/JFMCs are defunct. There is a need to revive, activate and involve these rural committees in forest management activities.

The detail of JFMCs in Parvati forest division as on 31.03.2014 is as under:

CURRENT STATUS OF JFMC'S IN PARVATI FOREST DIVISION:
(Table 2)

S.No.	Name of JFMC	Total Members	Male	Female	Registration Date & Year with CF Kullu
1	Mashgan	18	10	8	15.10.2003
2	Kalehali	16	8	8	15.10.2003
3	Chhohara	16	9	7	15.10.2003
4	Kharihar	16	9	7	15.10.2003
5	Bhullang	15	9	6	15.10.2003
6	Jouli	25	15	10	15.10.2003
7	Neul	15	10	5	15.10.2003
8	Najan	19	10	9	15.10.2003
9	Bhadiauli	16	10	6	15.10.2003
10	Jeshta	16	9	7	15.10.2003
11	Neenu-Ashani	17	9	8	15.10.2003
12	Chheur	16	9	7	15.10.2003

13	Jhuni Manihar	16	9	7	15.10.2003
14	Bashona	16	9	7	15.10.2003
15	Osan Banala	16	9	7	15.10.2003
16	Renuka	15	7	8	15.10.2003
17	Shyam Naggar	15	7	8	15.10.2003
18	Narogi-I	15	8	7	15.10.2003
19	Narogi-II	15	8	7	15.10.2003
20	Narogi Sharan	15	9	6	15.10.2003
21	Rauli	14	11	3	15.10.2003
22	Badogi	15	8	7	15.10.2003
23	Ursu	16	9	7	15.10.2003
24	Dhanali	14	9	5	14.05.2004
25	Deogra	12	7	5	14.05.2004
26	Dadei	13	7	6	14.05.2004
27	Shalag	14	8	6	14.05.2004
28	Kajiari	15	7	8	14.05.2004
29	Chhalal Katagla	10	6	4	15.10.2003
30	Lapas	11	7	4	15.10.2003
31	Shangna	16	8	8	15.10.2003
GRAND TOTAL		478	270	208	

10.6 FUTURE SCOPE

10.6.1 There is tremendous scope for the JFM activities in the division. All the forests allotted to the plantation and all 3rd class forests (UPF's) are suitable/ potential sites for afforestation, soil conservation, grassland improvement, NTFP development besides other forests. The main bottle neck is the high average income of the people in this area due to which they shirk away from forestry activities with very high gestation period, comparatively low income and changing govt. policies. The lack of commitment both at fields and higher level, target/data driven approach and lack of community mobilization experts are some of the reason for un-satisfactory results. However there is a ray of hope and possibly joint forest management is the only way to conserve, protect and enhance natural resources.

10.6.2 IDENTIFICATION OF JFM AREAS:- The degraded forest areas as well as common village land located in the vicinity of the villages are potential sites for JFM implementation. The deficiencies and strengths of these areas with regard to soil condition, water availability, grazing pressure, fuel wood production and requirements need to be understood, analyzed and shared with local people. It is pertinent to identify marginal & low income groups having their dependence solely on forests, for fuelwood, fodder & other petty needs. It is important to identify the actual user group after stake holder analysis and their requirements vis a vis technical consideration should aptly be merged before initiating any intervention. There is need to have at least two dedicated community mobilizers per division if long term joint forest management perspective is to be achieved.

10.6.3 NON TIMBER FOREST PRODUCE JFM can play an important role in collection, marketing and propagation of NTFPs. Many villagers are dependent on the collection of NTFP to sustain their livelihood. They usually collect various medicinal herbs and sell it to

the middleman who further sells in the market. The various medicinal herbs that are found or can be introduced in the tract, their method of cultivation, collection, harvesting have been discussed in Chapter.

10.6.4 VERMICOMPOSTING: In departmental nurseries a large amount of vermin-compost is required and this demand is difficult to meet with departmentally. Thus training may be imparted to local people preferably to women on vermin-composting and the department can give them buy back assurance. This will give a livelihood option to local people. The skill so upgraded will be of immense help in this horticulture/ cash crop rich area where demand for vermin-compost is ever increasing and everlasting.

10.7 POTENTIAL ACTIVITIES OF JFM COMMITTEES: The JFM/PFM committees are the future agencies of forest development, conservation and expansion. The potential activities to be executed through JFMC

Can be:-

- Afforestation activity.
- Soil & water conservation through treatment of macro and micro watersheds in a catchment.
- Recharging of water bodies like babris, ponds and underground water.
- Minor construction works of paths, irrigation channel, tanks etc.
- Awareness programmes for forest protection, fire protection, propagation of medicinal herbs on a larger scale.
- Livelihood options like Eco Tourism, vermin composting, cutting & pruning etc. through effective training.
- Collection, value addition and marketing of NTFP.

10.8 MODE OF WORKING: Traditionally Forest Department has been involved in protection of forests and the concept of involving people in forest management is relatively recent in Forest Department. Forest Department especially Forest Guards who have more regular and direct interaction with people have to adopt 'carrot and stick policy' which is not always easy. Thus it is desirable to involve local CBOs, NGOs etc. in implementation of programs involving 'people'. Forest staff is not imparted specialized training on participatory management of natural resources, which is vital for success of any people centric program. To start with the mode of working could be as follows which will further evolve with time:

- i) **Micro planning:** - Stake holder analysis done by involving community mobilizes and field functionaries and help of local Community based organization and NGO can also be taken. A long term planning for 5 to 10 years be done and there should not be any phasing out. Budget or no budget, but awareness and training program on more or less fixed time horizon must continue.
- ii) **WORK STRETEGY:** Whenever a plantation is raised or a water harvesting structure is constructed, it must be in consultation with local people, essentially with their end user. Such people should be constituted into User Groups, who will maintain assets, use them and if need be extend them. Thus Forest Department will be not only relieved of its function of monitoring each and every small plantation/ structure but will also be in a better position to connect with people. Such user groups will be registered and will have an account. Thus the budget received for plantation/ WHS etc can be directly transferred to their account. However, FD will

monitor the quality of work and give technical guidance. Plants will be provided from departmental nurseries.

iii) PANCHAYAT & COMMUNITY BASED ORGANIZATIONS: The role and strength of local panchayat representatives can be made use of in forestry activities. CBO like Mahila Mandals, Youth Clubs and temple committees should be identified, duly recognized and involved in JFMC activities. Similarly, local NGOs also have potential and should be symbiotically associated. Social audit of each activity is a must for empowerment of local people.

CHAPTER-XI

CLIMATE CHANGE

Climate change is the global phenomenon of climate transformation characterized by the change in the usual climate of the planet (regarding temperature, precipitation & wind) that are especially caused by human activities.

Climate Change has undoubtedly emerged as an issue of global concern. Climate Change has a potential to completely and adversely affect the balance of entire biodiversity. The terms 'global warming' and 'climate change' are often used interchangeably, but there is a difference. 'Global warming' is the gradual increase of the earth's average surface temperature due to greenhouse gases in the atmosphere, whereas the 'climate change' is a broader term. It refers to long-term changes in climate, including changes in average temperature and rainfall due to global warming. Climate change phenomenon which is much more complex is the result of activities that alters the composition of atmosphere, due to undesirable and unwanted over exploitation of our natural resources.

Paris Agreement: Paris agreement is a legally binding international treaty on climate change, it was adopted by 196 parties at COP-21 in Paris on 12.12.2015 entered into force on 4.11.2016. Its goal is to limit **global warming** well below 2⁰C, preferably to 1.5 ⁰C compared to pre industrial level. Climate change action needs to be massively increased to achieve the goal of Paris agreement years, giving into new concepts of carbon based solutions and new market. Countries, region and cities are establishing carbon neutrality targets. Zero carbon solution is becoming competitive across economic sector representing 25% of emission. The strategy involve energy and climate policy including the 20/20/20 target namely reduction of CO₂ emission by 20% , increasing renewable energy market share to 20% and increase in 20% in energy efficiency. Paris deal is world's first comprehensive climate agreement.

Paris Agreement: What are India's climate commitments?

In 2015 ahead of UN significant climate conference in Paris, India announced three major voluntary commitments called the National Determined Contributions.

- Improving the emission intensity of its GDP by 30-35% by 2030 over 2005 level.
- Increase share of non fossil fuels based electricity to 40 % by 2030.
- **Enhancing forest cover, thereby absorbing 2.5 to 3 billion ton of CO₂.**

India's progress in fulfilling its climate commitment:

- India has reduced emission intensity by 21% over 2005 level.
- Massive plantation activities across states YoY to increase forest cover and highlighting ToF (Trees Outside Forests).
- Solar capacity has grown from 2.63 GW in 2014 to 36GW in 2020.
- Renewable energy capacity is the 4th largest in the world and will reach 175 GW before 2022.

- India has set new target of 450 GW by 2030.
- Onward stage India has pioneered two major initiatives :
ISA (International Solar Alliance)
Coalition for disaster resilient infrastructures

Evidence of Climate change:- Following are the evidence which proves that climate change is the reality and needs to be taken into account for future policy and action.

1. Rise in local temperature.
2. Receding snow on glaciers and rising sea levels.
3. Rise in the event of forest fires.
4. Forest acidification resulting in the death of plants.
5. Shifting of tree lines northward.
6. Impact on soil fertility.
7. Increase in invasive/exotic species.

Vulnerability to Climate Change:

No detailed assessment of vulnerability of the sector to climate change exists; however, Available evidence suggests that the general effect of projected climate change is that the habitat of many species will move pole ward/ upward from their current locations. Disturbances can increase the rate of species loss and create opportunities for establishment of new species. The abrupt changes in climatic conditions in the mountainous part of the Himalaya are directly or indirectly affecting the vegetation development and regeneration of important species.

The variation in rainfall and temperature may lead the variations in phenological events of many species, particularly the dominant oaks. Some early studies on phenological aspects of tree and shrub species in the Himalayan region are available and could potentially be used as base line data would be helpful to predict the vegetation—climate change response and adaptation of species in such conditions.

Alpine ecosystems are particularly vulnerable to warming, as species occurring near the mountaintops will have no space for their upward march. The variation in such conditions may adversely affect the regeneration and growth of these species. Similarly many other species are vulnerable to the climate change phenomenon.

Issues, Challenges and Priorities

- ❖ The Himalayan ecosystem is particularly at risk with the rise in global temperatures. The biodiversity which resides in the higher altitudes will have less and less place to occupy and will be at increased risk of extinction.
- ❖ The increase in global temperatures will cause an increased occurrence of GLOFs (glacial lake outburst floods) and will affect the size of the glacial lakes. The breakage of such lakes can be extremely devastating to human habitations, among others.

- ❖ It can be stated that the precipitation will be with increased intensity and will become more erratic. This will make the fragile ecosystems susceptible to damage by cloudbursts, increased soil erosion, etc. The overall pattern of rainfall is expected to be heavy rainfall followed by long period of droughts. This will reduce the overall availability of water in the hills.
- ❖ The alpine meadows have high soil organic content and are very good at sequestering carbon. They are also extremely rich in biodiversity. The increase in global temperature threatens the existence of alpine meadows and makes them vulnerable to extinction.
- ❖ There will be a gradual shift of plant species towards higher altitudes. This will force local communities to shift to newer agricultural and fodder species. Because of this and the fact that the area lies in a highly sensitive seismic zone, there is bound to be a heavy stress on the housing sector.
- ❖ Increased tourism activities will cause severe stresses on the fragile Himalayan ecosystems, which are already reeling under the pressure of water scarcity, excessive constructions, heavy usage of fuel wood and improper waste management, to name a few.

Climate Change : Impact on Forests

Forests in Himachal Pradesh are an important ecological and natural resource and have been aptly termed as "Green Pearl" in the Himalaya. About 26% of the State's geographical area is the repository of 3,295 species out of which 95% are endemic to the state and 5% (150) species are exotic, most of the people in rural areas in the State depend directly or indirectly on forests for their livelihood and use significant quantity of forest goods and services like non-wood forest products, ecotourism, fodder, timber etc.

The immediate repercussions of climate change on the forests are visible in the form of shifting of tree line to higher altitudes and movement of pine species to higher altitudes. Available data on climate suggested that by 2100, under the most probable scenario, temperature of the state is likely to increase by 3°C and precipitation will decrease by 20% and in that situation the effects will be more visible and alarming also.

Climate Change Hazard Scenarios: District Kullu

1. Climate Change Induced Natural Hazards

Like in other parts of the Himalaya the glaciers are melting fast in the catchments of the Kullu valley. One of the most adverse consequences of this change that poses the greatest social, physical and economic risks to the people of the districts is the presence of glacial lakes in proximity to the melting glaciers. The glacier lake has the potential to sudden breach due to trigger like avalanche, slope failure and seismicity. The discharge of millions of cubic meters of water and debris from such lakes can destroy everything that comes in its way. The vulnerability of Kullu is very high as most of the life line infrastructure and population is concentrated along or on either side of the river.

The other climate induced hazards that are likely to impact the Kullu district are the occurrence of cloud bursts accompanied by flash floods. Flash floods that occur with little warning are triggered by intense rainfall, and breach of natural and manmade barriers and glacial lake out bursts. Presence of potential glacial lakes in the catchment of the Beas river

coupled with the experience of past events poses a serious threat to the downstream people and infrastructure.

Kullu valley is prone to flash floods and the valley experienced noticeable flash floods during the years 1902, 1945, 1988, 1993, 1995, 2000 and 2003. Analysis of discharge data indicate 2100 cusecs at Manali which increases to 14000 cusecs at Bhuntar. Floods on account of high precipitation or cloud bursts cause inundation where carrying capacity of the streams is exceeded. Floods not only causes huge economic loss in the form of damage to houses, roads, bridges, power projects, public utilities but also cause immense loss of human and live stock.

The flash floods and cloud bursts has caused enormous loss of life and property in past. The risk has also grown many times as large number of power projects and drinking water supply infrastructure in the state are situated in the major river basins. During the floods of 2000 the economic loss was estimated to the tune of more than Rs. 1,000 crores and 150 peoples were killed. Every year the relief is distributed to compensate for the losses incurred due to floods of various kinds.

Climate Change: District Kullu

As per the references available, climate change is reality as far as Forest in Himachal Pradesh are concerned and more particularly Forest in Kullu valley are the worst affected. Failure of largenumber of plantations and incident of forest fire around the area. Following points indicates vulnerability of Kullu district to the changing climate.

- (i) Kullu valley is witnessing unusual congestion of multiple economic processes happening simultaneously.
- (ii) Dwindling population of honeybees in wild fauna.
- (iii) The Beas and Parvati River are the life lines of the district on which the entire economic growth and livelihood about 90% people depends.
- (iv) Indicators of warming trend of Himalayas have become perceptible, visible and measureable.
- (v) Himalayan glaciers and alpine grasslands two most sensitive hot spots identified and indicated at national level are having sizable presence in the Kullu valley.
- (vi) 37% of the geographical area of the district lies in high sensitive seismic zone –V.
- (vii) Kullu valley is a part of Himalayan Geothermal Province (HPG) and a number of hot water spring are located here.

Climate Change Effect on Kullu/Parvati/Garsa Valley: “G.B. Pant NIHESD” Report

- Temperature data of 35 years was analyzed from 1985-2019. Temperature is continuously increasing in the area. The maximum temperature was recorded 29.5 °C during 2019 on the basis of temperature date analysis the temperature has been increasing at the rate of 0.07°C per year.
- Maximum rainfall was recorded 1304.4mm during 1988 and minimum 2009, while the mean rainfall was 927.4~28mm. Rainfall is decreasing @4.3mm/year
- In 1991-92 about 7% apple sown area has increased while -9.5% production have decreased. Similarly in 2016-17 the area grew by 2.9% while production decreased by -45%. Climate is main factor for decrease in apple production in this area.

The manifestation of the climate change in Kullu valley has been noticed as below:

1. The observations made by independent studies indicate that in the recent years temperature has risen in the Kullu valley more than anywhere else. The scenario for the valley would be very severe as indicated by future projections made based on regional climate model of the Hadley Centre (HaDRM3). The projection for Kullu indicates a rise of more than 2.47°C temperature accompanied by substantial decline in precipitation during critical months.
2. In consequence to the rising temperature and windward disposition glacier retreat in the valley has been observed to be more than anywhere else.
3. Number of moraine dammed and glacial lakes formation posing GLOF threat is also relatively higher in comparison to other river basins.
4. Decrease in rainfall and particularly in winter precipitation coupled with rising winter temperature has affected the alpine belt more than in other valleys. The shift in alpine belt is also more perceptible than in other parts of the State.
5. The valley has maximum concentration of eco sensitive areas such as wildlife sanctuaries and an important Great National Park.
6. The studies available so far indicate maximum shift in vegetation species recorded in the valley. Increasing anthropogenic stress on account of undesirable interference from power projects and tourism. The Kullu valley has the largest number of mega power projects under implementation.
7. Increasing frequency of weather related hazards such as cloud bursts and flash floods. Exponential increase in the ecological foot prints of tourist towns such as Manikaran and Manali surpassing the carrying capacity.
8. Fast rate of glacier melting and increasing frequency of natural disasters such as floods, flash floods, and cloud burst etc.

Relevant Existing Initiatives

Himalaya is rich in forests and has a long history of scientific forest management. It has an excellent protected area network.

Sectoral Strategies:**1. Sectoral Vision and Commitment**

The overall sectoral vision and commitment will be to improve forest and biodiversity management practices through multiple strategies and initiatives in the state to minimize the impacts of climate change and for the overall well-being of the state and its people.

2 Strategies

For improving the scientific knowledge and evidence base on climate change and its impacts, the following will be taken up for immediate research under the Forest Department:

1. Evaluation of total carbon stock and annual increment for Himachal Pradesh.
2. Monitoring the carbon fluxes of forests in various ecological and altitudinal zones.
3. RS-GIS analysis of the whole state to evaluate/monitor the carbon stock.
4. *Ex situ* conservation of the genetic diversity of both the flora and fauna.
5. Documentation and monitoring of the biodiversity of various ecosystems.
6. Development of appropriate silvicultural techniques with climate change considerations.
7. Research on the eradication of invasive alien species.
8. Management of forest fires.

9. Monitoring the population dynamics and movements of wildlife.
10. Studying the impacts on high-altitude wetlands, alpine meadows and moraines.
11. Documentation of traditional knowledge related to biodiversity.
12. There is a need to carry out studies to find out the impact of global change on the carbonmitigating capacity of the forests. There may be significant effects on thegrowth/decomposition rates, the area, type and intensity of natural disturbances, land-usepatterns and ecological services.Since a large portion of the population of this area is dependent on forests for theirbasic needs such as fuel and fodder, any climate response strategy has to be developedwith the community in mind. Comparing environmental and social co-benefits and costs with the carbon benefit will help promote sustainable development.
13. Extensive measures need to be taken by using both traditional as well as modern inputs tocontain forest fires. With the increase in the temperature, the forests are likely to be moreprone to fires. Hence, wildfire management needs to be taken up at a priority basis tocombat an increased frequency and intensity of wildfires in the future.

Proposed actions/programmes will include the following:

1. Increasing the existing area under forests and trees and improving the quality and densityof the degraded forests. The activities contemplated under this are the following:

Management intervention in Alpine forests:

1. Plantation of climate-resilient species beneficial also to local communities in third classforests.
2. Assisted natural regeneration in moderately dense forests.
3. Enhancing natural resources and livelihood options of the vulnerable sections

The following are action points towards meeting these challenges:

1. Mapping of all important rangelands using remote sensing and geographicalinformation systems (RS-GIS), followed by ground truthing.
2. Conservation of high-altitude meadows through local communitiesand related institutions.
3. Alternate livelihood options for communities such as non-timber forest produce(NTFP) collection, community based eco-tourism, biomass briquetting,establishment of decentralized nurseries and cultivation of medicinal herbs
4. Protection and management initiatives towards regulated grazing.

Soil and water conservation:

The observed warming (over several decades) has been linked to changes in the largescalehydrological cycle, such as increasing atmospheric water vapour content; changingprecipitation patterns, intensity and extremes; reduced snow cover and widespreadmeltng of ice and changes in soil moisture and runoff.

The soil and water conservation activities will include thefollowing:

1. Minimizing the human interference in the ecology of the glaciers.
2. Identifying vulnerable areas with the help of experts.
3. Strategic and scientific planning for road cutting that results in minimal loss of soiland water resources.

4. Construction of large-scale rainwater harvesting structures to reduce the water stress in moisture-deficient areas.
5. Enhancement of soil and moisture conservation regime by introduction of multi-tier forest plantations.

Fire management :

With changes in the monsoon system, short-term, high-intensity precipitation accompanied by intervening drought-like conditions are the major possible threats.

Main components of the strategy that will be adopted for effective fire management are as follows:

1. Quick response teams for firefighting.
2. Daily monitoring of fire threats with the help of satellite imagery and information technology.
3. Utilization of pine needles as an energy-efficient eco-friendly energy source for making pine needle check dams.
4. The Forest Department will undertake a detailed capacity needs assessment, especially the need for frontline field staff/personnel. Additionally, the assessment will also examine the scale and scope of capacity development that should be directed at local communities' for sensitizing school children and college students. Appropriate action measures will be designed and taken up based on the capacity needs assessment results.

Carbon sequestration:- it is the process capturing the waste CO₂ from large point sources. Planting tree and managing their development is proven way to reduce the no. of harmful particulate in air. If carbon is not emitted into atmosphere will ultimately reduce the GHG effect & lessen impact of climate change.

Carbon sequestration: Role of Parvati Division

Parvati division is carrying out plantation activities to the tune of about 200-250 hect/year & maintaining the area of new plantation as well as natural vegetation which is ultimately providing a good source for carbon sequestration. The Division, as part of HP Forest Department is further focusing on increasing the plantation area along with the active participation of local people through various community participation schemes such as JICA programme, Vidyarthi Van Mitra, Ek buta beti ke Naam etc.

As climate change is unfolding, the science of climate change too is in the process of development. Nevertheless, adaptation and mitigation efforts are urgently needed corresponding to the existing level of scientific understanding;

CHAPTER-XII

MISCELLANEOUS REGULATIONS

112.1 PETTY FELLINGS: - The felling of petty nature as detailed below may be treated as prescriptions of this working plan:-

1. Dry or green trees required to meet bonafide requirement of local people including the right holders and others.
2. Dry or green trees for ordinary departmental use or for other Govt. departments.
3. Dry or green trees to meet special free grant for construction of houses damaged/destroyed by natural calamities like fires, lightening etc. as per settlement provisions or as per Govt. orders.
4. The felling of dry or green trees after getting felling permission of competent authority under Forest Conservation Act, 1980.

All the trees and poles marked for such purpose shall be recorded in the respective compartment history files and such fellings will appear in the control forms. The silvicultural principles shall be strictly adhered to while carrying out such marking.

11.2 DEVIATIONS: - Any large or unusual felling operation not prescribed in the Working plan will be a deviation requiring prior sanction of the competent authority. The deviations may be due to:-

1. Large scale damage by snow, fire and wind storms.
2. Special fellings to meet the sudden unexpected heavy demand of particular industries or for security/defence purposes.
3. Large scale felling of trees coming in the alignment of major roads or transmission lines or hydro-electric projects.

11.3 ROADS AND PATHS

11.3.1 ROADS: - Generally, the construction of roads for public utility is undertaken by the PWD in the tract. However, if needed, small roads to meet the forest management requirement can be undertaken sparingly.

11.3.2 BRIDLE AND INSPECTION PATHS: - It is very essential to maintain roads and paths in a satisfactory condition for the purpose of transport of forest produce, inspection of forest, patrolling etc. A number of bridle and inspection paths covering all important forests have been constructed in the past. The existing roads and paths are detailed in Volume-II Appendix –IX page 93-100. These should be kept well maintained as these also act as fire lines. The width of these bridle/ inspection paths is about 1.5 meters in general but it varies considerably particularly near the habitations the paths are widened due to its excessive use and may vary from 2-3 meters. The inspection path should be constructed as far as possible along contours in such a way that whole of the forest is covered. It is essential to construct bridle path (i) 1/45 Charawat C-Ib to Chawara (5 Km) (ii) Inspection Path Rari to Doga Dhar,

3 Km (iii) Mashgan to Sujehni, 3 Km from Forestry Management point of view. Till now the Range Office and its subordinate offices at Jari are devoid of road. Hence a link road from Bradha Mod to Range Office Jari needs to be constructed on priority basis.

11.3.3 BUILDINGS: - A number of buildings of various types have been constructed from time to time in the past but most of them are at present in very bad condition. The reason for their being in poor condition is either lack of funds for their maintenance or they being neglected for one reason or other. There is a tendency among the local staff (field/ministerial) to work in their jurisdiction on a day scholar basis which is very bad both for the forestry activities as well as for the buildings. The forest officials be made to stay at their headquarter and regular maintenance and repair of all the buildings should be undertaken on priority basis. It is strange that till date in many beats there is no forest guard huts. The condition of Range Office cum residence of Bhunter Range and other associated buildings of Range Office Bhunter is miserable. At present Range Office is being run in a type-II building where Range Officer cannot attend to a delegation of three people comfortably. Moreover Range campus Bhunter is overcrowded due to opening of Tehsil office in the same campus w.e.f. 2015. It is proposed that a new building of Range Office cum Residence and associated buildings should be constructed at Shamshi Forest Complex with its headquarter at Shamshi on priority basis. Likewise the condition of forest guard hut Khokhan, Mohal, Diyar, Nareish, Jari, Kashawari and other buildings like FRH Jari, FRH Dhara, B.O Quarter Jari and Dhara, R.O Residence Jari is very bad and their special repair/ maintenance should be undertaken on priority basis. The forest guard hut at Khokhan, Mohal, Nareish and FRH Jari are in ruinous stage. Hence they should be written off and new buildings should be constructed at suitable places. The existing and proposed new constructions are given in Volume –II Appendix VIII page 89-92.

11.4 DEMARCATION AND SURVEY: - All the demarcated and un-demarcated protected forests are well demarcated and brought on 1:15000 scale survey sheets by the Survey of India. The area is also covered by 1:50000 scale maps.

11.5 FOREST BOUNDARIES: - The state of boundaries of forests is not satisfactory. The boundary registers are not maintained properly. The boundary pillars are not maintained on desired lines. As already recommended, the use of Global Positioning System (GPS) is the need of the hour for correct positioning of boundary pillars. The field staff must check the forest boundaries frequently. It is recommended that the forest guard will conduct complete annual checking of the boundaries of all forests and make a report to the Block Officer who in turn shall check at least 50% forests of his block complete in all respects at least once a year and make report to the Range Forest Officer. Similarly the range officer will conduct complete checking of 20% forests in his range in a year and shall make a report to the DFO. Till now a very meagre amount has been spent on repair/ maintenance of boundary pillars. In fact almost all the BPs are required to be reconstructed again and for this purpose mission based approach should be adopted. The forest wise details of boundary pillars (Large and Small) are given in Volume-II Appendix-X, Page No. 101-103.

11.6 MAPS: - The demarcated and un-demarcated protected forests have been stock mapped on 1:15000 scale. The stock maps have been filed in compartment history files. The management map on 1:50000 scale has been prepared by making use of survey sheets.

11.7 RAIN GAUGES AND SNOW GAUGES: - No rain & snow gauge has been installed in this division. Since this data is being collected by many institutions/departments. Therefore, no need of investing time, labour and finances on this activity.

11.8 NAUTORS AND ENCROACHMENTS: - Nautors were granted indiscriminately during emergency. The practice of grant of nautors is prohibited under the forest Conservation Act 1980 and has therefore been stopped. Encroachments in IIIrd class forests are rampant. Demarcation of land for initiation of eviction proceedings has to be got done through revenue authorities and this is the hurdle which is very difficult to cross. An eviction power given to the DFOs under the Public Premises Act has no meaning without this requirement. Spotting of encroachment without proper demarcation in the field is futile. A close coordination is required between the forest and revenue department. Periodical checking are required and action should be stringent.

11.9 MISCELLANEOUS

SEED STANDS: - It must be understood that seed for artificial regeneration must be collected from genetically superior trees. Marking with white paint, fencing of the seed stand, clearing the stand of unwanted growth etc must be done on priority. A list of seed stand trees must be kept for records. Following seed stands have already been identified by silviculture wing of forest department during July, 1983 and should be maintained properly. The names of forests are as under:-

(Table 1)

Range	Block/beat	Species	Forest & compartment	Area (in ha)	Remarks
Jari	Dhara/Shat	Kail	1/18 Khanoru Nal & C-IIa	81.38	500 Nos. Trees
Jari	Jari/Jari	Deodar	R/6 Bindraban & C-Ia	28.62	500 Nos. Trees

In addition to above, seed stands of Kullu Division should also be used for collection of good quality seeds. The details are as under:

(Table 2)

Range	Block/beat	Species	Forest & compartment	Area (in ha)
Manali	Vashishat/ Vashishat	Deodar	1/4 Dudlu C-IV	28.3
Naggar	Naggar/ Janna	Kail	1/24 Ledichalon C-II	16.19
Naggar	Hallan/ Barashai	Kail	1/14 Padra Dhanach (Whole)	23.47
Naggar	Hallan/ Sarsei	Kail	1/18 Janghar Kalon C-II	42.49
Naggar	Naggar/ Naggar	Deodar	1/19 Naggar Jhir C-II	13.4
Kullu	Kais/ Borsu	Deodar	1/31 Borsu C-II	36.42

RESEARCH, DEMONSTRATION PLOT AND SAMPLE STANDS:- Proper protection must be given to these plots and stands and efforts should be taken to utilize their result for effective, scientific forestry management. No marking and felling must be done in these areas.

FIRE PROTECTION: - Forests must be kept protected from fire. Good- will and cooperation of the people must be solicited and rights linked to responsibilities. Education and publicity must be given due stress. Bridle paths/ Inspection paths/ fire lines/ contour paths must be regularly maintained and kept clear of forest debris. More fire lines should be constructed particularly in Hurla and Bhunter Ranges. If necessity is felt, fire watchers are to be employed to ensure that fire does not ruin our precious forest wealth. The fire watchers must be provided with all firefighting equipment. Road rakes, showels, slashers and felling axes must be provided. A watch tower has been provided at Diyar forest area. Phat burning by the villagers does maximum damage as many times negligence and carelessness is found in the burning of the grasslands and consequent spread of fire to the adjoining forest. Phat burning brings encouraged growth of coarse grass and decrease the yield of grass per units area. This practice must therefore be discouraged and if required to be done, should be done under the supervision of the local beat guard. Wireless has been provided to the forest staff, which would be better equipped, if its use is familiarized. Joint forest management would be an ideal setup to educate the people in firefighting and would elicit the correct and responsive stimuli from the local populace. Modern firefighting equipment and training is a must for the forest personnel.

LOPPING: - Though lopping rules need stringent attention from the staff, the conditions in the field are quite lax. Kail and Oak are the maximum sufferers. Lopping rules included in the notification of DPFs are not adhered to. Gaddis and Gujjars also do maximum unchecked damage. Lopping rules must be enforced by the staff and people educated in this respect.

PRESERVED AND MONUMENTAL TREES:- Such historical, large sized/giant trees of important conifer and broad leaved species if found should be declared preserved and recorded, photographed, provided with a sign board giving its basic information.

TEMPLE GROVES:- All the temple grooves should be preserved irrespective of the species. No trees shall be felled from the temple grove.

TIMBER FOR RIGHT HOLDERS:- The genuine demand of right holders should be met as per provisions of settlement report, Govt. orders/instructions.

TIMBER/ FUELWOOD SALE DEPOTS: - The HPSFDC Ltd. is operating fuel wood & timber depots at 3 locations. Many Timber sale depots/ Joineries/ Furniture workshops are being operated by private parties after due registration from Forest Department.

11.10 CAT Plans: - There are three CAT plan in Parvati Forest Division namely (i) PHEP-II (ii) Malana-I (iii) Malana-II. PHEP-II CAT Plan is under implementation since 2003-04 and total financial outlay is Rs. 25,69,22,000. Malana-I CAT Plan is under implementation since 2001-02 and total financial outlay is Rs. 1,01,51,750. Malana-II CAT Plan is under implementation since 2006-07 and total financial outlay is Rs. 3,37,82,330.

11.11 Eco- Tourism: - ‘Eco-tourism’, in a very broad sense, means venturing into and enjoying nature in such a way as to assure that negative impacts on the cultural and natural environment are minimized and mitigated. It is, therefore, ‘responsible’ tourism, which, besides being ecologically and culturally sensitive, helps the local communities in realizing social and economic benefits. The vision is to preserve and protect the natural (both flora and fauna) and cultural heritage of Himachal Pradesh, provide opportunities to enhance livelihood of local people, generate resources for sustainable development and promote greater understanding and appreciation for this heritage through authentic Eco-Tourism initiatives. To boost the eco-tourism an initiative was taken to convert a waste land into a Nature Park at Mohal. The site was a degraded land which had been converted into a dumping site by the local inhabitants in unauthorized manner. The area actually falls in Kullu Division but has been developed and managed by Parvati Forest Division. This Nature Park at Mohal has been constructed by HP Forest Department under Nature Conservation Society (NACOSOC) funds during the year 2014 and has been opened for public during 2015. Till date a revenue of Rs. 60,69,700 has been generated from various eco-tourism activities of the visitors since its inception in the year 2015. A similar kind of Nature Park is under development at Kasol with a financial outlay of Rs. 1,84,72,000. Till date Rs. 60,00,000 has been allotted under CAMPA funds. There are other potential sites like Diyar/ Sholinda Dhar, Garsa in Garsa Valley, Khirganga in Parvati Valley which rich from eco-tourism point of view. For developing these sites to eco-tourism sites the necessary guidelines and safeguards as laid in revised eco-tourism policy of 2017 notified vide GOHP notification No. FFE-B-C(15)-3/2005-III dated 25.02.2017 should be adhered to strictly.

11.12 Establishment: - The paper workload has increased many folds whereas ministerial staff has been reduced. The staff sanctioned strength at the time of previous working plan vis a vis present scenario is tabulated below:-

(Table 3)

S.No.	Post	Sanctioned strength as on 1/4/1994	Sanctioned strength as on 01/04/2018	In position as on 01/04/2018
1	Suptt. Gr-II	1	1	1
2	Sr. Astt.	3	3	2
3	Jr. Astt./ Clerks	8	6	3
4	Typist	-	-	-

With coming of Right to Information Act and service guarantee act, the time bound completion of work/ information is mandatory. With such meager staff, DFO's and RO's are generally struck up in offices and important field work and inspections are sacrificed. The due importance should be given to this aspect so as to improve quality of field work and delivery of services. A post of data entry operator should also be created so as to make the online entries.

11.13 Administrative division: The area of Parvati Forest Division is divided into 4 ranges, 13 blocks and 39 beats. The constitution of beats needs some amendment which is suggested as under:

- With the rationalization of Nargu wild life sanctuary and transfer of R/9 Rajgiri and 2/63 Matiana forests to Wild Life Division Kullu, the Pah beat has left with no forests except 200 Hectare UPF area. Hence the Pah beat needs to be merged to Sandhar Beat of Dhora Nala Block which also needs to be merged into Shamshi Block. Vide DFO Parvati office order No. 204/2017-18 dated 19.01.2018 a new beat named Grahan (Area 1979.10 Ha) with its HQ at Kasol has been created after reorganizing the area of Kasol and Manikaran Beats.
- The check post Kandi at Bajoura should be abolished and check post at Garsa and Bajoura should be strengthened by deploying honest and efficient staff.
- The office of Range Officers needs to be strengthened by providing at least one Range Assistant. Similarly Telephone and mobility to Range Officer is also required.

11.14 Labour Supply: With the present rate of Rs. 210/- for unskilled labour, it does become very difficult to engage labour during fruit growing seasons, especially during the apple season, when labour get plentiful employment with very high wages. Availability of Gorkha labour is scarce now due to improving conditions in Nepal and so is the migrant labour thanks to MNREGA. Local labour for various forestry works is not readily available and during plantation season labour is imported from Mandi area. Therefore special attention needs to be given to this emerging labour problem.

11.15 Trainings: Training needs identification of front line staff and timely trainings is of utmost important. The new technologies are coming and so are the training needs. The use of GPS, Computer, community mobilization, Catchment area treatment, wild life, Soil and Water conservation, Forest protection are very important fields for training of front line staff. Along with training, exposure visits are also required to build up the vision of the staff. For these sufficient budgetary provisions are required to be ensured.

CHAPTER XIII

CONTROL AND RECORD

To ensure the proper implementation of the prescriptions of the plan, the following record will be maintained in the division:-

12.1 COMPARTMENT HISTORY FILES The compartment history files of all the demarcated and un-demarcated protected forests have been prepared afresh. The new descriptions, enumeration results, allotment, prescriptions, stock maps have been filed in the divisional as well as range copies of compartment history files. Entries of all the work done should be posted by range officers in range CH files and then divisional CH files are also updated accordingly. Important notes on silvicultural operations, markings, TD markings, regeneration progress and other cultural and subsidiary operations are to be recorded in CH files every year and notes by the inspecting officers also appended. RO shall ensure timely updating.

12.2 CONTROL FORMS To exercise proper check and control on the prescriptions of the working plan, the Divisional Forest Officer will submit the control forms 2a, 2b, 4 and C annually to the Conservator of Forests in accordance with the instructions laid down in Punjab Forest Leaflet No. 11. The control forms must be completed and submitted to CF in duplicate in the first quarter of the following year. Each compartment history file will have control forms “A” and “B” (Exploitation) and control form “C” (Regeneration and plantation works) and forest journal control form 2a, 2b and 4. Control forms are maintained for the control of the following –

- Fellings:- Standard control form 2(a) (Volume control) and 2(b) (Area control) will be maintained.
- Subsidiary operations:- Control form 4 will be maintained for roads and buildings.
- Regeneration and plantation works:- Control form ‘C’ will be maintained for all regeneration and plantation areas. Regeneration survey results are to be submitted for all PBI areas on 1:15000 scales, along with control forms.

Summary of deviations for sanction of Pr.CCF, are to be submitted along with the control forms, on standard form. The DFO must submit through his Conservator detailed explanation for any deviation, especially with regard to pace of fellings and progress of regeneration.

12.3 PLANTATION, NURSERY AND SOIL CONSERVATION JOURNALS:

1) REGISTER OF ROADS, PATHS AND BUILDINGS The register of roads, paths and buildings existing as well as new constructions will be maintained showing the year of construction, cost and other important details.

2) FOREST GUARD MANUAL/BEAT BOOK The range officers shall see that all the beat guards keep and carry copies of maps of forests of their beats and other record mentioning various details like area, allotment, prescriptions, and particulars of rights of local people forest-wise, order issued from time to time and other important details of the beat. The further instructions as laid down in Punjab Forest Manual III shall be kept in mind.

3) RESEARCH JOURNAL The research journals should be maintained in each division and relevant research activities conducted/undertaken should be entered.

4) PLANTATION/SOIL CONSERVATION JOURNAL Wherever sowing, planting and soil conservation works have been carried out, journals shall be maintained indicating the details of works done from time to time along with cost. Printed plantation general supplied by PCCF should be maintained and updated every year. The old plantation general should be kept in record properly by maintaining a register of all such plantation generals at range level. The location, legal status, boundaries, configuration, aspect, slope rock, geology, soil etc should be mentioned along with details of species planted, operations carried out and expenditure incurred. Maintenance done should also be entered in plantation generals. Inspection notes/ remarks of senior officers be kept as future record.

5) NURSERY JOURNAL A nursery journal for each nursery shall be maintained wherein the details of all the nursery operations like sowing, germination, weeding, pricking etc. shall be incorporated along with cost.

6) FIRE RECORDS A record of fires should be maintained according to the standing orders in force from time to time. The damage caused by fire to the forests should be properly described and corrective measures required should be taken and documented properly.

7) RECORD OF CAPITAL EXPENDITURE A record of capital expenditure on roads, buildings and other works shall be maintained in the prescribed form and separate registers should be maintained.

8) FOREST SETTLEMENT FILES All the forest settlement files should be well preserved and kept under the safe custody of Superintendent of the division. The efforts done by Forest settlement officers in past to declare UPF in to NDPF and its record files should be kept properly.

CHAPTER-XIV

FINANCIAL FORECAST AND COST OF PLAN

13.1 Past Revenue and Expenditure: Details regarding past revenue and expenditure during previous working plan period from 1994-95 to 2009-10 and after expiry of previous plan till date i.e. up to 2015-16 in respect of Parvati Forest Division is given below:

(Table 1)

YEAR	REVENUE (Rs.)	EXPENDITURE (Rs.)				
		Normal	NMPB	FDA	CAMPA	G.Total
1994-95	578877	13045328	0	0	0	13045328
1995-96	0	0	0	0	0	0
1996-97	574419	17649307	0	0	0	17649307
1997-98	577291	20054060	0	0	0	20054060
1998-99	4829487	31744761	0	0	0	31744761
1999-2000	854115	34876539	0	0	0	34876539
2000-01	2136157	24753222	0	0	0	24753222
2001-02	0	23054230	0	0	0	23054230
2002-03	22120592	19958916	0	0	0	19958916
2003-04	118862321	26711720	0	0	0	26711720
2004-05	135390262	26589442	0	96723	0	26686165
2005-06	69105503	34032560	0	4413911	0	38446471
2006-07	4181721	38543487	0	4217067	0	42760554
2007-08	15906043	38509462	0	4099640	0	42609102
2008-09	129398326	49655966	0	18635	0	49674601
2009-10	4824157	41360129	326624	843300	0	42530053
2010-11	5397187	57238081	1244460	933300	0	59415841
2011-12	13402808	41303404	1264170	390700	12981622	55939896
2012-13	15061868	55524142	491875	0	5989733	62005750
2013-14	3877964	58005554	349900	19000	10768800	69143254
2014-15	2897894	68966989	1331472	0	12003100	82301561
2015-16	25333891	68674164	136820	0	22782600	91593584
2016-17	4021995	77115632	0	0	14766500	91882132
2017-18 (up to 1/18)	6924507	55687241	0	11221	14766500	70464962

13.2 Future Yield: The annual prescribed yield for different species in each working circle have been done and tabulated below:

(Table 2)

SPECIES	DEO/KAIL WC (M ³)	FIR WC (M ³)	TOTAL (M ³)
Deodar	3050	-	3050
Kail	3690	-	3690
Fir/Spruce	4850	6400	11250

13.3 Future Annual Estimated Revenue:

There is a complete moratorium on the green felling in the state since 1980 and there is likely hood of continuance of this moratorium in the near future also. However just for academic purpose, the future revenue is estimated on the basis of royalty rates approved for HPSFDC for the year 2016-17 is calculated as under:

(Table 3)

SPECIES	RATES/ M ³ (Rs.)	ANNUAL YIELD (IN CUM)	AMOUNT (Rs.)
Deodar	6120	3050	18666000
Kail	3218	3690	11874420
Fir/Spruce	1045	11250	11756250
Grand Total			42296670

13.3.1 Market Rate (Auction Rate) for the year 2012-13:

(Table 4)

SPECIES	RATE /M ³ (Rs.)
Deodar	38941
Kail	25255
Fir/Spruce	13125
Chil	9349
Maple	6128
Kharsu	4888
Walnut	29622

Source:- DM Kullu

13.4 Future Expenditure: The future estimated annual expenditure for the plan period is calculated on the basis of expenditure incurred for the year 2017-18. The future estimated annual expenditure for the division is given below:

(Table 5)

S.No	EXPENDITURE HEAD	EXPENDITUR E INCURRED DURING 2017-18 (Rs.)	PLAN PERIOD (15 YEARS)	TOTAL ESTIMATED EXPENDITUR E (Rs.)
1.	Establishment Charges including Travelling charges:	4,82,91,552	15	72,43,73,280
2.	Carriage of seized timber etc.	-	15	17,00,000
3.	Office Expenses	12,07,800	15	1,81,17,000
4.	Demarcation and maintenance of Boundary Pillars	-	15	15,00,000
5.	Roads and Buildings	95,43,000	15	14,31,45,000
6.	Purchase of store tools and plants	-	15	7,50,000
7.	Raising of plantations	1,30,23,200	15	19,53,48,000
8.	Fire protection	1,00,000	15	1,55,00,000
9.	Miscellaneous charges	-	15	25,50,000

	(Procurement of GPS etc)			
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13.5 Cost of Plan: There is no cost of plan as such. The task was assigned to D.F.O. (Territorial) Parvati. He has carried out all the work with the help of his field staff without any additional assistance. The only expenditure incurred for the working plan was stationery and enumeration work which was put under Wages and Office expenses head.

Detail of SOE Wise Expenditure under Working Plan, under 102-32-SOON Preservation, Cons. & Management under 13th FC9TFC (WP), Scheme.

(Table 6)

02- Wages	05-O/Exp.	30-M/Vehical	33-M/Supply	G.Total
832850	45000	84719	70400	1032969

CHAPTER -XV

SUMMARY OF PRESCRIPTION

The following is the Summary of Prescriptions: -

Heading	Prescription	Paragraph	Page
<i>Deodar/Kail Working Circle</i>			
Silvicultural system	Punjab Shelterwood System in which natural regeneration will be supplemented with artificial regeneration.	2.11	168
Rotation (Exploitable diameter conversion period)	Exploitable diameter is 60cm d.b.h and rotation has been fixed as 120 years.	2.13	169
Regeneration period	30 years	2.15	169
Division into periodic blocks	Four periodic blocks have been formed	2.16	169
Calculation of yield	Yield has been calculated by volume for P.B.I , P.B.IV and P.B. III.	2.19	172
Prescribed annual yield	The prescribed annual yield in m ³ is as under:	2.19.5	175
Species	Final yield in m ³ Inter yield in m ³		
	P.B.I P.B.IV P.B.III		
	Total		
Deodar	1500 250 200 1950		
Kail	1600 290 200 2090		
Fir/spruce	2000 350 250 2600		
Total	5100 890 650 6640		
Table of felling.	Felling programme has been laid.	2.20	175
Method of executing felling in P.B.I	General principles lay down.	2.21.1	178
Method of executing felling in P.B.III	General principles lay down with thinning prescribed.	2.21.3	178
Method of executing felling in P.B.IV	General principles lay down.	2.21.4	179
Control of yield	Control of yield for a period of 5 years and plan period to be +/- 10%.	2.22	179
Subsidiary silvicultural operations in P.B.I	Works as per general principles.	2.23	179
Artificial regeneration in P.B.I	Carried out to supplement natural regeneration.	2.24	180
Miscellaneous regulations.	Effective closure of all P.B.I areas prescribed.	2.25	181
<i>FIR WORKING CIRCLE</i>			
Silvicultural system	Punjab Shelterwood System in which natural regeneration will be supplemented with artificial	3.10	190

	regeneration.		
Rotation (Exploitable diameter conversion period)	Exploitable diameter is 60cm d.b.h. and rotation has been fixed as 120 years.	3.11	191
Regeneration period	30 years	3.13	191
Division into periodic blocks	Four periodic blocks have been formed.	3.14	191
Calculation of yield	Yield has been calculated by volume for P.B.I	3.16	194
Prescribed annual yield	The prescribed annual yield in m ³ is as under:	3.16.3	196
Species	P.B.I P.B.IV Total		
Fir/spruce	6400 0 6400		
Control of yield	Control of yield for a period of 5 years and plan period to be +/- 10%.	3.16.5	196
Felling programme.	Felling programme has been laid.	3.17	196
Method of executing felling.	General principles lay down.	3.18	197
Subsidiary silvicultural operations in P.B.I	Works as per general principles.	3.20	198
Planting programme and artificial re-generation	Carried out to supplement natural regeneration.	3.21.1	199
Statement showing areas requiring immediate attention.	List of areas to be treated.	3.21.2	200
Miscellaneous regulations.	Effective closure of all P.B.I areas prescribed.	3.22	202
PROTECTION WORKING CIRCLE			
Method of treatment	Defined	4.9	209
Grazing	Defined	4.10	209
Fire protection	Defined	4.11	209
Miscellaneous regulations	Closures suggested for carrying out sowing/planting in degraded areas.	4.12	209
BROAD-LEAVED (OVER LAPPING) WORKING CIRCLE			
Silvicultural system	No system needed	5.7	216
Choice of species	Restocking with valuable B.L.	5.8	216
Treatment of area	Planting of broadleaved trees in suitable area suggested	5.9	216
GRAZING AND IMPROVEMENT WORKING CIRCLE			
Method of treatment	Treatment of alpine pastures suggested	6.6	221
Afforestation and rehabilitation of III rd class areas	Afforestation of degraded III rd class forests suggested	6.7	222
Prescription for new DPFs	Extent of area and species	6.8	223
PLANTATION (OVERLAPPING) WORKING CIRCLE			
Special object of	Defined	8.4	252

management			
Nurseries	Location, soil mixture, toll planting etc.	8.8	254
Tall Plants	SOP for raising tall plants	8.8.1	256
Choice of species	Zone-wise list	8.10	270
Maintenance	Maintenance and aftercare	8.13	271
MISCELLANEOUS REGULATIONS			
Petty fellings	Petty fellings have been defined	11.1	285
Deviation	Deviation defined and regulation made regarding the same.	11.2	285
Roads/ bridle paths/ contour paths and inspection paths.	Maintenance suggested	11.3.1& 11.3.2	285
Buildings	Suggestion added.	11.3.3	286
Demarcation and survey	Checking of boundaries of the demarcated forests with the help of their maps and preparation of boundary registers has been prescribed. Survey and demarcation of undemarcated forests has been suggested.	11.4	286
Forest boundaries	A quinquennial programme for checking of forest boundaries has been prescribed.	11.5	286
Miscellaneous i.e. Research and Sample plots, Seed stands, Monumental trees, Temple groves, Fire protection	Listing up of genetically superior trees suggested. Preservation and listing required. No fellings to be allowed from here. Fire lines, fire watchers employment, etc.	11.9	287
Eco-Tourism	Potential Sites suggested	11.11	289
CONTROL AND RECORDS			
Compartment history files	Proper maintenance and updating prescribed.	12.1	291
Control forms	Maintenance of control forms for fellings, subsidiary operations and regeneration works suggested.	12.2	291
Plantation, nursery and soil conservation journal.	To be maintained	12.3	291

Aishwarya Raj, IFS
WPO- cum-DCF Parvati

Anil Sharma, IFS
Conservator of Forests Kullu

Dr.Richa Verma, IAS
Deputy Commissioner, Kullu

H.V. Kathuria, IFS
CCF (WP&S) H.P. Mandi

Dr. Savita, IFS
Pr. CCF (HoFF) HP Shimla.