

HIMACHAL PRADESH FOREST DEPARTMENT



WORKING PLAN

for

SOLAN FOREST DIVISION

for the period

2025-26 to 2034-35

SUBMITTED BY

H.K. GUPTA , HPFS

DFO – cum – WPO

SOLAN FOREST DIVISION

Message

Working plans are essential for scientific management of forests. Forests being a resource that is often exploited not only for inputs to the industry but also for providing livelihoods to the vulnerable and excluded populations residing in lakhs of forest fringe villages across India. Himachal Pradesh, a hilly state situated in the northern part of our country, is bestowed upon with natural resources that are not only important for the state but also provide security to the overall environment of North India. I am confident that this working plan shall carry forward the tradition of efficient forest management and help in increasing the productivity of forests of the Solan Forest Division significantly. I congratulate the Divisional Forest Officer of Solan Forest Division and his team who have worked very hard to prepare this Working Plan.

**Sanjay Sood, IFS
PCCF (HoFF)**

Date:

Place:

Foreword

Forestry as a science originated in Europe during the latter eighteenth and early nineteenth centuries, largely in response to the poor condition of Europe's remaining forests and an impending wood famine. Intensive forestry had its beginnings in Germany during the mid-1800s, and India too delved deep in Scientific Management of Forests which is essential to ensure conservation and sustainable utilization of forest resources. For any management a plan is needed and preparation of a focused working plan is the first and the most important step in this direction.

Working Plans not only reflect the way the future of the forests will be shaped, but also the creativity and innovation on the part of the Working Plan Officer, who plays an important role in preparing the plan. It also reflects upon the sincerity of team at his disposal (ACFs, Range Forest Officers, Dy. Rangers and Beat Guards, etc.). A well-prepared plan provides a strong pathway of the forest management for at least 10 years and indeed paves the way for next decade or so, in ideal conditions.

DFO Solan and his team has devotedly prepared this plan, well corroborated by volume of data collected which might have resulted by extensive field visits, socio-economic survey of households in the forest fringe villages, and many other related tasks in addition to their normal duties, speak of dedication and determination.

The Working Plan prepared for the Solan Forest Division seeks to provide a roadmap that aims at increasing the productivity of the forests of the division, addressing the new paradigms of forests and environment and, the most important of all, linking forests to the society, particularly that of the poor and socially excluded population of forest villages. The plan, prepared as per the guidelines of the Working Plan Code 2014, is focused, precise and addresses all the pressing issues of the forestry sector ranging from utilization to carbon sequestration, relevant to area in question.

Congratulations to DFO, Solan and his team for working tirelessly to achieve the aims and objectives of this mammoth exercise, hanging fire for more than a decade, and that too in a time bound manner.

**Upasna Patial, IFS
APCCF Working Plan**

Date:
Place:

Preface

The present working plan is a revision of the Working Plan prepared by Ms. Archana Sharma for the period 2002-03 to 2016-17 and further extended up to 2018-2024. Based on the National Working Plan Code 2014, it is spread across two sections containing 31 chapters and introduction. While Part I speaks mostly about the forests of the Solan Forest Division, Part II focuses on the future management for the next ten years in the form of working circles and other important chapters that help in implementing the vision of the code. There are 12 chapters in part I and 19 in part II of the plan.

The forests of the division are clearly described in with detailed assessment of forest and tree cover along with areas under the different non-overlapping Working Circles. The biodiversity of the division with important biodiversity indices like Shannon-Weiner and Simpson's are covered along with Importance Value Indices of trees, shrubs and herbs. The plan also focuses on the health of the forests of the division with details of occurrences of forest fires and area affected. It also gives the presence of fire lines that have been made to prevent the incidents of forest fires in the forests and those that are proposed to be constructed. The effect on Natural Calamities on the forest wealth of the division is also detailed. Other important activities and aspects like grazing, invasion of weeds (especially Lantana), lopping, insect and pests are also covered. A detailed analysis of the drivers of forest degradation has been included.

Soil and water resources are the backbone of forest health. Soil and water conservation works carried out in the division are described in with a couple of success stories. A complete listing of rivers, streams and springs is also provided. An assessment of the productivity of the forest resource of Solan Forest Division and an estimation of carbon stocks in the forests of the division has been done, primarily to provide a baseline to assess the carbon increments in future. Total growing stock of major species found in the area has been included.

Scientific management of forests require and optimum use of forest resources to ensure sustainability. Distribution of timber to right holders, trees distributed under free grant, salvage markings, removals sanctioned under FCA and FRA, fuel-wood extraction, dependency of fringe villages on forests and presence of wood-based industry in the division are given in detail. The social, economic, cultural and spiritual benefits, Joint Forest Management, indigenous knowledge, welfare of labour employed in forests, species of social importance (cultural, religious), sacred groves, eco-tourism activities, etc are an essential part of this plan.

The policy and legal issues are covered comprehensively. A background of the existing policies and compliance with their statutes, the place of the forestry sector in the Constitution of India and all existing and updated laws and rules pertaining to the forests of Himachal Pradesh are covered. Forest offences are also covered vividly in this chapter along with mention of plan and non-plan allotment and expenditure. The work done during the last five years and that aimed at during the next five years is given in detailed tables. A historical account of the management of the forests of Solan Forest Division in the past has been included along with a vivid account of the working plans prepared since 1906 and all the working circles that formed a part of the previous working plans. Revenue and expenditure figures have been provided from 2002-03 to 2024-25. The last chapter of Part I details the statistics of growth and yield used for estimation of yield, primarily of Chil, for which felling programme has been given.

Part II of the Working Plan contains chapters that address the future management of the forests of the division. It comprises 19 chapters. Starting with details the basis on which the proposals have been made, the National Forest Policy 1988 and various forest policies of the state, the rationale behind the proposed management strategies is also detailed along with the constitution of the Working Circles and range-wise distribution of the area under the different working circles. The next 12 chapters are devoted to each of the 12 working circles constituted. The Working Circle are of two types, namely overlapping and non-overlapping. All the prescriptions and proposals are well-defined in these chapters.

With budget being an important requirement to carry on the prescriptions, the financial forecast for the plan component and routine works have been included. The miscellaneous regulations regarding issues like petty felling, deviation, grazing, lopping, paths, roads, buildings (along with construction programme), settlements, creation of new RF and PF, details of mother trees, Land Preservation Acts, amendments, etc. are given in detail. Forestry, being a scientific subject, a chapter on Science and Research gives an insight into the scientific aspects of forest management, projects carried out in the division by organizations like UHF, Nauni and HFRI, Shimla. The chapter also provides details of the scientific way forward proposed in the division like biodiversity assessment, regeneration, increments, etc. through establishment of permanent, temporary and linear increment plots.

All the important prescriptions have been summarized for different working circles and presented as an index for quick reference.. Trees outside forests present in the division along with the results of the studies carried out by Forest Survey of India form a part of last part of the plan while detailing steps the division proposes to augment the Trees outside forest areas. Although not a part of the Working Plan Code 2014, control forms and formats for regular monitoring of the implementation of the activities outlined in the Working Plan are included to enable efficient monitoring, evaluation and mid-course correction in the processes essential for carrying out the prescriptions of the plan. A chapter on Climate Change has also been included and forms the last chapter of the working plan. Apart from the issue of climate change, it also mentions in brief, the status of important climatic parameters with regard to Solan.

DFO, Solan

Acknowledgements

The preparation of this Working Plan demanded sustained dedication, coordination, and technical expertise from the entire team of the Solan Forest Division. It reflects not only the collective efforts of all officers and staff involved but also the deep trust and constant support extended by the senior authorities of the Himachal Pradesh Forest Department.

I express my sincere gratitude to Shri Sanjay Sood, IFS, PCCF (HoFF), Himachal Pradesh Forest Department, for his invaluable guidance, vision, and encouragement throughout the process. His continuous support served as a source of inspiration for the entire team in achieving this important milestone.

I am equally thankful to Mrs. Upasana Patial, IFS, APCCF (Working Plan), whose insightful suggestions and constant supervision helped refine the technical aspects of the plan. Her commitment to precision and scientific accuracy has been instrumental in shaping the document to its final form.

My heartfelt thanks also go to Shri Narendra Prakash Bhrot, CF, Solan, for his able leadership, motivation, and timely assistance in coordinating the various field activities essential for the compilation of this plan.

A special mention to Mrs. Chandrika Sharma, HPFS, ACF, Solan, for her perseverance, and meticulous attention to details. Her contribution towards data compilation, analysis, and drafting has been invaluable.

I also acknowledge with deep appreciation the wholehearted cooperation of all Range Forest Officers of the six ranges under Solan Forest Division, whose dedicated efforts and accurate field inputs formed the foundation of this document.

This Working Plan is, therefore, a true reflection of teamwork, professional commitment, and the shared vision of Sustainable Forest Management in the Solan Forest Division.

H.K. Gupta
DFO-cum-WPO Solan

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Executive Summary

Solan Forest Division is situated in Solan, Himachal Pradesh, in the Northern part of India. The climate is generally pleasant with occasional incidents of warm days during the summers. The division has a fertile soil that supports diverse vegetation with minimal monocultures. Eco-tourism opportunities are high. The Current Working Plan of the Solan Forest Division is revision of the Working Plan prepared by Ms. Archana Sharma for the period 2002-03 to 2016-17. Following the Working Plan Code, the plan is written in two volumes. Volume I contains 31 chapters in two parts, namely, Summary of Facts on which Proposals are Made constituting Part I and Future Management constituting part II. Part I contains 12 chapters and part II contains 19 Chapters.

The vision of the plan is to increase the productivity of forests of the division through scientific management and fulfill the requirements of the current paradigms of carbon and REDD Plus. The plan envisages protecting and conserving the forests of the division while increasing their productivity. Forest Protection, especially from fire encroachments and invasive weeds is another area where the plan focuses. The other aspects targeted are to contribute to the livelihoods of forest based villages and reduction soil erosion.

The division comprises six ranges, namely, Chail, Solan, Kandaghat, Subathu, Dharampur and Parwanoo. There are 17 blocks, 63 beats and 456 compartments in the division and it spans an area of 13151.268 ha out of which 148.4 ha comes under the Shilly Conservation reserve. Reserve forest constitutes 4454.368 ha. 8397.5 ha comes under demarcated protected forest while 151 ha under Un-demarcated protected forest. Forests of the division range from dry scrub and bamboo in the lower regions to Chir Pine, Ban Oak and Deodar in higher reaches. The division has three main forest types, namely Tropical Dry Deciduous, Tropical Pine and Himalayan Moist Temperate Forests. There are four non-overlapping working circles, namely, Chil, Ban Oak, Deodar and Protection-cum-Rehabilitation with 4602.6 ha, 111.068 ha, 1874.2 ha and 6415 ha area under them respectively. Protection from fire has been included in the PCR working circle. Other than these, there are seven overlapping working circles. Climatically, smooth series show that the precipitation has shown a slightly upward trend from 2013 to 2024. Temperature has also shown a minutely increasing trend while number of rainy days show a declining trend during the same period.

An analysis of Land Use Land-use Change (LULC) map indicates that the forest area has increased by 34.13 km² (from 274.11 to 308.24 km²) while agriculture land has expanded by 3.01 km². Thus, the intensification has come from other land-uses over a period of time. The threat (in form of forest degradation) to the forests of the division primarily from mild drought, soil erosion, fire, logging, grazing, resin tapping, insect pests, climbers, fungi attacks on primary species (Chil, Ban Oak, other broad – leaved species and Bamboo). The overall Shannon-Weiner Index for biodiversity is 1.44 for trees, 2.84 for herbs and 2.93 for shrubs.

Among fauna, the Himalayan Black Bear and Leopard are categorized under the vulnerable category while the Goral is near threatened. In flora, the Himalayan Maple is under the critically endangered category. There have been very few sightings of Leopard and Asiatic black bear in the division.

There have been incidences of fires, from as low as 3 in 2023 to as high as 84 in 2019-20. However, the fires have been largely ground fires. The total area affected by the fires in the forests of the Solan Forest Division ranges from 41.5 ha in 2023-24 to 2099.7 in 2024-25. Other natural calamities in the division have been landslides and heavy rainfall sometimes accompanied with flash floods. Lantana is another major cause of forest degradation. The efforts taken to eradicate lantana have resulted in eradication of lantana in total area of 1658.7 ha from 2015-16 to 2024-25. The remaining area to be freed from lantana is proposed in the present working plan. The major drivers of forest degradation are invasive weeds and encroachments, the latter being present in small scales and efforts to get rid of encroachments are underway.

195 check dams have been constructed in the division with maximum in Parwanoo (57) and minimum in Kandaghat and Solan (23 each). There have been success stories in this area as well, like *Jal Bhandaran* (Catch the Rain) programme and Rejuvenation of Dochi and Gussain springs. There are 180 springs identified in the division so far.

The forests are rich in terms of growing stock of trees with 546360.5 cum in Chil, 135922.1 cum in Ban Oak, 38880.3 cum in Deodar and 152274.6 cum in other broad leaved tree species across all diameter classes from 10 cm onwards. The estimated number of trees in all the diameter classes (10 cm onwards) is 1894304 for Chil, 764130 for Ban Oak, 75128 for Deodar and 740510 for other broad leaved tree species. Total estimated Carbon stock of major tree species present in the division is 236.79 thousand tonnes in Chil, 57.178 thousand tonnes in Ban Oak, 16.27 thousand tonnes in Deodar and 64 thousand tonnes in other broad leaved tree species. The distribution of trees to right holders for free grant for the purpose of marriage and religious rituals was stopped from 2012 onwards. However, trees are given for cremation purpose. From 2102-13 to 2024-25, 1706 trees were provided for cremation. Removals under salvage markings is a regular feature of forest management and in 2024-25, 3744.9914 cum have been removed. The trees removed comprise Chil, Khair, Kail, Broad-leaved and Deodar.

The villages around the forests of the division are dependent upon the forests of the division for forest products like small timber, fuel-wood, leaf fodder, grasses, NTFP and fodder carried away for stall feeding. Dependency for small timber is to the extent of 232.4 tonnes, for fuel-wood 742 tonnes, for leaf fodder 85.4 tonnes, for grasses 85.7 tonnes, for NTFP 4.9 tonnes and for fodder for stall feeding of cattle 207.2 tonnes.

There are 107 registered saw mills in the division and 20 depots for sale of imported timber. 21 private sale depots and 46 furniture shops are registered. A total of 29 permits for grazing have

been issued in the past with no new permit being issued. Resin is an important NTFP of the division with 21000 to 54000 blazes tapped from 2012 to 2023.

27 Joint Forest Management committees exist but only 6 are active with the rest being inactive due to budgetary concerns. The Present Working Plan seeks to make the remaining active and operational by identifying and involving them in entry point activities. The division hosts quite a number of plants that bear religious, aesthetic, or culinary importance.

During COVID the existing eco-tourism sites were shut down. This Working Plan proposed to restart them along with new ones raising the total number of eco-tourism sites to 13. Developmental activities under Forest Rights Act have been carried out mainly for creating link roads, mobile services, Water supply, community buildings, electricity towers, storage tanks, etc.

Illicit felling cases have been detected in the division with a total of 124 cases from 2012-13 to 2023-24, maximum 30 in 2014-15 and none in 2019-20 and 2020-21. There were 756 detected cases of lopping and 60 cases of grazing in the same time span.

Constitution of Working Circles and formulating prescriptions for their management is an important exercise. In the Preliminary Working Plan Report, 9 working circles were approved. Apart from these, two more have been added as they were left due to oversight. The Deodar Working Circle is constituted due to addition of Chail range and the PCR working circle with forest protection/fire protection working circle given in the PCR working circle.

The Chil Working Circle covers an area of 4602.6 ha out of which 1546.2 lies in Reserved Forest and 3056.4 in Demarcated Protected Forest. 34,50 ha is culturable blank and 8.95 ha unculturable blank. Four Periodic Blocks have been created with a PB Inter periodic block. Total standing volume per ha is 98.09 m^3 . The total area under PB-I is 1697.4 ha and in PB IV it is 844.2 ha. 2061 ha comes under PB Inter. The stocking percentage is 87.77. The total prescribed yield works out to 5400 m^3 (50% of total sustainable yield of 10872.041 m^3). Yield of 3200 m^3 is being prescribed with the remaining being available for compensating the salvage removals. The other details are given in chapter 2 of part 2 on Chil Working Circle.

The Deodar Working Circle covers an area of 111.068 ha and is mainly present in the newly added Chail range. A minor area measuring 2.4 ha is in Kandaghat range. The Deodar forests are well-stocked and the density varies from 0.4 to 0.8, average being 0.6 for the whole working circle. The forests under this working circle shall be managed by the Group Selection System. No felling is prescribed. Subsidiary silvicultural operations, namely, slash disposal, planting operation, weeding and cleaning & climber cutting shall take place.

The Ban Oak working circle covers an area of 1874.2 ha with 617.2 in reserved forest and 1257 in demarcated protected forests. Most of the areas have moderate to good density and ocular estimation indicates the density lies between 0.4 and 0.8 with the Chil and deodar patches also being well-stocked. Few forests do have poor density due to biotic pressures. No exploitation is

being prescribed with the forests being managed under the system of planting and improvement fellings under which only dead, dying, uprooted and fallen trees shall be removed only to meet the demands of the local right holders. Silvicultural works like singling pruning, coppicing and climber cutting shall be done according to the plan given in the chapter on the ban oak working circle.

The objective of the Protection cum Rehabilitation working circle is managing all the reserve, demarcated, un-demarcated protected forests if the division with an aim to check the deterioration of forests, improve ecology and growing stock. The total area under this working circle is 6415 ha with 2237.5 under RF, 4026.5ha under DPF and 1514 ha under UPF. 12 forests have shifted from Chil to PCR working circle. 52 ha is Culturable blank while 163.6 is unculturable blank. Total standing volume of the working circle is 255547.39 m³ and standing volume per ha is 39.83 m³. Removals will be done only to meet the demand of right holders. The main species covered are Ban Oak, Chil, deodar, Bamboo, Khair, Eucalyptus, and other Broad Leaved species. Resin tapping is banned in the forests under this working circle for the plan period under this working plan. Protection from forest fires shall also be done with a focus on fire prone areas. The fire vulnerability map shall form the basis of such decisions. Illicit felling is generally less, however, measures to check even few cases shall be taken up on priority with focus on forests and compartments identified as prone to illicit felling. Steps have already been taken to free the forest land from encroachment and details of cases are given in the chapter on the working circle.

Plantations have been planned on culturable blank areas in different working circles. IN addition to this, the areas and / or gaps produced due to salvage removals and other fellings shall also be taken up, including the gaps created in the current working plan period. This shall help in keeping the forest well stocked. There are 9 nurseries in the division that provide quality planting stock. Species for different altitudes and aspects have been identified and given in the concerned chapter. 320 ha of plantations have been proposed.

The Bamboo working circle is limited to Parwanoo and Dharampur (lower areas of the division) and bamboos are found either in pure or mixed patches with miscellaneous broad leaved species. Net area under bamboos is 1015.36 ha with 751.36 ha in Parwanoo and 264 ha in Dharampur range. Detailed bamboo felling programme is given in the chapter on Bamboo Working Circle. Bamboo plantations have also been proposed in 977.92 ha across both the ranges. The planting stock is proposed from a nursery raising plan with 2 nurseries in Parwanoo 1 in Dharampur. Subsidiary silvicultural operations like cleaning, sowing and planting, weeding and closure are proposed to be carried out in accordance with the proposals made. Proposal is also made for the gregarious flowering of bamboo and treatment of the flowered area.

A working circle for Non Timber Forest Products, an important constituent of forests, is constituted to ensure sustainable management and extraction of NTFPs from the forest areas of Solan Forest Division. The most important ones are resin and bamboo. Major NTFPs of the

division have been compiled. Major species that give NTFPs have been addressed in the plantation programmes. Being an overlapping circle, mention of species is present in the concerned working circles.

Soil supports plants. A separate working circle has been created for soil and water conservation. The synergy among the farmers and field staff of the department has been stressed upon. Project-based catchment treatment plans, sustainability of treatment measures adopted, comprehensive watershed development and maintenance through integrated sectoral approach, are some of the measures suggested. There are eight sub-watersheds in the division serving an area of 15125 ha with 2645 ha treatable. Proposed works include construction of check dams, staggered trenches with details regarding the ten-year plan of their construction. The proposed construction shall take into account the altitude and place the check dams in such a way so as to reduce the run-off from steep slopes. Monitoring and evaluation plan of the soil conservation works has been included in the working circle and includes creating silt observation posts, ascertaining flow of benefit to stakeholders, creating and utilizing irrigation potential, protection, cost-benefit analysis.

The division has a high potential of ecotourism. The ecotourism sites were closed during COVID 19 pandemic. 13 sites (including the closed ones) have been proposed. Upon approval, the sites shall worked out in accordance with the ecotourism policy of India. In order to ensure sustainability, measures have been suggested that include formation of committees to look after the processes, preparation of ecotourism plan, regulation of tourists, season and period of activities, waste management, capacity building of communities, encouraging local cuisines, focus on educational and economic benefits, etc.

Joint Management involves peoples' participation in forest management. In order to reap the success of JFM the plan proposes educating people, removing budgetary constraints and involving JFM committees in entry point activities. Sustainable conservation measures to be achieved by integrating community knowledge into forest management.

The wildlife management addresses the problems of leopards, monkeys and wild boars. No case of compensation is pending. Prescriptions are proposed for management of micro-habitats & macro-habitats, linking wildlife to conservation tourism, protection of roosting and nesting sites, inoculation of domestic cattle, trainings, periodic census, creation of waterholes and their protection and rehabilitation, prevention of damage to agriculture by wild animals.

The scientific management of forests should include science and research. Procedures have been provided to lay down various kinds of research plots (inventory plots, linear increment plots, plots to study carbon sequestration, preservation plots – temporary and permanent). Few research findings as an output of the research carried out by various institutions like UHF, Nauni and ICFRE-HFRI, Shimla have been included.

Trees outside forests augment the forest resource, especially for livelihoods and environmental protection. The division has a wide spectrum of trees outside forests which have been given range-wise along with average diameters. These trees are not planted by the department but are an initiative of the communities or other departments.

Although not in the Working Plan code, a chapter has been included for monitoring and evaluation of the plan prescriptions. Control forms and formats to assess silvicultural operations, grazing, forest fire control, NTFP harvesting, status of boundary pillars eradication of weeds and lantana, soil and water conservation, fuel-wood removals, bamboo harvesting. If need arises, formats and control forms can be devised according to the parameter needing monitoring. A chapter on Climate Change is also included in Part II of Volume I.

I Introduction

This Working Plan is a revision of the working plan prepared by Ms. Archana Sharma for the Solan Forest Division from the period 2002-03 to 2016-17. The Division is located in the Northern State of Himachal Pradesh. This plan covers the period from 2025-26 to 2034-35.

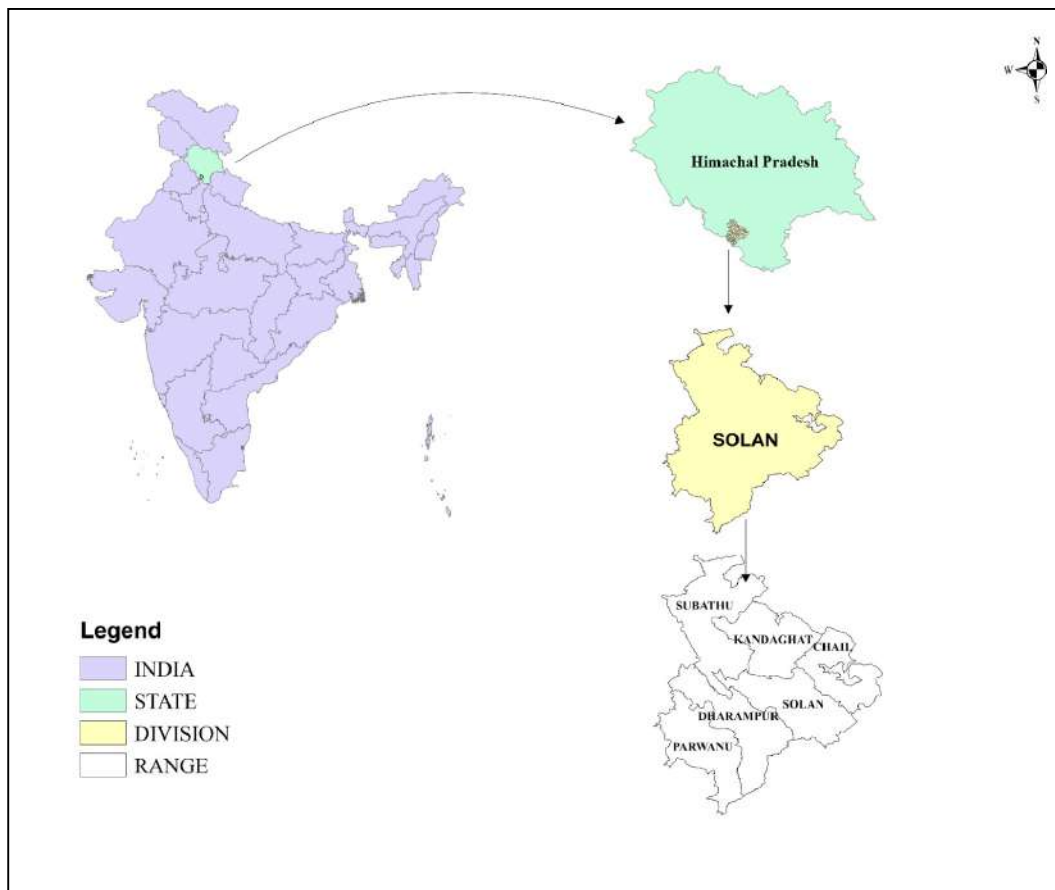


Fig. 1: Location of the Solan Forest Division

a) Vision Statement

The vision of the working plan is to provide a major fillip to the scientific management of the forests of Solan Forest Division keeping in mind the current expectations from the forestry sector especially in light of conservation, REDD+, increments in carbon stocks, scientific baselines and support to research and development of the sector.

b) Goals and Objectives of Management

The overarching goal of the management of the forests of the division is to ensure conservation and sustainable management of the forests of the Solan Forest Division which is envisaged to be achieved through the following objectives:

- i. Identifying the social and cultural value of the forests of the Solan Forest Division
- ii. Estimating the biodiversity present in the Division
- iii. Preparing the Working circles of the Division
- iv. Estimating the dependency of the forest and forest fringe villages on the forests of the Division
- v. To support scientific research through establishing and preserving permanent sample plots
- vi. To contribute to increase in forest productivity through scientifically robust prescriptions

c) SWOT analysis for prescription of strategies for achieving goals and objectives

The Solan Forest Division has its strengths and opportunities; however, they are not bereft of certain Weaknesses and Threats. Strategizing the prescriptions involves a careful and well-debated analysis of these components, clubbed together as SWOT (Strengths, Weaknesses, Opportunities and Threats). A detailed SWOT analysis is essential to identify beforehand the areas that require focus and adequate attention to take early action to mitigate the threats the forests face.

An analysis of the strengths, weaknesses, opportunities and threats is presented below:

Strengths No monoculture Rare human wildlife conflict High soil fertility Eco-tourism	Weaknesses Low community participation in forest protection Low participation of industries in raw material procurement (resin and pine leaf litter)
Threats Threats to the forests of the division emanate mainly from four causes, namely, natural (climate change, drought, frost, wind, soil erosion, snow), Manmade (fires, grazing, lopping, encroachment, resin, diversion of forest land for non-forestry purposes); Animals and insects (insects, fungi, insect pests and diseases)	Opportunities Eco-tourism as an alternate to adjoining Shimla. Provisioning of raw material to industries, mainly pine leaf litter for briquettes

d) Expected outcomes

The expected outcomes arising out of the prescriptions given in the working plans are summarized below:

- (i) Protection and preservation of forests of the Solan Forest Division
- (ii) Increase in the productivity of the Division's forests
- (iii) Reduction of forest fires
- (iv) Contribution of forests in the livelihoods of forest-based population
- (v) Sustainable utilization of the forest resources of the Division
- (vi) Reduction in human-wildlife conflict
- (vii) Reduction in soil erosion
- (viii) Increasing the contribution of forests in green GDP

e) Abstract of plan prescriptions

Chapter No.	Para No./ Sub Para no.	Prescribed Activity	Remarks
A	B	C	D
2	2.9.2 / 1)	Felling of mother trees, cleaning and tinning operations in Chil Working Circle	Of part 2 of Volume 1
2	2.9.5	Control of yield in Chil working circle	Of part 2 of Volume 1
2	2.12	Subsidiary Silvicultural Operations in Chil Working Circle	Of part 2 of Volume 1
2	2.13	Artificial Regeneration in Chil Working Circle	Of part 2 of Volume 1
2	2.14	Other regulations in Chil Working Circle	Of part 2 of Volume 1
3	3.6	Silvicultural System of Deodar Working Circle	Of part 2 of Volume 1
3	3.6.8	Subsidiary Silvicultural Operations in Deodar Working Circle	Of part 2 of Volume 1
4	4.8	Silvicultural system of Ban Oak Working Circle	Of part 2 of Volume 1
4	4.13	Subsidiary Silvicultural Operations in Ban Oak Working Circle	Of part 2 of Volume 1
4	4.14	Nursery techniques for Ban Oak Working Circle	Of part 2 of Volume 1
4	4.15	Artificial Propagation in Ban Oak Working Circle	Of part 2 of Volume 1
5	5.7	Silvicultural system of PCR working Circle	Of part 2 of Volume 1
5	5.11	Subsidiary Silvicultural Operations in PCR Working Circle	Of part 2 of Volume 1
5	5.12	Protection from Forest	Of part 2 of Volume 1
5	5.17	Lantana Eradication	Of part 2 of Volume 1
5	5.18	Silvicultural Works	Of part 2 of Volume 1
5	5.19	Fire protection in plantations	Of part 2 of Volume 1
6	6.8	Planting Techniques	Of part 2 of Volume 1

7	7.11	Bamboo removal plan	Of part 2 of Volume 1
7	7.13	Bamboo replanting	Of part 2 of Volume 1
7	7.14	Subsidiary Silvicultural Operations in Bamboo working circle	Of part 2 of Volume 1
9	9.14	Soil Conservation works	Of part 2 of Volume 1
12	12.7	Conservation and Management of Wildlife	Of part 2 of Volume 1

f) Works prescribed during the plan period

Chapter No.	Para No./Sub Para no.	Prescribed Activity	Year-wise (Year 1 – 10) distribution of physical target
A	B	C	D

Yearly details are given in the Part 2 of the Volume 1 in each of the chapter on Working Circles where prescriptions are required.

II Glossary of Terms

Local Terms	Meaning
Abadi	A village habitation.
Ara-ul-dast	A kind of official letter.
Balli	A round pole having a diameter of 10 to 30 cm. at butt end
Bartan	Rights of users.
Bartandar	An individual who enjoys rights in forest.
Baoli	A small water spring.
BanjarKadim	Waste land
BanjarJadid	A field lying fallow for more than four years.
Chak	Included cultivation.
Chhanda	The river island beyond the boom where the timber gets stranded
Chaukidar	Watchman
Coolie	Labourer
Charand	Grazing land
Chhang	Lopping
Chauki	An out post generally the residence of Forest Guard
Chhatan	Thinning.
Dhar	A ridge or saur
Dandasa	Bark of walnut root
Darbar	The Court of the Ruler
Dastur-Ul-Amal rates	Rates for the sale of various forest produce
Devta	A local deity.
Dochi or Dogri	Temporary filed residence.
Darat	Sickle used for lopping purposes
Dehat	Village
Dhulan	Manual carriage
Dhulanee	Labour used for Dhulan
Dimdima	An odd size of wood roughly axed
Faissla-e-Janglat	A forest settlement report
Gaddies	The professional shepherds belonging to Chamba, Kangra and Kinnaur
Godam	Ration godown
Ghall	Timber floating in stream or river
Ghallu	Labour engaged on floating of timber.
Ghasni	Grass land.
Gharat	Water flour mill
Ghat	A saddle in a hill
Gairmumkin	Land under building roads or streams
Gorkhalabour	Labour from Nepal.
Gujjar	A professional nomadic buffalo grazier

Gar Morusi	Non-hereditary right.
Hakries	Small triangular pieces of wood
Had bast Number	Serial number allotted to a village at the time of Revenue Settlement
Hooka	Smoking pipe
Ilaqua	Locality
Ijlas-ul-khas	Special court in PEPSU State
Jamabandi	Record of land maintained by Revenue Department
Jagirdar	Owner of Estate or grant
Jagir	An Estate or grant
Jugthi/Jugni	Torch wood
Jungle Mehfuza	Reserved forest
Jungle Mehdooda	Demarcated protected forest
Kanaits	Rajputs
Kanungo	A revenue official immediately above Patwari
Kiar	An axed squared scant
Khad	A small stream
Khala	Water course
Kiar	Irrigated field in which generally paddy is grown
Khudd	A small stream
Khasra	A field number given in village revenue record
Kiar	Irrigated field in which generally paddy is grown
Kilta	A conical basket for carrying farm-yard-manure, fruits, etc.
Kokat	Miscellaneous inferior tree species
Karam	A linear measurement unit equal to 146.05 cm
Kuhl	A water channel
Katha	A tannin extracted from heartwood of Khair trees
Lala	Shop keeper
Mali	Gardener
Mandi	Market
Morusi	Hereditary right
Mahkma Janglat	Forest Department
Makbooja	In possession
Misal Haqaiyat	Revenue document also containing information regarding custom rights and concessions
Mali	Gardener
Musherqua	Forest shared with people
Muslajir	Lease holder
Mauza	A unit of Revenue administration
Mazdoor	A labourer
Mistri	Head sawyer
Mohal	Revenue estate
Mela	Local fair
Moawza	Compensation

Manu	Current year's shoot of Bamboo
Nala, Nullah	Water Source
Naquabil	Land not fit for cultivation
Nadi	A stream
Nautor	Land granted for fresh cultivation
Nazrana	A fee leviable on the fresh breaking up of land
Panchayat	A village council
Patti	A section of village
Patwar	A group of village forming a Patwar Circle
Patwari	A revenue official at village level, incharge of patwar
Parao	Halting stage
Rakha	Keeper or Watchman
Rawana	Permit for exporting forest produce
Sahukar	Money lender
Shimla Mirch	Capsicum
Shamlat	Village common land
Smudha	A category of timber for sale purpose which includes all grades of timber
Sehada	Tri junction pillar of three Maujas
Tehsil	A Sub Division of District
Taraf	A sub division of a village
Tal	Lake / Pond
Thach	Grassy blank
Tikka	A village / hamlet
Tora	Raised edge of a cultivated field
Tibba	Hillock
Wajib-ul-arz	Regulations regarding land rights etc.
Zamindar	Owner of land assessed to land revenue
Zamindari	Land assessed to land revenue of which owner is the sole proprietor

III List of Flora

Trees

S.No	Botanical Name	Local Name	Family
1	<i>Acacia catechu</i>	Khair	Leguminosae
2	<i>Acer oblongum</i>	Parang	Sapindaceae
3	<i>Aegle marmelos</i>	Bel	Rutaceae
4	<i>Aesculus indica</i>	Khanor	Hippocastanaceae
5	<i>Albizzia chinensis</i>	Siris	Leguminosae
6	<i>Albizzia lebbek</i>	Siris	Leguminosae
7	<i>Albizzia doratissima</i>	Kala Siris	Leguminosae
8	<i>Albizzia procera</i>	SafedSiris	Leguminosae
9	<i>Anogeissus latifolia</i>	Chhal, Dhau, Bakli	Combretaceae
10	<i>Azadirachta indica</i>	Neem	Meliaceae
11	<i>Bauhinia purpurea</i>	Lalkaral	Leguminosae
12	<i>Bauhinia racemosa</i>	Karal	Leguminosae
13	<i>Bauhinia variegata</i>	Kachnar, Papri	Leguminosae
14	<i>Boehmeria rugulosa</i>	Shingar, Genthi	Urticaceae
15	<i>Bombax ceiba</i>	Semal	Malvaceae
16	<i>Buteamono sperma</i>	Dhak, Palah	Leguminosae
17	<i>Campsis grandiflora</i>	Delaun	Bignoniaceae
18	<i>Casearia elliptica</i>	Gouu, Chilla	Samydaceae
19	<i>Cassia fistula</i>	Amaltas	Leguminosae
20	<i>Cedrela serrata</i>	Dauri	Meliaceae
21	<i>Cedrela toona</i>	Toon	Meliaceae
22	<i>Cedrus deodara</i>	Deodar	Pinaceae
23	<i>Celtisa australis</i>	Khirik	Urticaceae
24	<i>Cordia dichotoma</i>	Lasura	Boraginaceae
25	<i>Cornus capitata</i>	Thumbi	Cornaceae
26	<i>Cupress ustorulosa</i>	Saru	Coniferae
27	<i>Dalbergia sissoo</i>	Shisham	Leguminosae
28	<i>Dendrocalamus strictus</i>	Bans	Graminae
29	<i>Ehretia laevis</i>	Chamror	Boraginaceae
30	<i>Ehretia serrata</i>	Pandayan	Boraginaceae
31	<i>Elaeodendron glaucum</i>	Morindu, Mirgu	Celastraceae
32	<i>Emblica officinalis</i>	Amla	Leguminosae
33	<i>Engelhardtia colebrookiana</i>	Samma	Juglandaceae
34	<i>Erythrina suberosa</i>	Dhaul, Padiara	Leguminosae
35	<i>Eucalyptus globulus</i>	Safeda	Myrtaceae
36	<i>Eugenia jambolana</i>	Kathamam	Myrtaceae

37	<i>Ficus bengalensis</i>	Bar, Bargad	Urticaceae
38	<i>Ficus glomerata</i>	Fagura	Urticaceae
39	<i>Ficus palmata</i>	Dhura, Fegra	Urticaceae
40	<i>Ficus religiosa</i>	Peepal	Urticaceae
41	<i>Flacourtia indica</i>	Kangu	Bixaceae
42	<i>Garuga pinnata</i>	Kharpat	Burseraceae
43	<i>Glochidion velutinum</i>	Saman	Euphorbiaceae
44	<i>Grewia oppositifolia</i>	Dhaman, Biul	Tiliaceae
45	<i>Grewia populifolia</i>		Tiliaceae
46	<i>Hamiltonia suaveolans</i>		Rubiaceae
47	<i>Holarrhena antidysentrica</i>	MarorPhali	Apocynaceae
48	<i>Jacaranda mimosaefolia</i>	Jacaranda	Scrophulariaceae
49	<i>Juglans regia</i>	Akhrot	Juglandaceae
50	<i>Kydia calycina</i>	Pula	Malvaceae
51	<i>Lagerstroemia indica</i>	Harsinghar	Lythraceae
52	<i>Lannea grandis</i>	Jhingan	Anacardiaceae
53	<i>Limonia acidissima</i>	Barnasi	Rutaceae
54	<i>Litsea glutinosa</i>	Chandana	Lauraceae
55	<i>Lyonia ovalifolia</i>	Ayar, Ailan	Ericaceae
56	<i>Machilus odoratissima</i>	Bajhaul	Lauraceae
57	<i>Maesa indica</i>	Burkain	Myrsinaceae
58	<i>Mallotus philippinensis</i>	Kamal, Kamela	Euphorbiaceae
59	<i>Mangifera indica</i>	Aam	Anacardiaceae
60	<i>Melia azadirach</i>	Drek	Meliaceae
61	<i>Milletia auriculata</i>	Shama	
62	<i>Mitragyna parviflora</i>	Kaem, Phaldu	Rubiaceae
63	<i>Moringa oleifera</i>	Sanjna	Moringaceae
64	<i>Morus alba</i>	Shahtoot	Urticaceae
65	<i>Morus serrata</i>	Toot	Urticaceae
66	<i>Myrica nagi</i>	Kaphal	Myricaceae
67	<i>Nerium indicum</i>	Kaner	Apocynaceae
68	<i>Olea cuspidata</i>	Kahu	Oleaceae
69	<i>Olea glandulifera</i>	Jharinu	Oleaceae
70	<i>Oroxylum indicum</i>	Tat-palanga	Bignoniaceae
71	<i>Ougeinia oojeinensis</i>	Sandan	Leguminosae
72	<i>Persea gamblei</i>	Bhadrol	Lauraceae
73	<i>Phoenix sylvestris</i>	Khajoor	Palmae
74	<i>Pinus roxburghii</i>	Chil, Chir	Coniferae
75	<i>Pistacia integerrima</i>	Kakkar	Anacardiaceae
76	<i>Populus ciliata</i>	Poplar	Salicaceae
77	<i>Populus deltoidea</i>	Poplar	Salicaceae

78	<i>Prunus armeniaca</i>	Khumani	Rosaceae
79	<i>Prunus persica</i>	Aru	Rosaceae
80	<i>Prunus puddum</i>	Paja	Rosaceae
81	<i>Punica granatum</i>	Daru	Lythraceae
82	<i>Putranjiva roxburghii</i>	Jaipota	Euphorbiaceae
83	<i>Pyrus communis</i>	Nashpati	Rosaceae
84	<i>Pyrus pashia</i>	Kainth	Rosaceae
85	<i>Quercus glauca</i>	Bani	Cupuliferae
86	<i>Quercus leucotrichophora</i>	Ban	Cupuliferae
87	<i>Rhododendron arboreum</i>	Buras, brass	Ericaceae
88	<i>Robinia pseudoacacia</i>	Rubinia	Leguminosae
89	<i>Salix alba</i>	Badah	Salicaceae
90	<i>Salix pyrina</i>	Biuns	Salicaceae
91	<i>Sapindus mukorossi</i>	Ritha, Soap nut	Sapindaceae
92	<i>Sapium insigne</i>	Baloje, Khirni	Urticaceae
93	<i>Stereospermum sauveolans</i>	Padal	Bignoniaceae
94	<i>Schleichera oleosa</i>	Kusum	Sapindaceae
95	<i>Syzygium cumini</i>	Jamun	Myrtaceae
96	<i>Tecoma stans</i>	Trumpet flower	Bignoniaceae
97	<i>Terminalia arjuna</i>	Arun	Combretaceae
98	<i>Terminalia belerica</i>	Bahera	Combretaceae
99	<i>Terminalia chebula</i>	Harar	Combretaceae
100	<i>Terminalia tomentosa</i>	Sain	Combretaceae
101	<i>Trewia nudiflora</i>	Gamhar	Euphorbiaceae
102	<i>Wendlandia exserta</i>	Chila, Pansara	Rubiaceae
103	<i>Xylosma longifolium</i>	Chirandi	Bixaceae
104	<i>Zanthoxylum armatum</i>	Trimal	Rutaceae
105	<i>Zizyphus mauritiana</i>	Ber	Rhamnaceae

Shrubs herbs

S.No	Botanical Name	Local/Hindi Name	Family
1	<i>Adathoda vasica</i>	Basuti	Acanthaceae
2	<i>Agave americana</i>	Ram Ban	Amaryllidaceae
3	<i>Agave cantala</i>	-	Amaryllidaceae
4	<i>Ageratum conyzoides</i>	Neelaphulnu	Asteraceae
5	<i>Anaphalis adnata</i>	Bujlu	Asteraceae
6	<i>Artemesia vulgaris</i>	Charmar (Khardar)	Asteraceae
7	<i>Arisaema wallichianum</i>	Cobra plant	-
8	<i>Arundinaria falcata</i>	Nar, Piuli	Gramineae
9	<i>Asclepias curassavica</i>	-	Asclepiadaceae
10	<i>Asparagus racemosus</i>	Sataron, Sansarmul	Liliaceae

11	<i>Bambusa arundinacea</i>	Kanta bans	Gramineae
12	<i>Berberis aristata</i>	Kashmal	Berberidaceae
13	<i>Berberis chitria</i>	-	Berberidaceae
14	<i>Berberis lycium</i>	Kashmal	Berberidaceae
15	<i>Bergenia ligulata</i>	Pathar Tor	Saxifragaceae
16	<i>Boenninghausenia albiflora</i>	Pissumarbuti	-
17	<i>Buddleia paniculata</i>	DurpaSiaru	Loganiaceae
18	<i>Caesalpinia decapitata</i>	-	Leguminosae
19	<i>Calotropis procera</i>	Aak	Asclepiadaceae
20	<i>Cannabis sativa</i>	Bhang, wild hemp	Urticaceae
21	<i>Capparis aphylla</i>	Karir	Capparidaceae
22	<i>Carissa opaca</i>	Karaunda	Apocynaceae
23	<i>Cassia tora</i>	Ailu	Leguminosae
24	<i>Chenopodium album</i>	Bathu	Chenopodiaceae
25	<i>Clerodendron phlomidis</i>	Dhak, Kari	Verbenaceae
26	<i>Cochlospermum gossypium</i>	Kumb	Bixaceae
27	<i>Cordia vestita</i>	Lasuri	Boraginaceae
28	<i>Coriaria nepalensis</i>	Nachhar	Coriariaceae
29	<i>Cotoneaster bacillaris</i>	Baint	Rosaceae
30	<i>Cotoneaster microphylla</i>	Chamror	Rosaceae
31	<i>Crotolaria albida</i>	-	Leguminosae
32	<i>Daphne cannabina</i>	Satbarna	Thymelaeaceae
33	<i>Datura stramonium</i>	Dhatura	Solanaceae
34	<i>Debregeasia hypoleuca</i>	Siharu	Urticaceae
35	<i>Desmodium tiliaefolium</i>	Matoi	Leguminosae
36	<i>Dodonea viscosa</i>	Mehndar	Sapindaceae
37	<i>Ductzia corymbosa</i>	Philru	Saxifragaceae
38	<i>Duranta plumieri</i>	-	Verbenaceae
39	<i>Elsholtzia fruticosa</i>	Potha	Labiatae
40	<i>Euonymus pendulus</i>	Bharmela	Celastraceae
41	<i>Euphorbia royaleana</i>	Thor	Euphorbiaceae
42	<i>Flemingia chappar</i>	Chhanchra	Leguminosae
43	<i>Fragaria indica</i>	-	Ranunculaceae
44	<i>Gerardiana heterophylla</i>	Bichhubuti	Urticaceae
45	<i>Glycosmis pentaphylla</i>	Ban Nimbu	Rutaceae
46	<i>Hippophae rhamnoides</i>	Gaihiu	Elaeagnaceae
47	<i>Ilex dipyrena</i>	Kanderu	Ilicaceae
48	<i>Indigofera gerardiana</i>	Kathi	Leguminosae
49	<i>Indigofera hirsuta</i>	Kathi	Leguminosae
50	<i>Indigofera pulchella</i>	Kathi, Nil	Leguminosae
51	<i>Iris nepalensis</i>	-	Liliaceae
52	<i>Jasminum humile</i>	Malu	Oleaceae
53	<i>Jasminum multiflorum</i>	Ban Malti	Oleaceae
54	<i>Jasminum officinale</i>	Dhurmalta	Oleaceae

55	<i>Jatropha curcas</i>	Jamalgota	Euphorbiaceae
56	<i>Lantana camara</i>	PhulLakri	Verbenaceae
57	<i>Loranthus longiflorous</i>	Narate	Loranthaceae
58	<i>Mentha arvensis</i>	Ban Pudina	Labiatae
59	<i>Mimosa rubicaulis</i>	Karingan	Leguminosae
60	<i>Murraya koenigii</i>	Gandhela	Rutaceae
61	<i>Myrsine africana</i>	Jhunjhra	Myrsinaceae
62	<i>Nyctanthes arbor-tristis</i>	Harsingar, Kura	Oleaceae
63	<i>Opuntia dillenii</i>	Nagphani	Cactaceae
64	<i>Plectranthus rugosus</i>	Chhichhari, Kathal	Sones
65	<i>Polygonum capitatum</i>	-	-
66	<i>Frinsepia utilis</i>	Bhekhal	-
67	<i>Randia dumetorum</i>	Rara	Rubiaceae
68	<i>Randia tetrasperma</i>	Jundru	-
69	<i>Rhamnus virgata</i>	Thalta	Rhamnaceae
70	<i>Rhus cotinus</i>	Tung	Anacardiaceae
71	<i>Rhuspun jabensis</i>	Tittar	Anacardiaceae
72	<i>Rhus semialata</i>	Bankhor	Anacardiaceae
73	<i>Rosa moschata</i>	Kuja	Rosaceae
74	<i>Rubus ellipticus</i>	Heer	Rosaceae
75	<i>Rubus macilentus</i>	Akha	Rosaceae
76	<i>Rumex hastatus</i>	Chulmora	Polygonaceae
77	<i>Rumex nepalensis</i>	JungliPalak	Polygonaceae
78	<i>Salvia glutinosa</i>	Makhiar	Labiatae
79	<i>Sarcococca saligna</i>	Diun	Euphorbiaceae
80	<i>Solanum indicum</i>	Ban Tambaku	Solanaceae
81	<i>Strobilanthes alatus</i>	-	Acanthaceae
82	<i>Triumfetta pilosa</i>	-	Tiliaceae
83	<i>Urtica dioica</i>	Bichhubuti	Urticaceae
84	<i>Viburnum coriaceum</i>	Basmol, Talanj	Caprifoliaceae
85	<i>Viburnum mullaha</i>	Ire	Caprifoliaceae
86	<i>Viburnum punctatum</i>	Shawange	Caprifoliaceae
87	<i>Vitex negundo</i>	Bana	Verbenaceae
88	<i>Viola canescens</i>	Banafsha	Violaceae
89	<i>Woodfordia floribunda</i>	Dhai	Lythraceae
90	<i>Zizyphus jujuba</i>	Ber	Rhamnaceae

Climbers

S.No	Botanical Name	Local Name	Family
1	<i>Acacia pennata</i>	Agla, Kandiali	Leguminosae
2	<i>Bauhinia vahlii</i>	Taur, Maljhan	Leguminosae
3	<i>Caesalpinia sepiaria</i>	Kanderi	Leguminosae
4	<i>Campsis grandiflora</i>	Chinese Trumpet	Bignoniaceae
5	<i>Clematis montana</i>	-	Ranunculaceae
6	<i>Clematis nutans</i>	Chibru, Machrun	Ranunculaceae
7	<i>Cuscuta reflexa</i>	Seragbali, Akashbel	Convolvulaceae
8	<i>Hedera helix</i>	Mithiari, Kareni	Araliaceae
9	<i>Parthenocissus semicordata</i>	Baulan, Panibel	Vitaceae
10	<i>Rosa moschata</i>	Kuja	Rosaceae
11	<i>Sarviflora</i>	Jhanjhrola, Ushwa	Liliaceae
12	<i>Trachlospermum fragrans</i>	-	Apocynaceae
13	<i>Trachlospermum lucidum</i>	-	Apocynaceae

Bamboos and grasses

S.No	Botanical Name	Local Name
1	<i>Andropogon spp.</i>	-
2	<i>Agropyron cristatum</i>	-
3	<i>Agrostis tenuis</i>	-
4	<i>Aristida depressa</i>	Lambi
5	<i>Arundinaria falcata</i>	Nirgaal
6	<i>Arundinella nepalensis</i>	-
7	<i>Bambusa arundinacea</i>	Kanta bans
8	<i>Bothriocloa pertusa</i>	-
9	<i>Brachiaria villosa</i>	-
10	<i>Bromus spp.</i>	-
11	<i>Chrysopogon fulvus</i>	Dholu
12	<i>Chrysopogon gryllus</i>	Dholu
13	<i>Chrysopogon montanus</i>	Dholu
14	<i>Cymbopogon martinii</i>	Makora
15	<i>Cynodon dactylon</i>	Dub
16	<i>Dendrocalamus strictus</i>	Bans/Male Bamboo
17	<i>Dendrocalamus hamiltonii</i>	Magar bans
18	<i>Dicanthium annulatum</i>	-
19	<i>Eulaliopsis binata</i>	Bhabbar
20	<i>Festuca spp.</i>	-
21	<i>Hemarthria compressa</i>	-
22	<i>Heteropogon contortus</i>	Lamb, Sariala
23	<i>Pennisetum orientale</i>	-

24	<i>Phalaris tuberosa</i>	-
25	<i>Phylostachys chinensis</i>	Chinese bamboo
26	<i>Poa pratensis</i>	-
27	<i>Saccharum spontaneum</i>	Kans
28	<i>Sehima notata</i>	-
29	<i>Sorghum nitidum</i>	Lunji
30	<i>Themeda arundinacea</i>	-
31	<i>Themeda anathera</i>	-

IV List of Fauna

Forest Fauna of Solan Forest Division

S. No.	Category	Common Name	Scientific Name	Local Name
Carnivores				
1	Mammal	Leopard	<i>Panthera pardus</i>	Bagh, Tendua
2	Mammal	Leopard Cat	<i>Felis bengalensis</i>	Ban Billi, Cheeta,
3	Mammal	Jungle Cat	<i>Felis chaus</i>	JangliBilli
4	Mammal	Black Bear	<i>Selenarctos thibetanus</i>	Bhalu, Reech
5	Mammal	Jackal	<i>Canis aureus</i>	Geedar , Siyaar
6	Mammal	Himalaya n Fox	<i>Vulpes bengalensis</i>	Lomari
Herbivora – Ungulates				
7	Mammal	Goral	<i>Nemorhaedus goral</i>	Ghoral
8	Mammal	Barking Deer	<i>Muntiacus muntjac</i>	Kakkar
Large Rodents				
9	Mammal	Indian Hare	<i>Lepus nigricollis</i>	Khargosh
10	Mammal	Indian Porcupine	<i>Hystrix indica</i>	Sail
Primates				
11	Mammal	Langur	<i>Presbytis entellus</i>	Langur
12	Mammal	Rhesus Monkey	<i>Macaca mulatta</i>	Bandar
Others (Omnivores/Scavengers)				
13	Mammal	Wild Boar	<i>Sus scrofa indicus</i>	JangliSuar
14	Mammal	Mongoose	<i>Herpestes edwardsii</i>	Neola
Avifauna - Game Birds				
15	Bird	Red Jungle Fowl	<i>Gallus gallus</i>	JangliMurga
16	Bird	Peacock	<i>Pavo cristatus</i>	Mor

17	Bird	Grey Partridge	<i>Francolinus pondicerianus</i>	Teetar
18	Bird	Black Partridge	<i>Francolinus francolinus</i>	Kala Teetar
19	Bird	Jungle Bush Quail	<i>Perdica asiatica</i>	Bater
20	Bird	Blue Rock Pigeon	<i>Columba livia</i>	Kabutar
21	Bird	Spotted Dove	<i>Streptopelia chinensis</i>	Ghuggi, ChittaFakta
22. Avifauna – Non-Game Birds		Crows, Tree Pies, Flycatchers, Warblers, Sparrows, Magpies, Parakeets, Nutcrackers		
Reptiles				
23	Reptile	Rat Snake	<i>Ptyas mucosa</i>	-
24	Reptile	Indian Krait	<i>Bungarus caeruleus</i>	-
25	Reptile	Himalayan Pit Viper	<i>Ancistrodon himalayanus</i>	-
26	Reptile	Indian Cobra	<i>Naja naja</i>	-
27	Reptile	House Lizard	<i>Hemidactylus spp.</i>	-
28	Reptile	Indian Monitor Lizard	<i>Varanus monitor</i>	Geh
29	Reptile	Rock Lizard	<i>Agama tuberculata</i>	Girgit

Insects

Pest Species	Common Name	Family	Host Plant(s)	Status
<i>Diohabalusca</i>	Defoliator	Chrysomelidae	<i>Celtis australis</i>	Serious
<i>Curculio sikkimensis</i>	Borer (Acorn)	Curculionidae	<i>Quercus leucotrichophora</i>	Serious
<i>Sitophilus glandium</i>	Borer	Curculionidae	<i>Quercus leucotrichophora</i>	Serious
<i>Hypsipylarobusta</i>	Borer	Pyralidae	<i>Toona ciliata</i>	Serious
<i>Aprionacinerea</i>	Borer	Cerambycidae	<i>Populus deltoides</i>	Serious
<i>Chrysomelapopuli</i>	Defoliator	Chrysomelidae	<i>Populus spp.</i>	Serious
<i>Plagioderaversicolora</i>	Defoliator	Chrysomelidae	<i>Populus and Salix spp.</i>	Serious
<i>Dioryctria abietella</i>	Borer	Pyralidae	Conifers (seeds & cones)	Serious
<i>Parebavestanumella</i>	Defoliator	Nymphalidae	<i>Debregezia hypoleuca</i>	Serious

Status of fauna according to IUCN

IUCN Category	Common name	Scientific Name
Vulnerable (VU)	Leopard	<i>Panthera pardus</i>
	Himalayan Black Bear	<i>Selenarctos thibetanus</i>
Near Threatened (NT)	Goral	<i>Naemorhedus goral</i>
Least Concern (LC)	Leopard Cat	<i>Felis bengalensis</i>
	Jungle Cat	<i>Felis chaus</i>
	Jackal	<i>Canis aureus</i>
	Himalayan Fox	<i>Vulpes bengalensis</i>
	Barking Deer	<i>Muntia cusmunjac</i>
	Indian Hare	<i>Lepus nigricollis</i>
	Indian Porcupine	<i>Hystrix indica</i>
	Langur	<i>Presbytis entellus</i>
	Rhesus Monkey	<i>Macaca mulatta</i>
	Wild Boar	<i>Susscrofa indicus</i>
	Mongoose	<i>Herpestes edwardsii</i>
	Red Jungle Fowl	<i>Gallus gallus</i>
	Peacock	<i>Pavo cristatus</i>
	Grey Partridge	<i>Francolinus pondicerianus</i>
	Black Partridge	<i>Francolinus francolinus</i>
	Jungle Bush Quail	<i>Perdica asiatica</i>
	Blue Rock Pigeon	<i>Columba livia</i>
	Spotted Dove	<i>Streptopelia chinensis</i>
	Rat Snake	<i>Ptyas mucosa</i>
	Indian Krait	<i>Bungarus caeruleus</i>
	Himalayan Pit Viper	<i>Ancistrodon himalayanus</i>
	Indian Cobra	<i>Naja naja</i>
	House Lizard	<i>Hemidactylus spp.</i>
	Indian Monitor Lizard	<i>Varanus monitor</i>
	Rock Lizard	<i>Agama tuberculata</i>

PART – I

SUMMARY OF FACTS ON WHICH PROPOSALS ARE MADE

Chapter – 1

The Tract Dealt With

1.1 Name and situation

This Working Plan is a revision of the working plan prepared by Ms. Archana Sharma for the period 2002-03 to 2016-17 and further extended up to 2018-2024. The previous plan provided guidelines and prescriptions for the management of Reserve Forests (RF), Demarcated Protected Forests (DPF) and Undemarcated Protected Forests (UPF).

The geographical extent of the division encompasses the Kandaghat, Solan & Kasauli Civil Sub Divisions within Solan District, with a total area of 571.58 sq. km within which the forested area constitutes 131.52 sq. km, approximately half of which lies in the catchment of Ghambar Khad. The division shares boundaries with the states of Haryana and Punjab in the South & South – West, Kunihar Division in West and district Shimla, the capital of Himachal Pradesh, in the North & North – East and with Rajgarh Division in the East.

Table 1.1: Administrative units of Solan Forest Division

Forest Range	Area (in ha.)	Blocks	Beats	Compartments
Chail	1220.668	2	6	34
Kandaghat	786.4	3	11	47
Solan	1618.2	3	10	83
Subathu	962.8	3	12	38
Dharampur	3866.4	3	10	131
Parwanoo	4696.8	3	14	123
Total	13151.268	17	63	456

The administrative structure of the division comprises six ranges, namely, Chail, Kandaghat, Solan, Dharampur, Parwanoo, and Subathu which are divided into 17 blocks and 63 beats. The headquarters of the division is located in Solan which is conveniently connected by all-weather roads to Shimla, Bilaspur, Nahan, and Chandigarh via National Highway-22. The largest range in the division is Parwanoo spanning an area of 4697 ha while Kandaghat is the smallest with an area of 786 ha. There are 456 compartments in the division with the largest number of them being in the Dharampur range (131) while Chail has the least (34). The area given above includes the area of Shilly Conservation Reserve which occupies 148.4 ha. Details are given in Chapter 2.

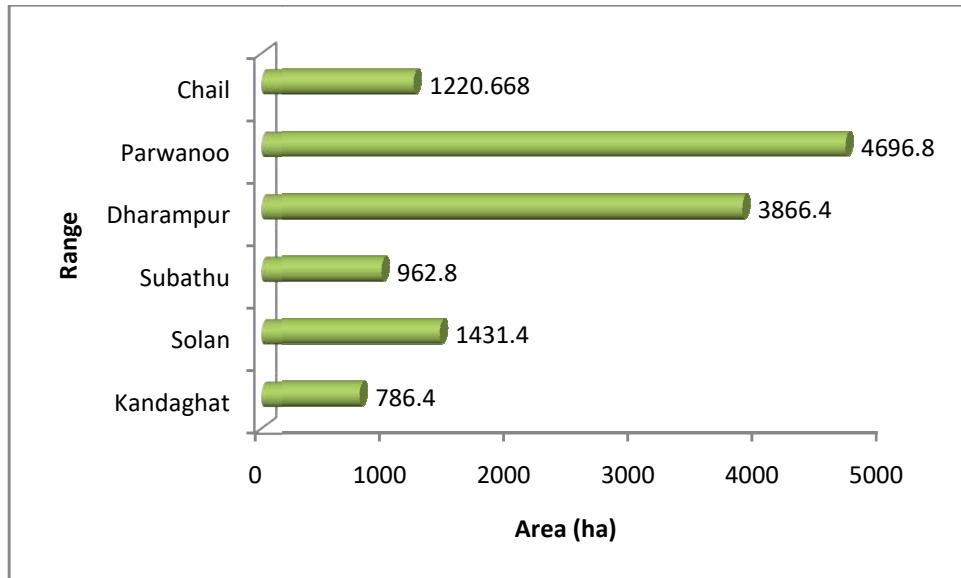


Fig. 1.1: Distribution of forest area in the ranges of Solan Forest Division

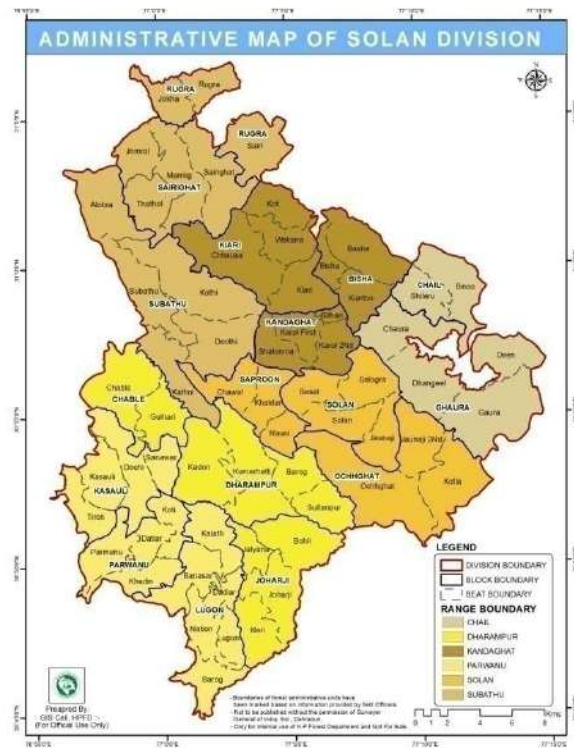


Fig. 1.2: Administrative Map of Solan Forest Division



Fig 1.3 (a): Administrative Map of Solan Range

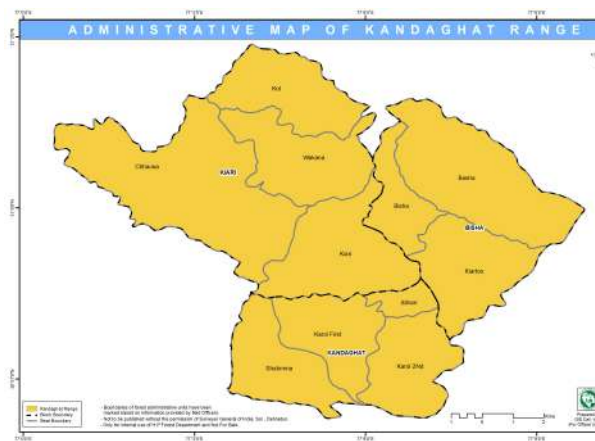


Fig. 1.3 (b): Administrative Map of Kandaghat Range

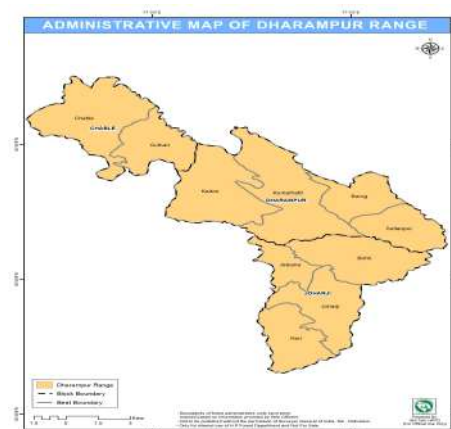


Fig. 1.3 (c): Administrative Map of Dharampur Range

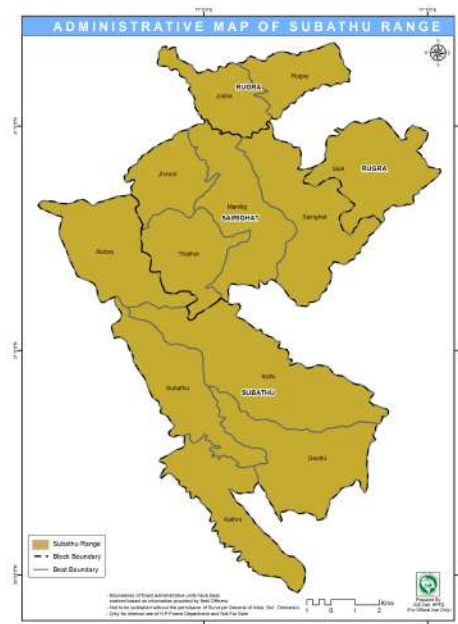


Fig. 1.3 (d): Administrative Map of Subathu Range

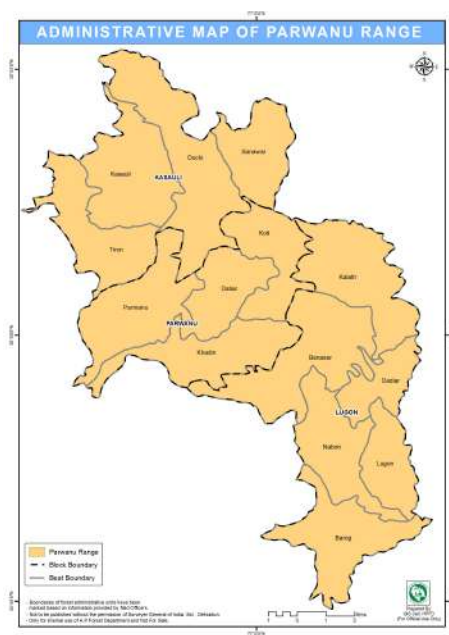


**Fig. 1.3 (e): Administrative Map
of Parwanu Range**

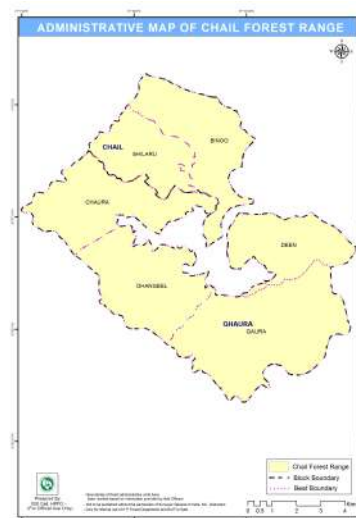


Fig. 1.3 (f): Administrative Map of Chail Range

1.2 Boundaries

The Solan Division is situated within the geographical coordinates of 76° 56' to 77° 12' East Longitude and 30° 46' to 31° 10' North Latitude, covering a total area of 571.58 km². It shares borders with the Shimla Forest Division to the North & North-East, with Rajgarh division in the East, the Kunihar Forest Division to the West, and the boundary of Haryana State to the South & South – West. The division is a compact block, except for the Rugra Block of the Subathu Range, which can be accessed by crossing Kunihar or via Ghanahatti near Shimla. It is noteworthy that this block does not contain any reserved or protected forests.

The terrain of the division is hilly, ranging from the outer Shiwalik to the Middle Himalayas, covering altitudes between 500 meters to 2500 meters. The slopes vary from moderate to slightly steep, with steeper areas observed in specific locations such as Karol, Chail, the catchment areas of Kaushalya Khad, Parwanoo, and the western slopes below Monkey Point in Kasauli.

The primary ridge running from Kaithlighat to Kandaghat, Solan, and Dagshai acts as the dividing line between the watersheds of the Satluj and Yamuna River systems. At Dagshai, it bifurcates into the Dagshai-Dharampur-Sanawar-Garkhal-Kasauli ridge and the Dagshai-Bauhli-Shaya ridge. The former divides the watersheds of the Ghaggar and the Satluj rivers, while the latter separates the watersheds of the Yamuna and Ghaggar rivers. A narrow strip of forest areas, transferred from Haryana after the reorganization of states in 1966, extends from Kasauli, crossing the Kaushalya and Bargodam Rivers and reaching up to Mallah (Baroa Forest) above the Ghaggar River.

The forested regions are mostly concentrated in Pargana Ajmergarh of Dharampur and Parwanoo Ranges, extending from Kamlog to Ajmergarh fort and terminating at Joharji, along the catchment areas on both the banks of Kaushalya Khad, a tributary of the Ghaggar Nadi. The Mallah-Joharji road has improved accessibility to these areas.

The Northern and North-Western slopes of the Satluj catchment, North-Eastern and Eastern slopes of the Ghaggar catchment, comprising the former PEPSU state and now Kandaghat and Chail Range, also house significant forests of Ban Oak. Prominent peaks in the tract include Sidh Baba (2300m), Karol (2253 m), Monkey Point (1907m), Basha top (1900m), and Banasar Top (1664 m).

Previously the Solan Forest Division was in Nahan Forest circle. Now it is a part of the newly constituted Solan forest circle, constituted in 2016-17, comprising of two forest divisions i.e. Solan and Nalagarh.

1.3 Geology, Rock and Soil

1.3.1 Geology and Rock

The main geological formations in the tract are given in the table below:

Table 1.2: Rock formations in the tract

Formations	Age
Nahan	Mid Miocene
Dagshai-Kasauli	Lower Miocene
Subathu	Mid Eocene to Upper Oligocene
Karol	Lower Carboniferous
Infra-Karol	Lower Carboniferous
Balaini	Upper Carboniferous
Nagthai-Chandpur	Devonian and Silurian
Shimla Slates	Lower Paleozoic
Chail Series	Lower Paleozoic

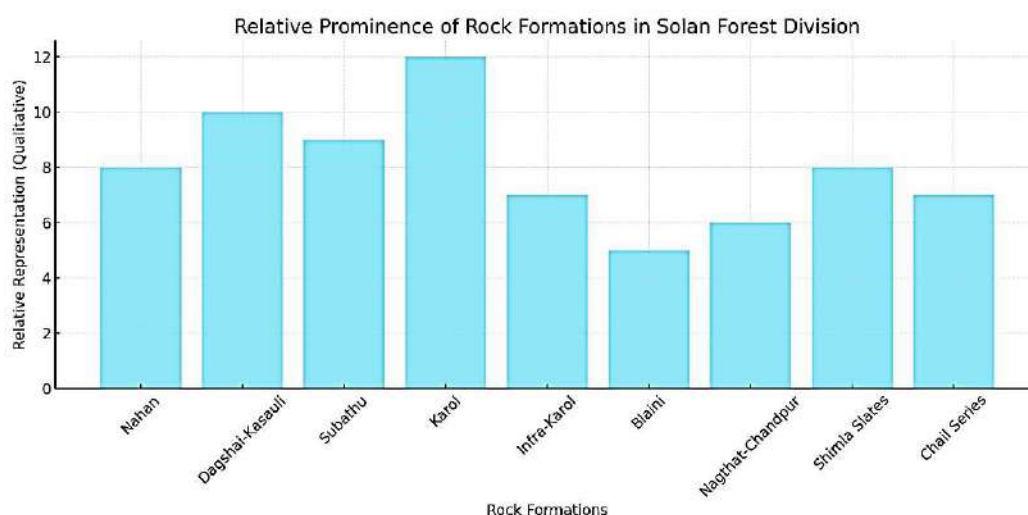


Fig. 1.4: Relative prominence of rock formations in Solan Forest Division

a) Nahan Formations

These formations are exposed from Jabli in the north-west through Shilu Kurd, Thadhugarh, Chandrani, Kalka and, Parwanoo in the South-east. In this formation, there are regular alterations of sandstone and shale. The sandstones are massive, soft and green-brown in color. The clays are chocolate and green in color and usually concretionary. Sandstone and clays are streaked with purple. The vegetation on this formation consists of serial species with Chil on higher reaches.

b) Dagshai – Kasauli Formations

These rock formations span a significant area from Kot Bija in Kunihar Division to Jagatgarh in the South, with exposure extending from Gawalsar in the North West through Mathan, Kainthri, Barog, and Kotla to the East of Karardev in the South-East. Within the Dagshai area, the formations comprise alternating layers of purple, cindery sandy shale, and purple and green sandstones, occurring in beds up to 5 meters thick. Between Dagshai and Subathu, these beds have a thickness of 650 meters, featuring conglomerates with limestone fragments and red shale derived from contemporaneous erosion. Contrasting with Dagshai, the Kasauli beds lack a general purple color, with sandstone prevailing over shale. The shale is less cindery, and the sandstones are massive and generally hard. The predominant vegetation in this formation includes Chil along with scrub species in the lower elevations.

c) Subathu Formations

This formation is present in numerous out crops trending NNW-SSE and NW-SE, characterized by long and linear stretches with some broader occurrences. The exposure extends from Jari in the North through Banshana, Laholi, Bhawani in the Kuthar Range of Kunihar Division to Subathu, Arla, and Gamthan to Dharampur in the South. Another outcrop is observed from west of Beware in the NW through Bhunda, Bhaira, and Daulin Jabli in the SE. It also appears from west of Kot Bija in Kunihar Division in the north through Dudra, Tiron, and east of Jabrot and Tibi to the east of Quadipur in Haryana, in the South. The formation comprises olive green and white sandstone, iron-stained quartzites, and occasional shaly sandstones. Shaly limestone is also present, and sporadic conglomerates consist of fragments of pale microcrystalline limestone set in calcareous sandy mud. The purple – green shale undergoes phyllitization and veining with quartz, while carbonaceous shale transforming to dirty slates. The primary vegetation in this formation is dominated by Chil.

d) Karol Formations

With maximum relative prominence, these rocks exhibit a north-southeast orientation and are visible from near Shalumna in the NW through Kalhog, Sanhech, Dhalain, Panog, Matiul, Shingar, Rajgarh, Dhar, Nandal in the SE, extending into the areas of Rajgarh Forest Division. They are also exposed from Shatal in the NW through Oel, east of Kainhri, west of Mangru, Panchmunda, and Mauri to Anji in the southeast. Karol sandstones can be observed from Shatal in the NW through Kothi, Bajrol, and Nagali to Anji in the SE. Additionally, they are present near Shalumna in the NW to Phagela in the Southeast, passing through Dhalain, Damkari, and Mashiwar.

Around Solan and Karol, the sandstone is soft, crumbly, lacking distinct bedding, and stained with an orange color due to iron content. North of the Karol Hill, in the *nala* flowing from Solan to join the Giri River, a conspicuous feature is the presence of bands rich in disc-like fragments of strongly black shale, seldom over 2 mm thick but up to 5 cm long. Near Kawal Khad, this sandstone is inter-bedded with carbonaceous shale. In the tightly squeezed Karol syncline, in the Kawal Khad, the sandstone transforms into horny

quartzite, strongly veined with quartz. Lower Karol limestone comprises limestone and shale with the limestones seldom being crystalline. Near Solan, there is a massive 6 to 16 meters thick limestone, frequently dolomitized, with common black chert bands.

Karol-B is characterized by soft, thinly laminated purple-red layers with the intercalation of green shales, featuring dolomitic and cherty limestones. Upper Karol limestone (Karol C, D, E) is also present. Karol C is the most conspicuous limestone on the hills around Solan, occurring in a single cleft from 50 to 100 meters in height. It is a massive, dark blue, crystalline limestone that weathers to a black surface. Karol-D consists of alternation of cherty limestone and shale, with the limestone either pale or dark and emitting a foul odor, in beds from 3 to 10 meters. The chert is pale in color, and the shale of black, red, green, and orange colors are soft, while sandstones are often found. The minimum thickness of this formation southeast of Narag in Rajgarh Forest Division is about 200 meters. In Karol-E, the main rock type is a banded green and pale cream, while microcrystalline limestone, freshly fractured, appears white and porcelain-like. Red, orange, and black shales are also present, and the transition of limestone from pale sandy limestone to pale calcareous sandstone is observed. The vegetation on this formation is dominated by Ban-Oak and Chil.

e) Infra Karol Formations

These occupy a large area from Plah in the NW to Phagla in the DE. They trend NW-SE and are exposed at Kharar, Shalymna, Dharot, Solan, Ber to Narag in Rajgarh Division. It mainly consists of dark shale and slates closely inter-bedded with thin bands of impure slaty buff weathering quartzite. Towards the top of Infra Karol, black carbonaceous shales or slates occur without the slaty quartzite. The infra-Karol has been intricately folded and faulted and show great variation in the grade of metamorphism. The banded faces of dark shales and pale impure quartzite weathers on hillsides to very concentric ring bleached slates. An admixture of Chil, Ban oak, and a few other broad-leaved species occur on these formations.

f) Blaini Formations

These are exposed from Niar in the NW to Bhala-gaon in the SE. In the SW part, the Blainis are exposed from Rahanain the NW to Gulhutin the SW.

The typical rock faces in Blaini are:

- a) Boulder beds or Tillute
- b) Limestone

Main crop on these formations consists of Ban oak and Chil.

g) Nagthat – Chandpur(Jaunsar)

These rocks are found in linear outcrops extending from east of Palianjan in the NW through Chamrog and Gara to Nagaon in the SE and from Kumarhatti in the NW through Niata, Banlog, Sainj, and Bages to Dhar in the SE. Towards the NW of these areas, these outcrops trend N-S to NNW-SSE, changing to NW-SE in the southern part. The most characteristic features of the Chandpur stage are a highly banded association of quartzite

and phyllite and the presence of abundant green beds. The phyllite grades into schistose phyllite. There are also current-bedded quartzites and an extensive series of chlorite tuffs, slates, and quartzites. The green rocks appear as distinctive homogeneous beds showing strong weathering. The majority of these rocks are metamorphosed tuffs. The main vegetation on these formations consists of Ban oak, Chil, and a few broad-leaved species. The rocks of the Nagthat stage comprise stone, quartzite, grits, conglomerates, slates, and phyllites displaying purple and green colors. Some of the sandstones are pyritic, weathering to rusty bleaching crusts. These arenaceous rocks are strongly current-bedded and ripple-marked. The conglomerates contain pebbles of vein quartz, often stained red or purple, and pale quartzites. Purple and green slate or phyllite grade sandstone is also present, while others are talco-sephyllite and schistose quartzites.

h) ShimlaSlates

The Shimla Slates are a geological formation found in the NNW-SSE to NW-SE trending outcrops from Barora in the NW through Damrog, Malkot, Bandroan, Kandaghat, and Barog to Shalumna in the SE. They also occur around Domehar, Shangri, Padhar, and Kamlog. The Shimla Slates are characterized by their dark color with grey-blue tints and are composed of micaceous shales, slates, occasional phyllite, and sandstone with predominant grey weckes. The bedding varies from half an inch to ten feet in thickness. In the Chhaosa type of Shimla Slates, massive beds (0.7 meters or more in thickness) of slate occur. A characteristic feature is the occurrence of numerous beds containing pillow- and kidney-shaped concretions up to 7 cm of impure quartzite. Grey wecks are predominant and generally occur as cliffs. The Domehar slates are thin-bedded and consist of green micaceous silts, gritty slates, and nodular sandstones. Ripple marks are common. This formation succeeds the Chhaosa slates and has a minimum thickness of 400 meters along the Gambhar River.

i) Chail Series

Chail Series is a geological formation with a NNW-SSE trend from Galhog in the NW to Dharin in the SE, which changes to NW-SE around Machog. These rocks are also exposed near Kanhal in the NW to Malhia in the SE. The orientation of the rocks changes from NW-SE near Kanhal to N-S near Malhia. The Chail Series mainly consists of quartzite, limestone, and schistose slates. The Chail Series is characterized by its various rock types, including quartzite, limestone, and schistose slates. The rocks may exhibit different degrees of metamorphism and often form distinctive layers or bands within the series. The vegetation associated with this formation typically includes Ban Oak and Chil, along with a few broad-leaved species.

1.3.2 Soil

All over the tract soil is sandy loam. Soil is fairly deep in the areas having good vegetative cover and is shallow in the naked areas. In the regions above 1500 meters it is deep and contains a thick layer of humus or leaf mould in Ban Oak, Chil and Deodar forests. Soil is dry on the Alobra – Sairighat ridge, although it is fairly deep in the northern part of the Sairighat forest where some good plantations have been raised in the past. The soil is friable and dry in

Ajmergarh, Parwanoo and Lugon areas also. Loose boundary soil that is highly susceptible to soil erosion is very common in the southern aspect on lower reaches.

1.4 Climatic parameters

In the lower reaches, the climate is subtropical and moist temperate in the upper reaches, especially in some parts of the Kandaghat, Solan and Chail Ranges. The seasons are well marked and there is distinct summer, rainy, autumn and winter seasons.

Locally Weighted Scatterplot Smoothing (LOWESS) was used to smooth the time-series of climatic parameters, viz. Precipitation, Temperature, and Number of Rainy days pertaining to the division. The method is a non-parametric regression method that helps in identifying trends in scatterplots. It fits multiple local linear regressions to subsets of data. Higher weights are given to points that are close to the point being estimated. The resultant curve is a smooth curve representing general trend in the data while reducing the outliers and noise present in the dataset. Being a non-parametric approach, the method does not assume a functional form rendering it flexible for a wide range of datasets. The weighting scheme is robust thus mitigating the effects of outliers in the dataset.

1.4.1 Precipitation

Precipitation is received both during the rainy and winter seasons, but the bulk of it is received during the rainy season from the Southeast monsoon. The Rainy season commences from the first week of July and continues up to the last week of August but sometimes extends up to mid-September. Winter rains generally commence from the last week of December and continue up to the end of February, April, May, October, and November are relatively dry months. Precipitation in the form of snow is received during January and February, mainly around Karol and Chail but occasionally come down to lower reaches.

Table 1.3: Average monthly rainfall recorded at UHF Nauni(Solan) in Solan Forest Division.

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2013	113.6	184.3	85.6	5.4	45.9	252.3	159.1	119.6	66.4	8.7	9.4	22.2
2014	63	107.8	123.8	57.6	51.2	101.8	361	83.8	129.4	15.7	0	75.6;
2015	49.4	67	213.6	71.8	16.1	91.1	294.4	102.2	41.6	34.6	7.6	18.8
2016	4	35.6	87.5	25.6	115	118.9	151.9	164.1	11.2	0	0	8.6
2017	122.2	7.6	33.2	57.8	100.8	197.8	162.3	233.8	133.8	0	2.4	19.4
2018	18	50.2	17.4	39.6	54.9	190	340.2	216.6	224.3	2.6	24.8	21.6I
2019	73	103.1	54.6	36.8	21.3	98.5	218.1	225.8	151.4	5.6	32.2	33.2
2020	168.3	38.5	171.8	47.7	74.8	58.7	278.1	148.6	6	0	37.7	23.8

2021	21.3	59.7	14.8	65.9	148.9	96.5	265.8	92.3	218.3	52.6	0	13.9
2022	258.8	82.7	0	1	84	85.6	195.4	219.5	233.5	63.2	2.4	0
2023	39.2	7.2	130.6	114.3	152.3	154	660.5	283.4	24.2	32.6	6.4	0.6
2024	0	102.2	63	32.8	23.8	97.6	170.6	267.2	63.6	0	0	0

Source: Dr.Y.S Parmar University of Horticulture and Forestry, Nauni

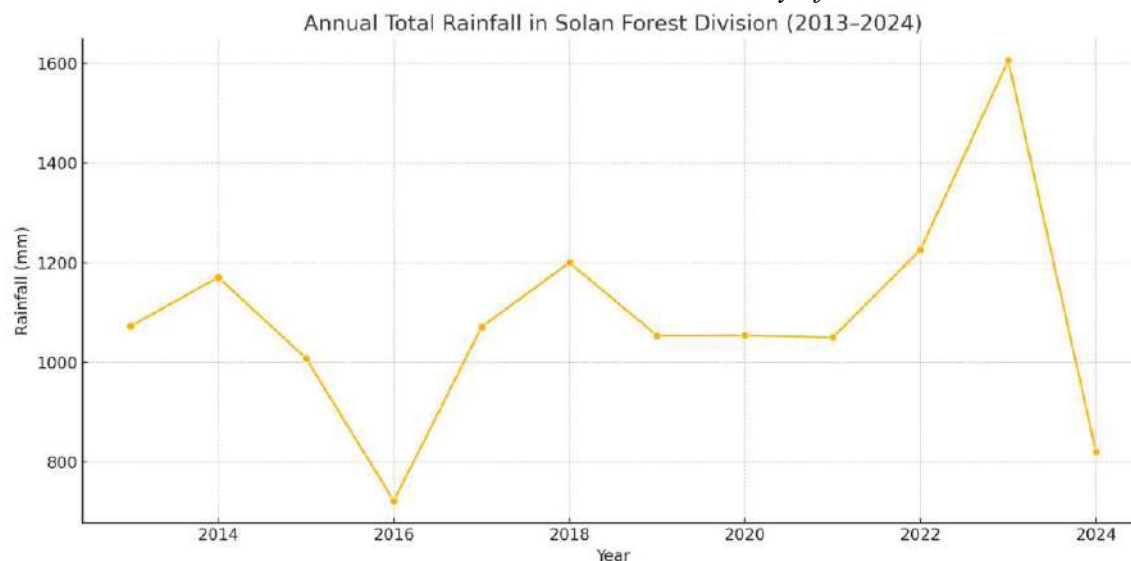


Fig. 1.5: Trend in total rainfall from 2013-2024 of Solan Forest Division

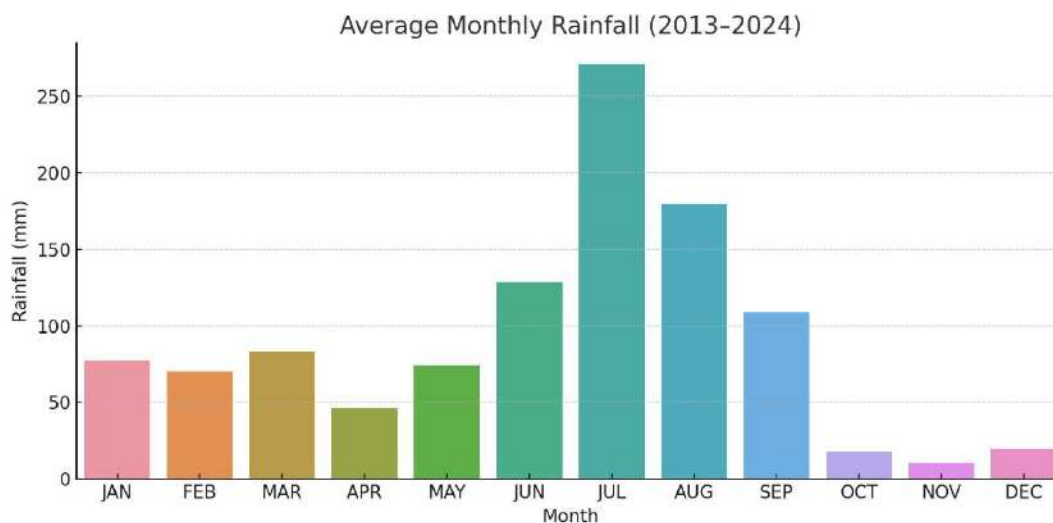


Fig. 1.6: Average monthly rainfall(2013-2024)

The graph shows that the monsoon months of July and August receive the highest rainfall, with July typically recording the peak. This confirms the dominance of the Southwest monsoon in the region. The winter months of January and February also contribute moderate rainfall due to western disturbances. Rainfall is significantly lower during April, May, October, and December, marking these months as relatively dry periods in the year.

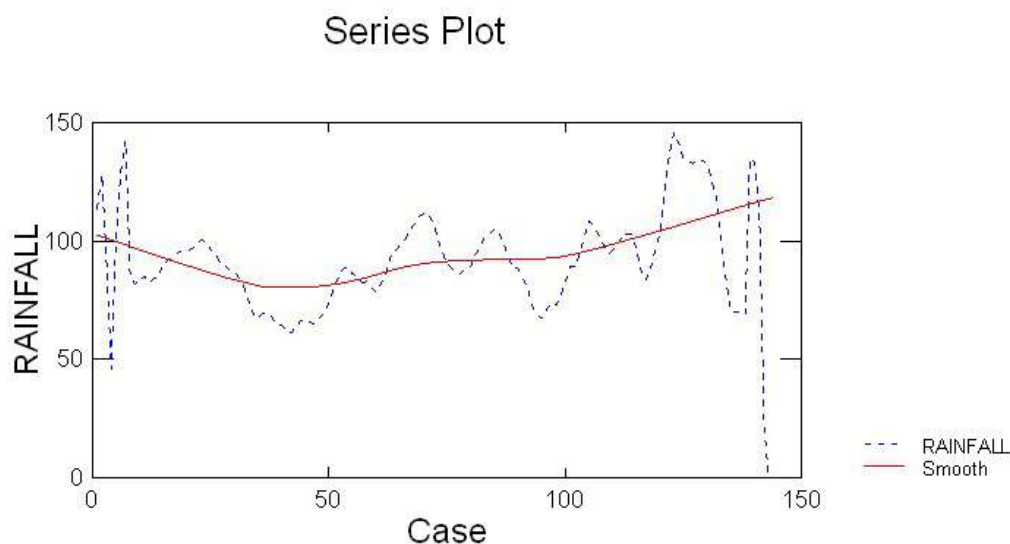


Fig. 1.7: Smoothened series of rainfall using LOWESS smoothing

The smoothened series of rainfall obtained after using LOWESS smoothing indicates that there is a decrease in rainfall in the initial part of decade then it shows an increase. This is probably due the variation in the altitude in this Division and possible micro-climatic disturbances.

1.4.2 Temperature

The temperature also varies considerably. The minimum temperature goes down below 0° C in high reaches during winter season and the maximum temperature exceeds 40°C in lower reaches during the summer season. The detail is as given in Table 1.3 and Table 1.4.

Table 1.4: Average Temperature (in °C) from 2013 to 2024

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2013	9.05	11.15	16.75	19.2	26.4	23.55	23.5	23.5	21.85	19.3	13.9	10.95
2014	10.1	10.6	14.2	18.35	22.2	25.2	23.65	23.7	22	18	14.65	11.05
2015	9.85	12.65	14.6	18.65	23.5	23.4	24.15	23.95	22.4	19.85	15.45	11.3
2016	10.85	13.05	16.65	21.45	23.55	24.4	24	23.4	23	19.5	15.8	13.05
2017	9.75	13.7	15.35	21.25	23.15	23.3	24	23.4	22	19.05	14.05	12.45
2018	10.6	12.75	16.55	19.85	23.4	24.3	23.45	23.8	21.7	17.1	14.1	9.85
2019	8.85	10.35	13.45	20	22.6	25.75	23.8	24.45	23.45	18.45	15.45	10.5
2020	9.1	12.15	14.2	19.15	22.05	24.1	25.05	24.95	24.1	20.4	14.6	12.2
2021	11.9	13.85	18.15	20.1	21.85	24.15	24.9	24.6	23.55	19.45	14.35	10.45
2022	9.65	10.7	19	23.25	24.05	24.9	24.5	24.45	22.8	18.85	15.25	12.1
2023	10.85	14.7	15.85	18.55	20.55	23.35	23.8	24.55	23.95	18.95	15.7	12.35
2024	10.85	10.65	15.5	19.65	24.65	26.45	25.5	24.65	23.8	20.3	16	11.15

Source: Dr.Y.S Parmar University of Horticulture and Forestry,Nauni

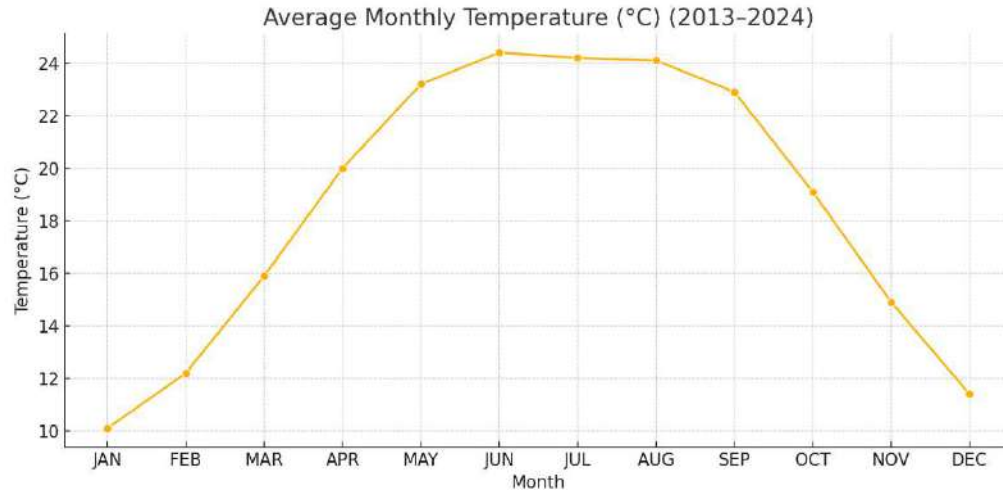


Fig. 1.8: Trend of average monthly temperature 2013-2024

The temperature trend indicates a gradual warming from January to June, with June and July being the warmest months, often exceeding 24°C. From August onwards, the temperature gradually cools down, reaching its lowest point in December and January. This pattern is typical for regions transitioning from subtropical climates in the lower elevations to moist temperate climates in the higher altitudes of the Solan Forest Division.

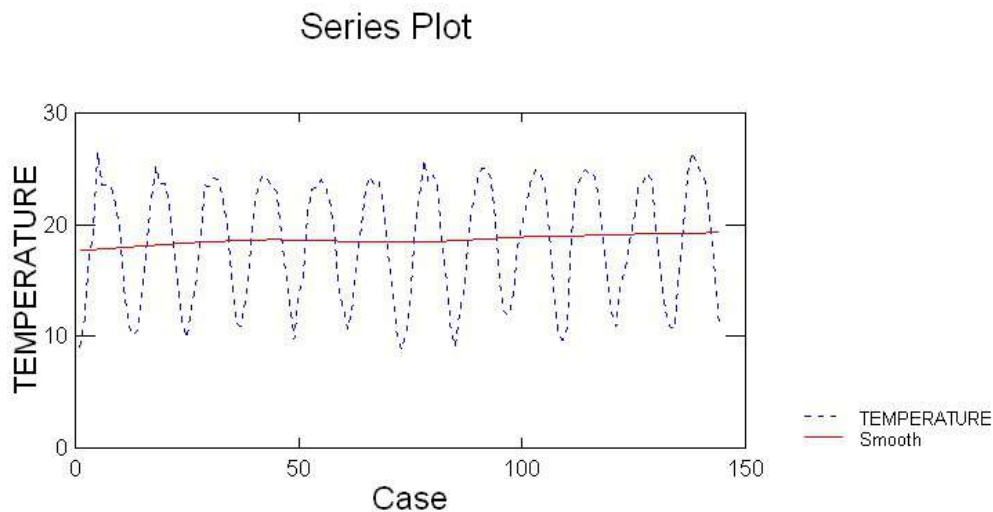


Fig. 1.9: The trend in temperature using LOWESS smoothing

The trend present in temperature is given in the figure above. A slight increase in temperature is noticed in the area with a very slight upward trend which is monotonic in nature, with rate of increase slowing down slightly in the mid of the series.

1.4.3 Number of rainy days

Table 1.5: Month-wise rainy days from 2013 to 2024

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2013	3	11	6	2	5	15	13	19	9	5	2	2
2014	5	9	12	7	5	12	14	6	9	4	0	4
2015	7	7	12	7	5	8	16	12	4	3	3	3
2016	1	5	10	5	5	11	7	17	4	0	0	2
2017	7	3	6	8	9	14	16	20	8	0	2	2
2018	1	4	5	8	5	12	20	8	10	2	3	3
2019	7	10	6	5	7	9	20	13	6	3	6	4
2020	9	5	12	6	8	11	18	15	2	0	4	3
2021	3	4	4	7	11	12	12	10	12	4	0	3
2022	11	8	0	1	7	8	22	15	11	4	1	0
2023	6	2	10	6	12	11	22	11	3	5	1	1
2024	0	6	5	5	3	8	11	21	10	0	0	4

Source: Dr.Y.S.Parmar University of Horticulture and Forestry, Nauni

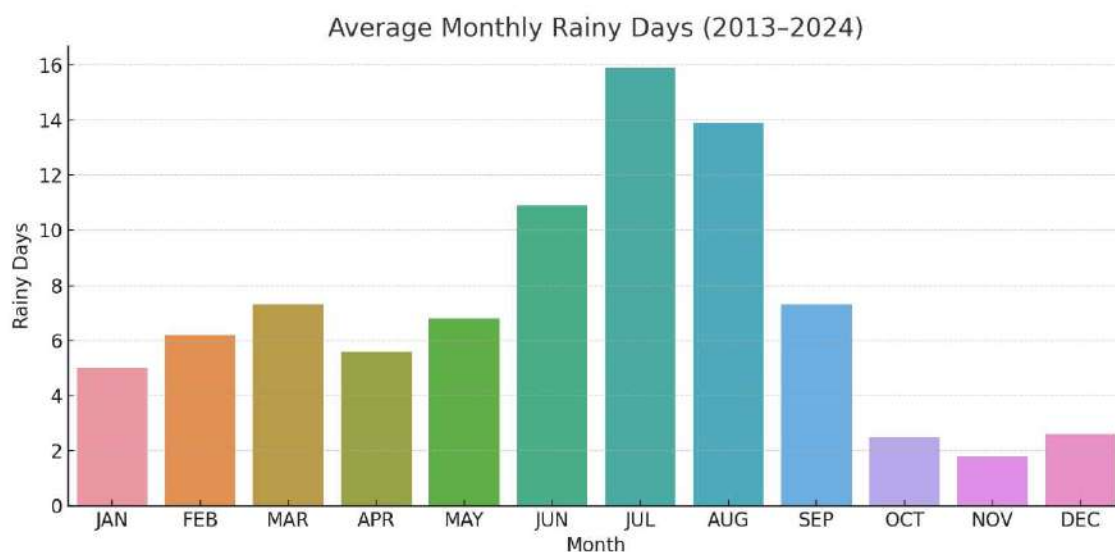


Fig. 1.10: Average monthly rainy days 2013-2024

This graph illustrates the distribution of rainy days across the year. The number of rainy days increases sharply during the monsoon season, especially in July and August, with more than 15 days of rainfall on average. In contrast, the dry months—particularly October, November, and April—witness very few rainy days. This pattern aligns with the seasonal rainfall distribution, showing concentrated wet periods and extended dry spells.

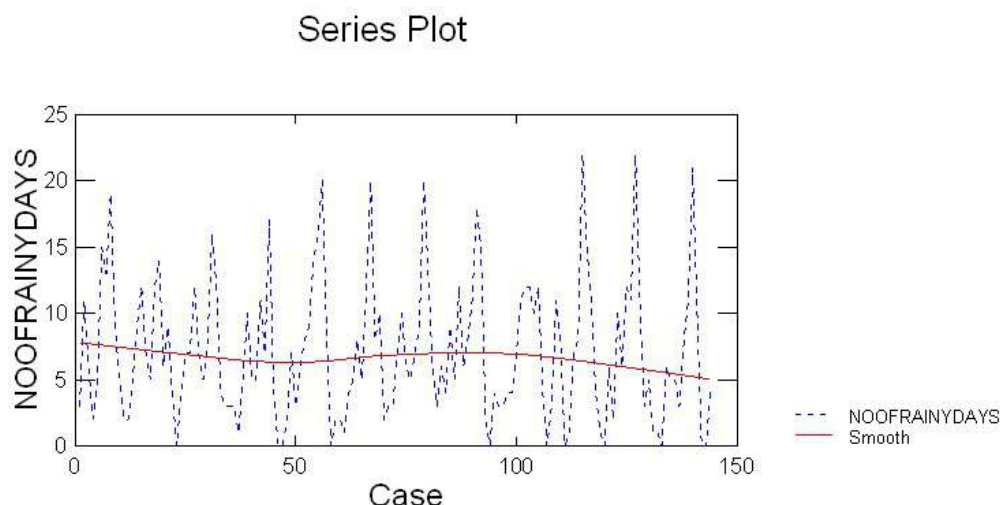


Fig. 1.11: The trend in number of rainy days using LOWESS smoothing.

The number of rainy days shows a marked downward trend during the decade indicating days of dry spell. In addition to this, cross-correlations were studied between the three pairs of the climatic parameters at Lag 0 to find the strength of relationship between the time-series of the three pairs of the climatic variables mentioned above. The following correlations were found:

Table 1.6: Correlation between climatic parameters at Lag 0

Pair	Correlation at Lag 0
Temperature – No. of rainy days	0.491
No. of rainy days – precipitation	0.834
Temperature – precipitation	0.396

There appears to be a weak correlation between the series representing temperature and precipitation indicating that there exists a weak cause and effect relationship between the two series. Either of them is not affected to a great extent by the other. Similar is the inference for temperature and number of rainy days, where the relationship is moderate. The correlation between precipitation and number of rainy days is strong indicating that incidences of very heavy rainfall on certain days is highly unlikely, and the rainfall is almost evenly distributed throughout the number of rainy days.

1.5 Water Supply

The catchment areas of the three rivers, namely Satluj, Yamuna, and Ghaggar, fall in this Division. The main tributaries of the Yamuna are Asni and Giri, while those of the Satluj River are Kiar-Ka-Nal, Gambar, Dabar-Khad, Kuthar-Nadi, and Balad-Nadi. Kaushalaya Nadi is the main tributary of the Ghaggar.

1. **Asni River:** It originates from the Mahasur ridge and, after receiving drainage from the Shimla and Chail areas, passes along the boundary of Solan Forest Division (Kandaghat, Solan, and Chail range) and receives drainage from Karol Dhar, Chail Valley, and forests

on the eastern aspects before joining the Giri River at Gaura, which further flows down to the Yamuna.

2. **Giri River:** The Giri River receives the waters of its tributary, Kawal ka Khal (Surajmukhi Nadi), which in turn receives drainage from the southern slopes of Rajgarh, Shahog Bhadrog main ridge, eastern slopes of Solan, Dagshai ridge, and the northern slopes of the Dagshai-Joharji-Shaya main ridge. It joins the Giri River three kilometers beyond Gaura.
3. **Satluj River:** The northern slopes of Shimla and the western slopes of Shimla-Kareru-Dagshai-Sanawar- Kasauli ridge drain into river Satluj through its various tributaries viz. Kiarkanal, Gambhar, Kutharnadi, Baladnadi etc.
4. **Ghaggar River:** It receives drainage from the southern and eastern slopes of the Kasauli-Dagshai-Joharji-Shaya ridge through its tributary, Kaushallia Nadi, and also receives drainage from most parts of the Ajmergarh and Lugon areas of the Dharampur and Parwanoo ranges.

All These streams draining the area are largely rain fed. The major ones are perennial but the quantity of discharge is low during summer months. Asni and Giri retain perpetual flow of water while Ghaggar, Kaushalya and Gambhar almost dry up before the monsoons. There are sufficient water springs both for drinking and irrigation purposes. A few of these have been tapped and there is a network of drinking and irrigation water supply scheme all over the division.

Chapter 2

Maintenance / Increase in the Extent of Forest and Tree Cover

2.1 Area of forests under different legal classes

The areas included in this plan are the absolute property of the Forest Department, Government of Himachal Pradesh. The forest areas under different legal classes within Solan Forest Division are given in table below:

Table 2.1: Area of forests under different legal classes (RF, DPF, UF)

Range	Reserve Forest		Demarcated Protected Forest		Un-demarcated Protected Forest		Total	
	Previous WP	Present WP	Previous WP	Present WP	Previous WP	Present WP	Previous WP	Present WP
Chail	-	81.868	-	1138.8	-		-	1220.668
Kandaghat	366.0	366.0	420.4	420.4	-	-	786.4	786.4
Solan	406.8	406.8	998.6	1037	26	26	1431.4	1469.8
Subathu	16	16	821.8	821.8	125	125	962.8	962.8
Dharampur	1970.1	1970.1	1896.3	1896.3	-	-	3866.4	3866.4
Parwanoo	1613.6	1613.6	3083.2	3083.2	-	-	4696.8	4696.8
Total	4372.5	4454.368	7220.3	8397.5	151.0	151.0	11743.8	13002.868

There is not a major change in the area of the division with the exception of the Chail Range being added to the division. There is a slight increase of 38.4 ha in Demarcated Protected Forest in Solan Range due to adding of three compartments from Shilly Conservation Reserve, which had 14 compartments. Now, Shilly CR has 11 compartments having an area of 148.4 ha and forms a part of Solan Forest Division which was earlier a part of Shimla WL Division.

Table 2.2: Details of Shilly Conservation Reserve

Range	Name of forest area	DPF	RF	Grand Total
Solan	D108 SShilly C-4	17.2		17.2
	D108 SShilly C-5	14.8		14.8
	D108 SShilly C-6	12.4		12.4
	D108 SShilly C-7	8.4		8.4
	D108 SShilly C-8	5.6		5.6
	D108 SShilly C-9	17.6		17.6
	D108 SShilly C-10	16.4		16.4
	D108 SShilly C-11	16.8		16.8
	D108 SShilly C-12	13.2		13.2
	D108 SShilly C-13	14		14
	D108 SShilly C-14	12		12
	Total	148.4		148.4

The area of 148.4 ha is a part of the Conservation Reserve which will be addressed in the Conservation Management Plan. The notification for Shilly Conservation Reserve is placed at Appendix XIV

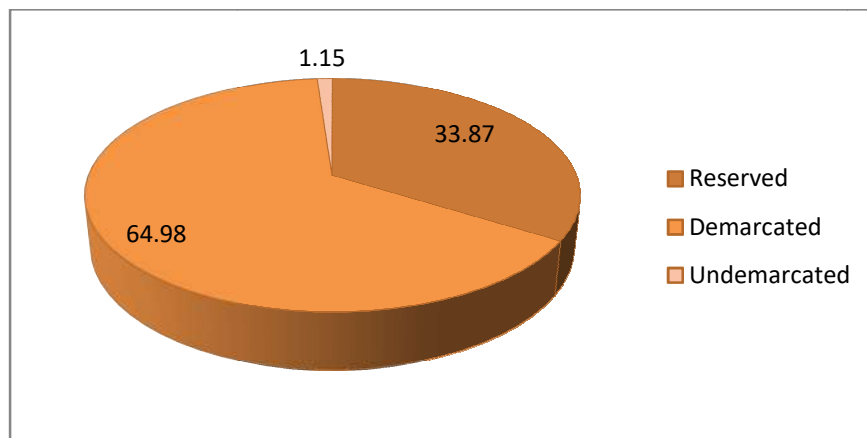


Fig. 2.1: Percentage distribution of class of forest

The following is the detail of the Government distribution of forest in different ranges within Solan Forest Division. The details of notifications are given in the Annexure.

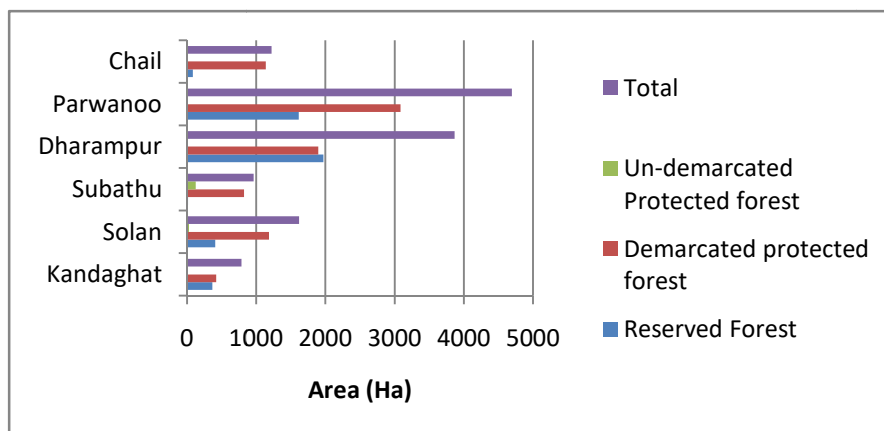


Fig. 2.2: Distribution of the Total area of Solan Forest Division in ranges

Thus, the range having maximum reserve forest area is Dharampur (1970 ha) while the one having minimum is Subathu (16 ha). Parwanoo range has the maximum demarcated protected forest (3083 ha) while Kandaghat has minimum (420 ha). Un-demarcated protected forests are present in two ranges only, namely, Solan and Subathu covering 26 and 125 ha.

2.2 Forest Area under different working circles

Table 2.3: Area under different working circles

Working Circle (WC)	Forest Range-wise area under the Working Circle (ha)						Total	Total in last WP
	Chail	Kandaghat	Solan	Subathu	Dharampur	Parwanoo		
Chil Working Circle	741.6	100	434.6	272.4	2239.1	814.9	4602.6	3840.2
Deodar Working Circle	108.67	2.4	-	-	-	-	111.068	-
Ban-Oak Working Circle	370.4	684	809.2	-	10.6	-	1874.2	1500.8
Protection-cum-Rehabilitation Working Circle	-	-	226	690.4	1616.7	3881.9	6415	6402.8

Apart from overlapping working circles, four main working circles are present in the division, namely, Chil, Deodar, Ban-Oak and Protection-cum-Rehabilitation. The largest working circle under a tree species in terms of area is the Chil working circle, Chil being the most dominant tree species present in the division and encompasses all six ranges. The total area under the Chil circle is to the tune of 4602.6 ha, maximum being in Dharampur (2239.1 ha) and minimum in Kandaghat (100 ha). Ban Oak working circle comes next with 1874.2 ha and being present in 4 out of the 6 ranges, maximum being in Solan (809.2 ha) and minimum in Dharampur (10.6 ha). Deodar working circle spans only 2 ranges, Chail and Kandaghat. However, the PCR circle spans the maximum area of 6415 ha. As compared to the last Working Plan Period, the area under Chil Working Circle has increased by 762.4 ha while that under Ban Oak Working Circle has increased by 373.4 ha. The Area under PCR Working Circle has increased by 12.2 ha. The compartment wise area under the different working circles is appended in Appendix-I

2.3 Percentage of forests with secured boundaries

Boundary pillars play a crucial role in demarcating forest boundaries, preventing encroachments, aiding in administrative clarity, and maintaining ecological security. They are critical physical markers for forest protection, legal compliance, and land management in forest governance. The detailed status of boundary pillars present in the Solan Forest Division is given in the tables 2.4 and 2.5 below:

Table 2.4: Range wise boundary pillars works in respect of Solan forest division

Range	Total Boundary Pillar as per Boundary Register	No. of New B.P. required to be constructed	Intact	Half Broken BP	Fully Broken/ Damaged Boundary Pillar	Missing BP	Total No. of Boundary Pillar
Chail	495	226	0	93	81	95	495
Kandaghat	513	0	320	37	38	136	531
Solan	1261	15	335	193	286	432	1261
Parwanoo	2431	0	2112	199	120	0	2431
Subathu	713	0	212	85	5	411	713
Parwanoo	2343	0	1349	378	266	335	2328
	7756	241	4328	985	796	1409	7759

Table 2.5: Status of repair of boundary pillars in the division

Year of repair	No. of Boundary pillars	Expenditure (Rs)
2011-12	407	1669008
2012-13	165	414192
2013-14	48	120000
2014-15	200	147000
2015-16	0	0
2016-17	0	0
2017-18	0	0
2018-19	503	1257500
2019-20	0	0
2020-21	0	0
2021-22	0	0
2022-23	594	1864200
2023-24	0	0

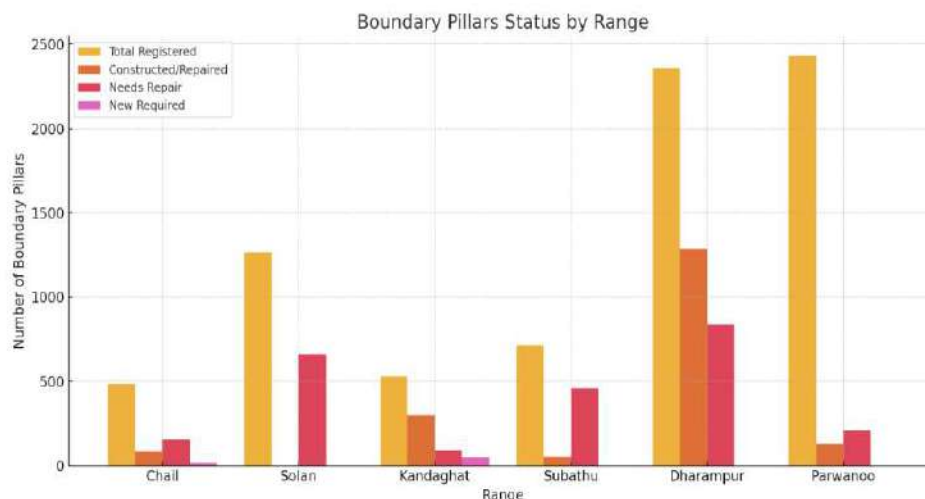


Fig. 2.3: Status of Range wise Boundary pillars, Solan Forest Division

The figure above gives a visual comparison of constructed/repared, repair-needed, and new-required boundary pillars across all the ranges. It is evident that Dharampur and Parwanoo demand continued attention despite substantial progress. Solan and Subathu stand out as priority zones for immediate boundary restoration efforts. Dharampur, having a large area under the working circles and also the maximum area under reserved forests also requires the maximum number of boundary pillars in need of repairs (836).

This data reflects an urgent need for strategic planning and budget allocation to address maintenance of Boundary pillars and support forest protection infrastructure across the division.

2.4 Land Use, Land Use Change and Forestry (LULUCF)

Land Use and Land Cover Change over the period of 2016-2024 in Solan Forest Division, Himachal Pradesh is given in the table below:

Table 2.6: LULC Map and Change Analysis

S. No	Class	Area (in sq km)		
		Year 2016	Year 2024	Change
1	Forest	274.112	308.241	34.129
2	Agriculture	114.708	145.718	31.010
3	Settlement	16.779	20.101	3.322
4	Scrub	146.354	99.606	-46.749
5	Barren	22.725	34.355	11.630
6	Water	33.424	35.290	1.865

Source: GIS Maps of the division

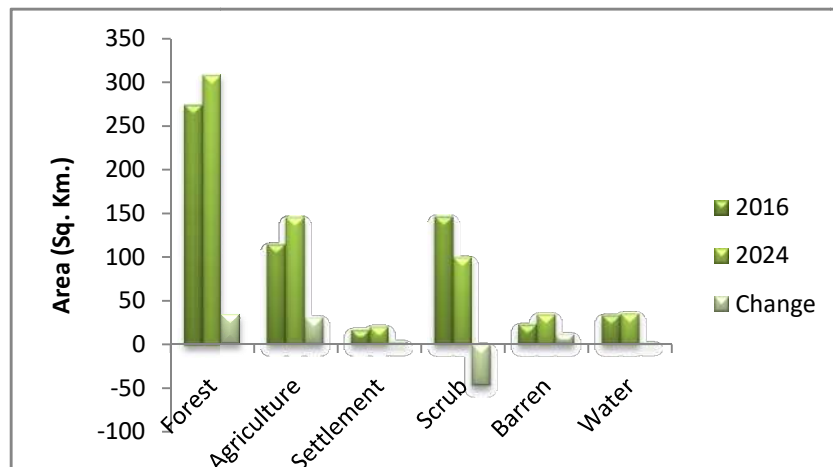


Fig. 2.4: Change in Land Use in Solan Forest Division from 2016 to 2024

Table 2.6 reveals notable shifts in land use and land cover (LULC) in Solan District between 2016 and 2024. The forest area has increased by 34.13 km², from 274.11 to 308.24 km². Agricultural land has also expanded by 31.01 sq km, possibly indicating either intensification or conversion of other land classes into cultivable areas. The settlement area shows a modest but clear growth of 3.32 km², reflecting expanding infrastructure or urbanization. Conversely, scrublands have sharply decreased by 46.75 sq km, likely contributing to the observed increase in forest and agricultural areas. There is also an increase in barren lands (11.63 km²) and water bodies (1.87 km²), which may result from both natural changes and anthropogenic activities such as damming, landslides and fire.

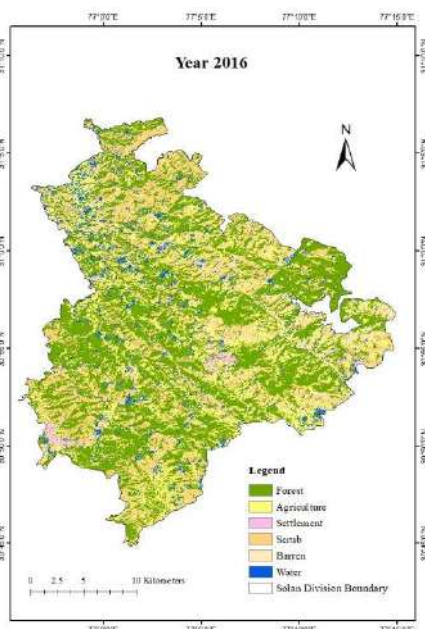


Fig. 2.5 (a): Landuse map, 2016

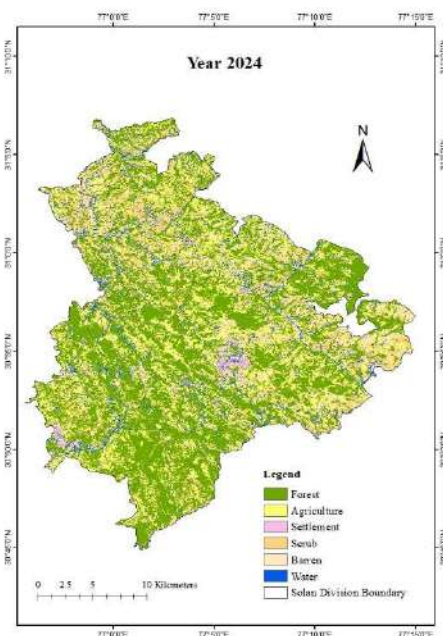


Fig. 2.5 (b): Landuse map 2024

Source: Google Earth Engine

Table 2.7: Abstract of Land Use Change under F.R.A., 2006 from 2016 to 2024-25

Year of Approval	Total cases approved under FRA	Total Area Diverted (ha)
2016-17	3	0.303
2017-18	4	1.4012
2018-19	24	11.0804
2019-20	0	0
2020-21	8	3.9888
2021-22	0	0
2022-23	11	5.991634
2023-24	30	9.5272
2024-25	14	5.8772
Grand Total	93	38.169434

The average area of land-use change per case approved under FRA 2006 was maximum in 2018-19 reaching 11.0804 ha. Range-wise details of Land Use Change under FRA are given in Appendix VII. The trend of diversion of area under F.R.A. shows an almost constant diversion after 2019-20 (when no land was diverted) with a peak in 2023-24 and no diversion in 2021-22. If diversion continues at the same rate, the area affected is likely to increase in future rendering the division with less area under forest land-use. In addition to this, the forests are also affected by grants under TD and free grants to the right holders.

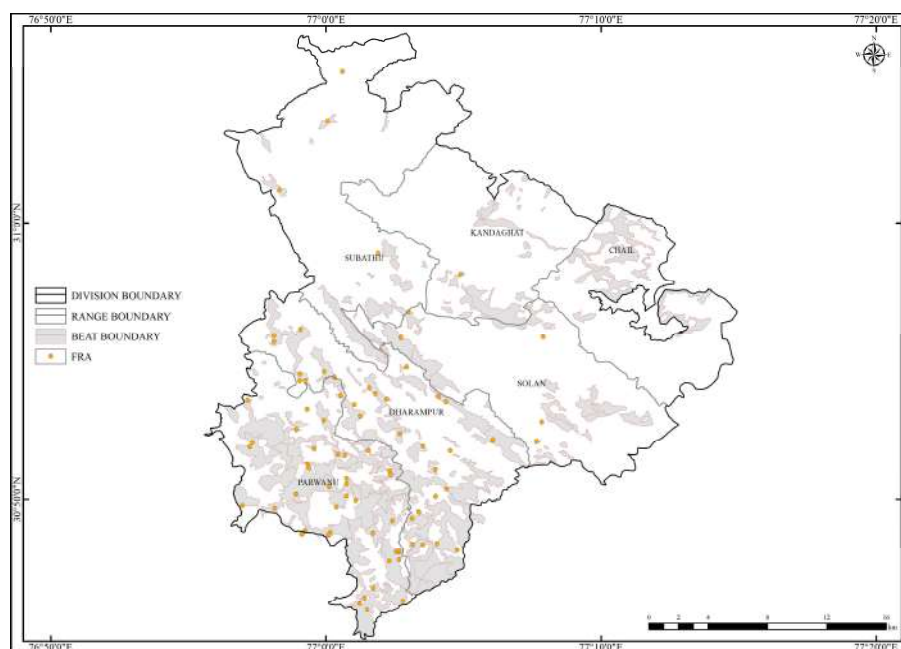


Fig. 2.6: Diversions under FRA

Diversions under FRA often lead to forest fragmentation. The map in figure 2.5 above gives an idea of the fragmentation that has occurred due to diversions under FRA. During this plan period, the approvals under FRA shall take into account the fragmentation and all efforts shall be done to minimize fragmentation. In areas having a high density of fragmentation, approvals under FRA shall be considered on a case to case basis with emphasis on the reason of approval of FRA.

Table 2.8: Abstract of Land Use Change under VSSA (2023) w.e.f. 2012-13 to 2023-24

Year of sanction	Total cases approved under VSSA (2023)	Total Area Diverted (ha)
1981	1	0.54
1983	1	0.88
1984	2	0.346
1987	1	0.972
1988	2	5.88
1990	2	18.833
1993	3	52.059
1995	1	0.21
1999	1	0.11
2000	6	8.4664
2001	2	0.744
2002	1	0.552
2003	2	0.6932
2004	2	2.453
2005	5	2.5334
2006	1	1.176
2007	1	0.99
2008	4	15.4149
2009	6	32.6297
2010	1	0.333
2011	2	4.563
2012	4	7.9857
2013	1	1.72
2015	2	68.373
2016	1	0.1728
2017	1	0.6
2020	2	22.1471
2021	2	16.2513
2022	1	0.98
2023	2	1.9438
Grand Total	63	270.5523

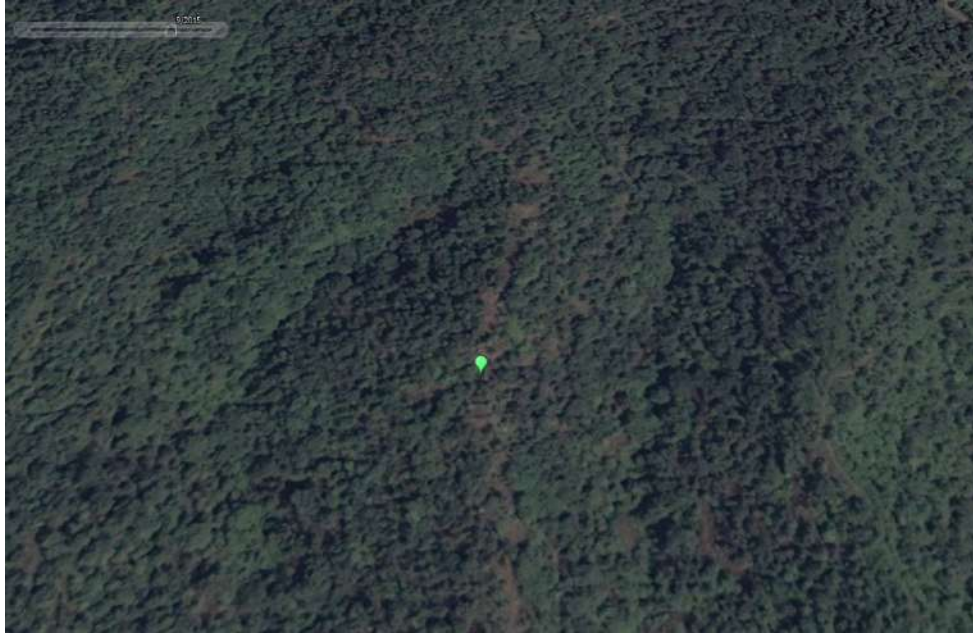
Table 2.8 reflects a longer-term trend of forest land diversion under the Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980. Although total diversions span several decades, a renewed uptick appears post 2015 with 68.373 ha, 2020 with 22.15 ha diverted in 2020, 16.25 ha in 2021, and 1.94 ha in 2023, suggesting that recent development activities are increasingly impacting forest areas.

The expansion in forest cover seen in Table 2.6 appears paradoxical when juxtaposed with the increased forest diversions recorded in Tables 2.7 and 2.8. However, this can be explained by afforestation or plantation drives compensating for degraded or diverted forests, possibly under CAMPA schemes. At the same time, the decline in scrubland suggests transitional conversion, where degraded scrub areas are either officially recorded as forest post-afforestation or converted to agriculture/settlement use.

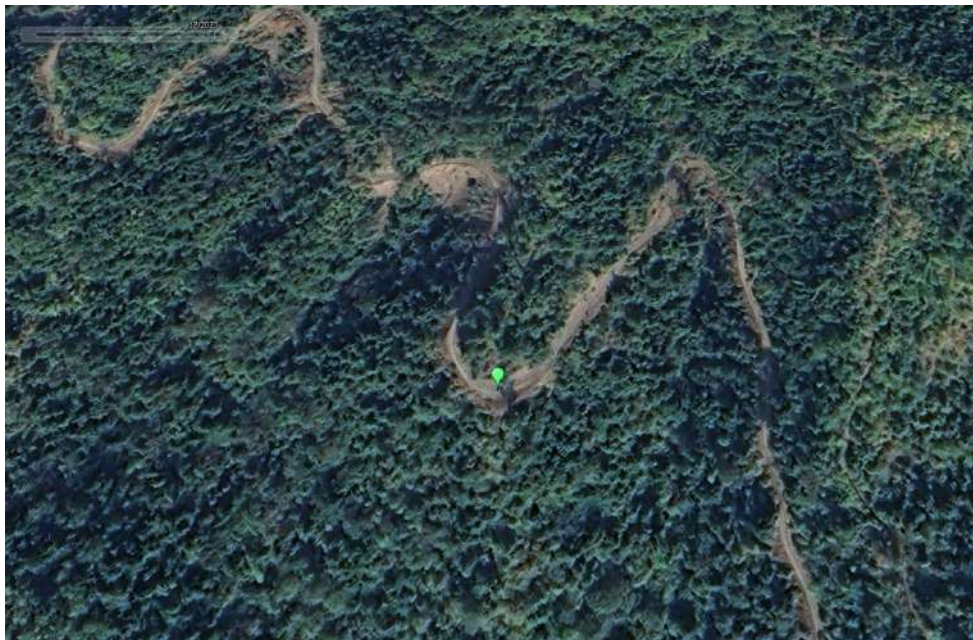
The increase in agriculture and settlement areas correlates with the land diverted under FRA, which often legitimizes traditional agriculture or habitation practices on forest land. Simultaneously, VSSA (2023)-related diversion aligns with infrastructure and utility expansion, such as road building, electricity transmission, and institutional projects. These trends point to a dual driver mechanism: legal recognition of community rights (FRA) and developmental imperatives VSSA (2023) – both contributing to land use changes. These land use transformations are driven by a combination of demographic pressures, infrastructure expansion, agricultural intensification, and policy implementations like FRA and VSSA (2023). While some forest area gains may be due to active plantation or reclassification, the increasing permanent diversions and habitat fragmentation indicate a growing burden on natural forest ecosystems. This can result in biodiversity loss, increased human-wildlife conflict, soil degradation, and hydrological disruptions.

The change in land use from 2015 to 2024 under various categories is given in the satellite images below:

I. Year 2015



I. Year 2024



Observations- Construction of road

II. Year 2015



II. Year 2024



Observations-

- Construction of road
- Loss in forest density

III. Year 2016



III. Year 2024



Observations-

- Construction of road
- Loss in forest density

IV. Year 2015



IV. Year 2024



Observations-

- Construction of road
- Expansion in settlement areas

V. Year 2015



V. Year 2024



Observations-

- Construction/ widening of road
- Expansion in settlement areas
- Reduction in forest density
- Loss of forest area

VI. Year 2015



VI. Year 2024



Observations-

- Construction/ widening of road
- Reduction in forest density
- Loss of forest area

2.5 Threats to the forests

The major threats to the forests in the Division are as follows:

- i. Natural causes
- ii. Man-made causes
- iii. Wild animals and insects
- iv. Plants (Pathogens fungi, etc)

2.5.1. Natural causes

Climatic conditions and their impacts play a significant role in damaging forest crops in Solan Forest Division. These effects can be direct, like wind & heavy rainfall leading to landslides and sheet erosion or indirect, like droughts leading to forest fires. The forests in the lower belt, especially in the Shiwalik hills, are particularly vulnerable due to their dry conditions, steep slopes, and human activities. Moreover, forests in the Dharampur range are dominated by Chil, litter of which contains resin and makes the forests vulnerable to fire.

a) Drought

Drought refers to a significant shortage of rainfall over a period of time, which harms plant growth. In the forests of Solan, droughts severely affect regeneration activities, especially the survival of young seedlings from both natural and artificial plantation efforts. Ban Oak & Chir pine (*Pinus Roxburghii*) seedlings are especially sensitive and often die during long dry spells. According to the India Meteorological Department (IMD), Himachal Pradesh has witnessed an increase in the frequency and intensity of pre-monsoon droughts, which often trigger forest fires.

b) Frost

Frost happens when air temperature falls below 0°C, causing ice to form on plants. This damages the internal tissues of many young plants. In Solan, Khair (*Acacia catechu*) seedlings are particularly vulnerable.

c) Wind

Strong winds and storms are a regular occurrence in some parts of Solan, especially in areas of Chil forests. These storms cause trees to fall, especially Chir pine trees that have been weakened by improper resin tapping methods.

d) Soil Erosion

The Shiwalik hills in Solan are naturally prone to soil erosion due to their steep terrain and fragile geology. This problem is made worse by deforestation, grazing, and poor land use. Different types of erosion sheet, rill, and gully erosion are commonly observed. Sheet erosion affects moderate slopes, while steep slopes are prone to deep gully erosion. This not only washes away fertile soil but also damages root systems and destabilizes the forest floor.

e) Lightning and Snow

Although less frequent, lightning strikes and heavy snowfall can still harm trees. Lightning can cause direct injury to large trees, especially in exposed hilltops, while heavy snowfall may break branches or even uproot trees.

2.5.2 Man-Made causes

These are a major cause of injury resulting in deterioration and degradation of the crop. Man is directly or indirectly responsible for most of the damage. The increasing permanent diversions & habitat fragmentation are the key man made drivers of degradation & deterioration of forest crop.

i) Fire:

The Solan Forest Division has faced a persistent and growing challenge of forest fires over the past thirteen years; primarily in Chir pine (*Pinus Roxburghii*) forests, which are highly susceptible due to their flammable needle litter and even-aged structure. Fire has become a regular seasonal hazard, particularly during dry periods, and is often intensified by dense undergrowth and poor management of combustible materials. The proximity of these forests to human settlements, roads, and railway lines, such as the Kalka-Shimla railway, further exaggerates the risk, turning many compartments into critical fire-prone zones.

From 2012 to 2024, a total of 586 forest fire incidents were reported, impacting an estimated 9767.05 hectares of forest area. As shown in the first graph, fire frequency and area impacted have followed an upward trend, with particularly severe years including 2012-13, 2018-19, 2019-20, 2022-23, and 2024-25. The year 2024-25 stands out with the highest recorded affected area (2099.7 ha) and 82 fire incidents, indicating a significant escalation in both frequency and severity of forest fires in recent times. This is closely followed by 2022-23, which recorded over 1096 ha affected across 73 fire incidents.

The fires have not only caused ecological damage such as destruction of young regeneration, weakening of resin-tapped trees, and promotion of invasive species like *Lantana camara* but have also resulted in economic losses, visualized in the second graph. The year 2022-23 saw an unprecedented damage assessment of ₹43.05 lakh, while 2024-25 recorded over ₹21 lakh in losses. In contrast, earlier years like 2013-14 and 2016-17 reported negligible or no assessed damages, reflecting the increasing intensity of forest fires over time.

Several anthropogenic factors contribute to the ignition and spread of fires. These include negligence by tourists, road and railway workers, and deliberate burning of ghasnis (grasslands) for fodder improvement. Forests adjacent to picnic spots and transportation corridors are particularly vulnerable. Compounding the issue is the deterioration of fire prevention infrastructure—such as fire lines, which are now poorly maintained due to lack of funding. Prescribed burning, though recommended in working plans, is rarely implemented due to financial and logistical constraints. Furthermore, the decline in participation of local communities and right-holders, who are legally obligated to help control forest fires, has weakened traditional fire management systems.

The combination of ecological fragility, lack of institutional capacity, anthropogenic pressures, and increasing climatic variability underscores the high fire vulnerability of the Solan Forest Division. Forests like Sanawar, Gulhari and Kadon, which are often affected by fire due to infrastructure proximity and tourist activities, serve as stark examples of degraded zones with reduced ecological resilience.

To mitigate these risks, a robust and integrated forest fire management strategy is urgently required with immediate funding to implement it in field. This should include:

- Revival and maintenance of fire lines
- Institutionalizing community-based fire watch programs
- Implementation of prescribed control burning
- Introduction of real-time monitoring through GIS and satellite tools
- Public awareness campaigns focusing on fire prevention, particularly in vulnerable zones

The data and visual analysis confirm that without proper funding for strategic intervention, forest fires in the Solan Forest Division are likely to increase in scale, frequency, and impact, jeopardizing both ecological balance and forest-based livelihoods in the region.

Table 2.9: Area affected by Forest Fire from 2012-2013 to 2024-25 (31.12.2024) in Solan Forest Division.

Year/Season	Number of Beat/compart ment affected	Frequency of fires (No. of Fire incidences in a seasons/year)	Total Forest area affected (in ha.)	Fire Sensitive Block	Damage assessed due to forest fire (Rs)
2012-13	25	79	1315.5	11	10000/-
2013-14	6	7	101	4	0
2014-15	9	12	281.3	7	--
2015-16	10	17	279.8	7	--
2016-17	27	48	838.2	9	0
2017-18	21	50	889	8	5,64,610/-
2018-19	33	66	1035.9	11	797000/-
2019-20	30	84	995.5	13	330000/-
2020-21	9	13	220.5	7	150000/-
2021-22	13	52	572.6	8	120000/-
2022-23	13	73	1096.55	10	4305497/-
2023-24	2	3	41.5	2	18776.35/-
2024-25	23	82	2099.7	12	2106505/-

Degree of the effect of forest fires is not high as the fires are mostly ground fires and do not affect the crown. There are very less incidents of crown fires in the division.

ii) Lopping

Lopping is commonly practiced by the local population for various purposes such as collecting fuel-wood, fodder, animal bedding, fencing material, manure, and more recently, stakes for supporting agricultural crops. Although forest rules permit lopping up to one-third of a tree's height from the ground in most forests, this regulation is often disregarded. Despite the existence of guidelines, enforcement remains weak, leading to significant damage to trees.

The impact of such unsustainable lopping is particularly severe in areas dominated by *Quercus leucotrichophora* (Ban Oak) near human settlements, where many forests have degraded into scrubland. Similarly, young *Pinus roxburghii* (Chir pine) forests face excessive lopping pressure, especially for procuring stakes used in vegetable cultivation such as tomatoes and peas. Given that Solan is a major vegetable-producing district in Himachal Pradesh, forests near agricultural zones experience intense pressure.

In the Lugon belt of Parwanoo Range, *Anogeissus latifolia* (Chhal) trees are heavily lopped, resulting in poor natural regeneration due to a decline in their vitality. During winters, migratory graziers also contribute to forest degradation by indiscriminately lopping trees, particularly around their temporary resting sites, thereby compounding the damage.

iii) Encroachments

Encroachment in the Solan Forest Division represents a significant anthropogenic pressure, primarily driven by the area's high connectivity through road networks, including a major stretch along the National Highway. This accessibility has catalyzed widespread encroachments, especially along roadsides, where forest land is increasingly being usurped for commercial activities. Additionally, small patches of forest area have been occupied illegally for agricultural purposes by adjoining private land owners. Such encroachments are not merely physical intrusions but are often compounded by systemic issues, particularly discrepancies in land ownership and dual entries in revenue records. These discrepancies have led to several legal disputes currently being adjudicated, involving compartments such as D-114 Kathni ki Daar, R-54 Karardev, D-62 Bisha, and D-126 Manlog Bhagat.

An analysis of the latest legal data (Appendix-XVI) reveals that as of 31st January 2025, a total of eight encroachment cases covering an aggregate area of 4.120 hectares are under litigation before various judicial authorities. Notably, none of these cases have seen implementation of eviction orders so far, which underscores the procedural delays and complexities in resolving forest land encroachments. These pending cases not only stall forest regeneration and protection efforts but also expose the administrative and legal challenges in addressing unauthorized occupation. The cumulative impact of such man-made encroachments is degradation of forest ecosystems, fragmentation of wildlife corridors, and loss of ecosystem services, thereby posing a significant threat to the ecological integrity of the Solan Forest Division.

iv) Grazing

Grazing is widely prevalent across most forest areas of Solan Forest Division and continues throughout the year, except in some *Quercus leucotrichophora* (Ban Oak) forests that remain snow-covered during winters. However, the unregulated and unrestricted nature of this activity

has adversely impacted the forest ecosystem, particularly the ground vegetation. In *Pinus roxburghii* (Chir pine) forests, the combined effects of heavy trampling, grazing, browsing, and soil compaction have severely hindered natural regeneration.

Bamboo forests are among the worst affected. The young bamboo shoots (manus), which emerge during the monsoon season, are frequently grazed by cattle before they can mature. This not only reduces the productivity of the area but also causes clump congestion. Similarly, past fellings in ban Oak forests have not resulted in adequate coppice regeneration due to intense grazing pressure.

The condition of scrub forests is also alarming. The spread of invasive species such as *Lantana camara* has further reduced the availability of palatable fodder. Whatever limited fodder remains is heavily grazed, leading to the complete absence of regeneration of valuable broad-leaved species.

To some extent Joint Forest Management Committees (JFMC's) in the region are protecting the plantation areas from grazing. The local communities, under JFM are regulating open grazing which will help promote natural regeneration and restoration of forest health in the Solan Forest Division. As most of the pasture lands are in common areas known as *Shaamlat*, it become important to include the Department of Animal Husbandry in efforts to develop pasturelands in order to prevent the cattle grazing inside forests, thereby leading to reduction in exploitation of forest resources and reducing forest degradation.

v) **Resin tapping**

Between 2012 and 2023, the resin extraction activities in the Solan Forest Division reveal a steady increase in the number of blazes tapped each year, rising from 31,634 in 2012 to 54,507 in 2023. While the total resin yield also increased proportionally—from 1,200.40 quintals in 2012 to 2,329.24 quintals in 2023—the yield per 1,000 blazes showed only modest improvement, fluctuating between approximately 38 and 44 quintals. This indicates that despite expanding operations, the per-tree productivity has remained relatively constant. Also the cost of resin extraction, which escalated significantly from ₹584.91 per quintal in 2012 to ₹1,574.16 in 2023 with a notable peak of ₹1,908.53 in 2020 in contrast, the royalty per quintal has remained relatively stagnant, indicating diminishing economic returns. Together, these trends underscore the long-term consequences of unsustainable resin tapping, emphasizing the urgent need for adopting improved techniques, implementing regulated tapping cycles, and integrating fire prevention strategies to ensure ecological and economic sustainability of resin operations in the region.

Table 2.10: Resin extraction from the forests of Solan Forest Division

Year	Blazes Tapped	Resin Yield (Q)	Yield per 1000 Blazes	Royalty per Blaze (Rs)	Extraction Cost per Quintal (in Rs)
2012	31634	1200.4	37.95	50	584.91
2013	33746	1306.46	38.71	58.78	811.18
2014	32332	1257.62	38.9	75.3	783.67
2015	42330	1644.86	38.86	65	899.91

2016	46270	1811.93	39.16	51	913.27
2017	47497	2086.3	43.92	50	1559.24
2018	46875	1907.46	40.69	42	1256.41
2019	45923	1880.19	40.94	43	1784.28
2020	48218	1843.23	38.23	46	1908.53
2021	51268	2007.46	39.16	75	1877.91
2022	52977	2166.28	40.89	72	1421.07
2023	54507	2329.24	42.73	54	1574.16

Source: HPSFDC Solan

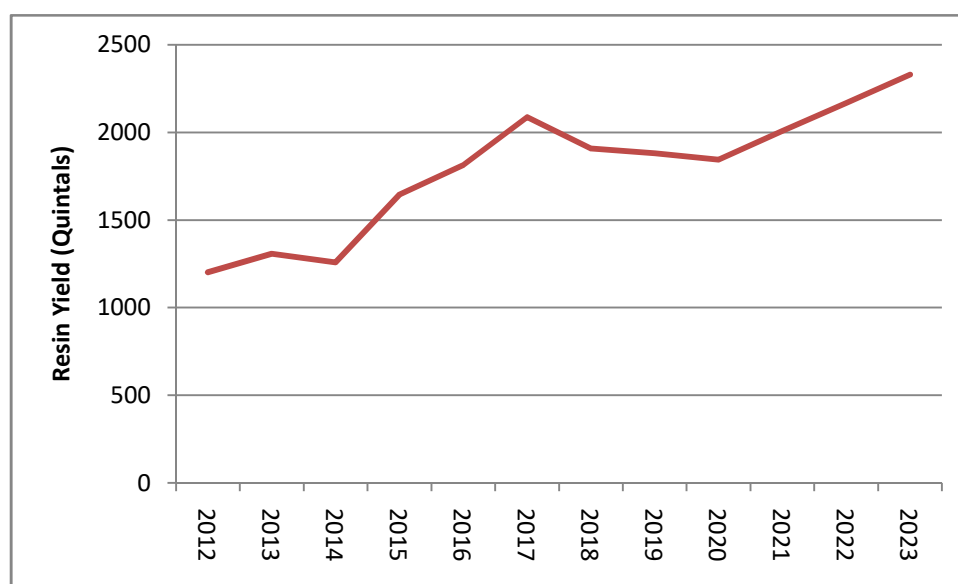


Fig. 2.7: Trend in Yield of Resin from Solan Forest Division

vi) Development works

Development works like construction of roads, transmission lines, and diversion of land for other non-forestry purposes are also responsible for reduction in area under forests. In addition to the diversion of land, construction of roads etc. involves removal of trees and triggers landslides and increases vulnerability to soil erosion.

2.5.3 Animal and Insects

a) Wild animals

Wild boars dig up the bamboo rhizomes and eat them up causing considerable damage to the bamboo clumps. They also eat up the new shoots of bamboo (Manus) and thereby hamper the proper development of the clump. Porcupines also eat up the roots of young plants of Chil and cut off the young broad-leaved saplings at the base in plantations. Monkeys and langurs are a menace in many Chil areas e.g. Bauhli and Chiroitiki Dhar and are responsible for uprooting the seedlings of Chil.

b) Insects

Oaks are subjected to severe attack by defoliators especially in the Jaunaji belt in early summer. Cockchafer grubs are a great nuisance and cut off seedlings flush to the soil surface in nurseries. Table 2.8 below details the insect pests found on tree species in the division.

Table 2.11: Insect pests of trees in Solan Forest Division

Species	Common Name	Family	Host Plant	Status
<i>Dioha balusca</i>	Defoliator	Chrysomellidae	<i>Celtis australis</i>	Serious
<i>Curculio sikkimensis</i>	Borer	Curculionidae	<i>Quercus leucotrichophora</i> (Acorn)	-do-
<i>Sitophilus glandium</i>	Borer	-do-	-do-	-do-
<i>Hypsipyla robusta</i>	Borer	Pyrallidae	<i>Toona ciliata</i>	-do-
<i>Apriona cinerea</i>	Borer	Cerambycidae	<i>Populus deltoides</i>	-do-
<i>Chrysomella populi</i>	Defoliator	Chrysomellidae	<i>Populus</i> spp.	-do-
<i>Plagioderma versicolora</i>	Defoliator	-do-	<i>Populus</i> and <i>Salix</i> spp.	-do-
<i>Dioryctria obeitella</i>	Borer	Pyrallidae	Conifers (seeds and cones)	-do-
<i>Pareba vestanumella</i>	Defoliator	Nymphalidae	<i>Debregezia hypoleuca</i>	-do-
<i>Melacosoma indica</i>	Defoliator	Lasiocampidae	<i>Pistacea integerrima</i> and other broad leaved spp.	-do-
<i>Dinoderu</i> spp.	Defoliator	-	<i>Dendrocalamus strictus</i>	-do-
<i>Heteropsill acubana</i>	Sucking	Psillidae	<i>Leucaena leucocephala</i>	-do-
<i>Holotrichia</i> spp	Soil	Scarabaeidae	<i>Polyphagus</i> nursery pest	Sometimes Serious
<i>Brahmina</i> spp.	Soil	-do-	-do-	-do-
<i>Agrotis</i> spp.	-do-	Noctuidae	-do-	-do-

2.5.4 Climbers

Bauhinia vahli is found extensively in the lower regions of Parwanoo and Dharampur ranges and is responsible for suppression and even death of trees in the forests. The other climbers causing damage to forest crop are *Rosa moschata*, *Vitish malayana*, *Smilax parviflora*, *S. aspera*, *Cuscuta reflexa* etc.

2.5.5 Fungi

Some fungal damage is noticed both in the forests and the nurseries. A few diseases and their pathogens are mentioned below:

A. Chir Pine

- i. Damping off and root rot: *Pythium*, *Fusarium* and *Rhizoctonia* are important fungi causing damping off and root rot in Chir pine. These fungi are soil inhibitors and not specialized to any specific host. They attack germinating seed and seedlings in the collar region. In root rot, the attack is on the tap root and secondary roots.
- ii. *Dothistroma* blight: The causal fungus *Dothistroma pini* infects and kills needles. Yellow and tan spots develop on the needles which later turn reddish brown, the ends of infected needles turn light green, tan and brown but the base of the needles remains green.
- iii. Seed decay: Many fungi such as *Aspergillus*, *Alternaria*, *Chaetomium*, *Stachybotrys* and *Stemphylium* infest the stored seed of Chir pine.

B. Oaks

- i. Heart Rots – The following heart rot fungi infecting various Oak species have been reported from the division *Phellinus* spp and *Dichomitus* spp.
- ii. Hypoxylon canker – *Hypoxylon mullerii* and *Hypoxylon rubiginosum* form cankers on branches.

Besides these, fungi causing wood decay and infecting leaves have also been reported.

C. Bamboo

Following fungi have been reported on the leaves and stems of bamboo in the division- *Alysidium resinae*, *Arthrinium phacospermum*, *Ceratocladium dendrocalami*, *Dasturella divina*, *Dictyoarthrinium sacchari* etc. but none of these is as serious as to warrant control measures.

D. Broad-leaved species

Occurrence of the below mentioned fungi is reported on broad-leaved species

Table 2.12: Fungi found on broad leaved tree species

Poplar:	Rust- <i>Melampsora ciliata</i>
	Leaf spot- <i>Cladosporium humile</i>
	<i>Alternaria alternata</i>
	Root rot- <i>Dematophora necatrix</i>
Willow:	Dieback - <i>Cytospora chrysosperma</i>
Robinia:	Powdery mildew- <i>Erysiphe polygoni</i>
Albizzia:	Rust- <i>Ravenelias</i> pp.

2.6 Description of Forest type in Solan as reported by FSI (Forest type Atlas) Description from Champion and Seth (1968)

2.6.1 General Description

The Solan Forest Division, comprising six ranges—Chail, Kandaghat, Subathu, Dharampur, Parwanoo, and Solan—exhibits a wide altitudinal variation from 500 m to 2250 m, resulting in a diverse composition of forest types. Forests range from dry scrub and bamboo types in the lower elevations to Chir pine and Ban Oak forests in the upper reaches. Dense, compact forest blocks are largely absent due to significant human presence, and the landscape is often fragmented by habitations and agricultural fields. The division experiences high biotic pressure, which has altered the natural forest structure and regeneration dynamics. Many areas are in a degraded state, dominated by shrubby growth or young regenerating stands, especially in Chir forests where green felling ban have led to irregular stocking and natural regeneration in canopy gaps. Transitional zones (ecotones) commonly feature a mix of broad-leaved and coniferous species.

a) Scrub Forests

Scrub forests are found predominantly in the lower altitudes of Parwanoo, Dharampur, and Subathu ranges. These forests generally lack commercial timber species and are composed of hardy, drought-resistant vegetation. Common species include Jhingan (*Lannea coromandelica*), Chhal (*Ehretia laevis*), Pula (*Butea monosperma*), Kainth (*Pyrus pashia*), Amaltas (*Cassia fistula*), Kamal, and Amla (*Phyllanthus emblica*). These forests are often open and degraded due to grazing, fuelwood collection, and encroachment.

b) Bamboo Forests

Bamboo forests are restricted to the lower reaches of Parwanoo and Dharampur ranges, especially along the Kaushalya and Ghaggar river tributaries and near the Haryana border around Parwanoo township. These forests occur either in pure patches or interspersed with miscellaneous broad-leaved species. Due to their riverine location, they are ecologically significant for soil stabilization and local livelihoods but are under pressure from grazing and local extraction.

c) Chir Forests

Chir pine (*Pinus roxburghii*) forests are widely distributed across all six ranges—Chail, Kandaghat, Subathu, Dharampur, Parwanoo, and Solan—and generally occur in pure stands. In transitional zones, Chir may be interspersed with broad-leaved species at lower altitudes and ban Oak at higher elevations. These forests have historically been used for timber and resin extraction, and the twigs are locally used as vegetable stakes in agriculture. Due to the ban on green felling, these forests were not worked in the previous working plan period, leading to the emergence of younger age classes in canopy gaps created by salvage removals or right-holder demands. Consequently, much of the Chir forest has reverted to an irregular structure with active regeneration.

d) Oak Forests

Ban Oak (*Quercus leucotrichophora*) is the only Oak species found in the Solan Forest Division and forms compact forests mainly in the Solan, Kandaghat, and Chail ranges, with sparse occurrences in the Dharampur range. Oak forests were once extensively harvested for fuelwood and charcoal, but all such exploitation has now been prohibited. These forests are vital for ecological stability due to their moisture-retention ability, soil binding capacity, and rich understory vegetation. However, high grazing pressure and biotic interference have hampered natural regeneration in many areas.

e) Deodar Forests

Deodar (*Cedrus deodara*) forests are present in this division but exist in isolated patches, particularly in Chail and Kandaghat ranges. These plantations are limited in extent and do not form a significant component of the forest composition in Solan.

2.6.2 Locality Factors

The forest distribution and composition in Solan Forest Division are greatly influenced by altitudinal gradient, soil moisture, and human intervention. The climate transitions from sub-tropical in the lower regions to temperate in the higher altitudes. Forest types change notably with even slight variations in topography or soil conditions scrub forests dominate drier aspects, while Chil and Oak forests are more prominent on moist and shaded slopes. The terrain and soil depth also control the presence of specific forest types, while human activity, including grazing, fuelwood extraction, and encroachment, has significantly altered natural succession and canopy structure. Degradation has led to the dominance of large shrubs and small tree species like *Nyctanthes arborescens* in many areas, making it difficult to distinguish natural transitional forms from human-induced changes.

2.6.3 Composition and condition of the crop

According to the "Revised Survey of the Forest Types of India" by Champion and Seth (1968), the following types and Sub-types are found in the Solan Forest Division.

Table 2.13: Forest Types of Solan Forest Division

Group/ Type	Name of the forest
a) Group 5	Tropical dry deciduous forests
Sub-group 5B	Northern tropical dry deciduous forests
Type 5B/C2	Northern dry mixed deciduous forest
Degradation stages of tropical dry deciduous forests	
5B/DS1	Dry deciduous scrub
5B/E9	Dry bamboo brake
b) Group 9	Tropical Pine forests
Sub group C1	Himalayan sub-tropical pine forest
Type 9/ Cla	Lower or Shiwalik Chir pine forest
Type 9/ C1b	Upper or Himalayan Chir pine forest

Degradation stages of Tropical Pine forests	
Type 9/ DS1	Himalayan sub-tropical scrub
Type 9/ DS2	Degraded Chir pine forest
c) Group 12	Himalayan Moist Temperate Forests
Sub-group C1	Lower Western Himalayan temperate forest
Type 12/Cla	Ban Oak forest (<i>Quercus leucotrichophora</i>)
Type 12/ Cla/ DS1	Oak scrub
Type 12/C1c	Moist Deodar Forest (<i>Cedrus deodara</i>)

The distribution, locality factors and general characteristics of these forest types is as under:

1. Type 5B/C2 – Northern Dry Mixed Deciduous Forests

Description:

These forests are dominated by broad-leaved deciduous species of generally poor quality, with short boles and heights typically under 15 meters. The forest is open and poorly stocked, although some better pockets exist in favorable sites. Species of limited economic value predominate, with *Anogeissus latifolia* being the most prominent, often forming near pure stands on southern slopes. However, due to extensive lopping, this species has degraded significantly, resulting in poor seed setting and inadequate regeneration. The under-story comprises shrubby vegetation, including xerophytic evergreens, with widespread infestation of *Lantana camara*. During dry summer months, these forests appear barren and leafless, whereas the monsoon season revitalizes them with lush herbaceous growth. Regeneration is generally unsatisfactory, with middle to mature age classes dominating, and biotic pressure contributing to forest degradation.

Distribution and Locality Factors:

These forests are found throughout the dry lower elevations of Solan Forest Division, particularly in the lower reaches of Parwanoo, Dharampur, and Subathu ranges, up to 1300 meters. Annual rainfall ranges from 900 mm to 1500 mm. The geology comprises sandstone and conglomerates, with sandy and erosion-prone soils. A long, hot, dry season characterizes this zone.

2. Type 5B/DS1 – Dry Deciduous Scrub

Description:

This forest type consists primarily of low, shrubby growth ranging from 3–6 meters in height, with scattered, stunted tree species. Vegetation is heavily degraded, usually many-stemmed from the base, and typically thorny and unpalatable, including species like *Carissa* and *Dodonaea*. The presence of a thin, patchy grass layer is common. Tree cover is minimal and often reduced due to recurrent fires, felling, lopping, and overgrazing. Bamboo is occasionally present in some areas, but it does not form dense stands.

Distribution and Locality Factors:

These forests are mainly found in the Lugon and Parwanoo blocks of Parwanoo range, as well as in Subathu range. They occur in the dry deciduous forest zone, and their current degraded condition is largely due to anthropogenic influences. Originally capable of supporting low tree growth, these areas now present stunted, shrubby vegetation because of persistent biotic pressure and environmental degradation.

3. Type 5B/E9 – Dry Bamboo Brake**Description:**

This forest type is defined by the dominance of *Dendrocalamus strictus*, which grows in dense, low brakes up to 7 meters tall. Bamboo clumps may occur as pure patches or mixed with deciduous trees and thorny shrubs. Over-wood, when present, includes hardy dry deciduous tree species. Clumps are typically congested due to poor working, and regeneration is limited as new bamboo shoots are trampled or grazed. Quality varies by site, with the best quality bamboo found in the Lugon block and Joharji block, while other areas like Parwanoo show lower-quality growth.

Distribution and Locality Factors:

Confined to the lower slopes of mainly Parwanoo range and some areas of Dharampur range, particularly in the catchments of the Ghaggar and Kaushalya rivers. Rainfall is about 900 mm, with prolonged dry periods. The soil is sandy, shallow, and stony. Bamboo brakes develop predominantly on dry hillsides or alluvial areas, where biotic pressure is high.

4. Type 9/C1a – Lower Siwalik Chir Pine Forest**Description:**

This forest type is dominated by *Pinus roxburghii*, occurring mostly in pure stands with sparse under-story. Associated deciduous species are found in cooler depressions. Fire is a frequent and influential factor, preventing the development of a shrub layer and impacting tree form, often resulting in twisted fibre. Regeneration is generally satisfactory, except in areas impacted by overgrazing and soil compaction. During monsoons, grass thrives, but in the dry season grasslands become devoid of grasses.

Distribution and Locality Factors:

Spread across all ranges of Solan Forest Division, Solan, Kandaghat, Subathu, Dharampur, and Parwanoo between elevations of 1180–1700 m. Soils are shallow to moderately deep and sandy, with rainfall between 900–1000 mm. Southern aspects typically lack this forest due to harsh conditions.

5. Type 9/C1b – Upper or Himalayan Chir Pine Forest

Description:

This type represents a higher elevation Chir pine forest, mostly consisting of *Pinus roxburghii*, with sparse second-storey broad-leaved associates like *Quercus*, *Rhododendron*, and *Myrica*. Fire incidents are relatively less frequent but still significant. On higher elevations and northern aspects, Chil is sometimes found mixed with deodar. Regeneration is not difficult, though shrub growth and fire can hinder it. The forest exhibits a more open canopy and develops best in areas with reduced fire impact.

Distribution and Locality Factors:

Occurs in the Bisha block of Kandaghat range and also in some areas of Chail range between 1200–1800 m elevation, overlapping lower tropical forests and extending into temperate zones. Rainfall ranges from 900–2000 mm. Fires and grazing influence forest composition.

6. Type 9/DS1 – Himalayan Subtropical Scrub

Description:

This forest type represents degraded remnants of Chir pine or deciduous forests, now reduced to open shrub formations due to shallow soil and harsh dry conditions. The overwood is absent or significantly diminished. Shrubs like *Carissa*, *Dodonaea*, and *Rhus* dominate, with vegetation shaped by both edaphic and biotic pressures.

Distribution and Locality Factors:

Found in degraded parts of Subathu, Dharampur and Parwanoo ranges. This type often marks transitions between pine and deciduous forests. It occurs on excessively dry, shallow soils.

7. Type 9/DS2-Degraded Chir pine forest

Description: This forest type characterized by the dominance of *Pinus roxburghii* (Chir Pine) in a deteriorated condition, likely due to human activities like logging or grazing, resulting in a less dense canopy and possibly an understory of more hardy, shrubby vegetation.█

Distribution and Locality Factors:

Found in degraded parts of Parwanoo range.

7. Type 12/C1a – Ban Oak Forest

Description:

This is a climax forest type composed mainly of *Quercus leucotrichophora*, often forming a closed canopy up to 20–25 m high. Due to biotic pressure especially lopping and grazing many forests are open, with gnarled and stunted trees. Undergrowth may include *Rhododendron*

arboreum, ferns, shrubs, and mosses. Regeneration is constrained by human activities, and fires from lower pine zones have contributed to the contraction of Oak forests.

Distribution and Locality Factors:

Present in Solan, Kandaghat, Chail and parts of Dharampur ranges between 1500–2300 m, often overlapping with Chir pine forests. Well-drained, humus-rich soils are typical. Oak descends lower on northern aspects.

8. Type 12/C1/DS1 – Oak Scrub

Description:

This represents heavily degraded ban Oak forests, where intense lopping and grazing have converted the area into low scrub dominated by *Berberis* spp., *Prinsepia utilis*, and occasionally *Rhododendron*. Soils are often eroded or completely denuded. These forests are typically located near human habitations.

Distribution and Locality Factors:

Found in Solan, Kandaghat & in some patch of Dharampur ranges. This type is a result of prolonged anthropogenic stress on Oak forests.

9. Type 12/C1c – Moist Deodar Forest

Description:

The Moist Deodar Forest is a temperate coniferous forest type, typically characterized by near-pure stands of *Cedrus deodara*. These forests are known for their tall, straight boles and moderately dense canopies. Tree heights generally range between 30 to 40 meters. Although predominantly deodar, these forests frequently include minor associates such as blue pine (*Pinus wallichiana*), spruce (*Picea smithiana*), and scattered Oak species like *Quercus dilatata* and *Quercus leucotrichophora*, especially on cooler aspects or in moist niches. The under story is often composed of *Rhododendron*, *Lonicera*, and *Viburnum*, with shrub layers varying based on grazing intensity. Moist deodar forests support diverse flora, including climbers like *Rosa moschata* and *Jasminum officinale*, and a rich epiphytic flora of mosses, ferns, orchids, and lichens especially in the monsoon season.

Distribution and Locality Factors:

Though not widespread, Moist Deodar Forests occur in isolated pockets of the Solan Forest Division, particularly in the Chail range and upper elevations of the Kandaghat and possibly in Barog ridge of Dharampur range, where altitude and climate conditions favor their growth. These forests are generally found between 1,700 and 2,500 meters, extending lower on shady, north-facing slopes and higher on exposed ridges. The typical rainfall range is between 1,100 to 1,800 mm, often with moderate winter snowfall, which is crucial for seed germination and forest health.

Soils in these forests are generally well-drained, often derived from rocky limestone formations, particularly on steep slopes. Moisture retention, moderate humidity, and a distinct winter season with cold temperatures are critical for sustaining this forest type. However, moist deodar forests avoid excessively wet outer ranges and do not thrive in high monsoon rainfall zones. They are often susceptible to fires, especially from adjoining Chir pine or blue pine zones below, with young plantations being particularly vulnerable. Heavy grazing pressure is a persistent issue, although moderate grazing may not significantly hinder regeneration if managed properly.

Exotics:

Extensive afforestation has been carried out in the division, ever since its inception. Species planted have been indigenous local species and some exotics also which have been introduced in the area on large scale on experimental basis. The most common exotic found in the division is *Eucalyptus globulus* (Safeda) and its hybrids. It was first planted somewhere in 1970s and has shown variable results. This was planted all over the division except for the Chail and Kandaghat ranges. Plantations of eucalyptus in most of the areas have shown mixed results, with the trees putting on poor height and diameter growth in areas of Dharampur where as tall and sturdy growth in Subath. Some of the fast-growing exotics found in the division are *Leucaena erucecephala* (Subsbool), *Robinia pseudoacacia*, which have been found suitable for fuel and fodder and have been extensively planted in the division, though even *Leucaena* has not exhibited encouraging results. *Ailanthus excelsa* and *Broussonetiapa pyrifera* have been good soil binders and are very fast growing. A lot of fundamentals have been introduced along the road sides as avenue trees and the more common categories are *Jacaranda mimosafolia*, *Delonix regia*, *Teco mastans*, *Campsis grandiflora*, *Grewellia robusta*, *Callistemon citrinus*, *Salix alba*, *Acacia mollissima*, etc.

2.7 Tree cover outside forest area

While making biennial assessment of land-use and forest cover, Forest Survey of India also assesses changes in trees outside forests using Satellite imageries for appropriate period. However, the data from the six ranges of the division were also provided to FSI in prescribed formats. The details of the Trees outside Forests are given in chapter 18 of part 2.

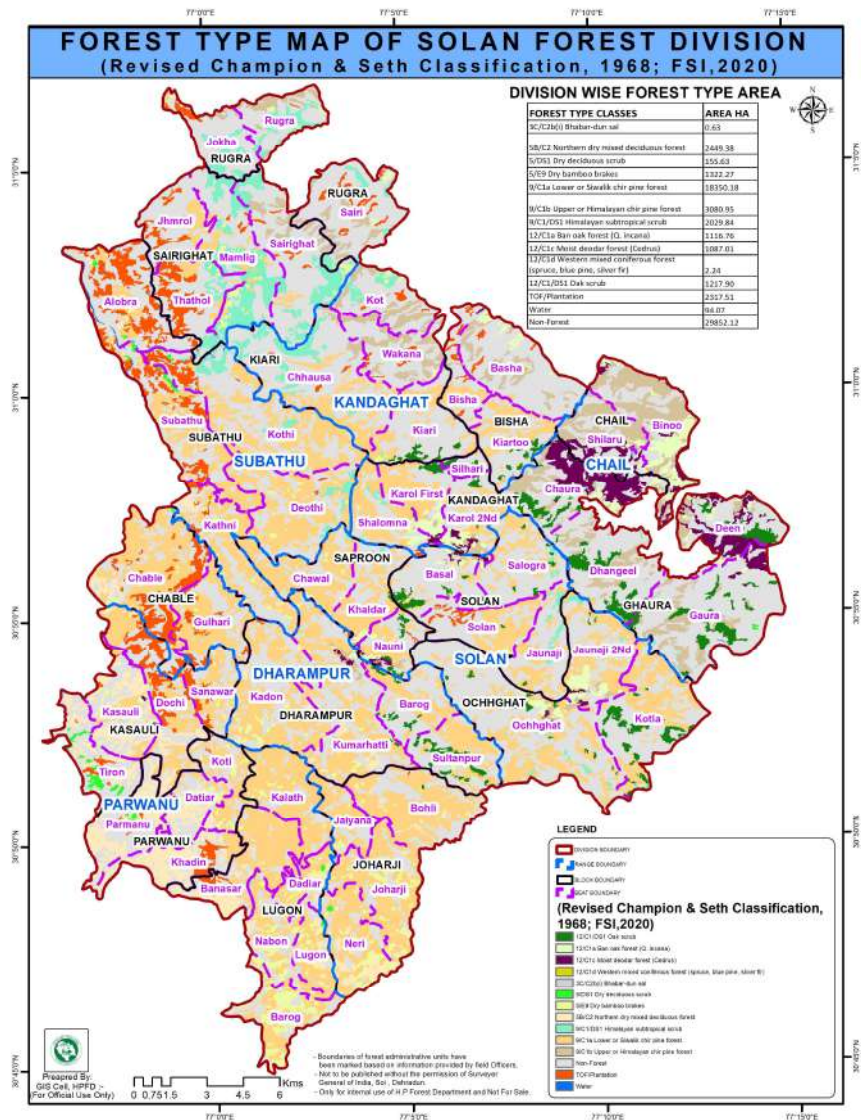


Fig. 2.7: Forest Type Map of Solan Forest Division

Chapter 3

Maintenance, Conservation and Enhancement of Biodiversity

3.1 Forest Composition and Distribution

The forests of Solan Forest Division are predominantly sub-tropical in nature, with patches of temperate vegetation occurring at higher elevations, particularly in the Chail and Kandaghat Ranges. Chir pine (*Pinus roxburghii*), locally known as Chil, is the most dominant species in the division, forming extensive pure stands on dry slopes and southern aspects. Moist and shaded valleys support a diverse assemblage of broad-leaved species such as *Quercus leucotrichophora* (Ban-Oak), *Myrica esculenta* (kaphal), and *Rhododendron arboreum*, while lower slopes and riverine areas with clayey soils are characterized by the presence of *Acacia catechu* (Khair) and *Toona ciliata*. Forests in the Subathu and Parwanoo Ranges exhibit degraded forms of dry deciduous and scrub vegetation due to intense biotic pressure and the proximity of human settlements. The composition and distribution of these forest types are significantly influenced by aspect, elevation, topography, soil conditions, and anthropogenic disturbances. Chir pine typically thrives on shallow, well-drained soils and steep terrain; whereas oak and other associated broad-leaved species are confined to cooler, moister northern aspects. However, natural regeneration across most forest types, particularly those dominated by *Quercus* and *Toona*, remains poor due to persistent grazing, lopping, illicit felling, frequent forest fires, and policy-driven restrictions on silvicultural interventions. A substantial portion of these forests lies within ecotonal or tension zones, where transitional features between forest types result in mixed species compositions that do not align neatly with the classification system proposed by Champion and Seth (1968), especially in disturbed or degraded areas.

3.1.1 Methodology adopted for Tree Enumeration

Enumeration of trees and vegetation was done by undertaking a field survey of the forest area of the division. The Primary Sampling Units (PSUs) comprised of quadrats of size 0.1 ha. The area was stratified using forest type as a criterion. A stratified random sample of 552 quadrats was selected. The sample size was estimated for 90% confidence level and 10% relative error taking costs and time into consideration. The exclusion criterion of the PSU's was their accessibility.

3.2 Plant Species Diversity

Species diversity is widely regarded as a key indicator of ecological variation within forest ecosystems. It refers to both the variety (number of species) and the abundance (number of individuals) of species within a given area. Forest ecosystems that exhibit higher species diversity tend to be more resilient and stable in the face of natural disturbances, as they encompass a broader range of functional traits. These traits enhance the ecosystem's ability to maintain essential functions and recover from stress. Thus, understanding species diversity is critical to take informed decisions forest management and conservation planning. To evaluate plant species diversity across the different working circles, a stratified random sampling approach was followed. The methodology involved the use of Grid and Quadrat Sampling. During enumeration, data on the number of individuals of each species and the diameter at breast height (d.b.h.) were recorded. These primary data were then used to compute several secondary

ecological metrics, including Basal Area, Density, Frequency, Importance Value Index (IVI), and the Shannon-Weiner Diversity Index.

3.2.1 The Importance Value Index (IVI)

IVI is a comprehensive measure that reflects the ecological dominance of a species within a forest community. It is calculated by summing up three key relative metrics: frequency, density, and basal area, as shown below:

$$\text{IVI} = \text{Relative Frequency} + \text{Relative Density} + \text{Relative Basal Area}$$

- **Frequency** indicates how commonly a species appears across all sampled plots. It is determined by dividing the number of plots in which a species occurs by the total number of plots. The Relative Frequency is expressed as a percentage of the total frequency of all species.
- **Density** refers to the average number of individuals of a species per plot. Relative Density is calculated by comparing the species' density with the cumulative density of all species and expressing it as a percentage.
- **Dominance** is assessed using the Basal Area, which quantifies the cross-sectional area of tree stems at breast height. The Relative Basal Area expresses this measure as a proportion of the total basal area of all species, multiplied by 100.

Together, these parameters provide an integrated understanding of the composition, structure, and ecological significance of plant species within the division, supporting the development of more effective conservation and silvicultural strategies. The frequency, density, basal area and IVI of most important trees and shrubs and herbs found in forests are given in Table 3.1 to 3.3.

Table 3.1: Ecological parameters of trees

Species	Relative Density	Relative Frequency	Relative Dominance	IVI
<i>Pinus roxburgii</i>	65.66	30.35	69.62	165.63
<i>Quercus leucotrichophora</i>	16.48	7.03	13.26	36.77
<i>Cedrus deodara</i>	5.00	3.27	7.24	15.51
<i>Lannea grandis</i>	1.46	7.27	1.43	10.15
<i>Mallotus philippinensis</i>	1.60	5.59	0.77	7.96
<i>Anogeissius latifolia</i>	0.97	2.56	1.12	4.65
<i>Cassia fistula</i>	0.63	3.51	0.32	4.46

Table 3.2: Ecological parameters of Shrubs

Species	Relative Density	Relative Frequency	Relative Dominance	IVI
<i>Carissa opaca</i>	23.54	15.87	27.35	66.75
<i>Rubus ellipticus</i>	17.68	15.08	6.57	39.33
<i>Myrsine africana</i>	12.06	8.52	17.63	38.20
<i>Berberis aristata</i>	3.10	4.90	17.84	25.84
<i>Lantana camara</i>	9.87	7.74	5.34	22.95
<i>Murraya koenigii</i>	5.93	6.46	2.30	14.69
<i>Lantana</i>	7.41	1.57	7.41	10.93

Table 3.3: Ecological parameters of herbs

Species	Relative Density	Relative Frequency	Relative Dominance	IVI
<i>Chrysopogon montanus</i>	21.37	20.86	13.95	56.18298
<i>Geranium carolinum</i>	14.53	10.66	11.06	36.24523
<i>Viola odorata</i>	3.60	4.31	13.86	21.76496
<i>Parthenium hysterophorus</i>	1.80	2.95	16.12	20.87179
<i>Halopyrum mucronatum</i>	11.28	7.26	0.50	19.03587
<i>Reinwardtia indica</i>	2.88	3.85	8.64	15.37543
<i>Cyperus articulatus</i>	6.72	4.76	0.66	12.14425

The details given here will serve as base year document for species diversity for future reference

3.2.2 Shannon-Weiner Diversity Index

The Shannon-Weiner Species Diversity Index is calculated by considering the number of individuals of each species and determining the proportion that each species represents of the total number of individuals in the community. For each species, the proportion is multiplied by the natural logarithm of the proportion. This index provides a measure of biodiversity that accounts for both the number of species (species richness) and the evenness of their distribution in the ecosystem.

$$H = -\sum_{j=1}^S p_i \ln p_i$$

- p_i is the proportion of individuals belonging to species i ,
- Σ represents the sum over all species.

Index calculated is given as follows

Table 3.4: Shannon Weiner diversity Index for working circles

Chil working circle	0.42
Ban working circle	0.42
<i>Deodar working circle</i>	0.68
PCR working circle	1.20

Table 3.5: Simpson Diversity Index for working circles

Chil working circle	0.19
Ban working circle	0.19
<i>Deodar working circle</i>	0.49
PCR working circle	0.66

Table 3.6: Overall Shannon Weiner Diversity Index

Plant Category	Index
Trees	1.44
Herbs	2.84
Shrubs	2.93

3.3 Status of Biodiversity Conservation in Forests

Biodiversity conservation is a critical element of sustainable forest management in India, particularly in ecologically sensitive Himalayan states such as Himachal Pradesh. Recognizing this, the state government formulated the Himachal Pradesh State Biodiversity Strategy and Action Plan (2020) under the National Biodiversity Action Framework, in alignment with India's

obligations under the Convention on Biological Diversity (CBD). The strategy outlines both short- and long-term measures for biodiversity conservation with a particular focus on forest ecosystems, which harbor significant ecological, economic, and cultural value.

The action plan emphasizes augmentation of forest resources through the restoration of original ecosystems, promotion of indigenous tree species, and protection of climax vegetation types by declaring them as closed forest areas. In the context of the Solan Forest Division, these strategies are particularly relevant due to the region's transitional ecological character—hosting both subtropical pine forests and broad-leaved temperate species. Restoration of native species such as *Quercus leucotrichophora*, *Rhododendron arboreum*, and *Terminalia* spp. can help reverse the trend of monoculture pine expansion and promote ecological stability.

Further, the strategy stresses the improvement of canopy density and promotion of natural regeneration, especially in degraded forest patches that have experienced anthropogenic stress. This aligns with national policies under the National Mission for a Green India (GIM), a sub-mission of the National Action Plan on Climate Change (NAPCC), which promotes ecosystem-based climate adaptation through afforestation and biodiversity conservation. Implementation of such mission-linked afforestation programs in degraded compartments of the Solan division has shown early signs of success in improving biodiversity, enhancing groundwater retention, and reducing soil erosion. To address conservation of rare and threatened species, the state has also implemented both in-situ and ex-situ conservation measures:

In-situ conservation includes the establishment and management of Protected Areas (PAs), Biodiversity Management Committees (BMCs), and community-managed forest patches, especially targeting Rare, Endangered, and Threatened (RET) species and those listed under the IUCN Red List. Important in-situ efforts in Himachal include the conservation of species like *Taxus wallichiana*, *Picrorhiza kurroa*, and *Swertia chirayita* many of which occur in mid-hill regions like Solan. Additionally, forest compartments identified as rich in such species are often declared as micro-reserves or conservation zones, restricting extractive activities.

Ex-situ conservation in the state is supported through the development of herbal gardens, botanical reserves, and medicinal plant nurseries, which help propagate threatened species outside their natural habitats. The Herbal Garden at Neri (Hamirpur) and Dr. Y.S Parmar University of Horticulture & Forestry & facilities under the State Medicinal Plants Board are involved in the propagation of species like *Rauvolfia serpentina*, *Podophyllum hexandrum*, and *Aconitum heterophyllum*, with seed distribution programs extended to forest divisions including Solan.

Anthropogenic interferences have influenced our environment in many ways. This is more specifically in the past few years, that the changes in society with the increasing pace of development, the scale of these impacts has catastrophically grown. There are numerous threats to natural resources which include habitat loss and degradation, invasion of alien spp., over exploitation of resources and climate change.

Conservation refers to the protection, preservation, management or restoration of natural resources such as forests, soil, water, flora and fauna. Conservation can be In situ conservation or Ex situ conservation.

Efforts are being made by UHF Nauni to conserve some important RET species of Western Himalayas through Ex situ conservation of rare, endangered, threatened, endemic and economic plant resources of North Western Himalayan region. The main purpose of ex-situ conservation is the protection & preservation of threatened genetic material and multiplication of species for re-introduction in cases where a species' continued survival in its native habitat is threatened. The detail of some of the RET spp conserved through Ex-situ conservation in botanical garden of UHF, Nauni are detailed as below:

Table 3.7: Rare Endangered and Threatened species conserved through *ex situ* conservation in UHF, Nauni

Botanical name	Conservation status	Distribution	Propagation technique	Economic importance
<i>Acer oblongum</i>	Critically endangered	China, Nepal, and North Western Himalayas and in Karol forests of Solan Division	Seeds and stem cuttings. The tree seeds abundantly	Fine textured wood used for making plywood, boxes and planks.
<i>Arnebiaeuchroma</i>	Endangered	Kashmir, Kumaon, Garhwal and Nepal on open rocky slopes. In H.P. it is found in Kullu-Manali and LahaulSpiti and in Karol tibba.	Seeds, terminal buds as well as splits of stem with roots.	Root is antipyretic, anti-cancerous, anti-oxidant, and contraceptive. Used in treatment of measles, mild constipation, burns, frostbite, eczema, dermatitis etc.
<i>Atropa belladonna</i>	Critically endangered	Native to Europe, North Africa & Western Asia. Sp. Found in natural state from Kashmir to Shimla and in Chail and Karol tibba at an altitude of 1800 to 3500 m.	Through seeds and roots.	Roots and leaves are used as anti-inflammatory, antidote to poisons, antispasmodic, anti-asthmatic, narcotic & sedative. Source of atropine used in dilation of pupils of eye.
<i>Berberisarista</i>	Endangered	Temperate region of South America. Commonly found in Sri Lanka, Nepal, Bhutan and	Seeds	Beberine from the extract is used in ophthalmic disorders. Rasont so extracted is used in treating

		in J& K, Uttarakhand, H.P. & Nilgiri hills in South India.		conjunctivitis, ophthalmia, bleeding piles, ulcers, jaundice, enlarged liver and enlarged spleen.
<i>Curculigo orchoides</i>	Endangered	Sub-tropical Himalayas, Western ghats, plains of West Bengal, Chhota Nagpur & other tropical zones. In H.p. it is found in grasslands & pastures.	Tuber	Used as aphrodisiac drug, has diuretic properties. Used in cough, jaundice, asthma and piles.
<i>Colchicum intantum</i>	Critically endangered	Pakistan, H.P. at an altitude of 1000 to 2700 m.	Corms	Source of colchicine. Have aphrodisiac, carminative and laxative properties. Used in treatment of inflammation and pain.
<i>Ginkgo biloba</i>	Endangered	China, Japan, Taiwan, Turkey.	Seeds and vegetative cuttings.	Used in treating memory disorders including Alzheimer disease, lyme disease and depression.
<i>Gmelina arborea</i>	Vulnerable	Nepal, Sikkim, Assam, Bangladesh, Sri Lanka, Burma, Cambodia, Thailand, China. In India found in eastern Sub-Himalayan tract, Indo-Gangetic plains, Aravali hills, Central India, Western Peninsula and Western Himalayas upto 1500 m.	Seeds, root suckers and stem cuttings.	Wood used in pulp wood production. Sawn wood is used in joinery, furniture components and other household fixtures.

<i>Malaxismuscifera</i>	Endangered	Afghanistan, Nepal, Bhutan, China & Pakistan. In India found in temperate Himalayas upto an altitude of 2400-3600 m	Pseudobulbs and Rhizomes.	Used in treating sterility, seminal weakness, internal and external haemorrhage, dysentery, fever, burning sensation.
<i>Podophyllum hexandrum</i>	Critically endangered	From Kashmir to Sikkim at an altitude of 3000 to 4200 m.	Seeds and rhizomes.	Rhizomes and roots contain podophyllotoxin which is used as hepatic stimulant, cholagogue, purgative, bitter tonic.
<i>Rauvolfiaserpentina</i>	Endangered	Foot-hills of Himalayas. In H.P. the spp. Is found in Kangra, Hamirpur, Una, Sirmour & Bilaspur	Seeds and root cuttings and stem cuttings,	The drug so extracted is useful in mental illness & acts on nervous system. Useful in treating high blood pressure, hysteria and sleeplessness.
<i>Saussurea costus</i>	Critically endangered	India Pakistan. Cultivated in Lahaul-Spiti and Kinnaur.	Seeds and roots.	The essential oil has strong antiseptic and insecticidal properties. Roots are used as diuretic, diaphoretic in gout and skin infections. Seed is used in psoriasis and toothache. Roots are used to treat liver problems, gall bladder pain.
<i>Swertia chirayita</i>	Critically endangered	Temperate zone of Himalayas between 1800 to 3000 m.	Seeds	Acts as a blood purifier. Used in curing diabetes and constipation. Used in treating indigestion and diarrhea.
<i>Taxus wallichiana</i>	Endangered	J& K, Uttarakhand, Arunachal	Branch cuttings	Leaves & bark contains taxol used in preparation of anti-

		Pradesh, Meghalaya, Nagaland, Manipur & in H.P. found in Mandi, Kullu, Chamba, Shimla & Kinnaur Districts		cancer drugs.
<i>Trillium govanianum</i>	Endangered	Nepa, China, Bhutan & in Kullu, Mandi, Shimla and Kinnaur areas of H.P. at an altitude of 2700-4000 m.	Seeds & rhizomes	Rhizome has antiseptic, antispasmodic, diuretic and ophthalmic properties.
<i>Valerianaajata mansi</i>	Endangered	Western Himalayas from Kashmir to Bhutan between 1800 to 2600 m. In H.P. it is found in Chamba, Shimla, Kinnaur & Kullu districts mostly under Oak, Deodar & Blue pine forests.	Seeds & Rhizome cutting	Dried rhizomes are used for hysteria and nervous problems

Another significant component is the cultivation of medicinal plants through inter-departmental coordination, which not only supports conservation but also enhances livelihoods. The mid-hill areas of Solan are well suited for the cultivation of high-value medicinal plants like *Valeriana jatamansi*, *Asparagus racemosus*, and *Acorus calamus*. This approach supports the objectives of the National Medicinal Plants Board (NMPB), which promotes the conservation and cultivation of medicinal flora with community involvement.

A key strength of the Himachal strategy is its emphasis on participatory forest governance, particularly the involvement of local communities and women in biodiversity conservation. This is strongly reflected in Solan division through the functioning of Joint Forest Management Committees (JFMCs) and Eco-Development Committees (EDCs), which facilitate community-led monitoring, patrolling, fire prevention, and afforestation.

Furthermore, the action plan promotes the economic valuation of biological resources managed by communities, encouraging conservation by recognizing the tangible and intangible benefits derived from biodiversity. This is consistent with global efforts under The Economics of Ecosystems and Biodiversity (TEEB) initiative, which aims to integrate ecosystem service valuation into policy-making. For Solan, where forest produce forms a supplementary livelihood source, such valuation frameworks can help justify resource allocation for conservation-based interventions.

At the national level, the India Biodiversity Awards, supported by the National Biodiversity Authority (NBA) and UNDP, encourage community conservation efforts and sustainable use of biological resources. Forest divisions like Solan can greatly benefit from such incentive-based mechanisms to recognize and replicate best practices.

In conclusion, the biodiversity conservation framework in Himachal Pradesh, guided by both state and national strategies, provides a holistic, inclusive, and ecosystem-based approach to forest conservation. The targeted implementation of these strategies in the Solan Forest Division, with a focus on ecological restoration, community participation, sustainable livelihoods, and policy convergence, is essential to maintaining long-term ecological resilience and forest-based socioeconomic sustainability.

3.4 Status of Species Prone to Overexploitation

Following Tables lists the concerning categories of plants present in Solan forest Division according to IUCN Red data list

Table 3.8: IUCN Status of fauna

IUCN Category	Common Name	Scientific Name
Vulnerable	Leopard	<i>Panthera pardus</i>
	Himalayan Black Bear	<i>Selenarctos thibetanus</i>
Near Threatened	Goral	<i>Naemorhedus goral</i>

Table 3.9: Flora

Near Threatened	Bel	<i>Aegle marmelos</i>
Critically Endangered	Himalayan Maple	<i>Acer oblongum</i>

3.5 Conservation of Genetic Resources

Genetic resources act as reservoirs for important traits such as disease resistance, climate resilience, and improved yield, which are essential for food security, ecological stability, and sustainable development. Solan Forest Division has carried out significant efforts for conservation of genetic diversity with both *in-situ* and *ex-situ* methods. To address conservation of rare and threatened species efforts carried out by Dr. Y.S Parmar University of Horticulture & Forestry are mentioned in detail in section 3.3 of this chapter. The research and development activities conducted in the Solan Forest Division, Himachal Pradesh, span a range of ecological aspects, with a strong focus on forest ecosystem management, biodiversity conservation, and climate change mitigation. Brief account of Research and development work done in Solan Forest Division is given in section 9.4 (Status of research and development) of chapter 9 of working plan. A part of *in situ* conservation efforts was documentation of NTFPs of the forest division. The details of the same are enlisted in appendix III in Vol II of the working plan.

3.6 Fauna and their Habitats

Following is the description of flagship wild species along with their suitable habitats and micro-habitats.

3.6.1 General

The Solan Forest Division has a variety of wild life owing to the diversity of vegetation types that occur here due to altitudinal variations. Earlier there were two sanctuaries viz. Chail and Shilli within the jurisdiction of the division. But with the creation of a separate Wildlife wing in the department, these have been transferred along with the Chail range to the Shimla Wildlife division in 1986. Thereafter some portion of Chail Wildlife Sanctuary (WL) and Shilli WL Sanctuary after rationalization of WL Sanctuaries and National Parks across H.P. was de-notified vide Govt. of H.P. Notification No. FFE-B-F(6)-11/2005-II/Shilli dated Shimla -2, 7th June, 2013 are merged in Solan Forest Division. Still the division abounds in fauna, avifauna and provides optimal habitats to them. A few, more common of them, are mentioned herein.

3.6.2 Carnivora

1. Leopard (*Panthera pardus*) - Local name: Bagh, Tendua

It is a sleek, short-haired animal with a fulvous or bright fulvous coat that is marked by close-set black solid rosettes. They thrive well in open places as well among rocks and scrub. Its prey-range includes a variety of animals, which it can overpower easily like sheep, goats, cattle, dogs and has become a bane for human life and property. Incidents of cattle lifting from cattle sheds are common but instances of attack on human beings are few and far between.

2. Leopard Cat (*Felis bengalensis*) - Local name: Ban Billi, Cheetah billi

This member of the cat family is about the size of a domestic cat but more long-legged. Its colour and markings give it the appearance of a miniature panther. It preys upon small birds and animals and inhabits the forested areas of the Division. It is nocturnal in habit and seldom sighted.

3. Jungle Cat (*Felis chaus*) - Local name: Jangli Billi

It is characterized by long legs and a comparatively short tail. The colour of its fur varies from sandy grey to yellowish grey and its tail is ringed with black towards the end and has a black tip. It is found in the drier and open scrub areas of the division. It preys on small mammals, birds and porcupines.

4. Black Bear (*Selenarctos thibetanus*) - Local name: Bhalu, Reechh

Very few of them exist in the present division as it is an animal primarily of the deodar zone. The coat is black and smooth and the claws are black. They inhabit the higher reaches of the dense oak forests in Karol area. Food varies with season and they thrive on oak acorns, nuts, and bark of trees, honey and other wild fruits. They have been known to raid maize fields and orchards at lower elevations for food.

5. Jackal (*Canis aureus*) Local name: Geedar or Siyaar

The Jackal is smaller in built and meaner in aspect than its nearest relative- the wolf. They can live in almost any environment and are common about towns, villages and cultivations. They usually come out at dusk and retreat at dawn and are an important scavenging agent.

6. Himalayan Fox (*Vulpes bengalensis*) - Local name: Lomari

It keeps being in open country and rarely inhabits forests. It is a slender-limbed animal distinctive by the black tip of its tail. Its general colour is grey contrasting with the rufous colour of its limbs. It feeds on small mammals, reptiles and insects and also on fruits and gram leaves and pods

3.6.3. Herbivora

3.6.3.1. Ungulates

1. Goral (*Nemorhaedus goral*) Local name: Ghoral

This member of the Goat-antelope group is a stocky goat-like animal with coarse hair forming a crest on the neck. It has a yellowish grey colour that is suffused with black and it has short, insignificant horns. They are found on the grassy hill sides or rocky places in forests and move in groups of 4 to 8. It is a much sought after game animal and falls easy prey to poachers. It is found usually above 900 meters elevation. Also found in Chail.

2. Barking deer (*Muntiacus muntjac*) - Kakkar

This animal prefers bushy and wooded areas and is generally seen singly or in pairs. Their hairs are coarse and colour varies from dark brown to chestnut with the belly being pale and dull. It is fairly diurnal in habit and its food consists of leaves and grasses and wild fruit. When alarmed and in flight, it utters a series of short and shrill cackling barks, which gives it the name. It is also a much sought after game animal for its meat. It is fairly common in Ajmergarh area in Dharampur range and Subathu and Chail areas of the division.

3.6.3.2 Large rodents

1. Common Indian Hare (*Lepus nigricollis*) Local name: Khargosh

It is a small sized rodent that has a distant dark brown or black patch on the back of its neck and the upper surface of its tail is black. They have a rufous brown coat while the lower parts are white. Large tracts of bush and Jungle alternating with cultivated lands afford ideal habitat conditions and therefore, it is a very common animal in the lower altitudes of the division. It is hunted for its meat illegally.

2. Indian Crested Porcupine (*Hystrix indica*) - Sail

This is a rodent characterized by the presence of long and formidable spines that are modified hair. The quills on the back are very profuse and each quill has brown or black and white rings. It inhabits open lands and forests and feeds mainly on roots and other plant parts and is extremely

destructive in plantations and nurseries. When alarmed or irritated it erects its spines, grunts and rattles its hollow tail quilts. It is a very common animal in the division.

3.6.3.3 Primates

1. Baboon (*Presbytis entellus*) – Langur

It is the long limbed, long tailed, black faced monkey that is found everywhere in the division. The Himalayan race is more heavily whiskered and coated than the peninsular race and their pale white heads stand out in contrast to the darker colour of the coat of the body. They are arboreal in habit and are vegetarian, thriving on wild fruits, flowers, buds, shoots and leaves. Thus, the forest plantations and nurseries are prone to damage by them.

2. Rhesus Monkey (*Macaca mullata*) - Monkey

It present in large numbers in this division and is a common sight along the Kalka-Shimla National Highway, moving in large troops. They have a preference for open country, living near habitations or in groves around temples. When living in forests, they keep to the fringes, rarely going deep inside.

3.6.4 Others

1. Indian Wild Boar (*Sus scrofa indicus*) –JangliSuar

It inhabits grass or scant bush jungle and is found in good numbers in the scrub and bamboo forests of the division. It is an omnivore and living on roots, tubers, thisomes, insects and carruan. It is a major culprit in destroying plantations, nurseries and digging up the thuanmes of bamboo its coat is black massed with grey and black bristles reach from the nape down the back, the younger boars being more brownish in colour. Males have well developed tusks.

2. Mongoose (*Herpestes edwardsi*)

They are not found in forests, but in open lands and scrub jungles. The color of the coat is tawny, yellowish grey with a pepper and salt tinge. They prey on rats, mice, snakes, lizards, frogs, scorpions, insects etc but at times also eat fruits and roots.

3.6.5 Avifauna

3.6.5.1 Game birds

1. The red jungle fowl (*Gallus gallus*)-Janglimurga

It is a common game bird in the lower reaches of the division but can be found in other areas as well. It is the ancestor of all domestic breeds of fowl. The cock is quite colourful while the female is plain streaked brown with rufous brown under-parts. It is a very shy bird and roosts up in trees or bamboo clumps, feeding on grain, vegetable shoots, insects, lizards etc.

2. The peacock or peafowl (*Pavo cristatus*)-Mor

Mostly found in the lower reaches i.e. Lugon, Parwanoo and Subathu inhabiting the dense scrub jungles, preferably in the neighbourhood of streams and near habitations, where they are protected because of religious sentiments. The male has an oscillated gorgeous tail. The hen is also crested like the cock, but smaller and lacking the ornamental train. Its food mainly consists of grain, shoots, insects, lizards, snakes etc.

3. The grey partridge (*Francolinus pondicerianus*) –Dhaulatectar

This bird commonly inhabits the scurby and bushy tracts in Dharampur, Subathu, and Solan ranges and is sought after game bird. It is a plump, greyish brown bird with a rufous-buff throat circumscribed by a broken blackish line. It feeds on grass seeds, grains, white ants and other small insects. When startled, it rises with a loud whir of wings and is a very fast runner.

4. The black partridge (*Francolinus francolinus*) - Kala Teetar

It's a small bird with black and spotted white plumage. The cock is distinct by its glistening white cheek patches and chestnut collar while the hen is paler, motile and speckled black and white. It is restricted to well water scrub and is not very common in the division with its distribution being confined to the dry scrub country and cultivations in the lower reaches only. It is an exceedingly swift runner. Its food habit is similar to that of the grey partridge.

5. Jungle Bush Quail (*Prodicula asiatica*) - Bater

It is another bird that is found at lower altitudes in the Subathu, Parwanoo, and Dharampur ranges of the division. It lives on grass seeds, tender shoots, and grains, and is usually found in coveys of 5–20 that rise suddenly when alarmed or almost trodden upon. The male is fulvous brown above and white on the underside, while the female is characterized by a pale pink rufous in the lower part.

6. The blue rock pigeon (*Columba livia*)- Kabutar

A very common bird found almost everywhere in the division. It is a slaty grey bird with a glistening green, magenta, and purple sheen on the neck and upper breast region. They live in large flocks, inhabiting cliffs and precipices in the wild. Mostly, it is found in a semi-domesticated condition and has become accustomed to humans and the bustle of urban life. It feeds on cereals, pulses, etc.

7. The Spotted Dove (*Streptopelia chinensis*) - Ghuggi, Chittafakta

This bird has white-spotted, pinkish-brown and grey upper parts, and a 'chessboard'-like black and white pattern on the hind neck. Generally found in open places and near cultivations all over the division, it is a swift, small bird that moves in pairs or in groups, feeding on grain

3.6.5.2 Non-game birds

Crows, treepies, flycatchers, warblers, sparrows, magpies, parakeets, and nutcrackers are common in this tract. Eagles, kites, and a few vultures constitute the common scavengers in the area. Babblers, bulbuls, bee-eaters, doves, mynahs, owls, wagtails, woodpeckers, thrushes, tits, cranes, egrets, etc., add to the variety and are important from the considerations of ecosystem balance, aesthetics, bird watching, and as destroyers of vermin and insects

3.6.6 Reptiles

The lower reaches of the division are very warm and provide an ideal habitat for many snakes and other reptiles. The rat snake (*Ptyas mucosus*), the common Indian krait (*Bungarus caeruleus*), the Himalayan pit viper (*Gloydius himalayanus*), and the Indian cobra (*Naja naja*) are among the snakes found in this region. The common house lizard or gecko (*Hemidactylus frenatus*), the common Indian monitor or goh (*Varanus bengalensis*), and the rock lizard or girgit (*Laudakia tuberculata*) are the main members of the lizard group seen in the area.

3.7 Threats and Challenges to Wildlife

Details of habitat fragmentation/loss, illegal trade, road and rail networks, and extended habitats in proximity to protected areas constitute threat and challenges to rare and endangered species

- **Urbanization and Infrastructure Development:** Expansion of Solan town, road construction (e.g., NH-5), and industrial zones contribute to forest fragmentation.
- **Tourist Pressure:** Unregulated ecotourism, camping, and construction of resorts disturb wildlife habitats.
- **Crop Raiding:** Wild animals like monkeys, wild boars, and porcupines often raid crops, leading to economic losses and retaliatory killings.
- **Livestock Predation:** Leopards and jackals occasionally prey on domestic animals, increasing friction with locals.
- **Habitat Overlap:** Increasing human settlements near forest fringes cause more direct encounters.
- **Invasive Flora:** Species like *Lantana camara* and *Parthenium hysterophorus* outcompete native plants, affecting food availability for herbivores.
- **Livestock-Wildlife Disease Transmission:** Unregulated grazing can lead to disease spillover (e.g., foot-and-mouth disease, brucellosis).
- **Erratic Rainfall and Forest Fires:** Altered rainfall patterns increase the frequency and intensity of forest fires during dry months.
- **Shifting Species Ranges:** Warming temperatures force some species to move to higher elevations, disrupting local ecological balance.
- Most of the wild animals and birds are shot or killed for their meat, which is a delicacy or for sheer reason of rarity. Some animals are hunted for their fur, trophies or for sheer pleasure, though it is banned in the state many instances of killing of wild animals are because of the damage done by them to the crop fields. Hunting and poaching are done both by the locals and the outsiders but no such case is reported in past 8-10 years.
- Climatic disturbances like drought, excessive rain, snow, frost lightening, storms etc can have their adverse effect on the animals, especially their young ones. Drying up of water

holes and bodies, breaking up of nests due to heavy rains, falling of trees in a storm etc result in loss of forest fauna

- The natural food chain in the forest ecosystem has been disturbed by man due to fragmentation of forests in the name of development. Excessive protection of some species has led to reduction in the numbers of some wild prey, which affected natural food chain. This has resulted in ecological imbalance and the prey-predator relationship has been badly affected.
- Though no cases of epidemics have been reported in the forests of the division, but there is every likelihood of their spread as domestic cattle graze freely in the forests and through them the wild animals, especially the ungulates like Sambhar, Kakkaretc can get infected with contagious diseases like the foot and mouth disease, rinderpestetc.

The Chail WL Sanctuary adjoins the division area. With the enactment of the Wildlife Protection Act (1972) and the ban on hunting of wild animals in Himachal Pradesh, incidents of wildlife hunting and poaching have considerably decreased. However, the existing forest fauna in the division, especially outside the protected areas, still needs to be protected and conserved from the perspectives of geology, aesthetics, tourism, etc. A strict vigil against hunters and poachers is to be ensured.

3.7.1 Man-Animal Conflict

The Solan Forest Division, while rich in biodiversity, is increasingly facing serious wildlife management challenges due to rising incidents of animal depredation and human-wildlife conflict. These issues not only threaten livelihoods but also complicate conservation efforts. Three primary problems demand immediate and coordinated attention:

a) Leopard Conflict

Leopard-related incidents have become a pressing concern in the division. Leopards often prey on domestic cattle, especially in forest fringes and grazing lands. Cases of leopards lifting cattle directly from cattle sheds are not uncommon. While no human casualties have been reported in the past 12–15 years, sporadic incidents of leopards straying into human settlements have created widespread panic.

Main encounters occur mainly in Bisha, Karol areas of Kandaghatrange, Sultanpur and Joharji area of Dharampur range, Tiron, Kasauli, Sanawar, Dochi, Barogareas of Parwanoo range.

These encounters highlight the need for urgent monitoring and preventive measures to manage the leopard population and reduce their dependence on livestock as a food source.

b) Monkey Menace

The monkey population has increased dramatically in recent years, leading to rampant crop depredation and nuisance behavior. Along the Kalka–Shimla National Highway (NH-22), especially in areas like Dtiyar, Sanwara, Jabli, and Kasauli, monkeys can be seen in large numbers, often depending on food handouts from tourists.

Their shift from forest interiors to roadside areas has not only disrupted their natural behavior but also led to safety concerns for both tourists and locals. Attempts to discourage feeding have largely failed, owing to religious sentiments and lack of awareness.

c) Wild Boar Damage

Wild boars are another significant nuisance, affecting both agricultural fields and forest plantations. They are known to destroy standing crops, particularly vegetables, and damage forest plantations by digging up soil and uprooting young plants, especially bamboo rhizomes.

3.8 Protection and Management of Fauna

Various measures have been initiated in the Division. Monkey sterilization measures fulfilling annual targets in order to curb the monkey population.

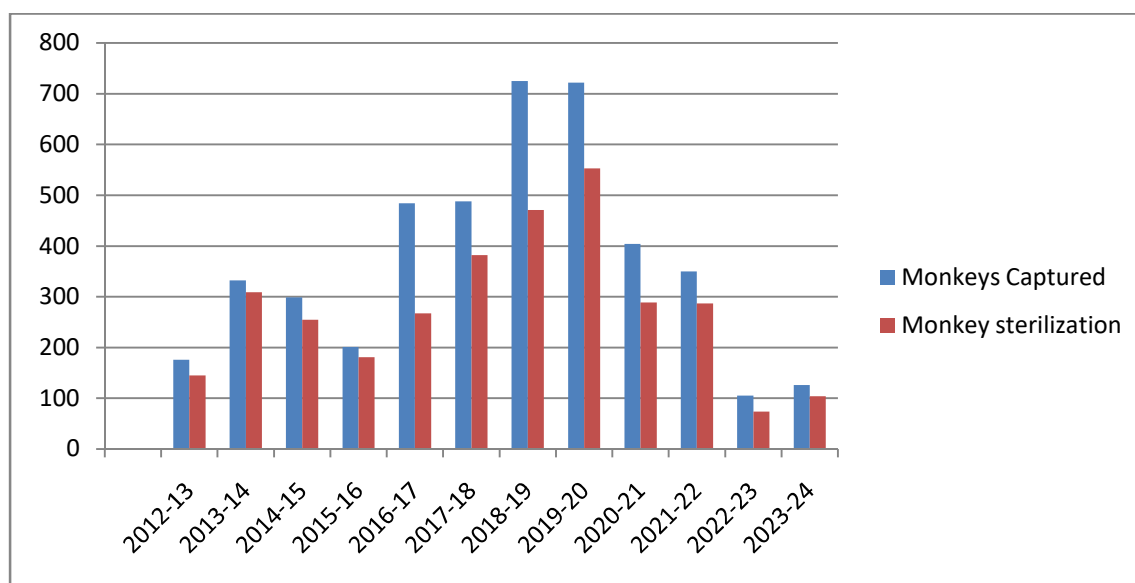


Fig 3.1: Monkey Sterilization in Solan forest division from 2012 to 2024

Out of the total monkeys captured, only those monkeys were non-sterilized due to reasons including captured monkeys being either pregnant, young in age and some were already sterilized before. Monkey capture and sterilization ratio were maximum during 2019 and 2020.

Government has also launched schemes where more & more fruit bearing plants are to be planted in forest area so that the monkeys & other wild fauna can get sufficient food in the forest itself.

H.P. Forest Department has adopted the Habitat Enrichment Plantation Model where multi-layered plantation consisting of local wild fruit bearing species preferred by monkey are planted to provide ample natural food resources to monkeys & other wild fauna & to lessen their tendency to raid agricultural crops.

Additional in the conservation context population estimation and conflict management planning for leopards and black bears in Himachal Pradesh was also carried out. Using advanced DNA-based capture-recapture techniques, it provided the first reliable population estimates—approximately 511 leopards and 530 black bears across the state.⁵⁶ unique Common Leopards were identified in Solan Forest Division, making it one of the top districts for leopard presence. Only one Asiatic Black Bear individual was recorded, indicating that this species is rare in Solan.

Conflict hotspot analysis shows Solan is a notable area for human-leopard interactions, requiring focused conflict mitigation strategies, whereas black bear-related conflict is much less significant.

Several conservation efforts have been implemented in the Solan Forest Division to conserve the Common Leopard and Asiatic Black Bear, focusing especially on conflict mitigation and community engagement. These include direct management actions, local involvement, rapid response strategies, and habitat interventions, with most actions targeting the much more prevalent leopard population

- **Community Awareness and Education:** Regular community education programs in local languages about leopard and bear behavior, the importance of conservation, and safety measures were conducted. This included interactive methods such as street plays, puppet shows, and documentaries.
- **Local Community Involvement:** Local residents were trained and engaged as wildlife watchers or eco-volunteers, participating in monitoring and species protection. Basic equipment like binoculars and cameras was distributed for reporting wildlife sightings
- **Preventive Physical Measures:** Leopard and bear-proof barriers (e.g., stone walls or chain-link fences) were erected around villages and livestock enclosures, with specifications such as a minimum height of 2.5 meters, overhangs, and sometimes electrified wires. **Deterrence Methods:** Strategies such as motion-sensor lights, sirens, and using guard animals (notably dogs to alert herders) were used, particularly to protect livestock from leopards.
- **Habitat Management:** Creation of buffer zones (at least 500 meters) between forests and settlements, restoration of forest areas with native species, and establishment of wildlife corridors to connect fragmented habitats was emphasized to support both species' ecological needs.
- **Rapid Response Teams:** Special rapid response teams, equipped with traps, cages, and tranquilizer guns, were created to handle conflict situations, capture and relocate animals if necessary, and respond to reported incidents via a 24/7 hotline
- **Livestock and Crop Protection:** Predator-proof sheds for livestock, promotion of deterrents around croplands (like chili-grease fences), and the use of devices and paints to ward off predators were supported by subsidies and training programs for farmers
- **Compensation and Insurance Schemes:** Transparent and timely compensation schemes for victims of wildlife conflicts, including attacks on humans, livestock, or crops, have been implemented. Efforts were made to ensure compensation within one month, and affordable crop insurance covering bear-related damages is being promoted.

Ongoing Research and Monitoring: Regular population surveys using camera traps and sign surveys, as well as conflict hotspot mapping and ecological research on species' diets and movement, are being conducted to inform management and conservation policies.

Chapter 4

Maintenance and Enhancement of Forest Health and Vitality

4.1 Status of Regeneration

The forests in Solan Forest Division are experiencing below-par natural regeneration due to adverse effects of biotic interference, fire, grazing, and the suspension of forestry silvicultural operations due to ban on green felling. The imposition of a moratorium on green felling has hindered the scientific management of forests, leading to a neglect of regeneration efforts. Although the green cover remains intact, the lack of felling has resulted in a decline in the pace of natural regeneration, as these processes are intricately linked.

To address the insufficient natural regeneration, there is an emphasis on supplementing it through the plantation of indigenous species such as Ban, Deodar, Bamboos, Jamun, Amaltas, Toon, etc. Several conditions influence the success of regeneration efforts:

1. **Condition of Weed Growth:** The presence of competing weed growth, whether grass, a mix of grass and shrubs, or shrubs alone, significantly impacts regeneration. Harmful species like *Lantana camara* and *Parthenium hysterophorus* need to be controlled.
2. **Grazing and Browsing:** Strict measures to control grazing, possibly through closures, are essential to prevent the destruction of regeneration by browsing animals.
3. **Crop Composition:** The composition of the forest crop affects soil conditions, and a mixed crop is considered more favorable for seedling establishment than pure crops.
4. **Light Availability:** Light is a crucial factor in seedling establishment, with varying requirements among different species and even within the same species based on climatic conditions and age. Major species in this division, such as Ban, Deodar, and Chil, are predominantly light-demanding.
5. **Seed-Year Impact:** The occurrence of a good seed-year for predominant species in the forests plays a pivotal role in regeneration success.

Efforts to address these conditions and implement suitable conservation measures are vital for promoting effective natural regeneration and sustainable forest management.

4.2 Area Affected by Forest Fires

During the summer season in the Solan Forest Division, temperature increases and humidity level drops, creating conditions conducive to the risk of forest fires. The fire hazard persists from April to June, marking the official fire season in the area. All instances of forest fires in this division are attributed to anthropogenic causes. The temperature during this period typically ranges from 35°C to 40°C in Dharampur & Parwanoo ranges, with the potential to reach a maximum of 42°C. Moreover, the region experiences scanty rainfall during these months.

The Chil trees, shedding their leaves from March to the beginning of May, contribute to the accumulation of leaf litter. This buildup of dry leaves exaggerates the fire hazard, multiplying the risk of forest fires. The fire incident summary for the division is outlined in the illustration below, providing an overview of the occurrences during this critical period.

In forests traversed by the railway line, numerous fire incidences occur during the summer season. This is also true for forests located alongside the National and State highways. Due to repeated fire outbreaks, areas such as the Kadon and Sanawar have been rendered devoid of ground flora, as the Kalka-Shimla railway line runs through these areas for a considerable stretch. In many places, tourists stop along the roadside & light fires for cooking or warming food and leave without extinguishing them properly. Such incidents are commonly observed in the forests of Sanawar, Gulhari, and Kadon. Additionally, road tarring activities are typically carried out during summer by the State Public Works Department (PWD), and workers often fail to extinguish the fires used during their work. This negligence has also contributed to forest fires in the adjoining areas.

Table 4.1: Details of fire incidences in forests of Solan

Year	No. of beats / compartments affected	No. of fire incidences	Total area affected
2012-13	25	79	1315.50
2013-14	06	07	101
2014-15	9	12	281.30
2015-16	10	17	279.8
2016-17 (2016)	27	48	838.20
2017-18	21	50	889
2018-19	33	66	1035.9
2019-20	30	84	995.5
2020-21 (2020)	9	13	220.5
2021-22 (2021)	13	52	572.6
2022-23 (2022)	13	73	1096.55
2023-24 (2023)	2	3	41.5
2024-25 (2024)*	23	82	2099.7

* Till December 2024

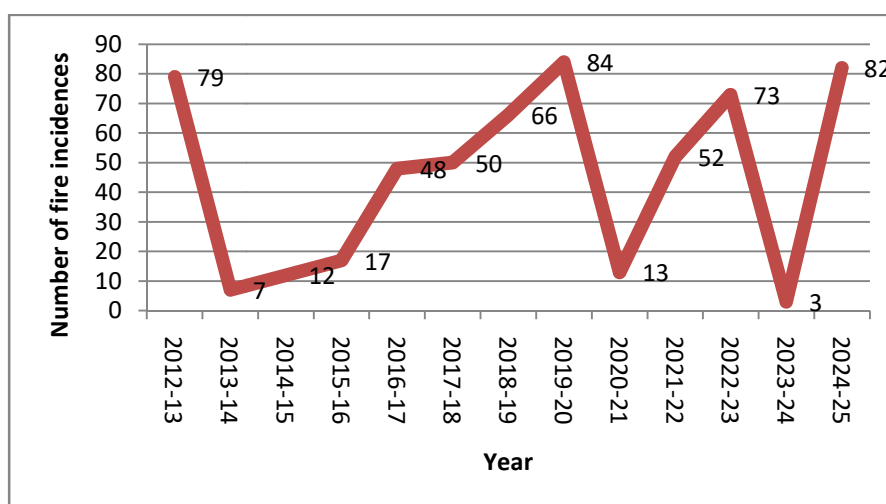


Fig. 4.1: Trend of fire incidences in forests of Solan Forest Division

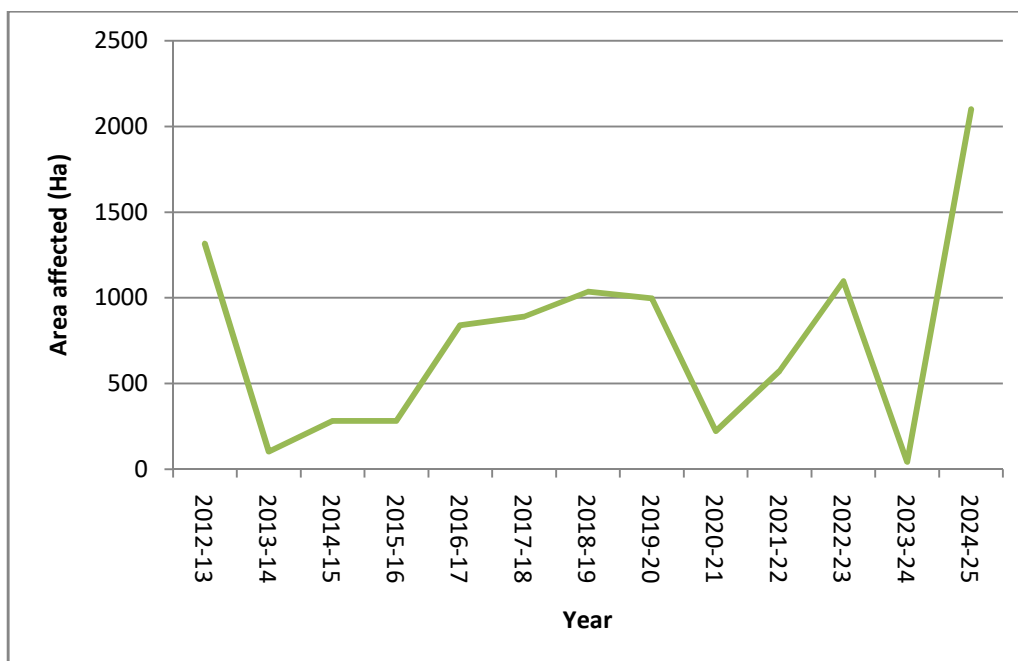


Fig. 4.2: Forest Area affected by fires in Solan Forest Division

Over the past 13 years (2012–2024), the Solan Forest Division has experienced a total of 586 fire incidents, affecting 9767 hectares of forest area. The data reveals a highly fluctuating pattern in both the frequency of fire occurrences and the extent of area impacted. Notably, 2024-25 witnessed the highest damage, with 82 fire incidents ravaging 2099.7 hectares, suggesting a serious spike in forest fire vulnerability. Similarly, 2019-20, 2018-19, and 2017-18 were also critical years, each recording over 800 hectares of damage. In contrast, 2023-24 saw a significant drop, mainly due to favorable climatic conditions, with only 3 incidents affecting 41.5 hectares. The overall trend highlights that fires in the region are not merely seasonal or climate-driven but also heavily influenced by anthropogenic activities. Factors such as proximity to human settlements, resin tapping in Chil forests, railway and road lines, and negligent fire-handling practices by laborers and tourists have compounded the problem. The presence of inflammable undergrowth, especially in even-aged Chil plantations, increases the intensity of fires. Moreover, the lack of funds for the maintenance of fire lines and irregular execution of prescribed control burning measures has left large forest tracts exposed. These fires have not only led to the depletion of mature Chil trees but have also destroyed young regenerations, making ecological recovery increasingly difficult. This analysis underscores the urgent need for strategic fire prevention measures, community awareness, and better forest infrastructure with timely funding to mitigate future risks.

A methodology for forest fire damage assessment has been devised by the department. The fire assessment report is prepared by the concerned Range Officer in two stages: (i) immediate assessment after the fire (Stage-I), and (ii) final assessment after the rains (Stage-II). In case the fire-damaged area is more than 5 hectares and up to 10 hectares, the area is inspected by the Divisional Forest Officer (D.F.O). If the area exceeds 10 hectares, the damage is inspected by the Conservator of Forests (C.F.)

Fire incidences are also reported online through the Forest Management Information System. There is no denying the fact that, besides causing economic loss, forest fires inflict immense damage to biodiversity, soil, flora, and fauna. Successive forest fires in an area can lead to retrogressive succession, thereby replacing palatable species with non-palatable ones.

Table 4.2 Presence of fire lines in Solan Forest Division

Name of Range	Block	Beat	Name of Fire Line	In Km.	Forest Covered (name of Forest)
Chail	Chail	Shilru	R-16Chaklain to D-45 TibbaKhateth	6	R-16 Chaklain, D-46 Chaklain&D-45 Tibbakhateth
Subathu	Subathu	Kathani	Khaldar -Subathu	7	D-114 Kathani& R 29 Kathani
	Subathu	Alobra	Raikot-Alobra Ridge	4	D-110 Raikot& D-112 Alobra
	Subathu	Deothi	D-127 shashal	1	D-127 Shashal
Dharampur	Chabal	Kumarhatti	Chabal Ki Dhar -I & IV	8	R-30 Chabal-C1 to C6, D-117,D-118, D-119 Chabal Ki Dhar
	Chabal	Chabal	Jubbar -Chanol	5	R-30 Chabal-C5a, C5b
	Dharampur	Barog	R-31 Barog C-2	2.5	R-31 Barog C-2
Solan	Solan	Oachghat	R-26 Nagali	1	R-26 Nagali
	Saproon	Chawal	D-132 Charar to R-28 Khaldhar	6	D-132 Charar to R-28 Khaldhar
Parwanoo	Lugon	Banasar	Jodhpur-Banasar	3.00	0.9 Hectares (R-57 Banasar C1b, R-57 Banasar C1c, D-222 Banasar)
	Lugon	Banasar	Banasar-Shoghighat	4.60	1.38 Hectares (R-57 Banasar C1b)

To further strengthen forest fire management and control, fire lines at the following locations are proposed.

Table 4.3 Fire lines proposed to be constructed in Solan Forest Division

Name of Range	Block	Beat	Name of Fire Line	Length (Km)	Forest Covered (name of Forests)
Kandaghat	Kandaghat	Karol-1st	Shikarki Devi to Karol Nursery	2	R-21 Karol
		Karol-2nd	Snach to Padotha	2	R-23 Karol
		Shalumna	Shikarkidevi to Karyali	1	D-101 Karyali
Dharampur	Joharji	Neri	Kaba To Meun Snog	2.5	D-210 Odder Jangeria, R-44 Jhanai C-2, D-217 Meun
		Joharji	Bhojnagar To kabaKalan	3	R-42 QuilaAjmergarh, D-214 GulzarC2, D-213 Kaba, D-215 Kaba
		Bohli	Bohli to Shaya Village	3	D-178 Cheroti Ki Dhar C1&C2, R-40 Bohli C2a and C2b, D-180 ShirguliKatiba C1
	Dharampur	Kumarhatti	R-32 Chunjari to R2 Chobbal	1	R 32 Chunjari
		Kadon	Radopaind to Sharla	3	D244 Cheola D159 Kadon
Parwanoo	Lugon	Lugon	ChandiDhar to Lugon Nursery	5	R-45 KhadarkiDhar
	Kasauli	Kasuali	Monkey point to Sari	5	R-54 Kurardev 3 & D-239 Sari C-6

4.3 Area Damaged by Natural Calamities

The Solan division is traversed by three main rivers: Ashwani Khad, Gambhar River, and Koshalya River. Annually, the region experiences intense monsoon rains that trigger substantial floods in the low-lying areas, resulting in significant bank erosion. This erosion is primarily caused by two mechanisms: fluvial erosion, involving the direct removal of soil particles by flowing water, and mass failure, leading to the collapse of the riverbanks. The Parwanoo range is highly susceptible to such damage.

The river in tracts within the division, which host toon, eucalyptus, bamboo, jingan are especially prone to bank erosion. As the flowing water undermines the roots of trees along the riverbanks, it often results in the uprooting and sweeping away of these trees into the rivers. This process of erosion and mass failure poses a considerable challenge to the stability of the riverbanks and the ecosystems supported by them. Efforts to manage and mitigate these effects are essential for the preservation of the region's natural landscape and biodiversity.

Table 4.4: Range-wise area affected by natural calamities in Solan Forest Division.

Range	Type of Events	Notable Impacts	Approx. Area Affected (ha)
Chail	Forest Fires	Repeated fires in plantations (2014-2024) in compartments D-44, D-42, D-48, D-39	30
Kandaghat	Landslides	Landslides in Karol nalla and Kiari due to diverted water during 2022 monsoon; damage to store building and nursery	0.5
Solan	Forest Fires (majority), few landslides	Extensive forest fires from 2012-2024 affecting multiple compartments in Charar, Khaldhar, Manlog, Deora, Nagali, Nauni, Rajgarh, etc.	800
Dharampur	Flood	Flash flood at Kiran Nursery in 2023; 30,707 plants affected.	0.5
Subathu	Heavy Rainfall & Flooding	Floods in Alobra Nursery (Rao Khad), 3920 plants washed away in 2023	0.5
Parwanoo	Forest Fire	Fire incidents in plantations in Kasauli, R-54 Kurardev under CA Scheme	42

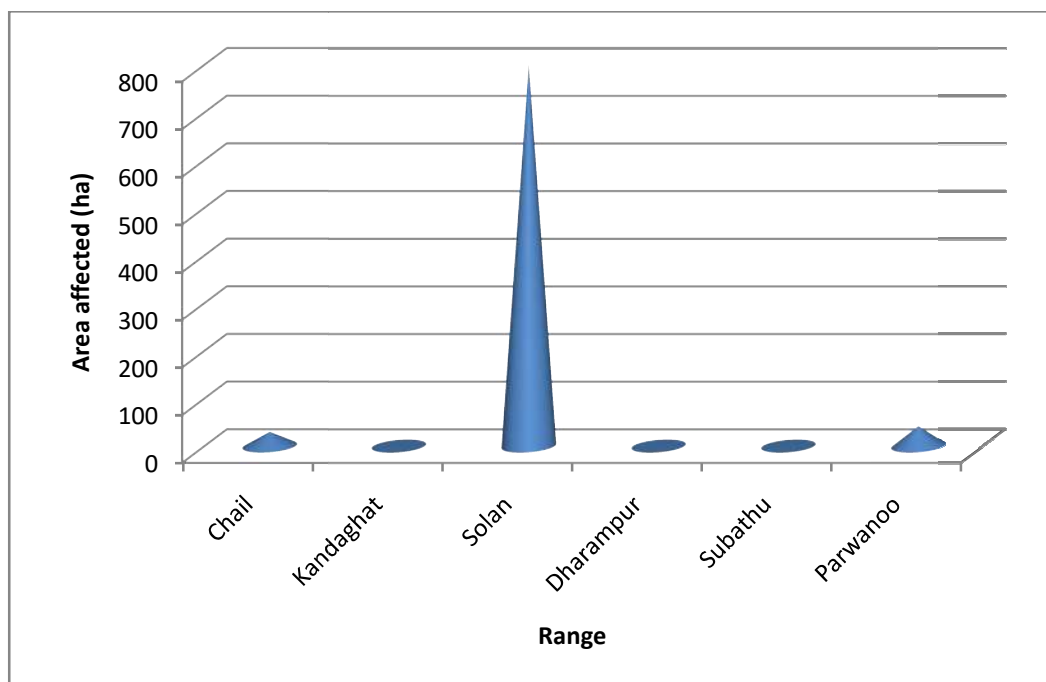


Fig 4.3: Range-wise area affected by natural calamities in Solan Forest Division

The graph above provides a range-wise and year-wise representation of natural calamities affecting the Solan Forest Division. The Solan Forest Division has experienced a range of natural and anthropogenic disturbances over the past decade. Forest fires remain the predominant threat, particularly in the Solan, Charar, and Khaldhar compartments, where fires have repeatedly affected hundreds of hectares of forest and plantation areas. In total, over 800 hectares of land have been impacted across Solan division due to forest fires, with Charar compartment alone witnessing numerous high-severity incidents between 2012 and 2024.

In Chail, periodic fires have been recorded since 2014, in D-44 Cheunth, D-42, D-48 affecting the plantations though maintenance efforts have mitigated long-term degradation. Kandaghat range has been affected by landslides, especially during the 2022 monsoon, resulting in infrastructural damage to nurseries and forest management structures. These incidents emphasize the vulnerability of areas adjacent to perennial streams and highway drainage runoffs.

Meanwhile, Dharampur and Subathu have witnessed flood-related losses due to intense monsoon rainfall. Notably, in 2023, flood events destroyed over 30,000 nursery plants in Dharampur and nearly 4,000 in Subathu, indicating a growing risk to forest regeneration infrastructure from hydrological disasters.

This pattern of calamities highlights a dual vulnerability: fire-induced degradation in upland dry and pine-dominated zones, and hydrological damage in nursery zones located near streams or drainage channels. Given the frequency and magnitude of events, integrating fire prevention, slope stabilization, and flood-proof nursery design into future management plans is essential.

4.4 Area Protected from Grazing

It is noteworthy that the villages in the region lack pastureland, making the forest areas the sole source of grazing for animals. The grazers, which include Gujjars, Gaddis, and local inhabitants (right-holders), heavily depend on these forested areas for their animals' sustenance. Grazing permits are issued to Gujjars and Gaddis, with restrictions on increasing the number of cattle outlined in the Grazing Policy of Himachal Pradesh, 1989.

However, there is a notable discrepancy as the current number of cattle grazing in the forests of Solan Forest Division surpasses the permissible limit stated in the department's regulations. This situation indicates that the animals grazing activities in the forest areas are exceeding the carrying capacity of the ecosystem. The overgrazing poses a significant challenge to maintaining the ecological balance and health of the forested landscapes. Addressing this issue requires a balanced approach to ensure sustainable forest management while meeting the needs of local communities and their livestock.

Due to continuous grazing pressure and the invasive spread of Lantana, the abundance of palatable grass species has significantly declined. The main grass species found in this division include *Chrysopogon fulvus*, *Chrysopogon montanus*, *Cymbopogon martini*, *Cynodondactylon*, *Eulaliopsisbinata*, *Heteropogon contortus*, *Saccharum spontaneum*, and *Sorghum nitidum*, among others

4.5 Lopping Practices

The practice of lopping Ban, Chhal, Amaltas, Khirak & Beul and various other species for fodder and fuel wood is prevalent, particularly during the winter season when the grasses are weathered. Unfortunately, the lopping is often carried out without consideration for the age of the trees, and in forested areas, trees are frequently lopped up to the top, sparing only a few small growing branches. This extensive lopping, especially during severe cold and frost, contributes to the drying of trees. To address this issue, restrictions on lopping have been imposed, including leaving one third of the crown intact, refraining from lopping trees below 20 d.b.h.(diameter at breast height), and avoiding the cutting of branches over 3 cm in diameter during lopping. Furthermore, branches above the upper half of the crown height should not be lopped. The recommended approach is to allow lopping in one portion of the area while closing off the other, and vice versa in the following season through a rotation system. This rotation system not only facilitates the healing of tree wounds but also ensures the availability of more foliage.

While the regulations governing lopping rights are considered adequate, there is a general concern about lax enforcement. Ensuring stricter adherence to these rules is crucial to promoting sustainable practices and maintaining the health of the forest ecosystem.

4.6 Area Infested by Invasive Weed Species in Forests

Invasive weeds such as *Lantana camara* and *Parthenium hysterophorus* have extensively invaded large tracts of forest areas in the region, causing adverse effects on biodiversity and regeneration. *Lantana camara* stands out as the most troublesome weed in the area, believed to have been introduced from tropical Central America. Its invasive nature is attributed to its wide adaptability, prolific seed-bearing capacity, ability to propagate vegetative, fast growth, and a

strong preference for light. These characteristics have led to its widespread invasion of forests, significantly impacting species diversity, land productivity, and altering the local ecology.

The deleterious effects of *Lantana camara* extend to the health of animals, especially cows, when accidentally consumed. The invasion has created dense thicket that negatively affects both palatable and non-palatable species, leading to ecological imbalance. Due to its rapid growth, *Lantana camara* tends to overshadow economically important species, undermining afforestation efforts. The eradicated infested forest areas are listed below, highlighting the extent of the invasion and its repercussions on the local ecosystem.

Table 4.5: Lantana affected forest areas eradicated from 2015-16 to 2024-25

Year	Total area eradicated of Lantana (ha)
2015-16	354
2016-17	569.2
2017-18	140
2018-19	279.2
2019-20	105
2020-21	35.2
2021- 22	35
2022-23	0
2023-24	0
2024-25	141.1

The above table reflects a dynamic trend in the *Lantana* eradication strategy, with an initial aggressive approach in the early years, followed by fluctuating efforts in the subsequent years. The high infestation patches received priority, while moderately and lightly infested areas were also tackled when feasible. The absence of data in two consecutive years signals planning or funding gaps that need to be addressed to ensure continuity in invasive species management. This eradication program, if sustained and monitored effectively, holds the potential to restore ecological balance, improve ground flora, and enhance regeneration of indigenous species in the forest landscapes of Solan Division.

Parthenium hysterophorus, of the family Asteraceae, is an erect and much branched annual or ephemeral herb, known for its notorious role as environmental, medical, and agricultural hazards. The details of the forest infested with lantana are given below:

Table 4.6: Beat-wise Intensity of forests infested with Lantana

S. No	Division	Range	Block	Beat	Name of Forest	Area in Ha.	Infested percent
1	Solan	Subathu	Subathu	Subathu	D-129- Rano	10	25%
2	Solan	Subathu	Subathu	Alobra	D- 110 Raikot	20	75%
3	Solan	Subathu	Subathu	Alobra	D-112 Alobra	30	100%
4	Solan	Subathu	Subathu	Alobra	D- 112 Alobra	10	75%
5	Solan	Subathu	Subathu	Deothi	D -127 -Sashal	6	50%

					C4a		
6	Solan	Subathu	Subathu	Deothi	D-127 Sashal c2	5	25%
7	Solan	Subathu	Subathu	Deothi	D-124 Katiyara C1	18	75%
8	Solan	Subathu	Subathu	Deothi	D-124 Katiyara C2	15	75%
9	Solan	Subathu	Subathu	Deothi	D-124 Katiyara C4	10	50%
	Solan	Subathu	Subathu	Deothi	D-128 kalikufarC1	6	25%
10	Solan	Subathu	Serighat	Serighat	D-113 Serighat	10	25%
11	Solan	Subathu	Serighat	Jhamrot	D- 109 Panewa	25	75%
12	Solan	Subathu	Serighat	Thathol	D-111Thathol	5	50%
13	Solan	Solan	Oachghat	oachghat	R-26 Nagali	3	50%
14	Solan	Solan	Oachghat	Kotla	D-80 Seri	3	50%
15	Solan	Parwanoo	Lugon	Lugon	D-199 Chawal ashnala c1	15	75%
16	Solan	Parwanoo	Lugon	Lugon	D-199 Chawal ashnala c2	15	75%
17	Solan	Parwanoo	Lugon	Lugon	D-198 Lugon bhagour	15	75%
18	Solan	Parwanoo	Lugon	Lugon	D-194 Pratha	20	75%
19	Solan	Parwanoo	Lugon	Lugon	R-45 Khadar ki Dhar	30	75%
20	Solan	Parwanoo	Lugon	Barog	R-61 Naraini c1	180	75%
21	Solan	Parwanoo	Lugon	Barog	R-61 Naraini c2	130	75%
22	Solan	Parwanoo	Lugon	Barog	R-61 Naraini c3	70	75%
23	Solan	Parwanoo	Lugon	Barog	D-218 Kamlog	5	75%
24	Solan	Parwanoo	Lugon	Barog	D-220 Barog	20	75%
25	Solan	Parwanoo	Lugon	Dadiyar	D-200 Chakli Dhanota C1a	52	75%
26	Solan	Parwanoo	Lugon	Dadiyar	D-200 Chakli Dhanota C1b	56.3	75%
27	Solan	Parwanoo	Lugon	Dadiyar	D-200 Chakli Dhanota C1c	63.7	75%
28	Solan	Parwanoo	Lugon	Dadiyar	D-200 Chakli Dhanota C1d	27.2	50%
29	Solan	Parwanoo	Lugon	Dadiyar	D-200 Chakli Dhanota C2	56	75%
30	Solan	Parwanoo	Lugon	Dadiyar	D-207 Dhadog	36.4	50%
31	Solan	Parwanoo	Lugon	Kalth	D-185 Kurla Johari c1	24.3	100%
32	Solan	Parwanoo	Lugon	Kalth	D-185 Kurla Johari c2	86.3	75%

33	Solan	Parwanoo	Lugon	Kalth	D-185 Kurla Johari c3	8.4	100%
34	Solan	Parwanoo	Lugon	Kalth	D-237 Serla	16.8	100%
35	Solan	Parwanoo	Lugon	Kalth	R-48 Kalth C2	14	75%
36	Solan	Parwanoo	Lugon	Kalth	R-47 Karal Ghat c1	51.2	50%
37	Solan	Parwanoo	Lugon	Nabhon	D-192 NabhonPratha	50	100%
38	Solan	Parwanoo	Lugon	Nabhon	D-191 Shogi Nabhon	20	100%
39	Solan	Parwanoo	Lugon	Nabhon	R-59 Jandori	10	100%
40	Solan	Parwanoo	Lugon	Nabhon	D-195 pratha C1	2	100%
41	Solan	Parwanoo	Lugon	Nabhon	D-195 pratha C2	3	100%
42	Solan	Parwanoo	Lugon	Nabhon	D-195 pratha C3	4	100%
43	Solan	Parwanoo	Lugon	Nabhon	R-60 Jandori	4	100%
44	Solan	Parwanoo	Lugon	Nabhon	D-188 Karal ghat c1	20	75%
45	Solan	Parwanoo	Lugon	Nabhon	D-188 Karal ghat c2	30	75%
46	Solan	Parwanoo	Lugon	Nabhon	D-193 umeriyaPratha	10	100%
47	Solan	Parwanoo	Lugon	Banasar	R-46 Jagatghar c3	15	100%
48	Solan	Parwanoo	Lugon	Banasar	D-222 Banasar	5	75%
49	Solan	Parwanoo	Lugon	Banasar	D-189 Jagat garh	10	75%
50	Solan	Parwanoo	Kasauli	Tiron	D-228 Ambota C1	30	75%
51	Solan	Parwanoo	Kasauli	Tiron	D-228 Ambota C2	15	75%
52	Solan	Parwanoo	Kasauli	Tiron	D-229 Tiron C1	5	50%
53	Solan	Parwanoo	Kasauli	Tiron	D-229 Tiron C1	5	50%
54	Solan	Parwanoo	Kasauli	Tiron	D-231 Shilu Jangeshu	30	75%
55	Solan	Parwanoo	Kasauli	Tiron	R-53 Tiron C1	20	75%
56	Solan	Parwanoo	Kasauli	Tiron	R-53 Tiron C2	8	75%
57	Solan	Parwanoo	Kasauli	Tiron	R-53 Tiron C3	20	75%
58	Solan	Parwanoo	Parwanoo	Khadeen	R-51 Gauri Ki Dhar	25	75%
59	Solan	Parwanoo	Parwanoo	Khadeen	D-223 Khadeen	35	75%
60	Solan	Parwanoo	Parwanoo	Khadeen	D-224 Sandhog	40	75%

61	Solan	Parwanoo	Parwanoo	Parwanoo	D-225 Gumma	42	75%
62	Solan	Parwanoo	Parwanoo	Parwanoo	D-226 Ananu	15	75%
63	Solan	Parwanoo	Parwanoo	Parwanoo	D-227 Ananu	2	75%
64	Solan	Parwanoo	Parwanoo	Parwanoo	R-52 Gumma C1	70	75%
65	Solan	Parwanoo	Parwanoo	Parwanoo	R-52 Gumma C2	12	75%
66	Solan	Parwanoo	Parwanoo	Parwanoo	R-56 Parwanoo C1	8	75%
67	Solan	Parwanoo	Parwanoo	Parwanoo	R-56 Parwanoo C2	40	75%
68	Solan	Parwanoo	Parwanoo	Koti	D-234 Ranigaon	15	50%
69	Solan	Parwanoo	Parwanoo	Koti	D-235 Chamgah	28	50%
70	Solan	Parwanoo	Parwanoo	Koti	D-238 Dhamiyana	5	50%
71	Solan	Parwanoo	Parwanoo	Koti	D-236 Kurar C1	35	50%
72	Solan	Parwanoo	Parwanoo	Koti	D-236 Kurar C2	8	50%
73	Solan	Parwanoo	Parwanoo	Datiar	D-233 Datiar C2	40	75%
74	Solan	Parwanoo	Parwanoo	Datiar	D-233 Datiar C3	20	75%
75	Solan	Parwanoo	Parwanoo	Datiar	D-233 Datiar C4	15	75%
76	Solan	Parwanoo	Parwanoo	Datiar	D-233 Datiar C6	45	75%
77	Solan	Dharampur	Joharji	Joharji	D-213 Kaba	47	100%
78	Solan	Dharampur	Joharji	Joharji	D-215 Kaba	30	75%
79	Solan	Dharampur	Joharji	Neri	D-210 Odder Jhangiriya	62	75%
80	Solan	Dharampur	Joharji	Neri	D-205 Neri	35	100%
81	Solan	Dharampur	Joharji	Neri	D-206 Neri	20	75%
82	Solan	Dharampur	Joharji	Neri	D-209 Bhagor	10	50%
83	Solan	Dharampur	Joharji	Neri	D-211 Halda	10	75%
84	Solan	Dharampur	Joharji	Neri	D-212 Halda	12	100%
85	Solan	Dharampur	Joharji	Neri	D-217 Meon Sanog	35	100%
86	Solan	Dharampur	Joharji	Neri	R-43 Halda C1	50	75%
87	Solan	Dharampur	Joharji	Neri	R-43 Halda C2	32	75%
88	Solan	Dharampur	Joharji	Neri	R-43 Halda C3	55	100%
89	Solan	Dharampur	Joharji	Neri	R-44 Jhanai C1	40	75%
90	Solan	Dharampur	Joharji	Neri	R-44 Jhanai C2	58	100%
91	Solan	Dharampur	Joharji	Bohali	D-176 Chiroti ki Dhar	15	25%
92	Solan	Dharampur	Joharji	Bohali	D-178 Chiroti ki	10	25%

					Dhar		
93	Solan	Dharampur	Joharji	Bohali	R-40 Bohali C2a	10	25%
94	Solan	Dharampur	Joharji	Bohali	R-39 Chiroti ki Dhar	5	25%
95	Solan	Dharampur	Joharji	Bohali	D-170 Bhogseri	2	25%
96	Solan	Dharampur	Chabal	Chabal	R-30 Chabal C5a	20	75%
97	Solan	Dharampur	Chabal	Chabal	R-30 Chabal C5b	18	50%
98	Solan	Dharampur	Chabal	Chabal	R-30 Chabal C4	22	50%
99	Solan	Dharampur	Chabal	Chabal	D-118 Chabal Ki Dhar	6	50%
100	Solan	Dharampur	Dharampur	Kadon	R-34 Mansa Devi	1	75%
101	Solan	Dharampur	Dharampur	Kadon	D-166 Dhar C2	20	75%
102	Solan	Dharampur	Dharampur	Kadon	D-244 Cheola C5	10	50%
					Total	2619.6	

4.7 Incidence of Pests and Diseases

Oaks are subjected to severe attack by defoliators, especially in the Jaunaji belt in early summer. Cockchafer grubs are a great nuisance and cut off seedlings flush to the soil surface in nurseries. The table below details the insect pests found on tree species in the division.

Table 4.7: Major Pests of Solan Forest Division

Pest Species	Common Name	Family	Host Plant(s)	Status
<i>Diohabda spp.</i>	Defoliator	Chrysomelidae	<i>Celtis australis</i>	Serious
<i>Curculio sikkimensis</i>	Acorn Borer	Curculionidae	<i>Quercus leucotrichophora</i> (Acorn)	Serious
<i>Sitophilus glandium</i>	Acorn/Seed Borer	Curculionidae	<i>Quercus leucotrichophora</i> (Acorn)	Serious
<i>Hypsipyla robusta</i>	Shoot Borer	Pyralidae	<i>Toona ciliata</i>	Serious
<i>Apriona cinerea</i>	Stem Borer	Cerambycidae	<i>Populus deltoides</i>	Serious
<i>Chrysomela populi</i>	Leaf Beetle	Chrysomelidae	<i>Populus</i> spp.	Serious
<i>Plagioderma versicolora</i>	Leaf Beetle	Chrysomelidae	<i>Populus</i> and <i>Salix</i> spp.	Serious
<i>Dioryctria abietella</i>	Cone Borer	Pyralidae	Conifers (Seeds & Cones)	Serious
<i>Parebav estanumella</i>	Leaf Feeder	Nymphalidae	<i>Debregeasia hypoleuca</i>	Serious
<i>Malacosoma indica</i>	Tent Caterpillar	Lasiocampidae	<i>Pistacia ntegerrima</i> & other broadleaf spp.	Serious
<i>Dinoderus</i> spp.	Bamboo Borer	Bostrichidae	<i>Dendrocalamus</i>	Serious

			<i>strictus</i>	
<i>Heteropsyl lacubana</i>	Psyllid (Sap Sucker)	Psyllidae	<i>Leucaena leucocephala</i>	Serious
<i>Holotrichia</i> spp.	White Grubs	Scarabaeidae	Nursery plants (Polyphagous)	Sometimes Serious
<i>Brahmina</i> spp.	White Grubs	Scarabaeidae	Nursery plants (Polyphagous)	Sometimes Serious
<i>Agrotis</i> spp.	Cutworms	Noctuidae	Nursery plants (Polyphagous)	Serious

Management of pests is important to reduce the incidents of insect pest attacks. The research done in this direction in different research institutes like ICFRE-FRI, ICFRE-HFRI, UHF, Nauni should be used to manage the insect pests.

4.8 Forest Degradation and its Drivers

Over time, the escalation of human and animal populations, coupled with the opening of forests for right holders in fringe villages and illicit removal incidents, has further accelerated the degradation process. The degradation is increased by the non-working of forests and a lack of adherence to cleaning operations. Consequently, crop deterioration has occurred, leading to decline in natural regeneration in forest areas, necessitating the enrichment through the planting of indigenous species. Several factors contribute to poor regeneration in forests, including:

Invasion of Weeds: The heavy invasion of weeds, notably *Lantana camara* and *Parthenium hysterophorus*, has either halted or significantly reduced regeneration. Biotic pressures from Fringe Villages: Biotic pressures, such as grazing and illicit removal, have inflicted damage on the crop and hindered regeneration.

Encroachments: Scattered human habitation in Solan Forest Division, driven by a growing population, has exerted substantial pressure on land resources. Encroachments in forest areas, especially near townships, often occur for agricultural and domestic purposes, contributing to illegal constructions.

The encroachment scenario in the Solan Forest Division presents a concerning picture, with forest lands increasingly coming under pressure due to expanding human activities. As of January 31, 2025, there are five ongoing encroachment cases covering a total area of approximately 3.163 hectares. The primary drivers of encroachment include agricultural expansion and domestic construction, particularly in forest areas adjacent to urban settlements. The lack of progress in eviction and enforcement underscores the need for stronger institutional action and timely implementation of court directives to safeguard the forest ecosystem in this ecologically sensitive region. Encroachment has been discussed in detail in Chapter 2 of part I

Mining: No mining practices reported in entire Solan Forest Division

4.9 Pollution Control and Protection of Environment

The main Industrial areas in Solan division are located in Parwanoo range. Proper vigilance needs to to be kept by the concerned staff regarding the discharge of liquid and solid waste by the industrial units in the adjoining forest land. The Solid waste including garbage, refuse etc. obtained from the house hold of Solan city was dumped by the Seri Gram Panchayat of Solan in the Forest land. The department took stringent action against this practice of Seri panchayat and fined them for this practice.

Chapter 5

Conservation and Maintenance of Soil and Water Resources

The Solan Forest Division of Himachal Pradesh is situated within the geologically young and ecologically fragile Shiwalik hills, which are predominantly composed of sedimentary rocks such as sandstone and shale. These formations are highly susceptible to soil erosion and land degradation, particularly during the monsoon season. The lower valley regions, characterized by silty and sandy alluvial soils, are primarily used for agriculture and human habitation, but remain vulnerable to seasonal runoff, gully formation, and the emergence of ephemeral torrents.

5.1 Area Treated Under Soil and Water Conservation Measures

This forest division has implemented extensive soil and water conservation measures to restore and protect the landscape. Among these, the construction of check dams has played a vital role in reducing erosion, stabilizing slopes, and enhancing groundwater recharge. These structures are strategically located in vulnerable areas across various ranges of the division to mitigate land degradation and ensure the sustainable management of natural resources. The ongoing efforts in this direction not only conserved the ecological integrity of the region but also support local livelihoods by protecting arable land and infrastructure.

Table 5.1: Range wise list of check dams constructed in Solan Forest Division from 2017 to 2024.

Name of Range	No. of Check Dams
Chail	28
Kandaghat	23
Solan	23
Subathu	27
Dharampur	37
Parwanoo	57

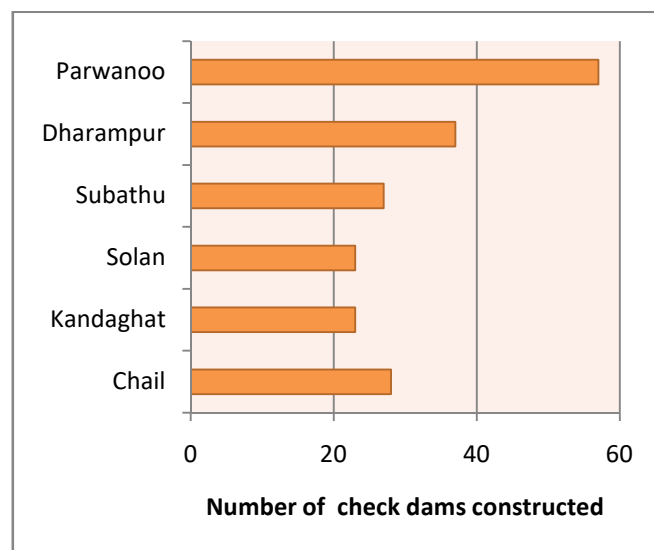


Fig. 5.1: Number of check dams constructed in the ranges of Solan Forest Division from 2017 to 2024

Success model under Jal Bhandaran “Catch the rain Programme”

A WHS structure comprising dimensions of 15m X 5.60 m (Length *Height) & a length of 35.10 metres was constructed in Kiartoo beat of Kandaghat range in Sainj Ka Nalla in 2022 with a pondage of 10 Lac litres. Rs 27,61,100/- were spent on its construction. Around 90 to 95 households from Sainj, Chanogri, Kotla, Kahli, Nagaon villages were benefited from this WHS as water needs for their agriculture and domestic use is fulfilled.



Rejuvenation of Dochi and Gussain springs

Around 1300 trenches were constructed in the recharge area of Dochi spring & Gussain spring in Dochi beat of Parwanoo range comprising an area of 2.2 hectares in 2022. The discharge rate increased considerably from 1.6 litre /minute to 2.9 litre /minute in lean period in case of Dochi spring and 15.36 litre/ min to 16.5 litre/min in Gussain spring. Around 45-50 households were benefited from the increased flow of the spring water for their domestic and agriculture use.



5.2 Duration of Water Flow in the Selected Seasonal Streams

In forest area duration of river and stream flow is significantly influenced by the moisture stock within the forest ecosystem. Forested catchments with high moisture retention due to dense vegetation and healthy soils tend to support longer durations of stream flow. Conversely, areas with reduced forest cover and degraded soils exhibit rapid runoff and short-lived flows, indicating a direct link between forest moisture dynamics and stream hydrology.

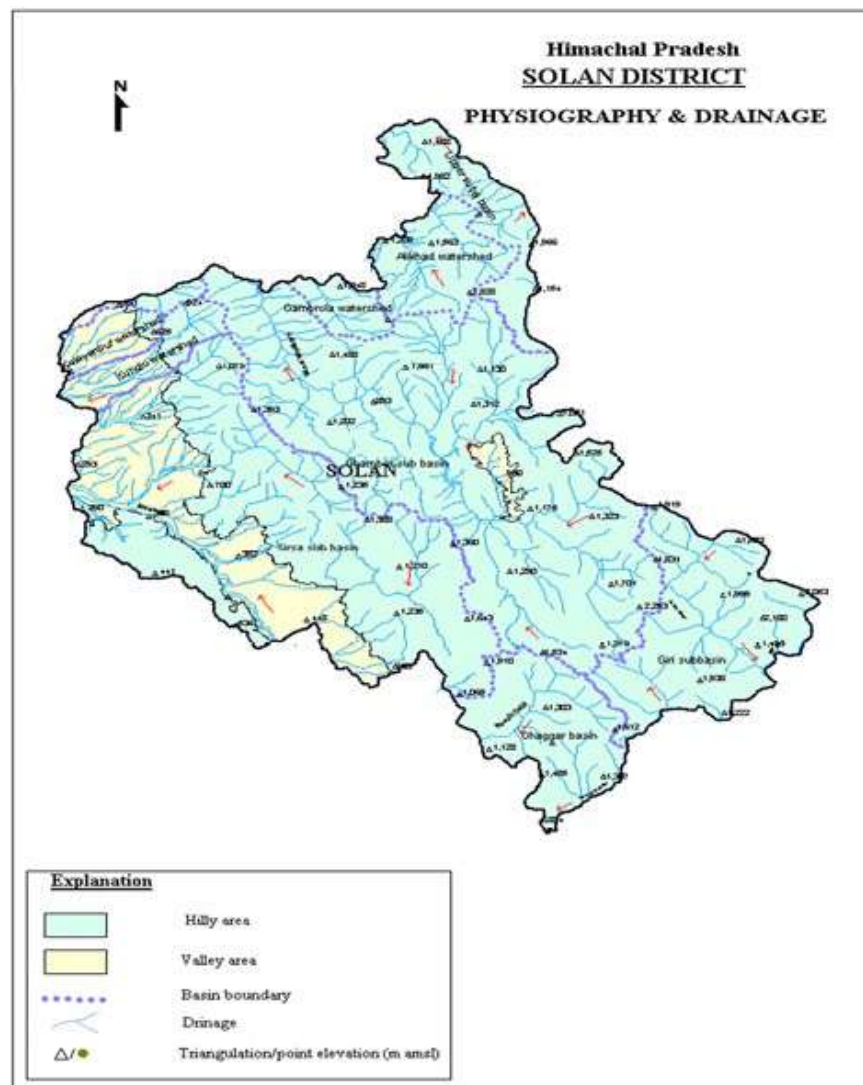


Fig. 5.2: Drainage Map of Solan Forest Division

Springs are the main ground water structures that provide water for domestic and irrigation purposes. Springs in the division are mainly gravity, contact or fracture type and springs located along major thrust/faults or structurally weak planes are high yielding. The springs are locally called as Chasma and the discharge varies from seepages to as high as fifty litres per min. Bowries, a type of dug well, are another structure constructed on the hill slopes to tap the seepages.

Table 5.2: Range wise list of rivers and streams in Solan Forest Division

Range	Name of River/Stream	From	To
Chail	Ashwani River	Shimla	Gaura in Giri River
Chail	Giri River	Chopal	Yamuna River
Solan	Changarka nalla(Stream)	Chambaghat	AshwaniKhadd
Solan	Ashwani Khadd (River)	-	-
Solan	Sharani Khadd	Matial	AshwaniKhadd
Solan	Rachhambu ka nala	Dharog	AshwaniKhadd
Solan	Manlog Khadd (Stream)	Sheel	SolanKhadd
Solan	Ghattika Nalla (Stream)	R-28 Khaldhar	SolanKhadd
Solan	Nauni Ka Nall (Stream)	D-137 Nauni	SolanKhadd
Solan	Solankanalla	Kotlanalla	Deothal
Solan	Giri River	-	-
Subathu	Gamber	Serighat(Shiv Mandir)	Alobra(JadliKyar)
Dharampur	Barog-NagaliNala	Chewa	ShranuBaggar
Dharampur	KoshalyaKhadd	Joharji	Gadiar
Parwanoo	TikkriKhad	Dadiyar	Lugon
Parwanoo	Kaushlaya River	Kurar	Kamli
Parwanoo	Gahi Streams	Jabli	Kurar
Parwanoo	NathKaKhol Stream	NathKaKhol	ParwanooBarriar

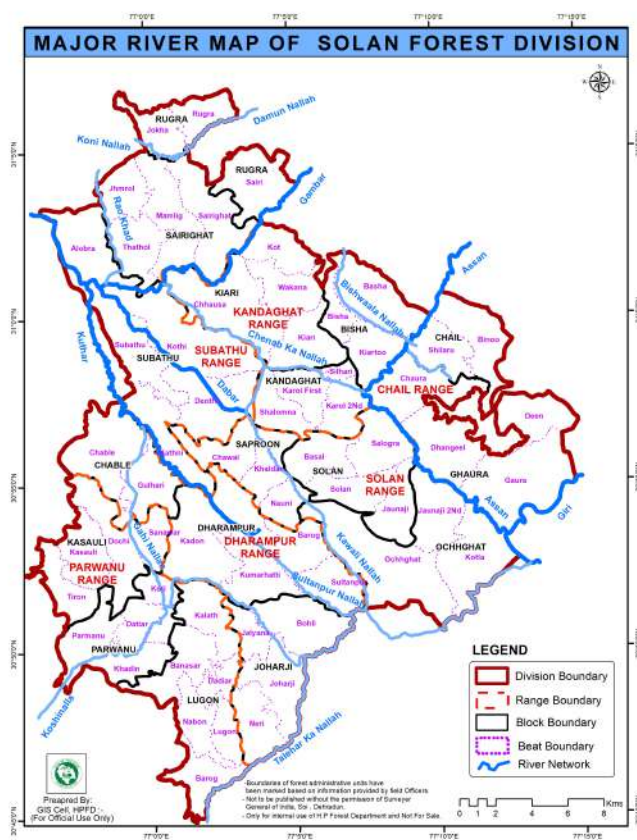


Fig. 5.3: River Map of Solan Forest Division

The survey of all forests was conducted by field staff & springs were located in different forests. The list of springs in forests of this division is mapped & detailed as below:

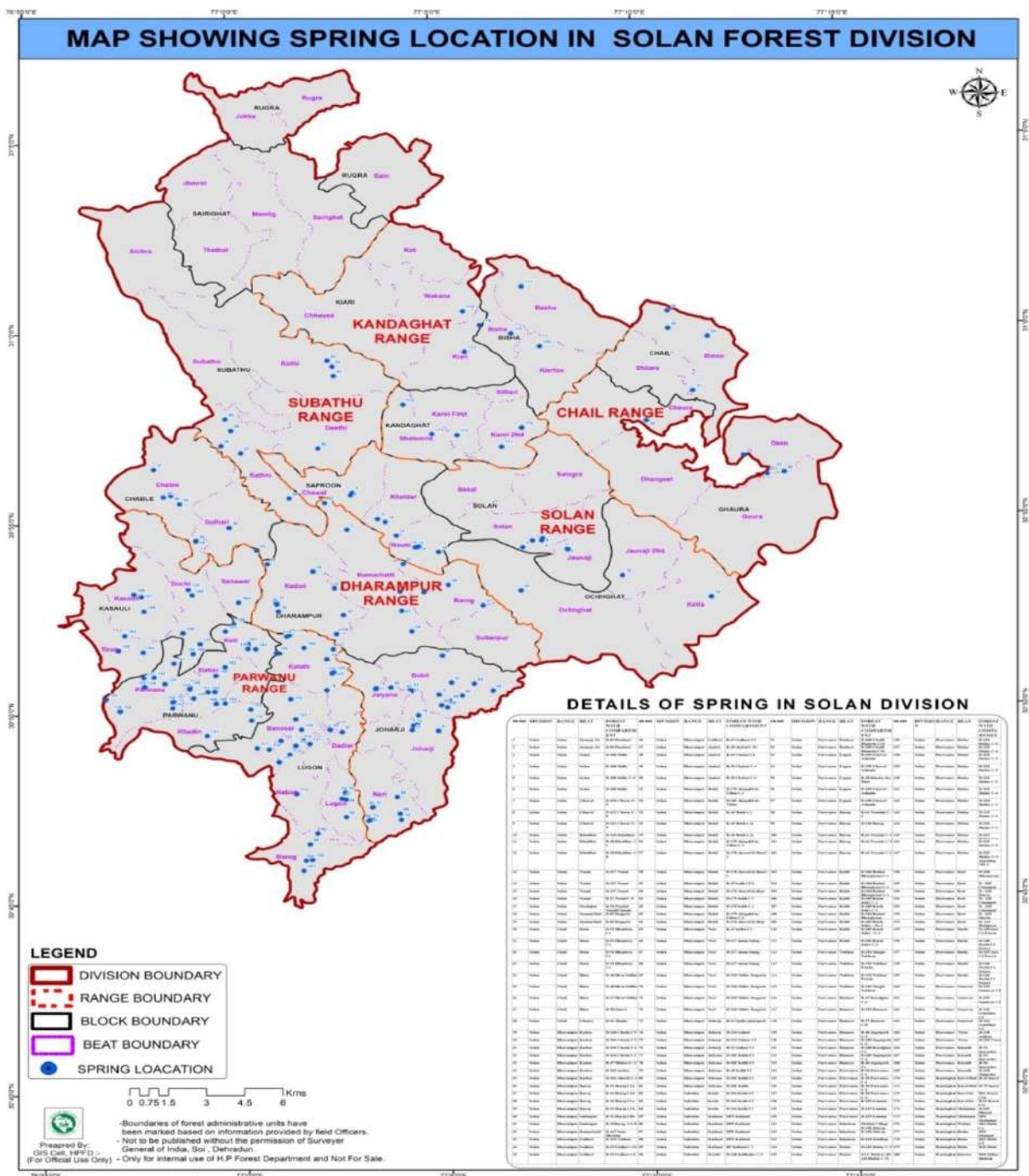


Fig 5.4: Springs in Solan Forest Division

5.3 Wetlands in Forest Areas

There are no wetlands in forest Division. However, Renukaji Wetland which is also a Ramsar site is the nearest wetland.

5.4 Water Level in the Wells in the Vicinity (Up To 5 Km) of Forest Area

No wells exist in the region

5.5 Status of Aquifers

Hydrogeology

Hydro-geologically, the unconsolidated valley fills or alluvial formation occurring in the valley area, semi-consolidated formations belonging to Siwalik Group and older consolidated hard rock's forms the aquifer in the area. Inter-granular pore spaces in the sedimentary formations and secondary fissured porosity in hard rocks, topographical set up coupled with precipitation in the form of rain and snow, mainly govern the occurrence and movement of ground water. Porous alluvial formation occurring in the valley area, forms the most prolific aquifer system, whereas the sedimentary semi-consolidated formations and hard rocks, form aquifer of low yield prospect. Major parts of the forest division are hilly and mountainous with highly dissected and undulating terrain. These areas are underlain by semi-consolidated and consolidated hard rocks of Tertiary and Proterozoic age. Ground water potential in such areas is very low, due to its hydro-geomorphic set up.

Recharge Area Details

The possible recharge of the aquifer system which is feeding the demand of groundwater in this valley is mainly through rain & snow and to some extent through alluvial formation occurring in small stretch in this region. Mostly this region has sedimentary semi-consolidated formations and hard rocks, form aquifer with low recharge.

5.6 Status of Springs in Solan Forest Division

There are 180 springs in the division details of which are given in the table below.

Table 5.3: Details of springs in Solan Forest Division

S. No.	Range	Beat	Name of Forest with compartment	Latitude.			Longitude			Flow rate (litres/min) in the month of april
				Deg rees	Min utes	Sec onds	Deg rees	Min utes	Seco nds	
1	Solan	JaunajiIst	D-84 Damkari	30°	54'	10"	77°	08'	10"	1 litre/min
2	Solan	JaunajiIst	D-84 Damkari	30°	54'	11.5 6"	77°	08'	09.37 "	0.10 litre/min
3	Solan	Solan	D-108 Shilly	30°	54'	24.9	77°	07'	18.24	0.1 litre/min

						3"			"	
4	Solan	Solan	D-108 Shilly	30°	54'	14.6 8"	77°	07'	03.26 "	6 litre/min
5	Solan	Solan	D-108 Shilly C-9	30°	54'	25.2 1"	77°	07'	31.53 "	4 litre/min
6	Solan	Solan	D-108 Shilly	30°	54'	28.4 4"	77°	07'	32.95 "	3 litre/min
7	Solan	Chawal	D-132 Charar C-5	30°	54'	46.3 8"	77°	02'	44.25 "	25 litre/min
8	Solan	Chawal	D-132 Charar C-8	30°	55'	40.7 2"	77°	02'	50.69 "	40 litre/min
9	Solan	Chawal	D-132 Charar C-9	30°	55'	44.2 5"	77°	02'	53.36 "	1 litre/min
10	Solan	Khaldhar	D-136 Khaldhar	30°	54'	57.5 4"	77°	03'	41.13 "	50 litre/min
11	Solan	Khaldhar	R-28 Khaldhar C-1	30°	55'	02.3 9"	77°	03'	29.80 "	0.300 litre/min
12	Solan	Khaldhar	R-28 Khaldhar C-4	30°	54'	35.8 2"	77°	03'	56.93 "	0.250 litre/min
13	Solan	Nauni	D-137 Nauni	30°	54'	18.2 2"	77°	04'	30.25 "	4 litre/min
14	Solan	Nauni	D-137 Nauni	30°	54'	17.1 9"	77°	04'	27.50 "	2 litre/min
15	Solan	Nauni	D-137 Nauni	30°	54'	16.9 8"	77°	04'	24.54 "	4 litre/min
16	Solan	Nauni	R-27 Nauni C-1	30°	54'	09"	77°	04'	58.96 "	6 litre/min
17	Solan	Oachghat	D-94 Nandal Nagali(Nagali)	30°	51'	22"	77°	08'	10"	300ml/min
18	Solan	JaunajiIind	D-83 Rajgarh	30°	52'	52.6 0"	77°	11'	40.41 "	3 litre/min
19	Solan	JaunajiIind	D-83 Rajgarh	30°	53'	28.3 5"	77°	09'	29.55 "	3 litre/min
20	Chail	Deen	D-52 Bhojdeen C1	30	94	824	77	20	392	1Ltr/1mints
21	Chail	Deen	D-52 Bhojdeen C1	30	93	493	77	22	188	1Ltr/1mints
22	Chail	Deen	D-52 Bhojdeen C1	30	94	189	77	20	746	1Ltr/1mints
23	Chail	Deen	D-52 Bhojdeen C1	30	94	631	77	20	422	3 lit/ min
24	Chail	Binu	D-48 Birni Shillai	30	99	500	77	19	527	1Ltr/1mints
25	Chail	Binu	D-48 Birni Shillai	30	99	944	77	19	655	3ltr/1mints
26	Chail	Binu	D-47 Birni Shillai	31	0	666	77	17	888	Dry
27	Chail	Binu	D-50 Sakori	30	97	138	77	18	916	Dry
28	Chail	Chaura	D-51 Jhajha	30	95	940	77	16	982	1 Lit/ 1.5 Mins

29	Dharampur	Kadon	D-244 Cheola C5	30	52	49.9	77	0	58.7	0.9 ltr./min
30	Dharampur	Kadon	D-244 Cheola C5	30	52	38.5	77	1	0.4	3lt/min
31	Dharampur	Kadon	D-244 Cheola C4	30	52	53.8	77	0	57.3	2.7lt/min
32	Dharampur	Kadon	D-244 Cheola C1	30	53	53.8	77	0	45.6	1.2ltr/min
33	Dharampur	Kadon	R-37 Maltoo C-2	30	52	31.8	77	2	36.5	5 ltr /min.
34	Dharampur	Kadon	D-162 maltoo	30	53	14.2	77	2	24.1	5.1ltr/min.
35	Dharampur	Kadon	D-161 sihardi C-1	30	53	41.1	77	1	52.7	3.5ltr/min.
36	Dharampur	Barog	R-31 Barog C2a	30	53	16.9	77	5	12.3	4.5 ltr /min.
37	Dharampur	Barog	R-31 Barog C1b	30	53	51.2	77	4	6.4	16ltr/min
38	Dharampur	Barog	R-31 Barog C1a	30	53	7.53	77	4	0.73	6ltr /min.
39	Dharampur	Barog	R-31 Barog C1b	30	53	6.11	77	4	36.1	0.1ltr /min
40	Dharampur	Sultanpur	R-31 Barog C8b	30	53	6.6	77	6	59.4	6.5ltr/min.
41	Dharampur	Sultanpur	R-31Barog C4 B	30	52	43.9	77	6	3	1.5ltr/min.
42	Dharampur	Kumarhatti	D-147 kana Dhyalag	30	55	28.8	77	2	12.5	1.1ltr./min
43	Dharampur	Gulhari	D-153 Gulhari	30	54	15.5	77	0	30.02	1.75ltr./min
44	Dharampur	Gulhari	R-33 Gulhari c1b	30	54	51.9	76	59	50.4	0.4ltr/min.
45	Dharampur	Gulhari	R-33 Gulhari C2	30	54	31.6	76	59	1.2	1.2ltr./min
46	Dharampur	Gulhari	R-33 Gulhari C2	30	54	31.5	76	59	0.83	0.5ltr/min.
47	Dharampur	chabal	R-30 chabal C-5a	30	56	24.8	76	58	0.48	0.9 ltr. /min.
48	Dharampur	chabal	R-30 Chabal C4	30	55	30	76	58	38	1.2ltr./min.
49	Dharampur	chabal	R-30 Chabal C-4	30	55	43.8	76	58	25	1 ltr. /min
50	Dharampur	chabal	R-30 Chabal C-6	30	55	41.3	76	58	14.5	0.5 ltr/min.
51	Dharampur	Bohli	D-179 shirgukli ka Tibba C-1	30	50	23.9 9	77	4	54.94	2.8 ltr/min.
52	Dharampur	Bohli	D-181 shirgukli ka Tibba	30	50	30.9 5	77	4	16.19	2ltr/ min.
53	Dharampur	Bohli	R-40 Bohli c-1	30	50	33.5 8	77	4	12.47	1ltr/min.
54	Dharampur	Bohli	R-40 Bohli c-2a	30	50	33.5 8	77	4	12.47	0.95ltr/ min
55	Dharampur	Bohli	R-40 Bohli c-2a	30	50	7.21	77	4	58.4	4 ltr/min
56	Dharampur	Bohli	D-179 shirgukli ka Tibba C-2	30	50	3.93	77	5	7.044	0.50ltr/min.
57	Dharampur	Bohli	D-178 charoti ki dharC-1	30	50	42.8	77	5	13.83	0.24ltr/min
58	Dharampur	Bohli	D-178 charoti ki dharC-1	30	52	4.4	77	4	16.9	0.7ltr/min
59	Dharampur	Bohli	R-40 bohli C2 b	30	50	14.2	77	5	10.7	1.3ltr/min
60	Dharampur	Bohli	D-176 charoti ki dhar	30	50	29.1	77	6	14.8	0.35ltr/min
61	Dharampur	Bohli	D-175 bohli C-1	30	51	25.6	77	5	1.3	0.72ltr/min
62	Dharampur	Bohli	D-175 bohli C-1	30	52	37.2	77	4	2.7	2.5ltr/min.
63	Dharampur	Bohli	D-179 shirgukli ka Tibba C-2	30	50	22.0 2	77	5	29.2	1.2ltr/min

64	Dharampur	Bohli	D-176 charoti ki dhar	30	50	40.6	77	5	47.2	1.5ltr/min..
65	Dharampur	Neri	R-43 halda C3	30	47	27.9	77	3	13.2	0.9ltr./min
66	Dharampur	Neri	D-217 meunSanog	30	47	7.4	77	3	13.9	1.2ltr./min
67	Dharampur	Neri	D-217 meunSanog	30	47	28.1	77	3	13.9	0.8ltr./min
68	Dharampur	Neri	D-217 meunSanog	30	47	17.4	77	3	53.5	0.35ltr./min.
69	Dharampur	Neri	D-210 Odder Jangeria	30	47	43.8	77	3	49.8	1.4ltr./min.
70	Dharampur	Neri	D-210 Odder Jangeria	30	47	7.6	77	3	55.1	3.2ltr./min
71	Dharampur	Neri	D-210 Odder Jangeria	30	47	6.61	77	3	7.2	3ltr./min
72	Dharampur	Neri	D-210 Odder Jangeria	30	47	7.7	77	3	8.69	5.5ltr/min
73	Dharampur	Joharji	R-42 Quila ajmergarh	30	49	38	77	4	22	0.35 ltr/min
74	Dharampur	Joharji	D-214 Gulzar	30	49	29	77	4	14	0.24 ltr/min
75	Dharampur	Joharji	D-214 Gulzar C3	30	49	36	77	4	16	1.5ltr/ min
76	Dharampur	Joharji	R-42 Gulzar C1	30	49	52	77	4	24	0.8 ltr/ min
77	Dharampur	Jalyana	D-202 Kalth C2	30	50	34.5	77	3	21.6	0.3 ltr/min.
78	Dharampur	Jalyana	D-202 Kalth C2	30	50	35.8	77	3	22.4	0.25 ltr/min.
79	Dharampur	Jalyana	R-48 Kalth C1	30	50	33.5	77	2	9.46	1.5ltr./min.
80	Dharampur	Jalyana	D-202 Kalth C1	30	50	36.6	77	3	44.1	1.7ltr./min.
81	Dharampur	Jalyana	D-182 Kalth	30	49	27	77	4	53	1.32ltr./min.
82	Subathu	Kothi	D 134 Kothi C2	30	59	13.2	77	2	20.6	1 ltr 2 minute 44 sec.
83	Subathu	Kothi	D 134 Kothi C2	30	59	3.8	77	2	27.5	2 ltr 1.minute 53 sec.
84	Subathu	Kothi	D 134 Kothi C1	30	58	49	77	2	29.3	1 ltr 21 minute
85	Subathu	Kathani	DPF Kathani	30	57	43	76	59	48	1 ltr 9 minute 13 sec.
86	Subathu	Kathani	DPF Kathani	30	57	25	76	59	56	1 ltr 1 minute 4 Sec
87	Subathu	Kathani	DPF Kathani	30	56	49	77	0	10	1 ltr 29 minute 3 sec.
88	Subathu	Kathani	DPF Kathani	30	57	1	76	59	41	1 ltr 11 sec.
89	Subathu	Kathani	RF kathani C 2	30	55	37	77	1	20	1 ltr 48 Sec.
90	Subathu	Deothi	D-128 Kalikufar	30	56	55	77	2	4	1 ltr / 5

			C-1							Second
91	Parwanoo	Dadiyar	D-200 Chakli Dhanota C1d	30	49	27.3 6	77	2	30.74	1.8 litre/min
92	Parwanoo	Dadiyar	D-200 Chakli Dhanota C1b	30	49	31.0 8	77	2	13.08	1.5 litre/min
93	Parwanoo	Lugon	D-199 Chawal Ashnala	30	47	51.5 8	77	2	33.22	1 litre/min
94	Parwanoo	Lugon	D-199 Chawal Ashnala	30	47	52.0 8	77	2	33.52	1.5 litre/min
95	Parwanoo	Lugon	R-45 Khadar Ke Dhar	30	47	13.2	77	2	34	1.2 litre/min
96	Parwanoo	Lugon	D-199 Chawal Ashnala	30	47	40.8	77	2	34.2	2 litre/min
97	Parwanoo	Lugon	D-199 Chawal Ashnala	30	47	42.2	77	2	28.19	0.8 litre /min
98	Parwanoo	Barog	R-61 Naranin C-2	30	46	47.8 2	77	1	51.24	0.5 liter/min
99	Parwanoo	Barog	D-220 Barog	30	46	30.8 4	77	1	39.84	15 liter/min
100	Parwanoo	Barog	R-61 Naraini C-1	30	46	5.4	77	1	33.6	0.8 liter/min
101	Parwanoo	Barog	R-61 Naraini C-2	30	45	49.5	77	1	29.7	1 liter/min
102	Parwanoo	Barog	R-61 Naraini C-1	30	46	6.78	77	1	42.72	2 liter/min
103	Parwanoo	Kalth	D-184 RathalBhargiyana C-1	30	50	59.9	77	2	17.7	5 Liters / Minute
104	Parwanoo	Kalth	D-184 RathalBhargiyana C-1	30	51	0.93 6	77	2	18.9	1.5 Liters/ Minute
105	Parwanoo	Kalth	D-184 RathalBhargiyana C-1	30	51	1.72	77	2	20.6	2 liter/min
106	Parwanoo	Kalth	D-185 Kurla Johri C-2	30	51	40.9	77	1	37.02	1.3 Liters/Min
107	Parwanoo	Kalth	D-185 Kurla Johri C-1	30	51	38.0 5	77	2	20.1	1.4 liters/Min
108	Parwanoo	Kalth	D-184 RathalBhargiyana	30	51	22.3 5	77	2	10.3	1.7 liters/min
109	Parwanoo	Kalth	D-185 Kurla Johri --No-1	30	52	1.88	77	2	25.7	2.4 Liters/Min
110	Parwanoo	Kalth	D-185 Kurla Johri -C-2	30	51	59.5	77	1	11.7	1 Liters/Min
111	Parwanoo	Kalth	D-185 Kurla Johri C-2	30	52	1.23	77	1	16.3	9 Liters/Min
112	Parwanoo	Nabhon	D-191 ShoghiNabhon	30	48	41.1	77	0	56.8	2 liters/min
113	Parwanoo	Nabhon	D-192 NabhonPratha	30	48	52.5	77	1	12.7	2 liters/min
114	Parwanoo	Nabhon	D-192 NabhonPratha	30	47	50.7	77	1	21.82	10 liter/min

115	Parwanoo	Nabhon	D-191 ShoghiNabhon	30	50	20.2 2	77	1	15.96	3 liter/min
116	Parwanoo	Banasar	R-47 Karalghat C-2	30	49	6.74	77	1	21.8	4 liter/min
117	Parwanoo	Banasar	D-222 Banasar	30	49	3.6	77	0	24.96	0.8 liter/min
118	Parwanoo	Banasar	R-57 BanasarC1b	30	49	1.44	77	0	42.24	2.3 Liter/Minute
119	Parwanoo	Banasar	R-46 Jagatgarh C-3	30	49	14.5 2	77	1	33.36	2.2 Liter/Minute
120	Parwanoo	Banasar	D-189 Jagatgarh C-2	30	49	32.1	77	1	30.69	0.9 Liter/Minute
121	Parwanoo	Banasar	D-188 Karalghat C1	30	49	9.2	77	1	42.3	1.7 Liter/Minute
122	Parwanoo	Banasar	D-189 Jagatgarh C-1	30	49	14.8	77	1	0.12	17 Liter/Minute
123	Parwanoo	Banasar	R-46 Jagatgarh C1	30	49	48.7 2	77	1	22.44	3.7 Liter/Minute
124	Parwanoo	Parwanoo	R-56 Parwanoo C-1	30	50	23.4 9	76	56	43.26	1.8 Liter/Minute
125	Parwanoo	Parwanoo	R-56 Parwanoo C-1	30	50	4.4	76	57	3.34	16 Liter/Minute
126	Parwanoo	Parwanoo	R-56 Parwanoo C-2	30	50	4.33	76	57	3.89	1.9 Liter/Minute
127	Parwanoo	Parwanoo	R-56 Parwanoo C-2	30	50	56.9	76	57	39.7	35 Liter/Minute
128	Parwanoo	Parwanoo	D-225 Gumma	30	50	42.7 5	76	57	41.25	0.2 Liter/Minute
129	Parwanoo	Parwanoo	D-225 Gumma	30	50	41.7 9	76	57	39.65	0.3 Liter/Minute
130	Parwanoo	Parwanoo	D-225 Gumma	30	50	46.9 5	76	58	10.53	3.7 Liter/Minute
131	Parwanoo	Khadeen	Mehlon Village D-190 Jabrog	30	82	28.9 8	77	0	5.36	2.2 Liter/Minute
132	Parwanoo	Khadeen	D-190 Jabrog	30	49	47.4 1	77	0	17.3	3.1 Liter/Minute
133	Parwanoo	Khadeen	D-224 Sandhog	30	81	90.9 1	76	98	66.85	3.6 Liter/Minute
134	Parwanoo	Datiar	D-233 Datiar C-5	30	85	44.5 9	76	99	52.9	18 Liter/Minute
135	Parwanoo	Datiar	GCL Datiyar (D-233 Datiar C-5)	30	83	83.4 7	76	97	26.62	19 Liter/Minute
136	Parwanoo	Datiar	D-233 Datiar C-5	30	84	8.2	76	97	60.63	13.5 Liter/Minute
137	Parwanoo	Datiar	D-233 Datiar C-4	30	84	25.4 7	76	98	71.99	15 Liter/Minute
138	Parwanoo	Datiar	D-233 Datiar C-5	30	84	48.2	76	97	98.05	11 Liter/Minute
139	Parwanoo	Datiar	D-233 Datiar C-5	30	84	0.05	76	98	16.1	9 Liter/Minute

140	Parwanoo	Datiar	D-233 Datiar C-3	30	84	85.0 7	76	99	26.09	12 Liter/Minute
141	Parwanoo	Datiar	D-233 Datiar C-4	30	85	15.6 6	76	99	72.47	6.3 Liter/Minute
142	Parwanoo	Datiar	D-233 Datiar C-5	30	84	38.3 3	76	97	97.79	4.6 Liter/Minute
143	Parwanoo	Datiar	D-233 Datiar C-5	30	84	48.2	76	97	97.79	5.2 Liter/Minute
144	Parwanoo	Datiar	D-233 Datiar C-6	30	83	93	76	99	97.63	12 Liter/Minute
145	Parwanoo	Datiar	D-233 Datiar C-6	30	83	74.7 3	76	98	4.59	8 Liter/Minute
146	Parwanoo	Datiar	D-233 Datiar C-6	30	83	74.0 6	76	99	4.34	7 Liter/Minute
147	Parwanoo	Datiar	D-233 Datiar C-3 adjoining NH-5	30	84	94.5 8	76	99	46.03	19 Liter/Minute
148	Parwanoo	Koti	D-238 Dhamiyana	30	86	86.2 5	77	0	89.24	3.2 Liter/Minute
149	Parwanoo	Koti	D - 235 Chamgah	30	85	96.8 7	77	0	82.18	0.2 Liter/Minute
150	Parwanoo	Koti	D - 236 Kurar	30	86	6.98	77	0	87.52	1.2 Liter/Minute
151	Parwanoo	Koti	D - 235 Chamgah	30	85	89.5 7	77	1	15.29	3.6 Liter/Minute
152	Parwanoo	Koti	D - 235 Chamgah	30	85	94.3 1	77	1	77.79	3.8 Liter/Minute
153	Parwanoo	Koti	D - 241 Shevla	30	86	48.6 8	76	99	11.91	7.3 Liter/Minute
154	Parwanoo	Koti	D -234 Ranigaon	30	84	6.55	77	0	87.52	6.8 Liter/Minute
155	Parwanoo	Dochi	D-239 Sari C2 Forest	30	51	33.9 6	76	58	53.4	8.3 Liter/Minute
156	Parwanoo	Dochi	D-240 Dochi C5 Forest	30	52	6.74	76	58	39	15.36 Liter/Minute
157	Parwanoo	Dochi	D-239 Sari C2 Forest	30	51	60.8 2	76	53	21.84	3.50 Liter/Minute
158	Parwanoo	Dochi	D-240 Dochi C1 Forest	30	52	47.5 2	76	53	20.22	1.6 Liter/Minute
159	Parwanoo	Dochi	D-240 Dochi C1 Forest	30	53	6.14	76	58	53.5	1.1 Liter/Minute
160	Parwanoo	Sanawar	D-245 Sanawar C2	30	51	33.9	76	58	53.46	1.25 Liter/Minute
161	Parwanoo	Sanawar	D-245 Sanawar C2	30	51	18.9	76	58	24.6	16.32 Liter/Minute
162	Parwanoo	Sanawar	D-242 Gahidhar C2	30	51	12.2	76	58	99.9	09.30 Liter/Minute
163	Parwanoo	Sanawar	D-242 Gahidhar C2	30	52	54	76	0	0.24	4.60 Liter/Minute
164	Parwanoo	Tiron	D-228 Amboa	30	51	37.0	76	57	39.58	21.25

						8				Liter/Minute
165	Parwanoo	Tiron	D-229 Tiron	30	57	45.0 6	76	56	53.76	11.60 Liter/Minute
166	Parwanoo	Kasauli	R-54 Kurardev	30	52	41.4 6	76	57	42.06	7.50 Liter/Minute
167	Parwanoo	Kasauli	R-54 Kurardev	30	53	4.68	76	57	38.58	1.90 Liter/Minute
168	Parwanoo	Kasauli	R-54 Kurardev	30	52	3.51	76	57	12.9	15.20 Liter/Minute
169	Parwanoo	Kasauli	D-230 Jangeshu	30	53	8.28	76	57	27.42	1.75 Liter/Minute
170	Kandaghat	Karol IInd	R-22 Karol	30	57	23.3	77	7	6.1	5ltr/ 21 min.32sec
171	Kandaghat	Karol IInd	D-75 Karol	30	56	53.8	77	6	35.6	5 ltr/ 22 Second
172	Kandaghat	Karol Ist	R21 Karol C1b	30	57	13	77	05	30	3.5 ltr / 1min.
173	Kandaghat	Karol Ist	R 21 Karol C1c	30	59	24	77	5	44	4 ltr/1min.
174	Kandaghat	Shalumna	D 100 Dharot	30	57	15.2	77	4	53.1	1 ltr/ 5 second
175	Kandaghat	Shalumna	D99 Shalumna	30	58	2.2	77	4	11.5	1 ltr / 4 second
176	Kandaghat	Wakna	D62 Bisha C1	31	0	28.0 8	77	5	42.56	1ltr/35 Second
177	Kandaghat	Basha	D53 Shungal	31	1	36	77	7	10	1 ltr/14 second
178	Kandaghat	Bisha	D62 Bisha C3	30	59	52	77	06	53	1 ltr/1min.50 second
179	Kandaghat	Bisha	R20 Bisha	31	0	6	77	6	7	1 ltr/50 second
180	Kandaghat	Kiartoo	D60 Shikar Badoon	30	59	31	77	7	35	1 ltr/1 min 10 sec

Chapter-6

Maintenance and Enhancement of Forest Resource Productivity

Forest Resource Productivity encompasses conservation and adding to the existing carbon stock. This chapter details the following:

- Growing stock of wood
- Efforts towards enhancement of forest productivity through quality plantation activities
- Carbon Stock
- Carbon sequestration and mitigation

6.1 Growing Stock of Wood

Growing stock of trees refers to the volume of all living trees in a forest that are above a certain threshold of diameter at breast height (generally 10 cm or more). It represents the standing timber volume available in a forest and is a crucial indicator of forest productivity, health and management potential. Growing stock is important because it reflects the forest's capacity to provide timber, fuelwood and other ecosystem services while also serving as a baseline for estimating carbon storage and sequestration. It helps forest managers assess sustainability, monitor changes over time and plan for future harvesting or conservation needs. The calculation of growing stock is usually carried out through forest inventories where tree measurements such as diameter at breast height (DBH), height and form factor are taken. These measurements are then used to estimate the volume of individual trees with the help of standard volume equations or biomass tables and subsequently aggregated to estimate the total growing stock per hectare or for the entire forest area. The growing stock of wood is typically measured in terms of volume (cubic meters or cubic feet). Growing stock of wood refers to the total volume of living trees in a specific forest or a larger geographical area. It is an important metric used to assess the health, productivity and sustainability of forest resources.

Forests provide a wide range of goods and services. Goods include timber, fuelwood as well as food products (berries, mushrooms, etc.) and fodder. In addition to important goods and services, forests and trees play a crucial role in the conservation of ecosystems, maintaining quality of water, preventing or reducing the severity of floods, avalanches, erosion and drought. The forest like other ecosystems are affected by climate change. The impacts due to climate change may be negative in some areas and positive in others. However, forests also influence climate by affecting the changes in the quantum of carbon dioxide in the atmosphere. They absorb CO₂ from atmosphere and store carbon in wood, leaves, litter, roots and soil by acting as “carbon sinks”. Carbon is released back into the atmosphere when forests are cleared or burned. Forests by acting as sinks are considered to moderate the global climate. Overall, the world's forest ecosystems are estimated to store more carbon than the entire atmosphere. Therefore, analysis of growing stock is necessary to know the capacity and potential of the forest to have tree growth and also to calculate harvestable yield in the working plan and assessing their capacity as carbon sinks. As the objective of forest management is gradually shifting towards regular flow of income and ecosystem services to local community keeping conservation and ecological security as the larger objective, the harvestable yield and the increment of the forest has to be considered to arrive at the crucial decision of sustainable management. The forest resource assessment

methodology prescribed in the National Working Plan Code 2014 was followed to conduct assessment of the total growing stock of trees and biomass. Growing stock is mentioned in Table 6.1. Sample plots were laid out and observational assessment of site quality, tree species, and composition, its health, density and crop age etc. were recorded.

Estimation of Total Growing Stock

The assessment of total growing stock and biomass was carried out using the Forest Resource Assessment method outlined in the National Working Plan Code, 2014. Within each working circle, a number of sample plots were established through systematic sampling, following a reconnaissance of the forest area. This ensured that all site qualities, forest types, and structural variations were properly represented.

Table 6.1: Total Growing stock

Diameter Class	Volume			
	Chil	Ban Oak	Deodar	Broad Leaved
10-20	63575.89	26140.44	2353.07	27932.21
20-30	83408	48416.92	2234.04	33364.07
30-40	104278	35610.67	9859.842	33508.19
40-50	108060	15327.98	10283.14	22391.24
50-60	98608	7457.58	8748.657	18490.07
60-70	57137	1712.039	4304.032	12623.16
70 above	31293	1256.491	1097.524	3965.706
Total	546360.5	135922.1	38880.3	152274.6

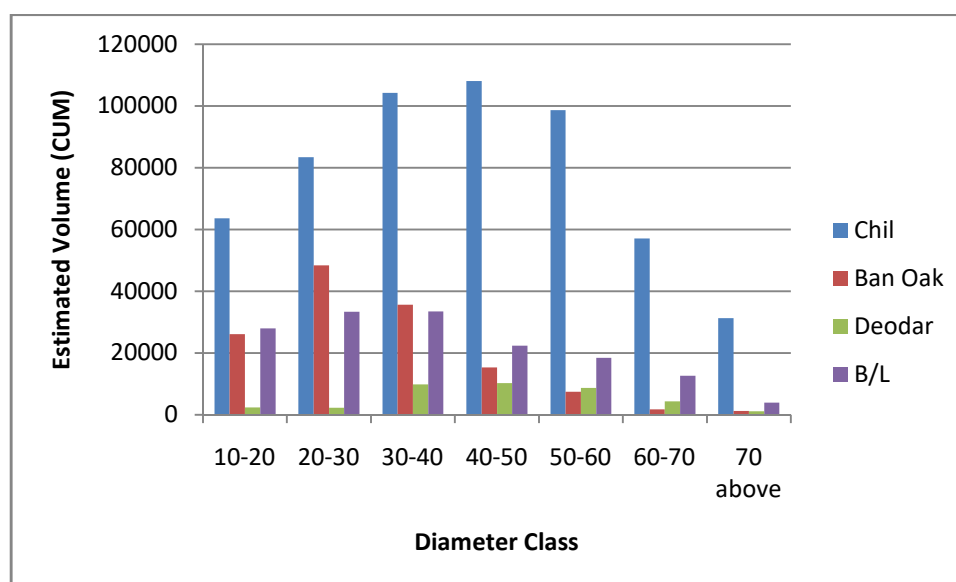


Fig. 6.1: Diameter Class wise Growing Stock of Trees

Table 6.2: Estimated number of trees of various diameter classes

Diameter Class	Total trees			
	Chil	Ban Oak	Deodar	Broad Leaved
10-20	1261426	484082	33282	436441
20-30	333766	193667.7	15777.09	181326.5
30-40	152320	63818.41	13928.3	80163.14
40-50	79785	15999.98	7263.128	25300.84
50-60	43646	4971.72	3433	12204.67
60-70	16808	917	1216	3832.167
70 above	6554	673	228	1242
Total	1894304	764130	75128	740510

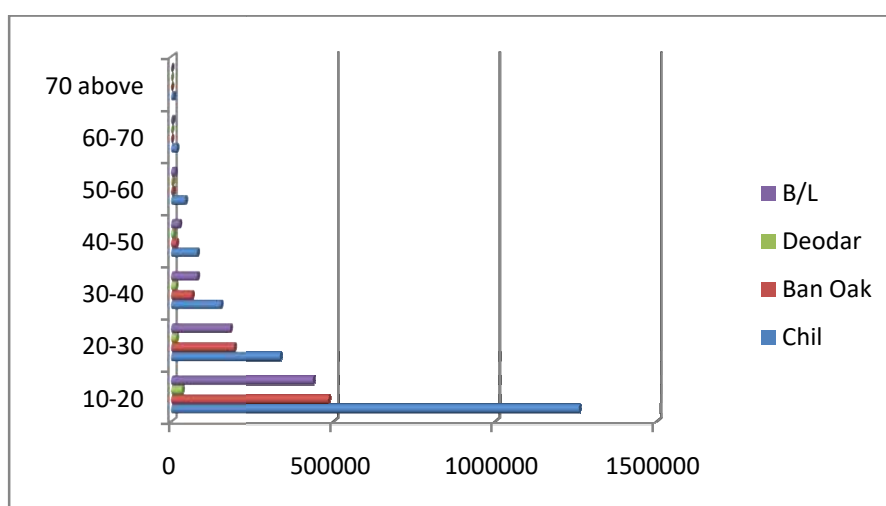


Fig. 6.2: Diameter Class wise estimated number of trees

6.2 Increment in volume of identified timber species

The increment tables of important species in the Solan Forest Division are given in the chapter on Statistics of Growth and Yield.

6.3 Efforts towards enhancement of forest productivity through quality plantation activities

Efforts towards enhancement of forest productivity through quality plantation activities focus on improving both the quantity and quality of forest resources while ensuring ecological sustainability. Quality plantation activities involve the use of site-specific and high-yielding species, improved seedlings, and scientifically guided silvicultural practices to maximize survival rates and growth performance. Proper site selection, soil and moisture conservation measures, timely weeding, thinning, and protection from grazing and fire are integral to these efforts. By adopting clonal and tissue-cultured planting stock, genetically superior varieties, and mixed-species plantations, productivity can be significantly enhanced while also improving

biodiversity and resilience against pests, diseases, and climate variability. Such efforts not only contribute to meeting the rising demand for timber, fuelwood, and non-timber forest products but also play a vital role in carbon sequestration, soil conservation, and livelihood generation for local communities. Thus, quality plantation activities serve as a cornerstone in sustainable forest management, ensuring that forest ecosystems remain productive, resilient, and beneficial for both present and future generations.

6.4 Carbon Stock

Biomass studies for carbon stock assessment are conducted separately for forest types present in the Solan Forest Division. Stock enumeration follows the methodology prescribed by the Forest Survey of India for the National Forest Inventory. Based on these observations, the above-ground biomass is estimated. For below-ground biomass, the contributions of litter, rhizomes, and soil are calculated separately and then combined with the above-ground biomass to determine the total biomass. The carbon stock is derived by applying the biomass–carbon conversion factors used by FSI. This provides the total carbon stock of these forests, which serves as a baseline for evaluating their carbon sequestration potential and guiding their management with this objective in focus.

6.4.1: Soil Organic Carbon Stock

Soil organic carbon is the second-largest contributor to the incremental total carbon stock in forests and plantations, after above-ground biomass. Its levels are closely linked to site characteristics such as vegetation type (deciduous or evergreen), climate, and rainfall. During the forest resource assessment survey soil samples were collected from selected compartments following standard procedures. These samples were analyzed for carbon content in the soil laboratory at Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni and the results are presented below.

Table 6.3: SOC in forest types of Solan Forest Division

Forest Type	Carbon stock (T/ha)
12/C1/DS1 Oak scrub	54.202
12/C1a Ban oak forest (<i>Q. incana</i>)	58.142
12/C1c Moist deodar forest (<i>Cedrus</i>)	67.725
5/DS1 Dry deciduous scrub	58.86
5/E9 Dry bamboo brakes	47.41
5B/C2 Northern dry mixed deciduous forest	49.201
5B/DS1 Dry Deciduous Scrub Forest	93
9/C1/DS1 Himalayan subtropical scrub	43.578
9/C1a Lower or Siwalik chir pine forest	67.513
9/C1b Upper or Himalayan chir pine forest	57.147

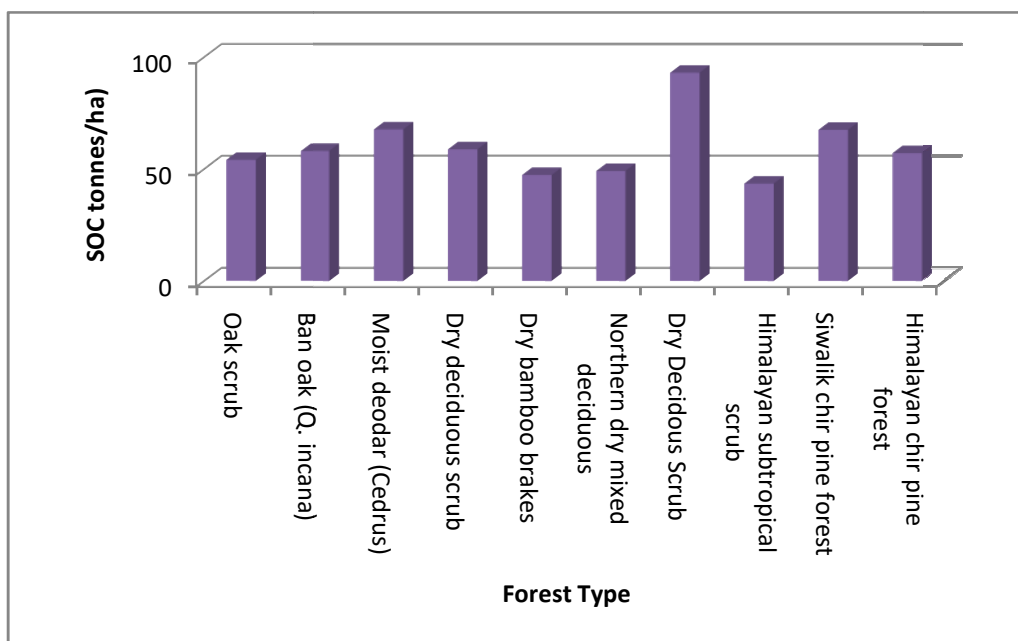


Fig. 6.3: Soil Organic Carbon in forest types of Solan Forest Division

Table 6.4: Biomass and carbon stock of major tree species in Solan Forest Division

Species	Total Biomass (Thousand tonnes)	Total Carbon Stock (Thousand tonnes)
Chil	503.82	236.79
Ban Oak	121.67	57.18
Deodar	34.61	16.27
Broad Leaved	136.17	64.00

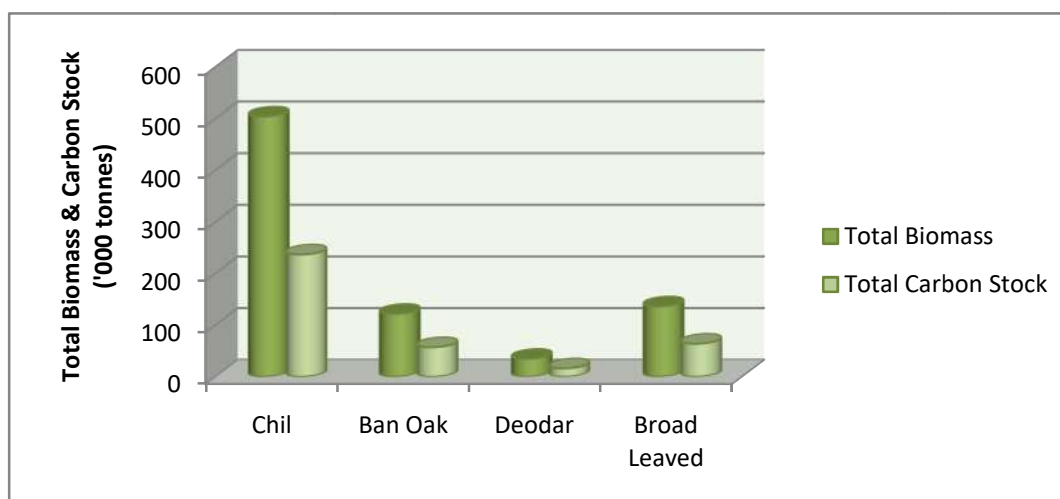


Fig. 6.4: Total Biomass & Carbon Stock under important species

Table 6.5: Carbon of different components distributed forest type wise

Forest Type	Herb (Kg/ha)	Shrub (Kg/ha)	Litter (Kg/ha)
12/C1/DS1 Oak scrub	3043.79	467.92	1520.03
12/C1a Ban oak forest (<i>Q. incana</i>)	1547.08	962.98	2904.49
12/C1c Moist deodar forest (<i>Cedrus deodara</i>)	1232.42	264.88	349.63
5/DS1 Dry deciduous scrub	982.91	4387.27	1791.73
5/E9 Dry bamboo brakes	2925.33	5672.61	1121.87
5B/C2 Northern dry mixed deciduous forest	1090.19	6645.17	1046.51
5B/DS1 Dry Deciduous Scrub Forest	1863.04	10820.71	567.06
9/C1/DS1 Himalayan subtropical scrub	96.10	68.63	77.97
9/C1a Lower or Siwalik chir pine forest	358.11	1548.25	1383.59
9/C1b Upper or Himalayan chir pine forest	4206.17	365.53	932.27

6.5 Carbon sequestration and mitigation

Forests in the Solan Forest Division form an important carbon sink within Himachal Pradesh's diverse Himalayan landscape. According to the India State of Forest Report (ISFR) 2023, Solan district has a forest cover of 908.75 km², comprising 45.84 km² of Very Dense Forest (VDF), 439.72 km² of Moderately Dense Forest (MDF), and 423.19 km² of Open Forest (OF), representing 46.94% of the district's geographical area. This distribution highlights a substantial extent of carbon-storing forest vegetation, with moderately dense and open forests contributing the maximum area.

At the state level, Himachal Pradesh's total forest cover is 15,580.35 km² (27.99% of its geographical area), and the forests maintain one of the highest per-hectare growing stocks in the country, averaging 219.46 m³ per ha, translating into significant biomass and carbon density (ISFR 2023, Vol. 1). The carbon stock of Himachal Pradesh is estimated at 167.1 tonnes C per hectare, higher than the all-India average, owing to its extensive temperate and sub-tropical pine forests that sequester large amounts of carbon both in above-ground biomass and soils.

In Solan, the predominance of Chir pine (*Pinus roxburghii*) forests contributes to above-ground biomass accumulation, while moist temperate patches enhance per-hectare carbon density due to their richer structure. Mitigation strategies in this division include quality plantation of native species, assisted natural regeneration, fire management in pine forests and soil carbon conservation practices. These interventions strengthen both above-ground and soil carbon pools. Moreover, the inclusion of plantation and agro-forestry practices contributes to "trees outside forests" (TOF), which are also significant carbon reservoirs in the district.

By combining inventory-based carbon stock assessments with ISFR estimates, the Solan Forest Division demonstrates a measurable role in India's climate change mitigation efforts. Enhancement of carbon sequestration potential through scientific management not only contributes to REDD+ commitments (Reducing Emissions from Deforestation and Degradation, plus conservation and enhancement of carbon stocks) but also supports biodiversity conservation and sustainable livelihoods in this ecologically sensitive Himalayan region.

Chapter 7

Optimization of Forest Resource Utilisation

7.1 Recorded Removal of Timber

During the year 1986, green felling in Himachal Pradesh was banned by the State government. Further, in the year 1996, Hon'ble Supreme Court of India passed a landmark judgment in W.P.(Civil)No.171/96 titled 'T.N. Godavarman vs. Union of India' in which a blanket ban on green felling was imposed in the State. Thus, the forests were never worked according to the prescriptions of the approved working plans. Timber removals from the areas allotted to different working circles were essentially required on account of:

- Timber distribution to local right holders
- Salvage removals
- Removal under F.C.A1980 & F.R.A 2006

7.1.1 Timber Distribution to The Local Right Holders

The details of timber distribution to the right holders of Solan Forest Division from 2012–13 to 2024–25 outlines the annual allotment of timber species primarily Deodar (*Cedrus deodara*), Chil (*Pinus roxburghii*), and Tun (*Toona ciliata*) granted to forest right holders under the Himachal Pradesh Forest (Timber Distribution to Right Holders) Rules, 2013. These rights are conferred in alignment with the provisions outlined in the Settlement Report (Faisla-E-Janglat). For the initial two years (2012–13 and 2013–14), no timber was distributed, possibly indicating administrative or procedural delays in the implementation of the policy. Distribution commenced in 2014–15 and saw a marked rise in 2016–17, which recorded the highest allotment of 69 trees majorly Deodar highlighting the growing awareness and utilization of timber rights. Deodar emerged as the most extensively distributed species, especially from 2016 onwards, due to its high cultural and structural value, while Chil showed moderate but consistent distribution. Tun, in contrast, was minimally allotted and only in the initial years. From 2017 to 2023, timber allotment stabilized with annual distribution ranging between 7 to 28 trees, suggesting an established and functional process. Recent data up to January 2025 shows continued distribution, with 8 Deodar trees granted. In addition to regular timber rights, timber is also provided for cremation purposes, and such allocations are maintained separately by the respective beat Guards.

Table 7.1: Details of Timber Distribution to the Right Holders from 2012-13 to 2024-25 (upto 31.01.2025) in respect of Solan Forest Division

S. No.	Year	Species			Total No. of Trees
		Toona	Chil	Deodar	
1.	2012-13	Nil	Nil	Nil	Nil
2	2013-14	Nil	Nil	Nil	Nil
3.	2014-15	01	13	01	15
4	2015-16	02	15	8	25
5.	2016-17	0	04	65	69
6.	2017-18	0	0	23	23
7.	2018-19	0	07	19	26
8.	2019-20	0	01	23	24
9.	2020-21	0	01	09	10
10.	2021-22	0	01	21	22
11.	2022-23	0	0	07	07
12	2023-24	0	08	20	28
13.	2024-25 (upto 31.01.2025)	0	0	08	08

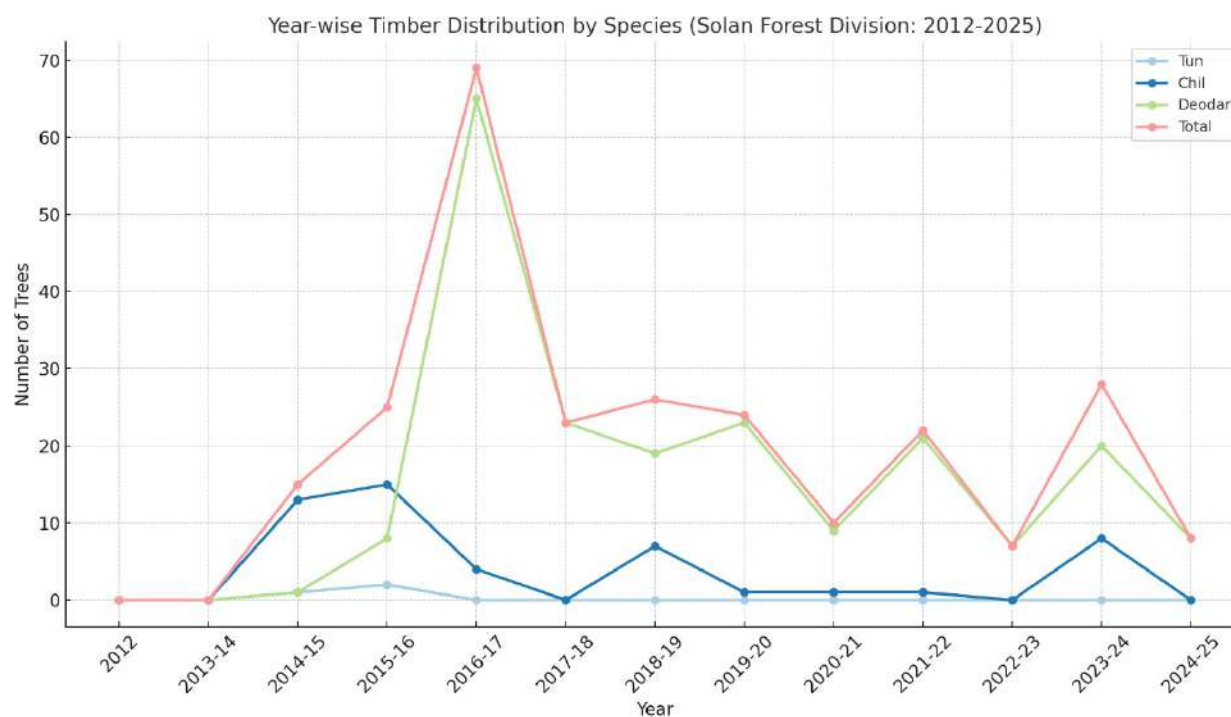


Fig. 7.1: Timber Distribution to the right holders of Solan Forest Division from 2012 to 2025

7.1.2 Trees for Free Grant to Right Holders

The distribution of trees to right holders for free grant for the purpose of marriage and religious rituals were stopped after year 2012.

Table 7.2: Detail of trees given for cremation and entry of dead body register in respect of Solan Forest Division

S. No.	Year	Number of trees						
		Solan	Parwanoo	Dharampur	Kandaghat	Subathu	Chail	Total
1	2012-13	14	37	36	0	2	0	89
2	2013-14	21	45	28	0	2	0	96
3	2014-15	24	62	34	0	4	10	134
4	2015-16	16	15	40	0	9	11	91
5	2016-17	25	39	49	0	10	30	153
6	2017-18	27	28	52	24	2	4	137
7	2018-19	19	49	45	27	0	11	151
8	2019-20	31	16	46	71	13	5	182
9	2020-21	21	24	41	69	8	8	171
10	2021-22	39	13	75	66	16	19	228
11	2022-23	29	27	69	66	7	10	208
12	2023-24	33	16	56	73	14	10	202
13.	2024-25	46	08	55	79	14	7	209
Total		345	379	626	475	101	125	2051

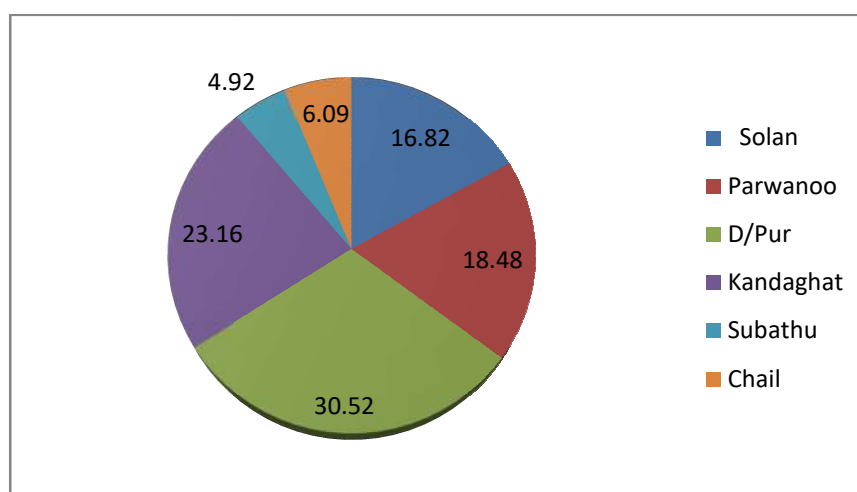


Fig. 7.2: Percentage contribution of ranges of Solan Forest Division in providing trees for cremation

7.1.3 Salvage Markings

Salvage markings refer to the process of identifying and marking of trees in a forest that are damaged, dead, dying, wind-thrown, uprooted, or otherwise unfit for normal timber operations, but can still be used for commercial or fuelwood purposes. These trees are marked to be removed (salvaged) before they deteriorate completely and become unusable. The lots of such trees are prepared on annual basis and are handed over to the Himachal Pradesh State Forest Corporation for felling and extraction. The detail of salvage removals from 2012-13 to 2024-25 is as under:

Table 7.3: Species-wise salvage from 2012-13 to 2024-25

Year	Volume in m ³							Royalty
	Chil	Ban	Khair	Kail	Broad Leaved	Deodar	Total	
2012-13	4061.311	0	21.54	0	12.680	0.708	4096.239	2864938
2013-14	4690.477	0	0	0	28.700	6.7947	4725.9717	3297684
2014-15	5568.335	0	0	20.670	0	11.698	5600.703	4454373
2015-16	885.079	0	0	0	0	0	885.079	563795
2016-17	2925.034	0	0	0	9.585	0	2934.619	793473
2017-18	3323.288	0	0	0	8.092	0	3331.380	1558762
2018-19	2201.318	0	0	0	9.926	0	2211.244	1371193
2019-20	3350.466	0	235.400	0	0	0	3585.866	3010022
2020-21	2383.953	0	0	0	7.647	0	2391.600	809648
2021-22	1294.064	0	78.48	0	0	1.416	1373.96	466653
2022-23	2223.635	0	0	0	0	0	2223.635	939277
2023-24	3726.105	0	16.84	0	248.759	45.802	4037.506	2384867
2024-25	3675.7314	0	2.11	0	67.1500	0	3744.9914	2121253

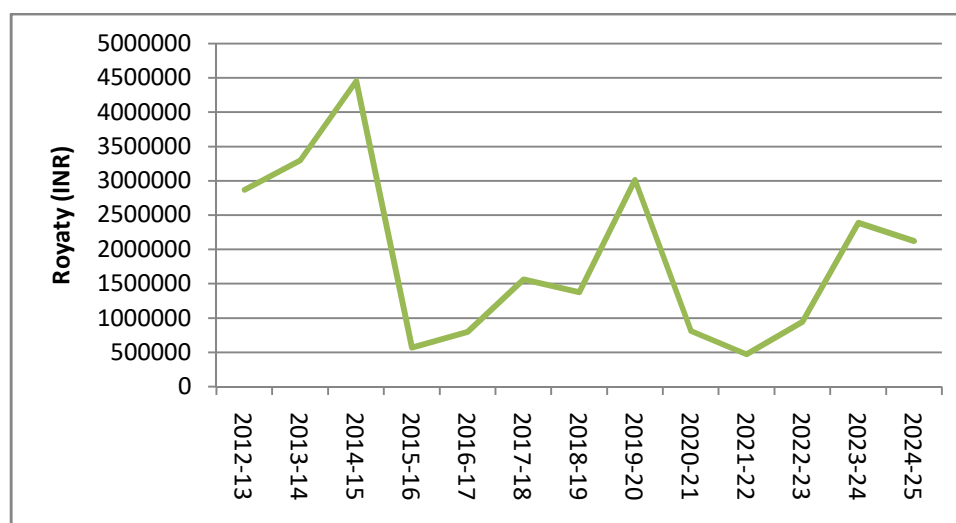


Fig. 7.3: Trend of royalty received from salvage removals of major species

Table7.4: Abstract of total volume of salvage from 2012-13 to 2024-25

Year	Removal under Salvage marking (m ³)
2012-13	3663.0815
2013-14	4697.271
2014-15	4431.19
2015-16	1618.807
2016-17	2803.658
2017-18	3331.3805
2018-19	2132.1154
2019-20	3585.8643
2020-21	2338.905
2021-22	1337.199
2022-23	2223.635
2023-24	4037.506
2024-25	3744.9914

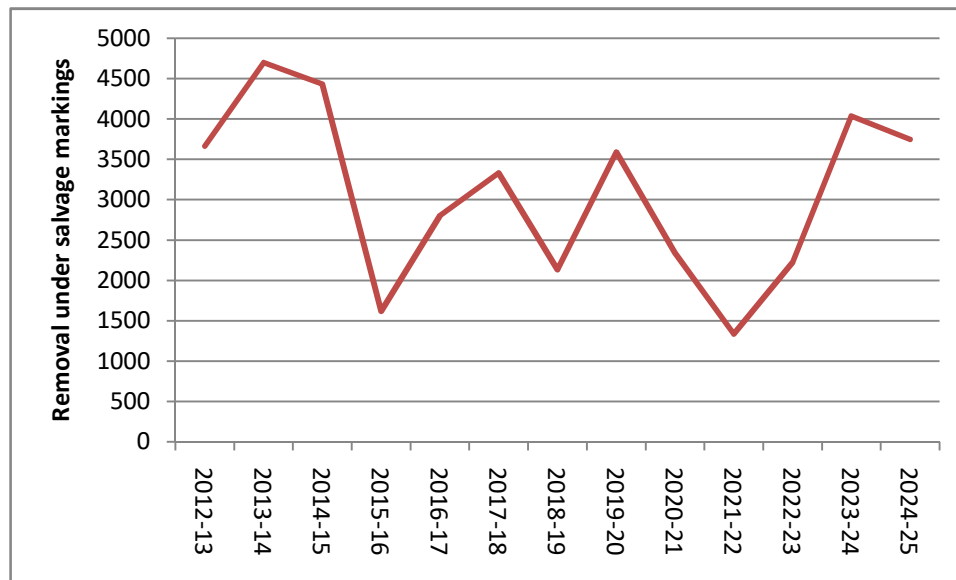


Fig 7.4: Year wise (2012- 2) salvage markings removals

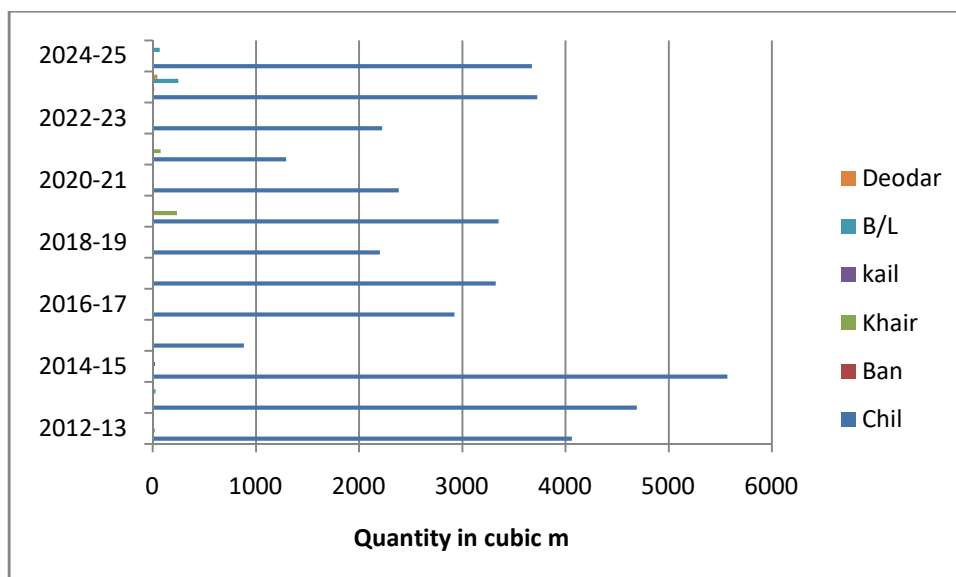


Fig 7.5: Species wise salvage removals (2012—2025)

As can be seen, the extraction for salvage removal is in consonance with the actual proportion of species distribution in the forests of Solan Forest Division. Chil is the species undergoing maximum extraction under salvage removal. Range-wise salvage is given in Appendix XIII

7.1.4 Removals Sanctioned Under F.C.A and F.R.A Cases

Trees involved in the land diverted under Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 cases and which are to be removed for developmental activities under Forest Rights Act, 2006 are marked and handed over to HPSFC for felling and extraction. Table 7.5 depicts the land diversions and sapling removals under VSSA and FRA.

Table 7.5: Land diversions/ trees & saplings removals sanctioned under VSSA and FRA

Year	Removal under VSSA(m ³)	Removal under FRA(m ³)
2012-13	81.7726	0
2013-14	35.672	0
2014-15	0	0
2015-16	2544.775	0
2016-17	0	4.8238
2017-18	1390.11	26.4684
2018-19	306.5296	79.0392
2019-20	29.6366	0
2020-21	118.1176	32.0186
2021-22	13.5978	0
2022-23	37.5848	36.8459
2023-24	79.2059	76.70309
2024-25	-	58.4287

7.2 Recorded Removal of Fuelwood

The locals have been granted rights and concessions as per the Settlement Report for the collection of dry fallen fuel wood for bona fide use. However, no such record is maintained. The use of fuel wood for cooking has considerably reduced due to popular Government schemes like Pradhan Mantri Ujjwala Yojana. Apart from fuelwood the population of forest fringe villages depends upon forests for fodder, NTFPs, grasses, etc. A household survey was carried out with the following methodology:

The household survey of forest fringe villages was carried out to estimate the dependency of the population residing around the forests. Two strata were identified based on the distance of the village from the forests: within 1 km from the forest boundary and over 1 to 3 km. It was based on an assumption that villages near to the forests will have a different level of dependency as compared to those far away. A pilot survey was then carried out to determine the coefficient of variation (mean and standard deviation) of the population parameters that were to be estimated. Based on this, the sample size of the number of households to be surveyed in each stratum for a confidence of 90% and relative error of 10% was determined. The 3 main parameters considered were fuelwood, fodder and grasses. The sample size was determined as 445 with 300 households from the first strata while 145 from the second strata.

Products such as, Small timber, Fuel wood, Leaf fodder, Grasses, NTFP products, Quantity of fodder used for stall feeding, are categorized under two strata, one is household within 1Km and another is household within 3Km. Total number of households in forest fringe villages are around 13000.

Table: 7.6: Dependency of population of forest fringe villages on forests

Product	Strata	Population	weight	mean per unit ($\bar{y}_{st}$)		Total quantity in a year ($N \cdot \bar{y}_{st}$) (in Q)	
				Private land	Forest land	Private land	Forest land
Small Timber etc	Strata 1	9252	0.7099	0.2440	0.1783	3179	2324
	Strata 2	3780	0.2901				
Fuelwood	Strata 1	9252	0.7099	0.1127	0.5694	1469	7420
	Strata 2	3780	0.2901				
Leaf fodder	Strata 1	9252	0.7099	0.2287	0.0655	2980	854
	Strata 2	3780	0.2901				
Grasses	Strata 1	9252	0.7099	0.3974	0.0658	5179	857
	Strata 2	3780	0.2901				
NTFP products	Strata 1	9252	0.7099	0.0142	0.0038	185	49
	Strata 2	3780	0.2901				

Quantity of fodder used for stall feeding	<i>Strata 1</i>	9252	0.7099	0.4967	0.1590	6473	2072
	<i>Strata 2</i>	3780	0.2901				

Total approximate households in the fringe villages are around 13000.

Population sizes (N_h) and their weights (W_h) are described under strata 1 and 2 for each product.

Weight for h^{th} stratum, $W_h = \frac{N_h}{N}$

where, N = Total population and h = stratum number

The population mean per unit ($\bar{y}_{st}$) under private land and forest land for each product is calculated by

$$\bar{y}_{st} = \sum_{h=1}^L W_h \bar{y}_h$$

where, $\bar{y}_h = \frac{\sum_{i=1}^{n_h} y_{hi}}{n_h}$ = sample mean of h^{th} stratum for each product, L = number of strata, n_h = sample size of h^{th} stratum and $y_{hi} = i^{th}$ observation in h^{th} stratum

Total quantity in a year for each product in quintals = $N\bar{y}_{st}$

7.2.1 Pastures

Pastures and grazing grounds are an important resource for the people residing in the villages around the forest areas. The table below gives the details of the pastures along the national highway adjoining Parwanoo range:

Table 7.7: Pastures in Parwanoo Range (Along National Highway)

S. No.	Name of Range	Name of Block	Name of Beat	Name of Forest & Compartment	Area in Hec.	Remarks
1	Parwanoo	Kasauli	Kasauli	R-55 Mashobra	05 Hectares	
2	Parwanoo	Kasauli	Kasauli	R-54 Kurar Dev C-2	05 Hectares	
3	Parwanoo	Kasauli	Sanawar	D-242 Gahidhar C-3	04 Hectares	Along NH
4	Parwanoo	Kasauli	Dochi	D-240 Dochi C-5	08 Hectares	

7.3 Recorded Removal of Bamboos and Rattans

Table 7.8: Removals of Bamboos and Rattans

Year	Name of Forest	Area under Bamboo (ha)	No. of Bundles extracted	Bundles extracted/ha	Remarks
2000-01	R43 Halda tibba C3, D-120 Odder Jangiria, D-225 gumma, D-229 Tiron, D-20 Barog, R45 Khadar ki dhar, D-221 Kiarua and D-233 Datyar C-6	285.40	44058	154.00	Green
2001-02	R-44 Jhan C1 and C2, R-48 Kalth C1, D206 Neri II, D-203 quila Ajmergarh, D-208 sari D-197 Pratha C1, D-198 Lugon Bagor, D-128 Kamlog, D-56 Parwanoo, D-233 datiarC-5, R-52 Gumma C1 and R-53 Tiron C3	293.60	53251	181.00	Green
2002-03	D-209 Bhagor, D-200 Chakli Dhonta C1b, C1c and C1d, D-207 sathdablog, D-199 Chawal ashmala , D-228 Ambota C1 & c2, R-45 Khadar ki dhar and D-194 Pratha C3	398.40	51354	129.00	Green
2003-04	R-43 Halda Kaba C3, D-210 OaderJhangeria, R-43 Halda Kabba C2, D-225 Gumma, D-229 tiron C1 and C2, D-220Barog (instead of D-116 C1) D-221 kyarwa and D-223 Datiyar C6	223.00	13762	62.00	Green
2004-05	R-45 Khadar ki dhar, R-61 Naraini, D-199 Chawal Ashnal, D200 Dhanota Chaka, D207 sathdadhog D-225 Gumma, D-228 C1& C2, D-229 Tiron C1 & C2, D-233 Datiyar C6, D-220 Barog C1, D-197 Pratha C1, D-98 Bhagaurlyen, D-218 KamlogR56 Parwanoo C1,C2, R52 Gumma c2, D-233 Datiyar C3 C4, R-53 Tiron C3, R-48 Kalth C1, R-43 Hallda C2 R-48 Halda	264.80	28758	109.00	Green
		615.20	169604	276.00	Dry

	C3, D-209 Baghor, D210 Odder Jangiria, R-44 Jhanai C1 R-44 JhanaiC2, D-203 ajmergarh, D-206 Beri and D-208 Sari				

Source: HPSFDC Solan

There was no extraction of Bamboos and Rattans from 2005-06 to 2024-25.

7.4 Recorded Removal of Locally Important NTFPs Including Maps

While recorded removal has not been done, meanwhile chil needles are collected on an experimental basis from some areas of the Solan Forest Range, especially in the Oachghat Beat. There is limited scope for planting, augmentation, harvest, and marketing of NTFPs in these forests. There are some locally known prominent medicinal plants i.e. Ram Ban (*Agave Americana*), Kashmal (*Berberis aristata*) Banaksha (*Viola canescens*), Bekhal (*Prinsepia utilis*) and Basuti (*Adathodavasica*) etc, these are not extracted/ harvested at a large scale for commercial purposes while local people use these NTFPs (medicine plants) for domestic uses as per their knowledge with limited extent in Solan Forest Division.

7.5 Demand and Supply of Timber and Important Non-Timber Forest Produce

7.5.1 Wood Based Industries

Following are the tables showing details of wood-based industries such as Saw mills, imported sale depots, Private Sale Depots, Furniture Shops.

Table 7.9: Number of Saw mills and depots registered under Himachal Pradesh (Sale of Timber Act, 1968)

S. No	Name of Range	Total No. of Saw Mills
1	Chail	6
2	Kandaghat	23
3	Solan	28
4	Subathu	28
5	Dharampur	16
6	Parwanoo	6
	Total	107

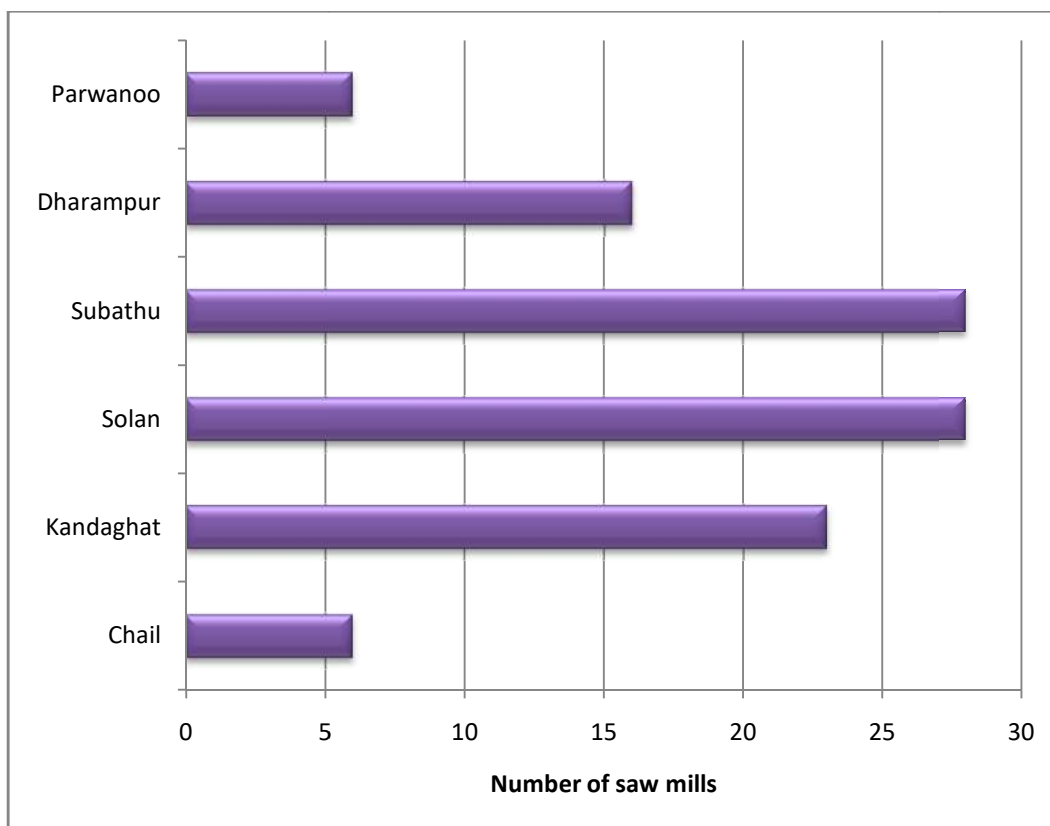


Fig.7.6: Range-wise number of saw mills in Solan Forest Division

Table 7.10: Number of Imported Sale Depots Registered Under Himachal Pradesh (Sale of Timber Act, 1968)

S.No.	Name of Range	Total No. of Imported Sale Depots
1	Chail	1
2	Kandaghat	3
3	Solan	5
4	Subathu	5
5	Dharampur	0
6	Parwanoo	6
	Total	20

Table 7.11: Number of Private Sale Depots Registered Under Himachal Pradesh (Sale of Timber Act, 1968)

S. No	Name of Range	Total No. of Private Sale Depots
1	Chail	1
2	Kandaghat	0
3	Solan	13
4	Subathu	0
5	Dharampur	7
6	Parwanoo	0
	Total	21

Table 7.12: Number of Furniture Shops Registered under Himachal Pradesh (Sale Of Timber Act, 1968)

S.No	Name of Range	Total No. of Furniture Workshops
1	Chail	0
2	Kandaghat	03
3	Solan	19
4	Subathu	24
5	Dharampur	0
6	Parwanoo	0
	Total	46

7.6 Removal of Fodder

Fodder removal were carried out as sale of grass through auctions and the details are given below

7.6.1 Sale of Grass through auctions

In a few RFs and DPFs of Dharampur, Parwanoo, Subathu and Solan ranges sale of grass is done through auction or local panchayats. The grass thus procured is used as fodder for cattle. The sale has multiple advantages for the department, which are increasing revenue, reducing fuel load and forest fire risk and promote stall feeding.

Table 7.13: Abstract of area auctioned for grass and amount received from such auction from 2016 to 2024

Range	Area of grass Auction (in Ha.)		Total area (in Ha.)	Amount received in auction for the last 8 years (in Rs.)
	RF	DPF		
Chail	0	0	0	0
Kandaghat	0	0	0	0
Solan	0	41.65	41.65	49050
Subathu	16	0	16	51110
Dharampur	267.65	145.35	413	490550
Parwanoo	335.11	99.61	434.72	699480

7.6.2 Grazing Permits for Shepherds

The geographical diversity of Himachal Pradesh, spanning from low-lying plains to mountainous hills with elevations ranging approximately from 4000 m to 6000 m, accommodates various communities. Among these, the nomadic and semi-nomadic tribes, such as the Gaddi Shepherds, have traditionally inhabited the high-altitude regions, particularly in Baijnath Tehsil of Kangra district and Moorang and Pooh tehsils of Kinnaur district. However, during the winter season when heavy snowfall occurs in the Himalayas, these pastoral communities migrate to lower-lying areas along with their cattle.

To facilitate this seasonal migration and grazing, the Gaddi Shepherds obtain permits for grazing their diverse livestock, including sheep, goats, lambs, kids, and horses. This process is regulated through the Grazing Advisory Committee, which convenes annually under the chairmanship of the Hon'ble Forest Minister of the state. As part of this system, pastoral communities engage with foresters within the Solan Forest Division to secure legal permits for grazing their cattle. This cyclical movement aligns with the natural patterns of the seasons and allows for sustainable pastoral practices within the diverse landscape of Himachal Pradesh.

Table no 7.14: Grazing permits given to shepherds in all the ranges

Range	No of permits	Area in ha
Chail	3	229
Kandaghat	2	170
Solan	5	234
Subathu	7	From non-forest government land (Shamlaat)
Dharampur	6	1618.78
Parwanoo	6	2236

No new permits have been issued to the shepherds for grazing. The above table details out the old permits issued.

7.6.3 Good Fodder Species

The majority of the population in Himachal Pradesh resides in rural areas, where people engage in cattle rearing for their livelihood and commercial purposes. As part of their traditional practices, these communities hold grazing rights in the forested areas. In the Solan Forest Division, the region offers a variety of high-quality fodder species. Some of these are:

a) Upper Tract: above 1000 meters

Trees: *Quercus leucotrichophora*, *Pyrus pashia*, *Morus serrata*, *Albizia* spp., *Prunus* spp., *Bauhinia purpurea*, *Celtis australis*, *Corylus colurna*, *Robinia pseudoacacia*, *Grewia oppositifolia*, *Leucaena leucocephala*

Shrubs: *Desmodium tiliifolium*, *Indigo ferapulchella*, *Rhuscotinus*, *Rubus niveus*

Herbs: *Fragaria* spp. *Viola* spp., *Trifolium repens*, *Polygonum chinense*

b) Lower tract: Below 1000 meters

Trees: *Anogeissus latifolia*, *Acacia catechu*, *Albizia* spp., *Bauhinia purpurea*, *Bauhinia variegata*, *Bombax ceiba*, *Celtis australis*, *Grewia oppositifolia*, *Terminalia tomentosa*, *Ougenia oojenensis*, *Bamboos*, especially *Dendrocalamus strictus*

Shrubs: *Flacourtia indica*, *Berberis lycium*, *Carissa opaca*, *Indigo ferapulchella*

Herbs: *Tridax procumbens*, *Boerhavia diffusa*, *Polygonum* spp., *Eichhornia crassipes*, *Xanthium strumarium*, *Trifolium repens*, *Cassia tora*, etc.

The grassland type found in the Shiwalik foothills conforms to the Themeda-Arundinella type of grassland. The vegetation of grasslands and other grazing areas of the Shiwaliks may generally be described as scrub vegetation. The dominant grass species found in the Shiwalik tract are *Chrysopogon fulvus*, *Cynodondactylon*, *Cymbopogon martinii*, *Heteropogon contortus*, *Bothriochloa intermedia*, *Imperata cylindrica*, *Saccharum spontaneum*, *Pennisetum purpureum*, etc.

7.7 Valuation of the Products

7.7.1 Timber

Valuation of timber extracted from forests of Solan Forest Division has already been mentioned in section 7.1 of the chapter

7.7.2 Resin

Resin tapping is an important forest-based economic activity in the Solan Forest Division, predominantly carried out in the Chir Pine (*Pinus roxburghii*) forests. These forests are distributed across all six ranges—Solan, Kandaghat, Subathu, Dharampur, Parwanoo, and Chail with Dharampur and Parwanoo ranges having the highest concentration of Chir Pine and hence contributing significantly to resin production.

The resin extraction process is managed by the Himachal Pradesh State Forest Corporation (HPSFC) through authorized agents. The extracted resin is supplied to the state-run Rosin and turpentine factories located at Nahan and Bilaspur. The tapping season typically spans from mid-March to mid-November. A noteworthy aspect of this process is the employment it generates.

Most of the laborers involved in resin tapping are seasonal workers drawn from other districts such as Kangra, Mandi, and Hamirpur, thus contributing to generation of livelihood of rural population.

Table 7.15: Detail of Resin Royalty from 2012 to 2023

Year	No. of blazes	Royalty per blaze (Rs.)	Royalty in Rs
2012	31634	50	1581700
2013	33746	58.78	1983589.88
2014	32332	75.3	2434600
2015	42330	65	2751450
2016	46270	51	2359770
2017	47497	50	2374850
2018	46875	42	1968750
2019	45923	43	1974689
2020	48218	46	2218028
2021	51268	75	3845100
2022	52977	72	3814344
2023	54507	54	2943378
2024	Not finalized		

The financial data from 2012 to 2023 demonstrates the economic relevance of resin tapping. Over these years, the number of blazes tapped annually ranged from around 31,000 to 54,000. Despite variations in the per-blaze rate, the total royalty generated has remained substantial, indicating the steady importance of this activity. For example, in 2015, although the number of blazes was slightly lower (42,330), the rate of ₹65 per blaze resulted in a royalty of ₹27.51 lakhs the highest in the recorded period. Conversely, even with a higher number of blazes in 2023 (54,507), the lower rate of ₹45per blaze yielded a slightly lesser royalty of ₹24.52 lakhs.

This consistent stream of income through resin royalty contributes significantly to the non-timber forest produce (NTFP) revenue of the Solan Forest Division. It also incentivizes the sustainable management of Chir Pine forests, ensuring their maintenance while allowing for regulated extraction. However, the long-term sustainability of this practice depends on adopting best practices in resin tapping to avoid tree damage, ensuring that ecological balance and forest health are not compromised.

Chapter 8

Maintenance and Enhancement of Social, Economic, Cultural and Spiritual Benefits

The National Forest Policy of 1988 marks a pivotal shift in forest governance by recognizing local communities not as threats but as key partners in conservation. It advocates for active community participation in the protection, management, and restoration of forest ecosystems. Central to this approach is the establishment of a continuous dialogue between forest officials and local stakeholders to ensure collaborative planning. Key areas of joint decision-making include species selection, afforestation, site identification, forest protection strategies, and equitable benefit-sharing, thereby promoting sustainable and inclusive forest resource management.

Joint Forest Management (JFM) emerged as a collaborative model to engage local communities as active partners in forest protection and management. It redefines their role from unintentional degraders to co-managers of forest resources, fostering shared decision-making that blends traditional knowledge with scientific forestry for more inclusive and sustainable governance.

Ecotourism holds significant potential for sustainable development, offering a dual benefit of biodiversity conservation and livelihood generation for forest-dependent communities. Identifying opportunities and investing in training and capacity building are essential for effective ecotourism management. This approach aligns with Joint Forest Management (JFM) by promoting inclusive governance and sustainable forest use.

8.1 Number of JFMC Committees and Areas Protected By Them

Table 8.1: List of Joint Forest Committee/ Village forest Committee

Name of Range	S. No.	Name of JFMC	Year of formation	Area	Status
Kandaghat	1	Mahi	2002	Karol II nd	Inactive
	2	Badewla	2006	Kot	Inactive
	3	Sainj	2009	Kiartoo	Inactive
	4	Tikker Kadhar	2009	Karol II nd	Inactive
	5	Hathon Palech	2009	Karol I st	Inactive
	6	Baran	2006	Shalumna	Inactive
Solan	1	Mashiwar	25-09-2003	Jaunaji II	Inactive
	2	Top kiber	25-09-2003	Chawal	Active
	3	SerBanera	25-09-2003	Kotla	In active
	4	Mansar	2006	Salogra	In active
Subathu	1	Sanjhi Van Yojana Kolthi Kanyara	2001-02	Alobra	Inactive
	2	VFDS Gaddon	2004-05	Subathu	Inactive
	3	Van Vikas Samiti Bholapanog	2010-11	Mamligh	Active
Dharampur	1	Kiard	2004-05	Kumarhatti	Inactive
	2	Gharti Maltu	2004-05	Kadon	Inactive

	3	Shaimajh	08-02-2010		Inactive
	4	Cheola	01-07-2020	Barog	Active
	5	Odder Jangeria	01-07-2020	Neri	Active
	6	Van Vistar Samiti Galyana	06-08-2023	Galyana, Barog, Mashon	Active
Parwanoo	1	JFMC Shillu Kalan	10.06.2002	Kasauli	Inactive
	2	VFDC Sandhog	24.10.2002	Khadeen	Active
	3	VFDC Kanana	25.09.2003	Lugon	Inactive
	4	VFDC Dadiyar	25.09.2003	Dadiyar	Inactive
	5	VFDC Thana Nabh	25.09.2003	Dochi	Inactive
	6	VFDC, Ratha Nakiyar	25.09.2003	Dadiyar	Inactive
	7	VFDC, Hadli.	25.09.2003	Datiar	Inactive
	8	FDC, Jakhroda	15.12.2011	Barog	Inactive

The approach of involving local communities in addressing deforestation and land degradation has gained widespread recognition as a key strategy for effective and sustainable forest management. The National Forest Policy of 1988 emphasized participatory and common property management, advocating for a broad-based people's movement especially with active involvement of women to achieve its goals. Building upon this policy, the Government of India, on June 1, 1990, issued guidelines promoting the participation of village communities and NGOs in forest regeneration, management, and protection. In alignment with these national directives, the Government of Himachal Pradesh introduced a state-level policy on May 12, 1993, endorsing Joint Forest Management (JFM) arrangements. This policy emphasized the involvement of village communities in the protection and management of forests, recognizing the crucial link between socio-economic incentives and sustainable forest development.

A significant milestone was the resolution issued by the Ministry of Environment and Forests on February 21, 2000, which provided legal backing to JFM committees. This resolution mandated that at least 50% of the general body members be women, extended JFM to well-stocked forest areas, and laid emphasis on the sustainable management of Non-Timber Forest Products (NTFPs).

The Government of Himachal Pradesh, through various initiatives, some supported by external agencies, has launched schemes that underscore people's involvement in forestry. Programs such as 'Sanjhi Van Yojana,' 'Van Samridhi Jan Samridhi Yojana,' and 'Samudayik Van Samvardhan Yojana', 'Vidhyarthi Van Mitra Yojana' aim to foster sustainable forest management by instilling a sense of joint ownership and responsibility among communities. To institutionalize this participatory approach, the Himachal Pradesh Participatory Forest Management Regulations, 2001, were enacted on August 23, 2001. These regulations apply to government-managed forests and common lands, promoting collaborative forest management and conservation with active community engagement.

8.2 Status of Empowerment of JFMCS

The Joint Forest Management Committees (JFMCs) in Himachal Pradesh are formed under the Forest Development Agency (FDA), which is registered under the Societies Registration Act. These committees operate through a decentralized funding mechanism, empowering them to draw sanctioned funds and implement forestry-related works following a resolution passed by the Gram Sabha. Each JFMC is headed by a President, a villager from the concerned area, along with other Executive Members from the same village. The Block Officer serves as the Member Secretary and, along with the President, jointly operates a bank account to manage project funds. A member of the Panchayat is mandatorily included in the committee to ensure representation of local governance. All adult villagers form the General Body of the JFMC, while the Executive Committee is responsible for day-to-day decisions and implementation that can be reconstituted periodically based on collective consensus. The functioning of JFMCs aligns with the provisions of the Societies Act, promoting community participation, financial transparency, and grassroots decision-making in forest management.

The Solan Forest Division holds a significant potential to further enhance participatory forest management through the effective functioning of Joint Forest Management Committees (JFMCs). With 28 JFMCs established across the ranges of Kandaghat, Subathu, Dharampur, Parwanoo, and Solan, there is a strong foundational framework already in place. Notably, six committees, including Van Vikas Samiti Bhola Panog, Cheola, Odder Jangeria, and Top ki Berare currently active and demonstrate the positive outcomes that can be achieved through community involvement, regular engagement, and institutional support. These active committees serve as inspiring examples, showcasing that with the right interventions, all JFMCs have the capacity to contribute meaningfully to forest conservation, afforestation efforts, and livelihood improvement leading to environmental protection and poverty alleviation. The Working Plan provides an excellent opportunity to revitalize and strengthen this network by introducing targeted strategies such as capacity building, periodic evaluation, enhanced financial transparency, and performance-based incentives.

8.3 Labour Welfare

All wages paid to labor are based on notified wage rates by Himachal Forest Department from time to time. The JFMC members, dwellers of forest fringe villages, are employed in all forestry related works both inside and outside RF area. Works include plantations, nursery maintenance, soil and moisture conservation works etc. Forest Villagers should be engaged in all forestry and non-forestry operations of Forest Department.

8.4 Use of Indigenous Knowledge

Documentation of the indigenous traditional knowledge and incorporation of the same in the micro plans and other prescriptions of the plan has not been done so far in the Division. During the tenure of this Working Plan, traditional and indigenous knowledge will be identified and systematically documented. A list of species for religious, culinary and aesthetic importance is being prepared for further evaluation.

Table 8.2: List of Species for culinary, religious and aesthetic importance

a) Plants of culinary importance

S. No	Botanical Name	Local/Hindi Name	Part Used / Use
1	<i>Aegle marmelos</i>	Bel	Fruit – Juices, digestive beverages
2	<i>Emblica officinalis</i>	Amla	Fruit – Rich in vitamin C, pickles, medicine
3	<i>Syzygium cumini</i>	Jamun	Fruit – Edible
4	<i>Zizyphus mauritiana</i> / <i>Z. jujube</i>	Ber	Fruit – Eaten raw, dried
5	<i>Punica granatum</i>	Daru	Fruit – Pomegranate
6	<i>Morus alba</i> / <i>M. serrata</i>	Shahtoot / Toot	Fruit – Edible berries
7	<i>Phoenix sylvestris</i>	Khajoor	Fruit – Wild date
8	<i>Pyrus communis</i> / <i>P. pashia</i>	Nashpati / Kainth	Fruit – Wild and cultivated pears
9	<i>Juglans regia</i>	Akhrot	Seed – Walnut
10	<i>Prunus armeniaca</i> / <i>P. persica</i>	Khumani / Aru	Fruit – Apricot / Peach
11	<i>Coriaria nepalensis</i>	Nachhar	Fruit – Traditional edible use
12	<i>Mentha arvensis</i>	Ban Pudina	Leaf – Wild mint, culinary herb
13	<i>Murraya koenigii</i>	Gandhela	Leaf – Curry leaves
14	<i>Glycosmis pentaphylla</i>	Ban Nimbu	Fruit – Pickling, seasoning
15	<i>Chenopodium album</i>	Bathu	Leaf – Cooked as vegetable
16	<i>Asparagus racemosus</i>	Sataron, Sansarmul	Shoots – Edible in early growth
17	<i>Fragaria indica</i>	—	Fruit – Wild strawberry
18	<i>Rubus ellipticus</i> / <i>R. macilentus</i>	Heer / Akha	Fruit – Wild berries
19	<i>Rumex hastatus</i> / <i>R. nepalensis</i>	Chulmora / JungliPalak	Leaf – Wild spinach

b) Plants of Religious/Spiritual Significance

S. No	Botanical Name	Local/Hindi Name	Religious/Cultural Use
1	<i>Ficus religiosa</i>	Peepal	Worshipped in Hinduism and Buddhism; associated with Lord Vishnu
2	<i>Ficus bengalensis</i>	Bargad (Banyan)	Represents Trimurti; worshipped for longevity and prosperity
3	<i>Aegle marmelos</i>	Bel	Leaves sacred to Lord Shiva
4	<i>Azadirachta indica</i>	Neem	Used in purification rituals
5	<i>Zanthoxylum armatum</i>	Trimal	Used in incense and spiritual cleansing
6	<i>Mangifera indica</i>	Aam	Mango leaves used in puja decorations
7	<i>Nyctanthes arbor-tristis</i>	Harsingar	Flowers offered to deities; mythological importance
8	<i>Butea monosperma</i>	Dhak / Palash	Used in HolikaDahan, sacred colors
9	<i>Calotropis procera</i>	Aak	Flowers offered to Lord Shiva
10	<i>Cynodon dactylon</i>	Dub	Sacred grass offered to Lord Ganesha
11	<i>Terminalia arjuna</i>	Arjun	Sacred tree; mentioned in Vedic texts
12	<i>Bauhinia variegata</i>	Kachnar	Flowers offered during rituals

c) Plants of Aesthetic Importance

S.No	Botanical Name	Local/Hindi Name	Aesthetic Feature
1	<i>Jacaranda mimosaeifolia</i>	Jacaranda	Purple-blue ornamental flowers
2	<i>Cassia fistula</i>	Amaltas	Yellow hanging flower clusters
3	<i>Bauhinia variegata</i> / <i>B. purpurea</i>	Kachnar / Lal Karal	Ornamental blossoms, also edible
4	<i>Rhododendron arboreum</i>	Buras	Bright red flowers, iconic in hills
5	<i>Erythrina uberosa</i>	Padiara	Coral red flowers
6	<i>Lagerstroemia indica</i>	Harsinghar	Pink to purple ornamental flowers
7	<i>Teco mastans</i>	Trumpet flower	Yellow trumpet-shaped flowers
8	<i>Nyctanthes arbor-tristis</i>	Harsingar, Kura	Fragrant night-flowering tree
9	<i>Jasminum officinale</i>	Dhurmalti	White fragrant flowers
10	<i>Jasminum humile</i>	Malu	Yellow flowers
11	<i>Jasminum multiflorum</i>	Ban Malti	Climbing, fragrant blooms
12	<i>Vitex negundo</i>	Bana	Ornamental shrub, also medicinal
13	<i>Woodfordia floribunda</i>	Dhai	Brilliant red blossoms
14	<i>Campsis grandiflora</i>	Chinese Trumpet	Showy climber
15	<i>Clematis montana</i> / <i>C. nutans</i>	Chibru, Machrun	Ornamental flowering climbers
16	<i>Parthenocis sussemicordata</i>	Baulan	Decorative foliage and climber

8.5 Extent of Cultural/Sacred Groves

There are no documented records indicating the presence of sacred groves within the forests of the Division. However, Pandav Guffa and Shikhar ki devi temple situated in R-21 Karol C3b forest have a high spiritual value among local people, therefore the forests nearby also hold the cultural & sacred importance.

8.6 Eco-tourism Area and Activities

National Strategy for Ecotourism 2022 formulated by Ministry of Tourism has defined ecotourism as “Ecotourism is responsible travel to natural areas that conserves the environment and improves the Well- Being of local people”.

8.6.1 Solan Forest Division has been pioneer in identifying the potential of eco-tourism as a possible Force Multiplier in forest conservation and management. K.K. Gupta’s Working Plan (1983-84 to 1997-98). He had created a Tourist Complex Working circle. The stated objectives of management were:

1. To preserves the environment around tourist centers and to maintain and enhance the utility and beauty tourist recreations and for the wild life.
2. To beautify the location by artificial planting of ornamental species.
3. To ensure perpetual unpolluted water supply.
4. To ensure protection of National highways and the Kalka-Shimla Railway line etc. against soil erosion and land Slides.

Total area of this working circle was 3691.20 hectares.

8.6.2 The main recommendations of K.K. Gupta Working Plan for tourism working circle were:

1. No felling of green standings trees shall be allowed in the forests allotted to this working circle.
2. Removals will be confined to the dry and green fallen/uprooted trees. Right holders demand will be met from such removals only. No top dry, half dry or dying trees will be felled.
3. Forests situated along the National Highway, the railway line and around Barog tourist complex have poor stocking.

8.6.3. Perusal to the recommendations and other proposals as formulated from time to time, several initiatives have been taken to boost ecotourism in Solan forest Division:

1. The Swarnim Vatika has been constructed by utilizing the National Highway dumping site at R-31Barog C- 4a by the Solan Forest Division which is now becoming the major halting point for tourist when coming to Shimla from Chandigarh.
2. Three Eco-tourism sites were operational in Solan Forest Division in R-33 C1 Motikona, R-32 Chunjari Chewa and R-31 Barog C5 & C7 Shividhar where Eco-huts & Eco-sports facilities were there and flourished well. During first wave of Covid in 2020 the tourist’s visits declined and these 3 sites were shut down.

8.6.4. The city of Solan is a well-known tourist destination in India, primarily due to the Jatoli Mahadev Temple, which is situated just 6 km away from the city center. This temple holds significance as Asia's highest Shiv Temple, drawing a considerable number of pilgrims each year. In addition to Jatoli Mahadev, the Solan Forest Division encompasses several other sites of religious importance. One such site is the Shoolini Mata Temple, located within Solan city, around 200 meters from the old bus stand.

The region offers various trekking routes, including the Karol Tibba Trek, leading to the highest point in Solan. This trek spans 11km from Chambaghat, Solan, to the Karol Devi Temple, dedicated to Goddess Kali, situated at the peak. The trek takes adventurers through diverse landscapes, including man-made brick surfaces, picturesque grasslands, and dense Ban oak forests. Along the route, trekkers encounter the Pandavas Cave, believed to have been built by the mythological characters, the Pandavas, during their exile.

Another trekking site near Dharo Ki Dhar village is the Gurkha Fort. Chail, a popular tourist destination is now part of the Solan Forest Division, is located 45 km from Solan and 44km from Shimla. Chail is renowned for its scenic beauty, pristine Deodar pine forests, and Ban oak forests. At the hill's summit, there is a famous Maa Kali temple, and within RMS Chail, there is the highest cricket ground situated at an altitude of 2,444 meters amsl. These attractions collectively make Solan and its surrounding areas a captivating destination for nature enthusiasts and pilgrims alike. Following are the area and list of proposed ecotourism sites for Solan forest division.

Table 8.3: List of proposed ecotourism sites

Range	Block	Beat	Site	Area
Dharampur	Chabbal	Chabbal	R-30 ChabbalkiDhar	0.9
Dharampur	Joharji	Joharji	R-41 Gulzar C1	1
Dharampur	Dharampur	Kumarhatti	R-32 ChunjariChewa	1
Dharampur	Dharampur	Sultanpur	R-31 Barog C5 & C7 Shivdhar	1
Dharampur	Chabbal	Gulhari	R-33 C1 GulhariMotikona	1
Chail	Gaura	Deen	D-52 Bhojdeen C2	0.97
Chail	Chail	Binnu	D-50 Sakori	0.8
Kandaghat	Kandaghat	Karol -Ist	R-21 karol C1 a	0.5
Subathu	Serighat	Serighat	Serighat	1
Solan	Oachghat	Jaunaji 2nd	R-24 Rajgarh C1, C2	0.4
Parwanoo	Kasauli	Kasauli	R-55 Mashobra C1	1
Dharampur	Dharampur	Barog	R-31 Barog C4a (SwarnimVatikaShamlech)	0.4
Parwanoo	Kasauli	Sanawar	D-245 Sanawar C-4	1

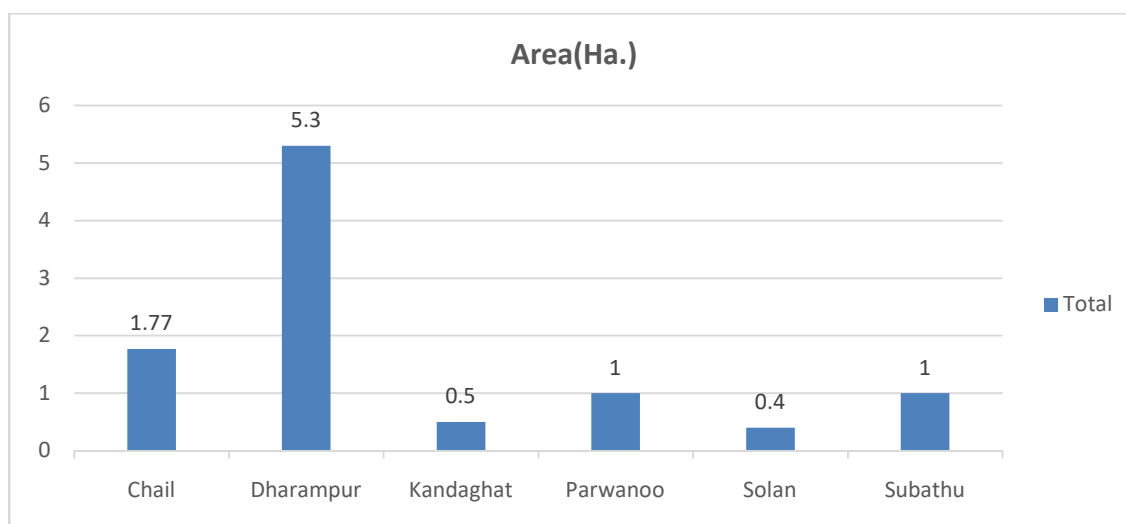


Fig 8.1: Range wise area (ha) proposed for ecotourism site development

8.7 Social Customs

The local culture of the Solan Forest Division is deeply intertwined with the surrounding forests, which have traditionally fulfilled essential needs such as fuelwood, fodder, and grazing. A significant proportion of the population of the division resides in urban areas. Communities have historically collected firewood and timber not only for domestic use but also for crafting agricultural tools and other necessities but now a shift in utilization patterns of timber and small timber has been observed. This shift can be attributed to changes in agricultural practices and the evolution of rural lifestyles, which have reduced the need for forest-based resources in certain areas. Despite these changes, the cultural and spiritual ties between people and forests remain strong. Fairs and festivals organized near prominent spiritual sites continue to serve as vital links between the community and the natural environment. These events provide opportunities for cultural expression and reinforce the traditional values of coexistence and conservation. They play a key role in preserving the symbiotic relationship between local communities and forests, reflecting a deep-rooted respect for nature that continues to shape the social fabric of the Solan Forest Division.

8.8 Status of Compliance of Forest Rights Act

The Forest Rights Act (FRA) of 2006, which came into force on January 1, 2008, is a transformative piece of legislation designed to empower Scheduled Tribes and other traditional forest dwellers by recognizing their rights over forest lands. It provides individual, community, and developmental rights to forest-dependent communities, ensuring their sustainable livelihoods and participation in forest governance.

a) Implementation Journey in Himachal Pradesh

Himachal Pradesh has made significant strides in implementing the FRA, despite initial challenges. Here is an overview of the progress:

b) Extension to Tribal and Non-Tribal Areas

The state began implementing the FRA in scheduled (tribal) areas in 2008, demonstrating its commitment to addressing the needs of tribal communities. By 2012-13, the Act was extended to the entire state, signaling a broader recognition of forest dwellers' rights across Himachal Pradesh.

c) Acknowledgment of Historical Processes

The Himachal Pradesh government initially relied on past revenue and forest settlements (e.g., those conducted in 1921 and 1984) to address forest rights. This approach reflected the state's belief that many claims had already been resolved. However, recognizing the need for a fresh start under the FRA, the State government submitted an affidavit to the Supreme Court in January 2016 acknowledging that implementation efforts were being restarted from scratch. This marked a turning point in ensuring compliance with the provisions of the Act.

d) Development Activities under Section 3(2)

Since 2017, Solan Forest Division has actively utilized Section 3(2) of the FRA to sanction 94 cases for development activities such as roads, water supply schemes, community centers and health centers. These initiatives reflect the state's commitment to balancing development with forest conservation.

e) Focus on Community Engagement

Efforts are ongoing to strengthen the recognition of individual and community forest rights under Section 3(1). While progress has been gradual, these steps lay the foundation for empowering forest dwellers and integrating them into sustainable forest management.

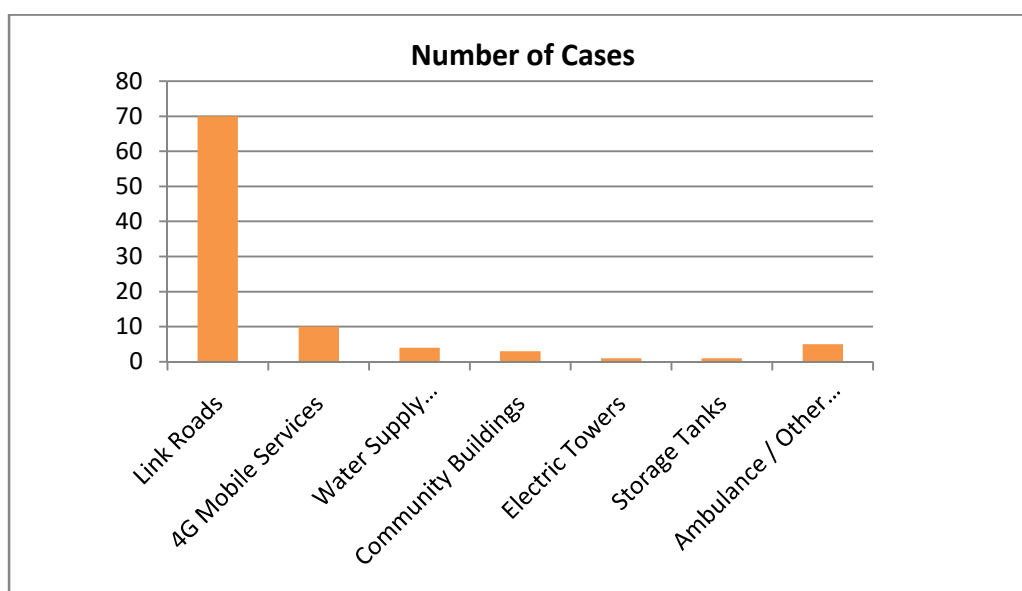


Fig 8.2: Number of FRA cases under different categories

Details of FRA cases range-wise are given in Appendix VII

8.9 Other Rights and Concessions

The forests (except Shamlat areas) in Solan Forest Division are classified as Reserved Forests (RF), Demarcated Protected Forest (DPF) and Un-demarcated Protected Forest (UPF). Some concessions are incorporated in the settlement report “FAISLA-E-JANGLAT” later notified by Himachal Pradesh Govt. Notification No. Ft43- 241B/49-3 dated Feb.25-1952. The rights included are given below.

Grazing of cattle and other domestic animals, lopping of miscellaneous tree species for fodder, salvage timber trees for house construction & cowsheds, dry fallen fuel wood for bonafide use, approach to drinking water sources for human beings and cattle, and collection of dry wood for cremation.

The concessions have been exercised and misused to such an extent that they have threatened the very existence of forests. As per the HP Forest (TD to Right Holders) Amendment Rules, 2015 vide Notification No. FFE-B-A (3) 4/2015 dated 26-02- 2016 TD rights means right of a Right Holder having cultivable land acquired only through inheritance of grant of timber for construction, repair and addition or alteration of residential house and cow shed for bonafide domestic use by the right holder as recorded in forest settlement reports of area. Upto 7 m³ of standing volume of salvage tree shall be granted for new construction and upto 3m³ for repair and addition or alteration. Periodicity for grant of TD to the right holder for new construction is once in 20 years and for repair, addition, or alteration once in 10 years. In case a right holder has land holding which qualifies him for grant of timber at more than one place, he may be granted timber only at one place where he resides. Only salvage trees will be granted. If any right holder contravenes any of the provision of TD rules except rule 3(ii) in utilization of timber obtained his rights shall be suspended for next 20 years. In case of contravention of rule 3(ii) TD rights of such right holder shall be suspended permanently. In addition, he will be liable to pay cost of trees at market rate.

Details of the same have been provided in Appendix VI. The rates charged from the right holders for various concessions are given in Dastur-ul-Amal (Schedule of rates).

8.10 Dependency of Local People on NTFPs

NTFPs are used only for limited bonafide needs like grass collection, bamboo, gums, resins, and medicinal plants. However, it is to be noted that the economic dependency on NTFPs in this Division compared to other parts of Himachal Pradesh is very low. Entire list of some of the relevant NTFPs are given in appendix III of volume II of the working plan.

Table 8.4: List of relevant NTFPs of Solan Forest Division

S. No.	NTFP Name	Botanical Name	Part Used	Uses
1	Amla	<i>Emblca officinalis</i>	Fruit	Pickles, candies
2	Daru	<i>Punica granatum</i>	Fruit	Making pickles, chatnis
3	Burras	<i>Rhododendron arboreum</i>	Flowers	Making chattnis, jams, squashes&food coloring.
4	Akhrot	<i>Juglans regia</i>	Fruit	Dry fruit, hair oil, medicinal properties
5	Kainth	<i>Pyrus pashia</i>	Fruit	Medicinal properties, fruit edible.
6	Jamun	<i>Syzygium cuminii</i>	Fruit	Fruit has medicinal properties.
7	Harad	<i>Terminalia chebula</i>	Fruit	Medicinal use
8	Behra	<i>Terminalia bellirica</i>	Fruit	Medicinal use
9	Neem	<i>Azadirachta indica</i>	Leaves	Medicinal use
10	Amaltas	<i>Cassia fistula</i>	Fruits	Medicinal
11	Giloe	<i>Tinospora cordifolia</i>	Leaves	Food additive, medicinal
12	Gandla	<i>Murraya koenigii</i>	Leaves	Food additive
13	Basuti	<i>Adhatoda vasica</i>	Flower	Medicinal
14	Bhabhar	<i>Eulaliopsi sbinata</i>	Grass	Rope-making, mat-making
15	Kachnar	<i>Bauhinia variegata</i>	Flowers, bark	Medicinal use, chatnis and pickles
16	Reetha	<i>Sapindus mukorossi</i>	Seeds	Medicinal use

8.11 Other Aspects

The mapping of designated Transhumance routes for livestock (Gaddis, Gujjars and others) is done by IDP Solan in all the 10 Districts and the data are being compiled at PMU level for planning the possible future interventions for this community. Data pertaining to their migratory routes, places of stay & flock strength is being recorded by Veterinary Extension Officers on standard formats circulated in the field.

A comprehensive strategy for ensuring upliftment of trans-humant community has been outlined comprising of following steps:

1. Fodder Augmentation
2. C/o Livestock managers
3. Climate Resilient Livestock – Small Ruminants
4. Climate Resilient Livestock - Large Ruminants
5. Tribal Action Plan
6. Training & Exposure visits
7. De-worming / Dipping of Flocks
8. Flock Management
9. Genetic Improvement

The HP Forest Department has issued directions for identifying traditional pastoral routes and halting sites across the state and to avoid tree plantation in these areas under any afforestation scheme. This decision announced on January 24, 2025. A total of 1637 locations have been identified as key passageways or halting sites for pastorals in H.P. This approach will reduce the costs associated with “ineffective plantation efforts” by focusing on areas that are less vulnerable to grazing. The forest officers will implement a system for tracking livestock movements, managing permits and monitoring grassland health.

Chapter 9

Adequacy of Policy, Legal and Institutional Framework

9.1 Existing Policy Legal Frame Work and their Compliance

Forest resources have been regulated since early times. The roots of legislations, policies, and guidelines for natural resource management in India can be traced back to the days of British Colonialism. The relevant constitutional frameworks at the backdrop of management of forests resources are briefly enumerated as following.

9.1.1 The Constitution of India

Article 48 of the Directive Principles, states that the State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country.

Article 51-A deals with the fundamental duties of citizens, which include the citizen's duty to value and preserve the rich heritage of our composite culture and to protect and improve the natural environment including forests, lakes, rivers, and wildlife and to have compassion for living creatures.

Article 246 points towards the Seventh Schedule to the Constitution, which enlists (in the union list, and the concurrent list) the subjects that the Central and State governments are to legislate upon. Forest is one of the subjects placed in the Concurrent List on which both the Central and State Government shall legislate upon.

In 1952, the erstwhile Ministry of Food and Agriculture, Government of India enunciated a Forest Policy to be followed in the management of Forests in the country. Subsequently, due to large scale deforestation and diversion of forestland for non-forestry uses finally led to the formulation of a new Forest Policy in 1988. The Forest Policy of 1988 was a pro-people document, placing greater emphasis on the ecological role of forests and recognizing for the first time the rights of the people, especially the tribal population, with the direction that their domestic requirements of fuelwood, minor forest produce and construction timber would be the first charge on forest produce.

9.1.2 Existing Forest Policy, Laws and Latest Amendments

Legal protection is provided to the forests through Acts and its Regulations. The Indian Forest Act, 1927 was adopted in the state before independence. The Act provides the procedure for the declaration of Protected and Reserved Forest and control over forests, timber, and other forest produce. The Indian Forest Act, 1927 (Himachal Pradesh IInd amendment Act, 1991) prescribe the procedure for confiscation of vehicles involved in forest offences under section 52 A. The Wildlife (Protection) Act 1972 as amended till date and the Wildlife Protection Rule 1995 are other acts and rules in force for dealing with the matter related to wildlife in the Division. Other Acts and Rules which are held by the Division for discharging its functions for management of Forests are Himachal Pradesh (Sale of Timber) Act, 1968, Himachal Pradesh Land Preservation Act 1978, Himachal Pradesh Public Premises and Land (Eviction and Rent Recovery) Act, 1971, Himachal Pradesh Forest Produce (Regulation of Trade) Act, 1982. Apart from this the Forest Officers of the State are empowered to take cognizance against mining related offences under Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of Illegal Mining,

Transportation and Storage) Rules, 2015. The Forest Officers are also authorized for taking cognizance against contravention of the provisions of Himachal Pradesh Non-Bio-degradable (Control) Act, 1995. Government of H.P has notified Fire Rules for protection from fire in the year 1999. The FRA, 2006 is being implemented in the state in full force after 2012 amendment.

Land Preservation Act, 1978 of Solan District, No. 15-4/71-SF-11, Shimla-2 dated 21-3-1980

Whereas the State Government is satisfied after due enquiry, under Section 7 of the Himachal Pradesh and Land preservation Act 1978 that regulations, restrictions, prohibitions or directions contained in this order are necessary for the purpose of giving effect to the provisions of this Act.

2. Now, therefore the Governor, Himachal Pradesh in exercise of the powers conferred by section 4 of the Himachal Pradesh Land Preservation Act, 1978 (Act No. 28 of 1978), is pleased to temporarily regulate, restrict and prohibit throughout the areas (except in Municipal Corporation/Municipal Committees, areas of other local bodies and areas falling in the peripheries' of such local bodies) specified in the schedule annexed to Himachal Pradesh Notification of even number dated 3-5-1979 in Solan District the following acts for a period of 30 years with effect from the date of publication of this order in the Rajpatra Himachal Pradesh in the manner indicated below;

1. The cutting of trees or timber and removal thereof in such areas shall be prohibited; Provided that there will be no restriction on the use of forest produce for bonafide domestic purposes of fuel and fodder;

Provided further that the owners may for their bonafide domestic and agricultural use fell up to three trees each year without permission. Any felling of more than three trees require written permission of the Divisional Forest Officer concerned.

Provided further that the trees for sale shall be felled in accordance with the 10 years felling programme, which will be framed by the officers of the Forest Department and approved by the State Government subject to the condition that trees used for timber and other purposes will be felled after obtaining permission of the Divisional Forest Officer concerned up to 200 trees in a year, of the Conservator of Forests up to 300 trees, in a year, of the Principal Chief Conservator of Forests up to 400 trees in a year, of the State Government for more than 400 trees and that for other trees the permission will be accorded by the Divisional forest Office concerned in accordance with the 10 years felling programme;

Provided further that any person felling the trees either for domestic or agricultural use or for sale shall be required to plant at least 3 trees for one tree felled. In case, however, a fruit orchard is planted in such area, it shall be planted according to the norms laid down by the State Horticulture Department for complete stocking of the area.

2. Subject to the provisions of Para I the extraction, collection or removal or subjection to any manufacturing process of any forest produce in such areas shall be prohibited;

Provided that extraction of resin will be undertaken with the written permission of the concerned Divisional Forest Officer in accordance with the instructions issued by the Chief conservator of Forest from time to time laying down the period of extraction, number of blazes, length, width and depth of the blazes and other related matters;

Provided further that the felling of Bamboos will be regulated according to 3-years felling program, which will be framed by the officers of the Forest Department and approved by the State Government and that the permission for felling of bamboos for sale will be granted by the concerned Divisional Forest Officers in accordance with 3-year felling programme

3. The Forest produce, passing out of such areas shall be subject to examination by a Forest officer and no forest produce will be removed by any person, even if it may have been extracted after obtaining permission aforesaid, without obtaining an export permit for the same.

4. The authority empowered to grant permission for extraction of forest produce may while granting permission impose such conditions as may be necessary in the interest of forest conservancy and to avoid misuse of the forest produce so extracted;

5. Notwithstanding anything to the contrary contained in the foregoing paragraphs, the State Government may by general or special order allow the cutting or removal of any tree or class of trees subject to such condition as it may deem fit to impose where ever it is expedient to do so in the public interest such as grant of Nautor Land Consolidation of holding or dry trees/fallen trees or in cases pending before 31-3-1979.

6. This Supersedes this Department notification of Even No. dated 21-3-1980.

Vide Government of Himachal Pradesh Notification No.FFE-B-A (3)-5/2020 Dated Shimla, the 28th August 2023 Para 1 of the Order No. FFE-B-A(3)-1/2017 dated 8th February 2021 was amended as below:

For the first proviso, the following shall be substituted namely:-

“Provided that there shall be no prohibition or restriction in felling of following species of trees:

S. No.	Local Name of Species	Botanical Name of Species
1	Kala Siris / Ohi / Siris	<i>Albizia spp</i>
2	Safeda	<i>Eucalyptus spp</i>
3	Poplar	<i>Populus deltoids</i>
4	Indian Willow/ Biuns	<i>Salix spp</i>
5	Bamboo culms/ Lathi bans / Maggar / Dharainch / Bans	<i>Dendrocalamus strictus / D. Hamiltoni / Bambusa nutans / B. bamboos</i>
6	Paik / Koi / Kosh / Kunis / Kunish / Nyun	<i>Alnus nitida</i>
7	Khirk / khadaki	<i>Celtis australis</i> <i>C. tetrendra</i>
8	Darak / Bakin	<i>Melia azedarach</i>
9	Teak / Sagun / Sagwan	<i>Tectona grandis</i>
10	Arjun	<i>Terminalia arjuna</i>
11	Semal / Shalmaltas	<i>Bombax ceiba</i>
12	Bihul / Beul / Bhimal / Bhl-unal / Dhaman	<i>Grewia optiva</i>
13	Kamala / Raini / Rohan / Rohini / Sinduri	<i>Mallotus philippensis</i>

Second proviso of Order No. FFE-B-A(3)-1/2017 dated 8th February 2021 is as below:-

“Provided further that there will be complete ban on felling of green trees of Peepal (*Ficus religiosa*), Bargad (*Ficus bengalensis*) and Aam (wild Genotype) (*Mangifera Indica*) growing on private lands, except for widening of road, dangerous trees posing threat to life and property and bonafide domestic use, for which the competent authority to grant permission will be the concerned Divisional Forest Officer”.

Amendment to the Land Preservation Act

There have been amendments to the act detailed above vide notification no. F.F.E. - B.-A(3) – 5 /2020 dated 4th January 2025 which amended the provisions of the orders dated 10.09.2002, 08.02.2021 and 28.08.2023. The amended clause reads as:

The tree species except those mentioned in the table below shall not be felled:

S. No.	Local name	Botanical name
1.	Safeda	<i>Eucalyptus spp.</i>
2.	Poplar	<i>Poplar deltoides</i>
3.	Bamboo culms / Laathi / Baans / Dhrench / Baans	<i>Dendrocalamus strictus</i> , <i>Dendrocalamus hamiltonii</i> , <i>Bamboosa nutans</i> / <i>Bambusa bamboo</i>

There shall be no restriction on the felling of trees for fodder and fuel-wood.

The owner of the trees can cut a maximum of 3 trees every year for household and agricultural use. For the number of trees exceeding this limit, written permission from the competent authority shall be required.

Also, the felling of Khair trees shall be done according to the 10-year felling plan which will be prepared by the officers of the forest department and approved by the state government. The felling of trees shall be done after obtaining permission from the following officials:

S. No.	Number of trees	Competent Authority
1.	Up to 200 trees in one year	Divisional forest Officer
2.	Up to 300 trees in one year	Chief Conservator /conservator of Forests
3.	Up to 400 trees in one year	Principal Chief Conservator of Forests (HOFF)
4.	More than 400 trees in one year	Himachal Pradesh Govt.

Note: For felling trees other than those mentioned above permission shall be given by PCCF (HOFF) but the process of identification of trees to be felled should have been completed before this order of 2025 according to the ten-year felling plan.

Whereas, for every tree felled for household, agriculture or selling purpose, three trees shall be planted. If horticulture species is planted, the stocking of the area shall be according to. The rules framed by the horticulture department.

Further amendment in order No. FFE-B-A-(3)-5/2020 dated 4th January, 2025 has made vide notification No. FFE-B-A(3)-2/2020 dated 17/01/2025 where amendment of para 1 : shall be read as after Sr. no. 03 following species of trees shall be added, namely :-

S. No.	Name of species	Botanical name of species
1.	Japanese Toot	<i>Broussonetia papyrifera</i>
2.	Leuceania	<i>Leuceania leucocephala</i>

(b) For the note mentioned below third proviso, the following shall be substituted, namely

“The felling of trees for sale in respect of other species shall be permitted by the Chief Conservator of Forests/Conservator of Forests (T), provided that the process of demarcation/marketing of trees under 10 year felling programme is completed upto 31.01.2025.”

Amendment in HP Forest Produce Transit (Land Routes)

The rules 2013 notified vide this Department Notification No. FFE-B-A(3)-2/2013 dated 26-11-2013 and published in the Rajpatra, Himachal Pradesh on 30th November 2013 are amended vide Govt. of HP Department of forest Notification No. FFE-B-A(3)-5/2020- Dated shimla 21st October, 2023.

In rule 2 of the Himachal Pradesh Forest Produce Transit (land Routes) Rules, 2013 after clause (f) of sub rule (1), the following shall be inserted namely:-

“(g) “Pass” means any transit permit/pass issued under these rules and shall also include transit pass generated through National Transit Pass System (NTPS)”

In rule 6 of the said rules, for the words, figures and signs “Rs 500 and Rs 1000”, the words, figures and signs “Rs 1000/- and Rs 2000/- respectively , shall be substituted.

For rule 7 of the said rules, the following shall be substituted, namely:-

“7. Issue of pass for export or transport of forest Produce-(I) No pass shall be issued for any unmarked forest produce other than fuel-wood, khair-wood, bamboos, charcoal, medicinal plants, grass, other plant parts including bark, leaves, stem, roots, flowers, fruits, cones and seeds as bears the marks not registered as herein after provided:-

(i) the Divisional Forest Officer may refuse to issue a pass for export or transport if he has reason to believe or for any other valid reasons that the forest produce has not been legally obtained by the applicant. However, the refusal to issue a pass shall be made in the shape of self-speaking written order; and

(ii) the person who has been refused the issue of pass may within fifteen days of the date of refusal prefer an appeal to the Chief Conservator/Conservator of Forests in charge of the area concerned and his orders on appeal shall be final.

(2) The Electronic Transit Pass/No Objection Certificate issued through online National Transit Pass System shall also be acceptable/valid in the whole of the State of Himachal Pradesh and no fresh pass shall be required to be issued for forest produce being transported under National Transit Pass System.

5. In rule 8 of the said rules.-

(i) for sub-rule(1), the following shall be substituted, namely :-

“ No person shall transport or cause to be transported any forest produce except that obtained from plant species specified in and obtained in accordance with provisions contained in Schedule-‘I’ of Annexure-D by land routes, without obtaining pass as per Annexure ‘A’ from the concerned Divisional Forest Officer or any officer or person so authorized;

(ii) for sub-rule(4), the following shall be substituted, namely :-

“No person shall transport or cause to be transported any forest produce except that obtained from plant species specified in and obtained in accordance with provisions contained in

Schedule-‘I’ of Annexure-D by land routes, unless the timber is properly affixed with an export hammer mark by the forest officer authorized by the Conservator of Forests concerned”;

6. After rule 8 of the said rules, the following rules shall be inserted namely: Insertion of rules – 8A and 8-B.

"8-A. Compliance if provision of Biological Diversity Act: - Any person or entity as specified in Section 7 of the Biological Diversity Act, 2002 (Act No 18 of 2003), intending to obtain pass shall ensure compliance of the provisions of the Act ibid and rules and regulation etc. framed thereunder”; and

“8-B. Revision of pass fee- The State Government may by order notify the rates of pass fees for the species listed in schedule-II of Annexure D, from time to time.

In rule 9 of the said rules:-

(i) For sub-rule (1), the following shall be substituted, namely:-

“The authority issuing pass shall specify a route by which alone forest produce may be transported within the State of Himachal Pradesh or outside the state for the forest produce obtained from plant species specified in and obtained in accordance with the provisions contained in Schedule ‘I’ of Annexure-D”, In such a manner that the forest Department of State Taxes and Excise:

Provided that such authority shall also specify the check post(s) where the forest produce shall be compulsorily checked en-route:

Provided further that no timber or other forest produce form any forest depot or intermediate depot or first section/depot of dispatch shall be loaded in vehicles, trolleys, bullock cart etc. after sun-set and before sun rise. The Divisional Forest Office concerned may further impose any restriction(s) if so warranted for controlling the movement of forest produce after sun-set and before sun-rise:

Provided further that the State Government may by order notify or amend the list of check posts of Himachal Pradesh Forest Department or barriers of State Taxes and Excise through which the forest produce shall compulsorily be transit from time to time”;

(ii) for sub-rule (2), the following shall be substituted namely:

“In case the produce is not to be exported outside the territory of Himachal Pradesh, the authority issuing the pass shall specify the route by which alone the forest produce may be transported and shall also determine the check post(s) where it shall be compulsorily checked”: and

(iii) for sub-rule (3), the following shall be substituted namely:

“The issuing authority shall also determine the other conditions subject to which the pass shall be issued and shall also determine the period for which the pass shall remain valid. However, the validity of any pass shall under no circumstances be exceeded beyond a period of three months including any extension (s), id any granted. A Pass processing fee of Rs.500/- shall be leviable for the issue of such pass:

Provided that the pass fee of Rs. 400/- per qtl. Shall be levied in case of resin to be exported outside the State of Himachal Pradesh. Provided further that pass processing fee in respect of forest produce obtained from species, including that listed in Schedule-II of Annexure- ‘D’ cultivated on private land in accordance with provisions contained in Schedule –III of Annexure- ‘D’ shall be levied Rs.,200/-

Provided further that in respect of medicinal plants as included in Schedule-II of Annexure –‘D’ purposed to be transported to the notified Herbal/ Agriculture Mandis, permit fee shall be levied in accordance with procedure detailed in Annexure-“E”. (Full notification is in appendix V of the Volume II of the working plan.

The Van (sanrakshan Evam Samvardhan) Adhiniyam, 1980 is being implemented in the State from 25th October 1980 and has been amended notably in 2023 to clarify its scope & applicability & to address certain exemptions & activities within forest areas. The amendment renames the act as Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980 and narrows the definition of forest land to include only areas notified or declared as forest under IFA, 1927 or other relevant laws & those recorded as forest in government record (Forest or Revenue) as of or after October 25, 1980. Provided that the provisions of this clause shall not apply to such land, which has been changed from forest use to non-forestry purpose on or before the 12 Dec 1996 in pursuance of an order issued by any authority authorised by a State Government or Union Territory Administration.

Some exemptions were also provided under sub-section 2 where the following categories of land shall not be covered under the provisions of this Act, namely:-

1. Such forest land situated alongside a rail line or a public road maintained by the government, which provides access to a habitation or to a rail and roadside amenity upto a maximum size of 0.10 ha in each case.
2. Such tree, tree plantations or reforestation raised on lands that are not specified in clause (a) or clause (b) of sub-section 1
3. Such forest lands—
 - i. As is situated within a distance of 100 kilometer along international borders or Line of Actual Control, as the case may be, proposed to be used for the construction of strategic linear project of national importance & concerning national security or
 - ii. Up to 10 hectares, proposed to be used for construction of security related infrastructure or
 - iii. As is proposed to be used for construction of defence related project or a camp for paramilitary forces or public utility projects as may be specified by the centre government, the extent of which does not exceed five hectares in a Left Wing Extremism affected area as may be notified by the Central Government.

The exemption provided under sub-section (2) shall be subject to such terms & conditions, including the condition of planting trees to compensate felling of trees under taken on lands, as the Central Government may, by guidelines, specify. All the relevant notifications are given in appendix V in Volume II of the working plan.

9.2 Status of Approved Working Plan and Compliance

The Working Plan by Sh. K. K. Gupta, IFS, was implemented from 1983-1998 and Archana Sharma IFS from 2001 to 2017. Compliance is given in table 9.1

Table 9.1: Status of prescriptions and their compliance

S. No.	Prescription	Working Circle	Status
1.	Closure for grazing	All Circles	Not strictly implemented
2.	Felling/removals	Chil, Ban, Protection cum Rehabilitation, Bamboo (overlapping)	Not implemented due to ban on green felling
3.	Soil and water conservation measures	All Circles	Carried out under State Plan, CAMPA and other schemes. However, many areas were left untreated
4.	Plantations	Plantation working circle	Plantations done in certain areas as Discussed in Chapter6, but some blank areas also exist for future plantations
5	Active participation of Forest Protection Committees	All Circles	Success model discussed in Chapter8. However, more scope for comprehensive and proactiveengagementof these committees
6	Construction of new buildings	Misc-regulation	Some new buildings were constructed as per requirement for field staff and ministerial staff as well as upgradation of Forest Rest Houses based on budget allotment
7	Checking and maintenance of forest boundaries	Misc. regulation	Not done as per program provided. Detailed list of boundary pillars constructed and repaired has been included in Appendix XIII.

9.3 Number of Forest Offences

Forest offences can be broadly categorized into five main types. Illicit felling from forest or government land is addressed under Section 26 and section 32,33 of the Indian Forest Act, 1927, while cases involving the theft of timber are registered under Section 379 of the Indian Penal Code (IPC). Smuggling of timber and violations of transit rules are prosecuted under Sections 41, 42 and 52A of the Indian Forest Act, 1927. For counterfeiting or defacing of marks on trees and timber and for altering boundary marks are also booked under section 63 of IFA. Petty offences, such as unauthorized grazing and lopping in restricted areas, are the most common and typically involve local right-holders seeking to meet their bona fide livelihood needs and such cases are compounded by realizing the compensation from offenders. The category of other offences includes violations of the Land Preservation Act, 1978, the Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2015, illegal mining from forest land, unauthorized collection of fuelwoods, cutting of saplings and dumping of garbage in forest area.

Table 9.2a: Illicit Felling Cases in respect of Solan Forest Division

S. No.	Year	No. of Cases
1	2012-13	23
2	2013-14	29
3	2014-15	30
4	2015-16	15
5	2016-17	12
6	2017-18	2
7	2018-19	0
8	2019-20	2
9	2020-21	0
10	2021-22	5
11	2022-23	2
12	2023-24	4

Table 9.2b: Lopping Cases Detected in respect of Solan Forest Division

S. No.	Year	No. of Cases
1	2012-13	74
2	2013-14	86
3	2014-15	76
4	2015-16	59
5	2016-17	52
6	2017-18	95
7	2018-19	66
8	2019-20	50
9	2020-21	54
10	2021-22	30
11	2022-23	56
12	2023-24	58

Table 9.2c: Grazing cases detected

Year	No. of cases
2012-13	6
2013-14	10
2014-15	6
2015-16	3
2016-17	1
2017-18	1
2018-19	7
2019-20	5
2020-21	11
2021-22	3
2022-23	7

9.4 Status of Research and Development

The research and development activities conducted in the Solan Forest Division, Himachal Pradesh, span a range of ecological themes, with a strong focus on forest ecosystem management, biodiversity conservation, and climate change mitigation. Brief account of Research and development work done in Solan Forest Division is given below.

Table 9.3: Studies carried out for research and development in Solan Forest Division

Study	Area	Key work done	Key findings
Carbon Partitioning in Subtropical <i>Pinus roxburghii</i> Forest, Solan, India by Shah et al., 2014	33 compartments across Solan and Dharampur Ranges, Solan	Non-destructive biomass estimation and soil sampling to quantify ecosystem carbon stocks.	Total ecosystem carbon density was 247.87 t/ha. Most carbon was stored in soil (190.89 t/ha), followed by vegetation (51.13 t/ha) and detritus (5.85 t/ha).

	Forest Division		High soil-to-vegetation carbon ratio indicates forest degradation due to human pressure
Effect of forest fire on soil properties and natural regeneration in Chirpine (<i>Pinus roxburghii</i>) forests of Himachal Pradesh, India (Sharma et al., 2023)	Conducted in 2020 at six locations across Solan, Hamirpur, and Dehra Forest Divisions in Himachal Pradesh	burnt and adjacent unburnt Chirpine forest patches (~300 m apart) were studied	pH and EC: Higher in burnt areas Nutrient Availability: Increased in burnt sites Organic Carbon: Decreased in burnt soils Seedling Density: Higher in burnt forests indicating fire facilitates germination (<i>Pinus roxburghii</i> seedlings in Oachhghat (burnt: 1.15; unburnt: 0.85 per 25 m ²) Sapling Density: Higher in unburnt forests, suggesting fire impedes long-term establishment (Jhaniari unburnt had the highest sapling density (3.30 per 25 m ²) Shrub Regeneration: Mixed response; often higher in burnt sites but species-specific variations were observed.
Impact of Controlled Burning on Herbs in High Altitude Zone of Chirpine Forests in Solan and Nahan Circles, Himachal Pradesh (Kumar et al, 2020)	☐ <i>Mangotimor</i> (Solan Forest Division) ☐ <i>Bagpashog</i> (Rajgarh Forest Division) ☐ <i>Lwasachowki</i> (Nahan Forest Division) Treatment Design: Controlled burning (B1) conducted during winter 2017 on 1.5 ha plots. Control (C)	Calculated Density, Frequency, Abundance, and Importance Value Index (IVI). Diversity assessed using Shannon-Wiener Index (H), Species Richness (R), Evenness (E), and Concentration of Dominance (Cd).	Burnt plots recorded higher herb diversity : 30 species (Bagpashog-B1) vs. 24 (Bagpashog-C). Total of 41 species observed across all sites, with higher density and richness in burnt areas . Diversity (H) highest at Bagpashog-B1 (3.30); lowest at Lwasachowki-C (2.63). Richness (R) highest at Bagpashog-B1 (4.30); lowest at Mangotimor-C (3.22). Evenness (E) highest at Mangotimor-B1 (0.974); lowest at Lwasachowki-C (0.863). Concentration of Dominance (Cd) was lower in burnt areas,

	plots of 0.5 ha remained unburnt at each site.		suggesting greater heterogeneity. Burnt plots showed better natural regeneration of tree and shrub species, including <i>Pinus roxburghii</i>, <i>Murraya koenigii</i>, and <i>Myrica esculenta</i>.
Land Use Change Detection in Solan Forest Division, Himachal Pradesh, India(Shah, 2015)	Solan Forest Division, covering five ranges: Subathu, Dharampur, Solan, Parwanoo, and Kandaghat.	Land use change assessed over 12 years (1998–2010). Data used- Satellite imagery from IRS 1D (LISS III) acquired in December 1998 and January 2010. Toposheets and forest stock maps. Land Use Classes Identified: Chir pine forest Ban oak forest Broadleaved forest Bamboo forest Khair forest Culturable blank Cultivation	Increase in Area: Chir pine: +191 ha (+4.55%) Khair: +77 ha (+23.40%) Cultivation: +129 ha (+13.81%) Decrease in Area: Ban oak: –181 ha (–16.58%) Broadleaved forests: –152 ha (–6.30%) Culturable blank: –71 ha (–2.72%) Bamboo: –7 ha (–0.47%) Implications: The increase in pine and khair reflects a shift towards commercial monoculture plantations. Decline in oak and broadleaved forests indicates anthropogenic pressure and ecological degradation. Expansion of horticultural cultivation has led to forest encroachment. Policies like the Timber Distribution scheme and nautor land rights contributed to forest area reduction.

9.5 Human Resource Capacity Building Efforts

To develop human resources and build capacity for developmental activities, the Division organizes various programmes. The department also conducts short-term training and refresher courses aimed at enhancing the skills required for effective human resource management and development. Training for Forest Guards is conducted at the Forest Training Institute (FTI), Chail, while Deputy Rangers receive their training at the Himachal Pradesh Forest Academy (HPFA), Sundernagar. Additionally, refresher courses for officers are held at HPFA Sundernagar at regular intervals to ensure continuous professional development.

9.6 Forest Resource Accounting

The tangible benefits derived from forests include timber, non-timber forest products (NTFPs), fuelwood, fodder, livelihood opportunities, ecotourism, and biodiversity conservation. In contrast, the intangible benefits of forests encompass carbon sequestration, soil erosion control, water recycling, oxygen production, air pollution mitigation, and provision of wildlife habitat, among others. During the tenure of this Working Plan, focused efforts will be made to quantify these intangible benefits to highlight their ecological and economic significance.

9.7 Budgetary Allocation to the Forestry Sector

Himachal Pradesh, being a predominantly forest-dominated state with approximately 66% of its land classified as forest area, receives relatively lower budget allocations compared to sectors such as Agriculture, Jal-Shakti and Rural Development. Nevertheless, the allocated budget has generally been adequate to meet both plan and non-plan expenditures. However, the budget is neither projected based on the prescriptions of the Working Plan prepared by the department nor allocated accordingly, which often results in the non-implementation of many key recommendations. The details of plan and non-plan expenditures are presented in the table below.

Table 9.4: Plan and non-plan expenditure in Solan Forest Division (in Rs)

S. No	Year	Non Plan		Plan Scheme	
		Allotment	Expenditure	Allotment	Expenditure
1	2012-13	57851900	57851900	18593422	18593422
2	2013-14	63759200	63759200	16493100	16493100
3	2014-15	71149760	71149760	16035678	16035678
4	2015-16	70812745	70812745	8917538	8917538
5	2016-17	76078500	76078355	13817500	13817500
6	2017-18	81433600	81433240	18032900	15268729
7	2018-19	76523918	76523706	28571592	28571472
8	2019-20	85310323	77155367	25663675	24654210
9	2020-21	83865680	79640524	47511814	37699700
10	2021-22	0	0	133913458	110777393
11	2022-23	0	0	120887584	119522332
12	2023-24	0	0	114741607	105594787

9.8 Existence of Monitoring, Assessment and Reporting Mechanism

Monitoring and evaluation of plantations and other forestry field activities are crucial for assessing the outcomes and effectiveness of these works. To ensure consistency and accountability, an Instruction Manual for the monitoring and evaluation of plantations, salvage checking, soil and water conservation works, nurseries, and other field operations was issued vide Technical Order No. 01/2018 dated 24-03-2018 by the Principal Chief Conservator of Forests (HoFF), Himachal Pradesh.

The mandatory field touring regime for field officers, as outlined in the manual, is based on the following official communications:

Principal Chief Conservator of Forests, HP: Letter No. Ft/3-17/66(PA) dated 04-05-1994

Forest Conservator-cum-Secretary (Fts): Letter No. Fts.-1(B)(15)-20/87-II dated 20-04-2001

Principal Chief Conservator of Forests (HoFF), HP: Letter No. Ft. 3-17/66(PA)-II dated 15-02-2007. These instructions have been periodically revised, with updates to the reporting formats to improve the effectiveness and transparency of the monitoring process.

9.9. Public Awareness and Education

Publicity and extension education are integral components of the Forest Department's outreach efforts. At present, a dedicated Publicity team based in Shimla under DFO Publicity is responsible for delivering extension services to the public. Forest education and awareness are promoted through the distribution of educational materials such as posters, pamphlets, manuals, yearly publication of HP forest department, *nukar nataks* by special teams, advertisements through TV and Akashvani and handouts related to forest laws and conservation practices.

Awareness on environmental and forest conservation is also raised during public gatherings held at local fairs and on key occasions such as Van Mahotsav, Wildlife Week, World Forestry Day, World Environment Day, World Biodiversity Day, and Earth Day. Furthermore, awareness meetings are regularly organized on important issues including forest fire prevention, water conservation, forest protection, and mitigation of human-wildlife conflicts involving species such as monkeys, leopards, wild boars, and black bears.

9.10 Adequate Manpower in the Solan Forest Division

The Solan Forest Division comprises six Territorial Ranges, namely: Chail, Solan, Khandaghat, Dharampur, Parwanoo, and Subathu. These Ranges are further divided into Blocks, which are subsequently subdivided into Beats for effective management and supervision.

As per the allocation of posts for the year 2018-19, the Division has a sanctioned staff strength of 7 Range Officers, 23 Deputy Rangers, and 80 Forest Guards. This represents the existing establishment of the executive and ministerial staff in the Division.

Table 9.5: Manpower List in Forest Division [as On 31.03.2024]

S. No.	Category of post	Sanctioned strength (as per allocation of post for the year 2018-19)	Existing Strength	Variation
1	IFS, DFO	1	1	0
2	HPFS, ACF	1	1	0
3	Forest Ranger	7	7	0
4	Dy. Ranger	23	17	-6
5	Forest Guard	80	69	-11
6	Superintendent	1	1	0
7	Sr. Asstt.	3	1	-2
8	Jr. Asstt./ Clerk/JOA (IT)	6	3	-3
9	Kanungo	0	0	0
10	Driver	1	1	0
11	Peon	15	6	-9
12	Chowkidar	8	8	0
13	Mali	10	7	-3
14	Sweeper	0	0	0
15	Forest Worker	50	27	-23
16	Multi Purpose Worker (MPW)	0	2	+2
17	Mali-cum-Nry.-Worker	2	2	0
18	Sycc	0	1	+1
19	Dak Runner	0	1	+1
	Total:	208	155	-53

List of DFOs served in the division right from the day of formation of the division is attached in Appendix X in Volume II of the working plan.

Chapter 10

Five year plans

The system of five-year plans adopted by the Government of India has been instrumental in development activities. The focus the plans provided have guided the preparation and implementation of policies that have overseen the growth of all the sectors of the Indian economy, forestry included.

10.1 Forestry from the lens of past Five Year Plans

The first three five year plans emphasized agriculture and industrialization, environment-related issues pertaining to the improvement of human environment such as sanitation, public health, nutrition, water supply and housing got due priority in national programmes under the three five-year plans. Protection and preservation of environment did not receive a significant place. The details of the past working plans have been provided in the chapter on Past Management Systems. The table below summarizes the forestry related concerns in different five-year plans:

Table 10.1: Evolution of forestry through diffefent five year plans

Plan	Issues related to forests
First Plan (1951 to 1956)	Rehabilitation of exploied forest areas. Efforts to stabilize soil in highly eroded areas through Afforestation. The Central Board of Forestry provided guidance to the Central Government in the policy and programme formulation in the field of forestry. The wastage in conversion and felling of trees was minimized. Manmade forests were raised, especially of economically important fores tree species. ‘Van Mahotsava’, started with the objective of creating mass awareness about the value of forests in human well-being.
Second Plan (1956-57 to 1960-61)	Emphasis was laid on preservation processes, improvement of communication, rehabilitation of degraded forests, establishment of new plantations, and application of modern systems of intensive forest management. Improvement of timber of inferior varieties through seasoning and preservation processes and introduction of modern techniques. Large tracts of degraded forests situated in the former Zamindari estates and princely States came under Government control. Schemes for the demarcation of such areas and preparation of maps were taken up.
Third plan (1961-62 to 1965-66)	Development of forest resources as an integral part of the programme for optimum land utilization.
Fourth plan (1969-70 to 1973-74)	To increase the productivity of the forests, To link up forest development with various forest-based industries To develop forests as a support rural economy. Emphasis was laid on measures to meet the immediate and long-term agricultural and industrial requirements, since the demand for various forest products, timber, domestic fuel and raw materials for industries has rapidly increased. Increase in forest production. Creating large scale plantations of fast-growing species especially of economic and industrial importance.

	Efforts to regenerate areas, where forest produce was removed for industrial uses was taken. Management of minor forests, pastures and grazing grounds in the interest of the population of the tract and to serve requirements of fuel and fodder requirements. The Wild Life (Protection) Act, 1972 was enacted intended solely to protect wild life. A Centrally sponsored scheme “Project Tiger” was launched in 1973 to ensure maintenance of a viable population of tigers in India. Preservation of areas of biological importance.
Fifth plan (1974-75 to 1978-79)	Creation of large scale manmade forests through institutional financing. The plan proposed a network of State Forest Corporations for establishment and management of manmade forests. The birth of Forest Corporation and the economic considerations further pushed the ecological consideration to secondary place. Develop farm forestry and to improve degraded forests so as to increase the fuel and timber supply in rural areas. Wild Life Protection Taken up. Programmes for development of national parks, strengthening of research on endangered animals including project tiger.
Sixth plan (1980-85)	Saving the natural forests from further depletion, formation of new fuel and fodder reserves to meet the growing needs of local population and creation of more National Parks and Wild Life Sanctuaries. The sixth five-year plan framework document as approved by the National Development Council States, “It is imperative that we carefully harvest our renewable resources of soil, water, plant and animal life to sustain our economic development. A chapter on ‘Environment and Development’ devoted to the discussion on problem of environmental degradation such as land use, agriculture, forestry, wildlife, water, air, marine environment, minerals, fisheries, renewable resources, energy and human settlement, with a view to evolve sound environmental and ecological principles has been included in the sixth plan. Department of Environment was replaced by an Integrated Department of Environment, Forest and Wild life. In addition to this, two powerful agencies were created to tackle specific environmental problem; namely, the National WasteLand Development Board and the Central Ganga Authority, to further improve the implementation of environmental law and policy decisions. With a view to meeting the basic and economic needs of community, the programme of social forestry initiated in 1981-82. The social forestry programme which inter-alia includes Farm Forestry, Extension Forestry, and Reforestation on degraded forests and Recreation Forestry. The 20 Point Economic Programme also included Afforestation, Social Forestry and Farm Forestry programmes.
Seventh plan (1985 to 1990)	The basic approach was sustainable development in harmony with the environment. To ensure that all development programmes, in all sectors, will take environmental considerations fully into account. Environmental management, a term encompassing environmental planning, protection, monitoring, assessment, research, education, conservation and sustainable use of resources, was now accepted as a major guiding factor for national development in India. The plan envisaged “Forest for survival” as its theme. The plan, giving highest priority to restore the forest cover, with 33% of the geographical area of the country being brought under forests.

	Asserted for preserving biological diversity, increase the vegetal cover by massive Afforestation and development Afforestation into a people's movement (Social Forestry) enhance the productivity of existing forest areas.
Eight plan (1992-97)	To ensure the protection of natural environment the plan suggests preventive and regulatory strategies suggested for protecting natural environment through public awareness, strict enforcement of laws, statutory assessment of environmental impact of projects. Prevention of environmental degradation through stringent laws, their rigorous implementation, through stringent punitive measures and by marking an undesirable action expensive for the offender. The plan calls for the necessity of statutory environmental impact assessment of all projects and activities before their implementation, as such would prevent environmental degradation by making it obligatory on the part of executing agencies to undertake compensatory measures. Priority was accorded to - Establishment of decentralized nurseries and school nurseries. - Block plantations especially on community land and lands of SC/ST and people living below the poverty line - Pasture development through people's institutions and involvement, and - Assistance in the implementation of the Tree Patta Schemes. An appraisal of the Afforestation schemes undertaken during the plan period has appeared some deficiencies.
Ninth plan (1997-2002)	The emphasis was given to the Integrated Watershed Approach. The measures such as conserving rain water, through treatment of drainage lines in the micro-watersheds and promoting in-situ moisture were proposed. This includes 3-tier appropriate vegetation consisting of grasses, shrubs and trees for fodder, fuel, timber and fruit in a topo sequence which is in consonance with soil depth and moisture. The objectives were: - Eco-restoration and Eco-preservation - Involvement of the local population - Gender sensitive planning - Use of appropriate technology - Redevelopment of traditional agro-eco-systems based on traditional knowledge and technology - Scientific approach to agriculture, animal husbandry and horticulture in order to raise productivity - Development of ecologically sustainable industries and tourism. 88
Tenth plan (2002-07)	Despite significant resource flows and national concern, the potential of forests to reduce poverty, realize economic growth, and their contribution to the local and global environment has not been fully realized. A combination of market and institutional failures has led to forests failing to contribute as significantly to rural incomes and poverty alleviation and economic growth as would be possible under good economic and technical management. The following strategies were proposed in order to address the concerns of forests sector and to achieve the objectives of sustainable forests management: The role of forests to maintain the hydrological balance is complementary. Successful models of watershed development have helped conserve soil and moisture, improve ground water recharge and the water regime and mitigated the adverse

	impacts of drought. The watershed approach should be universally adopted for the maintenance and development of forests. ii) Due to the increase in human and cattle population, the existing forest resource is under intensive pressure to meet the demands for various forest produce, i.e food, fodder, fuel, fertilizer, timber, bamboo, medicinal plant, etc. About 41% of the forest area is degraded due to over exploitation of forest produce. However, no strategy to conserve the forest eco-system would be successful unless the basic needs of the society are met. The future management strategy must, therefore, take into account this compelling need of the community to meet their requirements. iii) The forest areas near population centre's/villages have degraded faster due to over- exploitation and the forest resources has become impoverished. It has adversely affected the livelihood security and employment opportunity of people dependent on forests.
Eleventh plan (2007-28 to 2011-12)	The Integrated Forest Protection Scheme was redesigned to aid the states for building capacity and basic infrastructure for modern forest management. The following components were provided for modernization of the State forest management: i) Modernization of the management planning (Working Plan) units with equipment, infrastructure, and manpower. This may include forest inventories, training and satellite imagery processing, and GIS facilities. This included professional services such as ecologists and sociologists for relevant inputs. ii) Forest Land Information System for land records, with modern and empowered survey, and land record maintaining mechanisms for documenting the legally recognized individual rights, concessions, ownerships including those under the Scheduled Tribes and other Forest Dwellers (Recognition of Forest Rights) Act, 2006. iii) Forest boundary demarcation by providing assistance for the state-of-the-art infrastructure, training/outourcing survey work, fixing permanent boundary pillars, updating the forest block indices and compartment histories. iv) Installation of forest fire surveillance and warning systems, along with fire management planning in participatory mode.
Twelfth Plan (2011-12 to 2016-17)	Important issues focused upon during the Twelfth Plan: i) Securing ecology of watershed and catchment. ii) Cumulative Environmental Impact Assessment (CEIAs) for vulnerable regions. iii) Carrying capacity studies in selected river basins. iv) Maintaining acceptable water quality and quantity through pollution control of water resources. v) Restoration of wet lands & lakes etc., and vi) Management of waste water discharge from Industrial and Commercial establishment into major water bodies.
Niti Aayog	In the recent years, with the realization of forests as a key solution for combating global issues of climate changes, India has strengthened its commitment towards fighting global environmental challenges as well as fulfillment of Sustainable Development Goals. India's commitments in its 'Nationally Determined Contributions' post Paris agreement include: - Reducing emissions intensity of its GDP by 45 per cent by 2030, from 2005 level - To create additional carbon sink of 2.5-3 billion tonnes of CO₂ equivalent

	through additional forest and tree cover by 2030 • Achieving 50 per cent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030 • Commitment to Paris agreement which is a legally binding international treaty on climate change to limit global warming, adopted by 196 parties at COP-21 in Paris on 12.12.2015 entered into force on 4.11.2016. 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.

The details of the prescriptions of past working plans are given in detail in the chapter on Past Systems of Management.

10.2 Summary of work done during the last five years

The work done under the CAMPA in the Solan Forest Division during the last five years is detailed below

Table 10.2: Work done during last five years

2020-21

Activity	Target (ha)	Achievement (ha)
Plantations and maintenance		
Maintenance of old plantations – 1 st year	30.34	30.34
Maintenance of old plantations – 2 nd year	1.2	1.2
Maintenance of old plantations – 4 th year	137	137
Maintenance of old plantations – 5 th year	304	304
Maintenance of old plantations – 6 th year	289	289
Maintenance of old plantations – 8 th year	6.6	6.6
Total CA and maintenance	768.14	768.14
Assisted Natural Regeneration		
Clearing of infested area 25%	25.5	25.5
Clearing of infested area 50%	10	10
Clearing of infested area 75%	20	20
Clearing of infested area 100%	20	20
Total Clearing of infested area	75.5	75.5
Maintenance of cleared area from 2 nd year activity	250	250
Maintenance of cleared area from 3 rd year activity	339.2	339.2
Maintenance of cleared area from 4 th year activity	285	285
Artificial Regeneration Planting	39	39
Silvicultural activity – climber cutting	274	274

Protection of plantations – boundary pillars	131	131
Control burning	311	311
Development and maintenance of roof ran water harvesting structures	3	3
Development of ponds / trenches / water and snow harvesting structures	75	75
Check dams	312	312
Monkey capturing	500	500
Works under 20%		
Nurseries and planting stock production infrastructure	4	4
Residential and official buildings	2	2
Upgradation and maintenance of inspection paths, forest road, watch tower, check post	7	7

2021-22

Activity	Target (ha)	Achievement (ha)
Plantations and maintenance		
New Plantations	34	34
Maintenance of old plantations – 2 nd year	30.34	30.34
Maintenance of old plantations – 3 rd year	1.2	1.2
Maintenance of old plantations – 5 th year	137	137
Maintenance of old plantations – 6 th year	304	304
Maintenance of old plantations – 7 th year	289	289
Maintenance of old plantations – 9 th year	6.6	6.6
Total CA and maintenance	768.14	768.14
Assisted Natural Regeneration		
Clearing of infested area 25%	15	15
Clearing of infested area 50%	15	15
Clearing of infested area 75%	20	10
Clearing of infested area 100%	20	20
Total Clearing of infested area	70	60
Maintenance of cleared area	662	662
Artificial Regeneration Planting	25	25
Maintenance of plants in area cleared of Lanatana	39	0
Development of degraded forest land (check Dams)	210	195
Maintenance of biological diversity and resources (monkey capturing)	350	350
Upgradation and maintenance of inspection paths, forest road, watch tower, check post (under 20%)	10	0

2022-23

Activity	Target (ha)	Achievement (ha)
RCC fencing	42	42
Plantation	10	10
Maintenance of old plantations – 1 st year	34	34
Maintenance of old plantations – 3 rd year	30.34	30.34
Maintenance of old plantations – 4 th year	1.2	1.2
Maintenance of old plantations – 6 th year	137	137
Maintenance of old plantations – 7 th year	304	304
Maintenance of old plantations – 8 th year	289	289
Maintenance of old plantations – 10 th year	6.6	6.6
Total maintenance	802.14	802.14
Maintenance of Planting in Lantana Cleared area		
1st Year Maintenance 500 Tall Plants	20	20
Maintenance of normal plantation		
1st Year Maintenance 1100 plants	5	5
2nd Year Maintenance 1100 plants	39	39
Forest Fire Prevention and control Operations		
Control burning	1614	1614
Monkey capturing	200	200
Establishment Upgradation and Maintenance of Modern Nurseries and other planting stock production facilities (Infrastructure)	1	1
Construction of residential and official building	1	1
Upgradation and maintenance of inspection paths, Forest road, watch tower, check post	9	8

2023-24

Activity	Target (ha)	Achievement (ha)
Plantation	42	42
Maintenance of old plantations – 1 st year	10	10
Maintenance of old plantations – 2 nd year	34	34
Maintenance of old plantations – 4 th year	30.34	30.34
Maintenance of old plantations – 5 th year	1.2	1.2
Maintenance of old plantations – 7 th year	137	137
Maintenance of old plantations – 8 th year	304	304
Maintenance of old plantations – 9 th year	289	289
Total maintenance	805.54	805.54
Maintenance of Cleared area – 2nd year activity		
1st Maintenance of area infested 25% Maint. of Lantana	15	15
1st Maintenance of area infested 50% Maint. of Lantana	15	15
1st Maintenance of area infested 75% Maint. of Lantana	10	10
1st Maintenance of area infested 100% Maint. of Lantana	20	20
Total	60	60
Maintenance of Cleared area – 3rd year activity		
1st Maintenance of area infested 25% Maint. of Lantana	25	25
1st Maintenance of area infested 50% Maint. of Lantana	20	10
1st Maintenance of area infested 75% Maint. of Lantana	10	10
1st Maintenance of area infested 100% Maint. of Lantana	20	10
Total	75	55
Maintenance of Cleared area – 4th year activity		
1st Maintenance of area infested 25% Maint. of Lantana	0	0
1st Maintenance of area infested 50% Maint. of Lantana	30	15
1st Maintenance of area infested 75% Maint. of Lantana	90	55
1st Maintenance of area infested 100% Maint. of Lantana	130	100

Total	250	170
Artificial regeneration planting	45	25
Maintenance of planting ion areas cleared of Lantana	20	20
Maintenance of normal plantations	44	44
Forest Fire Prevention and control Operations – fire watchers	667	667
Check dams	57	57
Monkey catching	200	131
Establishment Upgradation and Maintenance of Modern Nurseries and other planting stock production facilities (Infrastructure)	1	1
Forest guard hut	1	1

2024-25

Activity	Target (ha)	Achievement (ha)
Removal of Lantana by Clearing of areas infested upto 75%	115.5	115.5
Maintenance of old plantations		
Maintenance of old plantations – 1 st year	42	42
Maintenance of old plantations – 2 nd year	10	10
Maintenance of old plantations – 3 rd year	34	34
Maintenance of old plantations – 5 th year	30.34	30.34
Maintenance of old plantations – 6 th year	1.2	1.2
Maintenance of old plantations – 8 th year	137	137
Maintenance of old plantations – 9 th year	304	304
Maintenance of old plantations – 10 th year	289	289
Total maintenance	847.54	847.54
3rd Year Maintenance 500 Tall Plants in areas cleared of Lantana	20	20
Maintenance of normal plantations	44	44
Maintenance of plantations MMVVY	25	25
Removal of Lantana by CRS method		
Clearing of Lantana Areas Infested upto 25%	10.6	10.6
Clearing of Lantana Areas Infested upto 50%	5	5
Clearing of Lantana Areas Infested upto 75%	10	10
Clearing of Lantana Areas Infested upto	15	15

100%		
Total	40.6	40.6
Maintenance of area cleared of Lantana	135	115
Prevention of forest fires		
Fire watcher mandays	3250	3250
Maintenance of Fire line (Km)	9	9
Control burning (Ha)	100	100
Soil & Moisture Conservation Works		
Roof Rain Water Harvesting Structure	1	1
Staggered trenches (km)	522.9	522.9
Retaining wall	2	2
Upgradation and maintenance of inspection paths, Forest road, watch tower, check post		
Repair of path	2	2

Table 10.3: General Scheme works 2020-21 to 2024-2025

Year	Name of Activity General Scheme	Phy. Target (ha)	Achievement (ha)
2020-21	Plantation in General Scheme	174	174
2020-21	Old Plantation Maintenance in General Scheme	744.7	744.7
2020-21	Ek Buta Beti Ke Naam kits distributed	500	500
2020-21	Water Pond	1	1
2020-21	Check Dam	68	68
2020-21	Maint of bridal path	2	2
2020-21	Maint. Of buildings	19	19
2020-21	Maint of roads	2	2

Year	Name of Activity in General Scheme	Phy. Target (ha)	Achievement (ha)
2021-22	Plantation	170	170
2021-22	Old Plantation Maintenance in General Scheme	868.7	868.7
2021-22	Ek Buta Beti Ke Naam kits distributed	750	750
2021-22	Check Dam	59	59
2021-22	Retaining walls	5	5
2021-22	Water harvesting structure	1	1
2021-22	Maint of bridal path	7	7
2021-22	Maint. Of buildings	2	2
2021-22	Maint of retaining walls	3	3

Year	Name of Activity in General Scheme	Phy. Target (ha)	Achievement (ha)
2022-23	Plantation	35	35
2022-23	Old Plantation Maintenance in General Scheme	846	846
2022-23	Ek Buta Beti Ke Naam kits distributed	750	750
2022-23	Amrit Sarovar	2	2
2022-23	Maint. of boundary pillars	594	594
2022-23	Main. Of Building	9	9
2022-23	New Building Constructed	4	4
2022-23	Maint of roads	1	1
2022-23	Maint of bridal paths	4	4

Year	Name of Activity in General Scheme	Phy. Target (ha)	Achievement (ha)
2023-2024	Plantation	18	18
2023-2024	Old Plantation Maintenance in General Scheme	507	507
2023-2024	Staggred Trenches	11950	11950
2023-2024	Crate wire Check Walls	4	4
2023-2024	New Building Constructed	2	2
2023-2024	Maint. Of path	1	1

2023-2024	Maint of buildings	20	20

Year	Name of Activity in General Scheme	Phy. Target (ha)	Achievement (ha)
2024-2025	Plantation	61.5	61.5
2024-2025	Old Plantation Maintenance in General Scheme	503.7	503.7
2024-2025	Staggred Trenches	2000	2000
2024-2025	Crate wire Check Walls	13	13
2024-2025	Check Dam	83	83
2024-2025	Farm Pond	2	2
2024-25	Maint of buildings	15	15
2024-25	New building Constructed	1	1

10.3 Planning of work to be carried out during the next five years

Table 10.4 Plantation Work in all 6 Ranges

S.No	Region	Name Of Forests	Area in Ha	Working Circle	Plantation Work		Year				
					Area (Ha)	No. of trees to be planted	I	II	III	IV	V
1	Chail	D39 SDhamdhar C-1	30.4	Chil W.C.	5	500 (Tall)	5	0	0	0	0
2	Chail	D39 SDhamdhar C-2	30	Chil W.C.	3	500 (Tall)	0	3	0	0	0
3	Chail	D52 SBhojdeen C-3b	58.4	Chil W.C.	3	500 (Tall)	0	0	3	0	0

S.No	Region	Name Of Forests	Area in Ha	Working Circle	Plantation Work		Year				
					Area (Ha)	No. of trees to be planted	I	II	III	IV	V
1	Kandaghat	D69 SPalhech I	22.4	Ban Oak W.C.	3	500 (Tall)	0	3	0	0	0
2	Kandaghat	D101 SKuryali	19.6	Ban Oak W.C.	5	500 (Tall)	5	0	0	0	0

S.No	Region	Name Of Forests	Area in Ha	Working Circle	Plantation Work		Year				
					Area (Ha)	No. of trees to be planted	I	II	III	IV	V
1	Solan	D126 SManlog C-2	13.4	Chil W.C.	1	500 (Tall)	1	0	0	0	0
2	Solan	D82 SJawa	43.6	Ban Oak W.C.	5	500 (Tall)	0	1	4	0	0

S.No	Region	Name Of Forests	Area in Ha	Working Circle	Plantation Work		Year				
					Area (Ha)	No. of trees to be planted	I	II	III	IV	V
1	Subathu	D122 SShangri	6.4	PCR W.C.	6	500 (Tall)	0	6	0	0	0
2	Subathu	D124 SKatiyara C-4	17.2	PCR W.C.	10	500 (Tall)	10	0	0	0	0
3	Subathu	D127 SShashal C-4b	10	PCR W.C.	2	500 (Tall)	0	2	0	0	0
4	Subathu	D129 SRano	18.8	PCR W.C.	5	500 (Tall)	0	0	5	0	0

S.No	Region	Name Of Forests	Area in Ha	Working Circle	Plantation Work		Year				
					Area (Ha)	No. of trees to be planted	I	II	III	IV	V
1	Dharampur	R31 SBarog C-2 a	45.2	Chil W.C.	8	500 (Tall)	8	0	0	0	0

2	Dharampur	R31 SBarog C-2 b	26.8	Chil W.C.	12	500 (Tall)	0	0	0	0	0
3	Dharampur	D176 SChiroti Ki DhaRI	38	Chil W.C.	10	200 (Tall)	10	0	0	0	0
4	Dharampur	D177 SChiroti Ki Dhar	21.2	Chil W.C.	3	200 (Tall)	3	0	0	0	0
5	Dharampur	D178 SChiroti Ki Dhar C-1	42.3	Chil W.C.	3	400 (Tall)	3	0	0	0	0
6	Dharampur	D178 SChiroti Ki Dhar C-2	29.1	Chil W.C.	3	500 (Tall)	3	0	0	0	0
7	Dharampur	D179 SShirgulKaTiba C-1	16	Chil W.C.	4	500 (Tall)	0	4	0	0	0
8	Dharampur	D179 SShirgulKaTiba C-2	13.6	Chil W.C.	5	500 (Tall)	0	5	0	0	0
9	Dharampur	R39 SCharoti Ki Dhar	44.4	Chil W.C.	2	400 (Tall)	2	0	0	0	0
10	Dharampur	D165 SMaltoo	41.2	Chil W.C.	8	500 (Tall)	0	8	0	0	0
11	Dharampur	R37 SMaltoo C-2	28.6	Chil W.C.	5	500 (Tall)	0	5	0	0	0
12	Dharampur	R33 SGulhari C-1a	44	Chil W.C.	10	1100	0	0	10	0	0
13	Dharampur	R30 SChabal C-1	30.4	Chil W.C.	2	200 (T)	0	0	2	0	0
14	Dharampur	R42 SAjmerGarh C-1	35.6	Chil W.C.	10	500 (T)	0	0	0	10	0
15	Dharampur	D180 SShirgulKaTiba C-2	21.2	Chil W.C.	10	500 (T)	0	0	0	10	0
16	Dharampur	R31 SBarog C-3	42.8	PCR W.C.	15	500 (T)	0	0	15	0	0
17	Dharampur	R44 SJhanai C-1	76.5	PCR W.C.	10	400 (T)	0	0	0	10	0
18	Dharampur	D210 SODderjhangiriya	97.7	PCR W.C.	3	400 (T)	0	0	0	0	3
19	Dharampur	D212 SHalda	16	PCR W.C.	5	400 (T)	0	0	0	0	5
20	Dharampur	D175 SBohali C-2	11	PCR W.C.	3	500 (T)	0	0	0	0	3
21	Dharampur	R40 SBohali C-2b	38	PCR W.C.	15	400 (T)	0	0	0	10	5
22	Dharampur	R35 SKadon	40.1	PCR W.C.	2	200 (T)	0	0	0	0	2
23	Dharampur	R48 SKalth.C-3	16	PCR W.C.	5	200 (T)	0	0	0	0	0
24	Dharampur	D203 SQuila Ajmergarh.C2	43.6	PCR W.C.	15	400 (T)	0	0	0	0	0
25	Dharampur	D202 SKalth_ II.C1	12	PCR W.C.	5	200 (T)	0	0	0	0	0
26	Dharampur	D213 SKabaBhalon	107.6	PCR W.C.	32	800	0	0	0	0	10
27	Dharampur	R41 SGulzar C-2	102.4	PCR W.C.	20	500 (T)	0	20	0	0	0

S.No	Region	Name Of Forests	Area in Ha	Working Circle	Plantation Work		Year				
					Area (Ha)	No. of trees to be planted	I	II	III	IV	V
1	Parwanoo	D245 SSanawar C-2	16.4	Chil W.C.	5	1100	0	0	5	0	0
2	Parwanoo	R57 SBanasar C-1b	43.2	Chil W.C.	10	800	10	0	0	0	0

3	Parwanoo	D234 SRanigaun	72	PCR W.C.	10	800	0	0	0	10	0
4	Parwanoo	D240 SDochi C-6	28.4	PCR W.C.	8	200 (T)	8	0	0	0	0
5	Parwanoo	R56 SParwanoo C-2	91	PCR W.C.	15	800	0	15	0	0	0

Check Dams

Sr.No.	Region	Name Of Forests	Area in Hact	Working Circle	Soil Work		Activities(CD-Check Dams) Year Wise				
					Activity	No of CD	I	II	III	IV	V
1	Chail	D39 SDhamdhar C-1	30.4	Chil W.C.	Check Dams	8	CD	-	-	-	-
2	Chail	D39 SDhamdhar C-2	30	Chil W.C.	Check Dams	7	CD	-	-	-	-
3	Chail	D47 SBirniShillai C-2	93.6	Chil W.C.	Check Dams	10	CD	-	-	-	-
4	Chail	D48 SBirniShillai C-1	36	Chil W.C.	Check Dams	9	CD	-	-	-	-

Table 10.5: Soil work

S. No.	Region	Name Of Forests	Area in Ha	Working Circle	Soil Work		Activities(CD-Check Dams) Year Wise				
					Activity	No of CD	I	II	III	IV	V
1	Kandagh at	R21SKarol C-1A	34.4	Ban Oak W.C.	Check Dams	20	-	CD	-	-	-
2	Kandagh at	R21SKarol C-1B	42	Ban Oak W.C.	Check Dams	20	-	CD	-	-	-
3	Kandagh at	R21SKarol C-1C	38.8	Ban Oak W.C.	Check Dams	20	-	CD	-	-	-
4	Kandagh at	R21SKarol C-2	58.4	Ban Oak W.C.	Check Dams	20	-	CD	-	-	-
5	Kandagh at	R21SKarol C-3A	39.6	Ban Oak W.C.	Check Dams	20	-	CD	-	-	-
6	Kandagh at	R21SKarol C-3B	32	Ban Oak W.C.	Check Dams	20	-	CD	-	-	-
7	Kandagh at	R21SKarol C-3C	34.4	Ban Oak W.C.	Check Dams	20	-	CD	-	-	-
8	Kandagh at	R22 SKarolNoII	12.4	Ban Oak W.C.	Check Dams	15	-	CD	-	-	-

9	Kandagh at	R23 SKarolNoIII	8	Ban Oak W.C.	Check Dams	15	-	CD	-	-	-
10	Kandagh at	D53 SShungal	11.2	Ban Oak W.C.	Check Dams	5	-	-	CD	-	-
11	Kandagh at	D54 SShadiyal	8.4	Ban Oak W.C.	Check Dams	5	-	-	CD	-	-
12	Kandagh at	D55 SSuro No 1	2	Ban Oak W.C.	Check Dams	5	-	-	CD	-	-
13	Kandagh at	D56 SSuro No 2	2.8	Ban Oak W.C.	Check Dams	5	-	-	CD	-	-
14	Kandagh at	D58 SBasha	11.2	Ban Oak W.C.	Check Dams	5	-	-	CD	-	-
15	Kandagh at	D59 SBagetu	2.4	Ban Oak W.C.	Check Dams	5	-	-	CD	-	-
16	Kandagh at	D61 SDhanoliDochi	6.4	Ban Oak W.C.	Check Dams	5	-	-	CD	-	-
17	Kandagh at	D62 SBisha C-1	49.1	Ban Oak W.C.	Check Dams	10	-	-	CD	-	-
18	Kandagh at	D64 SBirni	2.4	Ban Oak W.C.	Check Dams	4	-	-	CD	-	-
19	Kandagh at	D65 SBirniKasauli	7.2	Ban Oak W.C.	Check Dams	4	-	-	CD	-	-
20	Kandagh at	D67 SSainj	12.8	Ban Oak W.C.	Check Dams	8	-	-	CD	-	-
21	Kandagh at	D69 SPalhech I	22.4	Ban Oak W.C.	Check Dams	15	-	-	CD	-	-
22	Kandagh at	D70 SPalhech II	3.2	Ban Oak W.C.	Check Dams	10	-	-	CD	-	-
23	Kandagh at	D71 SKarol I	5.2	Ban Oak W.C.	Check Dams	10	-	-	CD	-	-
24	Kandagh at	D72 SKarol II	16.4	Ban Oak W.C.	Check Dams	10	-	-	CD	-	-
25	Kandagh	D73 SKarol III	10.4	Ban Oak	Check	10	-	-	CD	-	-

	at			W.C.	Dams						
26	Kandagh at	D74 SKarol IV	5.6	Ban Oak W.C.	Check Dams	10	-	-	CD	-	-
27	Kandagh at	D75 SKarol V	19.2	Ban Oak W.C.	Check Dams	15	-	-	CD	-	-
28	Kandagh at	D77 SKarol VII	1.2	Ban Oak W.C.	Check Dams	10	-	-	CD	-	-
29	Kandagh at	D78 SKarol VIII	4.8	Ban Oak W.C.	Check Dams	8	-	-	-	CD	-
30	Kandagh at	D79 SDed	14.4	Ban Oak W.C.	Check Dams	15	-	-	-	CD	-
31	Kandagh at	D99 SSalumna	23.2	Ban Oak W.C.	Check Dams	10	-	-	-	CD	-
32	Kandagh at	D100 SDharot C-2	18.8	Ban Oak W.C.	Check Dams	10	-	-	-	CD	-
33	Kandagh at	D101 SKuryali	19.6	Ban Oak W.C.	Check Dams	10	-	-	-	CD	-
34	Kandagh at	D57 SKumhala	4.8	Chil W.C.	Check Dams	5	-	-	-	CD	-
35	Kandagh at	D63 SKiarighat	23.6	Chil W.C.	Check Dams	8	-	-	-	CD	-
36	Kandagh at	D68 SHathon	6	Chil W.C.	Check Dams	10	-	-	-	CD	-
37	Kandagh at	D100 SDharot C-1	15.6	Chil W.C.	Check Dams	5	-	-	-	CD	-
38	Kandagh at	D102 SBaranKaCheon C-1	5.6	Chil W.C.	Check Dams	5	-	-	-	CD	-
39	Kandagh at	D102 SBaranKaCheon C-2	7.2	Chil W.C.	Check Dams	5	-	-	-	CD	-
40	Kandagh at	D102 SBaranKaCheon C-3	6	Chil W.C.	Check Dams	5	-	-	-	CD	-

S.N o.	Regio n	Name Of Forests	Area in Hact	Working Circle	Soil Work		Activities (CD-Check Dams) Year Wise				
					Activity	No of CD	I	II	III	IV	V
1	Solan	D108 SShilly C-6	12.4	Chil W.C.	Check Dams	10	-	-	-	-	CD
2	Solan	D126 SManlog C-1	14.4	Chil W.C.	Check Dams	10	-	-	-	-	CD
3	Solan	D132 SCharar C-6	33.6	Chil W.C.	Check Dams	10	-	-	-	-	CD
4	Solan	D132 SCharar C-8	13.2	Chil W.C.	Check Dams	10	-	-	-	-	CD
5	Solan	R25 SShahogBhadrog C-1	43.2	Ban Oak W.C.	Check Dams	10	-	-	-	-	CD
6	Solan	D106 SNalo C-1	23.2	Ban Oak W.C.	Check Dams	10	-	-	-	-	CD
7	Solan	D106 SNalo C-2	13.6	Ban Oak W.C.	Check Dams	10	-	-	-	-	CD
8	Solan	D83 SRajgarh C-1	70.4	Ban Oak W.C.	Check Dams	15	-	-	-	-	CD
9	Solan	D83 SRajgarh C-2	62.8	Ban Oak W.C.	Check Dams	20	-	-	-	-	CD
10	Solan	R25 SShahogBhadrog	59.2	Ban Oak W.C.	Check Dams	10	-	-	-	-	CD
11	Solan	D80 SSeri	20.8	Ban Oak W.C.	Check Dams	15	-	-	-	-	CD
12	Solan	D81 SCharech C-1	31.6	Ban Oak W.C.	Check Dams	20	-	-	-	-	CD
13	Solan	D81 SCharech C-2	40.8	Ban Oak W.C.	Check Dams	10	-	-	-	-	CD
14	Solan	R27 SNauni C-1	24.4	Ban Oak W.C.	Check Dams	20	-	-	-	-	CD
15	Solan	D132 SCharar C-4	24.4	PCR W.C.	Check	10	-	-	-	-	CD

					Dams						

					Soil Work		Activities(CD-Check Dams) Year Wise				
S.No	Region	Name Of Forests	Area in Hact	Working Circle	Activity	No of CD	I	II	III	IV	V
1	Subathu	D124 SKatiyara C-3	10.4	Chil W.C.	Check Dams	8	-	CD	-	-	-
2	Subathu	D127 SShashal C-1	21.2	Chil W.C.	Check Dams	7	-	CD	-	-	-
3	Subathu	D128 SKalikufar C-2	10.8	Chil W.C.	Check Dams	5	-	CD	-	-	-
4	Subathu	D128 SKalikufar C-4	22.8	Chil W.C.	Check Dams	9	-	CD	-	-	-
5	Subathu	D128 SKalikufar C-5	22	Chil W.C.	Check Dams	9	-	CD	-	-	-
6	Subathu	D134 SKothi C-1	63	Chil W.C.	Check Dams	7	-	CD	-	-	-
7	Subathu	D134 SKothi C-2	24.6	Chil W.C.	Check Dams	7	-	CD	-	-	-
8	Subathu	D124 SKatiyara C-1	14.4	PCR W.C.	Check Dams	8	-	CD	-	-	-
9	Subathu	D124 SKatiyara C-4	17.2	PCR W.C.	Check Dams	8	-	CD	-	-	-
10	Subathu	D129 SRano	18.8	PCR W.C.	Check Dams	5	-	CD	-	-	-

					Soil Work		Activities(CD-Check Dams) Year Wise				
S.No	Region	Name Of Forests	Area in Hact	Working Circle	Activity	No of CD	I	II	III	IV	V

1	Dharampur	D158 SAnji	11.2	Chil W.C.	Check Dams	8	-	CD	-	-	-
2	Dharampur	R31 SBarog C-2 a	45.2	Chil W.C.	Check Dams	20	-	CD	-	-	-
3	Dharampur	R31 SBarog C-2 b	26.8	Chil W.C.	Check Dams	15	-	CD	-	-	-
4	Dharampur	R31 SBarog C-4a	57.2	Chil W.C.	Check Dams	12	-	CD	-	-	-
5	Dharampur	R31 SBarog C-4b	28.8	Chil W.C.	Check Dams	15	-	CD	-	-	-
6	Dharampur	R31 SBarog C-5	62	Chil W.C.	Check Dams	20	-	CD	-	-	-
7	Dharampur	R31 SBarog C-6	51.6	Chil W.C.	Check Dams	18	-	CD	-	-	-
8	Dharampur	R31 SBarog C-8b	68	Chil W.C.	Check Dams	15	-	-	CD	-	-
9	Dharampur	D175 SBohali C-1	22.2	Chil W.C.	Check Dams	12	-	-	CD	-	-
10	Dharampur	D176 SChiroti Ki Dhar-I	38	Chil W.C.	Check Dams	25	-	-	CD	-	-
11	Dharampur	D177 SChiroti Ki Dhar	21.2	Chil W.C.	Check Dams	8	-	-	CD	-	-
12	Dharampur	D178 SChiroti Ki Dhar C-1	42.3	Chil W.C.	Check Dams	10	-	-	CD	-	-
13	Dharampur	D178 SChiroti Ki Dhar C-2	29.1	Chil W.C.	Check Dams	8	-	-	CD	-	-
14	Dharampur	D179 SShirgulKaTiba C-1	16	Chil W.C.	Check Dams	8	-	-	CD	-	-
15	Dharampur	D179 SShirgulKaTiba C-2	13.6	Chil W.C.	Check Dams	10	-	-	CD	-	-
16	Dharampur	R39 SCharoti Ki Dhar	44.4	Chil W.C.	Check Dams	15	CD	-	-	-	-
17	Dharampur	R 40 SBohli C-1	32	Chil W.C.	Check	10	CD	-	-	-	-

					Dams						
18	Dharampur	R40 SBohli C-2a	45.6	Chil W.C.	Check Dams	10	-	CD	-	-	-
19	Dharampur	D145 SChewakheelchunjari	12.4	Chil W.C.	Check Dams	10	-	CD	-	-	-
20	Dharampur	D146 SChewakheelchunjari	47.2	Chil W.C.	Check Dams	20	-	CD	-	-	-
21	Dharampur	D147 Skainthari kana Dhyalag	19.8	Chil W.C.	Check Dams	12	-	CD	-	-	-
22	Dharampur	R38 Skiard C-1	29.6	Chil W.C.	Check Dams	24	-	CD	-	-	-
23	Dharampur	D157 SKadon	13.6	Chil W.C.	Check Dams	15	-	CD	-	-	-
24	Dharampur	D161 SSihardi C-2	32	Chil W.C.	Check Dams	30	-	CD	-	-	-
25	Dharampur	D162 SMaltoo	28.4	Chil W.C.	Check Dams	20	CD	-	-	-	-
26	Dharampur	D165 SMaltoo	41.2	Chil W.C.	Check Dams	15	CD	-	-	-	-
27	Dharampur	D244 SCheola C-3	28.4	Chil W.C.	Check Dams	15	CD	-	-	-	-
28	Dharampur	D244 SCheola C-4	35.2	Chil W.C.	Check Dams	20	CD	-	-	-	-
29	Dharampur	R37 SMaltoo C-2	28.6	Chil W.C.	Check Dams	15	CD	-	-	-	-
30	Dharampur	R33 SGulhari C-1b	41.6	Chil W.C.	Check Dams	10	CD	-	-	-	-
31	Dharampur	D151 SGulhari	42.8	Chil W.C.	Check Dams	20	CD	-	-	-	-
32	Dharampur	D152 SGulhari	8.8	Chil W.C.	Check Dams	15	CD	-	-	-	-
33	Dharampur	D153 SGulhari	5.2	Chil W.C.	Check Dams	15	CD	-	-	-	-

34	Dharampur	D115 SChabalkiDhar	3.2	Chil W.C.	Check Dams	10	CD	-	-	-	-
35	Dharampur	D118 SChabalkiDhar	10.4	Chil W.C.	Check Dams	15	CD	-	-	-	-
36	Dharampur	D119 SChabalkiDhar	26.4	Chil W.C.	Check Dams	25	CD	-	-	-	-
37	Dharampur	R30 SChabal C-1	30.4	Chil W.C.	Check Dams	30	CD	-	-	-	-
38	Dharampur	R30 SChabal C-3	36	Chil W.C.	Check Dams	32	CD	-	-	-	-
39	Dharampur	R30 SChabal C-4	42	Chil W.C.	Check Dams	20	CD	-	-	-	-
40	Dharampur	R30 SChabal C-5b	21.4	Chil W.C.	Check Dams	30	CD	-	-	-	-
41	Dharampur	R41 SGulzar C-1	26.8	Chil W.C.	Check Dams	5	-	CD	-	-	-
42	Dharampur	R42 SAjmerGarh C-2	47.2	Chil W.C.	Check Dams	15	-	CD	-	-	-
43	Dharampur	D180 SShirgulKaTiba C-1	26	Chil W.C.	Check Dams	10	-	CD	-	-	-
44	Dharampur	D180 SShirgulKaTiba C-2	21.2	Chil W.C.	Check Dams	12	-	CD	-	-	-
45	Dharampur	R31 SBarog C-1a	14.8	PCR W.C.	Check Dams	10	-	CD	-	-	-
46	Dharampur	R31 SBarog C-1b	35.6	PCR W.C.	Check Dams	15	-	CD	-	-	-
47	Dharampur	R31 SBarog C-3	42.8	PCR W.C.	Check Dams	12	-	CD	-	-	-
48	Dharampur	R31 SBarog C-7	50	PCR W.C.	Check Dams	15	-	CD	-	-	-
49	Dharampur	R44 SJhanai C-1	76.5	PCR W.C.	Check Dams	20	-	CD	-	-	-
50	Dharampur	R44 SJhanai C-2	63.1	PCR W.C.	Check	10	-	CD	-	-	-

					Dams						
51	Dharampur	R43 SHalda C-3	74	PCR W.C.	Check Dams	8	-	CD	-	-	-
52	Dharampur	D208 SSari	2.4	PCR W.C.	Check Dams	5	-	CD	-	-	-
53	Dharampur	D210 SOdderjhangiriya	97.7	PCR W.C.	Check Dams	15	-	CD	-	-	-
54	Dharampur	D211 SHalda	10	PCR W.C.	Check Dams	7	-	CD	-	-	-
55	Dharampur	D212 SHalda	16	PCR W.C.	Check Dams	8	-	CD	-	-	-
56	Dharampur	D217 SMeunSanog	43.2	PCR W.C.	Check Dams	9	-	CD	-	-	-
57	Dharampur	R40 SBohali C-2b	38	PCR W.C.	Check Dams	15	-	CD	-	-	-
58	Dharampur	D161 SSihardi C-1	10	PCR W.C.	Check Dams	8	-	CD	-	-	-
59	Dharampur	R35 SKadon	40.1	PCR W.C.	Check Dams	10	-	CD	-	-	-
60	Dharampur	R36 SAnji	10.4	PCR W.C.	Check Dams	15	-	CD	-	-	-
61	Dharampur	D244 SCheola C5	26.8	PCR W.C.	Check Dams	8	-	-	CD	-	-
62	Dharampur	D214 STibaGulzar C-1	27.6	PCR W.C.	Check Dams	15	-	-	CD	-	-
63	Dharampur	D214 STibaGulzar C-3	94.8	PCR W.C.	Check Dams	10	-	-	CD	-	-
64	Dharampur	D216 SBanogBhallon	90	PCR W.C.	Check Dams	25	-	-	CD	-	-

					Soil Work		Activities(CD-Check Dams) Year Wise				
S.N o.	Region	Name Of Forests	Area in Hact	Working Circle	Activity	No of CD	I	II	III	IV	V
1	Parwano o	D185 SKurlajohri C-2	86.3	Chil W.C.	Check Dams	6	CD	-	-	-	-
2	Parwano o	D186 SKalth No V C-1	14.4	Chil W.C.	Check Dams	5	CD	-	-	-	-
3	Parwano o	D222 SBanasar Top	72.4	Chil W.C.	Check Dams	8	-	-	-	C D	-
4	Parwano o	D239 SSariDhar C-1a	12	Chil W.C.	Check Dams	7	-	-	-	C D	-
5	Parwano o	D239 SSariDhar C-1b	10.8	Chil W.C.	Check Dams	6	-	-	-	C D	-
6	Parwano o	D245 SSanawar C-1	12.4	Chil W.C.	Check Dams	6	-	-	C D	-	-
7	Parwano o	D245 SSanawar C-2	16.4	Chil W.C.	Check Dams	5	-	-	C D	-	-
8	Parwano o	D190 SJabrog	87.6	PCR W.C.	Check Dams	8	-	-	C D	-	-
9	Parwano o	D230 SJangeshu C-1	39	PCR W.C.	Check Dams	6	-	C D	-	-	-
10	Parwano o	D230 SJangeshu C-2	48.6	PCR W.C.	Check Dams	6	-	C D	-	-	-
11	Parwano o	D234 SRanigaun	72	PCR W.C.	Check Dams	7	-	C D	-	-	-
12	Parwano o	D235 SChamgah	52.8	PCR W.C.	Check Dams	8	-	C D	-	-	-
13	Parwano o	D240 SDochi C-6	28.4	PCR W.C.	Check Dams	6	-	C D	-	-	-
14	Parwano	R56 SParwanoo C-1	33	PCR W.C.	Check	6	-	C	-	-	-

	o				Dams			D			
15	Parwanoo	R56 SParwanoo C-2	91	PCR W.C.	Check Dams	6	-	C D	-	-	-

Table 10.6: Silvicultural works

Sivilcultural Work in Chail Range								
S.N o.	Region	Name Of Forests	Forest Area	Working Circle	Activity	Area In (Ha) in which Activity Has To Be Done	%	Year
1	Chail	D51 SJhajhaKhariun C-1	84	Ban Oak W.C.	Climber Cutting	25	-	2028
2	Chail	D51 SJhajhaKhariun C-3	42.4	Ban Oak W.C.	Climber Cutting	12	-	2030
3	Chail	D52 SBhojdeen C-1	129.2	Ban Oak W.C.	Climber Cutting	35	-	2027
4	Chail	D52 SBhojdeen C-2	90	Ban Oak W.C.	Climber Cutting	25	-	2029
5	Chail	D49 SBanjani C-1	14	Deodar W.C.	Climber Cutting	5	-	2030
6	Chail	D50 SSakori	32.4	Deodar W.C.	Climber Cutting	8	-	2030
7	Chail	R16 SChaklain C-2	50.4	Deodar W.C.	Climber Cutting	15	-	2029

Sivilcultural Work in Kandaghat Range								
S.N o.	Region	Name Of Forests	Forest Area	Working Circle	Activity	Area In (Ha) in which Activity Has To Be Done	%	Year
1	Kandaghat	D57 SKumhala	4.8	Chil W.C.	Climber Cutting	4	-	2027
2	Kandaghat	D63 SKiarighat	23.6	Chil W.C.	Climber Cutting	23	-	2027
3	Kandaghat	D68 SHathon	6	Chil W.C.	Climber	6	-	202

	hat				Cutting			7
4	Kandag hat	D100 SDharot C-1	15.6	Chil W.C.	Climber Cutting	15	-	202 7
5	Kandag hat	D102 SBaranKaCheon C-1	5.6	Chil W.C.	Climber Cutting	5	-	202 7
6	Kandag hat	D102 SBaranKaCheon C-2	7.2	Chil W.C.	Climber Cutting	7	-	202 7
7	Kandag hat	D102 SBaranKaCheon C-3	6	Chil W.C.	Climber Cutting	6	-	202 7
8	Kandag hat	D103 SDharotKaCheon	5.6	Chil W.C.	Climber Cutting	5	-	202 7
9	Kandag hat	R20 SBisha	66	Ban Oak W.C.	Climber Cutting	55	-	202 8
10	Kandag hat	R21SKarol C-1A	34.4	Ban Oak W.C.	Climber Cutting	30	-	202 9
11	Kandag hat	R21SKarol C-1B	42	Ban Oak W.C.	Climber Cutting	42	-	202 9
12	Kandag hat	R21SKarol C-1C	38.8	Ban Oak W.C.	Climber Cutting	35	-	203 0
13	Kandag hat	R21SKarol C-2	58.4	Ban Oak W.C.	Climber Cutting	55	-	203 0
14	Kandag hat	R21SKarol C-3A	39.6	Ban Oak W.C.	Climber Cutting	35	-	203 0
15	Kandag hat	R21SKarol C-3B	32	Ban Oak W.C.	Climber Cutting	30	-	203 1
16	Kandag hat	R21SKarol C-3C	34.4	Ban Oak W.C.	Climber Cutting	32	-	203 1
17	Kandag hat	R22 SKarolNoII	12.4	Ban Oak W.C.	Climber Cutting	10	-	203 1
18	Kandag hat	R23 SKarolNoIII	8	Ban Oak W.C.	Climber Cutting	8	-	203 1
19	Kandag hat	D53 SShungal	11.2	Ban Oak W.C.	Climber Cutting	10	-	203 1

20	Kandag hat	D54 SShadiyal	8.4	Ban Oak W.C.	Climber Cutting	8	-	203 1
21	Kandag hat	D55 SSuro No 1	2	Ban Oak W.C.	Climber Cutting	2	-	203 1
22	Kandag hat	D56 SSuro No 2	2.8	Ban Oak W.C.	Climber Cutting	2	-	203 1
23	Kandag hat	D58 SBasha	11.2	Ban Oak W.C.	Climber Cutting	10	-	203 1
24	Kandag hat	D59 SBagetu	2.4	Ban Oak W.C.	Climber Cutting	0	-	203 1
25	Kandag hat	D60 SBadoonShikar	28.4	Ban Oak W.C.	Climber Cutting	25	-	203 2
26	Kandag hat	D61 SDhanoliDochi	6.4	Ban Oak W.C.	Climber Cutting	5	-	203 2
27	Kandag hat	D62 SBisha C-1	49.1	Ban Oak W.C.	Climber Cutting	35	-	203 2
28	Kandag hat	D62 SBisha C-2	11.8	Ban Oak W.C.	Climber Cutting	10	-	203 2
29	Kandag hat	D62 SBisha C-3	19.1	Ban Oak W.C.	Climber Cutting	15	-	203 2
30	Kandag hat	D64 SBirni	2.4	Ban Oak W.C.	Climber Cutting	2	-	203 2
31	Kandag hat	D65 SBirniKasauli	7.2	Ban Oak W.C.	Climber Cutting	5	-	203 2
32	Kandag hat	D66 SKasauli	5.6	Ban Oak W.C.	Climber Cutting	5	-	203 2
33	Kandag hat	D67 SSainj	12.8	Ban Oak W.C.	Climber Cutting	10	-	203 2
34	Kandag hat	D69 SPalhech I	22.4	Ban Oak W.C.	Climber Cutting	20	-	203 3
35	Kandag hat	D70 SPalhech II	3.2	Ban Oak W.C.	Climber Cutting	3	-	203 3
36	Kandag	D71 SKarol I	5.2	Ban Oak	Climber	5	-	203

	hat			W.C.	Cutting			3
37	Kandag hat	D72 SKarol II	16.4	Ban Oak W.C.	Climber Cutting	15	-	203 3
38	Kandag hat	D73 SKarol III	10.4	Ban Oak W.C.	Climber Cutting	10	-	203 3
39	Kandag hat	D74 SKarol IV	5.6	Ban Oak W.C.	Climber Cutting	5	-	203 3
40	Kandag hat	D75 SKarol V	19.2	Ban Oak W.C.	Climber Cutting	18	-	203 3
41	Kandag hat	D76 SKarol VI	0.8	Ban Oak W.C.	Climber Cutting	0	-	203 3
42	Kandag hat	D77 SKarol VII	1.2	Ban Oak W.C.	Climber Cutting	1	-	203 3
43	Kandag hat	D78 SKarol VIII	4.8	Ban Oak W.C.	Climber Cutting	4	-	203 3
44	Kandag hat	D79 SDed	14.4	Ban Oak W.C.	Climber Cutting	12	-	203 4
45	Kandag hat	D99 SSalumna	23.2	Ban Oak W.C.	Climber Cutting	20	-	203 4
46	Kandag hat	D100 SDharot C-2	18.8	Ban Oak W.C.	Climber Cutting	15	-	203 4
47	Kandag hat	D101 SKuryali	19.6	Ban Oak W.C.	Climber Cutting	15	-	203 4

Sivicultural Work Solan Range								
S.N o.	Region	Name Of Forests	Forest Area	Working Circle	Activity	Area In (Ha) in which Activity Has To Be Done	%	Year
1	Solan	D-108 SShilly C-9	17.6	Ban Oak W.C.	Climber Cutting	10	-	2027
2	Solan	D-108 SShilly C-10	16.4	Ban Oak W.C.	Climber Cutting	10	-	2027
3	Solan	D-108 SShilly C-2	16	Ban Oak W.C.	Climber Cutting	10	-	2027
4	Solan	D-84 SDamkari	39.2	Ban Oak W.C	Climber cutting	10	-	2027
5	Solan	D - 85 SNiun	10.4	Ban Oak W.C	Climber cutting	5	-	2028
6	Solan	D - 86 SDharogNiun	33.6	Ban Oak W.C	Climber cutting	10	-	2028
7	Solan	D -87 SDiargDawan	5.2	Ban Oak W.C	Climber cutting	4	-	2028
8	Solan	D-88 SShahogBadrog	13.2	Ban Oak W.C	Climber cutting	3	-	2028
9	Solan	R-25 SShahogBadrog	43.2	Ban Oak W.C	Climber cutting	10	-	2028
10	Solan	D-104 SKarol C-1	22.4	Ban Oak W.C	Climber cutting	10	-	2029
11	Solan	D-104 SKarol C-2	44.8	Ban Oak W.C	Climber cutting	20	-	2029
12	Solan	R-28 SKhaldhar c2b	12	PCR W.C.	Climber Cutting	5	-	2029
13	Solan	R-28 SKhaldhar c3	34.8	PCR W.C.	Climber Cutting	6	-	2029
14	Solan	R-24 SRajgarh C1	42.8	Ban Oak WC	Climber Cutting	20	-	2029
15	Solan	D-83 SRajgarh C1	70.4	Ban Oak	Climber	20	-	203

				WC	Cutting			0
16	Solan	D-132 SCharar C-6	33.6	Chil WC	Climber cutting	5	-	2030
17	Solan	D-125 SSheelKaDhalla C-1	12.4	Chil WC	Climber Cutting	5	-	2030
18	Solan	R-27 SNauni C-2	55.6	Ban Oak	Climber cutting	15	-	2030
19	Solan	R 25 SSaogBadrog c2	59.2	Ban oak	Climber cutting	20	-	2031
20	Solan	D82 SJawaRajgarh	43.6	Ban oak	Climber cutting	20	-	2031
21	Solan	D105 SMathia C-2	48	Ban oak	Climber cutting	25	-	2031
22	Solan	D80 SSeri	20.8	Ban Oak W.C.	Climber cutting	5	-	2032
23	Solan	D81 SCharech C-1	31.6	Ban Oak W.C.	Climber cutting	10	-	2032
24	Solan	D81 SCharech C-2	40.8	Ban Oak W.C.	Climber cutting	10	-	2032
25	Solan	D80 SSeri	20.8	Ban Oak W.C.	Lantana Eradication	3	50 %	2032

Sivilcultural Work Subathu Range								
S.N o.	Region	Name Of Forests	Forest Area	Working Circle	Activity	Area In (Ha) in which Activity Has To Be Done	%	Year
1	Subathu	D127 SShashal C-4a	12.4	Chil W.C.	Lantana Eradication	5	50 %	2027
2	Subathu	D134 SKothi C-1	63	Chil W.C.	Lantana Eradication	20	75 %	2027
3	Subathu	D134 SKothi C-2	24.6	Chil W.C.	Lantana Eradication	20	75 %	2028

4	Subat hu	D124 SKatiyara C-1	14.4	PCR W.C.	Lantana Eradication	15	75 %	202 9
5	Subat hu	D124 SKatiyara C-2	21.6	PCR W.C.	Lantana Eradication	18	75 %	203 0
6	Subat hu	D112 SAlobra	54.4	PCR W.C.	Lantana Eradication	50	75 %	203 1
7	Subat hu	D110 SRaikot	34.8	PCR W.C.	Lantana Eradication	25	75 %	203 1

Sivilcultural Work Dharampur Range

S.No .	Region	Name Of Forests	Forest Area	Working Circle	Activity	Area In (Ha) in which Activity Has To Be Done	%	Year
1	Dharampu r	R31 SBarog C-2 a	45.2	Chil W.C.	Climber Cutting	-	-	2028
2	Dharampu r	R31 SBarog C-2 b	26.8	Chil W.C.	Climber Cutting	-	-	2028
3	Dharampu r	D170 SBhog Seri- I	12.4	Chil W.C.	Lantana Eradication	2	25%	2027
4	Dharampu r	D172 SBhog Seri- III	4.4	Chil W.C.	Lantana Eradication	1	25%	2027
5	Dharampu r	D175 SBohali C-1	22.2	Chil W.C.	Climber Cutting	2	-	2027
6	Dharampu r	D178 SChiroti Ki Dhar C-1	42.3	Chil W.C.	Lantana Eradication	6	25%	2027
7	Dharampu r	D178 SChiroti Ki Dhar C-2	29.1	Chil W.C.	Climber Cutting	4	-	2027
8	Dharampu r	D151 SGulhari	42.8	Chil W.C.	Lantana Eradication	6	25%	2027
9	Dharampu r	R30 SChabal C4	42	Chil W.C.	Lantana Eradication	10	50%	2028
10	Dharampu r	R30 SChabal C5a	38.6	Chil W.C.	Lantana Eradication	15	25%	2028

11	Dharampur	R30 SChabal C5b	21.4	Chil W.C.	Lantana Eradication	5	25%	2029
12	Dharampur	R30 SChabal C6	27.2	Chil W.C.	Lantana Eradication	3	50%	2029
13	Dharampur	D202 SKalth – II.C2	16.4	Chil W.C.	Lantana Eradication	3	50%	2029
14	Dharampur	R42 SAjmerGarh C-2	47.2	Chil W.C.	Lantana Eradication	18	-	2029
15	Dharampur	R31 SBarog C-1a	14.8	PCR W.C.	Climber Cutting	-	-	2030
16	Dharampur	R31 SBarog C-1b	35.6	PCR W.C.	Climber Cutting	-	-	2030
17	Dharampur	R43 SHalda C1	58	PCR W.C.	Lantana Eradication	-	75%	2033
18	Dharampur	R43 SHalda C2	48	PCR W.C.	Lantana Eradication	-	75%	2033
19	Dharampur	D210 SOdderjhangiriya	97.7	PCR W.C.	Lantana Eradication	-	75%	2033
20	Dharampur	D212 SHalda	16	PCR W.C.	Lantana Eradication	-	50%	2034
21	Dharampur	D217 SMeunSanog	43.2	PCR W.C.	Lantana Eradication	-	50%	2034
22	Dharampur	D244 SCheola C5	26.8	PCR W.C.	Lantana Eradication	10	50%	2030
23	Dharampur	R48 SKalth.C-3	16	PCR W.C.	Lantana Eradication	10	50%	2030
24	Dharampur	D203 SQuila Ajmergarh.C2	43.6	PCR W.C.	Lantana Eradication	10	50%	2030
25	Dharampur	D213 SKabaBhalon	107.6	PCR W.C.	Lantana Eradication	32	50%	2031
26	Dharampur	D215 SKaba	43.2	PCR W.C.	Lantana Eradication	30	75%	2031
27	Dharampur	D204 STikari	22.4	PCR W.C.	Lantana	15	50%	2031

	r				Eradication			
28	Dharampur	D204 STikari		PCR W.C.	Climber Cutting	20	-	2032
29	Dharampur	R41 SGulzar C-2	102.4	PCR W.C.	Lantana Eradication	20	75%	2032

Sivilcultural Work Parwanoo Range								
S.No	Region	Name Of Forests	Forest Area	Working Circle	Activity	Area In (Ha) in which Activity Has To Be Done	%	Year
1	Parwanoo	D189 SJagatgarh C-2	19	PCR W.C.	Climber Cutting	5	-	2027
2	Parwanoo	D190 SJabrog	87.6	PCR W.C.	Climber Cutting	8	-	2027
3	Parwanoo	D192 SNabhonPratha	149.6	PCR W.C.	Climber Cutting	10	-	2027
4	Parwanoo	D199 SChawalAshnala C-1	37.3	PCR W.C.	Climber Cutting	10	-	2027
5	Parwanoo	D199 SChawalAshnala C-2	29.1	PCR W.C.	Climber Cutting	10	-	2027
6	Parwanoo	D229 STiron C-1	16.2	PCR W.C.	Climber Cutting	5	-	2028
7	Parwanoo	D229 STiron C-2	16.6	PCR W.C.	Climber Cutting	5	-	2028
8	Parwanoo	D230 SJangeshu C-1	39	PCR W.C.	Climber Cutting	10	-	2028
9	Parwanoo	D230 SJangeshu C-2	48.6	PCR W.C.	Climber Cutting	15	-	2028
10	Parwanoo	D230 SJangeshu C-3	69.6	PCR W.C.	Climber Cutting	10	-	2028
11	Parwanoo	D234 SRanigaun	72	PCR W.C.	Climber Cutting	10	-	2029

12	Parwanoo	D235 SChangah	52.8	PCR W.C.	Climber Cutting	15	-	2029
13	Parwanoo	D240 SDochi C6	28.4	PCR W.C.	Climber Cutting	10	-	2029
14	Parwanoo	R56 SParwanoo C-1	33	PCR W.C.	Climber Cutting	10	-	2030
15	Parwanoo	R56 SParwanoo C-2	91	PCR W.C.	Climber Cutting	20	-	2030

Table 10.7: Staggered Trenches

Sr.No.	Region	Name Of Forests	Area in Hact	Working Circle	Soil Work		Activities(ST- Staggered Trenches) Year Wise				
					Activity	No. of ST	I	II	III	IV	V
1	Chail	D39 SDhamdhar C-1	30.4	Chil W.C.	Staggered Trenches	400	-	ST	-	-	-
2	Chail	D39 SDhamdhar C-2	30	Chil W.C.	Staggered Trenches	350	-	ST	-	-	-
3	Chail	D47 SBirniShillai C-2	93.6	Chil W.C.	Staggered Trenches	550	-	ST	-	-	-
4	Chail	D48 SBirniShillai C-1	36	Chil W.C.	Staggered Trenches	340	-	ST	-	-	-
5	Chail	D42 SChabri C-1	47.6	Chil W.C.	Staggered Trenches	470	ST	-	-	-	-
6	Chail	D42 SChabri C-2	40	Chil W.C.	Staggered Trenches	490	ST	-	-	-	-
7	Chail	D43 SPowash	28.4	Chil W.C.	Staggered Trenches	320	ST	-	-	-	-
8	Chail	D44 SCheunth C-1	40.4	Chil W.C.	Staggered Trenches	440	ST	-	-	-	-
9	Chail	D44 SCheunth C-2	40	Chil W.C.	Staggered Trenches	460	ST	-	-	-	-
10	Chail	D45 STibbaKathet C-1a	12	Chil W.C.	Staggered Trenches	300	ST	-	-	-	-
11	Chail	D45 STibbaKathet C-1b	24	Chil W.C.	Staggered Trenches	390	ST	-	-	-	-
12	Chail	D47 SBirniShillai C-1	58.8	Chil W.C.	Staggered Trenches	460	ST	-	-	-	-
13	Chail	D48 SBirniShillai C-2	25.6	Chil W.C.	Staggered Trenches	400	ST	-	-	-	-
14	Chail	D48 SBirniShillai C-3	12.4	Chil W.C.	Staggered Trenches	280	-	ST	-	-	-

15	Chail	D52 SBhojdeen C-3a	18.4	Chil W.C.	Staggered Trenches	270	-	ST	-	-	-
16	Chail	D52 SBhojdeen C-3b	58.4	Chil W.C.	Staggered Trenches	500	-	ST	-	-	-
17	Chail	D51 SJhajhaKhariun C-1	84	Ban Oak W.C.	Staggered Trenches	600	-	ST	-	-	-
18	Chail	D51 SJhajhaKhariun C-3	42.4	Ban Oak W.C.	Staggered Trenches	360	-	ST	-	-	-
19	Chail	D52 SBhojdeen C-1	129.2	Ban Oak W.C.	Staggered Trenches	800	-	ST	-	-	-
20	Chail	D52 SBhojdeen C-2	90	Ban Oak W.C.	Staggered Trenches	600	-	ST	-	-	-
21	Chail	D49 Banjani C-1	14	Deodar W.C.	Staggered Trenches	300	ST	-	-	-	-
22	Chail	D49 Banjani C-2	22	Chil W.C.	Staggered Trenches	450	ST	-	-	-	-
23	Chail	D49 Banjani C-3	16	Chil W.C.	Staggered Trenches	280	ST	-	-	-	-
24	Chail	D50 Sakori	32.4	Deodar W.C.	Staggered Trenches	470	ST	-	-	-	-
25	Chail	D45 STibbaKathet C-2a	16	Chil W.C.	Staggered Trenches	290	ST	-	-	-	-
26	Chail	D45 STibbaKathet C-2b	22.4	Chil W.C.	Staggered Trenches	320	ST	-	-	-	-
27	Chail	D46 Chaklain C-1	6	Chil W.C.	Staggered Trenches	250	ST	-	-	-	-
28	Chail	D46 Chaklain C-2	34.8	Chil W.C.	Staggered Trenches	390	ST	-	-	-	-
29	Chail	D46 Chaklain C-3	8.8	Deodar W.C.	Staggered Trenches	260	ST	-	-	-	-
30	Chail	R16 Chaklain C-1	28.4	Chil W.C.	Staggered	340	ST	-	-	-	-

					Trenches						
31	Chail	R16 Chaklain C-2	50.4	Deodar W.C.	Staggered Trenches	450	ST	-	-	-	-

					Soil Work		Activities(ST- Staggered Trenches) Year Wise				
S. No.	Region	Name Of Forests	Area in Hact	Working Circle	Activity	No. of ST	I	II	III	IV	V
1	Kandag hat	R21SKarol C-1A	34.4	Ban Oak W.C.	Staggered Trenches	1000	ST	-	-	-	-
2	Kandag hat	R21SKarol C-1B	42	Ban Oak W.C.	Staggered Trenches	2000	ST	-	-	-	-
3	Kandag hat	R21SKarol C-1C	38.8	Ban Oak W.C.	Staggered Trenches	2000	ST	-	-	-	-
4	Kandag hat	R21SKarol C-2	58.4	Ban Oak W.C.	Staggered Trenches	3000	ST	-	-	-	-
5	Kandag hat	R21SKarol C-3A	39.6	Ban Oak W.C.	Staggered Trenches	2000	ST	-	-	-	-
6	Kandag hat	R21SKarol C-3B	32	Ban Oak W.C.	Staggered Trenches	1000	ST	-	-	-	-
7	Kandag hat	R21SKarol C-3C	34.4	Ban Oak W.C.	Staggered Trenches	1000	ST	-	-	-	-
8	Kandag hat	R22 SKarolNoII	12.4	Ban Oak W.C.	Staggered Trenches	300	ST	-	-	-	-
9	Kandag hat	R23 SKarolNoIII	8	Ban Oak W.C.	Staggered Trenches	200	ST	-	-	-	-
10	Kandag hat	D53 SShungal	11.2	Ban Oak W.C.	Staggered Trenches	200	ST	-	-	-	-
11	Kandag hat	D54 SShadiyal	8.4	Ban Oak W.C.	Staggered Trenches	200	ST	-	-	-	-
12	Kandag hat	D55 SSuro No 1	2	Ban Oak W.C.	Staggered Trenches	100	ST	-	-	-	-

13	Kandag hat	D56 SSuro No 2	2.8	Ban Oak W.C.	Staggered Trenches	100	ST	-	-	-	-
14	Kandag hat	D58 SBasha	11.2	Ban Oak W.C.	Staggered Trenches	300	ST	-	-	-	-
15	Kandag hat	D59 SBagetu	2.4	Ban Oak W.C.	Staggered Trenches	100	ST	-	-	-	-
16	Kandag hat	D61 SDhanoliDochi	6.4	Ban Oak W.C.	Staggered Trenches	200	ST	-	-	-	-
17	Kandag hat	D62 SBisha C-1	49.1	Ban Oak W.C.	Staggered Trenches	2000	ST	-	-	-	-
18	Kandag hat	D69 SPalhech I	22.4	Ban Oak W.C.	Staggered Trenches	1000	-	ST	-	-	-
19	Kandag hat	D70 SPalhech II	3.2	Ban Oak W.C.	Staggered Trenches	200	-	ST	-	-	-
20	Kandag hat	D71 SKarol I	5.2	Ban Oak W.C.	Staggered Trenches	300	-	ST	-	-	-
21	Kandag hat	D72 SKarol II	16.4	Ban Oak W.C.	Staggered Trenches	600	-	ST	-	-	-
22	Kandag hat	D73 SKarol III	10.4	Ban Oak W.C.	Staggered Trenches	400	-	ST	-	-	-
23	Kandag hat	D74 SKarol IV	5.6	Ban Oak W.C.	Staggered Trenches	200	-	ST	-	-	-
24	Kandag hat	D75 SKarol V	19.2	Ban Oak W.C.	Staggered Trenches	1000	-	ST	-	-	-
25	Kandag hat	D77 SKarol VII	1.2	Ban Oak W.C.	Staggered Trenches	200	-	ST	-	-	-
26	Kandag hat	D78 SKarol VIII	4.8	Ban Oak W.C.	Staggered Trenches	200	-	ST	-	-	-
27	Kandag hat	D79 SDed	14.4	Ban Oak W.C.	Staggered Trenches	800	-	ST	-	-	-
28	Kandag hat	D99 SSalumna	23.2	Ban Oak W.C.	Staggered Trenches	1000	-	ST	-	-	-
29	Kandag	D100 SDharot C-2	18.8	Ban Oak	Staggered	500	-	ST	-	-	-

	hat			W.C.	Trenches						
30	Kandaghat	D101 SKuryali	19.6	Ban Oak W.C.	Staggered Trenches	500	-	ST	-	-	-
31	Kandaghat	D57 SKumhala	4.8	Chil W.C.	Staggered Trenches	200	-	ST	-	-	-
32	Kandaghat	D63 SKiarighat	23.6	Chil W.C.	Staggered Trenches	500	-	ST	-	-	-
33	Kandaghat	D68 SHathon	6	Chil W.C.	Staggered Trenches	300	-	ST	-	-	-
34	Kandaghat	D100 SDharot C-1	15.6	Chil W.C.	Staggered Trenches	400	-	ST	-	-	-
35	Kandaghat	D102 SBaranKaCheon C-1	5.6	Chil W.C.	Staggered Trenches	200	-	ST	-	-	-
36	Kandaghat	D102 SBaranKaCheon C-2	7.2	Chil W.C.	Staggered Trenches	200	-	ST	-	-	-
37	Kandaghat	D102 SBaranKaCheon C-3	6	Chil W.C.	Staggered Trenches	200	-	ST	-	-	-
38	Kandaghat	R20 SBisha	66	Ban Oak W.C.	Staggered Trenches	1500	-	ST	-	-	-
39	Kandaghat	D62 SBisha C-2	11.8	Ban Oak W.C.	Staggered Trenches	500	-	ST	-	-	-
40	Kandaghat	D62 SBisha C-3	19.1	Ban Oak W.C.	Staggered Trenches	800	-	ST	-	-	-

					Soil Work		Activities(ST- Staggered Trenches) Year Wise				
S. No.	Region	Name Of Forests	Area in Hact	Working Circle	Activity	No. of ST	I	II	III	IV	V
1	Solan	D125	12.4	Chil W.C.	Staggered	900	-	ST	-	-	-

		SSheelkaDhalla C-1			Trenches	Rmt					
2	Solan	D91 SBhawankiDhar	11.6	Chil W.C.	Staggered Trenches	1000 Rmt	-	ST	-	-	-
3	Solan	D93 SNandalNagali	12.4	Chil W.C.	Staggered Trenches	1000 Rmt	-	ST	-	-	-
4	Solan	D94 SNandalDamog	8.4	Chil W.C.	Staggered Trenches	1000 Rmt	-	ST	-	-	-
5	Solan	D96 SNagali-II	4	Chil W.C.	Staggered Trenches	1000 Rmt	-	ST	-	-	-
6	Solan	D97 SKiarTatool	4.4	Chil W.C.	Staggered Trenches	1000 Rmt	-	ST	-	-	-
7	Solan	R26 SNagali	33.6	Chil W.C.	Staggered Trenches	2000 Rmt	-	ST	-	-	-
8	Solan	D104 SKarol C-1	22.4	Ban Oak W.C.	Staggered Trenches	900 Rmt	-	ST	-	-	-
9	Solan	R27 SNauni C-2	55.6	Ban Oak W.C.	Staggered Trenches	900 Rmt	-	ST	-	-	-
10	Solan	R28 SKhaldhar C-3	34.8	PCR W.C.	Staggered Trenches	1000 Rmt	-	ST	-	-	-
11	Solan	R28 SKhaldhar C- 2b	12	PCR W.C.	Staggered Trenches	500 Rmt	-	ST	-	-	-
12	Solan	D136 SKhaldhar	16	PCR W.C.	Staggered Trenches	200 Rmt	-	ST	-	-	-
13	Solan	D132 SCharar C-2	17.6	PCR W.C.	Staggered Trenches	900 Rmt	-	ST	-	-	-
14	Solan	D132 SCharar C-5	18	PCR W.C.	Staggered Trenches	900 Rmt	-	ST	-	-	-

					Soil Work		Activities(ST- Staggered Trenches) Year Wise				
S.N o.	Regio n	Name Of Forests	Area in Hact	Working Circle	Activity	No. of ST	I	II	III	IV	V

1	Subat hu	D128 SKalikufar C-4	22.8	Chil W.C.	Staggered Trenches	9	-	ST	-	-	-

S.N o.	Region	Name Of Forests	Area in Hact	Working Circle	Soil Work		Activities(ST- Staggered Trenches) Year Wise				
					Activity	No. of ST	I	II	III	IV	V
1	Dharam pur	R31 SBarog C-2 a	45.2	Chil W.C.	Staggered Trenches	1100	-	-	ST	-	-
2	Dharam pur	R31 SBarog C-2 b	26.8	Chil W.C.	Staggered Trenches	1500	-	-	ST	-	-
3	Dharam pur	R31 SBarog C-4a	57.2	Chil W.C.	Staggered Trenches	1200	-	-	ST	-	-
4	Dharam pur	R31 SBarog C-5	62	Chil W.C.	Staggered Trenches	1400	-	-	ST	-	-
5	Dharam pur	R31 SBarog C-6	51.6	Chil W.C.	Staggered Trenches	1200	-	-	ST	-	-
6	Dharam pur	R31 SBarog C-8b	68	Chil W.C.	Staggered Trenches	1300	-	-	ST	-	-
7	Dharam pur	D175 SBohali C-1	22.2	Chil W.C.	Staggered Trenches	500 rmt	-	-	ST	-	-
8	Dharam pur	D176 SChiroti Ki Dhar-I	38	Chil W.C.	Staggered Trenches	1000rmt	-	ST	-	-	-
9	Dharam pur	D177 SChiroti Ki Dhar	21.2	Chil W.C.	Staggered Trenches	800 rmt	-	ST	-	-	-
10	Dharam pur	D178 SChiroti Ki Dhar C-1	42.3	Chil W.C.	Staggered Trenches	1000 rmt	-	ST	-	-	-
11	Dharam pur	D178 SChiroti Ki Dhar C-2	29.1	Chil W.C.	Staggered Trenches	800 rmt	-	ST	-	-	-
12	Dharam	D179	16	Chil W.C.	Staggered	600 rmt	-	ST	-	-	-

	pur	SShirculKaTiba C-1			Trenches						
13	Dharam pur	R39 SCharoti Ki Dhar	44.4	Chil W.C.	Staggered Trenches	1500rmt	-	ST	-	-	-
14	Dharam pur	R 40 SBohli C-1	32	Chil W.C.	Staggered Trenches	600 rmt	-	ST	-	-	-
15	Dharam pur	R40 SBohli C-2a	45.6	Chil W.C.	Staggered Trenches	2000 rmt	-	ST	-	-	-
16	Dharam pur	D145 SChewakheelchunjari	12.4	Chil W.C.	Staggered Trenches	500 rmt	-	ST	-	-	-
17	Dharam pur	D146 SChewakheelchunjari	47.2	Chil W.C.	Staggered Trenches	750 rmt	-	ST	-	-	-
18	Dharam pur	D147 Skainthari kana Dhyalag	19.8	Chil W.C.	Staggered Trenches	200 rmt	-	ST	-	-	-
19	Dharam pur	R38 Skiard C-1	29.6	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
20	Dharam pur	D161 SSihardi C-2	32	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
21	Dharam pur	D244 SCheola C-3	28.4	Chil W.C.	Staggered Trenches	500 rmt	-	ST	-	-	-
22	Dharam pur	D244 SCheola C-4	35.2	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
23	Dharam pur	R37 SMaltoo C-2	28.6	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
24	Dharam pur	R33 SGulhari C-1b	41.6	Chil W.C.	Staggered Trenches	1000 rmt	-	ST	-	-	-
25	Dharam pur	D151 SGulhari	42.8	Chil W.C.	Staggered Trenches	900 rmt	-	ST	-	-	-
26	Dharam pur	D152 SGulhari	8.8	Chil W.C.	Staggered Trenches	400 rmt	-	ST	-	-	-
27	Dharam pur	D153 SGulhari	5.2	Chil W.C.	Staggered Trenches	500 rmt	-	ST	-	-	-
28	Dharam pur	D115 SChabalkiDhar	3.2	Chil W.C.	Staggered Trenches	300 rmt	-	ST	-	-	-

29	Dharam pur	D118 SChabalkiDhar	10.4	Chil W.C.	Staggered Trenches	400 rmt	-	ST	-	-	-
30	Dharam pur	D119 SChabalkiDhar	26.4	Chil W.C.	Staggered Trenches	900 rmt	-	ST	-	-	-
31	Dharam pur	R30 SChabal C-1	30.4	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
32	Dharam pur	R30 SChabal C-3	36	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
33	Dharam pur	R30 SChabal C-4	42	Chil W.C.	Staggered Trenches	800 rmt	-	ST	-	-	-
34	Dharam pur	R30 SChabal C-5b	21.4	Chil W.C.	Staggered Trenches	550 rmt	-	ST	-	-	-
35	Dharam pur	D180 SShirgulKaTiba C-1	26	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
36	Dharam pur	R31 SBarog C-3	42.8	PCR W.C.	Staggered Trenches	1500 rmt	ST	-	-	-	-
37	Dharam pur	R31 SBarog C-7	50	PCR W.C.	Staggered Trenches	1500 rmt	ST	-	-	-	-
38	Dharam pur	R44 SJhanai C-1	76.5	PCR W.C.	Staggered Trenches	1100rmt	ST	-	-	-	-
39	Dharam pur	R44 SJhanai C-2	63.1	PCR W.C.	Staggered Trenches	600 rmt	ST	-	-	-	-
40	Dharam pur	R43 SHalda C-3	74	PCR W.C.	Staggered Trenches	700 rmt	ST	-	-	-	-
41	Dharam pur	D208 SSari	2.4	PCR W.C.	Staggered Trenches	500 rmt	ST	-	-	-	-
42	Dharam pur	D210 SOdderjhangiriya	97.7	PCR W.C.	Staggered Trenches	800 rmt	-	ST	-	-	-
43	Dharam pur	D211 SHalda	10	PCR W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
44	Dharam pur	D212 SHalda	16	PCR W.C.	Staggered Trenches	500 rmt	-	ST	-	-	-
45	Dharam	D217 SMeunSanog	43.2	PCR W.C.	Staggered	400 rmt	-	ST	-	-	-

	pur				Trenches						
46	Dharam pur	R40 SBohali C-2b	38	PCR W.C.	Staggered Trenches	2000rmt	-	ST	-	-	-
47	Dharam pur	D161 SSihardi C-1	10	PCR W.C.	Staggered Trenches	100 rmt	-	ST	-	-	-
48	Dharam pur	R35 SKadon	40.1	PCR W.C.	Staggered Trenches	800 rmt	-	ST	-	-	-
49	Dharam pur	R36 SAnji	10.4	PCR W.C.	Staggered Trenches	400 rmt	-	ST	-	-	-
50	Dharam pur	D244 SCheola C5	26.8	PCR W.C.	Staggered Trenches	No Data Found	-	ST	-	-	-
51	Dharam pur	R31 SBarog C-8a	24	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
52	Dharam pur	D181 SShirgulikatibba	25.12	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
53	Dharam pur	D168 SKiarad	9.2	Chil W.C.	Staggered Trenches	500 rmt	ST	-	-	-	-
54	Dharam pur	D169 SKiarad C-1	27.6	Chil W.C.	Staggered Trenches	750 rmt	ST	-	-	-	-
55	Dharam pur	R32 Schunjari	67.6	Chil W.C.	Staggered Trenches	1100 rmt	ST	-	-	-	-
56	Dharam pur	D155 SBhallon	3.2	Chil W.C.	Staggered Trenches	150 rmt	ST	-	-	-	-
57	Dharam pur	D163 SMaltoo	11.2	Chil W.C.	Staggered Trenches	400 rmt	ST	-	-	-	-
58	Dharam pur	D244 SCheola C-1	24	Chil W.C.	Staggered Trenches	550 rmt	ST	-	-	-	-
59	Dharam pur	D244 SCheola C-2	22.4	Chil W.C.	Staggered Trenches	550 rmt	ST	-	-	-	-
60	Dharam pur	R37 SMaltoo C-1	21	Chil W.C.	Staggered Trenches	550 rmt	-	ST	-	-	-
61	Dharam pur	R33 SGulhari C-2	34	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-

62	Dharam pur	D116 SChabalkiDhar	4.8	Chil W.C.	Staggered Trenches	350 rmt	-	ST	-	-	-
63	Dharam pur	R30 SChabal C-2a	36.4	Chil W.C.	Staggered Trenches	800 rmt	-	ST	-	-	-
64	Dharam pur	R30 SChabal C-2b	33.2	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
65	Dharam pur	R30 SChabal C5a	38.6	Chil W.C.	Staggered Trenches	800 rmt	-	ST	-	-	-
66	Dharam pur	R30 SChabal C6	27.2	Chil W.C.	Staggered Trenches	1000 rmt	-	ST	-	-	-
67	Dharam pur	D167 SGadiar.	23.2	Chil W.C.	Staggered Trenches	900 rmt	-	-	-	ST	-
68	Dharam pur	R48 SKalth.C-4	32	Chil W.C.	Staggered Trenches	400 rmt	-	-	-	ST	-
69	Dharam pur	D182 SKalth - III.	25.6	Chil W.C.	Staggered Trenches	500 rmt	-	-	-	ST	-
70	Dharam pur	D183 SKalth - IV.	36	Chil W.C.	Staggered Trenches	300 rmt	-	-	-	ST	-
71	Dharam pur	R48 SKalth.C-5	52.8	Chil W.C.	Staggered Trenches	400 rmt	-	-	-	ST	-
72	Dharam pur	R49 SGadiar.	31.2	Chil W.C.	Staggered Trenches	900 rmt	-	-	-	ST	-
73	Dharam pur	D202 SKalth _ II.C-2	16.4	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
74	Dharam pur	D203 SQuila Ajmergarh.C-1	40	Chil W.C.	Staggered Trenches	1100 rmt	-	ST	-	-	-
75	Dharam pur	D175 SBohali C-2	11	PCR W.C.	Staggered Trenches	200rmt	-	ST	-	-	-
76	Dharam pur	D169 SKiarad C-2	12	PCR W.C.	Staggered Trenches	400 rmt	-	ST	-	-	-
77	Dharam pur	D139 SBanjni	4	PCR W.C.	Staggered Trenches	100 rmt	-	ST	-	-	-
78	Dharam	R48 SKalth.C-3	16	PCR W.C.	Staggered	600rmt	-	ST	-	-	-

	pur				Trenches						
79	Dharam pur	D203 SQuila Ajmergarh.C-2	43.6	PCR W.C.	Staggered Trenches	400 rmt	-	ST	-	-	-
80	Dharam pur	D202 SKalth _ II.C-1	12	PCR W.C.	Staggered Trenches	500rmt	-	ST	-	-	-
81	Dharam pur	R48 SKalth.C-1	52.8	PCR W.C.	Staggered Trenches	300rmt	-	ST	-	-	-
82	Dharam pur	D204 STikari		PCR W.C.	Staggered Trenches	600 rmt	-	ST	-	-	-

					Soil Work		Activities(ST- Staggered Trenches) Year Wise				
S.N o.	Region	Name Of Forests	Area in Hact	Working Circle	Activity	No. of ST	I	II	III	IV	V
1	Parwan oo	D185 SKurlajohri C-2	86.3	Chil W.C.	Staggered Trenches	135	-	ST	-	-	-
2	Parwan oo	D186 SKalth No V C-1	14.4	Chil W.C.	Staggered Trenches	135	-	ST	-	-	-
3	Parwan oo	D222 SBanasar Top	72.4	Chil W.C.	Staggered Trenches	125	-	ST	-	-	-
4	Parwan oo	D239 SSariDhar C-1a	12	Chil W.C.	Staggered Trenches	125	-	ST	-	-	-
5	Parwan oo	D239 SSariDhar C-1b	10.8	Chil W.C.	Staggered Trenches	125	-	ST	-	-	-
6	Parwan oo	D245 SSanawar C-1	12.4	Chil W.C.	Staggered Trenches	125	-	ST	-	-	-
7	Parwan oo	D245 SSanawar C-2	16.4	Chil W.C.	Staggered Trenches	145	-	-	ST	-	-
8	Parwan oo	D188 SKaralghat C-1	48.4	Chil W.C.	Staggered Trenches	125	-	-	ST	-	-
9	Parwan	D188	54.4	Chil W.C.	Staggered	125	-	-	ST	-	-

	oo	SKaralghatC-2			Trenches						
10	Parwan oo	D239 SSariDhar C-2	22.4	Chil W.C.	Staggered Trenches	125	-	-	ST	-	-
11	Parwan oo	D240 SDochi C-1	25.2	Chil W.C.	Staggered Trenches	115	-	-	-	ST	-
12	Parwan oo	D242 SGahidhar C-2	20.8	Chil W.C.	Staggered Trenches	225	-	-	-	ST	-
13	Parwan oo	D245 SSanawar C-3	16.8	Chil W.C.	Staggered Trenches	225	-	-	-	ST	-
14	Parwan oo	R47 SKaralghat C-2	36	Chil W.C.	Staggered Trenches	225	-	-	-	ST	-
15	Parwan oo	R57 SBanasar C- 1a	48	Chil W.C.	Staggered Trenches	225	-	-	-	ST	-
16	Parwan oo	R57 SBanasar C- 1b	43.2	Chil W.C.	Staggered Trenches	225	-	-	-	ST	-

Table 10.8: Water holding structures

S.No.	Region	Name Of Forests	Area in Hact	Working Circle	Soil Work		Activities(WHS) Year Wise				
					Activity	No. of WHS	I	II	III	IV	V
1	Kandaghat	R21SKarol C-1A	34.4	Ban Oak W.C.	WHS	1	-		WHS		
2	Kandaghat	R21SKarol C-1B	42	Ban Oak W.C.	WHS	1	-	WHS	-	-	-
3	Kandaghat	R21SKarol C-1C	38.8	Ban Oak W.C.	WHS	1	-	WHS	-	-	-
4	Kandaghat	R21SKarol C-2	58.4	Ban Oak W.C.	WHS	1	-	-	-	WHS	-
5	Kandaghat	R21SKarol C-3A	39.6	Ban Oak W.C.	WHS	1	-	-	-	WHS	-
6	Kandaghat	R21SKarol C-3B	32	Ban Oak W.C.	WHS	1	-	-	WHS	-	-
7	Kandaghat	R21SKarol C-3C	34.4	Ban Oak W.C.	WHS	1	-	-	WHS	-	-
8	Kandaghat	R22 SKarolNoII	12.4	Ban Oak W.C.	WHS	1	-	-	WHS	-	-
9	Kandaghat	R23 SKarolNoIII	8	Ban Oak W.C.	WHS	1	-	-	WHS	-	-
10	Kandaghat	D53 SShungal	11.2	Ban Oak W.C.	WHS	1	-	-	-	WHS	-
11	Kandaghat	D54 SShadiyal	8.4	Ban Oak W.C.	WHS	1	-	-	-	WHS	-

12	Kandaghat	D55 SSuro No 1	2	Ban Oak W.C.	WHS	1	-	-	-	WHS	-
13	Kandaghat	D56 SSuro No 2	2.8	Ban Oak W.C.	WHS	1	-	-	-	WHS	-
14	Kandaghat	D62 SBisha C-1	49.1	Ban Oak W.C.	WHS	1	-	-	-	WHS	-
15	Kandaghat	D71 SKarol I	5.2	Ban Oak W.C.	WHS		-	-	-	-	WHS
16	Kandaghat	D72 SKarol II	16.4	Ban Oak W.C.	WHS	1	-	-	-	-	WHS
17	Kandaghat	D77 SKarol VII	1.2	Ban Oak W.C.	WHS	1	-	-	-	-	WHS
18	Kandaghat	D99 SSalumna	23.2	Ban Oak W.C.	WHS	1	-	-	-	-	WHS
19	Kandaghat	D57 SKumhala	4.8	Chil W.C.	WHS	1	-	-	-	-	WHS
20	Kandaghat	D68 SHathon	6	Chil W.C.	WHS	1	-	-	-	-	WHS

S.No .	Region	Name Of Forests	Area in Hact	Working Circle	Soil Work		Activities(WHS) Year Wise				
					Activity	No. of WHS	I	I I	II I	IV	V
1	Solan	D132 SCharar C-6	33.6	Chil W.C.	WHS	1	-	-	-	WHS	-
2	Solan	D132 SCharar C-8	13.2	Chil W.C.	WHS	1	-	-	-	WHS	-
3	Solan	D83 SRajgarh C-2	62.8	Ban Oak W.C.	WHS	1	-	-	-	WHS	-
4	Solan	D81 SCharech C-1	31.6	Ban Oak W.C.	WHS	1	-	-	-	WHS	-
5	Solan	R27 SNauni C-1	24.4	Ban Oak W.C.	WHS	1	-	-	-	WHS	-

Water Ponds

S. No.	Region	Name Of Forests	Area in Hact	Working Circle	Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise				
					Activity	No. of WP/FP/VS	I	II	III	IV	V
1	Chail	D39 SDhamdhar C-1	30.4	Chil W.C.	Van Sarovar	1	-		V S	-	-
2	Chail	D39 SDhamdhar C-2	30	Chil W.C.	Van Sarovar	1	-		V S	-	-
3	Chail	D47 SBirniShillai C-2	93.6	Chil W.C.	Van Sarovar	2	-		V S	-	-
4	Chail	D48 SBirniShillai C-1	36	Chil W.C.	Van Sarovar	1	-		V S	-	-
5	Chail	D42 SChabri C-1	47.6	Chil W.C.	Van Sarovar	1	-	V S	-	-	-
6	Chail	D42 SChabri C-2	40	Chil W.C.	Van Sarovar	1	-	V S	-	-	-
7	Chail	D43 SPowash	28.4	Chil W.C.	Van Sarovar	1	-	-	-	-	V S
8	Chail	D44 SCheunth C-1	40.4	Chil W.C.	Van Sarovar	1	-	-	-	-	V S
9	Chail	D44 SCheunth C-2	40	Chil W.C.	Van Sarovar	1	-	-	-	-	V S
10	Chail	D45 STibbaKathet C-1b	24	Chil W.C.	Van Sarovar	1	-	-	-	V S	-
11	Chail	D47 SBirniShillai C-1	58.8	Chil W.C.	Van Sarovar	2	-	-	-	V S	-
12	Chail	D48 SBirniShillai C-3	12.4	Chil W.C.	Van Sarovar	1	-	-	-	V S	-
13	Chail	D52 SBhojdeen C-3a	18.4	Chil W.C.	Van Sarovar	1	-	-	-	V S	-

14	Chail	D52 SBhojdeen C-3b	58.4	Chil W.C.	Van Sarovar	1	-	-	-	V S	-
15	Chail	D51 SJhajhaKhariun C-1	84	Ban Oak W.C.	Van Sarovar	2	-	-	-	V S	-
16	Chail	D51 SJhajhaKhariun C-3	42.4	Ban Oak W.C.	Van Sarovar	1	-	-	-	V S	-
17	Chail	D52 SBhojdeen C-1	129.2	Ban Oak W.C.	Van Sarovar	1	-	-	-	V S	-
18	Chail	D52 SBhojdeen C-2	90	Ban Oak W.C.	Van Sarovar	2	-	-	-	V S	-
19	Chail	D49 Banjani C-2	22	Chil W.C.	Van Sarovar	1	-	-	-	V S	-
20	Chail	D45 STibbaKathet C-2a	16	Chil W.C.	Van Sarovar	2	-	-	-	-	VS
21	Chail	D45 STibbaKathet C-2b	22.4	Chil W.C.	Van Sarovar	1	-	-	-	-	VS
22	Chail	D46 Chaklain C-2	34.8	Chil W.C.	Van Sarovar	1	-	-	-	-	VS
23	Chail	R16 Chaklain C-1	28.4	Chil W.C.	Van Sarovar	1	-	-	-	-	VS
24	Chail	R16 Chaklain C-2	50.4	Deodar W.C.	Van Sarovar	2	-	-	-	-	VS

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise				
S. No.	Region	Name Of Forests	Area in Hact	Working Circle	Activity	No. of WP/FP/VS	I	II	II I	I V	V
1	Kandag hat	R21SKarol C-1A	34.4	Ban Oak W.C.	Water Pond/Van Sarover	2	-	V S	-	-	-

2	Kandaghat	R21SKarol C-1B	42	Ban Oak W.C.	Water Pond/Van Sarover	2	-	V S	-	-	-
3	Kandaghat	R21SKarol C-1C	38.8	Ban Oak W.C.	Water Pond/Van Sarover	2	-	V S	-	-	-
4	Kandaghat	R21SKarol C-2	58.4	Ban Oak W.C.	Water Pond/Van Sarover	2	-	-	-	V S	-
5	Kandaghat	R21SKarol C-3A	39.6	Ban Oak W.C.	Water Pond/Van Sarover	2	-	-	-	V S	-
6	Kandaghat	R21SKarol C-3B	32	Ban Oak W.C.	Water Pond/Van Sarover	2	-	-	-	V S	-
7	Kandaghat	R21SKarol C-3C	34.4	Ban Oak W.C.	Water Pond/Van Sarover	2	-	-	-	V S	-
8	Kandaghat	D58 SBasha	11.2	Ban Oak W.C.	Water Pond	1	-	-	-	-	-
9	Kandaghat	D62 SBisha C-1	49.1	Ban Oak W.C.	Water Pond	2	-	-	-	-	-
10	Kandaghat	D67 SSainj	12.8	Ban Oak W.C.	Water Pond	1	-	-	-	-	-
11	Kandaghat	D69 SPalhech I	22.4	Ban Oak W.C.	Water Pond	1	-	-	-	-	-
12	Kandaghat	D72 SKarol II	16.4	Ban Oak W.C.	Water Pond	1	-	-	-	-	-
13	Kandaghat	D73 SKarol III	10.4	Ban Oak W.C.	Water Pond	1	-	-	-	-	-
14	Kandaghat	D75 SKarol V	19.2	Ban Oak W.C.	Water Pond	1	-	-	-	-	-
15	Kandaghat	D79 SDed	14.4	Ban Oak W.C.	Water Pond	1	-	-	-	-	-
16	Kandaghat	D99 SSalumna	23.2	Ban Oak W.C.	Water Pond	1	-	-	-	-	-
17	Kandaghat	D100 SDharot C-2	18.8	Ban Oak W.C.	Water Pond	1	-	-	-	-	-
18	Kandaghat	D101 SKuryali	19.6	Ban Oak	Water Pond	1	-	-	-	-	-

	hat			W.C.							
19	Kandaghat	D57 SKumhala	4.8	Chil W.C.	Water Pond/Van Sarover	1	-	-	-	-	-
20	Kandaghat	D63 SKiarighat	23.6	Chil W.C.	Water Pond	1	-	-	-	-	-
21	Kandaghat	D100 SDharot C-1	15.6	Chil W.C.	Water Pond	1	-	-	-	-	-
22	Kandaghat	D102 SBaranKaCheon C-1	5.6	Chil W.C.	Water Pond	1	-	-	-	-	W P
23	Kandaghat	D102 SBaranKaCheon C-2	7.2	Chil W.C.	Water Pond	1	-	-	-	-	W P
24	Kandaghat	D102 SBaranKaCheon C-3	6	Chil W.C.	Water Pond	1	-	-	-	-	W P
25	Kandaghat	D60 SBadoonShikar	28.4	Ban Oak W.C.	Water Pond	2	-	-	-	-	-
26	Kandaghat	D66 SKasauli	5.6	Ban Oak W.C.	Water Pond	1	-	-	-	-	-

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise				
S.No .	Region	Name Of Forests	Area in Hact	Working Circle	Activity	No. of WP/FP/VS	I	II	III	IV	V
1	Solan	R25 SShahogBhadrog C-1	43.2	Ban Oak W.C.	Water Pond	3	-	WP	-	-	-
2	Solan	D83 SRajgarh C-2	62.8	Ban Oak W.C.	Farm Pond	3	-	WP	-	-	-
3	Solan	D126 SManlog C-3	14	Chil W.C.	Farm Pond	2	-	-	FP	-	-
4	Solan	D132 SCharar C-7	18.8	Chil W.C.	Farm Pond	2	-	-	FP	-	-
5	Solan	D89 SGadhog-I	9.2	Chil W.C.	Farm Pond	1	-	-	FP	-	-
6	Solan	D90 SGadhog-II	13.2	Chil W.C.	Farm Pond	2	-	-	FP	-	-

7	Solan	D92 SDeora	25.6	Chil W.C.	Farm Pond	2	-	-	FP	-	-
8	Solan	D95 SNagali-I	3.6	Chil W.C.	Farm Pond	1	-	-	FP	-	-
9	Solan	D98 SBhawan Ki Dhar	19.2	Chil W.C.	Farm Pond	2	-	-	FP	-	-
10	Solan	R24 SRajgarh C-1	42.8	Ban Oak W.C.	Farm Pond	3	-	-	FP	-	-
11	Solan	D-83 SRajgarh C-1	70.4	Ban Oak W.C.	Farm Pond	4	-	-	FP	-	-
12	Solan	R28 SKhaldhar	28.4	Chil W.C.	Water Pond	3	-	-	-	W P	-
13	Solan	D138 SKhaldhar	11.2	Chil W.C.	Water Pond	1	-	-	-	W P	-
14	Solan	D104 SKarol C-1	22.4	Ban Oak W.C.	Water Pond	3	-	-	-	W P	-
15	Solan	D105 SMathiya C-3	7.6	Ban Oak W.C.	Water Pond	1	-	-	-	W P	-
16	Solan	R24 SRajgarh C-2	26	Ban Oak W.C.	Water Pond	2	-	-	-	W P	-
17	Solan	R28 SKhaldhar C-4	10	PCR W.C.	Water Pond	1	-	-	-	W P	-
18	Solan	D132 SCharar C-3	24	PCR W.C.	Water Pond	2	-	-	-	W P	-
19	Solan	D132 SCharar C-9	12	PCR W.C.	Water Pond	3	-	-	-	W P	-

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise				
S. No.	Region	Name Of Forests	Area in Hact	Working Circle	Activity	No. of WP/FP/VS	I	II	III	IV	V
1	Subathu	D128 SKalikufar C-2	10.8	Chil W.C.	Water Pond	1	-	-	-	WP	-
2	Subathu	D134 SKothi C-1	63	Chil W.C.	Water Pond	1	-	-	-	WP	-

3	Subathu	D134 SKothi C-2	24.6	Chil W.C.	Water Pond	1	-	-	-	WP	-
4	Subathu	D112 SAlobra	54.4	PCR W.C.	Water Pond	1	-	-	-	-	-
5	Subathu	D124 SKatiyara C-5	19.2	Chil W.C.	Water Pond	1	-	-	-	WP	-
6	Subathu	D127 SShashal C-2	19.2	PCR W.C.	Water Pond	1	-	-	-	WP	-
7	Subathu	D127 SShashal C-3	19.6	Chil W.C.	Water Pond	1	-	-	-	WP	-
8	Subathu	D128 SKalikufar C-1	21.2	Chil W.C.	Water Pond	1	-	-	-	WP	-
9	Subathu	D128 SKalikufar C-3	16.8	Chil W.C.	Water Pond	1	-	-	-	WP	-
10	Subathu	D133 SKoon	10.4	Chil W.C.	Water Pond	1	-	-	-	WP	-
11	Subathu	D110 SRaikot	34.8	PCR W.C.	Water Pond	1	-	-	-	WP	-

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise				
S. No.	Region	Name of Forests	Area in Hact	Working Circle	Activity	No. of WP/FP/VS	I	I I	III	IV	V
1	Dharampur	D158 SAnji	11.2	Chil W.C.	Water Pond	1	-	-	-	W P	-
2	Dharampur	R31 SBarog C-4a	57.2	Chil W.C.	Water Pond	5	-	-	-	W P	-
3	Dharampur	R31 SBarog C-4b	28.8	Chil W.C.	Water Pond	4	-	-	-	W P	-
4	Dharampur	R31 SBarog C-5	62	Chil W.C.	Water Pond	5	-	-	-	W P	-
5	Dharampur	R31 SBarog C-6	51.6	Chil W.C.	Water Pond	5	-	-	-	W P	-

6	Dharampur	R31 SBarog C-8b	68	Chil W.C.	Water Pond	6	-	-	-	W P	-
7	Dharampur	D176 SChiroti Ki Dhar-I	38	Chil W.C.	Water Pond	4	-	-	-	W P	-
8	Dharampur	D178 SChiroti Ki Dhar C-2	29.1	Chil W.C.	Water Pond	4	-	-	-	W P	-
9	Dharampur	D179 SShirgulKaTiba C-1	16	Chil W.C.	Water Pond	3	-	-	-	W P	-
10	Dharampur	D179 SShirgulKaTiba C-2	13.6	Chil W.C.	Water Pond	3	-	-	-	W P	-
11	Dharampur	R40 SBohli C-2a	45.6	Chil W.C.	Water Pond	5	-	-	-	W P	-
12	Dharampur	R38 Skiard C-1	29.6	Chil W.C.	Water Pond	4	-	-	-	W P	-
13	Dharampur	D161 SSihardi C-2	32	Chil W.C.	Water Pond	4	-	-	-	W P	-
14	Dharampur	D165 SMaltoo	41.2	Chil W.C.	Water Pond	5	-	-	-	W P	-
15	Dharampur	R33 SGulhari C-1b	41.6	Chil W.C.	Water Pond	5	-	-	-	W P	-
16	Dharampur	D151 SGulhari	42.8	Chil W.C.	Water Pond	5	-	-	-	W P	-
17	Dharampur	D152 SGulhari	8.8	Chil W.C.	Water Pond	2	-	-	-	W P	-
18	Dharampur	D153 SGulhari	5.2	Chil W.C.	Water Pond		-	-	-	W P	-
19	Dharampur	D119 SChabalkiDhar	26.4	Chil W.C.	Water Pond	3	-	-	-	W P	-
20	Dharampur	R30 SChabal C-1	30.4	Chil W.C.	Water Pond	3	-	-	-	W P	-
21	Dharampur	R30 SChabal C-3	36	Chil W.C.	Water Pond	4	-	-	-	W P	-
22	Dharampur	R30 SChabal C-4	42	Chil W.C.	Water	4	-	-	-	W	-

	ur				Pond					P	
23	Dharampur	R30 SChabal C-5b	21.4	Chil W.C.	Water Pond	3	-	-	-	W P	-
24	Dharampur	R41 SGulzar C-1	26.8	Chil W.C.	Water Pond	4	-	-	-	W P	-
25	Dharampur	R42 SAjmerGarh C-2	47.2	Chil W.C.	Water Pond	5	-	-	-	W P	-
26	Dharampur	D180 SShirgulKaTiba C-2	21.2	Chil W.C.	Water Pond	4	-	-	W P	-	-
27	Dharampur	R40 SBohali C-2b	38	PCR W.C.	Water Pond	4	-	-	-	W P	-
28	Dharampur	R35 SKadon	40.1	PCR W.C.	Water Pond	5	-	-	-	W P	-
29	Dharampur	R36 SAnji	10.4	PCR W.C.	Water Pond	2	-	-	-	W P	-
30	Dharampur	D214 STibaGulzar C-1	27.6	PCR W.C.	Water Pond	4	-	-	-	W P	-
31	Dharampur	D214 STibaGulzar C-3	94.8	PCR W.C.	Water Pond	6	-	-	-	W P	-
32	Dharampur	D216 SBanogBhallon	90	PCR W.C.	Water Pond	6	-	-	-	W P	-
33	Dharampur	R31 SBarog C-8a	24	Chil W.C.	Water Pond	3	-	-	W P	-	-
34	Dharampur	D171 SBhog Seri-II	5.6	Chil W.C.	Water Pond	1	-	-	-	W P	-
35	Dharampur	D169 SKiarad C-1	27.6	Chil W.C.	Water Pond	3	-	-	-	W P	-
36	Dharampur	R32 SChunjari	67.6	Chil W.C.	Water Pond	5	-	-	-	W P	-
37	Dharampur	D154 SDawnla	12.8	Chil W.C.	Water Pond	2	-	-	-	W P	-
38	Dharampur	D159 SAnji	3.6	Chil W.C.	Water Pond	1	-	-	-	-	W P

39	Dharampur	R33 SGulhari C-1a	44	Chil W.C.	Water Pond	4	-	-	W P	W P	-
40	Dharampur	R33 SGulhari C-2	34	Chil W.C.	Water Pond	4	-	-	W P	W P	-
41	Dharampur	D150 SGulhari	4.4	Chil W.C.	Water Pond	1	-	-	-	-	W P
42	Dharampur	D116 SChabalkiDhar	4.8	Chil W.C.	Water Pond	1	-	-	-	-	W P
43	Dharampur	R30 SChabal C-2a	36.4	Chil W.C.	Water Pond	5	-	-	W P	W P	W P
44	Dharampur	R30 SChabal C-2b	33.2	Chil W.C.	Water Pond	5	-	-	W P	W P	W P
45	Dharampur	R30 SChabal C-6	27.2	Chil W.C.	Water Pond	4	-	-	W P	W P	W P
46	Dharampur	D167 SGadiar.	23.2	Chil W.C.	Water Pond	4	-	-	W P	W P	W P
47	Dharampur	R48 SKalth.C-4	32	Chil W.C.	Water Pond	4	-	-	W P	W P	W P
48	Dharampur	D182 SKalth - III.	25.6	Chil W.C.	Water Pond	4	-	-	W P	W P	W P
49	Dharampur	D183 SKalth - IV.	36	Chil W.C.	Water Pond	3	-	-	W P	W P	W P
50	Dharampur	R48 SKalth.C-5	52.8	Chil W.C.	Water Pond	5	-	-	W P	W P	W P
51	Dharampur	R49 SGadiar.	31.2	Chil W.C.	Water Pond	4	-	-	W P	W P	W P
52	Dharampur	D202 SKalth _ II.C-2	16.4	Chil W.C.	Water Pond	3	-	-	-	W P	W P
53	Dharampur	D203 SQuila Ajmergarh.C-1	40	Chil W.C.	Water Pond	5	-	-	-	W P	W P
54	Dharampur	R42 SAjmerGarh C-1	35.6	Chil W.C.	Water Pond	4	-	-	-	W P	W P
55	Dharampur	D175 SBohali C-2	11	PCR W.C.	Water	3	-	-	-	W	W

	ur				Pond					P	P
56	Dharampur	D166 SDhar C-2	50	PCR W.C.	Water Pond	6	-	-	-	W P	W P
57	Dharampur	D139 SBanjni	4	PCR W.C.	Water Pond	1	-	-	-	W P	
58	Dharampur	R48 SKalth.C-3	16	PCR W.C.	Water Pond	2	-	-	-	W P	W P
59	Dharampur	D203 SQuila Ajmergarh.C-2	43.6	PCR W.C.	Water Pond	5	-	-	-	W P	W P
60	Dharampur	D202 SKalth _ II.C-1	12	PCR W.C.	Water Pond	2	-	-	-	W P	W P
61	Dharampur	R48 SKalth.C-1	52.8	PCR W.C.	Water Pond	5	-	-	-	W P	W P
62	Dharampur	D213 SKabaBhalon	107.6	PCR W.C.	Water Pond	8	-	-	-	W P	W P
63	Dharampur	D214 STibaGulzar C-2	19.2	PCR W.C.	Water Pond	2	-	-	-	-	W P
64	Dharampur	D215 SKaba	43.2	PCR W.C.	Water Pond	4	-	-	-	W P	W P
65	Dharampur	D204 STikari	22.4	PCR W.C.	Water Pond	2	-	-	-	-	W P
66	Dharampur	R41 SGulzar C-2	102.4	PCR W.C.	Water Pond	5	-	-	-	W P	W P

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise				
S. No.	Region	Name Of Forests	Area in Hact	Working Circle	Activity	No. of WP/FP/VS	I	I I	III	IV	V
1	Parwano	D185 SKurlajohri C-2	86.3	Chil W.C.	Water	3	-	-	-	W	W

	o				Pond					P	P
2	Parwano o	D186 SKalth No V C-1	14.4	Chil W.C.	Water Pond	2	-	-	-	W P	W P
3	Parwano o	D222 SBanasar Top	72.4	Chil W.C.	Water Pond	5	-	-	-	W P	W P
4	Parwano o	D239 SSariDhar C-1a	12	Chil W.C.	Water Pond	2	-	-	-	W P	W P
5	Parwano o	D239 SSariDhar C-1b	10.8	Chil W.C.	Water Pond	2	-	-	-	W P	W P
6	Parwano o	D245 SSanawar C-1	12.4	Chil W.C.	Water Pond	1	-	-	-	W P	0
7	Parwano o	D245 SSanawar C-2	16.4	Chil W.C.	Water Pond	2	-	-	-	W P	W P
8	Parwano o	D190 SJabrog	87.6	PCR W.C.	Water Pond	2	-	-	-	W P	W P
9	Parwano o	D230 SJangeshu C-1	39	PCR W.C.	Water Pond	4	-	-	-	W P	W P
10	Parwano o	D230 SJangeshu C-2	48.6	PCR W.C.	Water Pond	3	-	-	-	W P	W P
11	Parwano o	D234 SRanigaun	72	PCR W.C.	Water Pond	2	-	-	-	W P	W P
12	Parwano o	D235 SChamgah	52.8	PCR W.C.	Water Pond	2	-	-	-	W P	W P
13	Parwano o	D240 SDochi C-6	28.4	PCR W.C.	Water Pond	2	-	-	-	W P	W P
14	Parwano o	R56 SParwanoo C-1	33	PCR W.C.	Water Pond	2	-	-	-	-	W P
15	Parwano o	R56 SParwanoo C-2	91	PCR W.C.	Water Pond	2	-	-	W P	-	W P
16	Parwano o	D188 SKaralghat C-1	48.4	Chil W.C.	Water Pond	2	-	-	W P	-	W P
17	Parwano o	D188 SKaralghat C-2	54.4	Chil W.C.	Water Pond	2	-	-	W P	-	W P

18	Parwano o	D239 SSariDhar C-2	22.4	Chil W.C.	Water Pond	2	-	-	W P	-	W P
19	Parwano o	D240 SDochi C-1	25.2	Chil W.C.	Water Pond	2	-	-	W P	-	W P
20	Parwano o	D242 SGahidhar C-2	20.8	Chil W.C.	Water Pond	2	-	-	W P	-	W P
21	Parwano o	D245 SSanawar C-3	16.8	Chil W.C.	Water Pond	2	-	-	W P	-	W P
22	Parwano o	R47 SKaralghat C-2	36	Chil W.C.	Water Pond	2	-	-	W P	-	W P
23	Parwano o	R57 SBanasar C-1a	48	Chil W.C.	Water Pond	2	-	-	W P	-	W P
24	Parwano o	R57 SBanasar C-1b	43.2	Chil W.C.	Water Pond	2	-	-	W P	-	W P

Table 10.9: Proposed new construction of Buildings.

S No.	Range	Block	Beat	Name of Building	Year				
					I	II	III	IV	V
1.	Kandaghat	Kandaghat	Karol-II	Range office cum residence	Range office cum residence	-	-	-	-
2.	-do-	-do-	Shalumna	Guard Hut	-	Fgd Hut	-	-	-
3.	-do-	Kiari	Wakna	Guard Hut	-	Fgd Hut	-	-	-
4.	-do-	Bisha	Basha	Guard Hut	-	-	Fgd Hut	-	-
5.	-do-	-do-	Bisha	Guard Hut	-	-	Fgd Hut	-	-
6.	-do-	-do-	Kiartoo	Guard Hut	-	-	Fgd Hut	-	-
7.	-do-	-do-	Bisha	BO Quarter	-	BO Quarter	-	-	-
8.	-do-	Kandaghat	Karol-II	Chowkidar Quarter	-	-	-	Chowkidar Quarter	-
9.	Solan	Saproon	Saproon	BO Quarter	-	-	BO Quarter	-	-

S No.	Range	Block	Beat	Name of Building	Year				
					I	II	III	IV	V
10.	-do-	Ochghat	Jaunagi-II	Guard Hut	-	-	Fgd Hut	-	-
11.	-do-	Solan	Jaunagi-I	Guard Hut	-	-	Fgd Hut	-	-
12.	-do-	Saproon	Nauni	Guard Hut	-	-	Fgd Hut	-	-
13.	-do-	Solan	Khaldar	Guard Hut	-	-	-	-	Guard Hut
14.	-do-	Solan	Basal	Guard Hut	-	-	-	-	Guard Hut
15.	Parwanoo	Lugon	Dadiyar	Guard Hut	-	-	-	-	Guard Hut
16.	-do-	Lugon	Kalth	Guard Hut	-	-	-	-	Guard Hut
17.	-do-	Lugon	Naboh	Guard Hut	-	-	-	-	Guard Hut
18.	Subathu	Sarighat	Sarighat	BO Quarter	BO Quarter	-	-	-	-
19.	-do-	Subathu	Kothi	Guard Hut	Guard Hut	-	-	-	-
20.	-do-	Rugda	Syri	Guard Hut	Guard Hut	-	-	-	-
21.	-do-	Subathu	Kathni	Guard Hut	Guard Hut	-	-	-	-
22.	Dharmpur	Joharji	Joharji	BO Quarter	-	-	BO Quarter	-	-
23.	-do-	Chabal	Chabal	BO Quarter	-	-	BO Quarter	-	-
24.	-do-	Joharji	Neri	Guard Hut	-	-	-	Guard Hut	-
25.	-do-	Joharji	Jalyara	Guard Hut	-	-	-	Guard Hut	-
26.	-do-	Dharmpur	Barog	Guard Hut	-	-	-	Guard Hut	-
27.	Chail	Ghaura	Chaura	Guard Hut	-	-	-	Guard Hut	-
28.	Solan	Ouchghat	Ouchghat	BO quarter at Ouchghat		BO quarter			
29.	Chail	-	-	Gang hut	Gang hut				
30.	Kandaghat	-	-	Gang hut	Gang hut				
31.	Subathu	-	-	Gang Hut		Gang Hut			

S No.	Range	Block	Beat	Name of Building	Year				
					I	II	III	IV	V
32.	Parwanoo	-	-	Gang Hut		Gang hut			

Eco-tourism (approval)

13 Eco-tourism sites are proposed in the present Working Plan. Once approval is received, the same shall be developed as per the norms after following all codal formalities.

Plan for Construction / Repair of Boundary Pillars

Table 10.10: Status of Boundary Pillars

Range	Block	Beat	Name of Forest	Year of construction and repair				
				I	II	III	IV	V
Chail	Gaura	Deen	D52 Bhojdeen	10	10	15	10	0
		Dhangil	D39 Damdhar	2	2	3	0	0
	Chail	Shillru	D44 Cheunth	5	4	5	0	0
	„	„	D45 Tibba kathit	7	3	6	0	0
	„	„	D46 Chaklan	8	6	7	0	0
	„	„	R16 Chaklan	8	12	10	0	0
	Chail	Binnu	D47 Birni shillai	7	6	6	0	0
	„	„	D48 Birni Shillai	6	3	4	0	0
	„	„	D49 banjini	12	9	9	0	0
	„	„	D50 sakori	5	3	5	0	0
	Chail	Choura	D40 Khani ka nala	3	1	4	0	0
	„	„	D41 kaneola	1	0	2	0	0
	„	„	D42 Chabri	12	8	10	0	0
	„	„	D43 Powash	2	1	4	0	0
	„	„	D51 JhajhaKhariun	5	3	5	0	0
Kandaghat	Kandaghat	Karol 1st & Karol 2nd	R 21 Karol	8	16	15	10	0
	Kandaghat	Karol 2nd	R 22 Karol	7	0	1	0	0
	Kandaghat	Karol 2nd	R 23 Karol	3	0	8	0	0
	Bisha	Basha	D-53 Shungal	2	2	2	0	0
	Bisha	Basha	D-54 Shadiyal	0	0	8	0	0
	Bisha	Basha	D-56 Suro No 2	0	0	1	0	0
	Bisha	Basha	D-57Kumhala	0	0	3	0	0
	Bisha	Basha	D-58 Basha	0	0	1	0	0
	Bisha	Basha	D-59 Bagetu	0	0	1	0	0
	Bisha	Kiartoo	D-60 Badoon Shikar	0	0	2		

							0	0
	Bisha	Bisha	D-61 Dhanoli Dochi	0	0	2	0	0
	Bisha	Bisha	D-62 Bisha	8	2	8	0	0
	Kiari	Kiari	D-63 Kiarighat	0	0	2	0	0
	Bisha	Kiartoo	D-64 Birni	0	0	0	0	0
	Bisha	Kiartoo	D-65 Birni Kasauli	0	0	1	0	0
	Bisha	Kiartoo	D-66 Kasauli	0	0	3	0	0
	Bisha	Kiartoo	D-67 Sainj	0	0	2	0	0
	Kandaghat	Karol 1st	D-68 Hathon	0	2	1	0	0
	Kandaghat	Karol 1st	D-69 Hathon Palech	2	2	4	0	0
	Kandaghat	Karol 1st	D-70 Palech	0	0	4	0	0
	Kandaghat	Karol 1st	D-71 Karol I	0	0	5	0	0
	Kandaghat	Karol 1st	D-72 Karol II	2	0	0	0	0
	Kandaghat	Karol 1st	D-73 Karol III	0	0	0	0	0
	Kandaghat	Karol 1st	D-74 Karol IV	2	0	2	0	0
	Kandaghat	Karol 2nd	D-75 Karol V	0	3	4	0	0
	Kandaghat	Karol 2nd	D-76 Karol VI	0	0	0	0	0
	Kandaghat	Karol 2nd	D-77 Karol VII	0	1	0	0	0
	Kandaghat	Karol 2nd	D-78 Karol VIII	2	0	0	0	0
	Kandaghat	Karol 2nd	D-79 Ded	0	2	10	0	0
	Kandaghat	Salumna	D-99 Salumna	0	0	0	0	0
	Kandaghat	Salumna	D-100 Dharot	1	2	7	0	0
	Kandaghat	Salumna	D-101 Kuryali	0	2	3	0	0
	Kandaghat	Salumna	D-102 Baran Ka Cheon C1	0	0	7	0	0
	Kandaghat	Salumna	D-103 Dharot Ka Cheon	0	0	14	0	0
Solan	Oachghat	Kotla	D-80 Seri	1	2	11	0	0
			D-81 Charech	2	3	19	0	0
		Jaunajilind	R-24 Rajgarh	8	5	9	0	0
			D-82 Jawa Rajagarh No-II	2	1	9	0	0
			D- 83 Rajgarh	13	11	17	0	0
		Oachghat	R-26 Nagali	2	5	3	0	0
			R-25 ShaogBadrog C-2	5	0	16	0	0
			D-89 Gadog-I	3	0	6	0	0

			D-90 Gadog –II	2	5	6	0	0
			D-91 Bhawan ki Dhar	2	0	0	0	0
			D-92 Deora	10	5	10	0	0
			D-93 Nandal Nagali	4	1	-	0	0
			D-94 Nandal	2	5	6	0	0
			D-95 Nagali-I	1	-	3	0	0
			D-96 Nagali –II	2	2	4	0	0
			D-97 Kiar Tatoon	5	1	6	0	0
			D-98 Bhawan Ki Dhar	5	2	4	0	0
	Solan	Jaunaji Ist	R-25 ShaogBadrog C-1	-	1	10	0	0
			D-84 Damkari	6	21	14	0	0
			D-85 Niun	-	8	3	0	0
			D-86 DharogNiun	8	20	9	0	0
			D-87 Diarag Dawan	2	7	2	0	0
			D-88 ShogBadrog	5	3	7	0	0
		Basal	D-104 Karol	7	10	10	12	0
		Salogra	D-105 Mathia	10	14	16	10	0
			D-106 Naloh	11	0	4	0	0
			D-107 Dulhain	6	7	16	0	0
		Solan	D-108 Shilly	29	25	12	20	0
	Sapron	Chawal	D-125 Sheel Ka Dhala	1	20	10	0	0
			D-126 Manlog	13	13	26	10	0
			D-130 Chawal	8	0	0	0	0
			D-131 Mathan	23	14	0	0	0
			D-132 Charar	36	29	15	0	0
		Nauni	R-27 Nauni	15	0	0	0	0
			D-137 Nauni	1	0	0	0	0
		Khaldhar	D-123 Beola	8	2	5	0	0
			D-135 Khaldhar	4	2	0	0	0
			D-136 Khaldhar	18	4	0	0	0
			D-138 Khaldhar	6	5	0	0	0
			R-28 Khaldhar	23	19	5	0	0
	Parwanoo	Parwanoo	R-56 Parwanoo C-1	4	0	0	0	0
	Parwanoo	Parwanoo	R-56 Parwanoo C-2	2	0	0	0	0
	Parwanoo	Parwanoo	D-225 Gumma	12	0	0	0	0
	Parwanoo	Parwanoo	D-226 Ananu	2	0	0	0	0
	Parwanoo	Parwanoo	R-52 Gumma C-2	8	4	0	0	0
	Parwanoo	Datiar	D-233 Datiar	23	0	0	0	0
	Parwanoo	Koti	D-234 Ranigaon	6	0	0	0	0

Parwanoo	Parwanoo	Koti	D-235 Chamgah	0	8	0	0	0
	Parwanoo	Koti	D-236 Kurar C-1	7	0	0	0	0
	Parwanoo	Koti	D-236 Kurar C-2	12	0	0	0	0
	Parwanoo	Koti	D-238 Dhamiana	2	0	0	0	0
	Parwanoo	Khadeen	D-223 Khadeen	7	0	0	0	0
	Lugon	Kalth	D-184 Rathal C-1	12	0	0	0	0
	Lugon	Kalth	D-184 Rathal C-2	5	0	0	0	0
	Lugon	Kalth	D-185 Kurla Johri C-1	7	0	0	0	0
	Lugon	Kalth	D-185 Kurla Johri C-2	7	0	0	0	0
	Lugon	Kalth	D-185 Kurla Johri C-3	10	0	0	0	0
	Lugon	Dadiyar	D-200 Chakli Dhanota C1	7	0	0	0	0
	Lugon	Dadiyar	D-200 Chakli Dhanota C2	9	0	0	0	0
	Lugon	Dadiyar	D-207 Sath Dadhog	9	0	0	0	0
	Lugon	Barog	R-61 Naraini C1	4	8	0	0	0
	Lugon	Barog	R-61 Naraini C2	0	9	0	0	0
	Lugon	Barog	R-61 Naraini C3	0	12	0	0	0
	Lugon	Lugon	D-194 Pratha	7	0	0	0	0
	Lugon	Lugon	R-45 Kadar Ki Dhar	12	0	0	0	0
	Lugon	Lugon	D-198 Lugon Bhagour	5	0	0	0	0
	Lugon	Nabhon	D-192 Nabhonpratha	9	8	0	0	0
	Lugon	Nabhon	D-193 Umeria Pratha	0	12	0	0	0
	Kasauli	Dochi	D-240 Dochi C1	2	0	0	0	0
	Kasauli	Dochi	D-240 Dochi C2	6	0	0	0	0
	Kasauli	Dochi	D-240 Dochi C3	1	0	0	0	0
	Kasauli	Dochi	D-240 Dochi C4	5	0	0	0	0
Subathu	Subathu	Kathni	RF-29 Kathni	40	40	43	30	0
	Subathu	Jhamrot	D-109 Panewa	5	1	5	0	0
	Subathu	Alobra	D-110 Raikot	5	0	7	0	0
	Subathu	Thathol	D-111 Thathol	5	1	3	0	0
	Subathu	Alobra	D-112 Alobra	5	10	14	0	0
	Subathu	Serighat	D-113 Serighat	16	3	19	0	0
	Subathu	Kathni	D-114 Kathni	24	30	7	0	0
	Subathu	Deothi	D-121 Panshora	10	2	0	0	0
	Subathu	Deothi	D-122 Shangri	8	0	0	0	0
	Subathu	Deothi	D-124 Katiyara	6	5	0	0	0
	Subathu	Deothi	D-127 Shashal	8	18	0	0	0
	Subathu	Deothi	D-128 Kalikufar	6	17	17	0	0
	Subathu	Subathu	D-129 Rano	7	0	15	0	0

	Subathu	Kothi	D-133 Koon	5	15	0	0	0
	Subathu	Kothi	D-134 Kothi	10	30	26	0	0
Dharampur	Joharji	Bohali	D-170 Bhogseri	5	4	2	0	0
	Joharji	Bohali	D-171 Bhogseri	4	0	0	0	0
	Joharji	Bohali	D-178 Cheroti ki Dhar C1	3	0	0	0	0
	Joharji	Bohali	D-178 Cheroti ki Dhar C2	5	0	0	0	0
	Joharji	Bohali	D-179 siriguli ka tibba C1	2	0	0	0	0
	Joharji	Bohali	D-179 siriguli ka tibba C2	3	1	0	0	0
	Joharji	Bohali	D-181 siriguli ka tibba	3	4	2	0	0
	Joharji	Bohali	R-39 Cheroti ki Dhar	8	5	0	0	0
	Joharji	Bohali	R-40 Bohli C1	5	4	0	0	0
	Joharji	Bohali	R-40 Bohli C2a	3	6	0	0	0
	Joharji	Bohali	R-40 Bohli C2b	0	5	6	0	0
	Joharji	Jalyana	R-48 Kalth.C-1	0	5	3	0	0
	Joharji	Jalyana	R-48 Kalth.C-3	0	3	4	0	0
	Joharji	Jalyana	R-48 Kalth.C-4	6	4	0	0	0
	Joharji	Jalyana	R-48 Kalth.C-5	0	3	4	0	0
	Joharji	Jalyana	R-49 Gadiar.	0	3	9	0	0
	Joharji	Jalyana	D-167 Gadiar.	0	5	6	0	0
	Joharji	Jalyana	D-182 Kalth - III.	0	6	3	0	0
	Joharji	Jalyana	D-183 Kalth - IV.	6	5	0	0	0
	Joharji	Jalyana	D-201 Kalth -I.	9	4	1	0	0
	Joharji	Jalyana	D-202 Kalth _ II.C2	3	1	0	0	0
	Joharji	Jalyana	D-203 Quila Ajmergarh.C1	5	2	1	0	0
	Joharji	Jalyana	D-203 Quila Ajmergarh.C2	3	4	1	0	0
	Joharji	Joharji	R-41 Gulzar C1	4	2	3	0	0
	Joharji	Joharji	R-41 Gulzar C2	4	6	4	0	0
	Joharji	Joharji	R-42 Ajmergarh C1	0	7	4	0	0
	Joharji	Joharji	R-42 Ajmergarh C2	0	4	5	0	0
	Joharji	Joharji	D-214 Gulzar C1	0	3	2	0	0
	Joharji	Joharji	D-214 Gulzar C2	0	6	6	0	0
	Joharji	Joharji	D-214 Gulzar C3	3	4	5	0	0
	Joharji	Joharji	D-180 Siriguli Ka Tibba C1	0	3	2	0	0
	Joharji	Joharji	D-180 Siriguli Ka Tibba C2	1	4	6	0	0
	Joharji	Joharji	D-213 Kaba	2	6	1	0	0
	Joharji	Joharji	D-215 Kaba	2	4	8	0	0
	Joharji	Joharji	D-216 Bhallon	0	8	9	0	0
	Joharji	Joharji	D-204 Tikkari	0	6	2	0	0

Joharji	Neri	D-205 Neri-1	9	3	4	0	0
Joharji	Neri	D-206 Neri-II	4	3	0	0	0
Joharji	Neri	D-210 Odder Jangiria	6	5	9	0	0
Joharji	Neri	D-211 Halda No-1	0	2	0	0	0
Joharji	Neri	D-212 Halda No-11	2	0	3	0	0
Joharji	Neri	D-217 MiunSanog	0	0	0	0	0
Joharji	Neri	R-43 Halda C1	4	5	0	0	0
Joharji	Neri	R-43 Halda C3	9	3	1	0	0
Joharji	Neri	R-44 Jhanai C1	2	5	2	0	0
Joharji	Neri	R-44 Jhanai C2	2	0	0	0	0
Dharampur	Kumarhatii	R-32 Chewa Chunjri	5	15	5	0	0
Dharampur	Kumarhatii	R-38 Kiard C1	2	3	4	0	0
Dharampur	Kumarhatii	R-38 Kiard C2	2	1	4	0	0
Dharampur	Kumarhatii	D-140 Kainthri	5	2	5	0	0
Dharampur	Kumarhatii	D-142 JhojhonBhaili C1	2	2	3	0	0
Dharampur	Kumarhatii	D-142 JhojhonBhaili C2	3	2	3	0	0
Dharampur	Kumarhatii	D-143 Chewa Kihil Chunjri	1	0	2	0	0
Dharampur	Kumarhatii	D-144 Chewa Khil Chujri	2	0	3	0	0
Dharampur	Kumarhatii	D-145 Chewa Khil Chunjri	3	3	0	0	0
Dharampur	Kumarhatii	D-146 Chewa Khil Chunjri	10	5	15	0	0
Dharampur	Kumarhatii	D-147 Kanna	5	5	10	0	0
Dharampur	Kumarhatii	D-164 Maltoo	5	3	5	0	0
Dharampur	Kumarhatii	D-169 Kiard c1	5	5	12	0	0
Dharampur	Kumarhatii	D-169 Kiard c2	2	0	8	0	0
Dharampur	Kadon	D-154 Danwla	2	0	3	0	0
Dharampur	Kadon	D-157 Kadon	4	0	1	0	0
Dharampur	Kadon	R-34 mansa Devi	2	0	1	0	0
Dharampur	Kadon	R-35 Kadon	6	3	2	0	0
Dharampur	Kadon	R-36 Anji	5	0	0	0	0
Dharampur	Kadon	R-37 Maltoo C1	4	1	0	0	0
Dharampur	Kadon	R-37 Maltoo C2	6	0	2	0	0

	Dharampur	Kadon	D-160 Anji	3	0	0	0	0
	Dharampur	Kadon	D-161 SihardiC1	1	0	1	0	0
	Dharampur	Kadon	D-161 Sihardi C2	5	2	2	0	0
	Dharampur	Kadon	D-162 Maltoo	6	2	1	0	0
	Dharampur	Kadon	D-163 Maltoo	3	0	1	0	0
	Dharampur	Kadon	D-165 Maltoo	9	3	1	0	0
	Dharampur	Kadon	D-166 Dhar C1	2	2	1	0	0
	Dharampur	Kadon	D-166 Dhar C2	2	1	1	0	0
	Dharampur	Kadon	D-244 Cheola C1	1	0	0	0	0
	Dharampur	Kadon	D-244 Cheola C2	3	1	1	0	0
	Dharampur	Kadon	D-244 Cheola C3	4	2	0	0	0
	Dharampur	Kadon	D-244 Cheola C4	3	1	1	0	0
	Dharampur	Kadon	D-244 Cheola C5	4	1	2	0	0
	Dharampur	Barog	D-158 Anji	4	0	0	0	0
	Dharampur	Barog	D-141 Barog	2	0	3	0	0
	Dharampur	Barog	R-31 Barog C1a	2	0	3	0	0
	Dharampur	Barog	R-31 Barog C1b	0	0	2	0	0
	Dharampur	Barog	R-31 Barog C2a	0	0	1	0	0
	Dharampur	Barog	R-31 Barog C2b	0	0	2	0	0
	Dharampur	Barog	R-31 Barog C3	0	0	2	0	0
	Dharampur	Barog	R-31 Barog C4a	0	0	1	0	0
	Dharampur	Barog	R-31 Barog C4b	0	4	0	0	0
	Dharampur	Barog	R-31 Barog C5	0	0	0	0	0
	Dharampur	Barog	R-31 Barog C6	2	2	2	0	0
	Dharampur	Barog	R-31 Barog C7	3	0	2	0	0
	Dharampur	Barog	R-31 Barog C8a	0	0	2	0	0
	Dharampur	Barog	R-31 Barog C8b	0	0	3	0	0
	Chabal	Chabal	R-30 Chabal C2a	3	0	2	0	0
	Chabal	Chabal	R-30 Chabal C2b	8	3	2	0	0
	Chabal	Chabal	R-30 Chabal C3	4	3	6	0	0
	Chabal	Chabal	R-30 Chabal C4	6	6	6	0	0
	Chabal	Chabal	R-30 Chabal C5a	6	4	5	0	0
	Chabal	Chabal	R-30 Chabal C5b	8	1	2	0	0
	Chabal	Chabal	R-30 Chabal C6	5	6	6	0	0
	Chabal	Chabal	D-115 Chabal ki Dhar	2	0	6	0	0
	Chabal	Chabal	D-116 Chabal ki Dhar	6	4	1	0	0
	Chabal	Chabal	D-117 Chabal ki Dhar	3	2	0	0	0
	Chabal	Chabal	D-118 Chabal ki Dhar	5	2	0	0	0
	Chabal	Chabal	D-119 Chabal ki Dhar	7	9	0	0	0

	Chabal	Chabal	D-120 Chabal ki Dhar	6	2	4	0	0
	Chabal	Chabal	D-139 Banjani	3	2	0	0	0
	Chabal	Gulhari	R-33 Gulhari C1a	2	0	0	0	0
	Chabal	Gulhari	R-33 Gulhari C1b	5	3	0	0	0
	Chabal	Gulhari	R-33 Gulhari C2	8	0	0	0	0
	Chabal	Gulhari	D-150 Gulhari	6	0	0	0	0
	Chabal	Gulhari	D-151 Gulhari	6	7	0	0	0
	Chabal	Gulhari	D-152 Gulhari	1	0	0	0	0
	Chabal	Gulhari	D-153 Gulhari	4	4	0	0	0

CHAPTER 11

Past systems of management

11.1 Historical account of Forest settlement

A historical account of forest settlement is crucial for any forest division as it establishes the legal status of forest land, clarifies boundaries, and records the traditional rights of local communities. It forms the basis for classifying forests as Reserved, Protected, or Village Forests, and guides the preparation of working plans and management strategies. These records help prevent encroachments, resolve land disputes, and ensure that forest governance is legally sound and socially inclusive. Additionally, it supports the implementation of laws like the Forest Rights Act, 2006, and facilitates sustainable forest management by balancing conservation goals with community needs.

11.1.1 Legal Position

The Solan Forest Division comprised two kinds of areas, namely, the Erstwhile Punjab areas and Old Himachal areas

11.1.1. a Punjab Areas:

The hill tracts of Shiwalik and outer Himalayan ranges came into the possession of the Patiala State over the time after the end of the Gorkha war in 1815 A.D. Not much attention was accounted to the protection and improvement of the forests until Lord William Hay, Superintendent of Shimla Hill States in 1860 directed the attention to the State to this aspect. A separate Superintendent of Forests was appointed in 1879 and later on, the Forest department was separated from the Civil Nazamat in 1881. The forest management started getting due attention from 1889 onwards. The Punjab government hired the services of Mr. G.G. Minniken, an officer of the Imperial Forest Service in 1890 A.D., for the purpose of making a regular and systematic settlement of the State Forests. Waste lands were demarcated and were reused as 1st and 2nd class forests. He submitted his final report in 1892, but this report lay without any action till 1903, when it was printed. Though it did not have the formal sanction of Ijlas-i-Khas, this settlement still remained in operation.

The work of the revision of Mr. Minniken's Forest Settlement was taken up by Rai Bahadur Kahan Chand, in 1907. He conducted the operations under the supervision and guidance of Major Popham Young Settlement Commissioner Patiala State, simultaneously with the revenue settlement. This final report was submitted in 1909 A.D. The First and Second class forests as defined by G. G. Minniken were declared as State property subject to the right of user. All other common lands were recorded as Shamlat Deh vide para 25-B in the Patiala forest rules sanctioned vide Ijlas-i-khas on Arazdasht number 422 dated 17th October, 1912 A.D., first and second class forests were treated as state property while rules for the management of Shamlat Deh were also framed. There was much criticism of the report by the Forest Department as they had reservations about the manner in which the Settlement was carried out. This report was never implemented, so the Minniken Settlement Report continued to be followed till 1933, when Mian Budhi Singh, a retired Indian Forest Service officer was appointed by the Patiala government to take up the revision of the forest settlement, which he completed in 1938. This is the settlement that is in force till date.

Mian Budhi Singh's Settlement report divided the Patiala State into two series viz. Dun' and Hill, based on the physical features of the tract. Of this only the Hill section pertains to areas of present Himachal Pradesh. He changed the nomenclature of 1st and 2nd class forests of Minniken's Settlement to Reserved and Demarcated Protected Forests respectively as he reined that the terms 1st and 2nd Class carried no meaning and were not governed by any law. None of the Un-demarcated or 3rd Class forests have been transferred to Himachal Pradesh as a result of reorganisation of the States. In addition to the above, nine 2nd Class forests that were disforested by Rai Bahadur Kahan Chand (under the guidance of Major Popham Young) in his Settlement of 1909 were included again as DPFs. Though orders restoring these areas to Forest department were announced to the villagers, they did not prefer appeals against them. These forests had remained as forest lands in the Forest records while they were still being recorded as "Shamlat Deh" in the Revenue Papers. Mian Budhi Singh's Settlement states categorically that necessary correction in the records is to be done in this respect.

The Koti and Koon forests were demarcated as DPFs under revenue settlement of Punjab and continued to be governed by Wazib-ul-urz of the adjoining villages. The Shamlat Deh lands have been transferred to the Government under H.P. village Common Land Act. 1974 and some areas have been vested with the Government under H.P. Ceiling on land holding Act 1972.

11.1.2. Past systems of management

11.1.2.1 General History of the Forests

In the absence of any historical records regarding the forests of this tract, it can be inferred that efforts toward forest conservation likely began around the mid-19th century. Notably, in 1872, the Superintendent of Shimla Hill States issued a directive to the various ruling chiefs, urging them to conserve and protect forest areas.

Prior to this, forests were primarily used as hunting grounds by the ruling chiefs, while the less productive areas were largely neglected. Additionally, nomadic grazers were permitted by each state in the region—both as a source of revenue generation and to function as a natural manuring mechanism for agricultural lands.

It was only after the arrival of the British in India, when the demand for firewood and timber—particularly in the plains—began to rise, that serious attention was directed towards the forests in the hills. Subsequently, in the year 1886, a decision was taken to categorize wastelands into two distinct groups.

The first category, consisting of well-wooded areas, was designated as permanent forest, while the second category, which constituted a larger portion, was reserved for the use of local right-holders. These classifications eventually evolved into what are now known as Reserved Forests and Demarcated Protected Forests.

Presently, the forests under the erstwhile Bhagat State, those transferred from Haryana, and the areas covered under Sandhu's Plan for the Kandaghat Forest Division form part of the Solan Forest Division. As a result of the reorganization of forest divisions in the then un-reorganized Punjab on 1st September 1961, a total of 36 forests—covering 6,561 acres (2,625 hectares)—were transferred from the Pinjore Range of Ambala Forest Division to the Shimla Hills Forest Division. These included 9 blocks of Reserved Forests (Class I) comprising 3,670 acres (1,468 hectares) and 27 blocks of Protected Forests (Class II) covering 2,891 acres (1,157 hectares). Following the merger of hilly areas with Himachal Pradesh on 1st November 1966, and the subsequent reorganization of forest divisions, these 36 forests were incorporated into the reorganized Solan Forest Division, where they remain to this day.

The past history of management of the forests of present Solan forest division can be broadly discussed in three parts.

- Kandaghat Forests and are as transferred from Haryana.
- Forests of Bhagat State.
- Kuthar Forests which were part of Kunihar Forest Division.

11.2 Past Systems of Management and their Result

The Working Plan of the Solan Forest Division, currently under revision, was originally prepared by Ms. Archana Sharma, IFS, for the period 2002–03 to 2016–17. Several working plans have been formulated over time for the effective management of forests in the Division, all of which have been detailed in the current Working Plan under revision.

The list of working Plan is as under.

- Fazal-U-Din's Working Plan (1906 to 1935)
- Mian Budhi Singh's Working Plan (1936 to 1955)
- Sandhu's Plan (1956–57 to 1986–87)
- G.S. Mathauda's Working Plan (1961 to 1971)
- K.K. Gupta's Working Plan (1983–84 to 1997–98)
- Archana Sharma's Working Plan (2002–03 to 2016–17)

11.2.1 Early Management (1815to1905)

Much is not known of this period but Mian Budhi Singh has divided this period into Three parts:

- Early management from 1815 to 1860AD.
- Period of organization by the Revenue Department from 1861 to 1878 AD
- Period of transition under Forest Department from 1879 to 1905AD

11.2.2 Regular Management (1906 to date)

11.2.3 1st Working Plan by Mr. Fazal-U-Din(1906-1935):

This was the first regular Working Plan, and it focused exclusively on First Class forests. Only two classes of trees were enumerated:

First Class: Trees with a diameter over 24 inches (above 60 cm)

Second Class: Trees with a diameter between 18 to 24 inches (45–60 cm)

The general observation noted that the forests were far from normal, exhibiting a highly uneven age structure, with a predominance of smaller trees. This Working Plan comprised the following six Working Circles:

- Deodar Working Circle.
- Chil Working Circle.
- Oak High Forest Working Circle.
- Oak Coppice Working Circle.
- Scrub Working Circle.
- Bamboo Working Circle.

11.2.3.1 Chil Working Circle

The Chil Working Circle comprised 30 forests, many of which still fall within the Solan Forest Division. A system of selection with improvement felling, based on a felling cycle of 10 years, was adopted.

The main objective of management was to achieve maximum timber production and to establish a more balanced distribution of age classes within the forest. The exploitable size was fixed at trees with a girth exceeding 6 feet (approximately 55–60 cm in diameter). It was assumed that a tree takes about 25 years to grow from second class (45–60 cm diameter) to first class (60 cm and above diameter).

While prescribing fellings, second class Chil trees were not considered, and operations were confined to silviculturally available first class trees only. However, it was proposed that mature trees of other species should also be removed along with the Chil trees, if silviculturally available. The forests located in the Joharji–Banasar belt were not worked, as the timber from these areas had no market value due to their remote location. Areas under improvement felling were primarily noted in the Ajmergarh, Dagshai, Barog, Khaldhar, and Chabil forests, which had been subjected to periodic forest fires in the past. This often necessitated the extraction of fire-damaged trees from time to time.

11.2.3.2 Oak High Forest Working Circle

It covered an area of 3067 acres (1227 Ha) but only the R-21 Karol of the present Solan Forest Division was included. These forests were managed under Selection cum improvement fellings and an exploitable diameter of over 24" (60cm diameter) was fixed. The second-class trees were not considered as they were not expected to survive the second rotation. Moreover, many trees were to be removed in improvement felling as well. Only 50 per cent yield was extracted from the Karol Forest due to lack of demand and all areas prescribed for working under the circle could not be regenerated properly due to uncontrolled grazing. The older trees became unsound and hollow, thereby, becoming unfit to produce vigorous coppice shoots.

11.2.3.3 Oak Coppice Working Circle

This Working Circle covered 1,367.5 acres (547 hectares) of oak forests, where the growth primarily consisted of coppice shoots. The oak forests of the present-day Kandaghat and Solan Ranges were managed under this circle. The prescribed system was coppice with standards, with a rotation period of 30 years. The annual felling coupe area was approximately 33 acres (13 hectares), with retention of 25 standards per acre (or 62 standards per hectare). Additionally, all saplings with a girth below 9 inches (23 cm diameter) were to be retained. After harvesting, the coupe was to be closed for 10 years and sown with oak seeds to promote natural regeneration. The Bisha, Karol, and Shahog Bhadrog forests were not worked due to lack of sufficient demand.

11.2.3.4 Scrub Working Circle

These forests were heavily felled in the past, but were recovering gradually, and the crop comprised chiefly of coppice shoots. Fazl-U-Din, therefore, prescribed coppice with standards system, leaving 25 trees per acre (62/Ha). Rotation was fixed at 30 years, keeping in view the coppicing ability of the stools. An area of 251 acres (100.4 Ha) was prescribed to be worked for ten years. This posed a problem as these forests were heavily burdened with rights. To mitigate this, each forest was divided into 3 coupes, and each coupe was to be worked at an interval of 10 years, with the middle ones being taken up first. As the output was of poor commercial value and

the forests were too far from the market, the prescriptions of the Working Plan fell in areas prescribed could not be worked at all.

11.2.3.5 Bamboo working circle

Felling of bamboo areas was prescribed on a 2 years cycle and this circle was overlapping with scrub working circle. The forests were being worked on a regular basis (except from 1918 to 1922). Contracts for the removal of dry bamboo felling refuse used to be sold in the following years, but no attempt was made to carry out cleaning and removal of inferior shoots. During the later period of plan, the number of standards (Manus, Chals etc.) to be retained per clump was reduced to 8 from the previous 10 and afterwards to one fourth of the total number of bamboos in a clump with a minimum of 4 bamboos.

11.2.4 IInd Working Plan by Mian Budhi Singh (1936-1955)

This plan comprised the following seven Working circle:

- Deodar Working Circle
- Chil Working Circle – 3411.6 Ha
- Oak Working Circle – 546 Ha
- Scrub Working Circle – 3687.9 Ha
- Bamboo Working Circle – 252.8 Ha
- Protection Working Circle – 319 Ha
- Khair Working Circle

The Deodar Working Circle of this plan covered areas of Chail and Taradevi Ranges, which were no longer a part of Solan Forest Division at that time, and are therefore not discussed here.

11.2.4.1 Chil working circle

This working circle comprised all the pure chil forests and areas with mixed chil, ban oak, chil-scrub vegetation in both I class and II class forests. 8529 acres (3411.6 Ha) of II class forests were brought under regular management for the first time. An area of 123.1 Ha of I class forests that was managed under Chil working circle in Fazal-Ud-Din's working plan was transferred to protection working circle, owing to poor quality of chil in these forests.

The crop was enumerated in three diameter class i.e. over 60 cm (class I), 45-60 cm (class II) and 30-45 cm (class III). The percentage of class I trees was found to be low. Deodar coming up naturally was to be favored as far as possible. The silvicultural system adopted was the same as in the earlier plan i.e. selection felling with a felling cycle of 10 years.

Rotation was fixed at 130 years and the yield during the plan period was fixed half of the number of I class trees in both I class and IInd class forests. All prescriptions were carried out. Rather there was overexploitation than the 50 percent of the enumerated trees because of an oversight to account for removals made in 1936-37 and 1937-38 as part of the provisional programme.

Light thinnings were prescribed especially in the early stages but as the prescriptions were not specific and markings were not done, it resulted in congestion in the good Chil crop in many forests.

11.2.4.2 Oak Working Circle

It comprised of two felling series I and II. The felling series I had all Ban Oak forests that were covered under the oak high forest working circle in the Fazul-Ud-Din's Plan. The area of the I

class forests in this series was increased from 3067 acres to 3158 acres and 4906 acres of second-class forests were newly added.

The felling series II comprised of forests covered under the oak coppice working circle of Fazal-Ud-Din's Plan. The area here decreased from 1367.5 acres to 1351 acres and no second Class forest was allotted to this series.

Felling series I: Selection system combined with improvement felling was continued as in Falzal-Ud-Din's plan, but the felling cycle was reduced to 10 years from the earlier 15 years. There were 2 distinct categories of forests under the felling series I as under:

a) Forests which had all age class closely intermixed and/or which had been worked in the past under Oak High Forest system

b) Forests which had been worked under coppice with standard system or which contained only young crop.

The category (a) forests were to be worked on true high forest working system while the (b) category forests were to be converted to high forests.

11.2.4.3 Scrub working circle

A total of 9,113 acres was allotted to this working circle, but after the creation of the Siwalik Forest Division, only 977 acres remained with this division. Coppice with standards was the silvicultural system adopted, with a rotation of 30 years and an annual coupe of 328 acres was prescribed. 25–30 standards of the principal species per acre were to be retained, with a greater number of trees being retained on ridges and in areas vulnerable to denudation. Chil, Bamboo, and Khair were also to be retained as standards wherever they occurred. IN Bamboo areas, undergrowth was to be left intact. Stumps were to be kept 6" to 8" above ground. Each coupe was to be closed for grazing and grass cutting for a period of 10 years after felling.

11.2.4.4 Bamboo working circle

The area under this working circle remained the same as in Fazl-Ud-Din's Working Plan, i.e., 632 acres (252.8 Ha). The silvicultural system adopted was selection with thinning, based on the condition and requirements of the crop. Congested clumps were to be cleaned, and all dry, useless, and commercially inferior shoots were to be removed before the development of new bamboo shoots.

A felling cycle of 3 years was adopted, which could be reduced to 2 years in case of intensive departmental felling. Working was carried out through contractors, and the following felling rules were laid down.

1. The felling period was fixed between middle of October and end of February, but in practice it remained from 15th September to end of April each year.
2. Although digging of rhizomes was not permitted, but actually the number of rhizomes permitted to be dug out had been limited to one-sixth of the value of the produce removed on royalty basis.
3. Cutting of Bamboo was to be done with a sharp edged instrument at a height not more than 60 cm above ground level, leaving a minimum of 2 nodes.
4. No culms of the previous rains were to be cut and twice as many old culms as there were new culms were to be retained per clump. On the whole, at least 12 culms (old and new) and a maximum of 12 old culms per clump were prescribed to be retained. The older culms so retained were to be, as far as possible, evenly spaced on the periphery of the clump. But since good quality lathi, chatti are usually obtained from young clumps, there

was violation of this rule of retaining a minimum number of culms, and the culms retained after exploitation in young clumps were far less than the minimum of 12 culms.

5. In years when flowering occurred, no culms were to be cut till the seed had been shed. During the plan period (1936–55), no gregarious flowering was reported though.
6. Selection Working Circle.
7. Afforestation Working Circle.

11.2.4.5 Chil Shelter Wood Working Circle

The Working Circle comprised all those Chil forests that were better stocked and of silvicultural and economic Important. It covered an area of 10906 acres (5035.2 ha, i.e., 2346 ha of Reserve+2689.2 ha of DPF) of which 672.8 ha comprised area transferred from Haryana in 1961. An Area of 1100.8 ha of this working circle has since been transferred to Tara devi and Chail Range. The forests had variable density and were on the whole under-stocked, with general absence of young age classes in most forests enumerations were carried down to 20 cm diameter in 10 cm diameter classes.

The Silvicultural System adopted was the Punjab Shelterwood system where three felling series were created and forests allotted to P.B. I and P.B. un-allotted respectively. Three types of felling viz Seeding, Secondary and final were prescribed in the P.B I area. Though it was mentioned that each compartment allotted to P.B.I should be completely regenerated during the plan period, still it was expected that regeneration would establish itself in 10 years, which is ambiguous. It was prescribed that in order to avoid difficulties faced in complete closure of compartment, only one third of each compartment be closed to grazing for a period of 10 years at one time and seeding felling carried out in the beginning itself. The same process was to be repeated in the 2nd decade and 3rd decade. Grass cutting was disallowed in the P.B.I areas as it does not permit regeneration to come up. Sowing of Chil was prescribed to be undertaken in P.B.I areas to achieve the targets of regeneration in the shortest possible time.

Artificial regeneration was to be taken up from the very beginning at places where natural regeneration was not likely to occur. Only thinning were prescribed in P.B. un-allotted areas.

Resin tapping works done by French Cup & Lip Method were far from satisfactory and not carried out as per instructions laid in Punjab leaflet no. 13.

11.2.4.6 Oak Coppice Working Circle

This Working Circle contained all the areas under Ban Oak, except those that were poorly stocked. It covered an area of 1992.20 ha, of which 923 ha were Reserved Forests and 1062.2 ha were Demarcated Protected Forests (DPFs). Most of these forests were in the Chail and Tara devi Ranges and have since been transferred to other Forest Divisions.

Since yield control was to be by area, enumerations were considered unnecessary and were not undertaken. Three felling series were constituted after each range in which these forests occurred. The silvicultural system adopted was coppice with standards & retention of 25 – 30 trees per acre as standard was laid down. The number of standards (50 trees/acre) in steep and dry areas was the norm prescribed.

The coppice rotation was fixed at 30 years and that of the standards at 120 years. Control over yield was to be by area, and annually 64 ha was prescribed to be worked. To enhance crop value, the introduction of valuable species like Deodar and walnut in suitable coppiced areas was suggested. Felling rules were framed, and a closure period of 10 years was prescribed for the worked coppiced area.

Plantations of Deodar were successful, but those of walnut were not. Most of the forests close to habitation could not regenerate effectively, as coppice shoots were frequently lopped and hacked by local people.

11.2.4.7 Protection Working Circle

The areas included under protection working circle were areas mostly without any tree growth or with poor tree growth. It also included 13 forests, the legal position of which as far as revenue record was concerned was also then awaiting sanction of the government. The management was to aim at protection of the soil and preservation of forest cover in general by rotational closures. No felling except for the requirement of the right holders in satisfaction of their rights were concerned, only some suggestions in case of first Class forests were made. The conservator of hill forest was given discretion to extend the cultural works in second class forests also when the funds become available.

11.2.4.8 Khair Working Circle

Budhi Singh vide Para No. 148 of the working plan discussed the possibilities of Katha industry in the constituted hill forests of erstwhile Patiala state. During the currency of Budhi Singh's Plan no Khair fellings were done.

11.2.5 Sandhu's Plan for Management of Kandaghat Forest(1956-57to1986-87)

The following working circles were constituted:

Table 11.1: Working Circles in Sandhu's Plan for Kandaghat Forest

Deodar Shelterwood Working Circle	
Chil Shelter wood Working Circle.	10070.4Hac
Oak Coppice Working Circle.	1992.20Hac
Scrub Coppice working circle.	776 Hac
Bamboo working circle.	940 Hac
Selection Working Circle.	101.6 Hac
Afforestation working circle.	3607.8Hac

The Deodar Shelterwood Working Plan is not discussed under this Working Plan, as all the forests of the Tara devi and Chail Forest Ranges were no longer a part of the present Solan Forest Division.

11.2.5.1 Deodar Working Circle

This Working Circle comprised all the Deodar and Kail areas and continued to cover almost the same forests as in the previous plan. Complete enumerations were carried out down to 20 cm diameter, categorized in standard 10 cm diameter classes. The exploitable diameter for Deodar, Kail, and Chil was fixed at 60 cm diameter at breast height (d.b.h.).

The silvicultural system adopted was the Punjab Shelterwood System. Only thinnings were prescribed in compact portions of immature woods. The rotation was fixed at 150 years, and five periodic blocks of 30 years each were constituted.

11.2.5.2 Chil Shelterwood Working Circle

This Working Circle comprised all Chil forests that were better stocked and economically important. Enumerations were carried down to 20 cm diameter, categorized into 10 cm diameter classes. Three felling series were formed. The rotation was fixed at 120 years, with an exploitable diameter of 60 cm. Four periodic blocks were constituted.

Three types of fellings—seeding, secondary, and final—were prescribed. Regeneration was expected to be completed within 10 years. However, as the entire forest was planned to be felled in 21 years, it led to challenges related to closure and regeneration, which needed to be addressed.

11.2.5.3 Oak Coppice Working Circle

This included all the Ban forests. No enumerations were carried out since the control was by area. Three felling series were made. Silvicultural system adopted was coppice with standards. Rotation of the coppice was 30 years and that of the standards 120 years. Yield control was by area and 64 hawas prescribed to be gone over every year. Detailed felling rules were framed. Each coupe was to be closed for a period of 10 years. These areas were to be restocked with deodar and walnut where suitable soil and moisture conditions were prevailing.

11.2.5.4 Scrub Coppice Working Circle

All the scrub forests in which the proportion of bamboo was below 40 per cent were allotted to this working circle. No enumerations were carried out. Silvicultural system adopted was coppice with standards. Detailed felling rules were made. Rotation of coppice was fixed at 30 years and that of standards 90 years. No yield was calculated and annual coupe of 24.80 Ha was prescribed.

11.2.5.5 Bamboo Working Circle

All the scrub forests which had about 60 per cent or above proportion of bamboo were allotted to this working circle. No enumerations were carried out. Silvicultural system prescribed was selection felling and thinning in individual clump. Annual yield of 3,00,000 bamboos was estimated.

11.2.5.6 Selection working circle

This circle contained forests adjoining the Kalka–Shimla railway line, forests forming the catchment area of the Chail waterworks, and forests near the Snow View Point and the Chail Cricket Ground. Trees above 75 cm in diameter were enumerated throughout the entire working circle. Improvement fellings and thinnings were prescribed, and one-third of the area of each forest was to be closed from 1st April 1965. Yield was regulated by area, and 36.10 hectares were prescribed to be thinned annually. Forests around Chail remained preserved, while those along the Kalka–Shimla railway line and the National Highway remained untouched.

11.2.5.7 Afforestation working circle

This contained the remaining forest which could not be allotted to any other working circle and no enumerations were done. Annual planting programme was framed. There were sufficient funds under the various development schemes in five year plans and the afforestation programme was carried and mostly Khair and bamboos were planted.

11.2.6 G.S. Mathauda's Working Plan for Kuthar Forests (1961-1971)

Following working circles were constituted:

- a) Chil working circle. 1237.6Hac
- b) Coppice working circle. 321.6Hac
- c) Bamboo(partly over lapping) working circle.
- d) Plantation (partly over lapping)working circle.182Hac
- e) Protection working circle. 319Hac

11.2.6.1 Chil Working circle

This working circle contained all Chil forests where it occurred purely or formed a substantial part of the crop, and where the shelterwood system could be applied. Total enumeration of the growing stock down to 20 cm was carried out in 10 cm diameter classes. Rotation was fixed at 120 years with an exploitable diameter of 60 cm. Three types of felling were prescribed: seeding, secondary, and final felling in PB-I areas. It was emphasized that all three types of regeneration felling could take place simultaneously in an area, according to the regeneration programme. No fellings were to be done from PN-II areas.

11.2.6.2 Coppice working circle

This included Oak and deciduous broad leaves forests. The forests were to be worked on coppice with standards system. Rotation was fixed 35 years for coppice and 70 years for standards. Yield was fixed on the basis of net wooded area. The felling according to the proposed programme could not be done.

11.2.6.3 Bamboo (Partly overlapping) working circle

Only one forest compartment of D-293 Daiar (c6) was wholly managed under this working circle. Compartments 4, 5 and 7 of the same forest were partly managed under the working circle and mainly were under the Kalka Felling series of coppice working circle. Silvicultural system adopted was that of selection felling and thinning with each clump as an independent unit of working. 3 years felling cycle was adopted.

11.2.6.4 Plantation Working Circle

This working circle primarily comprised the in accessible oak areas and scrub forests which were suitable for raising valuable Plantations. only an area of 182 Ha. Out of the total of 2172 ha was transferred to the present Solan Forest Division out of which a further 22 ha of DPF Shilli is also now no longer a part of this Division. An annual programme for plantation was chalked out and modest targets of plantation works were fixed for the plan period. Planting of Eucalyptus was given preference in suitable areas.

11.2.6.5 Protection working circle

The subject for management were

- (a) To protect the areas against denudation an erosion
- (b) To give rest to overexploited areas and to provide for their improvement within practical limits

The areas were to be simply protected and no fellings were to be made, save for meeting the demands of right holders.

11.2.7 K.K. Gupta's Working Plan (1983-84 to 1997-98)

Following working circles were constituted:

- a) Chil working circle 4845.60 Ha
- b) Oak working circle 1172.6 Ha
- c) Rehabilitation working circle 6008.6 Ha
- d) Tourist complex working circle 3691.2 Ha

11.2.7.1 Chil Working Circle

It comprised all the Chil forests of the tract, except those allotted to the Tourist Complex Working Circle and also those with poor density or located on steep slopes. Complete enumeration of Chil in 10 cm diameter classes down to 10 cm DBH was done.

11.2.7.1.1 Analysis and Valuation of the Crop

Complete enumeration of Chil in 10 cm diameter classes down to 10 cm dbh was done. The average site quality of these forests conformed to Site Quality III with crown density varying from 0.3 to 0.8. The total growing stock of Chil was assessed as 66.18 M3 per ha and number of trees (class V and above) per ha. was worked out at 116.

11.2.7.1.2 Silvicultural system

The silvicultural system adopted was the Punjabi Irregular Shelterwood System. A rotation of 120 years with an exploitable diameter of 60 cm was adopted. With the regeneration period fixed at 30 years, four periodic blocks (PBs) were constituted, and definite allotments to various PBs were made as under:

Table 11.2: Periodic Blocks in Chil Working Circle

P.B.	Area Ha	Nature of crop
PBI	1032.8	i) un regenerated or partially regenerated area of Previous Working Plan
		ii) Where regenerated exists in patches and can be taken advantage of iii) Poor density forests where density is less than 0.4
PBII	1034.8	i) Middle aged to mature crop with relatively better density
PBIII	1117.2	Areas of the working circle not allotted to any other PB, having pole to middle aged crop.
PBIV	727.2	i) Forests having established regeneration

11.2.7.1.3 Yield Regulation

Yield was prescribed only from Periodic Block I (PB I) and Periodic Block IV areas. No green fellings were prescribed from PB II and PB III areas. The yield was calculated using Hufnagel's

Formula. From PB I areas, 70% of the total volume available in Class IIA and above was recommended for extraction, along with 30% removal in Class III and IV. The annual yield prescribed from PB I areas was 3,200 m³. From PB IV areas, 85% of the total volume of Class IIA and above was prescribed for removal, with 15% retained as fire insurance reserves. No removals from the lower classes were recommended as the crop density in these classes was already very low. The annual yield from PB IV was 1,400 m³. An additional 1,400 m³ was expected to be available through salvage removals, without affecting the planned removals from PB I and PB IV areas. Hence, the total annual yield for the working circle was fixed at 6,000 m³, although it was clearly stated that no attempts should be made to achieve the total prescribed yield. All removals down to Class V trees were to be counted toward the yield of the working circle, and the actual yield obtained must not exceed 10% of the prescribed yield. It was emphasized that the yield should be reviewed every three years, with silvicultural availability being of paramount importance. The sequence and method of executing markings and fellings were also explicitly laid down. Subsidiary silvicultural operations in PB I areas were specified and emphasis was given to natural regeneration by closures; to be supplemented by artificial regeneration, where ever necessary.

For ensuring Fire Protection, few new fire lines were proposed maintenance of old fire lines was emphasized. A detailed programme controlled burning was prescribed at 4 years intervals.

Due to damage caused by continuous and defective resin tapping, the Working Plan advocated a system of giving rest to about one-fourth area from resin tapping in a rotational manner and a programme was appended to this effect Resin tapping was not allowed in PB I areas also. The W.P.O suggested adoption of Rill Method for resin tapping over the conventional French Cup and lip" method.

11.2.7.1.4 Results of implementation of the Plan:

Due to a general moratorium on green fellings, most of the PB I and PB IV areas prescribed for fellings under the plan were not worked. Only four forests ie. D-42 Ajmerghar, R-31 Barog, R-47 Karalghat and R-49 Gadiar were worked during the plan Period. Nevertheless 71383.379m³ was removed from this working circle. Which is an deficit of the prescribed yield of 900000m³.

Table 11.3. Yield Prescribed and removed from Bamboo area during 1983 -1998

Year	Yield (ha)		Deviation (ha)
	Prescribed (ha)	Felled (ha)	
1983-84	195	47	-148.0
1984-85	195	123	-220.0
1985-86	195	252.8	-162.2
1986-87	195	105	-252.2
1987-88	195	180.4	-266.8
1988-89	195	195	-266.8
1989-90	195	205.6	-256.2
1990-91	195	119	-332.2
2091-92	195	192	-335.2
1992-93	195	195	-335.2
1993-94	195	205.6	-324.6
1994-95	195	162.4	-357.2
1995-96	192	0	-549.2
1996-97	195	195	-549.2
1997-98	195	0	-744.2
Total	2922	2177.8	

Table 11.4: Yield Prescribed and removed from Chil working Circle during 1983-1998

Year	Prescribed Yield m ³	Actual Yield m ³
2012-13	4200	2031.3789
2013-14	4200	3507.818
2014-15	4200	5693.1061
2015-16	4200	1059.4222
2016-17	4200	2934.949
2017-18	4200	4785.25
2018-19	4200	2571.122
2019-20	4200	3672.848
2020-21	4200	2395.132
2021-2022	4200	1403.78

11.2.7.2 Oak Working circle

This working Circle included all Oak forests of the division, except those situated near tourist complexes along national highway and the railway line, and also those containing vital water sources. The total area allotted to this working circle was 1263.4 ha, of which 482.4 ha fell under Reserved Forests, and the remaining 780.6 ha belonged to Demarcated Protected Forests (DPF). Out of the Reserved Forest area, 90.4 ha transferred to Shimla and Shimla Forest Division as part of the Tara devi Range. Therefore, the area currently under this working circle in the present Solan Forest Division is 1,172.6 ha.

11.2.7.2.1 Analysis and Valuation of Crop

Enumerations were not conducted, as no commercial fellings were proposed. It was observed that coppice shoots had come up well only in those forests that were away from habitation and where biotic pressure was low. Regeneration was, by and large, unsatisfactory. To improve Ban oak stocking, an oak planting programme was planned, under which 10 ha area was to be taken up for Ban oak planting annually. No yield or its control was prescribed.

11.2.7.3 Rehabilitation working circle

This working circle contained all the scrub forests, bamboo areas, and blank areas not fit for allocation to other working circles. It also included very open Chil areas not suitable for management as Chil forests. The area of the working circle was 6,008.6 hectares, and it was the major working circle of the plan.

The main objectives of management were to meet local demands and to improve the stocking and environmental condition of the degraded forests. The silvicultural system adopted was clear felling, with the retention of commercially important species such as Sain, Sheesham, Tun, Khair, and Chhal as reserves.

Artificial regeneration, using sturdy nursery stock of economically important species, was to follow the fellings. A rotation of 30 years for coppice crops and 90 years for the reserve species was prescribed. Bamboo areas were to be managed under a four-year felling cycle. No yield was prescribed from scrub areas.

11.2.7.4 Tourist complex working circle

This working circle was created as a new working circle and included all forest areas situated in and around the tourist complexes of Barog, Chail, and Shimla; forests along or around the National Highway and the Kalka–Shimla railway line, important from soil conservation and aesthetic points of view; and those forests that constituted the catchments of important water supplies to various places, etc. The main objectives of management were to preserve the environment and maintain the areas from aesthetic and tourism angles. The total area of the working circle was 3,691.2 ha, but with the deduction of Chail and Tara devi Ranges, now only 1,200.2 ha of this working circle remains with the present Solan Forest Division. Of this, Reserve Forests comprise 216.4 ha and Demarcated Protected Forests another 983.6 ha.

Improvement of stocking in most areas along the National Highway, railway line, and around the Barog tourist area was suggested, and it was left to the Territorial DFO to prepare the annual planting programme. Ornamental plants could be planted in Chil areas along the National Highway and railway line, while the rest of the forest could be enriched with the predominant species of the forest.

11.2.8 Archana Sharma's working Plan (2002-03 to 2016-17)

The following working circles were constituted:

- 1) The Chil working circle. 3840.20Hac
- 2) Ban Oak working circle. 1500.80Hac
- 3) Protection cum rehabilitation working circle. 6402.80Hac
- 4) Bamboo(overlapping)working circle. 2133.30Hac
- 5) The soil and water conservation (overlapping)working circle.

11.2.8.1 The Chil Working Circle

This includes all Chil forests of the working plan under revision. These forests were to be worked under the Punjab Shelterwood System. Regeneration was to be obtained naturally, supplemented with artificial regeneration. This Working Circle comprises all the Reserve and Demarcated Protected Forests of the Division which have Chil as the main crop, are better stocked, and situated on moderate terrain. The Working Circle is much the same as the Chil Working Circle of the previous plan, except for forests of the transferred Chail and Taradevi Range, which are not covered by this Division. In addition, some forests from the Tourist Working Circle of the last plan have been brought back to this Working Circle because no treatment was prescribed for the forests of that Working Circle, and as such, the crop became more or less irregular. In order to manage these forests on scientific lines and under specific prescribed treatment, these forests have been brought under the Chil Working Circle. The total area of this Working Circle is 3,840.20 ha.

11.2.8.1.1 General constitution, character and valuation of crop

The crop is pure with few associates like *Pistacea integrima*, *Sapium insignae*, *Pyrus pashia* etc. In the lower reaches Chil is invaded by and being partially replaced by scrub species and lanatana bushes while in the upper reaches chil is seen making ingress into ban oak areas. The total area of this working circle is 3840.20 ha under Solan Forest Division

11.2.8.1.2 Stock Maps

The whole area of this working circle was stock mapped on a scale of 1:15000. General site quality was III. The density varied from 0.1 to 0.9 with the average being 0.5. The quality varies from locality to locality, but on the whole the average quality of chil in this Division is III. Total enumeration of Chil was carried out in all forests falling in this working circle which was carried out in 10cm dia classes down to 10cm d.b.h. The average growing stock of Chil is 79.787 m³ per hectare.

11.2.8.1.3 Silvicultural System, Rotation and Conversion Period

The forests were to be managed under Punjab Shelter wood system or the Indian irregular shelterwood system. Natural Regeneration in PB-I are as was to be supplemented by artificial regeneration wherever necessary. The rotation of 120 years was adopted. Four periodic blocks were constituted with specific allotment. The regeneration period of 30 years was therefore adopted.

11.2.8.1.4 Regeneration Period

A period of 30 years has been fixed as the regeneration period and accordingly the rotation has been divided into four Periodic Blocks.

11.2.8.1.5 Calculation & control of yield:

Yield for this circle was calculated by volume separately for PB-I, PB-Inter and PB-IV on the basis of enumeration results. The CAI of the entire growing stock of chil down the class 10cm Dbh comes to 8351.563m³. Though the annual removals could be to the extent of 8400 m³, yet keeping in view the generally understocked nature of the forests and also the threat from factors like climate, fire etc. it was prescribed that the limit of total removals from this working circle should be to the tune of only 50 per cent. Hence, the total prescribed annual yield was fixed at 4200m³ which was distributed as follows:

$$\begin{array}{rcl} \text{Yield from PB-I} & = & 500 \text{ m}^3 \\ \text{Yield from PB-IV} & = & 2500 \text{ m}^3 \end{array}$$

The remaining margin of about 1200m³ was to be adjusted against the salvage removals to be made from the PB Inter annually, without affecting the removals from PB I and PB IV areas. Felling Programme for Chil Working circle of Solan forest Division

11.2.8.1.6 Regeneration felling

No regeneration felling has been undertaken due to ban on green felling. However, on the basis of selection felling trees has been given to right holder in T.D. besides salvage marking has also been carried out.

11.2.8.1.7 Sowing and planting

It was presumed that if adequate protection against fire and grazing is ensured, sufficient natural regeneration of Chil is expected to come up in areas having sufficient number of uniformly distributed seed bearers. If on account of some unfavourable factors, adequate natural regeneration of Chil does not come up within four years of seeding felling, artificial regeneration had to be resorted to.

11.2.8.1.8 Regeneration status

The regeneration status in the forests which were worked during plan period is satisfactory.

11.2.8.1.9 Cultural operations

Subsidiary Silvicultural Operation suggested in PB-I areas were carried out by removing there fuse and effective closure of the areas and regeneration by artificial planting/regeneration including, cleaning of the areas as safeguard against fire hazards. Control burning was followed and fire lines maintained as per availability of funds as per recommendations.

11.2.8.1.10 Control burning

The control burning was followed and fire lines maintained as per availability of funds as per recommendations. The Chil forests of this tract are highly susceptible to fire of accidental and intentional types and are subjected to frequent fires in the months of April to June. Between the year 1983-84 to 2000-2001, as per record of this Division, total 11388 ha forest area was damaged by fire. There are some factors which contribute to fire damage like high temperature, low humidity and inflammable material. Large areas of Chil get burnt every year.

11.2.8.1.11 Result of implementation of the plan:

- No green felling in PB-I to PB-III and PB-IV were carried out during the plan period.
- There are large number of regenerated Chil areas in PB-I and PB-IV in the working circle, which require immediate removal of the over wood. However, this silvicultural requirement could not be followed due to ban on green felling.
- The chil forests prescribed under PB-IV and PB-I areas were left to meet the demand of right holders as per the provision of settlements. No thinning cum improvement felling programme was prescribed for PB- III areas.
- Resin tapping by rill method has been adopted as per recommendation of Resin Advisory Committee, where tapable diameter has been suggested to be kept at 35 cm and above and acid concentration was to be diluted.

Critical Appraisal:

- It was worked under Indian Irregular Shelterwood system. Yield was prescribed in PB-I and PB-IV
 - The prescribed yield viz. seeding, secondary, final and thinning cum improvement felling were to be carried out but could not be done due to ban on green felling.
 - Due to fire, grazing and lack of proper opening of crop, regeneration remained deficient.
 - Special objects of the management could not be achieved.
- As no felling desired under Indian Irregular Shelter-wood system in Working Plan was carried out, no PB I areas can be designated as on date. Therefore, it is better that Indian Irregular Shelter wood system is replaced with Selection System.

11.2.8.2 Ban oak Working Circle

The working circle includes all the Ban Oak forests situated in the tract. Since, there was ban on the green felling of Oak trees; no felling was done during this plan period.

11.2.8.2.1 General character of the vegetation:

This working circle included all the areas under Ban oak whether well stocked or otherwise, falling in the Kandaghat and Solan Forest Ranges. No felling was recommended and areas were to be preserved for their ameliorative and aesthetic value. The total area of the working circle was 1500.80 Ha.

11.2.8.2.2 Analysis & valuation of the crop:

Random partial enumeration was done and only 5% forests were enumerated. No silvicultural system was prescribed as there is ban on felling of ban oak. Instead ban oak was to be managed under a system of planting and improvement fellings, in which only the dead, uprooted and fallen trees had to be removed that too only to meet the demands of the local right-holders. Rotation was not prescribed as no silvicultural fellings were indicated.

11.2.8.2.3 Results of implementation of the plan:

No commercial felling was carried out and only dead, dry, uprooted & fallen trees were removed in salvage marking & utilized for meeting the requirements of the right holders. The planting programme was prescribed, but not much has been achieved under it as most of the forests still

are under stocked. The weeding, cleaning and other cultural operations were not carried out for want of funds. The control over lopping of Ban- Oak trees as envisaged could not be enforced effectively resulting in depletion of growing stock and degradation especially in near habitation but status of these forests is good where biotic pressure is low.

Critical Appraisal:

Heavy lopping for fodder purpose has been noticed in these forests near habitation.

11.2.8.3 Protection cum Rehabilitation Working Circle

This working circle comprises all the Reserve, Demarcated Protected and Un-demarcated forests of the Solan Forest Division in which the prime object of management is protection in order to check the on-going steady deterioration of the forests; coupled with efforts to improve the ecology and growing stock of these areas. The total area allotted to this working circle was 6402.80 Ha.

11.2.8.3.1 General character of the vegetation: -

The vegetation consists of a heterogeneous mixture of different species and its composition varies with altitude and aspect. The overall density of the scrub areas is generally poor and the forests are degraded with profuse incidence of Lantana bushes which frustrates all efforts to regenerate the area either through natural means or artificially. Many steep and precipitous areas are under severe threat of soil erosion and require specific measures to halt the degradation process. Generally, the existing blocks and compartments were retained but few forests and compartments were further sub-divided as they were either too large for effective management or had distinct variation in crop composition e.g. R-54 Karardev, D-166 Dhar, R-56 Parwanoo, D-231 Jangesu are few such forests.

11.2.8.3.2 Method of treatment:

No silvicultural system was prescribed as the prime objective of constituting this working circle is to provide adequate protection to check the steady deterioration of the forests and no fellings were proposed except for khair trees which occur sporadically, which were to be felled on the principle of selection system. However, dry and fallen trees could be removed if need arises for exercise of rights by right holders.

11.2.8.3.3 Results of the implementation of plan:

Though no yield was prescribed and the only removals suggested were to meet the demands of the right holders and salvage removal of trees i.e. dead, drying, dry and uprooted trees as prescribed in the plan. Regeneration in these forests is very poor and artificial regeneration is also inadequate.

Critical Appraisal

The areas could not be stocked due to financial constraints as well as refractory nature of the sites.

11.2.8.4 Bamboo (overlapping) working circle

This working circle comprises 2,133.30 hectares of Reserve and Demarcated Protected Forests that form part of the Rehabilitation Working Circle. The forests and compartments included have a compact bamboo crop covering an area of 891 hectares, which can be worked intensively under a regular system of bamboo management.

11.2.8.4.1 Blocks and compartments

As the forests/compartments in some cases were very large and unwieldy, they have been further divided/sub-divided into smaller units mainly with the view to facilitate management e.g D-200 Dhanota Chakli compartment C-1 having an area of 199.2 ha has been further sub-divided into four sub-compartments on the basis of the vegetation and sub-compartment C1b and C-1d were allotted to Bamboo working circle as there is fair proportion of bamboo in them.

11.2.8.4.2 Enumerations

Enumerations for assessing the density of the clumps were done over 5 per cent of the area of each compartment. On an average the density of clumps per hectare comes out to 381 clumps in Lugon area of the division while in the Parwanoo belt the number of culms per ha is much higher at 759. Most of the clumps have a circumference ranging from 1-3 meters though a few clumps attained a circumference of more than 5 meters.

11.2.8.4.3 Silvicultural system

The silvicultural system prescribed for bamboo working is “Culm Selection cum clump improvement” i.e. selection felling and thinning in individual clumps. This was to be preceded by cleanings wherever necessary.

11.2.8.4.4 Felling Cycle

Keeping the yield, market demand and commercial value in consideration, a felling cycle of 3 years is adopted.

11.2.8.4.5 Methods of Treatment

Bamboo culms over the 5th year show signs of deterioration, while those of 2 years or less are raw and do not fetch a good market value. The proper time for exploitation is between the 3rd and 5th year. A clump is considered the unit of management, and yield should be based on net increment (i.e., annual production of manus minus losses due to malformation, decay, or deterioration). A clump remains healthy and vigorous only if the number of old culms removed equals the number of new culms produced. It is prescribed that the number of culms retained should not be less than the number of healthy culms from the two preceding seasons, i.e., manus and chals.

Critical Appraisal

- i) Regular financial allocations was a bottleneck in cleaning and decongestion of the bamboo clumps,
- ii) Since 2006-07 to 2014-15, bamboo plantations in various forests were undertaken under Nation Bamboo Mission programme. A total of 455 Ha bamboo plantations was carried out in Dharampur, Parwanoo and Kandaghat Forest Ranges.

11.2.8.5 Soil and Water (overlapping)Working Circle

This working circle overlaps with all other working circles, covering the entire division. Since a major portion of the Solan Forest Division lies within the ecologically fragile Shivalik Hills, special emphasis needs to be placed on soil and water conservation. Accordingly, specific schemes such as the RVP (River Valley Project), IWDP (Integrated Watershed Development Programme), and Kandi Hill were implemented to address this issue. During the tenure of Archana Sharma's Working Plan, significant soil and water conservation works were carried out in the Solan Forest Division. Noteworthy initiatives, such as the construction of Van Sarovars and various water harvesting structures, were undertaken. Although a few catchments were partially treated, there remains considerable scope for further catchment treatment. One of the major hindrances to achieving this goal is the paucity of funds.

11.3 Special works of improvement undertaken

a) Buildings constructed

Details of buildings constructed during the WP Period of Solan Forest Division 2006 to 2024-25.

Table 11.5: List of buildings constructed

S. No.	Year	Name of Building	Quantity	Name of Range	Expenditure (Rs.)
1	2006-07	Range Office cum residence Chambaghat Solan	1	Solan	1265400
2	2006-07	Type-III Quarter Chambaghat	1	Solan	1307700
3	2009-10	Range Office cum Residence Parwanoo	1	Parwanoo	2200000
4	2009-10	VFDC Meeting Hall at R-47 karalghat	1	Parwanoo	498000
5	2010-11	Const. of Fgd Hut Oachghat	1	Solan	780000
6	2015-16	Gang Hut Oachghat	1	Solan	650000
7	2016-17	Forest Guard Hut Barog	1	Parwanoo	940670
8	2016-17	Range Office Subathu	1	Subathu	1029500
9	2018-19	Forest Guard Hut Kasauli (Mashobra)	1	Parwanoo	1308461
10	2018-19	Block Officer Quarter Gaura	1	Chail	2762026
11	2021-22	Const. of Forest Guard Hut Chambaghat	1	Solan	1344730

12	2022-23	Const.of Conservator of Forest Residence Chambaghat	1	Solan	5716136
13	2022-23	Construction of Forest Rest House Joharji	1	Dharampur	6249014
14	2022-23	Consturction of Type-II Quarter at Chambaghat	1	Solan	1608293
15	2022-23	Construction of Block Officer Quarter Forest Colony Chambaghat	1	Solan	1467999
16	2023-24	Inspection Hut Ruda Kandaghat	1	Kandaghat	4123000
17	2023-24	Consturction of Forest Guard Hut Khadeen	1	Parwanoo	1449765
18	2023-24	Construction of Type-I quarters 2 Nos. Near DFO Residence Solan	1	Solan	2497450
19	2024-25	Const. of Forest Guard Hut Salogra	1	Solan	1349711
20	2024-25	Const. of Two additional set at Forest Rest House Serighat	1	Subathu	6073644

b) Sowing and Plantation: Efforts towards enhancement of forest productivity through quality plantation have been done in the working period, details of which have been discussed in chapter Plantation (Overlapping) Working Circle.

b) Demarcation: During this period, details of boundary pillars constructed and repaired are provided below along with the associated expenditure. Records of boundary pillars are maintained at the range level in the Boundary Pillar Register. From the period 2011-12 to 2023-24, a total of 1917 boundary pillars were repaired.

Table 11.6: Boundary pillars repaired maintained in Solan Forest Division w.e.r 2011-12 to 2023-24

Year of repair	No. of Boundary pillars	Expenditure (Rs)
2011-12	407	1669008
2012-13	165	414192
2013-14	48	120000
2014-15	200	147000
2015-16	0	0
2016-17	0	0
2017-18	0	0
2018-19	503	1257500
2019-20	0	0
2020-21	0	0
2021-22	0	0
2022-23	594	1864200
2023-24	0	0

d) Roads

Following Road were constructed

Table 11.7: Roads Constructed

Year of Construction	Name of Road	Type	Length(kms.)	Cost(Rs)
2016-17	Dharampur	Road Path from Kabakalan To KiranNursery	3.5	600000

11.4 Past Yield, Revenue and Expenditure

The estimated and actual yields from previous working plan period (2002-17)from the Chil Working Circle are as follows

Table 11.8: List of estimated yield and Actual yield

Year	Estimate Yield	Actual Yield
2002-03	3278.581	-
2003-04	3315.036	2689.781
2004-05	3142.154	3206.662
2005-06	2898.598	2117.197
2006-07	3014.498	4119.276
2007-08	3014.498	646.6731
2008-09	3034.422	5190.608
2009-10	2984.268	5541.796
2010-11	3052.716	5527.723
2011-12	3073.674	1648.662
2012-13	3408.486	4061.312

2013-14	2985.389	4698.798
2014-15	3037.003	5354.675
2015-16	3004.505	1618.807
2016-17	3030.464	2925.034

11.4.1 Revenue and Expenditure

The following table gives the past revenue and expenditure for the period 2002-03 to 2024-25 for Solan Forest Division

Table 11.9: Revenue and Expenditure from 2002-03 to 2024-25

Year	Revenue	Expenditure
2002-03	337426	25479700
2003-04	638119	255117500
2004-05	771522	26367200
2005-06	6443452	35265729
2006-07	1593257	38684489
2007-08	2896944	35386945
2008-09	10861450	47702888
2009-10	20643461	58956442
2010-11	1637790	61403952
2011-12	1192608	66694249
2012-13	1019268	76445322
2013-14	1668576	80252300
2014-15	1325189	87185438
*2015-16	83963024	79730283
2016-17	2830704	89895855
2017-18	1594228	96701969
2018-19	1516740	105095178
2019-20	6767476	101809577
2020-21	17256248	147577437
2021-22	4572359	133798191
2022-23	2864904	131138446
2023-24	6977217	120313366
2024-25	5169221	134442727

Chapter 12

Statistics of Growth and Yield

The Solan Forest Division has two main species that are commercially exploited, namely Chil and Bamboo. The growth and yield statistics for the two important species were determined using the enumeration data collected from a meticulously planned survey in the division details of which have been given in the chapter on Chil Working Circle and Bamboo Working Circle. Apart from these two species, the other three species are Deodar, Ban Oak and Broad Leaved) which are found in the tract.

12.1 Chil (*Pinus roxburghii*)

12.1.1 Volume factor

The volume factors prepared by Shri O.P. Sharma during revision of the erstwhile plan are used. These factors were computed by felling 219 trees of various height and diameter classes selected randomly all over the entire Chil zone in Rajgarh Division. The following table gives the results of the exercise:

Table 12.1: Volume table for Chil

Diameter class (cm)	Volume (m ³)
10-20 V	0.0504
20-30 IV	0.2499
30-40 III	0.6846
40-50 IIA	1.3544
50-60 IIB	2.2593
60-70 IA	3.3994
70-80 IB	4.7746
80-90 IC	6.3849
90-100 ID	8.2303

These volume factors will continue to be used in the current plan.

12.1.2 Growth

In the absence of green felling, the growth of the trees was also estimated using the estimates prepared by Shri O.P. Sharma (as in the past) for the revised working plan of the Rajgarh Forest Division. Hence the data in this regard has been adopted from Shri Sharma's Rajgarh Working Plan.

Table 12.2: Age-diameter, growth and recruitment for Chil

Diameter class (cm)	DBH (OB) (cm)	No. of years to reach dia	Passage time from lower to higher dia classes
10-20	15	27	8
20-30	25	44	17
30-40	35	63	19
40-50	45	82	19
50-60	55	102	20
60-70	65	130	28

Table 12.3: Relationship between age, height and diameter

S. No.	Age (in years)	Height (m)	Diameter (cm)
1	10	5.8	6
2	20	8.3	11.5
3	30	10.8	17.2
4	40	13.8	22.8
5	50	16.9	28.3
6	60	18.3	33.6
7	70	20.6	39.0
8	80	22.7	44.3
9	90	24.5	49.6
10	100	25.4	54.4
11	110	26.2	58.7
12	120	26.8	62.3
13	130	27.1	65.0

12.1.3 Increment

The current annual growth is also based on the estimates given in the revised working plan of Rajgarh Forest Division prepared by Shri O.P. Sharma

Table 12.4: Current Annual Increment (CAI) in percent

Diameter class (cm)	Mid point	Current Annual Increment	
		Last 10 years	Previous 10 years
10-20	15	4.56	4.66
20-30	25	3.75	4.60
30-40	35	2.69	3.24
40-50	45	2.26	2.35
50-60	55	1.99	2.13
60-70	65	1.56	1.88
70-80	75	1.14	1.14

80-90	85	0.92	0.92
90-100	95	0.66	0.66

Table 12.5: CAI and MAI of Chil (FRI Yield Table)

Age / Age class	Quality III			Quality II/III		
	CAI (m ³ /ha)	CAI %	MAI (m ³ /ha)	CAI (m ³ /ha)	CAI %	MAI (m ³ /ha)
10-20	0	0	0	0	0	0
20-30	4.688	20	1.539	10.636	20	3.534
30-40	13.015	11.64	4.408	13.33	7.71	5.983
40-50	7.977	3.68	5.108	10.356	3.556	6.858
50-60	8.467	2.836	5.668	9.412	2.413	7.277
60-70	7.837	2.063	6.018	8.607	1.793	7.487
70-80	6.367	1.412	6.018	8.082	1.435	7.557
80-90	7.137	1.377	6.158	8.222	1.275	7.627
90-100	7.137	1.211	6.228	7.732	1.068	7.627
100-110	5.388	0.826	6.158	6.123	0.772	7.627
110-120	3.849	0.551	5.948	4.234	0.501	7.208

12.1.4 Values of t and z

Here 't' denotes the time taken by a tree in IIB class to pass to IA class and 'z' denotes the mortality percent – decrease in number of trees from IIA class to IA class. The values of these parameters are adopted from the working plan of Rajgarh Forest Division prepared by Dr. M.B> Shrivastava. Thus, t = 30 and z = 23%.

Table 12.6: Estimated volume of Chil across all working circles

		Diameter Class						
		10-20	20-30	30-40	40-50	50-60	60-70	Above 70
	Volume per tree	0.050	0.250	0.685	1.354	2.259	3.399	4.775
Chil WC	Estimated trees	996556	243639	107574	59994	33521	12889	5336
	Total volume	50226.4 4	60885.5 0	73645.0 6	81255.8 7	75734.6 2	43815.0 3	25477.2 7
Ban Oak WC	Estimated trees	15340	6829	5801	1657	768	89	4
	Total volume	773.14	1706.69	3971.16	2243.71	1735.65	302.55	19.10
Deodar WC	Estimated trees	5404	1361	724	335	73	18	13
	Total volume	272.36	340.11	495.65	453.72	164.93	61.19	62.07
PCR WC	Estimated trees	244126	81936	38221	17799	9283	3812	1201
	Total volume	12303.9	20475.8	26166.1	24106.9	20973.0	12958.5	5734.29

		5	1	0	7	8	1	
	Total no. of trees	126142 6	333766	152320	79785	43646	16808	6554
	Total volume	63575.8 9	83408.1 1	104277. 97	108060. 27	98608.2 8	57137.2 7	31292.7 3

12.2 Ban-Oak

Due to the similarity of Ban Oak present in Solan to that in Rajgarh, the volume factors and conversion factors used are the ones developed for the Rajgarh Forest Division. They are based on the data collected from lots of Ban Oak in the Habban range and fuelwood lots from the Sarahan range of Rajgarh forest division. The volume segregated diameter class wise is given in the table below:

Table 12.7: Diameter classes and firewood / Charcoal production

Diameter class (cm)	Ban Oak			Kokat		
	Volume	Firewood	Charcoal (Qtl) 16.5% of F/wood	Volume	Firewood	Charcoal (Qtl) 10.25% of F/wood
10-20 (V)	0.054	0.65	0.107	0.06	0.40	0.041
20-30 (IV)	0.25	3.00	0.495	0.112	0.75	0.077
30-40 (III)	0.558	6.70	1.105	0.336	2.25	0.231
40-50 (IIA)	0.958	11.50	1.897	0.672	4.50	0.461
50-60 (IIB)	1.5	18.00	2.970	1.00	6.70	0.687
60-70 (IA)	1.867	22.40	3.696	1.284	8.60	0.881

Table 12.8: Conversion Factors between Volume, Weight of firewood and Charcoal

Species	Firewood		Charcoal	
	Weight (Qtl)	Volume (m ³)	Weight (Qtl)	Volume (m ³)
Oaks	12	1	1.98	16.5
Kokat	6.7	1	0.687	10.25

Table 12.9: Estimated volume of Ban Oak

	Diameter Class	10-20	20-30	30-40	40-50	50-60	60-70	Above 70
	Volume per tree	0.054	0.25	0.558	0.958	1.5	1.867	1.867
Chil	Estimated trees	13572	9121	3847	1895	881	295	89
	Total volume	732.87	2280.22	2146.67	1815.63	1321.59	550.77	166.16
Ban Oak	Estimated trees	465256	181382	58765	13602	3939	608	584
	Total volume	25123.85	45345.44	32791.06	13030.48	5907.99	1135.14	1090.33
Deodar	Estimated trees	0	0	0	0	0	0	0
	Total volume	0	0	0	0	0	0	0
PCR	Estimated trees	5254	3165	1206	503	152	14	0
	Total volume	283.72	791.25	672.95	481.87	228.00	26.14	0.00

Total		484082	193668	63818	16000	4972	917	673
Total volume		26140.44	48416.92	35610.67	15327.98	7457.58	1712.04	1256.49

12.3 Deodar

Deodar occurs in small quantities in the division. The volume factors are adopted from the adjoining Rajgarh divisions. The local volume factors derived from felling of 95 trees in the divisions mentioned above are reproduced in the table below:

Table 12.10: Volume factor for Deodar

Diameter class	Volume
10-20(V)	0.0707
20-30 (IV)	0.1416
30-40 (III)	0.7079
40-50 (IIA)	1.4158
50-60 (IIB)	2.5484
60-70 (IA)	3.5395
70-80 (IB)	4.8137
80-90 (IC)	6.0879
(0 and above (ID)	7.0879

In addition to this, the growth studies of stump analysis for the species are reproduced:

Table 12.11: Stump analysis for Deodar

Diameter class	DBH (OB) (cm)	No. of years taken to reach the diameter	Passage time from lower to higher diameter class (years)
10-20	15	30	-
20-30	25	53	23
30-40	35	76	23
40-50	45	100	24
50-60	55	125	25
60-70	65	153	28

The table below gives the estimated volume of deodar for different diameter classes in the concerned working circles:

Table 12.12: Estimated volume of Deodar

	Diameter Class	10-20	20-30	30-40	40-50	50-60	60-70	Above 70
	Volume per tree	0.0707	0.1416	0.7079	1.4158	2.5484	3.5395	4.8137
		7	6	9		4	5	
	Estimated trees	4391	3314	4548	2811	1432	295	94
Chil	Total	310.4	469.2	3219.	3979.99working	3649.	1044.	452.49

	volume	1	7	74	plans:	31	15	
Ban Oak	Estimated trees	2576 6	1027 8	6960	2238	998	550	35
	Total volume	1821. 65	1455. 37	4926. 98	3168.56	2543. 30	1946. 73	168.48
Deodar	Estimated trees	3001	2150	2382	2196	1000	368	99
	Total volume	212.1 7	304.4 4	1686. 22	3109.10	2548. 40	1302. 54	476.56
PCR	Estimated trees	125	35	38	18	3	3	0
	Total volume	8.84	4.96	26.90	25.48	7.65	10.62	0.00
Total		3328 2	1577 7	1392 8	7263	3433	1216	228
Total volume		2353. 07	2234. 04	9859. 84	10283.14	8748. 66	4304. 03	1097.5 2

12.4 Other Broad Leaved Tree Species

Table 12.13: volume factors for broad-leaved

Species	Class					
	10-20 (V)	20-30 (IV)	30-40 (III)	40-50 (IIA)	50-60 (IIB)	60-70 (IA)
<i>Terminalis tomentosa</i>	0.127	0.368	0.825	1.770	3.030	4.557
<i>Dalbergia sissoo</i>	0.064	0.176	0.467	0.977	1.523	2.265
<i>Juglans regia</i>	-	0.2	0.8	1.5	2.5	3.8
<i>Robinia pseudocacia</i>	-	0.3	0.6	1.0	1.4	1.7
Eucalyptus	0.114	0.312	0.500	0.600	0.600	0.600
Poplar	-	0.3	0.7	1.4	2.8	4.9
<i>Celtis australis</i>	0.3	0.7	1.3	2.2	3.3	4.6

Table 12.14: Estimated volume of Broad Leaved species

	Diameter Class	10-20	20-30	30-40	40-50	50-60	60-70	Above 70
	Volume per tree	0.064	0.184	0.418	0.885	1.515	3.294	3.193
Chil	Estimated trees	91479	21089	6053	970	537	184	25
	Total volume	5854.6 3	3880.3 8	2530.2 9	858.60	813.05	606.65	79.83
Ban Oak	Estimated	4624	810	32	20	0	0	0

	trees							
	Total volume	295.94	149.12	13.29	17.41	0.00	0.00	0.00
Deodar	Estimated trees	0	0	0	0	0	0	0
	Total volume	0	0	0	0	0	0	0
PCR	Estimated trees	340338	159427	74078	24311	11668	3648	1217
	Total volume	21781.63	29334.57	30964.60	21515.24	17677.02	12016.51	3885.88
Total		436441	181326	80163	25301	12205	3832	1242
Total volume		27932.21	33364.07	33508.19	22391.24	18490.07	12623.16	3965.71

12.5 Khair

In Nurpur Working Plan prepared by Sh. Nanak Chand, 10 trees of each diameter were sampled and data in respect of standing volume, heartwood volume, weight of chips & equality of katha was collected. The result so obtained is reproduced as below:

Table 12.15: Standing volume, and out turn of other products from Khair

Diameter Class (cms)	Height (m)	Standing Volume (m³)	Heartwood Volume (m³)	Weight of Chips (Kg)	Weight of Air Dried Katha (Kg)
10-15	8.30	0.0257	0.0122	11.2	—
15-20	10.10	0.0686	0.031	31.6	2.5
20-25	11.80	0.1181	0.0576	50.6	5.0
25-30	12.40	0.1697	0.1096	78.7	8.0
30-35	13.40	0.2528	0.1757	128.3	14.0
35-40	13.40	0.331	0.2406	167.7	18.0
40-45	13.40	0.4337	0.3016	197.4	23.0
45-50	13.40	0.5468	0.3898	280.1	29.0

12.6 Bamboo

Bamboo is an important species present in the division. The commercial classification of bamboos for the purpose of selling is given in the table below:

Table 12.16: Specifications of Bamboos

Class	Specification		No. of sticks per bundle
	Length (feet)	Girth (inches)	
Chawar	14	>6	5
Bahi I	6.5	5-6	10
Bahi II	6.5	4-5	15
Majhola	6.5	3-4	20
Lathi	6.5	2.5-3	30

Chatti	6.5	2.5	40
Pore I	14	>3	10
Pore II	12	2-3	15
Char	9	2	30

Table12.17: List of area wise Density and Composition of Clumps

Area	Avg. Clumps Per Ha	Avg. Culms per Clump	Avg. Manus Per Clump	Avg. Chals per Clump	Avg. Old Culms per Clump
Joharji	390	18.7	3.4	4.8	10.5
Lugon	368	26.15	1.92	2.13	22.1
Parwanoo	254	25.64	2.06	3.09	20.49

12.7 Density

Density of all compartments were calculated from the Compartment History files

12.8 Enumeration

Stratified Random Sampling using forest type as stratification criterion was used for enumeration. In order to arrive at greater accuracy of estimation, plots of 50m x 50 m were laid in some forests having distinct composition and quality of vegetation get as close a true picture of the crop composition as possible. Enumerations were done for important species down to 10cm diameter (d.b.h.) in 10cm diameter classes. The results of enumeration have been appended at the Appendix-IIA. The results were then extrapolated to other similar areas of the working circle.

12.9 Yield in culms per year

In terms of annual culms yield from the different areas prescribed in the 3 year felling cycle in Bamboo (overlapping) Working circle the fellings be based on the principle of maintaining the productivity of rhizome.

The annual yield from different areas is worked out as follows:-

$$A = T - (M + 2C)$$

Where A= culms available for felling/ha

T = Total culms present per ha

H= Manus present per ha

C = chals present per ha

Area wise culms available for felling are given in Bamboo Working Circle.

PART – II

FUTURE MANAGEMENT

Chapter – 1

Basis of Proposal

The intervening period of 2017-18 to 2024-25, after the expiry of the previous Working Plan and Preparation of the current working Plan may please be condoned.

1.1 The National Forest Policy, 1988

The National Forest Policy 1988 mainly emphasize on Maintenance of environmental stability through preservation and restoration of ecological balance, checking soil erosion and denudation in catchment areas of rivers, lakes, and reservoirs, substantially increasing Forest/Tree Cover through afforestation and social forestry, taking steps to meet requirements of fuel, wood, fodder, minor forest produces, soil and timber of rural and tribal population and creating a massive people's movement with the involvement of women. The strategy emphasizes on afforestation, social forestry and farm forestry, management of state forests, wildlife conservation, and forest-based industries to arrange for the raw material through the establishment of direct relationships with individuals who can grow raw material for them, and give financial support to forestry.

Within the broad framework of National Forest policy 1988, the state governments of Himachal Pradesh has issued its state policies focusing on the states specific priorities of the forest management.

1.2 Himachal Pradesh Forest sector Policy and Strategy 2005

This policy takes into account changes in the social, economic and environmental context of the state and the country. It promotes the concept of forestry as 'Sector', which includes various biophysical and environmental components such as land and biological resources in a comprehensive manner. The management of forests is based on the principles of multiple stakeholders and multiple forest values, which could fulfill livelihood needs of local people and contribute to their welfare. It provides comprehensive guidelines for forestland use and planning, distribution of rights and concessions, grazing, timber distribution, non-timber forest produce and various ecosystem services. One of the important features of this policy is that it recognizes the geographical constraints of the state to plan forestry sector schemes. The state has also notified Participatory Forest Management (PFM) Rules 2000 streamlining and consolidating role of communities in the management of forests. It entitles a Village Forest Development Society (VFDS), to manage the forests assigned to them for the purpose of management. These rules allow 100% right to non-timber forest produce such as fallen twigs, branches, lopping, grass, fruits, flowers, seeds, leaf fodder cost and partial right to timber benefits. These rules also define the structure and responsibilities of VFDS.

1.3 Objectives of Management

Keeping in view the existing National and State, Forest Policy and National Working Plan Code – 2014 the forest resources of Solan Forest Division are proposed to be managed. The working plan has incorporated holistic management of forest resources keeping in view the need for conservation as well as utilization of forest produce. The broad objectives in the working plan are as under:

- i. To increase the productivity of the forest ecosystem and maintain its vitality.
- ii. To maintain and improve the aesthetic beauty of forest areas and conserve the environment, conserving water sources, enhancing the water conservation capacity of the forest ecosystem and assisting in regulating the flow of water from its catchment.
- iii. To reduce soil erosion, enhance the fertility of the soil and ensure the stability of the forest ecosystem.
- iv. To conserve water sources enhance water conservation capacity of the forest ecosystem and assist in regulating the flow of water from its catchment.
- v. To conserve genetic resources (both floral and faunal including microorganism) and their sustainable use.
- vi. To reduce GHG emissions, enhance mitigation/ carbon sequestration capacity of the forests and finding ways for adaptation with change in climate.
- vii. To provide for the *bona fide* domestic and agriculture requirements of the local people for timber, fuel, charcoal, grass and grazing subject to the silvicultural availability and due regard to the promotion and protection of their traditional knowledge and cultural practices.
- viii. To promote and encourage the integrated development of the forest and other natural resources in the division and the district.
- ix. To guide the forest management towards an optimal portfolio of FES derived from the forests in the division
- x. To seek active people participation in the management of forests in the areas nearer to habitation on the principles of joint participatory forest management. To create awareness and educate local people through participatory forest management and seek their co-operation and participation in its management.
- xi. To restock the blanks and barren lands with valuable native species.
- xii. To regulate and control both the local and migratory grazing.
- xiii. To protect all forests in general & Chil forest in particular from fire and maintain ecological balance for protection, preservation and improved wildlife.
- xiv. To produce optimum yield of resin subject to the maintenance of Chil crop in healthy and thrifty conditions.
- xv. To be consistent with the above to obtain the maximum yield of timber, pulpwood, resin, fuel wood, charcoal and other forest produce in perpetuity.
- xvi. To identify flora and fauna which is getting extinct or dwindling fast in numbers and suggest measures aiming at conservation/rehabilitation of natural habitat and gene pool.
- xvii. To develop recreational forestry to encourage nature-based Eco-tourism and to regulate and control the growing tourist influx in forest areas in consonance with Eco-tourism principles keeping in view the FC, Act. 1980.

1.4 Method of Treatment to be adopted

The forests are mainly Chil (*Pinus roxburghii*), Ban – Oak (*Quercus leucotrichophora*) and Deodar (*Cedrus deodara*) with subsidiary spp with Chil e.g *Albizzia*, *Cassia* and *Jhingan*, Shisham, and with Ban Oak are *Berberis*, *Debregeasia*, *Tagetus* and climbers. Chail has pure deodar forests and also mixed patches of ban and deodar. In many areas due to poor regeneration of Chil the openings are infested with *Lantana camara*. In pure Ban – Oak forests, as in Kandaghat, due to closure of canopy thinning and cleaning operations are immediately required to improve the quality of stock.

Due to lack of silvicultural operations for past 40 years now, quality of growing stock has also been severely affected. Thus redressing the degraded areas and restocking of blanks different silvicultural treatments will be required especially suited to different species and working circles. Rehabilitation of degraded forests will need an intensive approach through exhaustive soil and water conservation as well as afforestation efforts based on the knowledge and experience gained in the past treatment of these forests.

The silvicultural treatments must be directed to reduce the invasion of lantana and its further invasion to new areas. The felling operations should be such that sufficient sunlight is received so that new regeneration of Chil, Ban – Oak and Deodar can come up rapidly. At the same time the flagship species find opportunities for regeneration by timely cleaning, thinning and cultural operations.

The methods of the treatment of the forest crop have been provided, given the ecological and silvicultural requirements for their sustainable management. Based on stakeholder consultations, field conditions, technical and legal environment, biotic factors, legal status of forests, drivers of degradation, etc. the proposals for the future management of the forest and Wildlife species have been formulated. The biodiversity conservation and preservation / development of natural resources have been focused upon.

Dealing with human-wildlife conflict in a proactive manner and to adopt innovative techniques to reduce human-wildlife conflict is also a major point addressed in this Working Plan

The assessment of forest resources has been made based on the methodology intended in the National Working Plan Code -2014.

1.5 Constitution of Working Circles

Given the broad objectives of management and principles of sustainable management of forests, the working circles have been constituted. The forest division has Chil (*Pinus roxburghii*), Ban – Oak (*Quercus leucotrichophora*), Deodar (*Cedrus deodara*), and bamboo as the major species. Host of Non Timber Forest Products and valuable medicinal plants are also present in the forests. The following working circles have been prescribed in the working plan:

- 1) Chil Working Circle
- 2) Deodar Working Circle.
- 3) Ban – Oak Working Circle
- 4) Protection-cum-Rehabilitation Working Circle
- 5) Plantation (Overlapping) Working Circle
- 6) Bamboo (Overlapping) Working Circle
- 7) NTFP (Overlapping Working Circle
- 8) Soil & Water Conservation working circle (overlapping)
- 9) Ecotourism (Overlapping) Working Circle
- 10) Joint Forest Management (Overlapping) Working circle
- 11) Wildlife Management (Overlapping) working circle

Areas covered under different working circles have been given in table 1.1 below.

Table 1.1: Area under the different Working Circles

S. no.	Forest Range	Forest classification	Deodar Working Circle (ha)	Chil working circle (ha)	Ban Oak working circle (ha)	Protection working circle (ha)	Total area (ha)
1	Chail	RF	53.468	28.4	-	-	81.868
		DPF	55.2	713.2	370.4	-	1138.8
	Total		108.668	741.6	370.4	-	1220.668
2	Kandaghat	RF	-	-	366	-	366
		DPF	2.4	100	318	-	420.4
	Total		2.4	100	684	-	786.4
3	Solan	RF	-	98.8	251.2	56.8	406.8
		DPF	-	335.8	558	143.2	1037
		UPF	-			26	26
	Total		-	434.6	809.2	226	1469.8
4	Subhatu	RF	-	-	-	16	16
		DPF	-	272.4	-	549.4	821.8
		UPF	-			125	125
	Total		-	272.4	-	690.4	962.8
5	Dharampur	RF	-	1199.6	-	770.5	1970.1
		DPF	-	1039.5	10.6	846.2	1896.3
	Total		-	2239.1	10.6	1616.7	3866.4
6	Parwanoo	RF	-	219.4	-	1394.2	1613.6
		DPF	-	595.5	-	2487.7	3083.2
	Total		-	814.9	-	3881.9	4696.8
	Total	RF	53.468	1546.2	617.2	2237.5	
		DPF	57.6	3056.4	1257	4026.5	
		UPF	-			151	
	Grand Total		111.068	4602.6	1874.2	6415	13002.868

Out of 13151.268 ha 148.4 ha comes under Shilli CR of which management plan will be made separately.

A separate chapter has been assigned to each working circle which provides the details including objectives of management, forest areas under the working circle and management prescriptions for achieving management objectives.

A comparative statement about the non-overlapping working circles with reference to the previous working plan is given in the table below:

Table 1.2: Area under Working Circles – Past and Present Working Plan

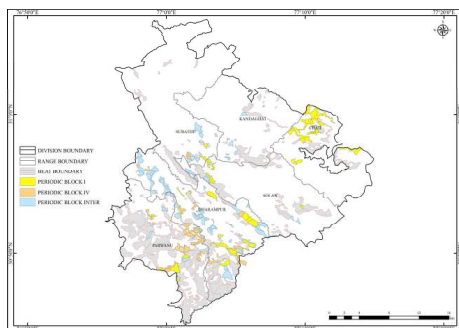
S. No.	Working Circle	Area during previous working plan (Ha)	Area in the current working plan (Ha)	Difference
1	Chil	3840.2	4602.6	762.4
2	Ban Oak	1500.8	1874.2	373.4
3	Deodar	0	111.068	111.068
4	Bamboo	2133.3 (891)*	1015.36	124.36**
5	PCR	6402.8	6415	12.2

* 891 ha compact area.

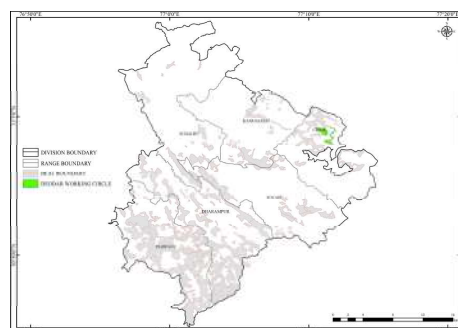
** With respect to compact area

1.6 Period of Working Plan and the necessity for intermediate revision

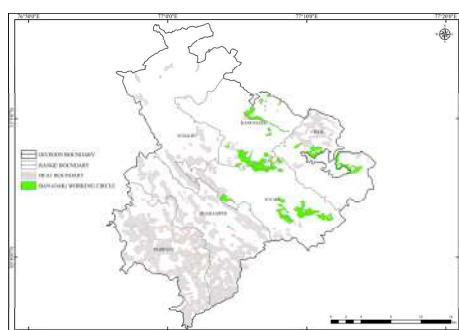
This working plan is for ten years, with effect from 01.12.2025 to 30.11.2035. Mid-term review of the working plan will take place after five years of its implementation and necessary modifications, if needed will be incorporated into the plan accordingly after approval from the competent authority.



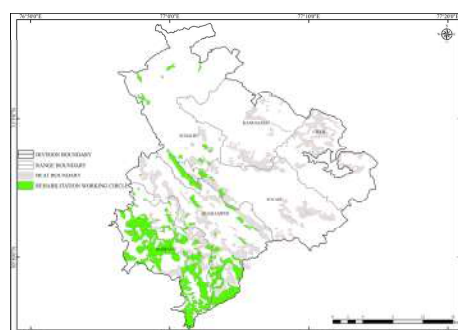
Chil Working Circle



Deodar Working Circle



Ban Oak Working Circle



PCR Working Circle

Fig. 1.1 Working Circles (Except overlapping) in Solan Forest Division

Chapter 2

The Chil Working Circle

2.1 General Constitution of the Working Circle:

All better stocked forests of the Division, whether falling under Reserve Forest or Demarcated Protected forest, where composition of the forest has predominantly Chil as the main crop, have been included in this Working Circle (WC). The working circle is much the same as in the previous Working Plan except for the forests of the transferred Chail range and the area of Shilli merged in Solan beat of Solan range are included in this Working Plan. Also, some Chil areas have been excluded from this Working Circle owing to their typical terrain characteristics such as steep, non-workable topography. The total area within this working circle is 4602.60 ha.

2.2 Area Statement:

The total area under this working circle is 4602.6 ha. The range-wise distribution of area under this working circle is given in the table below:

Table 2.1: Range-wise area under the Chil Working Circle

S. No.	Range	Reserved Forest (RF)	Demarcated Protected Forest (DPF)	Area in ha
1.	Chail	28.4	713.2	741.6
2.	Kandaghat	-	100	100
3.	Solan	98.8	335.8	434.6
4.	Subhatu	-	272.4	272.4
5.	Dharampur	1199.6	1039.5	2239.1
6.	Parwanoo	219.4	595.5	814.9
		1546.2	3056.4	4602.6

Table 2.2: Species-wise area distribution of Chil Working Circle

Range	Type of Forest	Ban Oak	Chil	Deodar	Kail	Bambo	Broad Leaved	Culturable Blank	Un – culturable Blank	Total
Chail	RF	0.00	17.59	10.81	0.00	0.00	0.00	0.00	0.00	28.40
	DPF	81.83	538.93	90.92	1.52	0.00	0.00	0.00	0.00	713.20
Kandaghat	RF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DPF	47.96	31.15	5.25	0.00	0.00	0.64	10.00	5.00	100.00
Solan	RF	92.76	2.92	0.00	0.00	0.00	0.12	3.00	0.00	98.80
	DPF	309.64	8.94	0.27	0.00	0.00	1.49	11.50	3.95	335.80
Subathu	RF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	DPF	269.03	0.00	0.00	0.00	0.00	0.37	3.00	0.00	272.40
Dharampur	RF	1177.76	6.53	0.61	0.00	0.00	8.70	6.00	0.00	1199.60
	DPF	868.72	2.76	0.00	0.00	0.22	166.80	1.00	0.00	1039.50
Parwanoo	RF	189.04	0.55	0.00	0.00	0.00	29.81	0.00	0.00	219.40
	DPF	507.98	0.37	0.00	0.00	1.16	85.99	0.00	0.00	595.50
Total		3544.73	609.74	107.87	1.52	1.38	293.91	34.50	8.95	4602.60

2.3 General characters of the vegetation:

Chil, which is found as almost a pure crop, is the principal species in areas falling within this Working Circle. It occurs in pure form and in depressions, with an admixture with *Quercus leucotrichophora* (Ban-Oak), *Rhododendron*, *Lyoni*, *Pistacea integerrima*, *Sapium insigne*, *Pyrus pashia* etc and a few other broad-leaved associates. In the lower reaches Chil is invaded by and being partially replaced by scrub species and *Lantana* while in the upper reaches Chil is seen making ingress into ban oak areas. The forests mostly conform to the Champion and Seth's Forest type 9 C 1a: Lower or Shiwalik Chir Pine Forests. The elevation of the area under this WC ranges between 980-1440 metre to 1760-1940 meters amsl. Except for the P.B.IV areas which generally contain fairly dense even-aged young crop, the forests in this WC are heterogeneous so far as age-class distribution is concerned and normal distribution of age gradations is absent in case of Chil crop. While younger age classes are predominantly present, presence of older trees is generally low. The reserve forests are better stocked as compared to the demarcated protected forests and this might be due to the fact that the DPFs usually form a buffer around or adjoining the Reserve forests. Chapter II of Part I of this plan gives a fair account of the general character of vegetation in this WC.

2.4 Felling Series

Only one felling series has been constituted.

2.5 Blocks and Compartments

The boundaries of the compartments and sub compartments have generally been retained as per the previous working plan.

2.6 Special objects of management:

The special object of management will be:-

- i) To convert the existing generally irregular crop of Chil to more or less uniform crop.
- ii) To tend the existing stands in a manner so as to progress in the direction of a normal forest by obtaining more normal distribution of age classes, normal growing stock, with normal increment and normal regeneration by natural or artificial means.

- iii) To improve the stocking of the existing Chil forests primarily by facilitating natural regeneration and supplement it by artificial means where natural regeneration is not coming up.
- iv) To harvest the standing mature/over mature Chil trees on a sustainable principle, with an aim to regenerate the forests
- v) To free the established regeneration from suppression so that optimum conditions for growth for the young crop are available.
- vi) Restocking of the poorly stocked areas and blanks as far as possible
- vii) Protection of forests from fire, insects, pests and natural destruction as well as biotic interference.
- viii) To meet the *bonafide* and legitimate demand of local right holders to best possible extent.
- ix) In consonance with the above objectives, to obtain maximum possible yield of resin, timber, small wood and other forest produce on sustainable basis.

2.7 Analysis and Valuation of the crop

2.7.1 Stock Maps

The entire area has been stock mapped afresh on 1:15,000 scale survey sheets and copies of the maps have been placed in the concerned compartment history files.

2.7.2 Density of the crop

Density is variable in different areas. Ocular assessment made during the field visit showed wide variation in density of the crop from 0.1 to 0.8. Average density is approximately 0.5. Respective compartment history files have mention of the density of the crop. The forests away from habitations and the PB IV areas are better stocked as compared to those in the lower reaches and located in the vicinity of villages. The density of each forest has been recorded in the list of forests in Appendix I

2.7.3 Age classes

The distribution of age classes is generally found to be irregular except in compartments that have been worked and regeneration has been established.

2.7.4 Site Quality

Though variable from locality to locality and ranging from II/III to IV, the overall site quality in the Forest Division is III. The forests R-30 Chabal ki Dhar, R-43 Kalath, have site quality equal to II whereas on the other hand forests in Kasauli block such as D-148 Samol, D-231 Jangorhu have site quality IV.

2.7.5 Enumeration

Taking up total or even partial enumeration in the compartments of the Working Circle would have been too capital intensive and time consuming. Due to paucity of funds and constraints of

time, total enumerations in the forests falling in this working circle could not be taken up. As an accepted alternative, stratified random sampling with scientifically strong statistical foundation and rationale was carried out. A brief account of the process and methodology adopted for sample enumeration is given below:

Stratified Random Sampling using forest type as stratification criterion was used for enumeration. In order to arrive at greater accuracy of estimation, plots of 0.1 ha were laid in some forests having distinct composition and quality of vegetation get as close a true picture of the crop composition as possible. Enumerations were done for important species down to 10cm diameter (d.b.h.) in 10cm diameter classes. The results were then extrapolated to other similar areas of the working circle.

Table 2.3: Abstracts of PB-wise results of the enumeration

	Chil		Deodar		Ban		Broad Leaved	
Dia Class (cm)	Tree Count	Vol m3	Tree Count	Vol m3	Tree Count	Vol m3	Tree Count	Vol m3
PB I								
10-20	316459	15949.53	2998	211.96	3517	189.918	4541	290.62
20-30	92278	23060.27	2853	403.98	3065	766.25	1189	218.78
30-40	36582	25044.04	4295	3040.43	1808	1008.864	473	197.71
40-50	17744	24032.47	2739	3877.88	1015	972.37	150	132.75
50-60	9200	20785.56	1432	3649.31	321	481.5	43	65.15
60-70	3538	12027.08	295	1044.15	80	149.36	21	69.17
70 & above	1491	7118.93	94	452.49	12	22.404	12	38.32
Total	477292	128017.9	14706	12680.2	9818	3590.666	6429	1012.5
PB IV								
10-20	206101	10387.49	44	3.11	70	3.78	39593	2533.95
20-30	54431	13602.31	21	2.97	50	12.5	11571	2129.06
30-40	14744	10093.74	0	0	0	0	3143	1313.77
40-50	6766	9163.87	0	0	0	0	698	617.73
50-60	4042	9132.09	0	0	0	0	313	474.2
60-70	2086	7091.1	0	0	0	0	132	434.81

		5						
70 & above	1079	5151.79	0	0	0	0	7	22.35
Total	289249	64622.44	65	6.08	120	16.28	55457	7525.87
PB Inter								
10-20	473996	23889.42	1349	95.338	9985	539.18	47345	6716.316
20-30	96930	24222.92	440	62.3116	6006	1501.47	8329	1532.544
30-40	56248	38507.28	253	179.3079	2039	1137.8	2437	1018.81
40-50	35484	48059.52	72	102.12	880	843.266	122	108.12
50-60	20279	45816.97	0	0	560	840.09	181	273.715
60-70	7265	24696.8	0	0	215	401.407	31	102.664
70 & above	2766	13206.54	0	0	77	143.76	6	19.16
Total	692969	218399.5	2114	439.0775	19762	5406.963	58451	9771.369
Grand Total	1459510	411039.8	16885	13125.36	29700	9013.909	120337	18309.74

Table 2.4: Abstract of Enumeration Results of Chil Working Circle

Dia Class	No. of trees	% of total trees in WC	Total Vol in m3	Average trees/ ha	Total standing Vol/ ha in m3
V	615659	37.85	31784.92	134	6.91
IV	277163	17.04	67515.38	60	14.67
III	122023	7.50	81541.76	27	17.72
IIA	65671	4.04	87910.09	14	19.10
IIB	36371	2.24	81518.57	8	17.71
IA	13663	0.84	46016.59	3	10.00
IB	5544	0.34	26175.74	1	5.69
	1626432		451488.79	353	98.09

Table 2.5: Summary of enumeration results

PB I (1697.4 ha)								
Parameter	10-20	20-30	30-40	40-50	50-60	60-70	70 & above	Total
No	327515	99385	43158	21648	10996	3934	1609	508245
Vol (m3)	16642.03	24449.28	29291.05	29015.47	24981.51	13289.76	7632.14	145301.25
No/ha	193	59	25	13	6	2	1	299
Vol/ha	9.80	14.40	17.26	17.09	14.72	7.83	4.50	85.60
PB IV (844.2 ha)								
No	245808	66073	17887	7464	4355	2218	1086	344891
Vol (m3)	12928.33	15746.84	11407.52	9781.60	9606.29	7525.96	5174.14	72170.68
No/ha	291	78	21	9	5	3	1	409
Vol/ha	15.31	18.65	13.51	11.59	11.38	8.91	6.13	85.49
PB Inter (2061 ha)								
No	42336	111705	60978	36559	21020	7511	2849	773296
Vol (m3)	2215	27319	40843	49113	46931	25201	13369	234017
No/ha	20.54	54.20	29.59	17.74	10.20	3.64	1.38	375.20
Vol/ha	1.07	13.26	19.82	23.83	22.77	12.23	6.49	113.55

Table 2.6: Stocking (Number and Vol. m³) of Chil Working Circle in past and present plan

Parameter	10-20	20-30	30-40	40-50	50-60	60-70	70 & above	Total
Past (Area Chil 3840.2 ha)								
Number	921876	221660	82416	41769	23344	9438	3967	1304470
Vol (m3)	47281.16	54723.43	56104.64	56219.16	52513.87	32058.81	18858.87	317759.94
No/ha	240	58	21	11	6	2	1	340
Vol/ha	12.31	14.25	14.61	14.64	13.67	8.35	4.91	82.75
Present (4602.6 ha)								
Number	615659	277163	122023	65671	36371	13663	5544	1626432
Vol (m3)	31784.92	67515.38	81541.76	87910.09	81518.57	46016.59	26175.74	451488.79
No/ha	134	60	27	14	8	3	1	353
Vol/ha	6.91	14.67	17.72	19.10	17.71	10.00	5.69	98.09

2.7.6 Silvicultural System

Chil is a strong light demanding species and hence most suited to be managed under the Uniform system or modifications of the Uniform system. As such, forests allotted to this working circle are to be worked under a modification of the Uniform system called “Punjab Shelterwood System” also identified as the “Indian Irregular Shelterwood System”. It is also noted that this

system has been adopted ever since the Sandhu's plan for management of the Chil areas of this division. The Punjab Shelterwood system allows the retention of compact groups or patches of well grown and vigorously growing poles as part of the future crop; and selection markings on steep slopes, nala banks etc. It is also well acknowledged under this system that a certain amount of irregularity in the young crop is inevitable.

2.7.7 Rotation and Conversion Period

At present the Chil forests in the Division are in the process of conversion from irregular to more or less regular crops. The mean annual increment for Quality III Chil crop stem timber culminates at 120 years as per the standard FRI yield tables. The Chil forests of this division have been worked on a rotation of 120 years in the past also. Based on this fact it was estimated that in 120 years the trees would attain a diameter of 60 cm. But a perusal of the FRI yield tables, a site quality III Chil tree reaches a diameter of 50 cm in 120 years and even at an age of 160 years the average diameter achieved is 55 cm. It can be inferred from this that even if we increase the rotation beyond 120 years, diameter of 60 cm is not likely to be attained. Hence the rotation adopted is kept at 120 years, but the exploitable diameter is being fixed at 50 cm

2.7.8 Conversion Period

The Chil forests of Solan forest division have been under conversion since 1956 (since B.S. Sandhu's plan), and a conversion period corresponding to the rotation period i.e. 120 years was adopted. It is an ongoing process and as the pace of conversion of the irregular forests to regular ones has been satisfactory, the conversion period is retained as 120 years of which about 70 years have elapsed. Since the beginning of management of the Chil forests under the Shelterwood system, 1023.7 ha of seeded felled areas have been converted to regular even aged crop and another 238.0 ha has been included in the PB IV, owing to the presence of sufficient young pole crop of Chil in them.

2.7.9 Regeneration Period

It is estimated that over a period of 30 years, new plants of Chil attain reasonable height and get established. A period of 30 years has therefore been fixed as the regeneration period and accordingly the rotation has been divided into four periodic blocks. Considering the periodicity of the seed years, the danger of incendiary fires and the time required for establishment of Chil regeneration, this regeneration period of 30 years is sufficient to obtain adequate regeneration.

2.8 Division into Periods and allotment to Periodic Blocks

With 120 years as rotation and 30 years for regeneration, 4 Periodic Blocks (PBs) could have been constituted in the Working Circle. However, since the process started earlier aimed at conversion of irregular Chil forests to regular ones did not progress owing to the general moratorium on green fellings since the early 1980s, seeding and final fellings as envisaged in the earlier working plans could not be carried out. As a result, the process of conversion to uniform Chil forests got halted. In this perspective, constitution of 4 distinct Periodic Blocks (PBs) is ruled out. The composition of Chil forests in most of the blocks of the Forest Division, except for the areas suitable to be designated under PB IV, is not such so as to allow formation of distinct

Periodic Blocks representing(especially) PBII and PB III. Hence the concept of “PB inter” is being adopted.

It has been observed that generally much greater population of younger plants of 10-20 cm diameter class (Class V trees). The reason for preponderance of younger regeneration is that the canopy of these forests has opened up as a result of salvage and TD removals. This has created conditions conducive for establishment of new plants through natural regeneration. All such areas which have been restocked with young regular even-aged crop have been allotted to Periodic Block (PB IV). Approximately 37% of the area of the Working circle has been assigned to Periodic Block I (P.B.I). All other compartments that have neither been allotted to PB I nor PB.IV have been allotted to PB inter as it is virtually impossible to find true representative PB area especially PB II and PB III for the remaining Chil forests

The allotment of various compartments to periodic blocks is given in Table 2.7, 2.8 and 2.9. General ban on green felling for more than four decades since the early 1980s has resulted in process of conversion of the irregular crop to regular one did not take place. As a result timely seeding and final felling also could not be carried out. Consequently, the process of conversion to uniform Chil forests got halted and progression of forests from one periodic block to the next one also did not take place. Moreover, adverse impact due to forest fires, salvage fellings transfer of certain forest lands for development works etc has also contributed in halting progression of the Periodic Blocks to the next one.

In view of these limitations, allotment of forests to the respective Periodic Blocks has been made considering the following aspects:

2.8.1 Periodic Block I

Forests/ compartments which have adequate regeneration in the form of sapling and/or pole stage and are in general open or have moderate stocking of mature trees, as well as those compartments where felling had taken place earlier, but regeneration did not come up fully, have been designated as PB I areas. Some compartments that are not fully stocked and require improvement in their stocking through management interventions have also been included in this PB. Total extent of PB – I is 1697.4 ha, which is approximately 37% of the total area of the working circle. The details are given below in table 2.7.

Table 2.7: Areas under Periodic Block – I

Name of Range	No. & Name of Forests	Compartment/Sub-Compartment	Area (in ha.)
Chail Range	D39 SDhamdhar	C-1	30.4
	D39 SDhamdhar	C-2	30
	D42 SChabri	C-1	47.6
	D42 SChabri	C-2	40
	D43 SPowash		28.4
	D-44 Cheunth	C-1	40.4
	D-44 Cheunth	C-2	40
	D45 STibbaKathet	C-1a	12

	D45 STibbaKathet	C-1b	24
	D45 STibbaKathet	C-2a	16
	D45 STibbaKathet	C-2b	22.4
	D46 SChaklain	C-1	6
	D46 SChaklain	C-2	34.8
	D47 SBirniShillai	C-1	58.8
	D47 SBirniShillai	C-2	93.6
	D48 SBirniShillai	C-1	36
	D48 SBirniShillai	C-2	25.6
	D48 SBirniShillai	C-3	12.4
	D49 SBanjani	C-2	22
	D49 SBanjani	C-3	16
	D52 SBhojdeen	C-3a	18.4
	D52 SBhojdeen	C-3b	58.4
	R16 SChaklain	C-1	28.4
Total			741.6
Solan Range	D91 SBhawan ki dhar		11.6
	D92 SDeora		25.6
	D93 SNandalNagali		12.4
	D95 SNagali-I		3.6
	D96 SNagali-II		4
	D97 SKiarTatul		4.4
	D98 SBhawan ki dhar		19.2
	D123 SBeola		4.4
	D125 SSheel ka dhala	C-1	12.4
	D125 SSheel ka dhala	C-2	8.8
	D126 SManlog	C-1	14.4
	D126 SManlog	C-2	13.4
	D126 SManlog	C-4	9.6
	D132 SCharar	C-8	13.2
	D135 SKhaldhar		5.6
	R26 SNagali		33.6
	R28 SKhaldhar	C-1	28.4
Total			224.6
Subhatu Range	D124 SKatyara	C-3	10.4
	D127 SShashal	C-4a	12.4
Total			22.8
Dharampur Range	D154 SDawala		12.8
	D156 SKadan no. 2		2.3
	D157 SKadon-I		13.6

	D170 SBhogseri		12.4
	D171 SBhogseri		5.6
	D177 Scharoti ki dhar		21.2
	D178 Scharoti ki dhar	C-1	42.3
	D182 SKalath No. III		25.6
	D214 STibbaGuljar	C-1	27.6
	D224 Cheola	C-2	22.4
	D224 Cheola	C-3	28.4
	R31 SBarog	C-4a	57.2
	R31 SBarog	C-4b	28.8
	R31 SBarog	C-5	62
	R32 SChunjari		67.6
	R39 SCharoti ki dhar		44.4
	R40 SBohali	C-1	32
	R40 SBohali	C-2a	45.6
Total			551.8
Parwanoo Range	D239 SSaridhar	C-3	22
	D239 SSaridhar	C-4	19.6
	R46 SJagatgarh	C-1	43.8
	R57 SBanasar	C-1b	43.2
	R57 SBanasar	C-1c	22
	R58 SJagatgarh		6
Total			156.6

GRAND TOTAL. 1697.4ha

2.8.2 Periodic Block IV

The forests having young, sapling to young and pole stage crop of moderate to dense stocking and partly with middle aged to mature trees in which regeneration has established itself have been allotted to this P.B. These are forests mostly with young crop and require removal of over wood existing over more or less established crop. The total extent of this PB is 844.2 ha. The details are given below in table 2.8.

Table2.8: Areas under PB-IV

Name of Range	No. and Name of Forest	Comptt/ Sub-Comptt	Area (in ha)
Subhatu Range	D128 SKalikufer	C-1	21.2
	D128 SKalikufer	C-2	10.8
Total			32.0
Dharampur Range	R31 SBarog	C-2b	26.8

	R41 SGuljar	C-1	26.8
	R48 SKalth	C-5	52.8
	R49 SGadiar		31.2
	D116 SChabal ki dhar		4.8
	D117 SChabal ki dhar-IV		2.4
	D118 SChabal ki dhar-III		10.4
	D159 SAnji No. III		3.6
	D160 SAnji No. I		10.4
	D161 SSiharari	C-2	32
	D172 SBhogseri-III		4.4
	D178 Scharoti ki dhar	C-2	29.1
	D179 Ssirguli ki tiba	C-1	16
	D179 Ssirguli ki tiba	C-2	13.6
	D181 SSirgulikitiba-III		25.2
	D203 SQuilaAjmergarh	C-1	40
Total			329.5
Parwanoo	R57 SBanasar	C-1a	48
	D184 SRathal	C-1	61.2
	D185 SJohari	C-2	86.3
	D186 SKalath No. V	C-1	14.4
	D188 SKaralghat	C-1	48.4
	D188 SKaralghat	C-2	54.4
	D200 SDanotaChakali	C-1a	52
	D222 SBanasar Top		72.4
	D239 SSaridhar	C-1b	10.8
	D239 SSaridhar	C-2	22.4
	D245 SSanawar	C-1	12.4
Total			482.7

GRAND TOTAL 844.2

2.8.3 Periodic Block Inter

The forests that are still under the process of conversion, which have preponderances of age classes approaching maturity as well as young pole to middle aged crop with a few mature and maturing trees still constituting an irregular crop of Chil have been allotted to PB Inter. Basically, these are forests/ compartments that have neither been allotted to PB 1 nor PB IV. Such areas have been clubbed together as PB Inter. The extent of this PB is 2061.0 ha. (Maximum resin tapping can be done in this Periodic Block.)
The details are given below in table 2.9.

Table 2.9: Areas under PB Inter

Name of Range	No. & Name of Forests	Compartment/Sub-Compartment	Area (in ha.)
Kandaghat Range	D57 SKamhla		4.8
	D63 SKiari		23.6
	D68 SHathon		6
	D69 SPalech no. I		22.4
	D70 SPalech-II		3.2
	D100 SDharot	C-1	15.6
	D102 SBaran ka cheon	C-1	5.6
	D102 SBaran ka cheon	C-2	7.2
	D102 SBaran ka cheon	C-3	6
	D103 SBaran ka cheon		5.6
Total			100
Solan Range	R28 SKhaldhar	C-2a	36.8
	D89 SGadhog No. I		9.2
	D90 SGadhog No. II		13.2
	D94 SNandal		8.4
	D108 SShilly	C-1	5.2
	D108 SShilly	C-3	17.2
	D126 SManlog	C-3	14
	D130 SChawal		4
	D131 SMathan	C-1	18
	D131 SMathan	C-2	20.4
	D132 SCharar	C-6	33.6
	D132 SCharar	C-7	18.8
	D138 SKhaldhar No III		11.2
Total			210
Subhatu Range	D124 SKatyara	C-5	19.2
	D127 SShashal	C-1	21.2
	D127 SShashal	C-3	19.6
	D128 SKalikufer	C-3	16.8
	D128 SKalikufer	C-4	20.8
	D128 SKalikufer	C-5	22
	D133 SKoon		10.4
	D134 SKothi	C-1	63
	D134 SKothi	C-2	24.6
Total			217.6
Dharampur	R30 SChabal ki dhar	C-1	30.4

Range			
	R30 SChabal ki dhar	C-2a	36.4
	R30 SChabal ki dhar	C-2b	33.2
	R30 SChabal ki dhar	C-3	36
	R30 SChabal ki dhar	C-4	42
	R30 SChabal ki dhar	C-5a	38.6
	R30 SChabal ki dhar	C-5b	21.4
	R30 SChabal ki dhar	C-6	27.2
	R31 SBarog	C-2a	45.2
	R31 SBarog	C-6	51.6
	R31 SBarog	C-8a	24
	R31 SBarog	C-8b	62
	R33 SGulhari	C-1a	44
	R33 SGulhari	C-1b	41.6
	R33 SGulhari	C-2	34
	R37 SMaltu	C-1	21
	R37 SMaltu	C-2	28.6
	R38 SKiard	C-1	29.6
	R38 SKiard	C-2	7.6
	R40 SBohali	C-2b	38
	R48 SKalth	C-4	32
	D115 SChabal ki dhar		3.2
	D119 SChabal ki dhar-II		26.4
	D120 SChabal ki dhar-I		3.6
	D140 SKainthari		6
	D141 SBarog		2
	D142 SJhajaBahali	C-1	6.6
	D143 SChewakhilchunjari		2.4
	D144 SChewakheelchunjari		5.2
	D145 SChewakhilchunjari		12.4
	D146 SChewaKheelchunjari-IV		47.2
	D147 SKainthri Kana Dhyalag		19.8
	D150 SGulhari no. IV		4.4
	D151 SGulhari no. III		42.8
	D152 SGulhari no. II		8.8
	D153 SGulhari no. I		5.2
	D155 SBhallon		3.2
	D158 SANji No. I		11.2
	D162 SMaltu No. II		28.4
	D163 SMaltu No. I		11.2

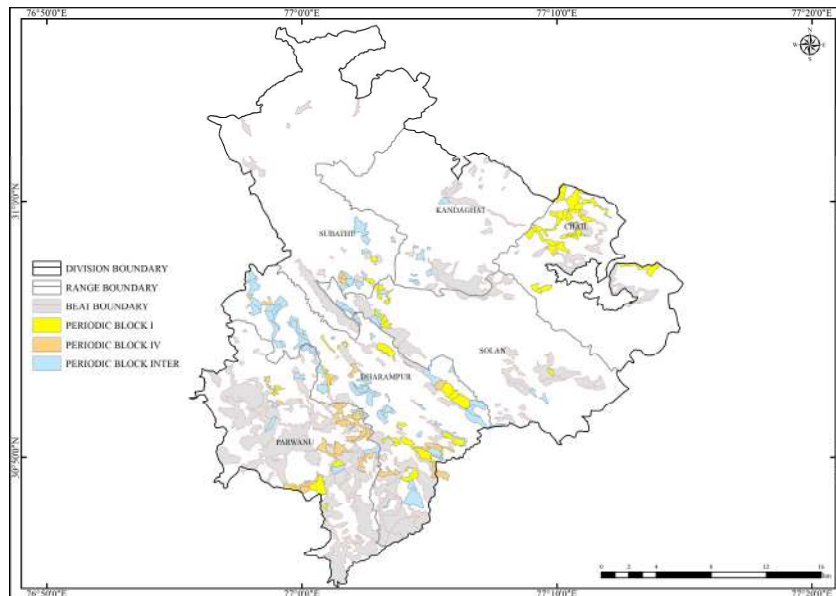
	D164 SMaltu-I		15.6
	D165 SMaltu No. IV		41.2
	D167 SGaduar		23.2
	D168 SKiarad No. I		9.2
	D169 SKiard No. II	C-1	27.6
	D173 Sbohali ki chali		10.4
	D175 SBaholi	C-1	22.2
	D176 SCharoti ki dhar		38
	D211 SHalda no. I		10
	D213 SKabaBahaur		107.6
	D214 STibbaGuljar	C-2	19.2
	D244 Cheola	C-1	24
	D244 Cheola	C-4	35.2
Total			1357.8
Parwanoo	R46 SJagatgarh	C-2	51.2
	R50 Skalath No II		5.2
	D239 Ssaridhar	C-1a	12
	D240 SDochi	C-1	25.2
	D240 SDochi	C-4	28
	D242 SGahidhar	C-2	20.8
	D245 SSanawar	C-2	16.4
	D245 SSanawar	C-3	16.8
Total			175.6
GRAND TOTAL			2061.0

Table 2.10: Periodic Block-wise and Range-wise Allotment of Area

Name of Range	Class of Forest	PB-I (ha)		PB-IV (ha)		PB-Inter (ha)	
		Total	Under Chil	Total	Under Chil	Total	Under Chil
Chail	RF	28.4	17.6	-	-	-	-
	DPF	713.2	538.9	-	-	-	-
	UPF	-	-	-	-	-	-
	Total	741.6	556.5	-	-	-	-
Kandaghat	RF			-	-		-
	DPF			-	-	100	56.4-
	UPF			-	-	-	-
	Total			-	-	100	56.4
Solan	RF	62	61.8	-	-	36.8	33.7
	DPF	162.6	161.6	-	-	173.2	161.5
	UPF	-	-	-	-	-	-

	Total	224.6	223.4	-	-	210.0	195.2
Subhatu	RF	-	-	-	-	-	-
	DPF	22.8	22.7	32.0	32.0	217.6	217.2
	UPF	-	-	-	-	-	-
	Total	22.8	22.7	32.0	32.0	217.6	217.2
Dharampur	RF	337.6	335.3	137.6	136.6	724.4	688.1
	DPF	214.2	204.3	191.9	151.4	633.4	525.9
	UPF	-	-	-	-	-	-
	Total	551.8	539.6	329.5	288.0	1357.8	1214.1
Parwanoo	RF	115.0	112.3	48.0	48.0	56.4	25.2
	DPF	41.6	41.6	434.7	348.5	119.2	119.1
	UPF	-	-	-	-	-	-
	Total	156.6	153.9	482.7	396.5	175.6	144.2
	G. Total	1697.4	1552.5	844.2	716.4	2061.0	1770.8

Total area of Chil WC **4602.60**
Total Stocked area **4039.66**
Stocking Percent **87.77**



Periodic Blockes in Chil Working Circle

Fig. 2.1: Periodic Blocks in Chil Working Circle

2.9 Calculation of Yield

Calculation of yield has been done by volume. PB IV areas, where final felling as well as felling against thinning and cleaning operations is to be carried out will be the chief source of yield from this WC. In addition, seeding felling to be done in PB I areas has also been taken into account. Taking this into consideration, the yield has been calculated by volume separately for PB I and PB IV. Basis for calculation of yield is data obtained through carrying out sampling in representative areas. The results of enumeration in different PBs are presented below in tabular form. Since Chil forests are susceptible from damage from fire incidents and there is damage from wind storms and other natural calamities, as a safety factor against these exigencies, increment has been ignored and has not been taken into account to serve as emergency reserves. Volume of removals of dead, dying, uprooted, dried or otherwise damaged trees as well as salvage removals will also count towards the yield. Taking into account all such extraction, the yield has been prescribed by volume.

2.9.1 Calculation of Yield from PB-I

The growing stock as per the enumeration result for PB I is given in the table below:

Table 2.11: Abstract of growing stock in PB I

Chil	PB I (1697.4 ha)								
	Dia Class	10-20	20-30	30-40	40-50	50-60	60-70	70 & above	Total
	Tree Count	316459	92278	36582	17744	9200	3538	1491	477292
	Vol (m ³)	15949.53	23060.27	25044.04	24032.47	20785.56	12027.08	7118.93	128017.88

Table 2.11 above gives an abstract of number of Chil trees of diameter class 10-20 cm and above and their volume as assessed during enumeration exercise. The increment has not been taken into account to compensate for removal as a safeguard against unforeseen removals due to natural calamities such as forest fires, slope failures, wind damage etc. This approach has been adopted to avoid excessive felling and provide a cushion against removals that cannot be forecast but may become essential due to such emergent situations. Only growing stock of Chil trees has been taken into account for calculating the yield. Growing stock of other species present in small number and the broad-leaved species has not been considered as they are important for day-to-day requirements of the local people.

Yield Calculation for PB I areas:

The following formula has been used for estimation of Yield from PB I areas:

$$Y = [GS - (V_1 + V_2 + V_3)] / P$$

Where

Y = Annual Yield in m³

GS = Total standing volume of trees in PB I areas

V₁ = Total volume of mother trees to be retained @ 20 trees of 40-50 and 50-60 cm diameter class per ha taking into consideration the average volume

V_2 = 10% of the growing stock of the forest to be retained on very steep and precipitous slopes, forest boundaries etc for their locational importance

V_3 = 75% of the total volume of trees to be retained as future crop in 10-20, 20-30 and 30-40 cm diameter class

P = Plan period (which is proposed at 10 years)

Calculation of V_1

V_1 = Total volume of mother trees to be retained @ 20 trees of 40-50 and 50-60 cm diameter class per ha taking into consideration the average volume

Number of trees in 40-50 cm diameter class = 17744

Number of trees in 50-60 cm diameter class = 9200

Total number of trees in 40-50 and 50-60 cm diameter class = 26944

Total area of PB I = 1697.4 ha

Mother trees to be retained @ 20 Trees per ha = $20 \times 1697.4 = 33948$

Average volume per tree of 40-50 cm dia class = $24032.47 / 17744 = 1.354 \text{ m}^3$

Average volume per tree of 50-60 cm dia class = $20785.56 / 9200 = 2.259 \text{ m}^3$

Average volume per tree of 40-50 cm and 50-60 cm dia class = $(1.354 + 2.259) / 2 = 1.807 \text{ m}^3$

Total volume of mother trees to be retained = $33948 \times 1.807 = 61344.036 \text{ m}^3$

Calculation of V_2

Total Growing stock = 128017.88

10% = 12801.788

Calculation of V_3

Total volume of 10-20 cm diameter class trees = 15949.53 m^3

Total volume of 20-30 cm diameter class trees = 23060.27 m^3

Total volume of 30-40 cm diameter class trees = 25044.04 m^3

Total 64053.84 m^3

75% of 64053.84 = 48040.38 m^3

Using the formula $Y = [GS - (V_1 + V_2 + V_3)] / P$, the yield Y comes to:

$Y = [128017.88 - (61344.036 + 12801.788 + 48040.38)] / 10$

= $(128017.88 - 122186.204) / 10$

= $5831.88 / 10$

= **583.188 m^3** Or, SAY 600 m^3 per annum

2.9.2 Yield from PB-IV

This periodic Block constitutes areas where regeneration has come up. The forests have reasonably good stock of pole crop, but mother trees have not been removed and are still standing. To facilitate speedy growth of the new crop in the regenerated area final felling is to be done. However, as a precautionary measure against over extraction, increment has not been taken into account for yield. Moreover, species other than Chil are retained. Deodar, Ban Oak and other broad leaf species may only be removed under salvage felling.

Thus, yield from this Periodic Block will be available from two sources

1) Final felling of mother trees

The mother trees having diameter 40 cm and above, that are still standing over the young regenerated crop is to be brought under final felling. However, some of such older / mature trees would need to be retained owing to the nature of terrain where they are growing (steep and vulnerable to erosion, rocky strata), or are important for soil & water conservation, where there is blank and area is devoid of vegetation or similar other considerations.

Moreover, some mature trees would also need to be retained against hazards like damage due to fire incidents, wind damage or the like as insurance reserve. Taking into account all these factors, about 20% of the total volume available for felling from the mature trees shall be retained and only the balance 80% of the volume shall be available for exploitation.

2) Cleaning / Thinning operations in lower diameter trees

Cleaning/ thinning operations will be carried out in lower diameter (20-30 and 30-40 cm) classes of which the annual yield is estimated to be around 20% of the standing volume of Chil crop of class III and IV of PB IV areas. . The projected growing stock as per the enumeration result for PB IV is given in the table below:

Table 2.12: Abstract of Growing Stock of Chil in PB IV

PB IV (844.2 ha)								
Dia class cm	10-20	20-30	30-40	40-50	50-60	60-70	70-80	TOTAL
Tree count	206101	54431	14744	6766	4042	2086	1079	289249
Vol (m3)	10387.4 9	13602.3 1	10093.7 4	9163.8 7	9132.0 9	7091.1 5	5151.7 9	64622.4 4

All removals from the working circle shall count towards total yield

Calculation of Yield from PB IV:

The following formula has been used for calculating average annual yield from PB IV :

$$Y = C_1 V_1 + C_2 V_2 / P$$

Where Y = Average annual yield in m³

C₁ = constant representing the fraction of volume of trees of 40-50 cm dia class and above that will be available for felling

V₁ = corresponding volume of trees of 40-50 cm dia and above

C₂ = constant representing the fraction of volume of trees of 30-40 cm and 20-30 cm dia that will be available for felling

V₂ = corresponding volume of trees of 20-30 and 30-40 cm dia class

P = Plan period, i.e. 10 years

Calculations:

$$C_1 = 80\%$$

$$V_1 = 9163.87 + 9132.09 + 7091.15 + 5151.79 = 30538.90 \text{ m}^3$$

$$C_2 = 10\%$$

$$V_2 = 13602.31 + 10093.74 = 23696.05 \text{ m}^3$$

Using the formula for calculating average annual yield from PB IV areas comes to:

$$Y = (80\% \text{ of } 30538.90) + (10\% \text{ of } 23696.05) / 10$$

$$\begin{aligned}
&= 24431.12 + 2369.60 \\
&= 26800.72 \text{ m}^3 / 10 \\
&= 2688 \text{ m}^3 \quad \text{or Say } 2600 \text{ m}^3
\end{aligned}$$

2.9.3 Yield from PB Inter

No yield has been prescribed in this periodic block, as the forests of this Periodic Block are generally under-stocked do not offer any opportunity for thinning cum improvement felling.

No silvicultural felling or commercial felling have been prescribed. However, diseased & dying, dry, wind-fallen, uprooted, damaged trees may have to be removed on account of salvage markings, are removed whenever and wherever necessary. This yield is going to contribute towards yield prescribed for the working circle.

The yield from PB Inter will be in form of silvicultural and salvage markings only if at all these are available. These removals, if any would count towards yield and should be adjusted against grant of timber to right-holders for meeting their *bonafide* demands

Table 2.13: Showing Increment % and Total Increment

Diameter class	No of trees	Volume factor (m ³)	Volume (m ³)	CAI %	Total Increment (m ³)
V	996556	0.0504	50226.441	4.560	2290.326
IV	243639	0.2499	60885.500	3.750	2283.206
III	107574	0.6846	73645.060	2.690	1981.052
IIA	59994	1.3544	81255.868	2.260	1836.383
IIB	33521	2.2593	75734.620	1.990	1507.119
IA	12889	3.3994	43815.026	1.560	683.514
IB	5336	4.7746	25477.266	1.140	290.441
IC	-	6.3849	-	0.192	-
ID	-	8.2303	-	0.660	-
Total	1459510		411039.782		10872.041

2.9.4 Total Yield prescribed from the Chil Working Circle

While managing a forest on the principle of sustained yield, it has to be ensured that extraction from a forest in a year must never exceed the increment that a forest area puts on annually. Instead of adopting a liberal view on standing volume, annual felling must be based on conservative principles to be on safer side.

The CAI% figures for Chil have been given in **table above**. As the table above shows, the total Current Annual Increment (CAI) of the entire growing stock of Chil from diameter class 10-20 cm dbh (ie. V class) and above comes to **10872.041 m³**. Though, theoretically, the forests under analysis can give a sustained yield of approximately **10872 m³** annually, to safeguard against the vagaries of nature and unpredictability of incidents of fire, effects of climate change, unplanned excess felling that may be required due to transfer of forest lands for development activities and

other threats to the crop, it is prescribed that the limit of total removals from this working circle should be to the tune of only 50% of the total increment. Hence, the total prescribed annual yield is fixed at 5400 m³, which is approximately half the CAI, which would be distributed as follows:

Yield from PB-I = 600 m³

Yield from PB-IV = 2600 m³

Total Yield = 3200 m³

As compared to stipulated yield of 5400 m³, yield of only 3200 m³ is being prescribed. The 2200 m³ of remaining available yield (that is not being prescribed) shall compensate for the heavy salvage removals that take place in the area almost every year from PB inter without affecting the removals from PB I and PB IV areas. An account of salvage removals in the year 2022-23 is given below which gives an idea of removals from different forest ranges and compartments in one year. Any deviations from the remaining 2200 m³ shall be adjusted so as not to increase the yield beyond 5400 m³. Deviation beyond prescribed yield will be managed as per provisions of NWP Code 2014 with approval of competent authority.

Table 2.14: Salvage removals in the Year 2022-23

Name of Range	No. & Name of Forest	Comptt / Sub – Comptt	Area in Ha
Subathu	DPF-122 Shangri	0	6.4
	DPF-124 Katiara	1	14.4
	DPF-124 Katiara	2	21.6
	DPF-124 Katiara	3	10.4
	DPF-124 Katiara	4	17.2
	DPF-124 Katiara	5	19.2
	DPF-127 Shashal	1	21.2
	DPF-127 Shashal	2	19.2
	DPF-127 Shashal	3	19.6
	DPF-127 Shashal	4a	12.4
	DPF-127 Shashal	4b	10
	DPF-128 Klikufar	1	21.2
	DPF-128 Klikufar	2	10.8
	DPF-128 Klikufar	3	16.8
	DPF-128 Klikufar	4	20.8
	DPF-128 Klikufar	5	22
Dharampur	R-33 Gulhari	C1a	44
	R-33 Gulhari	C1b	41.6
	R-33 Gulhari	C2	34
	D-150 Gulhari		4.4
	D-151 Gulhari		41.8
	D-152 Gulhari		8.8

	D-153 Gulhari		5.2
	R-30 Chabbal	C1	30.4
	R-30 Chabbal	C2a	36.4
	R-30 Chabbal	C2b	33.2
	R-30 Chabbal	C3	36
	R-30 Chabbal	C4	42
	R-30 Chabbal	C5a	38.6
	R-30 Chabbal	C5b	21.4
	R-30 Chabbal	C6	27.2
	D-115 Chabal ki Dhar		3.2
	D-115 Chabal ki Dhar		4.8
	D-115 Chabal ki Dhar		2.4
	D-115 Chabal ki Dhar		10.4
	D-115 Chabal ki Dhar		26.4
	D-115 Chabal ki Dhar		3.6
	D-139 Banjini		4
	R-31 Barog	C1B	35.6
	R-31 Barog	C2B	26.8
	R-31 Barog	C1A	14.8
	R-31 Barog	C2A	45.2
	D-161 Sihari	C1	10
	D-161 Sihari	C2	32
	D-156 Kadon		2.3
	R-35 Kadon		40.1
	R-34 Mansa Devi		3.8
	D-163 Maltoo		11.2
	R-37 Maltoo	C1 & C2	49.2
Solan	R-27 Nauni	C2	55.6
	R-28 Kahldhar	C1	28.4
	R-28 Kahldhar	C2a	36.8
	R-28 Kahldhar	C2b	12
	D-138 Khaldhar		11.2
	R-28 Khaldhar	C4	10
	D-136 Khaldhar		16
Parwanoo	D-242 Ghaidhar	C2	20.8
	D-245 Sanawar	C3	16.8

2.9.5 Control of Yield

The prescribed yield will be controlled from each periodic block. All removals from each Periodic Block down to 10-20 cm diameter class will count towards the yield of the working

circle. The yield will include the markings done to meet the local right holders demand as well. This yield should not exceed 10% of the prescribed yield and will be checked after every three years. No efforts should be made to obtain the prescribed yield, if the yield is not available silviculturally. The removals will also depend upon the status of regeneration. The regeneration assessment should be done in every three years. In case the progress of regeneration is unsatisfactory, the further fellings shall be discontinued till the status of regeneration is satisfactory. If a forest/compartment has been taken for marking, it should be marked purely on silvicultural considerations, and any excess yield available should be adjusted in future fellings. The annual excess or deficit will be brought forward in the control form and adjusted at the end of 3 years period. Normally, deviation should not be allowed beyond +/- 10% of total annual yield of the block.

NOTE:

1. In case felling that is not prescribed has to be carried out because of some special reasons (e.g. natural disasters, wind damage, transfer of forest land for development under the provisions of Van (sanrakshan Evam Samvardhan) Adhiniyam, 1980etc.) in some of the forests allotted to this working circle for any reasons whatsoever the same will count towards yield prescribed for P.B.I. In such an event compensatory plantation is to be done in suitable areas and such compensatory plantation should be done simultaneously. Felling in P.B.I to the extent felled for aforesaid reasons is different from felling programme for the year.
2. The yield prescribed will be inclusive of trees marked to meet the right holders demand or for any other purpose.

2.10 Method of executing felling

The recommendations regarding felling mentioned here will be subject to rulings and guidelines subscribed by competent authority in view of the general moratorium on green felling. Only two kinds of felling namely, seeding felling and final felling are suggested.

2.10.1 Methods of Executing Felling in PB-1 areas

Felling in PB I areas will be of the nature of Seeding Felling with an object of obtaining natural regeneration. The objective is to get uniform opening with seed bearers spread well at equidistance.. The general guidelines for marking trees for seeding felling are as follows:

- i) On cooler northern and eastern aspects and other suitable areas 15 to 18 Seed bearers per hectare should be retained as seed bearers, but on hot southern and western aspects, on steep slopes, areas where soil erosion has taken place or areas otherwise vulnerable to erosion, 20 to 25 seed bearers per hectare should be retained.
- ii) The seed bearers retained should be, as far as possible, uniformly distributed and at an average spacing of 20-25 meters. However, quality of seed bearers should not be compromised for the sake of maintaining their desired spacing.
- iii) More number of seed bearers should be retained on ridges as compared to lower slopes
- iv) Marking has to be conservative in areas with invasion of undesired species resulting in their dense undergrowth and areas that have experienced repeated ground fires.

- v) Seed bearers to be retained should be in 40-60 cms. d.b.h. class. If required number of seed bearers in the d.b.h. range of 40-60 cms is not available, preference for retention should be given to tree of 30-40 cms. d.b.h. instead of trees over 60 cm d.b.h.
- vi) The seed bearers so retained should be straight grained and free from twist, with well-formed long, straight, clear cylindrical bole, well-formed crown, free from rotor disease, free from all kind of malformations, sound at tapping height.
- vii) Well grown poles in compact groups with average 30 cm d.b.h. and not less than 0.1 ha. in area and density not less than 0.7 should be retained as advance growth to form part of future crop. However isolated poles should not be retained. Along with seeding marking in the area dense patches of advance growth could also be appropriately thinned. All trees of larger dimensions occurring in patches of such advance growth shall be removed.
- viii) It must be ensured that marking on steep and broken grounds, along the drainage lines, nalas and other vulnerable areas is kept conservative in nature and should correspond to selection felling.
- ix) Scattered regeneration expected to merge with future crop can be retained but scattered poles not likely to merge with future crop should be marked for felling.
- x) Only lighter marking comparable to selection-cum-improvement marking will be carried out in 10 m wide belt on either side of the roads and along periphery of forest especially near the villages for road protection.
- xi) Revisit to areas marked for felling shall be mandatory in case of serious fires, heavy wind damage, landslides or other events resulting in serious damage to the crop and marking should be revised after taking into account the damage caused.

2.10.2 Method of executing felling in P.B-IV

Felling in P.B-IV shall aim at removal of over wood suppressing of young crop. The general guidelines for marking trees for felling in this PB are as follows:

- i) The marking should aim at freeing the established regeneration by removing the over wood to further boost their growth
- ii) The removal of over wood should be conservative. along Nala banks, boundary line and steep to precipitous slopes
- iii) Improvement felling may need to be adopted for removal of badly formed, gnarled, dried, diseased and moribund trees
- iv) Broad leaved trees should not be marked unnecessarily. Lopping could be resorted to if they are likely to suppress the young regeneration of Chil.
- v) Final felling will be carried out only when the regeneration is fully established and has attained a height of 3 meters, i.e., when the regeneration is reasonably beyond the susceptible height for fire damage
- vi) As an insurance against damage by fire, and also as increment trees, about 5 tall, healthy and vigorously growing seed bearers per ha shall be retained
- vii) Advance growth retained at the time of seeding felling shall, in no case, be felled. Thinning may, however, be carried out if required.
- viii) Mother trees (seed bearers) likely to damage the young crop shall be lopped before felling, to minimize damage.

2.10.3 Method of Executing Felling in PB Inter

In order to safe guard the future yield, no regular felling shall be carried out in this periodic block. However, to improve the hygiene of the crop, only the removal of dead, dying, diseased, moribund and wind fallen trees shall be permitted.

2.11 Description of Felling programme

2.11.1 For PB I,

20 trees per Ha to be retained (1) = area in ha*20

No of Trees in 40-50 & above Dia Class (2) = (No. of trees in (40-50)+(50-60)+(60-70)+(70&above) cm dia class)

Trees available for Felling (3) = **(2)–(1)**(Some figures will be in negative also)

Actually available (4)= Chil of compartments(only positive figures from 3 to be taken)

Volume of 40-50 trees (5) = no. of trees in 40-50 dia class*1.3544
Volume factor for 40-50 is 1.3544

Volume of 50-60 trees (6) = no. of trees in 50-60 dia class*2.2593
Volume factor for 50-60 is 2.2593

Volume of 60-70 trees (7) = no. of trees in 60-70 dia class*3.3994
Volume factor for 60-70 is 3.3994

Volume of 70 & above trees (8) = no. of trees in 70 & above dia class*4.7746
Volume factor for 70 & above trees is 4.7746

Total Volume of 40-50 cm and above dia class (9)= (5) + (6) + (7) + (8)

Volume of 10-20 dia trees (10) = no. of trees in 10-20 dia class*0.054
Volume factor for 10-20 is 0.054

Volume of 20-30dia trees (11) = no. of trees in 20-30dia class*0.2499
Volume factor for 20-30 is 0.2499

Volume of 30-40dia trees (12) = no. of trees in 30-40 dia class*0.6846
Volume factor for 30-40 is 0.6846

Total Volume of 10-20 cm to 30-40 dia class (13) = (10)+(11)+(12)

Growing Stock (14) = (9)+(13)

Volume of 40-50 and 50-60 dia trees to be retained (15) = no.of 40-50 and 50-60 dia trees*1.807

Volume factor for 40-50 and 50-60 dia trees is 1.807 (average of volume factors for 40-50 and 50-60 dia trees)

Estimated Yield = Growing Stock – (V1+V2+V3) where V1 is the volume of 40-50 and 50-60 cm dia class trees in the compartment which are to be retained (@ 20 trees /ha); V2 = 10% of the Growing Stock; V3= 75% of the volume of 10-20, 20-30 and 30-40 cm dia class trees in the compartment ***A reducing factor of 0.3731 to be applied to compensate for compartments where number of trees per ha is too low and even 20 trees per ha (which are to be retained) are not available.***

2.11.2 For PB IV

No of Trees in 40-50 & above Dia Class (1) = (No. of trees in (40-50) + (50-60) + (60-70) + (70 & above) dia class)

Volume of 40-50 trees (1) = no. of trees in 40-50 dia class*1.3544

Volume factor for 40-50 is 1.3544

Volume of 50-60 trees (2) = no. of trees in 50-60 dia class*2.2593

Volume factor for 50-60 is 2.2593

Volume of 60-70 trees (3) = no. of trees in 60-70 dia class*3.3994

Volume factor for 60-70 is 3.3994

Volume of 70 & above trees (4) = no. of trees in 70 & above dia class*4.7746

Volume factor for 70 & above trees is 4.7746

V1 (5) = Total Volume of 40-50 & more trees ((1) + (2) + (3) + (4))

Volume of 20-30 trees (6) = no. of trees in 20-30 dia class*0.2499

Volume factor for 20-30 is 0.2499

Volume of 30-40 trees (7) = no. of trees in 30-40 dia class*0.6846

Volume factor for 30-40 is 0.6846

V2 (8) = Total Volume of 20-30 & 30-40 trees ((6) + (7))

Estimated Yield = C1V1+C2V2, where C1 = 80% and C2 = 10%

C1V1 (9) = 80% of V1 (80% of (5))

C2V2 (10) = 10% of V2 (10% of (8))

Table 2.15: Felling Programme for Chil Working Circle

Year	Compartment (with positive figures)	Sub-compartment	Area (in ha)	Estimated Yield
1	2	3	4	5
YEAR 1	D39 SDhamdhar	C-2	30	26
	D44 Cheunth	C-2	40	78
	D45 STibbaKathet	C-1a	12	132
	D45 STibbaKathet	C-2a	16	155
	D45 STibbaKathet	C-2b	22.4	239
	D48 SBirniShillai	C-2	25.6	119
	D48 SBirniShillai	C-3	12.4	527
	D49 SBanjani	C-2	22	237
	D49 SBanjani	C-3	16	95
	D52 SBhojdeen	C-3a	18.4	277
	D52 SBhojdeen	C-3b	58.4	528
	R16 SChaklain	C-1	28.4	459
	D91 SBhawankidhar		11.6	191
	D93 SNandalNagali		12.4	83
YEAR 2	D126 SManlog	C-1	14.4	276
	D126 SManlog	C-2	13.4	145
	D132 SCharar	C-8	13.2	301
	R28 SKhaldhar	C-1	28.4	126
	D124 SKatyara	C-3	10.4	309
	D154 SDawala		12.8	152
	D157 SKadon-I		13.6	121
	D177 Scharotikidhar		21.2	369
	D178 Scharotikidhar	C-1	42.3	703
	R31 SBarog	C-4b	28.8	234
	D128 SKalikufer	C-2	10.8	505
YEAR 3	D116 SChabalkidhar		4.8	181
	D117 SChabalkidhar-IV		2.4	649
	D118 SChabalkidhar-III		10.4	2417
YEAR 4	D178 Scharotikidhar	C-2	29.1	2470
	D160 SAnji No. I		10.4	223
	D179 Ssirgulikitiba	C-2	13.6	590

YEAR 5	D186 SKalath No. V	C-1	14.4	510
	D188 SKaralghat	C-1	48.4	1670
	D188 SKaralghat	C-2	54.4	1129
YEAR 6	R48 SKalth	C-5	52.8	262
	D184 SRathal	C-1	61.2	1554
	D185 SJohari	C-2	86.3	1421
YEAR 7	D181 SSirgulikitiba-III		25.2	474
	D203 SQualaAjmergarh	C-1	40	1125
	R31 SBarog	C-2b	26.8	681
	R41 SGuljar	C-1	26.8	564
	R49 SGadiar		31.2	413
YEAR 8	D200 SDanotaChakali	C-1a	52	2675
	R57 SBanasar	C-1a	48	471
	D159 SAnji No. III		3.6	136
YEAR 9	D222 SBanasar Top		72.4	1265
	D245 SSanawar	C-1	12.4	810
	D239 SSaridhar	C-1b	10.8	595
	D179 Ssirgulikitiba	C-1	16	415
	D172 SBhogseri-III		4.4	118
YEAR 10	D128 SKalikufer	C-1	21.2	1605
	D239 SSaridhar	C-2	22.4	393
	D161 SSiharari	C-2	32	1479
	TOTAL			32682

2.12 Subsidiary Silvicultural Operations:

2.12.1 P.B.I Areas

Subsidiary Silvicultural Operations in P.B. – I areas will be carried out after the seeding felling and exploitation operations are completed.

i) **Slash Disposal**

In the Chil areas that are close to habitation, after the seeding felling and exploitation operations are over, the local people should be encouraged to take away the debris for use as fuel. Usually, the refuse would be collected by the villagers in such areas. In

other forests and where debris is not cleared by villagers, it will be done departmentally immediately after the felling is over. All slash should be removed from around the bases of mother trees to a distance of about 5 meters. The branch wood and all felling refuse should be collected and heaped in open areas and in depressions and nallas away from the seed bearers and advance growth outside the regeneration patches.. There should be gaps between such heaps of slash. Slash should be thoroughly burnt under strict control to avoid damage to the standing crop. After the burning of refuse and lops and tops has been completed, the area should be thoroughly control burnt in order to get a clean seed bed for the germination of seed. Collection and burning of the debris should commence from top of the forests and progress down hills. Chips should be thoroughly raked to ensure complete burning. In areas where young regeneration exists or advance growth has been retained as part of future crop, slash should be disposed off more carefully.

ii) Subsidiary felling

Some of the marked trees that have not been felled and trees damaged during the felling in the area, the advance growth which is not promising and has malformed and ill developed stems should be felled before burning the debris and disposed off. The left overs should be burnt along with the felling refuse.

iii) Climber and Shrub-cutting

Climbers and shrubs invading the area do not allow young regeneration to establish and grow. The climbers, and other unwanted growth, should be removed from the area. Lantana, Mysrine, Carissa, Dodonea, Rosa etc. and such other shrubs and bushes infesting the regeneration areas should be cut repeatedly till the young plants become free from suppression from these species.

iv) Cutting/ thinning of associate species

The tendency to clear the area for Chil regeneration may prompt the field staff to remove other broad-leaved species, which needs to be curtailed as local people may prefer such species over Chil to meet their day-to-day requirement of fuel, fodder and small timber. Such species should be nurtured along with Chil. Patches that are supporting Ban oak and are also suitable for Oak planting should be thinned and planted with Ban oak and other suitable broad-leaved species.

v) Pruning

Pruning may be required to ensure growth of a clear bole and to obtain quality timber. It should be carried out using pruning scissors starting from below upwards.

vi) Cleaning Operations

As the regeneration attains a height of one metre or above, for proper growth of stems, especially in the clustered groups of young plants, cleaning operation should be carried out in a manner that new plants are spaced about a metre apart. Though the spacing of one metre is desirable, more emphasis is to be given to vigorous and superior quality plants over ensuring the spacing. Second cleaning is to be carried out when the crop has grown to two meters or more in height to get a desirable spacing of three metres. The material generated after the cleaning/ thinning operations may be

allowed to be taken away by local people for their use. Left over material or the material not taken away by villagers could be suitably utilised for paper& pulp and activated carbon if it proves to be economically sound proposition.

The terminology and theoretical aspects regarding requirement and technique of thinning/cleaning is given below:-

- a) Thinning consists of lessening the congestion in the crowns of the best trees in a canopy so as to favour their development. Thinning in crops below 4 cm in diameter are called 'cleanings' while thinning in crops of 10 cm up to 20 cm in diameter (usually done semi-automatically with a stick of appropriate length to give the desired average spacing) are designated "early thinning" The principles underlying all thinning operations, however remain the same.
- b) The necessity of thinning has long been recognized; the importance of thinning among the dominant and dominated and diseased trees having been especially realized. The removal of suppressed and dead or moribund trees has an appreciable effect on reducing root competition.
- c) Removals through cleaning/ thinning operations become distinctly undesirable when the cut material cannot be removed from below the crop without unjustifiable expenditure, since not only is money is wasted in felling such material, the fire hazard is greatly increased by the mass of dry wood lying under the standing crop.
- d) Thinning is done not only to increase increment but also as a measure of fire protection. Crops which are well thinned at an early date and which are free from an excess of suppressed and inflammable material are much less subject to fire damage than uncleaned / unthinned crops.
- e) Thinning should commence early and be repeated as often as necessary, subject only to the condition that inflammable material is not to be left lying on the forest floor. 'Cleanings' and "Early thinning" must be considered essential in over-dense crops for the establishment of vigorous and sturdy regenerated crop and for the encouragement of increment from the earliest age.
- f) In older crops where cut material cannot be disposed of without incurring expenditure, true thinning should ordinarily be postponed till cut material can be disposed of either free or at a price. However, in areas under concentrated regeneration (e.g. P.B.I and the youngest P.B. under the Shelterwood system) early and repeated thinnings are so important for the optimum development of the crop that periodical thinnings must be carried out even though the disposal of the cut material involves expenditure. It will undoubtedly be repaid in course of time by accelerated maturity of the remaining crops. However, thinnings in young woods must not be so heavy as to prevent the production of long clean boles when timber production is an object of management.

vii) Sowing and Planting

In case of Chil, which is a strong light demander, in most cases sufficient, even overabundant natural regeneration is expected to come up with the correct manipulation of the canopy through judicious seedling felling leading to sufficient number of uniformly distributed seed bearers, effective closure and adequate protection against fire and grazing ensured. However, if on account of some unfavourable factors, adequate

natural regeneration of Chil does not come up within four years of seeding felling, artificial regeneration may need to be resorted to immediately to reduce the period of closure and restock the area earlier the areas will be taken up for planting at earliest.

2.13 Artificial Regeneration

For artificial regeneration, following points should be kept in mind:

- i) In case, absence of natural regeneration in a particular patch is due to inadequate dispersal of seeds in the area from the seed bearers, it could be assisted by artificially seeding the area after working up the soil and carrying out patch sowing.
- ii) In other cases where nursery raised seedlings are required to restock the area through artificial regeneration, Chil seedlings should be raised in polythene bags. Such seedlings should be 1.5 years old at the time of planting. The plants should be at least 30 cm in height and should possess good vigour.
- iii) Nursery raised plants should be planted out in the field with the first showers of pre-monsoon rains just before the onset of the monsoons if the sub soil is found to be reasonably well soaked
- iv) Planting is done in pits of size 30 cm x 30 cm x 30cm. Usually spacing of 3 x 3 m. is kept, but the hilly terrain may require the spacing to be manipulated to suit the area
- v) Collection of quality seeds should be from straight bole middle-aged trees and preferably from designated seed plots.
- vi) Raising of seedlings in the nurseries should be taken up in right earnest and done carefully observing all scientifically sound practices. Success of planting depends on the quality of plants raised in the nursery which are then planted in the field.
- vii) Before taking up planting/Sowing, the area should be closed to grazing and effectively fenced.
- viii) The mortalities should be replaced as soon as possible. Beating up should be done till the areas have been fully stocked.

2.14 Other Regulations

2.14.1 Closure

All the P.B. – I areas are to be closed for 15 years after carrying out seeding felling. The area should be closed to grazing by proper fencing immediately after the felling is over. All such closures must be properly notified and made effective. After the notification, these should be fenced with loose stone (coolie) wall or effective barbed wire fencing. If managed properly and protected from fire and other interferences, within a period of 15 years Chil seedlings grow to a stage beyond damage. Therefore, it will not be always necessary to enforce closures for full regeneration period of 30 years. As soon as the area is fully regenerated with established crop, it could be thrown open to grazing after 15 years.

2.14.2 Fire Protection

Chil forests are initially vulnerable to the risk of fire up to a certain stage. Most of the damage from fires occurs during pre-monsoon summer months of April to June when lot of inflammable

material is present on the forest floor. Fires can be accidental, or caused by sparks that may emanate from charcoal burning, camp fires by travellers, wedding processions, celebratory fireworks, honey gatherers, road construction workers, and carelessly throwing away of burning matchsticks, *Bidis*, cigarette butts etc., Some of these fires can be controlled if detected at the starting stage itself.

Some of the fires could also be deliberately started by poachers, Shikaris, hunters, labourers and could be of incendiary nature due to various reasons; such as rivalry, by persons disgruntled with forest functionaries, political reasons, uncontrolled burning of Ghassnis to induce new growth of grass, kindling of fires to drive away wild animals or to cover evidence of forest crimes. In such cases of incendiarism, results are really destructive as fires could spread over extensive areas. In such cases it is very difficult to control such conflagrations.

The entire area of the working circle needs to be protected against fires. Strict fire protection will have to be carried out in P.B. I areas. However, forests cannot be protected against fire without the good will and cooperation of the local people. By meeting the reasonable and legitimate demands of locals for fuel wood, fodder, grazing etc., granting their rights well in time and providing them employment in the forest activities would help in winning their goodwill and getting support for fire protection.

For protection against fire in P.B. – I, areas the following points may be taken into consideration:

- i) Fire lines: Existing fire lines around P.B.I areas should be thoroughly cleaned from debris, dried material, useless undergrowth etc. and control burnt every year during winter months. Old fire lines should be maintained and new fire lines should be laid in fire sensitive areas.
- ii) Fifteen meter wide strip along the fence in the PB I areas should be kept clean. Pine needles, undergrowth of useless shrubs and bushes should be removed, especially during hot summer months.
- iii) Chil forests adjoining regeneration areas should be control burnt regularly.
- iv) Depending upon the extent of area, adequate number of firewatchers should be engaged during the fire season and firefighting equipment should be provided to the firewatchers.
- v) Effective communication system amongst field forest personnel in the form of wireless network is of great help. It is recommended that handset slinked with the wireless system be provided to field staff for reporting the fire incidents and progress of fire control
- vi) Cleaning of roads and paths: Forest roads, bridal paths, and inspection paths should be properly maintained and cleared of growth of inflammable material so as to function as fire lines also. A strip of 1.5 to 3 metre width just outside the forest roads and paths should be kept clear of any vegetation.
- vii) Timely completion of felling, thinning, extraction, salvage and other forest operations and before the start of fire season
- viii) List of forests most vulnerable to forest fires should be identified taking into account the fire incidents that had occurred in the past, their frequency and the area affected. Special attention should be paid to such forests.
- ix) Fire plans should be prepared well in advance before the fire season taking into account the views of the local people during meetings with them.

- x) Awareness campaigns and publicity regarding measures for protection against forest fires could also of help.

2.14.3 Grazing and Grass-cutting

The new regeneration which has come up after seeding felling is susceptible to being cut along with grasses. Similarly, grazing by animals would result in trampling of young saplings. Therefore, after commencement of regeneration operations, grass cutting and grazing in all the P.B.I areas shall be prohibited. However, when the young crop has grown beyond the stage of damage, i.e. 50 cm and above grass cutting on cut and carry method could be allowed under strict supervision of the forest staff. Supervision would ensure that seedlings are not cut along with grass. Grazing shall be strictly prohibited in the regeneration areas during the plan period.

2.14.4 Resin Tapping

Following broad guidelines should be followed: -.

- i) Method of tapping in force should be continued
- ii) For resin tapping in the area only rill method should be adopted
- iii)
- iv) In PB-I areas which are under regeneration resin tapping should not be carried out.
- v) Trees having diameter of minimum 35cm or more should only be taken up for resin tapping
- vi) Total enumeration of trees eligible for resin tapping should be conducted at an interval of every 5 years
- vii) If it is observed that pine trees are drying up in certain forest areas after being tapped for resin, such forest areas should be given rest and should be closed for tapping.
- viii) Only after the reasons for drying up of trees in such areas are methodically analysed and effective steps are taken to eliminate them, the areas so closed earlier may be opened for tapping after minimum three years of rest.
- ix) Complete record in this respect will be maintained at divisional level.

2.14.5 Right Holder's Demand for T.D.

T.D. should be marked preferably from final felling (PB-1) and PB-IV (removal of overwood) areas. Salvage trees from such areas should be marked for T.D. irrespective of their year of felling.

2.14.6 Salvage Removals

The qualitative and quantitative norms for salvage marking fixed from time to time are to be strictly followed in letter and spirit. The fire burnt Chil trees should not be taken as dry or dead until there is no sign of revival till end of September of the year of fire.

2.14.7 Surveys for Assessment of Status of Regeneration

Regeneration Survey shall be carried out every alternate year in all the PB- I areas where seeding felling has taken place till the stock is established. The regeneration should keep pace with the felling. In case regeneration does not keep pace with felling the specific reasons for failure

should be accounted in a detailed report and corrective measures taken. At the time of periodic reviews of the Working Plan, these reports be placed before the review committee. All felling should commensurate with the regeneration and no felling should be carried out unless funds for regenerating the felled areas are available.

2.15 The Resin Industry

2.15.1 General Introduction

Resin is economically the most important forest produce of the Division and is one of the principal source of revenue to the Department. The price of resin in recent years has been very favourable, hence, every effort should be made to extend resin-tapping operations to all suitable chil areas.

Resin tapping was started in this division as early as the beginning of twentieth century. The work, however, stopped before conclusion of Fazl-ud-Din's Working Plan(1935). This practice was resumed in 1951 and has been going on continuously since then. Resin tapping was previously done by the French Cup and Lip method but was later on replaced by the more effective Rill method. Due to continuous and defective resin tapping in the past, trees have become highly susceptible to wind fall. During 1981-82 and in the mid nineties, a large number of trees were removed as salvage owing to the reason of wind fall and frequent fire incidences. Resin tapping upto 1975, used to be done departmentally, but with the creation of the H.P.State Forest Corporation Ltd in 1974 this work is being executed by the Corporation now.

Prior to 1984, the tapping was done by conventional French "Cup and lip" method. This method involved deep and rather uncontrolled depth of the blaze which coupled with frequent fires and high velocity winds was responsible for salvage removals. Besides, quantitative and qualitative output of timber was also affected adversely, as the butt log was rendered useless due to the deep gullies and subsequent destruction by fires.

The conventional method was gradually replaced by improved 'Rill method' of resin tapping and the tapping since 1988 is being done by this method. This technique of tapping has been evolved at Forest Research Institute, Dehradun and its important features were brought out in a publication 'Field guide to Modern Methods of Resin Tapping by Shri V.P. Verma, IFS, Forest Research Institute and Colleges, Dehradun in 1978.

Subsequently a 'Manual of Rill Method of Resin Tapping from Pines' by Shri D.C Chaudhari. Scientist, Non-wood Forest Products Division, Forest Research Institute, (I.C.F.R & E), Dehradun has been published. The salient features of resin tapping by rill method are described here under.

2.15.2 Salient Features of Rill Method:

The improved method shows the increase in yield by about 22 to 50% per blaze per season and has faster healing quality. It does not reduce resistance to storms and helps in reducing incidences of fire in pure forests. Some other parameters are as:

- (a) The width of blaze is 20 cm and vertical sides are 38 cm. This is delineated on the tree with the help of a blaze frame made out of tin sheet. A handle is fixed in the centre of the frame to enable the labourer to hold it against the tree. The angle between the vertical and slanting sides of frame is 40°.
- (b) Loose and rough bark over a surface area of about 45 x 30cm leaving a space of about 15 cm from ground level is removed with the help of bark shaver.
- (c) The blaze frame is put on the stem in vertical position so that the lowest point of the frame is 15 cm above the ground level and the position of the blaze is marked with the marking gauge. The position of the central groove is also marked with the help of the wooden board and marking gauge.
- (d) The central groove, 4 mm deep and 7-9 mm wide, is then cut with the help of a groove cutter.
- (e) The lip measuring 7 cm long, 6.5 cm wide, bent at 1.5 cm from one side made out of used tin sheet is fixed to the tree with two bullock shoe nails. A 5 cm long wire nail is driven into the tree about 2 cm

below the mid point of the lip for hanging the collection pot on it the nail is driven at a slight angle so that the pot hangs snugly against the tree. The pot of conical shape with the diameter of 11.5 cm and length of 16.5 cm is made out of tin sheets. A hole is made about 1 cm from the top so that the pot can be hung on the wire nail stuck in the tree

(f) The plastic spray bottle is 13.5 cm long and 7.5 cm in dia with a 9.0 cm long cap which has a pin hole at the end. A 22.5 cm long capillary tube is fitted in the bottle to ensure a fine spray of liquid. The diameter of the capillary tube should not be more than 1.0mm otherwise the liquid comes out of the bottle in the form of jet, instead of a spray.

(g) The freshening knife consists of a wooden handle, the steel blades guides, side washer wooden piece and the nut and bolt with washer. The guides fixed with each blade enable the worker to move the knife in right direction, thus leaving the bark of the requisite thickness between the rills. It has to be ensured that the rills neither extend beyond the limits of the blaze mark nor fall short of it. The average width of the bark left between consecutive rills is 5 mm and average width of the rills is 5 to 6 mm [fig. 1(a) & 1(b)]. The blaze attains a height of 35 to 38 cum in one season of tapping. The depth of the rills is about 2 mm in the wood. The total number of rills are 32 in eight months.

(h) Freshly blazed rills are treated with acid mixture, by squeezing the plastic bottle, sprayer keeping at an angle of 45° and 3-5 cm away from it and moving its nozzle in a steady motion along the rill

(i) The preparation of setting of crop for the subsequent years should be started from the first week of February. The bark shaving should be done above the top of the first year's blaze and the position of the blaze is marked just above the previous year's blaze and rest of the operations of the first year are repeated.

(j) August to October. If necessary, from May to July, collection may be done with each freshening.

Measurements of the blaze: -

a) Length	38 Cm
b) Width	20 Cm
c) No of rills	32 Cm
d) Width of rills	5.6 mm
e) Depth of rills	2 mm

Rills falling short of blaze limit

Correct and incorrect

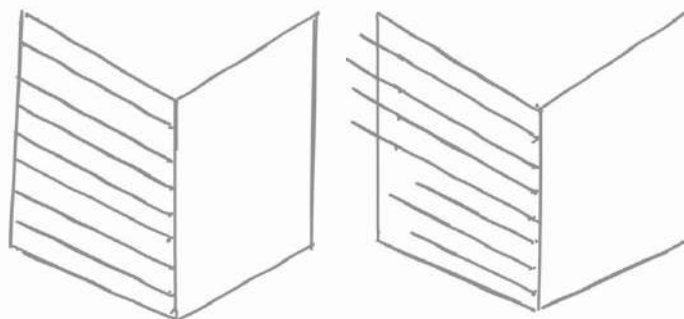
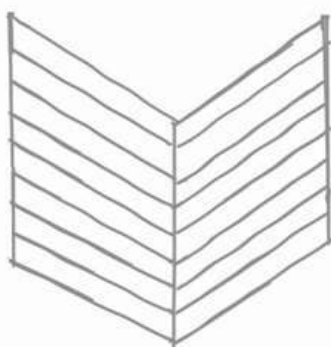
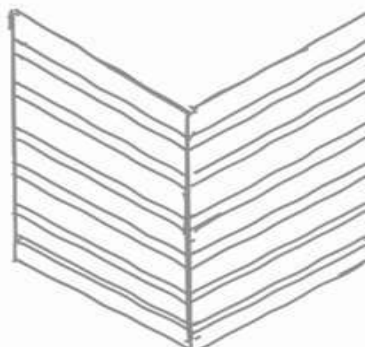


Fig.2.2 (a) Showing rills extending beyond and falling short of blaze frame

Correct and Incorrect



EQUAL SPACE BETWEEN
CONSECUTIVE RILLS



UNEQUAL SPACE BETWEEN
CONSECUTIVE RILLS

Fig 2.2 (b) Spacing between rills

- f) Width of bark between consecutive rills 5 mm
- g) Intervening space between two blazes 7.5 cm

Stimulant for one section

Water	875 ml.
Sulphric acid	70 ml.
Nitric acid	53 ml.

2.15.3 Yield

The average yield from 30cm dia trees at New Forest, Dehradun by the new method of tapping is 3.211 Kg/tree/ season against 2.523 Kg by old method. The details of the blazes tapped and the yield obtained during the previous plan period is tabulated as below.

2.15.4 Tappable diameter:

As per the instructions communicated by Pr.CCF/HP vide his memo No.A-1259-15/67(s) dated 21st Jan, 1997, the tappable diameter for Rill method is fixed as 30 cm. This, however, is on the lower side and there are reports that this has led to large scale drying up of trees. It is suggested that the minimum tappable diameter be kept at 35 cm.

2.15.5 Areas Available for Resin Tapping:

Resin tapping will be carried out in all the Chil forests of the division subject to availability of adequate number of blazes. The trees due for final felling may be tapped heavily. The Divisional Forest Officer may stop resin tapping in any forest where it is felt that the resin extraction work is likely to interfere with the growth of the trees or may be a potential fire hazard. Tapping shall be done only by rill method. Tapping shall not be preferred in the areas allotted to Protection-Cum-Rehabilitation Working Circle.

2.15.6 Suspending Resin Tapping operation:

In case drying up of trees due to resin tapping is observed in some forests, it should be immediately closed for tapping for a minimum period of 3 years. Retapping in these forests should be taken up only after the reasons for drying up of trees are analysed and effective steps taken to prevent recurrence.

2.15.7 Data Collection and Recording:

It is observed that HPSFC Ltd. does not maintain data of resin extraction compartment wise. It is, therefore, prescribed that the data of resin extraction be got maintained compartment wise and entered in the respective compartment history file.

2.15.8 Fire Protection:

Pine needles and other refuse within 1 metre of the trees tapped for resin should be removed and other instructions laid down in the H.P.Forest Manual Vol. IV and other latest instructions must be observed carefully. Areas being tapped for resin are very susceptible to fire and need intensive fire protection. Some fire fighting equipments should be provided in all resin depots whether in Forest or on road side to meet an emergency. All staff posted on resin work should be trained in handling these equipments.

2.15.9 Collection of Resin:

The pot should be removed from the tree and the resin should be poured in to collection can (container). The resin still adhering to the pot should be removed with the help of scraper central groove should also be cleaned after each collection with groove cleaner. For improving labour output, collection of resin from the pots should be done with alternate freshening in March, April and August to October. If necessary, from May to July, collection may be done with each freshening.

2.15.10 Tapping Season:

Crop setting must be started by 15th February and completed by 15th March. Tapping season extends from 15th March to 15th November. Freshenings are not made from 16th November to 30th November and during this period resin is scrapped.

2.15.11 Continuous tapping for 20 years:

After two years tapping, the blaze reaches a height at which it is not possible to pull the freshening knife upwards. Therefore, third years freshening is done by pushing the freshening knife upwards from the central groove towards the outer edge of the blaze mark.

In this way, the blaze can be extended up to four years. During fifth year, the height will be beyond reach of the tapper. Hence it is necessary to use a ladder. Research has shown that much higher yields can be obtained if tapping is done at a height of 2-4 m from the ground. If the practical difficulties of making blazes to a greater height could be overcome, the production of resin could be almost double.

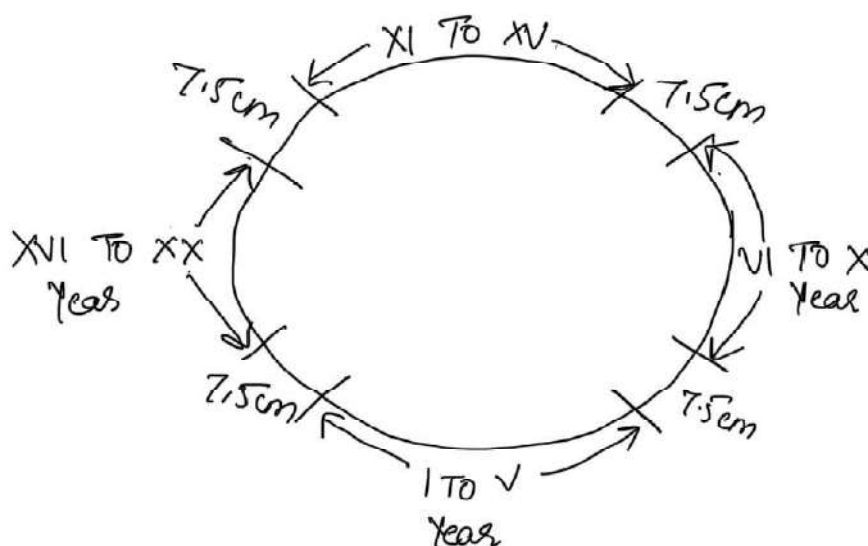


Fig 2.3: Space along the girth of the trees during sixth year of tapping.

During sixth year of tapping, a new blaze is made at the bottom of the tree in the same manner as in the first year, leaving 7.5 cm wide space along the girth of the tree from the edge of the first blaze as shown in the figure (Fig.2.3). Thus tapping trees of 35 cm diameter can be continued for 20 years, and they can accommodate four blazes of 20 cm width.

2.15.12 Latest Instructions

Latest guidelines on tapping are listed below:

- i. No. of Rills:** Only 32 rills are permissible during the entire tapping season. A penalty of Rs. 3/- per blaze is leviable if the number of rills is from 33 to 40. In case this number is from 41-50, Rs.50/- per rill will be charged as penalty. If the number exceeds 50, penalty will be levied at Rs.100/- per rill.
- ii. Interdistance between rills, depth and width:** Permissible limits on these accounts are 5 mm, 2 mm and 20 cm respectively. A penalty of Rs. 10/- has to be accounted for each such defect, separately.
- iii. Concentration of stimulant:** Sulphuric acid and Nitric acid mixed in equal proportion w/w to prepare 20% solution, is the permissible concentration of stimulant. A sum of Rs.500/- per offence as penalty shall be chargeable for using stimulant in higher concentration than the prescribed.
- iv. Penalty:** Rs.100/- per blaze has now been fixed as penalty for illicit tapping for illicit blaze. Penalty for not using the guide with the rill knife has now been prescribed at Rs.10/- per offence.

2.15.13 Resin Extraction from Private Lands:

Resin trade is nationalised under "The Rosin and Resin Product (Trade) Act 1981" the resin from the trees standing on private land ownership is also purchased by H.P. State Forest Corporation. This has helped a great deal in checking illicit and defective tapping in private ownership and pilferage of resin from Government forests. The owners and their agents engaged for tapping are questioned for unreasonably high yield.

2.15.14 Merits of "Rill Method":

1. The guide provided in the freshening knife controls the depth of blaze to 2mm in live bark and sapwood. This eliminates the damage to the heartwood, saves loss of timber and revenue.

2. Fast healing of shallow blazes makes it possible to tap the trees for a second cycle there by increasing the tapping life of a tree and conserving the pine forest.
3. Does not make the trees vulnerable to wind storm as compared to cup and lip method.
4. Helps in reducing incidences of fire in pine forests
5. The essential use of 20% acid mixture as a stimulant facilitates a prolonged resin flow and tapping season resulting in increased resin production and employment to the tappers for almost the whole year
6. Yield about 50% more resin per tree per season.
7. Additional revenue from the sale of tapped log as timber at the end of felling cycle.

2.15.15 Considerations to Augment Resin Production:

In addition to the above details discussed a wise resin tapper should also know the following apothegms:-

- a. The yield of resin is largest in the region of the root column, less in the clear part of the bole, and least in the vicinity of the branches.
- b. More resin is secreted:
 - i) On the south than on the north side of the stem.
 - ii) in a warm than in a cold climate.
 - iii) on a warm than on a cool aspect.
 - iv) on dry, and warm soils than in moist places.
 - v) in open than in crowded forest.
 - vi) on loose, sandy than on stiff and cold soils.
 - vii) on hilly or sloping than on level ground.
- c. Moderate tapping: Promotes diametric increment of the stem and spread of crown, thereby increasing secretion of resin.

2.16 Trend of Area for resin tapping

The compartment – wise details regarding resin tapping done from 2020-2021 to 2024-25 is given in the following tables.

Table 2.16 (a): Resin tapping in 2020-2021

Name of Range	No. & Name of Forest	Comptt/Sub-Comptt	Area in ha
SOLAN	R-28 Khaldhar	C-2a	36.8
	D-138- Khaldhar		11.2
	D-132 Charar	C-6	33.6
	D-132 Charar	C-7	18.8
	D-131 Mathan	C-1	18
	D-131 Mathan	C-2	20.4
CHAIL	D-44 Chiunth	C-2	40
	D-45 Tibba Kathet	C-2a	16
	D-45 Tibba Kathet	C-2b	22.4
	D-46 Chaklain	C-2	34.8
	D-47 Birni Shillai	C-2	93.6
	D-48 Shallai	C-3	12.4
	D-49 Banjani	C-3	16
	D-42 Chabri	C-1	47.6

	D-43 Powash		28.4
	D-45 Tibba Kathet	C-1a	12
	D-45 Tibba Kathet	C-1b	24
	D-44 Cheunth	C-1	40.4
	D-52 Bhoj Deen	C-2	90
	D-52 Bhoj Deen	C-3a	18.4
	D-52 Bhoj Deen	C-3b	58.4
PARWANOO	R-47 Karalghat	C-2	36
	D-188 Karalghat	C-1	48.4
	D-188 Karalghat	C-2	54.4
	D-184 RathalBhargiana		61.2
	D-186 Kalth	C-1	14.4
	D-239 Sari	C-1a	22.4
	D-239 Sari	C-1b	
	D-239 Sari	C-2	22.4
	D-239 Sari	C-3	22
	D-239 Sari	C-4	19.6
	D-240 Dochi	C-1	25.2
	D-240 Dochi	C-4	28
	D-245 Sanawar	C-1	12.4
	D-245 Sanawar	C-2	16.4
	D-245 Sanawar	C-3	16.8

Table 2.16 (b): Resin tapping in2021-22

Name of Range	No. & Name of Forest	Comptt/Sub-Comptt	Area in ha
CHAIL	D-42 Chabri	C-1	47.6
	D-43 Powash		28.4
	D-44 Cheunth	C-1	40.4
	D-44 Cheunth	C-2	40
	D-45 Tibba Kateth	C-1a	12
	D-45 Tibba Kateth	C1b	24
	D-45 Tibba Kateth	C-2a	16
	D-45 Tibba Kateth	C-2b	22.4
	D-46 Chaklain	C-2	34.8
	D-47 BiriniShillai	C-2	93.6
	D-48 Shillai	C-3	12.4
	D-49 Banjani	C-3	16
	D-52 Bhoj-Deen	C-2	90
	D-52 Bhoj-Deen	C-3a	18.4

	D-52 Bhoj-Deen	C-3b	58.4
PARWANOO	R-47 Karalghat	C-2	36
	D-188 Karalghat	C-1	48.4
	D-188 Karalghat	C-2	54.4
	D-184 RathalBhargiana		61.2
	D-186 Kalth	C-1	14.4
	D-239 Sari	C-1a	22.4
	D-239 Sari	C-1b	
	D-239 Sari	C-2	22.4
	D-239 Sari	C-3	22
	D-239 Sari	C-4	19.6
	D-240 Dochi	C-1	25.2
	D-240 Dochi	C-4	28
	D-245 Sanawar	C-1	12.4
	D-245 Sanawar	C-2	16.4
	D-245 Sanawar	C-3	16.8
	D-245 Sanawar	C-1	12.4
	D-245 Sanawar	C-2	16.4
	D-245 Sanawar	C-3	16.8
	D-240 Dochi	C-1	25.2
	D-239 Sari	C-2	22.4

Table 2.16 (c): Resin tapping in2022-23

Name of Range	No. & Name of Forest	Comptt/Sub-Comptt	Area in Hac.
Subathu	D-124 Kaitiyara	C-1	14.4
Parwanoo	R-47 Karalghat	C-2	36
	D-188 Karalghat	C-1	48.4
	D-188 Karalghat	C-2	54.4
	D-184 RathalBhargiana	C-1	61.2
	D-186 Kalth	C1	14.4
	D-239 sari	C-1a	12
	D-239 sari	C-1b	10.8
	D-239 sari	C-2	22.4
	D-239 sari	C-3	22
	D-239 sari	C-4	19.6
	D-240 doachi	C1	25.2
	D-240 doachi	C-4	28
	D-245 Sanawar	C-1	12.4

	D-245 Sanawar	c-2	16.4
	D-245 Sanawar	C-3	16.8
Dharampur	R-38 Kiard	C-1	29.6
	R-38 Kiard	C-2	7.6
	R-30 Chabal	C-2a	36.4
	R-30 Chabal	C-4	42
Chail	D-44 Cheunth	C1	40.4
	D-45 Tibba Kateth	C1a	12
	D-45 Tibba Kateth	C1b	24
	D-45 Tibba Kateth	C2a	16
	D-45 Tibba Kateth	C2b	22.4
	D-44 Cheunth	C2	40
	D-47 Birni Shilai	C2	93.6
	D-48 shillai	C3	12.4
	D-49 banjani	C3	16
	D-52 Bhoj Deen	C2	90
	D-52 Bhoj Deen	C3a	18.4
	D-52 Bhoj Deen	C3b	58.4
	D-42 Chabri	C1	47.6
	D-43 Powash		28.4
	D-39 Dhamdhar	C1	30.4
	D-39 Dhamdhar	C2	30
	D-42 Chabri	C1	47.6
	D-46 Chaklain	C2	34.8
	R-16 Chaklain	C1	28.4
	R-16 Chaklain	C2	50.4
	D-46 Chaklain	C1	6
	D-46 Chaklain	C2	34.8

Table 2.16 (d): Resin tapping in 2023-24

Name of Range	No. & Name of Forest	Comptt/Sub-Comptt	Area in Hac.
Parwanoo	R-47 Karalghat	C-2	36
	D-188 Karalghat	C-1	48.4
	D-188 Karalghat	C-2	54.4
	D-184 RathalBhargiana	C-1	61.2
	D-186 Kalth	C1	14.4
	D-239 sari	C-1a	12
	D-239 sari	C-1b	10.8
	D-239 sari	C-2	22.4

	D-239 sari	C-3	22
	D-239 sari	C-4	19.6
	D-240 doachi	C1	25.2
	D-240 doachi	C-4	28
	D-245 Sanawar	C-1	12.4
	D-245 Sanawar	c-2	16.4
	D-245 Sanawar	C-3	16.8
Dharampur	R-38 Kiard	C-1	29.6
	R-38 Kiard	C-2	7.6
	R-41 Gulzar	C-1	26.8
	D-214 Gulzar	C-2	19.2
	R-30 Chabal	C1	30.4
	R-30 Chabal	C3	36
	R-30 Chabal	C5a	38.6
	R-30 Chabal	C6	27.2
	D-118 Chabal ki Dhar		10.4
	D-119 Chabal ki dhar		26.4
	R-30 Chabal	C2b	33.2
	R-30 Chabal	C5b	21.4
	D-116 Chabal ki Dhar		4.8
	D-117 Chabal ki Dhar		2.4
	D-150 Gulhari		4.4
	R-33 Gulhari	C2	34
	D-124 Kaitiyara	C-1	14.4
	D-127 Shashal	C-2	19.2
Chail	D-44 Cheunth	C1	40.4
	D-45 Tibba Kateth	C1a	12
	D-45 Tibba Kateth	C1b	24
	D-45 Tibba Kateth	C2a	16
	D-45 Tibba Kateth	C2b	22.4
	D-44 Cheunth	C2	40
	D-47 Birni Shilai	C2	93.6
	D-48 shillai	C3	12.4
	D-49 banjani	C3	16
	D-52 Bhoj Deen	C2	90
	D-52 Bhoj Deen	C3a	18.4
	D-52 Bhoj Deen	C3b	58.4
	D-42 Chabri	C1	47.6
	D-43 Powash		28.4
	D-39 Dhamdhar	C1	30.4
	D-39 Dhamdhar	C2	30

	D-42 Chabri	C1	47.6
	D-46 Chaklain	C2	34.8
	R-16 Chaklain	C1	28.4
	R-16 Chaklain	C2	50.4
	D-46 Chaklain	C1	6
	D-46 Chaklain	C2	34.8

Table 2.16 (e): Resin tapping in2024-25

Name of Range	No. & Name of Forest	Comptt/Sub-Comptt	Area in Hac.
Parwanoo	R-47 Karalghat	C-2	36
	D-188 Karalghat	C-1	48.4
	D-188 Karalghat	C-2	54.4
	D-184 RathalBhargiana	C-1	61.2
	D-186 Kalth	C1	14.4
	D-239 sari	C-1a	12
	D-239 sari	C-1b	10.8
	D-239 sari	C-2	22.4
	D-239 sari	C-3	22
	D-239 sari	C-4	19.6
	D-240 doachi	C1	25.2
	D-240 doachi	C-4	28
	D-245 Sanawar	C-1	12.4
	D-245 Sanawar	c-2	16.4
	D-245 Sanawar	C-3	16.8
Subathu	D-124 Kaitiyara	C-1	14.4
	D-127 Shashal	C-2	19.2
Chail	D-39 Dhamdhar	C1	30.4
	D-39 Dhamdhar	C2	30
	D-42 Chabari	C2	47.6
	R-16 Chaklain	C1	28.4
	R-16 Chaklain	C2	50.4
	D-46 Chaklain	C1	6
	D-46 Chaklain	C2	34.8
	D-44 Cheunth	C1	40.4
	D-45 Tibba Kateth	C1a	12
	D-45 Tibba Kateth	C1b	24
	D-45 Tibba Kateth	C2a	16
	D-45 Tibba Kateth	C2b	22.4
	D-46 Chaklain	C2	34.8

D-47 Birni Shilai	C2	93.6
D-48 shillai	C3	12.4
D-49 banjani	C3	16
D-52 Bhoj Deen	C2	90
D-52 Bhoj Deen	C3a	18.4
D-52 Bhoj Deen	C3b	58.4
D-42 Chabri	C1	47.6
D-43 Powash		28.4
D-44 Cheunth	C2	40

Table 2.17: Range-wise abstract of area allotted for resin tapping in the past 5 years

Range	2020-21	2021-22	2022-23	2023-24	2024-25
Parwanoo	399.6	492.8	400	400	400
Subathu	0	0	14.4	0	33.6
Chail	554.4	554.4	782	782	782
Solan	138.8	0	0	0	0
Dharampur	0	0	115.6	386	0
Total	1092.8	1047.2	1312	1568	1215.6

The area allotted for tapping of resin has remained almost constant in Parwanoo range. In Chail, there is a sudden increase in the area allotted from 2022-23 remaining constant thereafter. The overall trend is presented in the figure below:

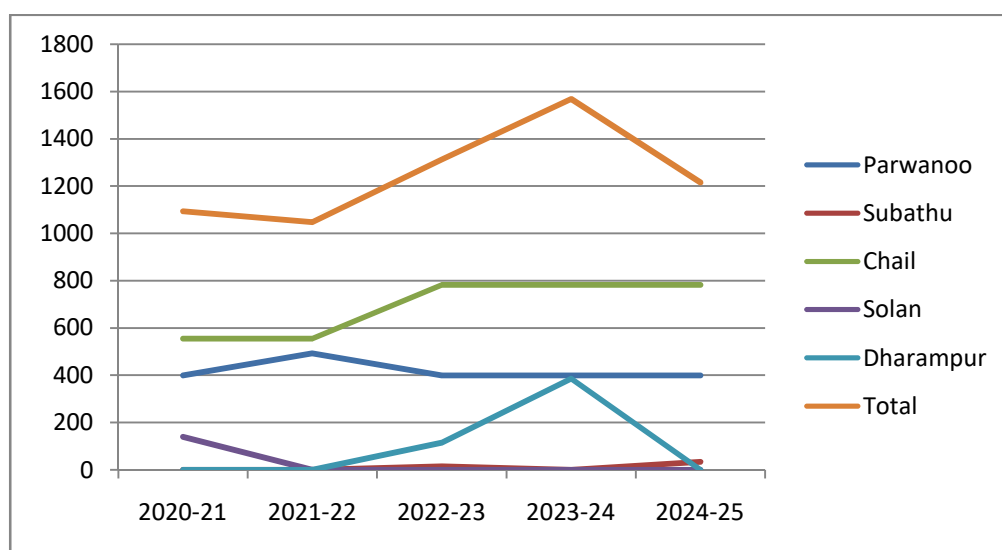


Fig. 2.4: Trends in area allotted for resin collection (overall and range-wise)

Chapter 3

Deodar Working Circle

3.1 General Constitution of the Working Circle

As a symbol of resilience, strength, and ecological balance, numerous benefits of Deodar extend beyond its majestic appearance; providing essential support for biodiversity, climate regulation, and cultural heritage. In view of this, management of Deodar forests attracts special interest.

The area covered by the previous Working Plan did not have Deodar as prominent crop. Since some Chail Range, where Deodar is a major crop, has been included in the Division, after de-notification of Chail Wildlife Sanctuary in 2014, a separate and new Working Circle has been created for management of Deodar forests of Solan Forest Division. All the forests with deodar as the principal crop where deodar as a species consists of almost pure crop with a few associate species has been included in this Working Circle (WC) including the established Deodar plantations. Most of the area in the WC has moderate to less steep slopes, and is well stocked with Deodar and some shrubs as undergrowth. Total area of this Working Circle is 111.07 ha

3.2 Area Statement

This working circle covers an area of only 111.07 ha where Deodar is present in a distinctly identifiable formation. Most of Deodar is located in Chail Range only. A very small area of 2.4 ha has been allotted to this working Circle in Kandaghat Range also, which is negligible from management perspective. The range-wise distribution of area under Deodar Working Circle is as under:

Table 3.1: Deodar Working Circle area (ha) Range wise

Range	RF	DPF	Total
Chail	53.468	55.2	108.668
Kandaghat	-	2.4	2.4
Solan	-	-	-
Subhatu	-	-	-
Dharampur	-	-	-
Parwanoo	-	-	-
	53.468	57.6	111.068

The species-wise distribution of area of the Deodar Working Circle is given in Table 3.2 below:

Table 3.2: Species-wise area distribution in Deodar Working Circle (ha)

Range	Forest	Ban Oak	Chil	Deodar	Broad Leaved	Culturable Blank	Unculturable Blank	Total
Chail	RF	0.00	44.03	9.44	0.00	0.00	0.00	53.47
	DPF	0.00	3.29	51.91	0.00	0.00	0.00	55.20
Kandaghat	RF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DPF	0.00	0.12	2.28	0.00	0.00	0.00	2.40
Total		0.00	47.44	63.63	0.00	0.00	0.00	111.07

3.3 General characters of the vegetation:

The crop is mainly Deodar occurring gregariously in pure patches of varying proportions and at some places, sprinkling with its associates such as oaks and other broad-leaved species. Deodar is sparse towards the lower altitudinal zone intermixed with Chil. Dense undergrowth of a few shrub species is present with a small inter mixture of other evergreen and deciduous broad-leaved species along the nallas and depressions and at some other moist places. Along the lower limits deodar is confined to sheltered places only.

The main associates found in the area are Oaks, Walnut, Birdcherry and Rhododendron. The forests are fairly well stocked except on southern slopes, on steep slopes and areas adjoining habitations.

3.4 Special Objects of the Management

Without prejudice to the general objects of management, the special objects of management will be:

- i. To convert the irregular and uneven aged crop into more or less uniform, normal even aged crop.
- ii. To improve health of the Deodar forests in general by reducing congestion and by removing excessive overhead shade.
- iii. To obtain a sustained yield of timber and eco-services from the area
- iv. To restock the poorly populated areas and other blank areas as soon as possible by resorting to artificial regeneration wherever required
- v. To raise best suited broad-leaved species preferred by the local people, especially in the depressions in order to restock fodder and fuel species of importance.
- vi. To preserve and protect the forests to maintain the fragile mountain ecosystem

3.5 Analysis and Valuation of the Crop

3.5.1 Stock Maps

Stock maps have been prepared and have been attached in the compartment history files.

3.5.2 Site Quality

Quality classes have been estimated ocularly. The average quality in these forests for deodar is quality class II and II/III.

3.5.3 Age Classes

Crop is generally uneven aged. Middle age class is in preponderance, while some areas have mature trees as well. In a case of old plantations, the crop is even aged.

3.5.4 Density

By and large these forests are well stocked. As per ocular estimation for density it varies between 0.4 to 0.8, the average being 0.6 for the whole working circle.

3.5.5 Enumeration

Taking up total or even partial enumeration in the compartments of the Working Circle would have been too capital intensive and time consuming. Due to paucity of funds and constraints of time, total enumerations in the forests falling in this working circle could not be taken up. As an accepted alternative, stratified random sampling with scientifically strong statistical foundation and rationale was carried out. A brief account of the process and methodology adopted for sample enumeration is given below:

Stratified Random Sampling using forest type as stratification criterion was used for enumeration. In order to arrive at greater accuracy of estimation, plots of 0.1 ha were laid in some forests having distinct composition and quality of vegetation get as close a true picture of the crop composition as possible. Enumerations were done for important species down to 10cm diameter (dbh) in 10cm diameter classes. The results of enumeration have been appended at the Appendix-IIA. The results were then extrapolated to other similar areas of the working circle. The results have been appended at Appendix – II A.

Table 3.3: Summary of enumeration results

S. No.	Range	Compartment	Sub-Compartment	Area in ha.
1.	Chail	D46 SChaklain	C-3	8.8
2.		D49 SBanjani	C-1	14
3.		D50 SSakori		32.4
4.		R16 SChaklain	C-2	50.4
5.		R18 SSakori	C-2b	3.068
Total				108.668
6.	Kandaghat	D59 SBagetu		2.4
Total				2.4
Grand Total				111.07

Table 3.4: Number of Trees and Volume of Different Dia. Classes in Deodar Working Circle

Diameter Class	Trees count and Volume	Species			Total
		Chil	Ban Oak	Deodar	
(V) 10-20 cm	Trees Count	5404	0	3001	8405
	Volume	272.3616	0	212.1707	484.5323
(IV) 20-30 cm	Trees Count	1361	0	2150	3511
	Volume	340.114	0	304.440	644.554
(III) 30-40 cm	Trees Count	724	0	2382	3106
	Volume	495.650	0	1686.218	2181.868
(IIA) 40-50 cm	Trees Count	335	0	2196	2531
	Volume	453.724	0	3109.097	3562.821
(IIB) 50-60 cm	Trees Count	73	0	1000	1073
	Volume	164.929	0	2548.400	2713.329
(IA) 60-70 cm	Trees Count	18	0	368	386
	Volume	61.189	0	1302.536	1363.725
(IB) 70 & above	Trees Count	13	0	99	112
	Volume	62.070	0	476.556	538.626
Total Trees Count		7928	0	11196	19124
Total Volume		1850.038	0	9639.4176	11489.455

3.6 Silvicultural System

The forests allotted to this working circle will be managed under Group Selection System. It would involve felling of small groups of trees of exploitable diameter to create openings for regeneration.

Group Selection system would facilitate harvesting of mature trees in small scale and allow gradual and small scale opening of the forest canopy allowing more light to reach the forest floor. It will eventually

lead to creating conditions for successful regeneration of new deodar plants in partial shade and partial light reaching the forest floor. The increased light will encourage regeneration of new seedlings and advanced growth of Deodar within the openings without compromising the existing local conditions.

Over time, these regenerated groups merge to form a multi-aged forest structure, creating a diverse landscape rather than a uniform stand of trees of the same age.

Compact groups of advance growth up to 30 cm dbh and 0.2 ha or more in extent will be retained as advance growth. Regeneration will be supplemented by artificial regeneration operation. No felling will be carried out except salvage removal. Cleaning/ thinning will be carried out in regenerated areas, which have established crop wherever required.

3.6.1 Choice of species for planting

Species most suited to the locality along with Deodar as principal species and its associates will be preferred. No unnecessary removal of associate species will be done. Broad leaved associates of Deodar will be introduced in nallas and depressions.

3.6.2 Rotation

A diameter of 60 cm dbh is suited for conversion in to standard sized sleepers and other large size scantling which are mostly in demand. According to the growth data of comparable forests where Deodar is managed as principal crop, 60 cm diameter is attained in about 95 years by Deodar. Giving an allowance for below par regeneration due to failures and other natural causes the rotation of 120 years has been fixed for all the species in this working circle.

3.6.3 Regeneration period

Regeneration Period of 30 years is considered sufficient to regenerate the area. Hence regeneration period of 30 years is fixed.

3.6.4 Exploitable diameter

The exploitable diameter of Deodar is fixed 60 cm dbh.

3.6.5 Division into periods and allotments to the periodic blocks

In view of the adoption of Group Selection System, division into specific periods and allotments to the periodic blocks is not envisaged. With the rotation of 120 years and regeneration period of 30 years, with the progress of regeneration in the openings made in the forest canopy, entire area is expected to be regenerated in the rotation period. The resultant crop will continue to be uneven-aged/ irregular.

3.6.6 Yield calculation

The yield from this working circle which will be managed under Group Selection System will primarily be from salvage felling and felling to meet legitimate local demands of the right holders. Therefore, no yield is being prescribed.

3.6.7 Control of yield

Since all the removals in this working circle will be of the nature of salvage felling, outturn from all such felling would count towards the yield. The yield from all extractions for the WC shall be monitored on annual basis and any over exploitation resulting in unregenerated gaps shall lead to stoppage of further

extraction. The gaps generated shall be artificially regenerated through planting of Deodar and its associates with reasonable admixture of broad-leaves species of the choice of the local people.

3.6.8 Subsidiary Silvicultural Operations

The following operations will be carried out after each salvage felling:

1. Slash disposal
2. Planting operation
3. Weeding
4. Cleaning and climber cutting

(i) Slash disposal

After the salvage felling is over, felling refuse shall be effectively disposed off without damaging the remaining crop during winter months following the year of working. The villager should be encouraged to remove as much of the felling refuse as possible. Whatever felling refuse is left after collection by the villagers, it should be collected and taken away from the felling area at a distance of at least 5 meters. The slash should be burnt under strict supervision to avoid damage to other trees. After this operation is over, control burning be done in order to get clean and receptive seedbed. In areas where there is young regeneration and advance growth slash should be removed from the patches of regeneration or advance growth. Care should be taken that no debris or logs roll down in the young regeneration or advance growth during slash disposal or control burning.

(ii) Planting

It is expected that after slash disposal debris burning, a clean and receptive seedbed shall be available for the regeneration to come up. In the years that follow, in a good seed, natural regeneration of deodar will come up on the clear ground in most cases and there should be no problem of regeneration. However, to reduce the period required to get natural regeneration, and to restock the ensuing blanks fully within shortest period, artificial regeneration through planting, supported by seed sowing is proposed to be done without waiting for the natural regeneration to come up.

(iii) Weeding

For healthy growth of plants in areas under regeneration, and to reduce competition from undesirable species that come up after gaps are created due to felling, weeding operation becomes necessary from the first year. Generally two weeding in growing season are to be carried out; first weeding in the month of April to June before onset of monsoon and second weeding during the month of September when monsoon recedes. The main object of weeding is that plants/seedlings/recruits must always be kept free from weeds during the growing season.

(iv) Cleaning and Climber Cutting

When the regeneration has attained a height of about two meters cleaning operation is to be carried out very carefully and should be of minimum required intensity. As Deodar saplings in the initial stages are shade tolerant, some miscellaneous species of low value may need to be retained around the new regeneration for some time to help the main crop in getting established. Cleaning should, therefore, be done without any bad effect on the future crop. This will offer an opportunity to regulate the mixture of the species to the advantage of the main crop of superior species. During cleaning operations, healthy growing saplings should be retained and crooked, sickly, forked, and damaged stems be removed. The spacing of plants till the first regular thinning is done should be from 1.75 m

to 2.75 meters. Unwanted scrub species, bushes etc should be cut at the time of cleaning. All the cut material should be removed outside the regeneration area to minimize fire hazard.

3.7 Protection from Fire

Deodar is quite susceptible to fires, especially in younger stages. Therefore, all the forests in Deodar Working Circle will be strictly protected from fires. Especially, the young deodar plantations and regenerations areas would require special attention and complete protection from fires is to be ensured. As a first precaution against fires, forest floor is to be kept clean from any combustible material. Special precautions are necessary in the areas adjacent to Chil forests. The fire lines, inspection paths and bridle paths should be kept clean of needles especially in hot summer months. Adequate number of fire watchers should be engaged during fire season that should be provided with suitable fire-fighting equipment. New fire line may be made in areas more vulnerable for forest fires, such as areas near habitation, eco-camps, areas adjoining Chil forests etc.

3.8 Regeneration Survey

The regeneration survey in areas where salvage removals have been carried out shall be carried out every alternate year till the regeneration is established. If regeneration is inadequate further felling will be curtailed for the next year. A detailed report pin-pointing the reasons for such failure should be prepared, and corrective measures taken and reviewed. The regeneration should be made to keep pace with the felling and in case there are short falls on this account with reference to the openings/ gaps created due to felling, further felling should not be carried out and deferred till the problem is resolved.

Chapter 4

Ban (Oak) Protection cum Improvement Working Circle

4.1 General Constitution

Ban Oak (*Quercus leucotrichophora*) forests represent the climax evergreen vegetation between 1200 mts to 2300 1874.2 mts of altitude in the central Himalayan region. Oak forests are source of fuelwood, fodder and can be correlated with natural springs and wildlife and plays a vital role in conservation of soil, water, native flora and fauna thereby, providing numerous ecosystem services to mankind. They play a crucial role in maintaining biodiversity, stabilizing watersheds, and preventing soil erosion on Himalayan slopes. Himalayan oak forests are vital for the subsistence economy in the Western Himalayas, providing fuelwood, fodder, and other resources. The ban oak is particularly widespread and useful, being lopped for fuelwood, and its leaves used as fodder. Degradation of oak forests can have adverse impacts on local ecological services, wildlife, and water resources. Climate change, including increasing temperatures and declining precipitation, can negatively impact oak regeneration and survival. Lopping, cutting, and fire can affect the growth, regeneration, and survival of oaks in the region.

This working circle comprises all the areas under Ban oak (*Quercus leucotrichophora*) whether well-stocked or otherwise, falling in the Chail, Kandaghat, Solan and Dharampur Forest Ranges. These areas are not to be exploited and need to be maintained and protected for their ameliorative, aesthetic and environmental values. Efforts are to be concentrated in the direction of improvement of the stocking and hygienic conditions of these forests:

The total area of the working circle is **1874.2** ha and details range-wise and forest wise, class wise are given in subsequent section.

4.2: Area under Ban Oak Working Circle

Range-wise distribution of area of this Working Circle is as follows:

Table 4.1: Range-wise distribution of the Working Circle

Range	Reserve Forest (ha)	Demarcated Protected Forests (ha)	Total (ha)
Chail	-	370.4	370.4
Kandaghat	366	318	684
Solan	251.2	558	809.2
Dharampur	-	10.6	10.6
Total	617.2	1257	1874.2

Details of area allotted to Ban-Oak working circle with block compartment and range names is given below in Table 4.2:

Table 4.2: Area allotted to the Ban Oak Working Circle

Particular RF/DPF,UPF				
Range	Name of forest area	DPF	RF	Grand Total
Chail	D40 SKhaniKaNaIa	20.4		20.4
	D41 SKaneoala	4.4		4.4
	D51 SJhajhaKhariun C-1	84		84
	D51 SJhajhaKhariun C-3	42.4		42.4
	D52 SBhojdeen C-1	129.2		129.2
	D52 SBhojdeen C-2	90		90
	Chail Total	370.4		370.4
Kandaghat	D100 SDharot C-2	18.8		18.8
	D101 SKuryali	19.6		19.6
	D53 SShungal	11.2		11.2
	D54 SShadiyal	8.4		8.4
	D55 SSuro No 1	2		2
	D56 SSuro No 2	2.8		2.8
	D58 SBasha	11.2		11.2
	D60 SBadoonShikar	28.4		28.4
	D61 SDhanoliDochi	6.4		6.4
	D62 SBisha C-1	49.1		49.1
	D62 SBisha C-2	11.8		11.8
	D62 SBisha C-3	19.1		19.1
	D64 SBirni	2.4		2.4
	D65 SBirniKasauli	7.2		7.2
	D66 SKasauli	5.6		5.6
	D67 SSainj	12.8		12.8
	D71 SKarol-I	5.2		5.2
	D72 SKarol-II	16.4		16.4
	D73 SKarol-III	10.4		10.4
	D74 SKarol-IV	5.6		5.6
	D75 SKarol	19.2		19.2
	D76 SKarol-VI	0.8		0.8
	D77 SKarol-VII	1.2		1.2
	D78 SKarol-VIII	4.8		4.8
	D79 SDed	14.4		14.4
	D99 SSalumna	23.2		23.2
	R20 SBisha		66	66
	R21 SKarol C-1a		34.4	34.4
	R21 SKarol C-1b		42	42
	R21 SKarol C-1c		38.8	38.8
	R21 SKarol C-2		58.4	58.4
	R21 SKarol C-3a		39.6	39.6

	R21 SKarol C-3b		32	32
	R21 SKarol C-3c		34.4	34.4
	R22 SKarol		12.4	12.4
	R23 SKarol		8	8
Kandaghat Total		318	366	684
Solan	D104 SKarol C-1	22.4		22.4
	D104 SKarol C-2	44.8		44.8
	D105 SMathia C-1	19.6		19.6
	D105 SMathia C-2	11.2		11.2
	D105 SMathia C-3	7.6		7.6
	D105 SMathia C-4	9.6		9.6
	D106 SNaloh C-1	23.2		23.2
	D106 SNaloh C-2	13.6		13.6
	D107 SDulhain C-1	10.8		10.8
	D107 SDulhain C-2	7.6		7.6
	D108 SShilly C-2	16		16
	D80 SSeri	20.8		20.8
	D81 SCharech C-1	31.6		31.6
	D81 SCharech C-2	40.8		40.8
	D82 SJavaRajgarh	43.6		43.6
	D83 SRajgarh C-1	70.4		70.4
	D83 SRajgarh C-2	62.8		62.8
	D84 SDamkari	39.2		39.2
	D85 SNiun	10.4		10.4
	D86 SDharogNiun	33.6		33.6
	D87 SDiaragDaun	5.2		5.2
	D88 SShogBadrog	13.2		13.2
	R24 SRajgarh C-1		42.8	42.8
	R24 SRajgarh C-2		26	26
	R25 SShahogBhadrog C-1		43.2	43.2
	R25 SShawagBadrog		59.2	59.2
	R27 SNauni C-1		24.4	24.4
	R27 SNauni C-2		55.6	55.6
Solan Total		558	251.2	809.2
Dharampur	D142 SJhojoBhaili C-2	6.6		6.6
	D174 SBiggar	4		4
Dharampur Total		10.6		10.6
Grand Total		1257	617.2	1874.2

4.3 Species wise area distribution:

The area under different species in the Ban (Oak) working circle is summarised in Table 10.2 given below. It is evident from the species-wise figures that ban oak comprises four-fifths (i.e. 80%) of the area of the working circle (75% as pure crop and another 5% as a mixture with other species). About 10% of the crop is present as mixtures of various proportions i.e. Ban oak and deodar Ban Oak and Chil etc. These figures are based on the enumeration estimates based on the sampling. The area under species like deodar, Chil etc. has been based on sample plots and extrapolation may have led to slightly inflated figures. It can however be inferred that about 8-10% area of the working circle is under coniferous species, e.g. deodar and Chil.

Table 4.3: Species wise area distribution in Ban oak Working Circle

Range		Ban Oak	Chil	Deodar	Broad Leaved	Culturable Blank	Unculturable Blank	Total
Chail	RF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DPF	299.46	43.45	27.48	0.00	0.00	0.00	370.40
Kandaghat	RF	338.40	3.22	14.47	4.91	2.00	3.00	366.00
	DPF	245.27	33.17	31.05	3.51	3.00	2.00	318.00
Solan	RF	233.01	3.65	9.54	0.00	0.00	5.00	251.20
	DPF	490.79	12.88	35.26	0.38	14.54	4.15	558.00
Dharampur	RF	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DPF	5.09	5.51	0.00	0.00	0.00	0.00	10.60
Total		1612.03	101.88	117.80	8.80	19.54	14.15	1874.20

4.4 Blocks and Compartments

Based on the crop composition, field visits and discussions with the field officials, there is slight modification in area under Ban Oak working circle from that shown in the old working plan. D-98, Bhuwan ki Dhar having 19.2 ha has been shifted from Ban Oak working circle to Chil Working Circle in the present working plan. No changes have been made in the existing boundaries of the forests, compartments and sub-compartments.

4.5: General character of the vegetation

The forest are mainly ban oak areas conforming to the Forest Type-12/ C-I-a of Champion and Seth's Classification. A few areas have chil and deodar trees interspersed which are either natural or of plantation origin. Many forests of this working circle have mature stage compact patches of deodar that were planted from 1960 onwards, as it was the prescription under the Sandhu's plan (1956-83) that deodar and walnut be introduced in oak areas after felling. As was the policy earlier, the ban oak areas were to be gradually replaced by plantations of deodar and walnut, as ban oak was not considered valuable enough as compared to deodar. However, with the change of time and the new forest policy of 1988 the focus has

now been on the conservation of oak forests in the forest division which have gained due attention for their improvement and rehabilitation. Many oak forests, which were earlier coppiced, have now formed as mature stands. Oak has its presence mainly in the northern slopes and have better growth in moist areas. It is an excellent species for water conservation and supports the multi-storey nature of the forest. Patches of oak forests away from villages and free from biotic pressure have improved, primarily because of effective protection. These can be seen distinctively and never fail to attract onlookers and have high environmental and aesthetic value. But areas burdened with biotic pressures, including the dependence of the people on the oak trees for fodder and fuel, many ban oak patches near habitations have been reduced to degraded state because of unregulated lopping. Lopping by far has been the most harmful practice with severe adverse impacts on the oak trees. Lopping for fodder leaves, especially during winter months has been the major threat to the crop. The trees that have been regularly lopped have lost their normal rounded crowns and the coppiced shoots have attained a bushy form due to the production of numerous small shoots from the remnant main tree trunk. The locals also use ban oak for agricultural implements, bedding for cattle and compost.

Main associate species

Trees

(*Quercus leucotrichophora*)] (*Quercus semicarpifolia*),(*Quercus floribunda*)](*Abies Grandis* Foliage)] (*Pinus wallichiana*)] (*Cedrus deodara*)] (*Betula alnoides*)] (*Sorbus lanata*)] (*Taxus baccata*)] (*Carpinus viminea*), *Ilex dipyrena*)] (*Aesculus indica*)] (*Rhododendron arboreum*)] (*Toona cerrata*)] (*Fraxinus micrantha*)w] (*Acer acuminate*)] (*Alnus nitida*)] (*Juglans regia*)] (*Alnus nepalensis*)] (*Machilu odoratissima*) (*Ehretial aevis*)] (*Thamnocalamu sfalcone*)(*Lyoniaovalifolia*)] (*Aesculus indica*)] (*Pyrus pashia*)] (*Pinus roxburghii*)] (*Toona ciliata*) (*Toona serrata*)

Shrubs

(*Berberis aristata*)] (*Rosa moschata*)] (*Indigofera heterantha*)] (*Rubus lasiocarpus*)] (*Cotoneaster bacillaris*)] (*Pyracantha crenulata*)] (*Prinsepia utilis*)] (*Skimmia laureola*)] (*Adhatod avasica*)] (*Viburnum cotinifolium*),(*Acotinum balfourii*)

Herbs

(*Saxifragali gulata*)] (*Imperata cylindrica*)] (*Chrysopogon gryllus*)] (*Apluda mutica*) (*Heteropogon contortus*)] (*Cymbopogon martinii*)] (*Girardinia heterophylla*)] (*Mentha sylvestris*)] (*Potentilla fulgens*)]

4.6 Special Objective of Management:

- (i) To preserve the ban oak forests for their environmental and ameliorative benefits specially water conservation.
- (ii) To improve the biodiversity and growing stock
- (iii) To maintain the forest areas for their tourism potential and aesthetic value.
- (iv) To meet the *bonafide* demands of the local right holders as per the provisions of the Settlement.
- (v) To rehabilitate degraded oak forests by improving the stocking of ban oak through planting, protection and discouraging indiscriminate lopping.

4.7 Analysis and Valuation of the crop

4.7.1 Stock Maps

All forests have been stock mapped on a scale of 1:15,000 on copies of Survey of India sheets and filed in the respective Compartment History Files.

4.7.2 Density of the crop

Ocular estimation of crown density has been made and recorded in the concerned compartment history file for every compartment. Most of the areas have moderate to very good density that ranges between 0.4 to 0.8 Thechil and deodar patches in the oak forests too are well stocked. Only a few forests like R-25 Shahog C1, D-74 Karol IV, D-105 Mathia C3, D-106 Naloh, D-107 Dhalain etc. have poor density due to excessive biotic pressure. Average density is around 0.6

4.7.3 Site Quality

The crop has not been assigned any site quality as no standard quality classes have been fixed for ban oak. The forests away from habitations and road head give the appearance of Selection forests as they have escaped biotic interference and are dense, of good quality and show presented all age classes while those near habitations are severely lopped and hacked and many are now in a degraded state.

4.7.4 Enumerations and their results

Stratified Random Sampling using forest type as stratification criterion was used for enumeration. In order to arrive at greater accuracy of estimation, plots 0.1 ha were laid in some forests having distinct composition and quality of vegetation get as close a true picture of the crop composition as possible. Enumerations were done for important species down to 10cm diameter (dbh.) in 10cm diameter classes. The results of enumeration have been appended at the Appendix-IIA. The results were then extrapolated to other similar areas of the working circle. The species wise volume distribution in the working circle is as under:

Table 4.4: Number of trees and standing volume of major species in Ban oak Working Circle

Species	Total number	Trees per Ha	Total Volume m ³	Volume per Ha m ³
Chil	30491	16.27	10751.99	5.74
Ban Oak	724135	386.37	124424.29	66.39
Deodar	46824	24.98	16031.08	8.55
Broad Leaved	5486	2.93	475.76	0.25

4.8 Silvicultural System:

Ban oak has been managed under the Coppice with Standards system in the past. The retention of standards was considered essential for the production of large sized timber and ensure seed supply to the coppiced areas. But since the moratorium on the felling of ban oak, no exploitation of green trees is being done. Keeping this in view and also considering the objects of management, no silvicultural fellings are proposed, hence no silvicultural system is being prescribed. Instead ban oak shall be managed under a system of planting and improvement fellings, in which only the dead, dying, uprooted and fallen trees shall be removed, that too only to meet the demands of the local right-holders. Planting of degraded areas and gap planting in suitable patches will be done by planting ban oak and other suitable associate native species. Assisted Natural Regeneration(ANR) and Planting , as detailed in subsequent para will be resorted to.

4.9 Yield:

Since no feelings have been prescribed, the yield would be of academic Interest only. Hence no yield is being prescribed. Only dead, dying, diseased, uprooted and fallen trees are to be removed. Though no feelings are prescribed in this working circle, the DFO for the ease of control, can divide the working circle area under different felling coupes and salvage felling should be allowed only once from each felling coupe area during the working plan period.

4.10 Rotation

Rotation is not being prescribed as no silvicultural feelings have been indicated.

4.11 Status of Regeneration in Oak areas:

A total area of 208.9 ha was felled between 1971 and 1980 under the coppice with standards silvicultural system, all areas have regeneration in various stages of growth, but established coppice shoots are generally very less. Due inadequate and poor protection and closure the coppice shoots have been heavily lopped, grazed by cattle and the trees have acquired a bushy form. However, a few forests that were coppiced prior to this period, like R-25 Shahog C1, R-24 Rajgarh C1 and C2, now have coppice shoots that have established but need tending. In forests like D-107 Dhalain, even after nearly 55 years of felling many of the coppice shoots have not established due to excessive biotic interference. It has been observed that grazing and grass cutting are very adverse factors in the establishment of oak regeneration. In addition in grazed areas where ban oak is mixed with conifers eg. Chil. Often it is observed that the crop is gradually becoming converted to a pure coniferous form owing to the ease of natural regeneration of Chil while that oak fails.

4.12 Assisted Natural Regeneration (ANR) and Planting Programme:

The forests that have been felled in the past had sufficient rootstock to regenerate themselves and effective closure, soil and moisture conservation methods followed by periodical silvicultural interventions like singling, removal of parasites and supporting the natural seedlings of oak and associates would have completely restocked the areas but due to ban on green felling no silvicultural operations were performed. Due to which many areas will require planting or the techniques of Assisted Natural Regeneration where natural regeneration would need to be supplemented by artificial efforts. The DFO may use his discretion to ascertain wherever planting would be necessary to supplement natural regeneration after closures. Ban oak will be the main species to be planted and all efforts should be made to encourage the establishment of this species. However, a mix of about 25 percent local associate species should also be included for improvement in biodiversity. The past experience has proven beyond doubt that effective protection against biotic pressures and a combination of soil & moisture conservation works with appropriate silvicultural operations is the best way to rehabilitate the degraded ban oak forests with available rootstock. The following programme for closure/ planting is prescribed for this working circle-

Table 4.5: Closure and planting programme for Ban Oak Working Circle

S.No.	Region	Name Of Forests	Area (ha)	Plantation Work		Activities					
				Area (Ha)	Plant / Ha	Year I	Year II	Year III	Year IV	Year V	Total
1	Kandaghat	D69 SPalhech I	22.4	3	200		3				
2	Kandaghat	D101 SKuryali	19.6	5	200	5					
3	Solan	D82 SJawa	43.6	7	200		5	2			

4.13 Subsidiary Silvicultural Regulations:

a. Treatment maps for the areas to be taken up for closure and planting in a particular year should be prepared to incorporate the extent of area, soil characteristics, slope, work undertaken and appended in the concerned compartment history file. Planting should be started just after the break of monsoons and completed by July end and regular beating up to the extent of approved norms would be done till 3 years to ensure stocking of the area.

b. Some ban oak areas that were coppiced in the past have coppice shoots, but these do not exhibit very good growth because of various biotic interferences. Effective closure would enable the shoots to establish and put on good crown development.

c. Cleaning of coppice shoots in the areas coppiced in the past is necessary. Inferior shoots interfering with the growth of vigorous shoots should be either cut or simply lopped and only three vigorous shoots should be retained

d. Some oak areas have Chil and deodar plantations and are now fairly dense patches of pole crop. The trees need to be pruned and some thinnings may also be necessary to improve the hygiene of the crop as also to prevent damage due to fires. When the ban on green felling is lifted silvicultural operations must be performed to improve the quality of growing stock.

e. Many coppiced areas and plantations have profuse growth of climbers, especially Rona and Smilax that have straddled the poles and coppice shoots, suppressing them and inhibiting their growth. Climber cutting has over the years been a neglected area. This needs to be regularly carried out for hygienic considerations and to promote better growth of desired species.

Silvicultural operations: The main silvicultural operations in Ban Oak Working circle consists of singling, pruning, coppicing, climber cutting and eradication of invasive shrubs. The soil and water conservation works are integral and important activities for proper management of water regime.

Table 4.6: Silvicultural works prescribed in the Ban Oak Working Circle

Silvicultural Works								
Sr. No.	Region	Name Of Forests	Forest Area	Working Circle	Silvicultural Activities	Area In (Ha) Which Activity Has To Be Done	%	Year
1	Chail	D51 SJhajhaKhar	84	Ban Oak	singling, pruning, coppicing, climber	25	-	2027

		ium C-1		W.C.	cutting			
2	Chai l	D51 SJhajaKhar ium C-3	42.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	12	-	20 28
3	Chai l	D52 SBhojdeen C-1	129.2	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	35	-	20 27
4	Chai l	D52 SBhojdeen C-2	90	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	25	-	20 29
5	Kan dagh at	R20 SBisha	66	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 28
6	Kan dagh at	R21SKarol C-1A	34.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 29
7	Kan dagh at	R21SKarol C-1B	42	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 29
8	Kan dagh at	R21SKarol C-1C	38.8	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 30
9	Kan dagh at	R21SKarol C-2	58.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 30
10	Kan dagh at	R21SKarol C-3A	39.6	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 30
11	Kan dagh at	R21SKarol C-3B	32	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 31
12	Kan dagh at	R21SKarol C-3C	34.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 31
13	Kan dagh at	R22 SKarolNoII	12.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 31
14	Kan dagh at	R23 SKarolNoIII	8	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 31
15	Kan dagh at	D53 SShungal	11.2	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 31
16	Kan dagh at	D54 SShadiyal	8.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 31
17	Kan dagh at	D55 SSuro No 1	2	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 31

18	Kan dagh at	D56 SSuro No 2	2.8	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 31
19	Kan dagh at	D58 SBasha	11.2	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 31
20	Kan dagh at	D59 SBagetu	2.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 31
21	Kan dagh at	D60 SBadoonShi kar	28.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 32
22	Kan dagh at	D61 SDhanoliDo chi	6.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 32
23	Kan dagh at	D62 SBisha C-1	49.1	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 32
24	Kan dagh at	D62 SBisha C-2	11.8	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 32
25	Kan dagh at	D62 SBisha C-3	19.1	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 32
26	Kan dagh at	D64 SBirni	2.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 32
27	Kan dagh at	D65 SBirniKasau li	7.2	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 32
28	Kan dagh at	D66 SKasauli	5.6	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 32
29	Kan dagh at	D67 SSainj	12.8	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 32
30	Kan dagh at	D69 SPalhech I	22.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 33
31	Kan dagh at	D70 SPalhech II	3.2	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 33
32	Kan dagh at	D71 SKarol I	5.2	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 33
33	Kan dagh at	D72 SKarol II	16.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 33
34	Kan	D73 SKarol	10.4	Ban	singling, pruning,	-	-	20

	dagh at	III		Oak W.C.	coppicing, climber cutting			33
35	Kan dagh at	D74 SKarol IV	5.6	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 33
36	Kan dagh at	D75 SKarol V	19.2	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 33
37	Kan dagh at	D76 SKarol VI	0.8	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 33
38	Kan dagh at	D77 SKarol VII	1.2	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 33
39	Kan dagh at	D78 SKarol VIII	4.8	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 33
40	Kan dagh at	D79 SDed	14.4	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 34
41	Kan dagh at	D99 SSalumna	23.2	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 34
42	Kan dagh at	D100 SDharot C-2	18.8	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 34
43	Kan dagh at	D101 SKuryali	19.6	Ban Oak W.C.	singling, pruning, coppicing, climber cutting	-	-	20 34

The eradication of invasive shrubs/bushes like eupatoria and lantana etc. should be taken up at appropriate sites after field survey.

The details of soil and water conservation works have been given in soil and water conservation overlapping working circle.

4.14 Nursery Technique

4.14.1 Seed Production

Oak trees produce both male and female flowers. The male flowers are arranged in catkins, while the female flowers are smaller and develop into acorns enclosed in a cupule. Oaks are primarily wind-pollinated, meaning the wind carries pollen from the male catkins to the female flowers, leading to fertilization and the development of acorns. Fertilization takes place soon after pollination in May-June. There is a little growth during the first season and the seed ripens during next December-January. Acorns mature within 6-18 months. Factors like climate, soil conditions, and the overall health of the tree can influence acorn production and maturation. The ripened seeds fall between February to April. Normal seeding starts on 25 years old trees. Seeds should be collected December - January before these fall and get damaged on the ground. These acorns should be dried in shade and stored in sealed tins. (Never in gunny bags). The properly stored seeds give 60% fertility and last for one year. One kilogram of seed contains 400-600 acorns. Seeds are produced sufficiently almost every year, however, the acorns are

favourite food of bears, monkeys, langurs, flying squirrels and rats etc. If these attack, then a good seed year turns into a bad one. Larvae also bore through the seeds and damage large proportion of seeds on the tree itself.

4.14.2 Nursery Practice:

Ban Oak seeds collected in November - December, dried in sun, well mixed with sterilized sand and aldrex / B.H.C. powder should be stored in washed Kerosene/ ghee tins with their tops properly shouldered to avoid the exchange of air and kept in cool, airy room on wooden planks. Nutweavils (*Curculio* spp), particularly in poor seed years, cause great loss. The adult weevils come out of the ground in July/August and lay eggs in developing seeds. After feeding on the seed contents the full-grown larva cuts a circular hole in the seed coat emerges and reenters the soil. The entire kernel of the acorn may be consumed in less than a month. Carbon bisulphide is one of the common fumigants with which seeds need to be mixed before it is stored.

Raised germination beds should be prepared for oak seed sowing. Before sowing viable seeds are selected and are soaked in water for 24 hours. Use high-quality, locally sourced seeds to ensure genetic diversity and adaptability. When sown in root trainers or polythene bags pre-germinated seeds should be used to take care of possible failures. Seeds should be sown 5 cm. apart in nursery beds in February and March (and even in April in snow bound nurseries) in line spaced at about 25cm-30cm. Sowing depth should be 2-3 cm. Light side shade facilitate better germination. Provide artificial shade if natural shade isn't sufficient. Provide regular irrigation, especially during dry periods, but avoid overwatering, which can lead to fungal diseases. Regularly remove weeds to prevent competition for resources.

Germination starts in 10-12 days and takes 5-7 weeks to complete. The seedlings should be spaced 10 cm. apart in the beds. Polythene bags and root trainers and beds are properly weeded and only one plant retained per root trainer or polythene bag. NPK at the rate of about 1 gm per bag is administered. Root trainers are better than poly bags for growing plants. This facilitates better root growth and helps in establishing the plants when planted in the field. It is always advisable to use only tall plants with well-developed root systems for plantation.

4.15 Artificial Propagation

4.15.1 Direct sowing

The sowing is done in lines or patches. The spacing is 3m between the lines and 3mx3m between the patches. Seed requirement is about 10kg of acorns per hectare for direct sowing. Seeds should be sown 2 cm. deep in late June just before the monsoon rains. If the seeds collected in the same year are ward and there are normal rains, then a germination of 60-70% can be expected Weeding, bush cutting during first two-year and protection from grazing and fire is of utmost importance

4.15.2 Planting

The nursery seedlings become plantable by third year after it has attained a height of 15-20 cm. The plants in root trainers or polythene bags should be planted in the field during monsoon and planting should be complete by July end.

4.16 Natural Regeneration:

The fallen seeds have fair amount of shade for germination and those which fall on exposed locations receiving direct sun and fail to germinate. Thus light covering of leaves or soil is helpful for germination. Germination takes place in July with the monsoon showers. Drought during autumn and summer, grass cutting and grazing are major reasons for seedlings mortality. Combination of seedling regeneration and coppice shoots from existing root stock has been found to be showing good results. Protection against

biotic pressures combined with periodical silvicultural operations often gives excellent results in the rehabilitation of the degraded oak forests. With effective protection oak is quick to regenerate and establish itself. This fact is also underlined by hill farmers who skillfully grow and nurture oaks on terrace bunds and in grooves on their holdings. Community participation in the protection of oak forests should always be encouraged.

4.17 Ban Oak lopping Cycle

Oaks are evergreen species and their old leaves fall only after new leaves have made their appearance in March/April. The tree needs full protection from lopping during the time of appearance of new leaves in spring. The shoots become woody and the leaves coriaceous during the second winter. Due to this a lopping cycle of 3 years is to be adopted for Ban Oak i.e. if a tree is lopped the winters of year 1, it would again be ready for lopping in the winter of the year 4.

4.18 Uses of Ban Oak

- (1) Nutritious green leafy fodder for livestock during the lean winter months.
- (2) Best firewood for Cooking and heating purposes.
- (3) Quality Charcoal which burns well and lasts longer.
- (4) Good small timber for agricultural implements.
- (5) Leaves provide good bedding for livestock and forms good compost from this bedding.
- (6) Increases moisture regime for quality water through springs
- (7) Acorns are preferred food of many Wild Life e.g. bears, Monkeys, Langurs, squirrels, rodents etc.

4.19 Exercise of Rights and privileges

a. Trees fit for removal as salvage should only be given as Timber grant (T.D.) to the right holders. Deodar trees and poles should not be marked for T.D. purposes and should be allowed to grow to higher diameter classes.

b. Lopping of oak trees is done extensively by the local people especially during winters when other foliage is deficient, for fodder and animal bedding. This lopping is done, many times with total disregard to all rules and prescriptions. This will be strictly regulated and a system of rotational lopping of trees be followed by invoking participatory process. The following rules will be complied with -

I) A lopping cycle of 3 years will be adopted for the ban trees.

II) Only trees over 30cm dbh will be lopped.

III) Only light Blades or sickles, like those used for cutting grass be allowed for lopping and heavy instruments should not, be permitted

IV) Leading branch should not be touched and lopping should be done leaving at least the upper 1/3rd of the crown intact.

V) Climber cutting should be made mandatory

VI) Lopping should only be permitted from November to March

C. The areas taken up for planting should be closed to grazing for a period of 50 years to facilitate establishment of the plants

D. Grass cutting (under auction or for local use) in closed areas should be done under strict supervision of the staff to ensure that young seedlings are not cut along with the grass.

Chapter 5

Protection cum Rehabilitation Working Circle

5.1 General constitution of the Working Circle

This working circle comprises all the Reserve, Demarcated Protected and Un-demarcated protected forests of the Solan Forest Division in which the prime object of management is protection in order to check the on-going steady deterioration of the forests, coupled with efforts to improve the ecology and growing stock of these areas. This working circle includes primarily scrub areas of poor density that have been invariably invaded lantana bushes, steep hill slopes having sparse tree growth, areas along the banks of Kaushalya and Ghaggar rivers which are prone to heavy soil erosion, and degraded Chil forests of the division. The areas which cannot be allotted to the other working circles because of heterogeneous character and degraded status of vegetation are also a part of this working circle. Forest area of 6415 ha has been allotted to this working circle in this plan. The details of the area are given in the subsequent paragraphs.

5.2 Area Statement:

The following table shows the range-wise area distribution of this working circle.

Table 5.1: Forest areas (ha) under Protection-Cum-Rehabilitation Working Circle by ranges and forest classes

Forest Range	RF (ha)	DPF (ha)	UPF (ha)	Total (ha)
Solan	56.8	143.2	26	226
Subhatu	16	549.4	125	690.4
Dharampur	770.5	846.2		1616.7
Parwanoo	1394.2	2487.7		3881.9
Total	2237.5	4026.5	151	6415.0

The range wise and forest area wise details are given in table 5.2.

Table 5.2: Protection-Cum-Rehabilitation Working Circle

Particular RF/DPF,UPFother area please specify						
Range	Name of forest area	DPF	RF	UPF	Grand Total	
Solan	D132 SCharar C-3	24			24	
	D132 SCharar C-1	20			20	
	D132 SCharar C-2	17.6			17.6	
	D132 SCharar C-4	24.4			24.4	
	D132 SCharar C-5	18			18	
	D132 SCharar C-9	12			12	
	D136 SKhaldhar	16			16	
	D137 SNauni	11.2			11.2	
	R28 SKhaldhar C-2b		12		12	
	R28 SKhaldhar C-3		34.8		34.8	

	R28 SKhaldhar C-4		10		10	
	U1 STikkar			10	10	
	U2 SKather			12	12	
	U7 SSheel			4	4	
Solan Total		143.2	56.8	26	226	
Subathu	D127 SShashal C-2	19.2			19.2	
	D127 SShashal C-4(b)	10			10	
	R29 SKathani C-1		2.3		2.3	
	R29 SKathani C-2		13.7		13.7	
	D109 SPanewa	38.4			38.4	
	D110 SRaikot	34.8			34.8	
	D111 SThathol	5.2			5.2	
	D112 SAlobra	54.4			54.4	
	D113 SSerighat	17.6			17.6	
	D114 SKathani	287.8			287.8	
	D121 SPanshora	3.6			3.6	
	D122 SShangri	6.4			6.4	
	D124 SKatiara C-1	14.4			14.4	
	D124 SKatiara C-2	21.6			21.6	
	D124 SKatiara C-4	17.2			17.2	
	D129 SRano	18.8			18.8	
	U 8 SChakli			20	20	
	U10 SKothiBhagat			4	4	
	U3 SRanoParli C-1			6	6	
	U3 SRanoParli C -2			2	2	
	U3 SRanoParli C -3			17	17	
	U4 SRanowarli			12	12	
	U5 STRashri			18	18	
	U6 SSaug			40	40	
	U9 SKharotaBhagat			6	6	
Subathu Total		549.4	16	125	690.4	
Dharampur	D139 SBanjani	4			4	
	D161 SSihardi C-1	10			10	
	D166 SDharAnji C-1	19.6			19.6	
	D166 SDharAnji C-2	50			50	
	D169 SKiarDII C-2	12			12	
	D175 SBohali C-2	11			11	
	D180 SShirgulKaTiba-II C-1	26			26	
	D180 SShirgulKaTiba-II C-2	21.2			21.2	
	D183 SKalth-IV	36.3			36.3	

	D201 SKalth-I	55.6			55.6	
	D202 SKalth-II C-1	12			12	
	D202 SKalth-II C-2	16.4			16.4	
	D203 SQuilaAjmergarh C-2	43.6			43.6	
	D204 STikari	22.4			22.4	
	D205 SNeri-I	52			52	
	D206 SNeri-II	24.4			24.4	
	D208 SSari	2.4			2.4	
	D209 SBaghor	15.6			15.6	
	D210 SOdderJangiria	97.7			97.7	
	D212 SHalda-II	16			16	
	D214 STibaGulzar C-3	94.8			94.8	
	D215 SKaba	43.2			43.2	
	D216 SBanogBhallon	90			90	
	D217 SMiunSanhog	43.2			43.2	
	D244 SChewla C-5	26.8			26.8	
	R31 SBarog C-1a		14.8		14.8	
	R31 SBarog C-1b		35.6		35.6	
	R31 SBarog C-3		42.8		42.8	
	R31 SBarog C-7		50		50	
	R34 SMansa Devi		3.2		3.2	
	R35 SKadon		40.1		40.1	
	R36 SANji		10.4		10.4	
	R41 SGulzar C-2		102.4		102.4	
	R42 SAjmerGarh C-1		35.6		35.6	
	R42 SAjmerGarh C-2		47.2		47.2	
	R43 SHalda C-1		58		58	
	R43 SHalda C-2		48		48	
	R43 SHalda C-3		74		74	
	R44 SJhanai C-1		76.5		76.5	
	R44 SJhanai C-2		63.1		63.1	
	R48 SKalth C-1		52.8		52.8	
	R48 SKalth C-3		16		16	
Dharampur Total		846.2	770.5		1616.7	
Parwanoo	D148 SSanoli	4			4	
	D149 SSanoli	8.4			8.4	
	D184 SRathal C-2	61.2			61.2	
	D185 SKurlaJohri C-1	24.3			24.3	
	D185 SKurlaJohri C-3	8.4			8.4	
	D186 SKalthNo.V C-2	6			6	

	D187 Skalth No. IV	8.8			8.8	
	D189 SJagatgarh C-1	10.6			10.6	
	D189 SJagatgarh C-2	19			19	
	D190 SJabrog	87.6			87.6	
	D191 SShoghiNabhon	64.4			64.4	
	D192 SNabhonPratha	149.6			149.6	
	D193 SUMariaPratha	17.2			17.2	
	D194 SPratha No. III	49.2			49.2	
	D195 SPratha No. II C-1	3.5			3.5	
	D195 SPratha No. II C-2	3.2			3.2	
	D195 SPratha No. II C-3	4.5			4.5	
	D196 SMohri	6			6	
	D197 SPrathaNo I	4.8			4.8	
	D198 SBhagounLugon	30.8			30.8	
	D199 SChawalAshnala C-1	37.3			37.3	
	D199 SChawalAshnala C-2	29.1			29.1	
	D200 SChakliDhanota C-1b	56.3			56.3	
	D200 SChakliDhanota C-1c	63.7			63.7	
	D200 SChakliDhanota C-1d	27.2			27.2	
	D200 SChakliDhanota C-2	56			56	
	D207 SSathDadhog	30.4			30.4	
	D218 SKamlog	7.2			7.2	
	D219 SSatrol No. 1	1.2			1.2	
	D220 SBarog C-1	28.7			28.7	
	D220 SBarog C-2	2.9			2.9	
	D221 SKiarwa	8.4			8.4	
	D223 SKhadeen	76			76	
	D224 SSandhog	90			90	
	D225 SGumma	84			84	
	D226 SAnanu No. II	30.8			30.8	
	D227 SAnanu No. I	8			8	
	D228 SAmbota C-1	54			54	
	D228 SAmbota C-2	32.4			32.4	
	D229 STiron C-1	16.2			16.2	
	D229 STiron C-2	16.6			16.6	
	D230 SJangeshu C-1	39			39	
	D230 SJangeshu C-2	48.6			48.6	
	D230 SJangeshu C-3	69.6			69.6	
	D231 SShilluJangeshu	51.2			51.2	
	D232 SBangowa	6.8			6.8	

	D233 SDatiar C-1	13.2			13.2	
	D233 SDatiar C-2	91.6			91.6	
	D233 SDatiar C-3	65.2			65.2	
	D233 SDatiar C-4	29.2			29.2	
	D233 SDatiar C-5	105.2			105.2	
	D233 SDatiar C-6	79.6			79.6	
	D233 SDatiar C-7	33.6			33.6	
	D234 SRaniGaun	72			72	
	D235 SChamgah	52.8			52.8	
	D236 SKurar C-1	64.8			64.8	
	D236 SKurar C-2	16.4			16.4	
	D237 SSherla	16.8			16.8	
	D238 SDhamiana	16.4			16.4	
	D239 SSaridhar C-5	24			24	
	D239 SSaridhar C-6	24			24	
	D240 SDoachi C-2	23.2			23.2	
	D240 SDoachi C-3	21.2			21.2	
	D240 SDoachi C-5	32			32	
	D240 SDoachi C-6	28.4			28.4	
	D241 SSheola	22.4			22.4	
	D242 SGhidhar C-1	11.4			11.4	
	D242 SGhidhar C-3	18.8			18.8	
	D242 SGhidhar C-4	38.4			38.4	
	D243 SSuji	8.8			8.8	
	D245 SSanawar C-4	14.8			14.8	
	D246 SKasauli C-1	9.6			9.6	
	D246 SKasauli C-2	3.6			3.6	
	D247 Ssatrol II / D219	7.2			7.2	
	R45 SKhadar Ki Dhar		110.4		110.4	
	R46 Sajatgrah C-3		41.4		41.4	
	R47 Skaraghat C-1		51.2		51.2	
	R47 Skaraghat C-2		36		36	
	R47 Skaraghat C-3		49.6		49.6	
	R48 SKalth C-2		14		14	
	R51 SGauri Ki Dhar		42		42	
	R52 SGumma C-1		128.4		128.4	
	R52 SGumma C-2		51.2		51.2	
	R53 STiron C-1		35.8		35.8	
	R53 STiron C-2		16.4		16.4	
	R53 STiron C-3		33.4		33.4	

	R54 SKurardev C-1		71.7		71.7	
	R54 SKurardev C-2		48.5		48.5	
	R54 SKurardev C-3		31.4		31.4	
	R55 SMashobra C-1		5.4		5.4	
	R55 SMashobra C-2		5.8		5.8	
	R56 SParwanoo C-1		33		33	
	R56 SParwanoo C-2		91		91	
	R59 SJandori		14.4		14.4	
	R60 SJandoriNaraini		6.8		6.8	
	R61 SNaraini C-1		227.2		227.2	
	R61 SNaraini C-2		164.8		164.8	
	R61 SNaraini C-3		84.4		84.4	
Parwanoo Total		2487.7	1394.2	0	3881.9	
Grand Total		4026.5	2237.5	151	6415	

5.3 General Character of Vegetation:

The forests falling under this working circle can be mainly divided into the following categories depending upon the predominant vegetation type:

Scrub areas Forest Type 5/Cla: 5B/DSI

Bamboo forests: Forest Type 58/E9

Ban Oak forests: Forest Type 12/Cla

Chir pine forests: Forest Type 9/Cla

Deodar and Chil pine plantations in the higher zone, especially Kandaghat range are also included here.

The vegetation consists of a heterogeneous mixture of different species and its composition varies with altitude and aspect. The overall density of the scrub area is generally poor and the forests are degraded with profuse presence of Lantana bushes, which frustrates all efforts to regenerate the areas either through natural means or artificially. Blanks are common though invaded by bush growth, mainly Lantana. On account of irregular fellings in the past, heavy biotic pressure, frequent fires etc. these forests are poorly stocked and have large blanks in them. Many steep and precipitous areas are under severe threat of soil erosion and require specific measures to halt the degradation process. Due to refractory sites and repeated fires, many Chil areas have become degraded and these have now been taken out of the Chil working circle and placed here. Bamboo areas have been constituted as an overlapping working circle and dealt with detail in a separate chapter of this plan.

5.4 Special Objectives of Management

- (i) To restore the vegetative and soil cover in the degraded areas by checking the degradation through treatments (vegetative and mechanical), and improve the moisture regime, in situ.
- (ii) To maintain the areas and improve their stocking, wherever necessary, from the social, ecological and aesthetic point of view.
- (iii) To meet the *bona fide* demands of the local right holders as per the existing Settlements
- (iv) To counter the menace of lantana and other invasive species infestation by adopting eradication measures.

5.5 Blocks and Compartments

Generally the existing blocks and compartments have been retained as per previous Working Plan.

5.6 Analysis and Valuation of the Crop:

5.6.1 Stock Maps

Stock maps have been prepared for all the forests on 1:15.000 scales of Survey of India maps and placed in the respective compartment files. As regards the un-demarcated protected forests, all of which are added to this working circle, the revenue maps have been reduced nearest to the scale, since no other maps exist for these forests. The range wise and species-wise stocking of the different categories of forests is given in Table 5.3

5.6.2 Site Quality

Site quality of the forests has been recorded in the respective Compartment History files. The site quality of Chil areas is usually III and in some cases even IV. For the broad leaved areas no quality class has been assigned as no standard quality classes have been fixed for these species, the predominant trees being *Lannea grandis* and *Anogeissus latifolia*. Still, an ocular, observation of the forests having broad-leaved species, reveals that the forests are of very poor quality. All age classes are represented, though regeneration is far from satisfactory

5.6.3 Enumerations

Stratified Random Sampling using forest type as stratification criterion was used for enumeration. In order to arrive at greater accuracy of estimation, plots 0.1 ha were laid in some forests having distinct composition and quality of vegetation get as close a true picture of the crop composition as possible. Enumerations were done for important species down to 10cm diameter (dbh) in 10cm diameter classes. The results of enumeration have been appended at the Appendix-IIA.. The results were then extrapolated to other similar areas of the working circle. The species wise volume distribution in the working circle is as under

Species wise area (ha) in Protection cum rehabilitation Working Circle Forest areas (ha) under Protection Circle by range and forest class

Table 5.3: Species-wise area distribution in PCR Working Circle

Range		Ban Oak	Chil	Deodar	Bamboo	Broad Leaved	Eucalyptus	Khair	Culturable Blank	Unculturable Blank	Total
Solan	RF	43.72	6.94	1.64	0.00	0.00	0.00	0.00	4.00	0.50	56.80
	DPF	113.35	13.69	0.06	0.00	0.00	0.00	0.00	4.00	12.10	143.20
	UPF	14.73	11.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.00
Subhatu	RF	9.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.00	16.00
	DPF	490.46	0.55	0.14	0.00	19.31	7.32	0.62	31.00	0.00	549.40
	UPF	125.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	125.00

Dharampur	RF	341.66	15.62	0.00	149.54	244.01	0.00	9.67	10.00	0.00	770.50
	DPF	370.18	0.00	0.00	117.57	356.45	0.00	2.00	0.00	0.00	846.20
Parwanoo	RF	193.91	0.00	0.00	466.82	657.40	2.52	73.56	0.00	0.00	1394.20
	DPF	375.42	4.91	0.00	787.97	1265.49	5.11	48.80	0.00	0.00	2487.70
Total		2077.44	52.98	1.84	1521.90	2542.65	14.94	134.66	52.00	16.60	6415.00

Table 5.4 below gives the growing stock of major species in Protection Working Circle of the Division.

Table 5.4: Species-wise distribution of trees and volume per ha in PCR Working Circle

Species	Total number	Trees per Ha	Total Volume m3	Volume per Ha m3
<i>Chil</i>	396383	61.79	115677.013	18.03
<i>Ban Oak</i>	10294	1.60	2619.637	0.41
<i>Deodar</i>	223	0.03	75.288	0.01
<i>Khair</i>	20866	3.25	7609.3053	1.19
<i>Eucalyptus</i>	2380	0.37	747.736	0.12
BROAD LEAVED	617519	96.26	137547.449	21.44

Thus the overall stocking of the working circle excluding bamboo growth comes to 39.83 m³ per ha, which is low. The enumeration results of the working circle are annexed at Appendix-VIII.

5.7 Silvicultural System

The areas allotted to this working circle are poorly stocked and are, generally, degraded, denuded and lack sufficient vegetative growth. Therefore, commercial fellings are not foreseen and no silviculture system is prescribed. The prime objective of constituting this working circle is to provide adequate protection to check and reverse the steady deterioration of the forests and no fellings are proposed. However, dry and fallen trees can be removed, if need arises for exercise of rights by right holders.

Eradication of lantana and other invasive species is a prerequisite for rehabilitation of these areas. Alongside assisted natural regeneration of local species including grasses and shrubs would be promoted by strict protection and soil & water conservation measures. Plantations carried out in the past have not been successful due to suppression by invasive weeds, hostile sites and lack of protection.

5.8 Rotation and exploitable diameter

As fellings are not prescribed in this working circle so there is no use of providing rotation age and exploitable diameter.

5.9 Yield

In the previous working plan, the W.P.O. has mentioned that the area allotted to the Rehabilitation working circle was worked as coppice lots. Field observations of these areas reveals that regeneration has not been satisfactory instead the gaps have not regenerated and have been invaded profusely by bushes, especially lantana. This may be due to any one or a combination of reasons over grazing, frequent fires, lack of protection after felling. The situation is further aggravated due to drier aspects and fragile nature of soil. Therefore, no yield is being prescribed from these forests. The enumerations carried out indicate the growing stock of these forests to be as follows:

Total standing volume in the entire working circle: 255547.39 m³

Standing volume per ha for the working circle: 39.83 m³

Removals will be done for meeting the demands of the right holders.

5.9.1 Khair

The lower reaches of Parwanoo, Dharampur and Subathu ranges due to climatic factors, favour khair (*Acacia catechu*) and, therefore this species is found sprinkled in the dry deciduous forests of Parwanoo and Lugon blocks. The trees are generally scattered and do not exhibit luxuriant growth. The species, in its natural form, is confined to a small patch in the forest R-61 Naraini compartment C-1. Attempts have been made in the past to plant these areas with Khair, as is evident from the plantation programme of rehabilitation working circle of previous working plan. The success has not been promising as the species has been suppressed by profuse growth of lantana bushes. Only one R30 Parwanoo has a good compact patch over 35 ha of Khair, that planted around 45 years back (1979-80) A small patch of young Khair also exist in D-166 Dhar. Only in R-56 Parwanoo, compartment C2 Sufficient trees have reached the exploitable size. It is proposed that this part of the forest should be managed as a demonstration-cum-research plot by HFRI to study the various aspects of Khair management.

5.10 Method of treatment

As already mentioned, most of the area of this working circle is poorly stocked or is a shrub covered blank and the soil is friable and susceptible to erosion. Thus, it can be deduced that large scale efforts to artificially restock these areas need to be done and appropriate soil conservation methods need to be adopted to counter these problems. The suitable species of local importance and utility from fuel, fodder and fruit bearing, small timber point of view will be preferred.

5.10.1. Choice of species:

Efforts should be made to improve the economic and social value of these forests by effective protection with ANR and planting species of local importance that are also suitable to the site. Species yielding multiple uses e.g. timber, smallwood, fodder, fruit, medicinal products etc. should be preferred, depending on the local demand. The species recommended for the different zones of the division are indicated in Table 5.5.

Table 5.5: Suitable species for planting in different zones

Zone	Fuel	Fodder	NTFP Yielding	Timber Small Wood
Lower zone	Khair, Siris, Kachnar, Toon, Harar, Bahera, Sain, Chhal, Shahtoot, Subabool, Arjun, Kahu, Bamboo	Bel, Suhanjana, Beul, Kachnar, Chhal, Arjun, Bahera, Pula	Ritha, Amla, Dheu, Daru, Harar, Bahera, Phegura, Ber, Kachnar	Chil, Khair, Siris, Toon, Safeda
Upper Zone	Ban Oak, Poplar, Khanor, Dhauri, Robinia, Kachnar, Siris, Khirak, Bamboo	Ban, Bani, Kachnar, Robinia, Khirak, Dhauri, Toot, Siris, Paja, Chinese bamboo	Kachnar, Daru, Kaphal, Akhrot	Chil, Toon, Dhauri, Akhrot, Deodar, Michelia (Champa), Machilus, Acer

No year-specific planting programme is being drawn up as uncertainty of budget allocations/targets, as has been witnessed in the last few years which tend to unsettle such fixed programmes. Moreover, with the shift in focus to community based forestry, new schemes of JFM like MMVVY and RGVSY which are being encouraged, which entail drawing up of the management plan, with the active participation of the people. These participatory management activities are usually confined to degraded forest areas, which form a part of the Protection-cum-Rehabilitation Working Circle. The year wise distribution of area for closure and plantation is a part of such plans and planting would follow the provisions made in such plans.

An annual planting programme is drawn every year keeping in view the available areas on the basis of the prevailing social and economic environment.

In addition to the areas listed for plantation, there may still be some blank/ understocked areas in this working circle. These are the areas that have already been planted up at some time in the past but have either failed or have shown poor survival (40% and below). The failure of these plantations may be attributed to a variety of reasons, chief being invasion of noxious weeds like lantana, frequent fires, and adverse climatic and soil factors. These will have to be replanted afresh. Such areas will be taken up for planting after observing all the necessary formalities/instructions associated with replanting of failed areas.

5.11 Subsidiary Silvicultural Operation:

The subsidiary silvicultural operations to be carried out are prescribed as under:

5.11.1 Notification of Closures:

The area to be taken up for plantation should be notified for closure under section 33 of IFA, one year in advance. The tenure of closure may be 10-15 years depending upon choice and growth of species.

5.11.2 Preparation of sites:

The area to be taken up for regeneration will be cleared off the lantana bushes. It is important to retain and promote the naturally growing grasses, bushes and other tree species in the area. Past experience has shown that artificial planting programmes in these degraded and refractory sites have not yielded desired success. Removal of lantana and invasive bushes should be completed by the end of March positively. Measures to effectively protect the area against biotic pressure should be put in place in time. Fencing of locally available material, barbed wire fencing and even effective trenching should be explored by the staff and DFO should provide guidance on site to site basis.

5.11.3 Treatment Map:

For the areas taken up in a particular year, treatment maps on certain scale shall be prepared showing soil type, depth, drainage, slope, planted area, ANR methods with details of protected species and species raised for planting as ANR should be mentioned in Compartment History files.

5.11.4 Site preparation and earth works:

Sowing of seeds will be done in IMF patches laid along the contours distance of 3 m. The planting of economically superior species should be done at a spacing of 3x3 m in pits of 30x30cm or 45x45cm size, depending upon the requirement of species. The area should be closed simultaneously with barbed wire fencing. The earth work and fencing should be completed by the end of May every year. As mentioned earlier it is re-emphasized that it is important to retain and promote the naturally growing grasses, bushes and other tree species in the area. Experience has shown that artificial planting programmes alone in these degraded and refractory sites have not yielded desired success.

5.11.5 Nurseries

One permanent nursery which is centrally located is being managed in each range so as to facilitate the availability of good and healthy planting stock. The nursery operations are taken up well in time so that the planting stock is available in required quantity at the right time. The specialised containers being used are made of high density polypropylene or high density polyethylene or expanded polyethylene with UV inhibitor and have 4-6 projected grooves/ ribs in their inner surface which guide the seedling roots towards the open bottom end where they are air pruned. Root trainers are available in single tubes or blocks and are reusable. An individual container supported in a tray or rack is termed as a cell or tube and together as block, in blocks, these could be available in book/ sleeve form or multi-pots in a rectangular or square block and are available in different sizes. There are numerous advantages associated with the use of root trainers over the conventional polythene bags and are being used in Modern nursery Dhamiyana.

The primary requirement of growing seedlings in containers is growing medium. Texture, bulk density and structure of growing medium play an important role in meeting the functional requirements of seedlings for water air, mineral nutrients and physical support. Growing medium which has high water holding capacity and continuous air supply for aerobic respiration is ideal for seedling production. Nursery technique of some of important tree species has been given in the plantation working circle. The production and use of Vermi-compost in forest nurseries is encouraged. Vermi-compost is natural organic manure made through earthworms on decomposed vegetable matter and cow dung etc. Its chemical composition is more superior to compost made from conventional composting pits or by bacterial decomposition. It consists of humus which is the basic building block of fertile soil and contains all the essential macro and micro nutrients for plants in readily available form.

5.11.6 Sowing and Planting

Patch sowing should be done with the first shower of monsoon. Planting of seedlings should be completed latest by 15th of August positively and in winter it should be carried out only at the places where sufficient precipitation is received, so that the plants get sufficient period of rains to establish well to withstand the post monsoon drought. The failures will be beaten up till the areas get fully stocked.

5.11.7 Weeding

Weeding shall be carried out till the plants are above the weed height and not smothered any more. At least one weeding is essential during the growth period i.e. in August/September for three consecutive plantations.

5.11.8 Cleaning

Cleaning should be carried out in denser patches of young regeneration comprising mainly of sapling. All material should be burnt as a fire protection measure. When the crop attains young pole stage, it is subjected to the thinnings.

5.12 Fire Protection and control burning

Internal fire lines 3-5 m wide dividing the entire plantation area in blocks of not more than 10 ha should be cleared and maintained in addition to other existing fire lines given in Forest Fire management circle. Chil crop will be control burnt departmentally when regeneration has attained an average height of over 2.5 m. This will be done annually till the regeneration attains an average height of 5 m. The boundaries of plantation/ regeneration area will also be kept clear of the inflammable material during fire season.

5.13 Grazing and grass cutting

The area having good regeneration and planting shall not be allowed to grazing till it is established and the plants are out of danger. However, controlled grazing can be permitted where there is no regeneration. Most of forests falling under this working circle are either allowed for grazing by migratory local graziers or allowed for grass cutting thereby affecting the regeneration. It is suggested that proper control should be exercised over grazing and grass cutting so that forest which are deficient in regeneration are stocked well.

5.14 Monitoring and Evaluation

During the past much attention has not been paid towards monitoring and evaluation of plantation activities. Regular monitoring of plantation areas during the period of maintenance (i.e. 5 years) not only will help to test the suitability of the species planted to the locality but will also help in assessing the success percentage of various species. This offers an opportunity to beat up the area with other better suitable species. In case of failure of a plantation, timely action to get the area written off in order to take it up again for replanting should be initiated as per the instructions in this regard. It is therefore prescribed that regular review of plantation areas is necessary and the field agencies should accord due importance and emphasis to this aspect.

5.15 Exercise of rights and concessions

The timber requirement of right holders shall be met from salvage removals. The un-restricted grazing shall have to be checked and stall feeding of domestic animals be encouraged.

5.16 Resin tapping

The resin tapping is banned completely in all the forests allotted to this working circle at least for the period of this plan.

5.17 Lantana eradication

Lantana camara, commonly known as "Phul-lakri", in this part of Himachal Pradesh, is an exotic weed that has been responsible for large tracts of land becoming unproductive. The bush has no productive value other than being a soil cover and abating soil erosion. Its leaves and seeds are poisonous to cattle and is of limited use as fuel. It has extensively invaded open forests in the Shiwalik hills and poses a major threat to plantations by suppressing them and is also a major fire hazard. Eradication of this

obnoxious weed is, therefore, a challenge before the forest department. The intensity of infestation of the forests of the Division by Lantana is given in chapter 4 of part I. The distribution of Lantana in the division is depicted in the figure below:

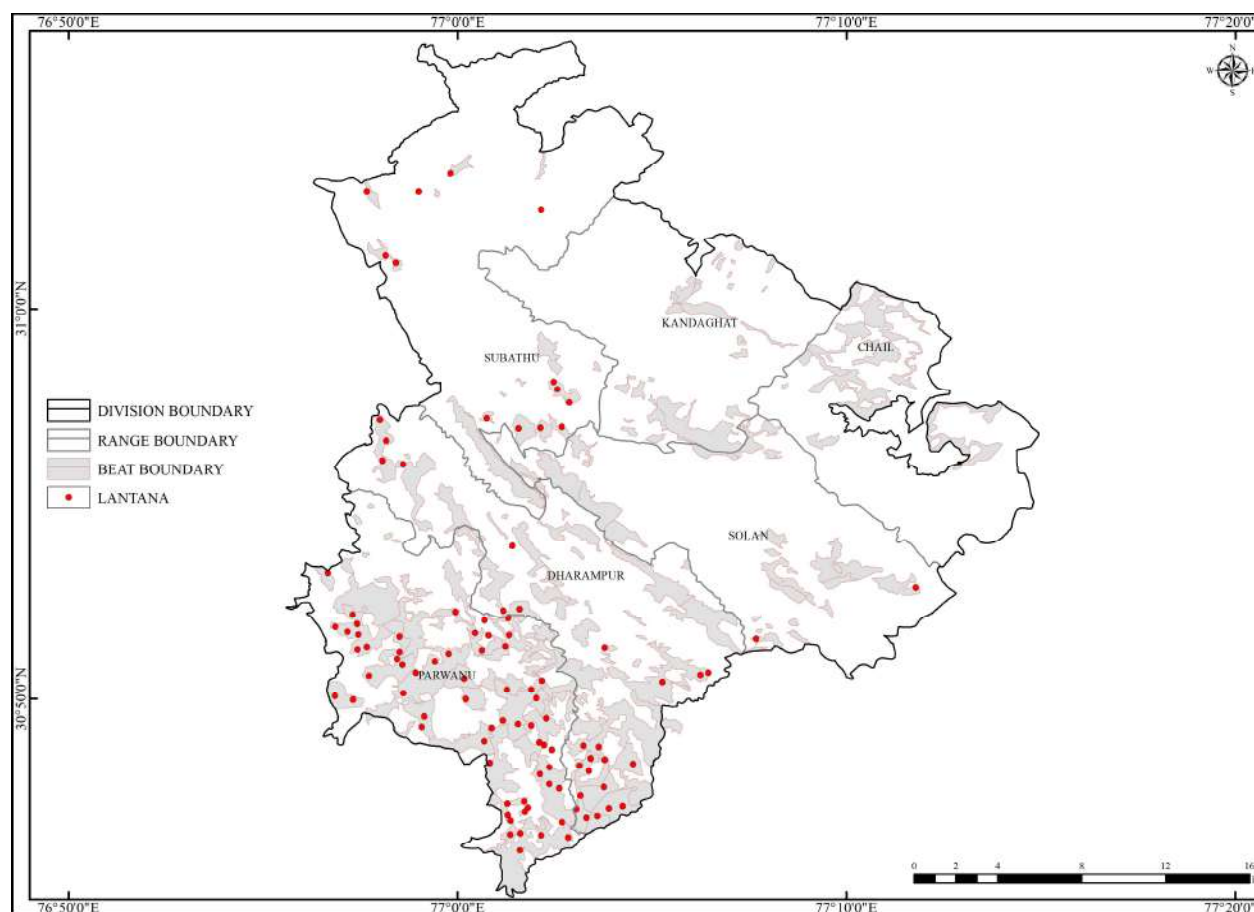


Fig.5.1: Distribution of Lantana in Solan Forest Division

The following measures are being adopted for lantana eradication by the forest department.

5.17.1 The C.R. Babu method for lantana removal

The C.R. Babu method for lantana removal also known as the "Cut Root Stock" (CRS) method, involves manually cutting the main tap root of the lantana plant below the coppicing zone. This prevents regrowth by ensuring that the plant doesn't sprout from its rootstock. It is usually advised to be done during winters. This method is being adopted by Solan division in 2012-13 to remove lantana in all infested forests of the division. While the CRS method is effective, it is combined with other techniques like uprooting seedlings, and broadcasting of grass seeds in lantana eradicated areas and further to avoid re-infestation the areas are taken under plantation in phased manner.

5.18 Silvicultural Works

The major silvicultural works to be carried out in this working circle are given below in table 5.6.

Table 5.6: Major silvicultural works to be carried out in PCR Working Circle

Sivilcultural Work PCR WC								
S. No.	Rang e	Name Of Forests	Forest Area	Workin g Circle	Activity	Area In (Ha) in which Activity Has To Be Done	%	Ye ar
1	Solan	R-28 SKhaldhar c2b	12	PCR W.C.	Climber Cutting	5	-	20 29
2	Solan	R-28 SKhaldhar c3	34.8	PCR W.C.	Climber Cutting	6	-	20 29
3	Subat hu	D124 SKatiyara C-1	14.4	PCR W.C.	Lantana Eradicatio n	15	75 %	20 29
4	Subat hu	D124 SKatiyara C-2	21.6	PCR W.C.	Lantana Eradicatio n	18	75 %	20 30
5	Subat hu	D112 SAlobra	54.4	PCR W.C.	Lantana Eradicatio n	50	75 %	20 31
6	Subat hu	D110 SRaikot	34.8	PCR W.C.	Lantana Eradicatio n	25	75 %	20 31
7	Dhara mpur	R31 SBarog C-1a	14.8	PCR W.C.	Climber Cutting	-	-	20 30
8	Dhara mpur	R31 SBarog C-1b	35.6	PCR W.C.	Climber Cutting	-	-	20 30
9	Dhara mpur	R43 SHalda C1	58	PCR W.C.	Lantana Eradicatio n	-	75 %	20 33
10	Dhara mpur	R43 SHalda C2	48	PCR W.C.	Lantana Eradicatio n	-	75 %	20 33
11	Dhara mpur	D210 SOdderjhangiri ya	97.7	PCR W.C.	Lantana Eradicatio n	-	75 %	20 33
12	Dhara mpur	D212 SHalda	16	PCR W.C.	Lantana Eradicatio n	-	50 %	20 34
13	Dhara mpur	D217 SMeunSanog	43.2	PCR W.C.	Lantana Eradicatio n	-	50 %	20 34
14	Dhara mpur	D244 SCheola C5	26.8	PCR W.C.	Lantana Eradicatio n	10	50 %	20 30
15	Dhara	R48 SKalth.C-	16	PCR	Lantana	10	50	20

	mpur	3		W.C.	Eradication		%	30
16	Dharampur	D203 SQuila Ajmergarh.C2	43.6	PCR W.C.	Lantana Eradication	10	50 %	20 30
17	Dharampur	D213 SKabaBhalon	107.6	PCR W.C.	Lantana Eradication	32	50 %	20 31
18	Dharampur	D215 SKaba	43.2	PCR W.C.	Lantana Eradication	30	75 %	20 31
19	Dharampur	D204 STikari	22.4	PCR W.C.	Lantana Eradication	15	50 %	20 31
20	Dharampur	D204 STikari		PCR W.C.	Climber Cutting	20	-	20 32
21	Dharampur	R41 SGulzar C-2	102.4	PCR W.C.	Lantana Eradication	20	75 %	20 32
22	Parwanoo	D189 SJagatgarh C-2	19	PCR W.C.	Climber Cutting	5	-	20 27
23	Parwanoo	D190 SJabrog	87.6	PCR W.C.	Climber Cutting	8	-	20 27
24	Parwanoo	D192 SNabhonPratha	149.6	PCR W.C.	Climber Cutting	10	-	20 27
25	Parwanoo	D199 SChawalAshnala C-1	37.3	PCR W.C.	Climber Cutting	10	-	20 27
26	Parwanoo	D199 SChawalAshnala C-2	29.1	PCR W.C.	Climber Cutting	10	-	20 27
27	Parwanoo	D229 STiron C-1	16.2	PCR W.C.	Climber Cutting	5	-	20 28
28	Parwanoo	D229 STiron C-2	16.6	PCR W.C.	Climber Cutting	5	-	20 28
29	Parwanoo	D230 SJangeshu C-1	39	PCR W.C.	Climber Cutting	10	-	20 28
30	Parwanoo	D230 SJangeshu C-2	48.6	PCR W.C.	Climber Cutting	15	-	20 28
31	Parwanoo	D230 SJangeshu C-3	69.6	PCR W.C.	Climber Cutting	10	-	20 28
32	Parwanoo	D234 SRanigaun	72	PCR W.C.	Climber Cutting	10	-	20 29
33	Parwanoo	D235 SChamgah	52.8	PCR W.C.	Climber Cutting	15	-	20 29
34	Parwanoo	D240 SDochi C6	28.4	PCR W.C.	Climber Cutting	10	-	20 29
35	Parwanoo	R56 SParwanoo C-	33	PCR W.C.	Climber Cutting	10	-	20 30

		1						
36	Parwanoo	R56 SParwanoo C- 2	91	PCR W.C.	Climber Cutting	20	-	20 30

5.19 Forest Fires

Forests are a major natural resource, which play a crucial role in maintaining environmental balance. Fire is an integral part of the functioning of various forest ecosystems. Mankind has used fire for thousands of years as a land management tool. Forest fires are one of the important forces that have influenced forests and wildlife over time, and as a natural process, they serve an important function in maintaining the health of landscapes and ecosystems. However, in the latter part of the twentieth century, changes in human-fire dynamics, complex climate changes, and ever-increasing human access to forests have led to a situation where forest fires have become a major threat to many forests and biodiversity.

Fire is a major factor that causes considerable damage to the forests of this division. Fires, both accidental and incendiary, are very common in this tract due to the fact that the majority of forests are easily accessible by roads and paths, as well as national and state highways. Other roads and railway tracks also pass through most of the forests. Also, most of the forests lie in dry/hot areas. As most of the forests are either Chil or scrub forests, any incident of severe fire has a considerable adverse effect not only on the vegetation but also on wildlife habitat and air quality.

Fire has an adverse effect on soil, water and ecological balance of the affected area. Soil becomes vulnerable to soil erosion and its structure gets affected, thereby retarding plant growth. The soil-building micro-organisms are destroyed and the area is ultimately rendered susceptible to erosion and decreasing productivity. The young regeneration is wiped out, the growth of surviving vegetation is adversely affected, the yield of forest produce is immensely reduced and the vegetation damaged by fire becomes vulnerable to insect and fungal attack. The high salvage removals are attributed to this. In the fire burnt forests change in crop pattern takes place, resulting in mixed crops in the forests. Many ban oak areas have now been invaded by fire-resistant species like Chil as a result of repeated fires. A mention of fire as a factor that causes injury to the forest crop has already been made in Chapter II Flora and Fauna of Part I of this plan.

The Chil forests in this division are highly susceptible and are subjected to frequent fires in the months of April to June. If fires are not controlled in time, these cause serious damage. Between the year 1983-84 to 2000-2001, as per records of the division, a total 11388 ha. Forest area was damaged by fire. Fire incidents occurred every year, except in the year 1994-95. The maximum annual forest area recorded as burnt was 3743.65 ha in the year 1999-2000 and thereafter in 2024-25 comprising of burnt area of 2099.7 ha. Negligence by tourists, roads and railway workers, communities and right –holders in controlling forest fire has weakened the traditional forest fire management system.

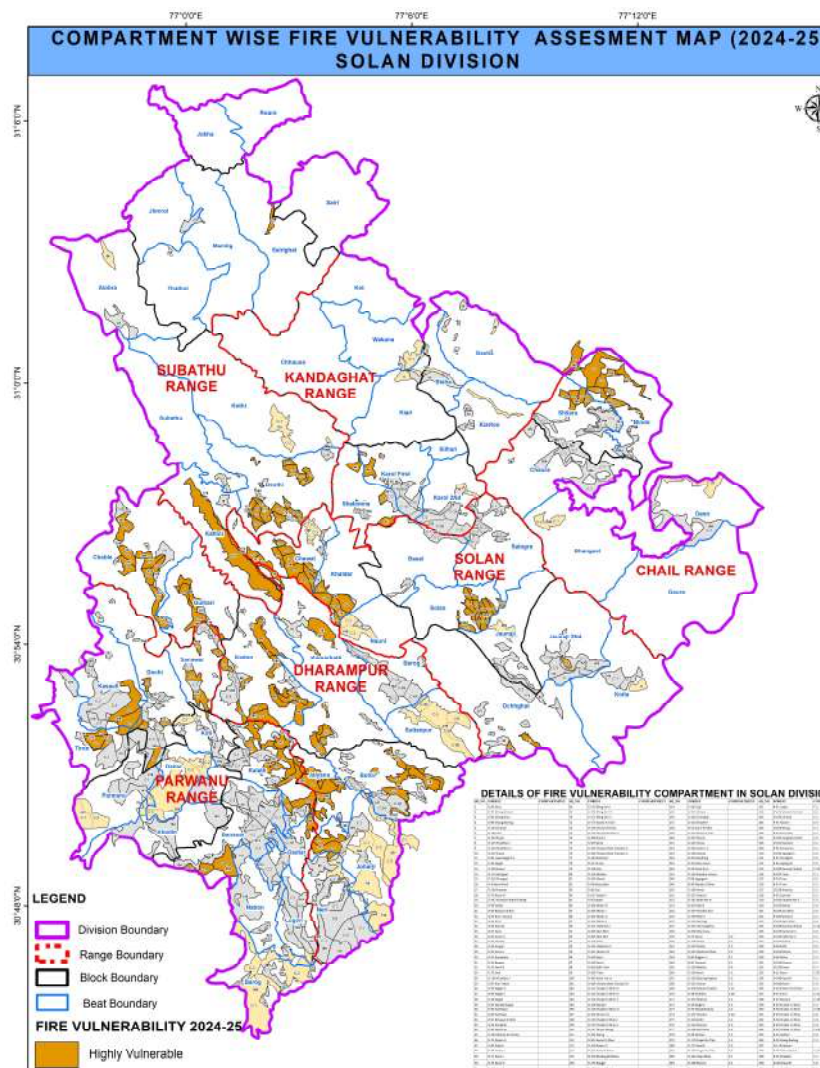


Fig. 5.2: Forest Fire Vulnerability Map

All the reasons mentioned above necessitate prevention and control of forest fire which assumes great importance in Solan Forest Division and there is an urgent need to take effective steps to counter the menace of forest fires, with the aim of:

- Protecting forests from damaging fires by taking up all preventative measures like administrative, technical, social, legal etc.
- Preparing adequately and taking appropriate action for controlling suppressing and extinguishing forest fires, to minimize the loss caused by them;
- Educating local people about fire damage and eliciting their cooperation in preventing, controlling and extinguishing fires

5.19.1 Types of Forest Fire

Forest fires are categorized in three categories as described below:

Ground fires: These are not easily discernible as these fires usually spread below surface within the accumulated organic matter rather than on top of it. It consumes organic matter and has the unique characteristic of having a smoldering edge with no flame and little smoke. Ground fires are most difficult to handle.

Surface fire: These are characterized by a fast moving fire, which consumes small vegetation and surface litter along with loose debris on the floor of forest.

Crown Fire: Crown fires advances from top of trees or shrubs in a galloping fashion without any close link with surface fire. It is fastest to spread and most destructive to trees and wildlife.

5.19.2 Causes of Forest Fires

The main causes attributable for the outbreak of fires are various and can be summarised as under:

Natural: This is caused due to lightening, friction between quartzite stones and dry bamboo culms. Such fires are rare.

Human causes: -Almost all forest fires in the Division are attributable to human factors - unintentional or intentional.

- Unintentional Fires: Such fires are caused due to carelessness on account of any of the following -
 - Throwing of burning matchstick, live bidi / cigarette stumps, or torch wood along the roads or in the forests, especially during dry seasons.
 - Leaving the fires moldering in temporary hearths set up by graziers, labour, NTFP gatherers and travelers to cook food.
 - Falling of glowing coal pieces from trains speeding through forests.
 - Falling of dry pine needles or leaves on electric poles giving outsparks.
 - Escape of fires to forests from burning of stubble in the fields or homestead, or burning of the grasslands adjacent to the forests.
 - Accidental spread of fire in the forest while burning fire lines departmentally.
- Intentional Fires: Such forest fires are caused due to deliberate human actions on account of the following –
 - Inducing new shoots of grass in summer by burning the dry grass.
 - Destroying evidence of illicit felling by charring the stumps of illicitly felled trees.
 - Making the collection of NTFP easy by burning the undergrowth and dry grass.
 - Poaching/ trapping of wild animals.
 - Scaring away wild animals from near villagers.

Major causes of forest fires in Solan Division:

- Negligence of people residing or working in and around forest areas
- Deliberate and intentional fire setting by villagers for getting fresh flash of new grass for fodder and ease of harvest
- Fire spreading into nearby forest areas when slash burning in agriculture fields is left unattended

- Accumulation of Chir pine needles during fire season leading to fire hazard (more the ambient temperature, heavier the fall of pine needles)
- Low humidity coupled with high atmospheric temperature
- Scant or no winter rain fall and long dry spells during summer months
- Accumulation of inflammable leaf litter/ left out slash/ dry and fallen twigs and logs on the forest floor
- Carelessness of travelers / tourists with smoking habits
- Fires made by workers for heating coaltar for black topping of motor roads left unattended
- Throwing of burning bidi/ cigarette butts and matchsticks in forest areas
- Camp fires left behind by picnickers
- Fires made for ease in collection of Non Timber Forest Produce
- Fires started for driving away the wild animals
- Sparks emanating from transformers
- Fires deliberately started to settle score with forest department staff or due to personal rivalry/ enmity
- Uncontrolled/ unsupervised prescribed burning/ control burning

The details of fire incidents in this division during the previous ten years has been summarised below:

Table 5.7: Fire incidences and area affected from 2012-13 to 2024-25

Year/Season	Number of Beat/compartment affected	Frequency of fires (No. of Fire incidences in a seasons/year	Total Forest area affected (in ha.)	Fire Sensitive Block	Damage assessed due to forest fire (Rs)
2012-13	25	79	1315.5	11	10000/-
2013-14	6	7	101	4	0
2014-15	9	12	281.3	7	--
2015-16	10	17	279.8	7	--
2016-17	27	48	838.2	9	0
2017-18	21	50	889	8	5,64,610/-
2018-19	33	66	1035.9	11	797000/-
2019-20	30	84	995.5	13	330000/-
2020-21	9	13	220.5	7	150000/-
2021-22	13	52	572.6	8	120000/-
2022-23	13	73	1096.55	10	4305497/-
2023-24	2	3	41.5	2	18776.35/-
2024-25	23	82	2099.7	12	2106505/-

The following factors contribute to the forest fires:

- (i) High temperature:

With the increase in temperature during summer season, the possibility of fire increases. In this area 35°C is considered the critical temperature, above which the cases of fires keep on increasing with increasing temperature.

- (ii) Low humidity
This factor also contributes towards spread of fire. The areas which are more humid are less prone to fire, than the areas, which have low humidity in summers. This is the reason that the casual rain fall reduces the fire risk for a few days.
- (iii) Inflammable material
In most of the forests, grasses, Chil needles, resin, fallen trees, bushes etc., make ample inflammable material. The possibility of forest fire depends upon the quantity of inflammable material on forest floor. To reduce the inflammable material in forests, control burning is done

Fire season

The greatest danger of fire occurrence is during summer months from March to early July, up to the commencement of monsoon rains. During autumn, normally the danger of forest fire is less but occasionally the fires do occur in this period also.

5.19.3 Special Fire Risk Zones

The areas burnt during the past years indicate that the following beats of forests are particularly prone to fires:

Table 5.8: Fire prone areas in the Division

Name of Range	Name of beat	Name of Fire sensitive forests as per record of Fires occurred in Forests in 2024
Kandaghat	Karol-I	D-68 SHathon
	Karol-I	D-69 SPalhech-I
	Karol-I	D-70 SPalhech-II
	Shalumna	D-99 SShalumna
	Shalumna	D-100 SDharot C1
	Shalumna	D-101 SKaryali
	Shalumna	D-103 SDharotKaChewn
Chail	Binnu	D47 SBirniShillai
	Binnu	D48 SShillai
	Binnu	D49 SBanjni
	Shillru	D45 STibbaKathet all compartment
Solan	Chawal	D-131 SMathan
	Chawal	D-132 SCharar
	Chawal	D-126 SManlog
	Khaldhar	R-28 SKhaldhar
	Oachghat	D-92 SDeora
	Oachghat	R-26 SNagali
	Oachghat	D-93 SNandal
	Solan	D-108 SSilly
Parwanoo	Tiron	R-53 STiron C-2 & C-3, D-229 STiron C-1.
	Kasauli	R-54 SKurardev C-1, C-2 & C-3.
	Sanawar	D-242 SGahidhar C-2 & C-4, D-245 SSanawar C-1 & C-4, D-239 SSaridhar

		C1a, C1b.
	Dochi	D-240 SDochi C-4 & C-6
	Kalth	D-184 SRathalBhargiyana C-1 & C-2, D-185 SKurla Johri C-2.
	Banasar	R-57 SBanasar C1a, C1b, C1c.
Subathu	Alobra	D-110 SRAikot
	Serighat	D-113 SSerighat
	Kathani	R-29 SKathani
	Kathani	D-114 SKathani
	Deothi	D-121 SPanshora
	Deothi	D-122 SShangri
	Deothi	D-124 SKatiyara
	Deothi	D-127 SShashal
	Deothi	D-128 SKalikufer
Dharampur	Kadon	D-166 SDhar C1&C2, R-35 SKadon, D-154 SDawla, D-161 SSihardi, D-244 SCheola C1 & C5, R-36, D-165 SMaltoo, R-37 SMaltoo C1& C2
	Kumarhatti	R-32 SChunjari, D-147 SKanaDhyalag, R-38 SKiard C1 & C2 , D-164 SMaltoo, D-169 SKiard C1&C2, D-145 SCHewa Kheel
	Barog	R-31 SBarog C1a, C1b, C2a, C2b, C3 C4a
	Bohli	D-173 SBohlikiChewal, D-175 SBohli, D-176 SCheroti ki Dhar, D-178 SCheroti Ki Dhar C1& C2, D-179 SShirguli Ka Tibba C2, R-39 SCheroti Ki Dhar
	Jalyana	R-48 SKalth C1, C3, C4, C5, R-49 SGadiyar, D-201 SKalth, D-202 SKath C1&C2 , D-203 SQulaAjmergarh, D-182 SKalth, D-183 SKalth.
	Chabal	R-30 SChabal C1, C2a, C2b, C3, C4, C5a, C6, D-118 SChabal
	Gulhari	R-33 SGulhari C1a, C1b, C2, D-151 SGulhari

Special attention is required for the above forest zones during the fire season.

5.19.4 Management of Fire Protection

The steps that will prove effective in fire management can broadly be classified into two categories, namely, Preventive measures and Remedial Measures.

5.19.4.1 Fire Prevention measures

a) Public orientation measures

- “Prevention is better than cure”, and this holds goods in case of forest fires too. Prevention of fire is more beneficial and cost effective than fighting the fire. For this effective steps should be taken well in time, such as summarized below :-
- Involvement of communities and earning good will of local people:-The forests cannot

be protected against fires without winning the goodwill and cooperation of the local people. This can be done by making regular contact with local villagers and meeting the reasonable *bona fide* demands of right holders, well in time. Also, the closures made should be effected for the minimum required period

- Education and publicity for awareness creation: Wide publicity especially in villages nearby forests, should be given Against the harms caused by forest fires. For this, timely action should be taken for distribution of pamphlets and other educative material during the fire season, well in advance, so as to acquaint the villagers/local people through Panchayats. The staff should hold regular meetings with local villagers in their areas to create awareness. Also, hoardings, notice boards and banners should be displayed at prominent points to make aware the tourists and local public regarding the damage caused by fires.
- Restriction on tarring of roads:-During fire season, tarring of roads and highways passing through forest areas should only be allowed under the supervision of responsible P.W.D./NHAI staff. The staff of concerned agencies should be held accountable for any fire spreading to nearby forest areas due to unsupervised or negligent fire underneath drums of bitumen leading to wild Fires. The staff on such deployment should be made aware and educated about the precautions to be taken during road tarring work on roads passing through forest areas.
- Concept of Joint Forest Management:-Joint Forest Management may help in preventing and controlling fires. For this active participation of local villagers should be sought by involving people in forestry activities.
- Removal of pine needles: Local villagers should be allowed and encouraged to collect and remove the pine needles, beforehand, for domestic purposes and use as packing material for fruits and vegetables. This will reduce the fire hazard to a great extent. Efforts should be made to incentivize the removal of pine needles before and during fire season by the local villagers.
- Cleaning and thinning in regeneration and plantation areas:- All regeneration and plantation areas should be isolated by cleaning a strip of 2 meter width, all around, from all inflammable material, leaves, bushes etc. Early cleanings and thinning in such areas should be done. Debris should be collected at a suitable Nallah/place and control burnt. These activities should be done before the beginning of the fire season.
- Implementation of working plan prescriptions and preparation of annual district forest fire management plans
- Controlled burning of forest areas on an annual basis as per management plans
- Management and maintenance of forest fire lines to contain the damage by fire
- Issuances of daily fire danger rating bulletin by forest division for the next 24 hours

b) Administrative & technical measures:

Control measures

- 24x7 Control room at division level with RRT team at division level fully equipped with fire tools.
- Establishment of watch towers at strategic locations for early detection of fire
- Establishment of decentralized fire crew stations at range level with 5 to 7 fire crew members well equipped with tools & implements for attending forest fires with minimum response time.

- Use of satellite-based MODIS for fire detection followed by field checks and appropriate response by fire crew members.
- Divisional Forest Officer will engage sufficient number of fire watchers during the fire season. Fire watchers (preferably the local villagers), will patrol the areas extensively for detection and protection against fires and will ensure all preventive measures with the local forest field staff.
- Daily fire reporting on FIRE portal.

Fire protection equipments

The field staff (near the fire-prone forests) should be provided with sufficient fire-fighting equipment, such as brooms, shovels, slashers, axes, hatches, forks, buckets, gunny bags etc, to meet any emergency and facilitate speedy extinguishing of fire.

Field staff should be imparted training for effectively controlling of forest fires.

Fire lines

The existing fire lines be properly maintained and kept clear of all bushes, needles etc. to check the spread of fires. This division has a very good network of National/State Highways, link roads, bridle/inspection paths, and highways passing along or through the majority of forests. These also serve as important means to check the spread of forest fires from one area to another. It is recommended that all such roads/paths/Railway tracks should be kept clear of all inflammable material, especially during the fire season. The details of the existing and proposed forest fire lines are given below.

Table 5.9: Present fire lines in Solan Forest Division

Name of Range	Block	Beat	Name of Fire Line	In Km.	Forest Covered(name of Forest)
Chail	Chail	Shilru	Chaklain to D-45 TibbaKhateth	6	R-16 SChaklain ,D-46 SChaklain& D-45 STibbakhateth
Subathu	Subathu	Kathani	Khalдар -Subathu	7	D-114 SKathani& R 29 SKathani
Subathu	Subathu	Alobra	Raikot- Alobra Ridge	4	D-110 SRaikot& D- 112 SAlobra
Subathu	Subathu	Deothi	D-127 shashal	1	D-127 SShashal

Dharampur	Chabal	Kumarhatti	Chabal Ki Dhar -I & IV	8	R-30 SChabal-C1 to C6, D-117,D-118, D-119 SChabal Ki Dhar
Dharampur	Chabal	Chabal	Jubbar -Chanol	5	R-30 SChabal-C5a ,C5b
Dharampur	Dharampur	Barog	R-31 Barog C-2	2.5	R-31 SBarog C-2
Solan	Solan	Oachghat	R-26 Nagali	1	R-26 SNagali
Solan	Saproon	Chawal	D-132 Charar to R-28 Khaldhar	6	D-132 SCharar to R-28 SKhaldhar
Parwanoo	Lugon	Banasar	Jodhpur-Banasar	3.00	0.9 SHectares (R-57 SBanasar C1b, R-57 SBanasar C1c, D-222 SBanasar)
Parwanoo	Lugon	Banasar	Banasar-Shoghighat	4.60	1.38 Hectares (R-57 SBanasar C1b)

(Source: DFO, Solan)

Proposal for creation of new fire lines is kept especially in ranges where there is less scope to control fire in particular forests. These new fire lines will act as check to prevent fire from crossing over to another area and will also serve as path to fire fighting team to reach to the fire incident areas.

Table 5.10: Fire lines proposed to be constructed

Name of Range	Block	Beat	Name of Fire Line	Length (km.)	Forest Covered (Name of Forests)
Kandaghat	Kandaghat	Karol-1st	Shikarki Devi to Karol Nursery	2	R-21 SKarol
Kandaghat	Kandaghat	Karol-2nd	Snach to Padotha	2	R-23 SKarol
Kandaghat	Kandaghat	Shalumna	Shikarkidevi to Karyali	1	D-101 SKaryali
Dharampur	Joharji	Neri	Kaba To Meun Snog	2.5	D-210 SOdderSJangeria, R-44 SJhanai C-2, D-217 SMeun

Dharampur	Joharji	Joharji	Bhojnagar To kaba Kalan	3	R-42 SQuilaAjmergarh, D-214 SGulzar C2, D-213 SKaba, D-215 Kaba
Dharampur	Joharji	Bohli	Bohli to Shaya Village	3	D-178 SCheroti Ki SDhar C1&C2, R-40 SBohli C2a and C2b,D-180 SShirguli Ka tiba C1
Dharampur	Dharampur	Kumarhatti	R-32 Chunjari to R2 Chobbal	1	R 32 SChunjari
Dharampur	Dharampur	Kadon	Raropaind to Sharla	3	D244 SCheola D159 SKadon
Parwanoo	Lugon	Lugon	ChandiDhar to Lugon Nursery	5	R-45 SKhadar ki Dhar
Parwanoo	Kasauli	Kasuali	Monkey point to Sari	5	R-54 SKurardev 3 & D-239 SSari C-6

The fire lines proposed in the earlier working plan which could not be constructed in Kumarhatti and Kadon beats in Dharampur range and Kasuali beat of Parwanoo range have also been included in the list of proposed fire lines. It is important that the alignment of forest fire lines should be done with due care to ensure their potential as effective fire breaks. These should be formed along the existing ridges in the hilly areas. The exact alignment should be approved by the DFO before these fire lines are actually established. Forest fire lines have important role in containing and controlling forest fires. These can serve this purpose well only if these are well maintained and periodically inspected by the field staff and officers. The annual maintenance of fire lines must be ensured before the fire season starts.

Construction of Watch towers:-A network of watch towers, at suitable commanding locations, should be developed. These should be permanently manned by fire watchers/Forest Workers during the fire season. The fire watcher will immediately come to know and report to the beat guard, any outbreak of fire that may occur. The beat guard will take further necessary action for fire-fighting.

Table 5.11: Watch towers in the Division

S. No.	Forest Range	Name of Forest	GPS Co-ordinates	
1.	Chail	Nil	Nil	Nil
2.	Kandaghat	Nil	Nil	Nil
3.	Solan	D-108 Shilli C3	30.907583	77.120929
4.	Solan	D-108 Shilli C4	30.911008	77.056523
5.	Subathu	Nil	Nil	Nil
6.	Dharampur	R-32 Chunjari	30.902615	77.056523
7.	Parwanoo	Nil	Nil	Nil

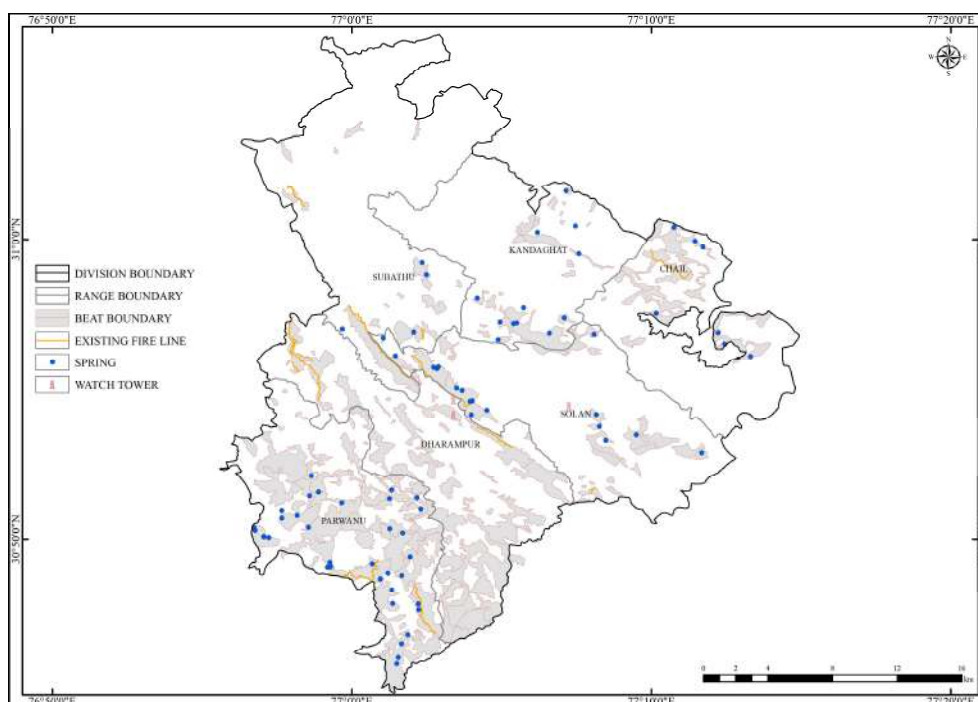


Fig.5.3: Firelines, watch towers and springs in Solan Forest Division

Chir pine (*Pinus roxburghii*) forests particularly, are more vulnerable to fires. It is due to presence of highly inflammable resinous matter in the pine needles which fall during summer and accumulate on the forest floor. The vulnerability of Chir areas is further accentuated by the presence of current year's rills made on the tree trunks for resin tapping, and remnants of old resin channels.

Solan forest division has about 27% forest area where Chir pine is the dominant species. These areas are also very densely populated and subjected to maximum biotic pressure. Besides Chir pine forests, deodar, fir and spruce forests, where a thick layer of leaf litter has accumulated over years, are also very vulnerable to forest fires and prone to ground fires that go on simmering/smouldering for long periods under the thick layers of leaf litter.

Control burning

It is essential, that forests, allotted to Chil and other Working Circles are adequately protected against fire. The control burning is the most important operation and should never be neglected. The triennial programme for controlled burning is the most important operation and should never be neglected. The triennial programme for control burning is chalked out and is given in the following table

Table 5.12: Triennial Programme for Control Burning

Range	2002-03,2005-06,2008-09,2011-12,2014-15		2003-04,2006-07,2009-10,2012-13,2015-16		2004-05,2007-08,2013-14,2016-17	
	Name of Forest	Area (ha)	Name of Forest	Area (ha)	Name of Forest	Area (ha)
Dharampur	R-30 Chabbal C-3	36	R-30 Chabbal, C-5a	38.6	R-30 ChabbalkiDhar C-1	
	C-4	42	C-5b	21.4	C-2a	
			C-6	27.2	C-2b	
	R-31 Barog C-2a	45.2	R-31 Barog C-5	62	R-33 Gulhari, C-2	
	C-2b	26.8	C-6	51.6		
	C-4a	57.2	C-8a	24		
	C-4b	28.8	C-8b	62		
	R-33 Chunjri	67.6	R-40 Bohli C-1	32	R-36 Anji	
			C-2a	45.6		
			C-2b	28		
	R-33 Gulhari C-1a	44	D-140 Kainthri	6	R-39 Chiroti Ki Dhar	
	C-1b	41.6				
	R-35 Kadon	40.1	D-143 Chewa KhilChunjri No. II	2.4	R-48 Kalth C-3	
					C-4	
					C-5	
	R-37 Maltu C-1	21	D-167 Gadiar	23.2	D-115 Chabbal Ki Dhar	
	C-2	28.6				
	R-41 Gulzar C-1	26.8	D-176 Chiroti Ki Dhar	38	D-116 Chabbal Ki Dhar	
	R-42 Ajmergarh C-1	35.6	D-178 Chiroti Ki Dhar C-1	42.3	D-117 Chabbal Ki Dhar	

	C-2	47.2	C-2	29.1		
	D-146 Chewa KhillChunjri	47.2	D-179 SiriguliKaTibba C-1	16	D-118 Chabbal Ki Dhar-III	10.4
			C-2	13.6		
	D-147 Kainthri	19.8	D-180 SiriguliKaTibba No. II C-1	26	D-119 Chabbal Ki Dhar-II	26.4
			C-2	21.2		
	D-154 Damla	12.8	D-181 SiriguliKaTibba No. III	25.2	D-120 Chabal Ki Dhar -I	3.6
	D-157 Kadon	13.6	D-182 KaithNo.III	25.6	D-142 Jhajabhaili C-1	6.6
	D-159 Anji	3.6	D-183 Kaith No. IV	36.3	D-144 Chewa KhillChunjri	5.2
	D-160 Anji	10.4	D-203 QuilaAjmergarh	40	D-145 Chewa KhillChunjri	12.4
	D-161 Siwardi	42			D-150 Gulhari- IV	4.4
	D-164 Maltu	15.6			D-151 Gulhari- III	42.8
	D-165 Maltu- IV	41.2			D-152 Gulhari- II	8.8
					D-153 Gulhari-I	5.2
					D-155 Bhallon	3.2
Dharampur					D-156 Kadon-II	2.3
					D-158 Anji-I	11.2
					D-162 Maltu-II	28.4

It is laid down that all the forest areas planted should not be controlled burnt, until the plants attain a height of 1.5 meter. The list of plantations raised is given in Appendix-XIII

The detailed instructions on control burning are contained in the H.P. Forest Manual Vol. IV and are summarised as below:

- 1) The control burning should always be done during winters in January-February.
- 2) Burning should progress from uphill to downhill in calm weather and special care should be taken, to keep the line of fire as straight as possible and under control.

- 3) The fire should start along the ridge, a cleared path or specially cleared lines.
- 4) Chil needles and other inflammable material should be fully raked to ensure thorough burning.
- 5) In forests under resin tapping, it must be ensured that all chips, fallen resin, needles, etc, are cleared about 1.5 m away from the base of the trees by the resin labourers.
- 6) Cleanings and early thinning in young regeneration areas must be completed before the control burning.
- 7) Burning shall be done always under strict supervision and control of the executive staff and shall never be left to the engaged labour.
- 8) The existing fire lines should be properly maintained and kept clear. The roads, bridle and inspection paths etc. must be kept clear of all inflammable material, so as to act as fire lines.
- 9) Sufficient number of trained fire watchers should be employed during the fire season to help the field staff and provided with necessary equipments. No felling operations, even to the right holders, should be allowed during the fire season.

It is, however, to be noted that areas under regeneration should not be control burnt, until the regeneration reaches a height of about 2.5 m. In such areas, however, the grass cutting/needle collection by right holders be encouraged.

The control burning will also form a part of control forms and deviation reflected there should be explained very clearly giving valid reasons.

In order to protect the forests, against fire risk, in case of other forests allotted to protection cum Rehabilitation working circle, which are not included under the Chil working circle and are not prescribed for control burning, and to maintain the sanitation of the forests, the following guidelines/steps are laid down:-

- 1) The inflammable/fire hazard material, from the forests should be collected and disposed off during the winter.
- 2) The job should be got done preferably, through the regular forest workers of concerned ranges
- 3) Collection of humus and other inflammable material should be done by raking the area from top of the forest to the downhill.
- 4) Stack in moderate heaps in open places or suitable Nallahs
- 5) Burn the heaps downhill so that the smoke does not interfere with men working below and reduces the risk of fire.
- 6) Burn the heaps in rotation to reduce the heat.
- 7) Burning operation should be carried out under the supervision of forest guard concerned.
- 8) Steps should be taken to make it mandatory for right holders and Forest Corporation, to collect the felling refuse after felling trees into heaps or its removal from the forest should be specified.

The above measures shall be applied to all the forests including bamboo areas to prevent loss of crop from fires in bamboo plantations.

Fire Fighting

When a fire is observed, Forest Guard or the fire watcher should at once inform the Block Officer (Dy. Ranger) and the Range Forest Officer. He should also inform the president of the local panchayat immediately, as well as, the staff of the Government Offices or institutions situated in the vicinity and seek their help in the fire fighting operations. In case of alarming situations, immediate help of organisations, like S.S.B, various Army Cantonment Head Quarters, Fire Brigade, N.C.C., N.S.S., situated near the vicinity of each range, the services of such institutions can be availed. District Administration may be requested for immediate help, as and when, required. The fire is normally controlled by beating with a broom of green bushes.

Counter firing should only be done under order of a senior officer in charge of operations and attempted from a defined line such as road or ridge or fire line. A line is formed along the ridge by clearing the

forest floor and cutting bushes and from this fire is started, so to consume the fuel in advance of the oncoming fire. Wind direction and gradient should always be kept in mind, while counter firing Roads/Paths are useful, provided, enough man power is present. After the fire has been brought under control, the smouldering stumps should be extinguished by putting the dug earth on them and strict vigilance be kept till all dangers of fire spreading be taken care of. Arrangement for the transport of food, water and adequate fire fighting tools are essential. The rolls of right holders who helped to fight the fire, should be kept in record, so that the rights of defaulting right holders can be suspended.

Preparation of Annual Plan:

An exhaustive annual fire plan of Solan Forest Division is prepared for 2025 and submitted to CF Solan for approval. This annual fire plan should be prepared every year and approved from CF for implementation.

i) Administrative aspects are also very important in connection with fire protection efforts. Encouragement should be given to good staff, while negligent staff should be punished appropriately so that the officials remain Vigilant and cautious in their work. DFO and the concerned Conservator of Forests can give suitable rewards, in case of exemplary work done by any official or any other person, so that the incentive is more towards the firefighting operations.

(ii) Regarding Government common land and other forests, which are not under the direct control of the forest department the D.F.O. should coordinate with the revenue department authorities or the concerned authorities asking them to take fire protection measures during fire season. Coordinated efforts have to be put in place by different agencies.

5.19.4.2 Remedial measures

These are the measures taken to control and extinguish fires, which break out despite the preventive measures. The following is the broad outline for such measures:

a) Early detection

The earlier a fire is detected and reported, the less will be the damage done by it. Measures for early detection include deployment of fire watchers, and establishing fire observation posts at vantage points. The use of technology has come to help early detection of forest fires, and the satellite based information of forest fires in the form of fire alerts through mobile apps is of good use and all the staff from forest guard's upto CCF should be enrolled on the FSI website for the fire alerts.

b) Quick Communication

The early detection of forest fires needs to be followed up with immediate relay of information to the concerned field units. With the mobile phone technology becoming available, fire alerts are now increasingly been sent through mobile apps.

c) Early Action

Quick action is needed for suppression of fires. The following must be ensured for this: - Strategic locating of the fire-fighting squads, so that they may reach the affected area at a short notice. - Keeping adequate manpower including forest staff, community volunteers and keeping adequate provision of water, fire fighting tools, etc.

5.19.5 Legal Measures to be taken up in cases of Forest Fires

All cases of incendiaries should be properly investigated and punitive measures should be taken against the culprits. Legal provisions regarding forest fires are available under Indian Forest Act, 1927. Setting fire to Reserve Forest is punishable under Section 26 of the Act with imprisonment up to two years or fine up to Rs. Five thousand or both. Similarly, whenever, fire is caused wilfully or by gross negligence in a protected forest, the State Government may, notwithstanding, that any penalty has been inflicted under this section, direct that in such forest or any portion thereof the exercise of any right of pasture or to forest produce shall be suspended for such period as it thinks fit.

Section 79 (1) of the Indian Forest Act, 1927 makes obligatory on every person, who exercises any right in a reserved or protected forest or who is permitted to take any forest produce from forest or Govt. employee shall be bound to furnish without un-necessary delay to the nearest Forest Officer or Police Officer any information with respect to any commission of forest offence, and shall forthwith take steps, whether so required by Forest Officer or Police Officer or not:

- a) To extinguish any forest fire in such forest of which he has knowledge or information.
- b) To prevent by any lawful means in his power any fire in the vicinity of such forest of which he has knowledge or information from spreading to such forest, and shall assist any Forest Officer or Police Officer demanding his aid.
- c) In preventing the commission in such forest of any forest offence.
- d) When there is reason to believe that any such offence has been committed in such forest in discovering and arresting the offender.

And any violation of the provision of this Section is punishable under Section 79(2) with imprisonment for term which may extend to one month, or with fine which may extend to two hundred rupees or with both. Therefore, field functionaries/staffs must act accordingly so that the object of fundamental duty could be achieved. Further, the H.P. Govt. has framed rules regarding fire protection known as Himachal Pradesh Forest (Protection from Fires) Rules, 1999 vide H.P. Govt. Notification No. FFE-A(C)7 1/96 dated 17-11-1999. The field functionaries should follow the Rules and instructions as contained in the given notification.

Fire record

All cases of fires are to be registered with police for investigation and bringing the culprits to book soon after the outbreak of fire. The fire reports on prescribed proforma are prepared, immediately after controlling the fire highlighting cause of fire, extent of area burnt and damage done, suggestions for the treatment of area and safeguards for future incidences. The fire reports should contain a map of the area burnt. All the fire reports are sent to higher authorities and follow up action taken accordingly.

A complete record of fires will be maintained, both in Range, as well as in Divisional Offices. Maps of the forests showing the area burnt by fire will be filled in the compartment history files along with other relevant details regarding forest fire.

Fire Reporting

A system of daily fire reporting is constituted through on line “FIRE” portal. The reporting from range to division office should be done strictly through FIRE portal in addition through offline reporting. As soon as the reporting of fire is done on FIRE portal it will be visible to DFO, CF & PCCF (HoFF).

Assessment of loss caused by fire

Fire causes tangible and intangible damages to the forests and Wild Life Loss of timber, resin, etc. are tangible, whereas loss of soil fertility and soil constituent are intangible. Fire damage leads to increase in rate of soil erosion and causes drying up of water sources. Fire causes adverse effect on regeneration and destroys under growth leading to invasion by weeds. Natural succession goes into retrogression. Wild animals and birds are killed. Being afraid of disciplinary action, the loss caused by forest fire is often not actually recorded by field staff and is also under estimated because of which calculation of exact

magnitude of loss is hardly possible. The offenders responsible for causing fire are also rarely caught and punished for which concrete and sincere efforts are required. Detailed protocol for assessing damage due to forest fire has already been conveyed to field units. The damage due to forest fires shall be assessed by the concerned Range Officer using the given protocol after monsoons and convey it to the Divisional Forest Officer. Also the forest fire post –monsoon damage assessment (Stage-II) should be uploaded on FIRE portal after monsoons. The Divisional Forest Officer shall scrutinize the fire damage reports so as to adhere to the standard forest fire damage assessment protocol. Fire area burnt up to 5 ha will be inspected by RO, more than 5 ha and up to 10 ha will be inspected by DFO and area burnt more than 10 ha will be inspected by CF.

Khosla Committee Report

Govt. of India, vide No.A-34011/6/95-FF, dated 11th July 1995, from Sh.SarveshwarJha, Jt. Secy., Ministry of Environment and Forest, constituted a team consisting of Sh. R.P.Khosla, IAS(Retd.) former Chief Secy., U.P. and former Secy., Ministry of steel, G.O.I., and Sh. S. Parmeswarappa, IFS (Retd.) former Pr.CCF., Karnataka to enquire into causes of forest fires, the extent of damage to forest wealth and to formulate a strategy to prevent the Occurrence of such large scale fires in future and suggest measures for their control.

The latest guidelines in respect of the prevention and control of Forest Fires are laid down by Govt. of H.P. Forest department Notification No. FFE-A(C) 7-1/96-II dated Shimla-2, 17-11-1999.

Forest Fire Preparedness in Himachal Pradesh

An Evaluation Team was constituted to assess the level of preparedness of the state machinery of Himachal Pradesh in combating forest fires. The team comprised:

- i. Shri S.P. Negi, Deputy Director General (Forests), MoEF&CC, Regional Office, Chandigarh.
- ii. Commandant Aditya Kumar, Senior Consultant (ME-IRS, Coastal), National Disaster Management Authority (NDMA).
- iii. A representative from the Ministry of Home Affairs (MHA)

The recommendations that are relevant to the Solan Forest Division are reproduced in the below excerpt.

- (i) Group insurance coverage to be provided for staff engaged in fighting forest fires.
- (ii) Provision of protective gear (lightweight fire-resistant uniforms and shoes, gloves, helmets, etc.) to fight forest fires
- (iii) Removal of pine needles from forest floor
- (iv) Liaise with the District Disaster Management Authority
- (v) Conducting mock drills at random to assess preparedness
- (vi) Integrate programmes like MNREGA in fire fighting

5.20 Illicit Felling

Though there is less illicit activities in this division protection measures should always be taken to avoid such activities. Also, owing to Parwanoo range bordering the Haryana State, this area of Division becomes a crucial transit point for movement of forest produce. Open forest wealth is accessible to people especially near road side and multiple entry and exit routes. Illicit felling of trees by unscrupulous mafia is another factor responsible for damaging the forest property. The details of cases of illicit felling of trees detected for the period 2012-13 to 2022-23 is tabulated in Table 5.13 below.

Table 5.13: Cases of Illicit Felling in Solan Forest Division

S. No.	Year	No. of Cases	Timber involved (m ³)	Assessed Value
1	2012-13	23	7.914	180810
2	2013-14	29	12.3093	279110
3	2014-15	30	14.7169	1050556
4	2015-16	15	5.2947	120786
5	2016-17	12	7.7699	144661
6	2017-18	2	2.6491	29527
7	2018-19	0	0	0
8	2019-20	2	4.855	325466
9	2020-21	0	0	0
10	2021-22	5	16.1854	30090.96
11	2022-23	2	2.9148	189474
12	2023-24	4	19.4537	820465

As per Indian Forest Act, 1927, any act causing damage by negligence or deliberately felling of a tree or breaking of land or clearing of land for cultivation or any other purpose in ‘Reserved Forest’, is an offence and punishable with imprisonment for a term may extend to two years or with fine up to five thousand rupees, or both. Sub section (3) of Section 2 of Indian Forest Act, 1927 defines the term “Forest Offences” to mean an offence punishable under the Indian Forest Act or rules made there under. Nature of forest offence is varied. There may be serious aggravation of offences perspective of money value involved and similarly, criminal intent behind the offence may not be that serious as compared to the damage caused for forest ecology and environment. There are two types of forest offenders that one comes across. A section of the poor people and forest dwellers i.e. right holders who break the law and rules to keep up their livelihood and to meet their basic needs. The other class of forest offenders belongs to a chain of criminals e.g. forest mafia, encroachers or Company or Corporate bodies or Contractors who knowingly break the law and rules and commit forest offences to meet their illegal ends through gullible, needy groups and villagers.

5.20.1 Causes of Illicit Felling

The causes of illicit felling are briefly discussed below:

With ever increasing human population and urbanization of tract of Solan Forest Division, the demand for constructional timber, fuelwood, and agricultural implements have increased manifolds. That is why some people indulge in illicit felling to satisfy their needs if their demands are not met with judiciously. Poor economic conditions of forest dwellers have compelled them to resort to illicit felling of trees who further

sell timber to wood smugglers and other persons or building contractors to earn their livelihood. Installation of imported timber depot, Saw Mills, furniture Industry and failure of the department to fulfill their requirement, sometimes, leads to illicit felling in the forests.

5.20.2: Forests area Prone to Illicit Felling

Based on the field observation and record of illicit felling, following forests area are prone to illegal felling/cutting of trees which need effective protection and measures is tabulated:

Table 5.14: Forest Areas Prone to Illicit Felling

S. No.	Range	Sensitive beat	Forest & compt.	Species
1.	Chail	Binnu	D-49 Banjani C1 and C2	Deodar
2.	Chail	Binnu	D-50 Sakori	Deodar
3.	Chail	Shilru	D-46 Chaklain C2 & C3	Deodar
4.	Chail	Deen	D-52 Bhojdeen C1, C2 and C3b	Deodar
5.	Parwanoo	Parwanoo	R-56 Parwanoo C1 and C2	Khair& Broad Leaved
6.	Parwanoo	Barog	R-61 Naraini C-1 and C3	Khair&Broad Leaved
7.	Dharampur	Kumarhatti	R-32 Chunjani	Chil
8.	Dharampur	Barog	R-31 Barog C1a	Chil
9.	Dharampur	Kadon	D-157 kadon	Chil
10.	Dharampur	Kadon	R-37 Maltoo C2	Chil
11.	Dharampur	Sultanpur	R-31 Barog C3	Chil
12.	Dharampur	Neri	R-44 Jhanai C1 & C2	Bamboo

5.20.3 Measures to check illicit felling

The measures to check illicit felling are preventive as well as remedial in nature. The measures that will be taken up are detailed below:

Strategy for Sensitive Beats:

- Need to ensure sensitive beats are not lying vacant or functioning on additional charge. There is in fact need for provisioning of at least two Forest workers / manpower to be attached with forest guards especially in sensitive beats.
 - Forest Guards must patrol the forests falling in jurisdiction of their respective beats regularly to avoid any chance of illicit felling. Range Officer & Block Officer are equally responsible to prevent large scale illicit felling in their respective jurisdiction and they should check all the sensitive forests periodically, preferable organizing group patrolling/night raids etc. Similarly, ACF should check sensitive forests fortnightly to plug any loopholes left by subordinate staff. Divisional Forest Officer himself should review the progress of detection of forest offences regularly and inspect the forest area prone to illicit felling monthly.
 - Ensuring boundary pillars re-assessment is carried out each year by forest guards to be clear about their forest boundaries / providing staff with GPS sets/compass individually.
 - Carrying out proper demarcation exercises with revenue department (preferable if DFOs are provided with Forest 'patwaris' to avoid undue delays).
 - Increased joint patrolling and intelligence sharing from locals
 - Drone usage as deterrence among locals as well as for actual monitoring purpose to identify damage in remote areas
 - Capacity building of field staff with respect to making seizure memos/DR etc. • Incentivising people for protection of forests in intelligence gathering and information sharing– rewards, Timber Distribution preference etc.

- Adequate awareness should be spread among local people regarding importance of forests
- Police should also be involved in group patrolling in highly sensitive beats. Investigation of forest offences by police after FIR is necessary for deterrence
- Provision of patrolling vehicle at range level round the clock; To check the illegal trade of timber and poaching, patrolling staff/ ROs must be provided with vehicle, mobile phone, rifle etc.
- Ensuring proper checking of salvage lots with mandatory monitoring by Range Officers, ACF, DFO, CF and strictly adhering to the time periods for carrying out operations
- Before provisioning of timber for TD distribution, proper stock-taking and record of available dry-standing trees beat wise with photographs and GPS coordinates
- Adhering to the TD policy timelines and strict non-issuance during fire-seasons
- In coordination with District Administration convergence, create purposeful employment activities e.g. under MGNREGA especially in the lean season when illicit threats increase
- Considering the concept of 'smart forests' and using of 'green bots' on experimental basis for early detection and warning of illicit activities
- Frequent checking of saw mills and wood-based industries are indispensable to prevent illegal trade of timber.
- Whenever, a complaint is received by the staff by any means whether orally, telephonically or in writing, whether by name or anonymously or pseudonymously, the preliminary enquiry shall be initiated immediately and completed within two weeks if a forest offence is found to have been committed. Damage report shall be issued immediately and action shall be taken by following the rules and procedure including Court Challan. Major cases of illicit felling should invariably be registered with police immediately.

5.21 Encroachment

The problem of encroachment is seriously persistent in forested region of Himachal Pradesh. There can be no denying fact that during the past three decades forest areas have been shaved off extensively for non-forestry purpose. Year by year, more and more land under forest cover is being brought under the plough even by way of large-scale encroachments. The land grabbers have evolved a strangely novel method to eliminate the forest growth. Under the Forest (Conservation) Act, 1980, diverting of forest lands for non-forestry purpose without the prior approval of Govt. of India is not permissible. As such, even the settlement staff of the revenue department cannot divert forest land for non-forestry purposes without the permission of the Govt. of India. The provision of Indian Forest Act, 1927 are only punitive. For eviction of the encroachers, simultaneous action is to be taken to file a challan before the Assistant Collector Grade I concerned for taking up proceeding under Section 163 of H.P. Land Revenue Act, 1954 for eviction of the encroachers on the Govt. land i.e. other than forest land and whereas in respect of the encroachment on forest land eviction proceedings by the DFO-cum-Collector shall be commenced under the Himachal Pradesh Public Premises and Land (Eviction & Rent Recovery) Act, 1971, unless the proceedings are initiated under the Act, eviction of the encroachers will not be possible under the Indian Forest Act, 1927. The latest position of encroachment cases in Solan Forest Division has been updated on MOFEES portal of HP Forest Department. The incidences of encroachment are very less and a small area is under encroachment which is under removal through the intervention of courts. The summary of cases is as follows (It is to be noted in Hon'ble High Court HP Orders, the areas have been evicted in 6 no. cases after retaining 5 bigha i.e. 2.4 ha).

Table 5.15: Summary of Encroachment cases

Table 5.15 (a): Collector-cum-DFO Solan under the H.P. Public Premises and Land (Eviction and Rent recovery) Act, 1971.

Total No. of Cases		No. of cases in which orders have been passed		No. of cases in which land actually got evicted		No. of case in which orders are yet to be implemented		Balance case s upto 31.01.2025	
No.	Area (in ha.)	No.	Area (in ha.)	No.	Area (in ha.)	No.	Area (in ha.)	No.	Area (in ha.)
1	0.084	--	--	--	--	--	--	1	0.084

Table 5.15 (b): Hon'ble High Court of HP

Total No. of Cases		No. of cases in which orders have been passed		No. of cases in which land actually got evicted		No. of case in which orders are yet to be implemented		Balance cases upto 31.01.2025	
No.	Area (in ha.)	No.	Area (in ha.)	No.	Area (in ha.)	No.	Area (in ha.)	No.	Area (in ha.)
2	0.00210	--	--	--	--	--	--	2	0.00210

Table 5.15 (c): Civil Judge Senior Division Kandaghat

Total No. of Cases		No. of cases in which orders have been passed		No. of cases in which land actually got evicted		No. of case in which orders are yet to be implemented		Balance case s upto 31.01.2025	
No.	Area (in ha.)	No.	Area (in ha.)	No.	Area (in ha.)	No.	Area (in ha.)	No.	Area (in ha.)
1	0.0504	--	--	--	--	--	--	1	0.0504

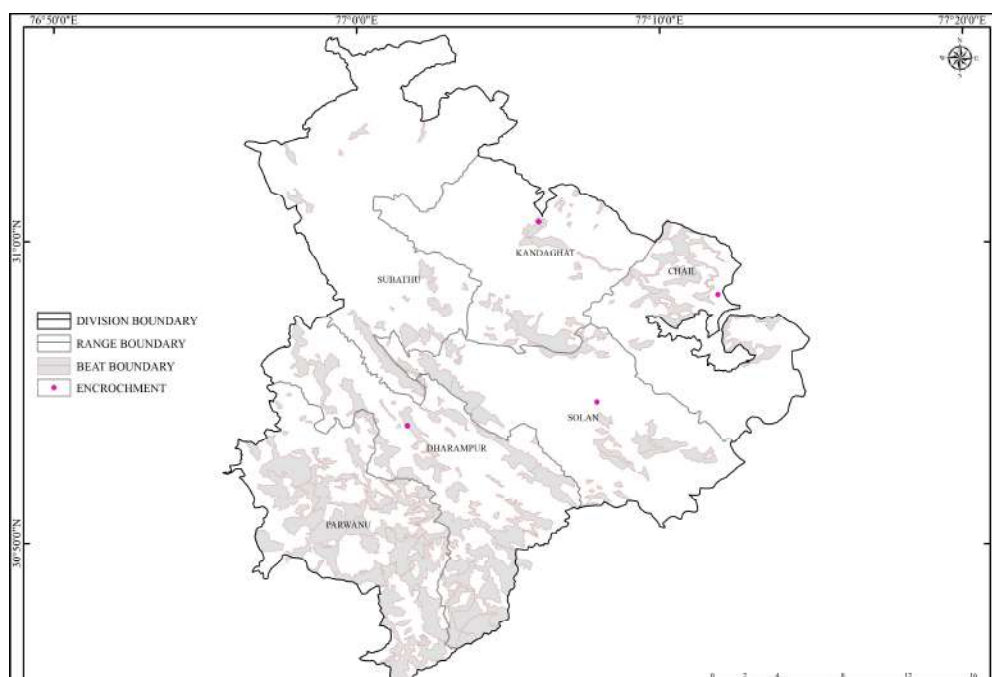


Fig.5.4: Encroachments in Solan Forest Division

5.21.1 Measures to prevent encroachment of forest land and clearing of encroachments

i) Forest officials must be well conversant with boundaries of the forests falling in their respective jurisdictions. Range Officer, Block Officers and Forest Guards must check the boundary pillars frequently and if anything is found wrong, immediate step should be taken for maintenance of boundary pillars and booked the wrongdoer under the Act.

ii) Forest Guard must issue the damage report under the provision of Indian Forest Act, 1927 and information in this regard be sent to his superior within 3 days. On the report of in-charge beat guard, Block Officer/Range Officer, should get the area encroached upon demarcated under Section 107 of the H.P. Land Revenue Act, 1954 and challan the case before the DFO-cum-Collector court for initiating eviction proceedings under the H.P. Public Premises and Land (Eviction & rent Recovery) Act, 1971. Limitation period for challaning the forest offence under Section 514 of BNS, 2023 is 3 years but challans should not be delayed unreasonably.

iii) Periodic checking of all forest offence cases and review of progress etc. by ACF/DFO and CF is, therefore, necessary.

iv) Boundary pillars are important to demarcate the forest boundaries with other areas. Maintenance of boundary pillars is a routine exercise carried out in the forests. New boundary pillars shall be constructed along the boundary of forests with townships and villages, areas that are vulnerable to encroachment on a priority basis after identification of such areas.

5.21.2 Steps Taken for Eviction on Forest Land

All Divisional Forest Officer have been delegated with the powers of Collector under H.P. Public Premises and Land (Eviction & Rent Recovery) Act, 1971 within their respective jurisdiction vide H.P. Govt. Notification No. 1-21/71 239 SLG dated 8-6-1994 besides taking punitive action against the encroachers under Section 329 (3) of BNS, 2023 read with Section 26 of Indian Forest Act, 1927. Powers of carrying out demarcation of disputed land in question are vested with Revenue Authority under Section 107 of the H.P. Land Revenue Act, 1954 The forest and revenue officers/officials are responsible and liable for detection/removal of encroachment cases under the provision of H.P. Prevention of Specific Corrupt Practice Act, 1983. Therefore, revenue officers/official are responsible for initiating eviction proceeding under Section 163 of the H.P. Land Revenue Act, 1954 against the encroacher who have encroached upon the Govt. land i.e. other than forest land which is not a notified forest land under the provision of Indian Forest Act, 1927. In compliance of the Hon'ble High Court order dated 28-8-2009, Pr. Secretary Forests issued notification on dated 5-5-2010 has directed that, when encroachment is detected on forest land, action for removal of such encroachment shall be initiated under the Himachal Pradesh Public Premises and Land (Eviction and Rent Recovery) Act, 1971 and also action for committing forest offence by the encroacher shall be initiated under the Indian Forest Act, 1927.

FIR under various provisions of Bharat Nyaya Samhita (BNS) shall be registered with Police in case of

- (i) Boundary pillars have been tampered with
- (ii) Permanent structure has been made
- (iii) Area encroached more than 10 bighas
- (iv) There is encroachment within the Protected Area Network (PAN) i.e. in a Wild Life Sanctuary or National Park.
- (v) The cases involving avoidable damages exceeding rupees 10 lakhs caused by the Companies or Corporate Bodies.

Thus, it should be made clear to the field executive staff that encroachments are their direct responsibility. If any encroachments are allowed, the Forest Guard concerned shall be personally responsible for allowing such encroachment. In case the Forest Guard issue damage report and submit the cases to the B.O. and the Block Officers/Range Officer do not take further action under the provision of law, they shall be responsible for the encroachment. The Range Officer and the Divisional Forest Officer shall also be held responsible for such cases, if these are kept pending in their respective office without taking further action in compliance of the Hon'ble H.P. High Court order. Therefore, the Range Officer has to ensure that no encroachments take place in reserved forests and wherever such encroachments have already taken place or to be taken, the case should be detected and challan be prepared for eviction and punishment after following the due process of law.

Chapter 6

The Plantation (Overlapping) Working Circle

6.1 Background

The state of Himachal Pradesh is ecologically fragile, yet vital for the country. The Himalayan region of the state serves as the source of major rivers, regulates climate, supports biodiversity, and sustains the livelihoods of millions of people. However, increasing pressure from deforestation, developmental projects, and climate change has led to large-scale degradation of forests. In this context, plantation works in the degraded forest areas assume great significance, not only for restoring ecological balance but also for supporting local communities, the state and the national interests. There is an important ecological importance of plantation and afforestation works, which are essential to conserve soil and water in the steep and erosion-prone mountain slopes. Tree plantations bind the soil, reduce landslides, and lessen siltation in rivers and reservoirs downstream. In regions where agriculture, hydropower, and drinking water supply depend on forested watersheds, plantations play a direct role in maintaining water security. Furthermore, plantations of native species such as Oak, Deodar, Chil, and Bamboo, along with shrubs and grasses, help to restore degraded habitats and corridors, thereby supporting biodiversity. They also act as carbon sinks, mitigating climate change and moderating local microclimates in these vulnerable ecosystems. The rural population of the state relies heavily on forests for timber, fodder, fuelwood and medicinal plants. By introducing species like Amla, Harad, Bahera, Bamboo, Ritha, medicinal plants, and other locally useful species, plantation works also provide valuable non-timber forest products (NTFPs), which contribute to rural incomes and small-scale industries. Seasonal employment opportunities generated through plantation activities and their maintenance under schemes like CAMPA, MGNREGA and other departmental schemes further enhance the economic significance of such works.

The plantation activities in remote and difficult terrains serve as a lifeline for communities living there and provide them employment opportunities in the short term as well as in the long run. Plantation programmes carried out through Joint Forest Management (JFM) and VDFSs actively involve local people in planning, implementation, and protection of forests. Women and youth, in particular, find job opportunities in nursery raising, fuelwood & other forest produce collection, and harvesting NTFPs, thereby strengthening social equity and inclusion. The region is prone to flash floods, landslides and cloudbursts. Plantations play a crucial role in reducing the severity of such disasters by stabilising slopes, reducing surface runoff, and regulating stream flows. Forests in the Himalayan states are deeply intertwined with cultural traditions. Sacred groves, Dev Vans, and temple forests are protected and rejuvenated through plantations, ensuring continuity of cultural and spiritual practices. Moreover, plantations enhance the scenic beauty of hills, thereby supporting eco-tourism and recreation.

6.2 Objectives of management

The special objectives of the management for the plantation working circle are:

1. To develop and augment the forest resources of the area by afforestation of blank and scrub patches with suitable species.
2. Maintenance and management of existing plantation areas with a view to improving their overall condition.
3. To improve the vegetative cover of the forests through the plantation of suitable species on blanks degraded areas or where natural regeneration is insufficient.
4. To carry out plantation activities with a mix of trees, shrubs, herbs and grasses for soil, moisture and biodiversity conservation.

5. To improve the quality and quantity of growing stock of the forests and to promote wild fruit plant species in the forests so as to enhance food availability to the wild animals.
6. To control the growth and spread of invasive alien species to larger areas.
7. To augment carbon sequestration

6.3 General constitution of the working circle

Plantation overlapping working circle has been constituted out of the blank areas, under-stocked forests and the areas where the natural regeneration is inadequate or altogether absent, provided such areas can be restocked through plantation. The total area is calculated after field visit and also by interpretation of satellite images/KML files through GIS and by analyzing plantation and natural forest inventory data.

The Working Circle has been constituted taking into consideration the present status of plantations in the Division. The purpose of creation of this Working Circle is to assist natural regeneration to increase the tree cover and its density.

6.4 Plantations in the past

Large-scale plantations have been raised in the forest division under various afforestation schemes on degraded land and other land designated for plantation under replenishment plantation, pasture improvement, and reforestation of scrub areas. A good number of plantations have also been raised in other areas by the Mid Himalayan Watershed Development Project. The plantations carried out in the department during the period of WP under revision have been updated as an Annexure to the WP.

6.5 Limiting factors of plantations

Not all plantations done, till date, were successful. Many were burnt during fire season; some showed very less survival due to grazing pressure and many such limiting factors. The major factors which play an important role in successful or failure of plantation is listed below which should be taken care of before taking a new plantation activity:

1. Selection of suitable plantation site
2. Choice of spp. As per site
3. Analysis of factors which were responsible for previous factors
4. Seed procurement from known sources
5. Healthy nursery stock
6. Proper depth of pits
7. Timely release of budget for plantation
8. Protection from grazing, fire etc.

6.6 Plantations raised from 2012 to 2024

The summary of the plantations carried out from 2012 to 2024 are given below in table 6.1

Table 6.1: The summary of the plantations carried out from 2012 to 2024

Year	General Plantation Area (ha)	CA Plantation Area (ha)	NPV Plantation Area (ha)	Total Plantation area (ha)	Expenditure
2012-13	353.43	6.6	0	360.03	9552335
2013-14	227.53	0	50	277.53	4578178

2014-15	144	289	61	494	9179764
2015-16	62	304	0	366	14207428
2016-17	224	137	9	370	11151165
2017-18	195	0	0	195	6350500
2018-19	286	1	0	287	8792640
2019-20	197.7	30.34	0	228.04	8641923
2020-21	174	0	39	213	8331130
2021-22	170	34	25	229	10050795
2022-23	35	10	0	45	1517160
2023-24	18	42	25	85	5740793
2024-25	61.5	0	0	61.5	6825720

Details of plantations raised in 2024-25 are given in table 6.2 below:

Table 6.2: Details of the Plantations carried out in the Year 2024-25

S. No.	Scheme	Range	Block	Beat	Name of area	Work Description	Area in Ha.	No. of Plants to be planted
1	Demand No. 16-2406-01-102-43-SOON DSFP Improvement of Tree Cover	Chail	Gaura	Dhangel	GCL Karog	500 Tall Plants / hac. with wooden fence post	5	2500
2	Demand No.32-2406-01-789-27 DSFP Improvement of Tree Cover	Chail	Gaura	Dhangel	D-39 Damdhar C2	500 Tall Plants / hact with wooden fence post	5	2500
3	Demand No. 16-2406-01-102-43-SOON DSFP Improvement of Tree Cover	Kandaghat	Kiari	Kot	GCL Kadaur	800 Normal Plants/Hac. with wooden fence post	4	3200
4	Demand No. 16-2406-01-102-43-SOON DSFP Improvement of Tree Cover van Mahotsav	Kandaghat	Bisha	Basha	GCL Ruda	300 Tall Plants/hac. with wooden fence post	1	300
5	Demand No. 16-2406-01-102-43-SOON DSFP Improvement of Tree Cover	Solan	Saproon	Chawal	D-126 Manlog C-1	800 Normal Plants/Hac. with wooden fence post	4	3200
6	Demand No. 16-2406-01-102-43-SOON DSFP Improvement of Tree	Solan	Oachghat	Oachghat	D-97 KyarTatool	800 Normal Plants/Hac. with wooden fence post	2	1600

	Cover								
7	Demand No. 16-2406-01-102-43-SOON DSFP Improvement of Tree Cover	Subathu	Serighat	Thathol	GCI Ghorri	200 Tall Plants /Hac.with wooden fence post	2	400	
8	Demand No. 16-2406-01-102-43-SOON DSFP Improvement of Tree Cover	Dharampur	Joharji	Bohali	D-181 Shirguli katibba	400 Tall Plants/Hac.w ith wooden fence post	3	1200	
9	Demand No. 16-2406-01-102-43-SOON DSFP Improvement of Tree Cover	Dharampur	Joharji	Neri	D-217 MeunSano	800 Tall Plants/Hac.w ith wooden fence post	5	4000	
10	Demand No. 16-2406-01-102-43-SOON DSFP Improvement of Tree Cover van Mahotsav	Dharampur	Chabal	Gulhari	R-33 Gulhari C1a	300 Tall Plants/hac. with wooden fence post	0.5	150	
11	Demand No. 16-2406-01-102-46-SOON - MukhyaMantri van VistarYojna	Dharampur	Joharji	Jalyana	R-48 Kalth C4	500 Tall Plants/hac. with RCC fence post	25	12500	
12	Demand No. 16-2406-01-102-43-SOON DSFP Improvement of Tree Cover	Parwanoo	Lugon	Nabhon	D-192 Nabhon Pratha	800 Normal Plants / hac.with wooden fence post	5	4000	
					Grand Total		61.5	35550	

6.7 Nursery

There are 9 permanent nurseries under Solan forest Division with one central nursery in each range to cater the plantation stock for nearby plantation areas of the range. The details of all the nurseries are tabulated in the following table:

Table 6.3: Nurseries in the Solan Forest Division

Nursery	Area (hac)	Name of beat	Status	Altitude (m)	Longitude	Latitude	Distance from road (metres)	Water Tank (capacity litres)	Vermi-compost	Mali Hut	Pol y-house	Capacity to accommodate stock
Alobra	0.5	Alobra	Permanent	832	76.97506	31.01847	30	12000	Yes	Yes	Yes	80,000

Cheunth	0.2	Shilru	Permanent	1457	77.16066	30.975329	20	90,000	Yes	Yes	Yes	60,000
Dahar	0.2	Gaura	Temporary	957	77.196588	30.898166	20	35,000	Yes	No	Yes	1,00000
Dhamiyan	2	Koti	Permanent	1045	77.0010770	30.8676794	750	85000	Yes	No	Yes	3,00,000
Karol	1.5	Karol-I	Permanent	1578	77.09368	30.5203	700	10,000	Yes	No	No	1,50000
Kiari	0.5	Kiari	Permanent	1450	77.09274	30.99551	20	22000	Yes	No	Yes	50,000
Lugon	0.50	Lugon	Permanent	750	77.02720	30.46850	400	60,000	No	No	Yes	1,00000
Majholi	0.75	Sultanpur	Temporary	1492	77.11477	30.85850	20	40,000	No	No	No	70,000
Kiran	0.8	Neri	Permanent	1105	77.03683	30.79209	10	50,000	Yes	No	Yes	80,000

6.7.1: Importance of Nursery

Healthy nursery plantable stock with the optimum height and collar diameter is a crucial criteria for ensuring survival of these plants in the forests. In addition to ensuring the basic infrastructure including vermin compost adequacy, it is also necessary that proper maintenance, shifting and grading of the plants be done and plants raised as per Nursery protocols. Monitoring by officers (CF, DFO, ACF, RO) as per Monitoring protocols must be ensured to keep track of growth and give technical inputs required, if any. Species diversification is another aspect that has to be laid stress upon, especially to avoid monoculture planting. The rare and endangered species are reducing from the native forests which must be raised in nurseries to preserve such species and be given in public distribution for wide plantation. A list of nursery techniques have been devised for some species that are suitable for raising in Solan nurseries and have been added in Appendix XIII(Others) for reference.

6.8 Planting Techniques

Solan forest division is located in the western Himalayas and is characterised by steep altitudinal gradients that range from the sub-tropical foothills to the upper extremities of sub-tropical areas. These variations in altitude bring about significant changes in temperature, rainfall, snowfall, and soil type. As a result, different ecological zones emerge, each supporting its own characteristic vegetation. For successful afforestation and ecological restoration, it is essential to select species that are well-suited to the altitude and climate of the region. The altitudinal zone-wise details of the suitable species have been given below:

6.8.1 Sub-Tropical Zone (up to about 900 m amsl)

The foothill areas of Solan division, mainly the Parwanoo forest range, experience hot summers and mild winters, with relatively dry conditions. In this zone, species such as *Acacia catechu* (Khair), *Dalbergia sissoo* (Shisham), *Azadirachta indica* (Neem), *Albizia lebbeck* (Siris), and *Cassia fistula* (Amaltas) are suitable for plantations. These species not only thrive in dry conditions but also provide timber, fuelwood, and fodder to local communities.

6.8.2 Sub-Tropical Pine Zone (900 –1,800 m amsl)

The major forest area of the forest division falls in this altitudinal zone. This zone is dominated by natural forests of Chirpine (*Pinus roxburghii*) and Ban oak. Species like *Quercus*

leucotrichophora (Banj oak), *Quercus dilatata* (Moru oak), *Aesculus indica* (Horse chestnut), *Alnus nepalensis* (Alder), *Toona ciliata* (Toon), *Morus alba* (Mulberry), *Melia azedarach* (Dharek) etc. are suitable for plantation. These species are important for meeting the needs of fuelwood, fodder, and small timber, while also playing a role in soil conservation.

6.8.3 Sub-Temperate Zone (1,800–2,500 m amsl)

The Chail forest range and some areas of Kandaghat are primary constituents of this zone within the forest division. Chail range supports good forests of Deodar (*Cedrus deodara*). Kandaghat range and other areas in this zone supports ban oak forests with a mix of associate species. With cooler temperatures and higher moisture, this zone supports valuable conifers and broadleaf species like *Cedrus deodara* (Deodar), *Quercus leucotrichophora* (Ban oak), *Quercus dilatata* (Moru oak), *Aesculus indica* (Horse chestnut), and *Alnus nepalensis*. These species are important for watershed protection and soil fertility, and environmental conservation.

6.8.4 Slope Aspect-wise Suitable Plantation Species

The aspect of a slope significantly influences the choice of plantation species in the forests. While south- and west-facing slopes demand hardy, drought-resistant species such as Chir pine, Khair, and Siris, the north- and east-facing slopes are better suited for moisture-loving, shade-tolerant, and high-value species like Deodar, Oaks, Spruce, and Alder. A slope-aspect-based plantation strategy ensures better survival, faster growth, and higher ecological benefits. It also aligns plantation works with natural site conditions, thereby enhancing the long-term sustainability of afforestation programmes in the fragile hill ecosystems of the forest division. Solan forest division presents a complex mosaic of landforms where slope, altitude, and aspect (the direction a slope faces) strongly influence vegetation growth. Aspect determines the amount of sunlight, soil moisture, and microclimatic conditions available on a slope. In general, **south-facing slopes** receive more sunlight and are drier and better suited for hardy or drought-resistant species. In contrast, **north-facing slopes** retain more moisture and support species that require cool and humid conditions. Recognising these variations is critical for planning afforestation and restoration programmes in the hill forests of the forest division. The details of suitable species for different aspects are given below:

6.8.4.1 South-facing Slopes (Sunny, Dry Aspects)

South-facing slopes are exposed to strong sunlight, have higher evaporation rates, and often suffer from moisture stress. These sites are best suited for drought-resistant and light-demanding species. Suitable species include:

- *Pinus roxburghii* (Chir pine)
- *Albizia lebbbeck* (Siris)
- *Bauhinia variegata* (Kachnar)
- *Cassia fistula* (Amaltas)
- *Acacia catechu* (Khair)
- *Dalbergia sissoo* (Shisham)
- *Ziziphus mauritiana* (Ber)

Planting these species on dry aspects helps control soil erosion, improves slope stability, and provides timber, fodder, and fuelwood to local people.

6.8.4.2 North-facing Slopes (Cool, Moist Aspects)

North-facing slopes receive less direct sunlight, conserve more soil moisture, and provide a favourable microclimate for shade-tolerant and moisture-loving species. These slopes are ideal for plantations of conifers and broadleaf species of high ecological and timber value. Commonly suited species are:

- *Cedrus deodara* (Deodar)
- *Quercus leucotrichophora* (Banj oak)
- *Quercus semecarpifolia* (Kharsu oak)
- *Pinus wallichiana* (Kail)
- *Alnus nepalensis* (Alder)
- *Aesculus indica* (Horse chestnut)
- *Populus ciliata* (Himalayan poplar)

These species play a major role in watershed protection, maintaining perennial water sources, and enriching soil fertility through leaf litter and nitrogen-fixing capacity (*Alnus* spp.)

6.8.4.3 East-facing Slopes (Morning Sun, Moderate Moisture)

East-facing slopes get the morning sun and moderate moisture, making them favourable for mixed plantations. Species suitable for these aspects include:

- *Toona ciliata* (Toon)
- *Robinia pseudoacacia* (Robinia)
- *Morus alba* (Mulberry)
- *Melia azedarach* (Dharek)
- *Alnus nepalensis*
- *Salix* spp. (Willows, along streams)

Plantations here combine soil conservation with livelihood support, as many of these trees provide fodder, fibre, and timber for rural households.

6.8.4.4 West-facing Slopes (Afternoon Sun, Dry & Windy)

West-facing slopes are exposed to the hot afternoon sun and winds, leading to moisture stress and soil desiccation. The species selected for these aspects must tolerate dryness and prevent soil erosion. Some suitable species are:

- *Pinus roxburghii* (Chir pine)
- *Dalbergia sissoo*
- *Acacia* species.
- *Eucalyptus* spp. (on selected sites, mainly for fuelwood)
- *Leucaena leucocephala* (Subabul, for fodder and fuelwood)

These plantations are crucial for reducing runoff, checking erosion, and providing quick-growing resources for local needs. The choice of species is subject to the state policy for afforestation and plantations in the forest areas.

6.9 Forest Fire Protection Measures in Plantation Areas of Forests

Solan forest division faces significant threats from forest fires every summer, particularly in **Chir pine, dry deciduous forests, and plantation areas**. Newly raised plantations are

especially vulnerable, since young seedlings have tender bark and shallow roots that cannot withstand fire. Forest fires not only destroy plantations but also reverse years' of investment in soil and water conservation. Therefore, adopting effective fire protection measures in plantation areas is essential for ensuring the survival, growth, and sustainability of afforestation programmes in the state.

a. Preventive Measures

- **Site Selection & Design:** While planning plantations, fire-prone areas such as dry southern slopes should be planted with species less susceptible to fire. Mixed plantations help reduce fire spread. **Creating green belts** around the plantation boundary with planting of less flammable species (e.g., broadleaf trees like *Grewia*, *Albizia*, or *Salix*) as green barriers reduces fire intensity.
- **Creation of Fire Lines:** Clear strips (5–10 m wide) are established around and within plantation blocks. These fire lines act as barriers to the spread of fire and are cleaned annually before the fire season (February–June).
- **Controlled Burning (Early Burning):** Dry grass and litter in surrounding forest areas are burned under the supervision of the forest field staff before the fire season to reduce fuel load.
- **Fuel Management:** Regular removal of dry needles, litter, and weeds from plantation areas reduces combustible material. Pine needles can be collected and used for briquettes, bedding, or composting.

b. Preparedness Measures

- **Watchtowers and Fire Lookouts:** In vulnerable ranges, watchtowers and vantage points should be established to detect fires early.
- **Firefighting Tools:** Field staff should be equipped with basic fire protection tools such as fire beaters, rakes, and water sprayers.
- **Community Engagement:** Local communities, JFM committees, VDFSs, and Eco-development Committees should be trained and organised into fire protection squads for quick response.
- **Awareness Campaigns:** Educating villagers and the staff about the hazards of accidental fires from grazing, resin tapping, and careless burning of agricultural residues should be done every year during Feb- May.

6.10 Nursery techniques

The following are the main points to be kept in mind for the site selection and development of the forest nursery:

A) Site selection

Location: Choose nursery sites with good drainage and access to water.

Soil: Loamy soil enriched with organic matter is preferred.

Shade: Partial shade is beneficial, especially for young seedlings.

B) General Design and Layout of the nursery beds

- **Width:** 1.0–1.2 m (so workers can access centre of the bed easily).
- **Length:** 10–15 m (longer beds are difficult to manage).

- **Pathways:** 30–50 cm wide between beds for movement.
- **Orientation:** Beds laid **east–west** to get uniform sunlight.
- **Soil Mix:** Fine-textured soil + sand + well-decomposed FYM/compost (2:1:1 ratio).
- **Raised nursery beds** are most suitable for Solan forest division due to heavy monsoon rains and slope conditions.

C) Common Nursery Equipment

Bed Preparation & Soil Work

- **Spades and Hoes** – digging and mixing soil.
- **Rakes** – levelling beds, removing clods.
- **Sieve** – sieving soil for fine texture in germination beds.
- **Wheelbarrows** – carrying soil, sand, compost.

Seed Sowing & Planting

- **Seed Drills / Dibblers** – for precise sowing depth.
- **Measuring Tape / Line Markers** – uniform row spacing.
- **Trowels** – transplanting seedlings into beds/polythene bags.

Irrigation & Watering

- **Watering Cans with Fine Rose** – gentle watering to avoid seed wash.
- **Flexible Hoses / Sprinklers** – for larger nurseries.
- **Drip Irrigation Kits** – efficient water use in hilly nurseries.

Weeding & Maintenance

- **Small Hoes / Khurpi** – weeding and soil loosening.
- **Hand Forks** – aeration around roots.
- **Secateurs / Pruning Shears** – clipping damaged shoots.

Protection & Shade

- **Shade Nets (50–75%)** – for temperature control.
- **Bamboo Mats / Straw Thatch** – temporary shade.

Container Nursery Tools

- **Root Trainers & Polybags** – Though both types of containers are easily available in the market but the use of root trainers for raising nursery seedlings is superior and is recommended. It facilitates raising sturdy seedlings with intact root balls.
- **Potting Mix Sieves** – preparing a uniform soil mix.
- **Mist Chambers** – for vegetative propagation (cuttings, grafting).
- **Polyhouses / Greenhouses** – protection against frost, excessive rain.

Note: For preparing seedlings for plantation, a few days-old pricks from seed beds should be transferred to the root trainers filled with good potting mix. The seedlings in these root trainers should be maintained and raised for 1 to 2 years before using them for planting in the field.

6.10.1 Root trainers

For raising seedlings in the nursery, root trainers should be used instead of polythene bags. They are specialised containers designed to grow seedlings with a well-formed, straight, and healthy root system. They are widely used in forestry, horticulture, and medicinal plant nurseries to improve seedling survival, growth, and transplantation success. The advantages of root trainers are that they produce strong, healthy seedlings with a fibrous root system. They reduce the mortality rate after out-planting, save space in nursery beds and allow high-density seedling

raising and minimise transplant shock, especially in hilly terrains. Root trainers are a cost-effective and efficient tool for producing high-quality seedlings in forestry and medicinal plant nurseries. By promoting a strong, vertical root system and reducing transplant shock, they significantly improve survival rates, growth performance, and success of afforestation and enrichment plantation programmes, particularly in the hilly terrains of the forest division.

Purpose of Root Trainers

- Encourage deep, vertical root growth and prevent root circling.
- Facilitate easy transplantation without disturbing roots.
- Enhance survival rates in harsh field conditions (slopes, dry areas, or exposed sites).
- Allow efficient space utilisation in nursery beds.

Table 6.4: Potting Mix recommended for major species in Forest Nursery

Species	Soil Type	Sand (%)	FYM / Compost (%)	Optional Additives	Special Notes
<i>Cedrus deodara</i> (Deodar)	Forest soil / loamy soil	20–25	20–25	Coir 5–10%, Vermicompost 5%	Well-drained mix; avoid waterlogging
<i>Pinus roxburghii</i> (Chir pine)	Sandy loam	30	20	Neem cake 2–5%	Light, aerated mix for proper root penetration
<i>Quercus leucotrichophora</i> (Banj oak)	Loamy forest soil	20	25	Vermicompost 5%	Moisture-retentive, slightly acidic mix
<i>Alnus nepalensis</i> (Alder)	Loam + forest soil	25	25	Coir 5%, Vermicompost 5%	Nitrogen-fixing; retains moisture

<i>Emblica officinalis</i> (Amla)	Sandy loam	25	20	Coir 5%	Avoid waterlogging; neutral pH
<i>Terminalia chebula</i> (Harad)	Sandy loam	25	20	Neem cake 2–5%	Moderate moisture; good drainage
<i>Terminalia bellirica</i> (Bahera)	Sandy loam	25	20	Coir 5%, Vermicompost 5%	Well-drained mix; avoid compaction
<i>Withaniasomnifera</i> (Ashwagandha)	Sandy soil	30	15	Coir 5%	Less FYM to prevent root rot; well-drained
<i>Asparagus racemosus</i> (Shatavari)	Loam + compost	20	25	Coir 10%	Moist mix; partial shade recommended
<i>Ocimum sanctum</i> (Tulsi)	Sandy loam	25	20	Vermicompost 5%	Well-drained; prevent water stagnation

The broad guidelines to use potting mix in the Root Trainers are as follows:

- All soil, sand, and FYM should be sieved to remove stones and clods.
- Blend all components thoroughly for a uniform texture.
- Optional solarisation or fungicidal treatment reduces damping-off.
- Filling:** Use a mix of forest soil, sand, and well-decomposed Farm Yard Manure (FYM) and optional additives suggested in the table above.

- v. Lightly moisten before filling root trainers.
- vi. Fill root trainers or polybags 2/3 to 3/4 full; avoid compacting soil.
- vii. **Sowing/Planting:** Seeds are sown directly in the trainer; cuttings/rhizomes are planted carefully.
- viii. Maintain moisture but avoid waterlogging.
- ix. **Irrigation & Care:** Water regularly; remove weeds and protect from pests.
- x. **Hardening:** Before planting out, gradually expose seedlings to sunlight and reduce watering.
- xi. **Transplanting:** Seedlings are lifted with the root ball intact and planted in the field with minimal root disturbance.

6.11 The proposed plantations

The following areas are proposed for plantation works during the plan period. The area details are based on field visits and discussions with officials from the forest division, as well as suggestions from them.

Table 6.5: Proposed plantations in Solan Forest Division

Range	S.No.	Name of Forest	Area (ha)	Working Circle	Plantation Work	
					Area (Ha)	Plants (per Ha)
Chail	1	D39 Dhamdhar C-1	30.4	Chil W.C.	5	500
Chail	2	D39 Dhamdhar C-2	30	Chil W.C.	3	500
Chail	22	D52 Bhojdeen C-3b	58.4	Chil W.C.	3	500
Kandaghat	31	D-69 Palhech I	22.4	Ban Oak W.C.	3	-
Kandaghat	44	D-101 Kuryali	19.6	Ban Oak W.C.	5	-
Solan	37	D-126 SManlog C-2	13.4	Chil W.C.	Tall plantation (500 plants/ha)	-
Solan	54	D-82 SJawa	43.6	Ban Oak W.C.	Tall plantation	-
Subathu	10	D-122 Shangri	6.4	PCR W.C.	6	500
Subathu	13	D-124 Katiyara C-4	17.2	PCR W.C.	10	500
Subathu	15	D-127 Shashal C-4b	10	PCR W.C.	2	500
Subathu	16	D-129 Rano	18.8	PCR W.C.	5	500
Dharampur	68	R-31 Barog C-2 a	45.2	Chil W.C.	8	500
Dharampur	69	R-31 Barog C-2 b	26.8	Chil W.C.	12	500
Dharampur	81	D176 Chiroti Ki Dhar-I	38	Chil W.C.	10	200
Dharampur	82	D177 Chiroti Ki Dhar	21.2	Chil W.C.	3	200
Dharampur	83	D178 Chiroti Ki Dhar C-1	42.3	Chil W.C.	3	400
Dharampur	84	D178 Chiroti Ki Dhar C-2	29.1	Chil W.C.	3	500
Dharampur	85	D179	16	Chil W.C.	4	500

		ShirgulKaTiba C-1				
Dharampur	86	D179 ShirgulKaTiba C-2	13.6	Chil W.C.	5	500
Dharampur	88	R39 Charoti Ki Dhar	44.4	Chil W.C.	2	400
Dharampur	111	D-165 Maltoo	41.2	Chil W.C.	8	500
Dharampur	117	R-37 Maltoo C2	28.6	Chil W.C.	5	500
Dharampur	118	R-33 Gulhari C1a	44	Chil W.C.	15	1100
Dharampur	131	R-30 Chabal C1	30.4	Chil W.C.	2	200
Dharampur	148	R42 Ajmer Garh C-1	35.6	Chil W.C.	10	500
Dharampur	151	D180 ShirgulKaTiba C-2	21.2	Chil W.C.	10	500
Dharampur	21	R-31 Barog C-3	42.8	PCR W.C.	15	500
Dharampur	23	R-44 Jhanai C1	76.5	PCR W.C.	10	400
Dharampur	32	D-210 Odder jhangiriya	97.7	PCR W.C.	3	400
Dharampur	34	D-212 Halda	16	PCR W.C.	5	400
Dharampur	36	D175 Bohali C-2	11	PCR W.C.	3	500
Dharampur	37	R40 Bohali C-2b	38	PCR W.C.	15	400
Dharampur	43	R-35 Kadon	40.1	PCR W.C.	2	200
Dharampur	47	R-48 Kalth.C-3	16	PCR W.C.	5	200
Dharampur	48	D-203 Quila Ajmergarh.C2	43.6	PCR W.C.	15	400
Dharampur	49	D-202 Kalth – II.C1	12	PCR W.C.	5	200
Dharampur	51	D213 KabaBhalon	107.6	PCR W.C.	32	800
Dharampur	59	R41 Gulzar C-2	102.4	PCR W.C.	20	500
Parwanoo	163	D-245 Sanawar C2	16.4	Chil W.C.	5	1100
Parwanoo	167	R-57 Banasar C1b	43.2	Chil W.C.	10	800
Parwanoo	71	D-234 Ranigaun	72	PCR W.C.	10	800
Parwanoo	73	D-240 Dochi C6	28.4	PCR W.C.	8	200
Parwanoo	75	R-56 Parwanoo C2	91	PCR W.C.	15	800

The plantations shall be raised in culturable blank areas of the working circles, areas where salvage removals will take place and has taken place on the past and where fellings shall be carried put (specific to the Chil Working Circle). The following table gives the current status of culturable blanks in the working circles:

Table 6.6: Blanks in Working Circles for Plantations

Working Circle	Culturable blanks	Unculturable Blanks
Chil	34.5	8.95
Ban Oak	19.54	14.15
PCR	52	16.6

There is no culturable blank on the Deodar Working Circle. In addition to this, areas shall be made available from felling programme outlined in the Chil Working Circle.

6.12 Miscellaneous

The budget should be released in time every year so that plantation activities can be executed in time bound manner. Dovetailing with other agencies and convergence should also be attempted to integrate plantation and soil & moisture conservation works with the ongoing schemes of the government at district, state and national levels. Failure to achieve the plantation targets for the given year shall be considered a deviation. In case of deviation, approval should be taken from the competent authority and efforts should be made to complete the plantation targets at the earliest in the next year.

Chapter 7

Bamboo (Overlapping) Working Circle

The Solan Forest Division encompasses six forest ranges: Dharampur, Parwanoo, Solan, Kandaghat, Chail and Subathu. These ranges collectively cover forest area of approximately 13151 hectares. Within this division, bamboo forests are primarily found in the lower elevations, coexisting with species like chir pine (*Pinus roxburghii*).

7.1 General Constitution of the Working Circle and Character of Vegetation

The forests and compartments included have compact bamboo crop over an area of 1015.36 ha which can be worked intensively under a regular system of bamboo management. These areas are mainly confined to the Lugon and Parwanoo blocks of Parwanoo Range and Joharji block of Dharampur Range. It includes all commercially exploitable bamboo areas of the division and the main objective of this working circle is to rehabilitate the old bamboo areas and to promote the growth of bamboos in existing bamboo forests in addition to introducing bamboos in areas suitable for their growth. The bamboo species found in the tract is of *Dendrocalamus strictus*. The Range wise distribution of bamboo areas is as under in table 7.1:

Table 7.1 Area Distribution of Bamboo Forest in Solan Forest Division

Range	RF (ha.)		DPF (ha.)		Total (ha.)	
	Total Area	Under bamboo	Total Area	Under bamboo	Total Area	Under bamboo
Dharampur	389.6	146.00	299.30	118.00	688.90	264.00
Parwanoo	839.40	235.92	1138.60	515.44	1978.00	751.36
Total	1229.00	381.92	1437.90	633.44	2666.90	1015.36

Bamboo is found either in pure or mixed with scrub or miscellaneous broad-leaved species. The FSI study states that any bamboo area with 200 clumps per ha are to be classified as a pure bamboo area and most of these areas are densely stocked with bamboo clumps (250 or more). However, the size of clumps is small and in most cases the circumference does not exceed 2m. The standard set by the FSI to assess site quality cannot be applied here as almost all areas have more than 200 clumps per hectare, but the quality of bamboo is in no case akin to 'Site Quality I'. In the present case an area having 300 clumps per ha or more has been considered as completely stocked with bamboos. The quality of bamboo, however, is not very good and most of the clumps suffer from severe congestion, being full or half cut, broken, twisted and malformed green and dry culms. The present state of the clumps is governed by many factors like the moisture regime, quality, characteristics and drainage of soil, slope of the ground, extent of shade, age of clump, degree of injury from grazing, lopping and frequency of cleanings and regular cutting of the clump. The general character of vegetation in these forests has been described in detail in chapter 2 of Part 1.

7.2 Special Objectives of Management

These are mainly related to sustainable production, preservation and expansion of the bamboo cover.

- To work the areas scientifically so as to improve their present condition and maintain their production capacity at the optimum level.
- To rehabilitate and regenerate the areas as and when bamboo flowers gregariously.
- Consistent with the above, to obtain progressive annual yield of bamboo for other industries and usages and manage the bamboo forests such as to obtain maximum sustained revenue to the state.

7.3 Distribution of Bamboo areas in Forests

Table 7.2 Forests along with area under bamboo that are included under this working circle.

Range	No. and Name of Forest	Gross area (in ha)	Net area under bamboo (in ha)
Dharampur	R-43 Halda Kaba C-2	48.0	12.0
	R-43 Halda Kaba C-3	74.0	50.0
	R-44 Jhanai C-1	76.5	30.0
	R-44 Jhanai C-2	63.1	40.0
	R-48 Kalth C-1	128.0	14.0
	D-203 Ajmergarh C-2	83.60	25.0
	D-205 Neri	52.0	25.0
	D-206 Neri	24.4	24.4
	D-209 Bhagor	15.6	11.6
	D-210 Odder jhangeria	97.7	25.0
	D-211 Halda	10.0	3.0
	D-212 Halda	16.0	4.0
	Total Dharampur	688.9	264
Parwanoo	R-45 Khadar Ki Dhar	110.4	70.4
	R-52 Gumma C-1	128.4	38.52
	R-52 Gumma C-2	51.2	14.0
	R-53 Tiron C-3	33.4	18.0
	R-56 Parwanoo C-1 & C-2	124.0	35.0
	R-61 Naraini C-1	227.2	6.0
	R-61 Naraini C-2	164.8	54.0
	D-197 Pratha -I	4.8	4.8
	D-198 BhagourLugon	30.8	7.0
	D-199 ChawalAshnala	66.4	20.0
	D-200 Dhanota Chakali C-1b	56.3	56.3
	D-200 Dhanota Chakali C-1c	63.7	63.7
	D-200 Dhanota Chakali C-1d	27.2	7.0
	D-202 SathDadhog	30.4	30.4

	D-218 Kamlog	7.2	3.0
	D-225 Gumma	84.0	52.0
	D-220 Barog C-1	31.6	20
	D-221 Kiarwa	8.4	5.0
	D-228 Ambota C-1	54.0	50.0
	D-228 Ambota C-2	32.0	5.0
	D-229 Tiron C-1	16.2	15.0
	D-229 Tiron C-2	16.8	8.0
	D-233 Datiar C-3	65.2	32.0
	D-233 Datiar C-4	29.2	10.0
	D-233 Datiar C-5	105.2	34.0
	D-233 Datiar C-6	79.6	8.0
	D-226 Ananu	30.8	5
	D-227 Ananu	8	1
	D-224 Sandhog	90	18
	D -223 Khadeen	76	22.8
	D -235 Chamgan	52.8	15.84
	D -234 Rani Gaon	72	21.6
	Total Parwanoo Range	1978.00	751.36
	Grand Total Solan Division	2666.90	1015.36

The following forest compartments, namely R-52 Gumma C-1, D-226 Ananu-II, D-277 Ananu-I, D-224 Sandhog, D-223 Khadeen, D-235 Chamgan, and D-234 Ranigaon, represent areas with significant and naturally established bamboo growth. The total bamboo cover in these areas, as per the present field assessment, is recorded as follows:

- R-52 Gumma C-1 – 128.40 ha (Bamboo cover 38.52 ha)
- D-226 Ananu-II – 30.80 ha (Bamboo cover 5.00 ha)
- D-277 Ananu-I – 8.00 ha (Bamboo cover 1.00 ha)
- D-224 Sandhog – 90.00 ha (Bamboo cover 18.00 ha)
- D-223 Khadeen – 76.00 ha (Bamboo cover 22.80 ha)
- D-235 Chamgan – 52.80 ha (Bamboo cover 15.84 ha)
- D-234 Ranigaon – 72.00 ha (Bamboo cover 21.60 ha)

Although these compartments are not specifically recorded under “Bamboo Zone” in the previous Working Plan, the present condition clearly indicates significant regeneration and expansion of bamboo in these forests over the years. In addition, departmental records confirm that bamboo plantations have also been undertaken in these areas under various schemes, which have further strengthened their bamboo status, as detailed below:

- R-52 Gumma C-1 – 5 ha plantation in 2013–2014
- D-226 Ananu-II – 5 ha plantation in 2011–2012

- D-223 Khadeen – 5 ha plantation in 2011–2012, 5 ha in 2012–2013, 10 ha in 2016–2017, 10 ha in 2019–2020
- D-235 Chamgah – 9 ha plantation in 2010–2011
- D-234 Ranigaon – 7.78 ha plantation in 2012–2013, 6 ha in 2013–2014, 8 ha in 2018–2019

On the basis of the above facts, it is evident that these forest compartments have consistently demonstrated significant bamboo presence and regeneration and may be considered under the Bamboo Zone category for management purposes.

The area figures have undergone change from the previous working plan as a few new areas like D-205 Neri, D-211 Hald, D-212 Halda, R-52 Gumma C1, D-226 Ananu – II, D-227 Ananu – I, D-224 sandhog, D-223 Khadeen, D-235 Chamgah and D-234 Rani Gaon have been added. A few forests have recorded a reduction in the area under bamboo as fires in the past have destroyed some portions of bamboo crops e.g. D-210 Odar Jangeria where the area is reduced to 25 ha from 53 ha w.r.t. the previous working plan. Thus, a total increase in area under Bamboo from the previous working plan is 124.36 ha.

7.4 Blocks and Compartments

There is addition of 10 new forests which are allotted to this working circle which has already been described in the earlier paragraphs.

7.5 Analysis and Valuation of the crop

The entire area of this working circle has been stock mapped on 1:15,000 scale copies of the survey sheets and area under bamboo depicted there in . These maps have been posted in the respective Compartment History Files. The net bamboo area is 1015.36 ha or 38 % of the area of this circle. The bamboos in Lugon block of Parwanoo Range are superior to other blocks.

7.5.1 Enumeration

Enumeration for assessing the density of the clumps was done in 100 plots of 0.1 ha area as per instructions given in Working Plan Code 2014. On an average the density of clumps per ha recorded in Lugon Block of Parwanoo Range were 368 Clumps per ha, in Parwanoo Block of Parwanoo Range 254 clumps per ha were recorded, while in Joharji Block of Dharampur Range 390 Clumps per ha on an average were recorded. The quality of Bamboo is better in Lugon block as compared to Parwanoo Block in terms of culm height and diameter. The average no of culms per clump in Lugon is 26.15, Parwanoo is 25.64 and Joharji is 18.7. Most of the clumps have circumference ranging from 1-3 meters though a few clumps have attained a circumference of more than 5 meters.

Table 7.3 (a): Results of enumeration of bamboo forests in Joharji Block of Dharampur range

S. No.	Name of Forest (area of study)	Area in ha.	Area under Bamboo	Size of Plot in ha	No of Plots	Area of Plot in ha.	No of Clump	No of Clump per ha.
1	D-203 QuilaAjmergarh C-2	83.60	25.0	0.1	2	0.2	57	285
2	D-205 Neri	52.0	25	0.1	3	0.3	152	506
3	D-206 Neri	24.4	24.4	0.1	5	0.5	149	298
4	D-209 Bhagor	15.6	11.6	0.1	2	0.2	57	285
5	D-211 Halda	10.0	3.0	0.1	2	0.2	47	235
6	D-212 Halda	16.0	4.0	0.1	2	0.2	86	430
7	R-43 Halda C-2	48.0	12.0	0.1	3	0.3	123	410
8	R-43 Halda C-3	74.0	50.0	0.1	3	0.3	107	356
9	R-44 Jhanai C-1	76.5	30.0	0.1	3	0.3	173	576
10	R-44 Jhanai C-2	63.1	40.0	0.1	3	0.3	161	536
11	R-48 Kalth C-1	128.0	14	0.1	2	0.2	59	295
	Total	591.2	239	1.1	30	3	1171	390

Table 7.3 (b) Results of enumeration of bamboo forests in Parwanoo block of Parwanoo Range

S. No.	Name of Forest (area of study)	Area in ha.	Area under Bamboo	Size of Plot in ha	No of Plots	Area of Plot in ha.	No of Clump	No of Clump per ha.
1	D-225 Gumma	84	52	0.1	4	0.4	140	350
2	R -56 Parwanoo C-1&2	124	35	0.1	6	0.6	207	346
3	R-52 Gumma C-1	128.4	38.52	0.1	1	0.1	4	40
4	R -52 Gumma C-2	51.2	14	0.1	3	0.3	110	366
5	D-226 Ananu	30.8	5	0.1	1	0.1	6	60
6	D-227 Ananu,	8	1	0.1	1	0.1	5	50
7	D-224 Sandhog	90	18	0.1	2	0.2	16	80
8	D -223 Khadeen	76	22.8	0.1	2	0.2	20	100
9	D -233 Datar C-5	105.2	34	0.1	3	0.3	89	296
10	D -233 DatarC-4	29.2	10	0.1	3	0.3	86	286
11	D -233 Datar C-3	65.2	32	0.1	3	0.3	82	273
12	D -235 Chamgah	52.8	15.84	0.1	2	0.2	21	105
13	D -234 Rani Gaon	72	21.6	0.1	2	0.2	21	105

14	D -229 Tiron C-1	16.2	15	0.1	2	0.2	58	290
15	D -229 Tiron C-2	16.8	8	0.1	2	0.2	51	255
16	D -228 Ambota C-1	54	50	0.1	2	0.2	51	255
17	D -228 Ambota C-2	32	5	0.1	2	0.2	67	335
18	R -53 Tiron C-3	33.4	18	0.1	1	0.1	33	330
	Total	1069.2	395.76	1.8	42	4.2	1067	254

Table 7.3 (c): Results of enumeration of bamboo forests in Lugon Block of Parwanoo Range

S. No.	Name of Forest (area of study)	Area in ha.	Area under Bamboo	Size of Plot in ha	No of Plots	Area of Plot in ha.	No of Clump	No of Clump per ha.
1	D- 200 Chakli Dhanota C1b	56.30	56.30	0.1	2	0.2	61	305
2	D- 200 Chakli Dhanota C1c	63.70	63.70	0.1	2	0.2	81	405
3	D- 200 Chakli Dhanota C1d	27.20	7.00	0.1	2	0.2	88	440
4	D- 207 SathDadhog	30.40	30.40	0.1	2	0.2	75	375
5	R- 45 Khadarkidhar	110.40	70.40	0.1	4	0.4	156	390
6	D- 199 ChawalAshnala C-1	66.40	20.00	0.1	3	0.3	90	300
7	D- 198 LugonBhagour	30.80	7.00	0.1	2	0.2	49	245
8	D- 218 Kamlog	7.20	3.00	0.1	1	0.1	25	250
9	D- 221 kiarawa	8.40	0.00	0.1	1	0.1	40	400
10	R- 61 Naraini C-1	227.20	9.00	0.1	2	0.2	84	420
11	D- 220 Barog	31.60	20.00	0.1	2	0.2	79	395
12	R- 61 Naraini C-2	164.80	54.00	0.1	4	0.4	169	423
13	D- 197 Pratha	4.80	4.80	0.1	1	0.1	35	350
	Total	829.2	347.6	1.3	28	2.8	1032	368

Table 7.4: Area wise Density and Composition of Clumps

Area	Avg. Clumps Per Ha	Avg. Culms per Clump	Avg. Manus Per Clump	Avg. Chals per Clump	Avg. Old Culms per Clump
Joharji	390	18.7	3.4	4.8	10.5
Lugon	368	26.15	1.92	2.13	22.1
Parwanoo	254	25.64	2.06	3.09	20.49

The dead culms choking the clumps in natural bamboo areas are common and these have not been counted while determining the clump composition. It can be inferred that higher the number of clumps per unit areas, smaller is the size of the clump in terms of the number of culms.

The bamboo areas have generally degraded and deteriorated in the past. It is an established fact that congestion in clumps is caused by maltreatment and over - cutting of the easily accessible peripheral culms. Non- regular fellings and poor control over execution of fellings and non - adherence to the felling rules have left the clumps in a sorry state and most of the clumps are extremely congested, choked with the dead, dry and malformed culms and also with the remains of the broken culms. The old and dry bamboos restrict the proper development of new shoots (Manus) and the expansion of the clumps. Most of the new shoots are crooked and whippy, there by being of low commercial value.

7.6 Silvicultural System

The silviculture system prescribed for bamboo working is “Culm Selection-Cum-Clump Improvement” i.e., selection felling and thinning in individual clumps. This will be preceded by cleanings wherever necessary.

7.7 Silviculture and management of bamboos

Indian Forest Records, volume II no. 4 by P.N. Deogan gives full information about the silviculture and management of bamboos. The following are broad conclusions which may be kept in view in the working of bamboos in this division:-

1. Congestion in clumps retards the production of new culms and makes them inferior and hence should not be allowed to develop.
2. Adequate foliage for food supply to the rhizomes and sufficient support for the new culms are necessary for better production and quality hence the necessary number of old culms must always be kept in each clump.
3. Culms less than three years old are somewhat immature and less than two years are unacceptable in the market therefore they should not be cut for sale as far as possible.
4. Closure for three months annually during the rainy season to protect the new shoots and for ten year after a gregarious flowering to regenerate the forest is essential.
5. Lopping of bamboos for fodder is the most destructive practice and it should not be allowed at any cost.

Although it is realized that under present conditions it is somewhat difficult to enforce the working on these lines, yet it is emphasized that every effort should be made to introduce correct methods of working. It will not only increase new culm production and avoid considerable depletion in capital, but will also save large sum of money and labour on cultural operations which in advanced stages of congestion become impracticable and fruitless.

7.8 Calculation of rotation

Rotation of bamboo is of academic interest only and has no bearing on the management. Earlier studies have established that 4-5 year old culms show signs of deterioration and accordingly 6 years may be taken as the maximum age of an individual culm and this can be theoretical rotation. Culms below three years age do not fetch a good price in the market as they are prone to appreciable shrinkage and are light weight. Thus, only culms over three years in age will be felled. A few culms of over three years age may have to be retained for giving support to the young “manus” and also where felling rules restrict minimum number of culms to be retained as six. The culms so retained should be evenly distributed.

Since the felling rules prescribed that a minimum of 6 clumps are to be left in a clump, even if the first and second year's shoots are not present, the older culms should be retained to maintain this number. A perusal of the data collected from the natural bamboo area of Lugon block of Parwanoo range reveals that on an average, 25% of the clumps in the forest have 6 or less than 6 culms in them, thereby these need to be retained as such and cannot be worked from commercial angle. It can be presumed that 20-25% clumps are not worked because of congestion that makes their working economically unviable. Therefore, in practice only half the total clumps present in the forest are worked, resulting in loss to the State exchequer on the one hand and leading to further deterioration of the clumps due to further congestion, malformation of culms etc. on the other.

7.9 Felling Cycle

Keeping the yield, market demand and commercial value in consideration, a felling cycle of three years is adopted. Studies conducted on the frequency of felling have indicated that a three- or four-year felling cycle is the most suitable. The previous working plan had a felling cycle of 3 years and this has been observed that a longer felling cycle aids congestion.

7.10. Method of executing fellings

As mentioned earlier, bamboo culms over 5th year show signs of deterioration and those of two years or so, are raw and do not fetch a good market, the proper time of exploitation is from third to fifth year. A clump is the unit of management and yield should be based on net increment (i.e Annual production of manus-loss through malformation/decay/deterioration). Another aspect to be kept in mind is the very short span of suitable period of exploitation during the life of the culm. A clump can remain healthy and vigorous only if all old culms removed equal the new culms produced. But this is rarely the case and due to improper working in the past many clumps have become congested and unworkable, as only good culms were extracted, leaving the malformed, dead, decayed culms standing in the clump. It is thus

prescribed that the number of culms left should not be less than the number of healthy culms of the two preceding seasons i.e. Manus and chals.

7.11 Standard Bamboo cutting prescriptions (Felling rules)

Bamboo cutting prescriptions have been more or less standardized which are as follows:

1. The felling should commence in the middle of October and should be completed by the end of February. Any felling done before mid-October are liable to injure the new culms whereas those done after February may cause borer attack.
2. The maximum number of culms (individual bamboos) to be cut in a clump (entire cluster), except in case of congested /dry of flowered clumps, should not exceed the number of culms which have come up in the last three years. This should approximately be the number of manus (current year's abouts) plus twice the number of chals (last year's shoots). This is the maximum number which can be cut. However the actual number to be cut will be determined after retaining the culms as prescribed below from (a) to (f) .
 - (a) All the manus and chals are to be retained. These are not only an important source of rhizome growth but are also raw and unfit for sale. Sometimes, manus are cut for binding the bundles. This practise should be stopped.
 - (b) In addition to manus and chals, old healthy culms not less than the number of manus should also be retained as support. But the minimum number of old culms to be retained should be four. These should be distributed uniformly all over the clump. There is a general tendency not to leave the supports as these old healthy culms give good quality bamboo. But their non retention increases the chances of young tender shoots being toppled/ broken by winds. The retention also helps in food supply to rhizome.
 - (c) The total number of manus, chals and old culms retained should not be less than six. If there are less manus / chals, more number of old culms should be retained .If the number of culms in a clump is less than six, all culms are to be retained.
 - (d) The culms present on the periphery of the clump are to be retained, as they are conducive to the main (outer) growth of the rhizome.
 - (e) All the culms (except dry/ dead ones) in the open clumps are to be retained.
 - (f) Single/ some flowering culms in a clump will be retained till seeds are shed.
3. Any cutting or the culms meant for retention(a) to (f) above in para(2) should be considered as illicit cutting.
4. The cut should be as low as possible, preferably within 30 cms of ground level and should be just above a node (preferably the first one) so as to avoid accumulation of water in the internode, which is generally hollow. However, if support is required for some adjoining 'manu' the cut may be higher.
5. The cut should be clean and made with a sharp instrument in one stroke so as to avoid splitting / tearing of culms. It should be in slanting position.
6. There is a general tendency to leave congested clumps unworked. The congested culms are those in which the culms are either packed together firmly or are overcrowded and are also held together either by side branches or by some of the culms interlacing each other indifferent ways. Their working is difficult and expensive. In many cases the quality of bamboo obtained may be poor. But the clumps once worked properly, would definitely give higher yield and good quality bamboo and will satisfactory compensate the initial higher expenditure and poor return. For working congested clumps and culms are retained on the

periphery (particularly on the uphill side) of the clump. Other culms should be cut, however, efforts be made to follow rule 2 above as far as possible.

7. The totally dry clumps will be clear felled. A clump which is two third or more dry will be considered totally dry.
8. Clumps which have flowered will be cut (clear felled) only after seed fall.
9. In case there are some partially flowered and partially dry clumps (less than 2/3rd dry), only those culms which have flowered and dried up during previous season will be cut. The culms flowering during the current season shall not be cut. These will be cut after the seed fall. The rest of the clump will be worked as per usual rules.
10. Cleaning, comprising of the removal of dead and dry culms should invariably be done.
11. No cut portion of bamboos should be left in the clumps.
12. No area or clump should be left unworked, rather each clump should be treated as a unit of working.
13. Digging of rhizomes should be prohibited.
14. Climbers infesting the clumps should be cut.
15. All the worked clumps should be cleared of lops and tops of cut bamboos strictly shall be heaped into nallas and rivers and burnt or used.
16. Main fellings as well as cleanings will be constantly supervised by a forest official capable of deciding the silvicultural limit of exploitation.
17. In case of gregarious flowering, all clumps which have flowered will be clear felled after they have shed their seeds and the area protected against grazing and fires.

Table 7.5: Prescribed Bamboo Felling Programme

2025-26, 2028-2029, 2031-32, 2034-35, 2037-38, 2040-41			2026-27, 2029-30, 2032-33, 2035-36, 2038-39			2027-2028, 2030-31, 2033-34, 2036-37, 2039-40		
Name of Forest	Total Area (ha)	Area under Bamboo	Name of Forest	Total Area (ha)	Area under Bamboo	Name of Forest	Total Area (ha)	Area under Bamboo
R-44 Jhanai C-1	76.5	30	R-61 Naraini C-1	227.2	6	R-43 Halda Kaba C-2	48	12
R-44 Jhanai C-2	63.1	40	R-61 Naraini C-2	164.8	54	R-43 Halda Kaba C-3	74	50
R-48 Kalth C-1	128	14	D-199 ChawalAshnala	66.4	20	D-211 Halda	10	3
R-52 Gumma C-2	51.2	14	D-200 Dhanota Chakli C-1b	56.3	56.3	D-212 Halda	16	4
R-53 Tiron C-3	33.4	18	D-200 Dhanota Chakli C-1c	63.7	63.7	R-45 Khadar Ki Dhar	110.4	70.4
R-56 Parwanoo C1 & C-2	124	35	D-200 Dhanota Chakli C-1d	27.2	7	D-210 OdarJangeria	97.7	25

D-197 Pratha No. I	4.8	4.8	D-207 SathDadhog	30.4	30.4	D-220 Barog C-1	31.6	20
D-198 Bhagaur	30.8	7	D-209 Bhagor	15.6	11.6	D-221 Kiarwa	8.4	5
D-203 Ajmergarh	83.6	25	D-228 Ambota C-1	54	50	D-225 Gumma	84	52
D-206 Neri	24.4	24.4	D-228 Ambota C-2	32	5	D-229 Tiro C-1	16.2	15
D-205 Neri	52	25	R-52 Gumma C- 1	128.4	38.52	D-229 Tiro C-2	16.8	8
D-218 Kamlog	7.2	3	D-226 Ananu-II	30.8	5	D-233 Datiyar C-6	79.6	8
D-233 Datar C-3	65.2	32	D-227 Ananu-I	8	1	D-235 Chamgah	52.8	15.84
D-233 Datar C-4	29.2	10	D-224 Sandhog	90	18	D-234 Rani Gaon	72	21.6
D-233 Datar C-5	105	34	D-223 Khadeen	76	22.8			
Total	879	316.2		1070.8	389.32		717.5	309.84

No bamboo fellings were performed after the expiry of the Working Plan in 2016-17.

7.12 Yield

7.12.1 The yield of bamboos in bundles per ha is given in table 7.6

Table 7.6: Yield of Bamboo (in bundles) during 2001 to 2024 extracted by HPSFDC (i.e. During the year of working Plan study)

Year	Name of Forest	Area under Bamboo (ha)	No. of Bundles extracted	Bundles extracted/ha	Remarks
2000-01	R43 Haldatibba C3, D-120 Odder Jangiria, D-225 gumma, D-229 Tiron, D-20 Barog, R45 Khadarkidhar, D-221 Kiarua and D-233 Datar C-6	285.40	44058	154.00	Green
2001-02	R-44 Jhan C1 and C2, R-48 Kalth C1, D206 Neri II, D-203 quilaAjmergarh, D-208 sari D-197 Pratha C1, D-198 LugonBagor, D-128 Kamlog, D-56 Parwanoo, D-233 datiarC-5, R-52 Gumma C1 and R-53 Tiron C3	293.60	53251	181.00	Green

2002-03	D-209 Bhagor, D-200 ChakliDhonta C1b, C1c and C1d, D-207 sathdablog, D-199 Chawalashmala , D-228 Ambota C1 & c2, R-45 Khadarkidhar and D-194 Pratha C3	398.40	51354	129.00	Green
2003-04	R-43 HaldaKaba C3, D-210 OaderJhangeria, R-43 HaldaKabba C2, D-225 Gumma, D-229 tiron C1 and C2, D-220Barog (instead of D-116 C1) D-221 kyarwa and D-223 Datiyar C6	223.00	13762	62.00	Green
2004-05	R-45 Khadarkidhar, R-61 Naraini, D-199 ChawalAshnal, D200 Dhanota Chaka, D207 sathdadhog D-225 Gumma, D-228 C1& C2, D-229 Tiron C1 & C2, D-233 Datiyar C6, D-220 Barog C1, D-197 Pratha C1, D-98 Bhagaurlyen, D-218 KamlogR56 Parwanoo C1,C2, R52 Gumma c2, D-233 Datiyar C3 C4, R-53 Tiron C3, R-48 Kalth C1, R-43 Hallda C2 R-48 Halda C3, D-209 Baghor, D210 Odder Jangiria, R-44 Jhanai C1 R-44 JhanaiC2, D-203 ajmergarh, D-206 Beri and D-208 Sari	264.80	28758	109.00	Green
		615.20	169604	276.00	Dry
Information regarding bamboo bundles extracted during the FY-2005-06 upto 2024-25 may be treated as NIL.					
By comparing the table 7.5 it is evident that maximum yield in bundles /hac is approximately 276 and minimum 62 from different forests of Dharampur and Parwanoo ranges.					

7.12.2 Yield in culms per year

In terms of annual culm yield from the different areas prescribed in the three year felling cycle, the fellings be based on the net increment and controlled on the principle of maintaining the productivity of the rhizomes. The gross increment in a bamboo forest is the total number of new shoots (manus) produced in a year. The net increment is the gross increment minus the loss through decay, malformation and all kinds of damage. In the present condition, the number of exploitable culms removed from a clump should not be more than the number of healthy and well shaped culms produced in the two preceding seasons. In addition, a few older culms to provide support to the young shoots also need to be retained.

The annual yield from different areas is worked out as follows:-

$$A = T - (M + 2C)$$

Where

A = the culms available for felling (annual cut) per ha

T= Total culms present per ha

M= Manus (first year shoots) present per ha

C= Chals (Second year shoots) present per ha

Table 7.7: List of area wise clumps available for felling per hectare

Area	Clumps Per ha	Manus Per Ha	Chal Per ha	Old Culms per ha	Total Culms/ha	Available cut per/ha
Joharji	390	1326	1872	4095	7293	2223
Lugon	368	706.56	783.84	8132.8	9623.2	7348.96
Parwanoo	254	523.24	784.86	5204.46	6512.56	4419.6

Keeping in view the felling rules prescribe that at least 4 numbers of older culms per clump have to be retained as support to the felled clump, it can be safely assumed that an additional 10% of the culms available for felling shall have to be retained.

7.13 Bamboo Plantation Proposal

The proposal for plantation of Bamboos during the period of the Working Plan is given in the table below:

Table 7.8: Proposed bamboo plantations

S N o.	Range	Block	Beat	Name of Forest	Are a (in He c)	Plant s to be plant ed /Hec.	GPS Co-ordinates of Plantation sites		Speci es to be plant ed	Year of Plantat ion Propos al
							Latitude	Longitud e		
Parwanoo Range										
1.	Parwan oo	Parwa noo	Parwa noo	R-52 Gumma C-2	14	800	30.84440 1	86.96727 8	Bamb oo, Kachn ar, Amla, Baher a	2026- 2027
2.	Parwan oo	Kasaul i	Tiron	R-53 Tiron C-3	18	800	30.86256 7	76.95173 1	Bamb oo, Kachn ar, Amla, Baher a	2026- 2027
3.	Parwan oo	Parwa noo	Parwa noo	R-56 Parwanoo C-1 & C-2	35	800	30.83176 6	76.95868 3	Bamb oo, Kachn ar, Amla,	2026- 2027

S N o.	Range	Block	Beat	Name of Forest	Area (in Hec)	Plants to be planted /Hec.	GPS Co-ordinates of Plantation sites		Species to be planted	Year of Plantation Proposal
							Latitude	Longitude		
									Bahera	
4.	Parwanoo	Lugon	Nabhoan	D-197 Pratha	4.8	800	30.806887	77.034481	Bambooo, Kachnar, Amla, Bahera	2026-2027
5.	Parwanoo	Lugon	Lugon	D-198 Lugon Bhagour	7	800	30.779546	77.047013	Bambooo, Kachnar, Amla, Bahera	2027-2028
6.	Parwanoo	Lugon	Barog	D-218 Kamlog	3	800	30.77355	77.048496	Bambooo, Kachnar, Amla, Bahera	2027-2028
7.	Parwanoo	Parwanoo	Datiar	D-233 Datiar C-3	32	800	30.50'59"	76.59'27"	Bambooo, Kachnar, Amla, Bahera	2027-2028
8.	Parwanoo	Parwanoo	Datiar	D-233 Datiar C-4	10	800	30.50'16"	76.59'01"	Bambooo, Kachnar, Amla, Bahera	2027-2028
9.	Parwanoo	Parwanoo	Datiar	D-233 Datiar C-5	34	800	30.50'15"	76.58'31	Bambooo, Kachnar, Amla, Bahera	2027-2028
10.	Parwanoo	Lugon	Barog	R-61 Naraini C-1	6	800	30.768001	77.0116392	Bambooo, Kachnar,	2028-2029

S N o.	Range	Block	Beat	Name of Forest	Area (in Hec)	Plants to be planted /Hec.	GPS Co-ordinates of Plantation sites		Species to be planted	Year of Plantation Proposal
							Latitude	Longitude		
									Amla, Bahera	
11.	Parwanoo	Lugon	Barog	R-61 Naraini C-2	54	800	30.769889	77.027241	Bamboos, Kachnar, Amla, Bahera	2028-2029
12.	Parwanoo	Lugon	Lugon	D-199 Chawal Ashnala C-1	20	800	30.802088	77.042607	Bamboos, Kachnar, Amla, Bahera	2028-2029
13.	Parwanoo	Lugon	Dadiyar	D-200 Chakli Dhanota C1b	56.3	800	30.820354	77.041954	Bamboos, Kachnar, Amla, Bahera	2028-2029
14.	Parwanoo	Lugon	Dadiyar	D-200 Chakli Dhanota C1c	63.7	800	30.820454	77.038074	Bamboos, Kachnar, Amla, Bahera	2028-2029
15.	Parwanoo	Lugon	Dadiyar	D-200 Chakli Dhanota C1d	7	800	30.814282	77.036144	Bamboos, Kachnar, Amla, Bahera	2028-2029
16.	Parwanoo	Lugon	Dadiyar	D-207 Sath Dadhog	30.4	800	30.812009	77.04177	Bamboos, Kachnar, Amla, Bahera	2028-2029
17.	Parwanoo	Kasauli	Tiron	D-228 Ambota C-1	50	800	30.853126	76.955716	Bamboos, Kachnar,	2029-2030

S N o.	Range	Block	Beat	Name of Forest	Area (in Hec)	Plants to be planted /Hec.	GPS Co-ordinates of Plantation sites		Species to be planted	Year of Plantation Proposal
							Latitude	Longitude		
									Amla, Bahera	
18.	Parwanoo	Kasauli	Tiron	D-228 Ambota C-2	5	800	30.858925	76.965499	Bamboos, Kachnar, Amla, Bahera	2029-2030
19.	Parwanoo	Parwanoo	Parwanoo	R-52 Gumma C-1	38.52	800	30.50'41.79"	76.57'39.65"	Bamboos, Kachnar, Amla, Bahera	2029-2030
20.	Parwanoo	Parwanoo	Parwanoo	D-227 Ananu I	1	800	30.842564	76.967625	Bamboos, Kachnar, Amla, Bahera	2029-2030
21.	Parwanoo	Parwanoo	Parwanoo	D-226 Ananu II	5	800	30.50'45.24"	76.57'82.23"	Bamboos, Kachnar, Amla, Bahera	2029-2030
22.	Parwanoo	Parwanoo	Khadeen	D-224 Sandhog	18	800	30.821179	76.987393	Bamboos, Kachnar, Amla, Bahera	2029-2030
23.	Parwanoo	Parwanoo	Khadeen	D-223 Khadeen	22.8	800	30.828044	76.967029	Bamboos, Kachnar, Amla, Bahera	2029-2030
24.	Parwanoo	Lugon	Lugon	R-45 Khadar Ki Dhar	70.4	800	30.795046	77.044023	Bamboos, Kachnar,	2030-2031

S N o.	Range	Block	Beat	Name of Forest	Area (in Hec)	Plants to be planted /Hec.	GPS Co-ordinates of Plantation sites		Species to be planted	Year of Plantation Proposal
							Latitude	Longitude		
									Amla, Bahera	
25.	Parwanoo	Lugon	Barog	D-220 Barog C1	20	800	30.772807	77.034854	Bambo, Kachnar, Amla, Bahera	2030-2031
26.	Parwanoo	Lugon	Barog	D-221 Kiarawa	5	800	30.763828	77.025665	Bambo, Kachnar, Amla, Bahera	2030-2031
27.	Parwanoo	Parwanoo	Parwanoo	D-225 Gumma	52	800	30.840944	76.962231	Bambo, Kachnar, Amla, Bahera	2030-2031
28.	Parwanoo	Kasauli	Tiron	D-229 Tiron C-1	15	800	30.862047	76.949186	Bambo, Kachnar, Amla, Bahera	2030-2031
29.	Parwanoo	Kasauli	Tiron	D-229 Tiron C-2	8	800	30.85964	76.956958	Bambo, Kachnar, Amla, Bahera	2031-2032
30.	Parwanoo	Parwanoo	Datiar	D-233 Datiar C-6	8	800	30.50'67"	76.58'85"	Bambo, Kachnar, Amla, Bahera	2031-2032
<u>Dharmpur Range</u>										
31.	Dharmpur	Joharji	Neri	D-205 Neri	25	800	30.811362°N	77.051212°E	Bambo, broad	2026-27

S N o.	Range	Block	Beat	Name of Forest	Area (in Hec)	Plants to be planted /Hec.	GPS Co-ordinates of Plantation sites		Species to be planted	Year of Plantation Proposal
							Latitude	Longitude		
									leaves spp.	
32.	Dharam pur	Joharji	Neri	D-206 Neri	24. 4	800	30.80627 4°N	77.05205 3°E	Bambo, broad leaves spp.	2026- 27
33.	Dharam pur	Joharji	Neri	R-44 Jhanai C1	30	800	30.78664 7°N	77.06968 4°E	Bambo, broad leaves spp.	2027- 28
34.	Dharam pur	Joharji	Neri	R-44 Jhanai C2	40	800	30.78590 8°N	77.06427 8°E	Bambo, broad leaves spp.	2027- 28
35.	Dharam pur	Joharji	Neri	D-209 Bhagor	11. 6	800	30.78639 6°N	77.05086 9°E	Bambo, broad leaves spp.	2028- 29
36.	Dharam pur	Joharji	Neri	D-211 Halda	3	800	30.80539 0°N	77.05682 9°E	Bambo, broad leaves spp.	2028- 29
37.	Dharam pur	Joharji	Neri	D-212 Halda	4	800	30.80705 1°N	77.06272 9°E	Bambo, broad leaves spp.	2029- 30
38.	Dharam pur	Joharji	Neri	R-43 Halda C2	12	800	30.79724 9°N	77.05476 8°E	Bambo, broad leaves spp.	2029- 30
39.	Dharam pur	Joharji	Neri	R-43 Halda C3	50	800	30.78190 4°N	77.05449 9°E	Bambo, broad leaves spp.	2030- 31
40.	Dharam pur	Joharji	Neri	D-210 Oder jangeria	25	800	30.79417 9°N	77.06303 0°E	Bambo, broad leaves spp.	2030- 31

S N o.	Range	Block	Beat	Name of Forest	Area (in Hec)	Plants to be planted /Hec.	GPS Co-ordinates of Plantation sites		Species to be planted	Year of Plantation Proposal
							Latitude	Longitude		
41.	Dharampur	Joharji	Jalyana	D-203 Quila Ajmergarh C1	25	800	30.81933 1°N	77.05592 5°E	Bamboo, broad leaves spp.	2031- 32
42.	Dharampur	Joharji	Jalyana	R-48 Kalth C1	14	800	30.83825 0°N	77.04593 4°E	Bamboo, broad leaves spp.	2031- 32

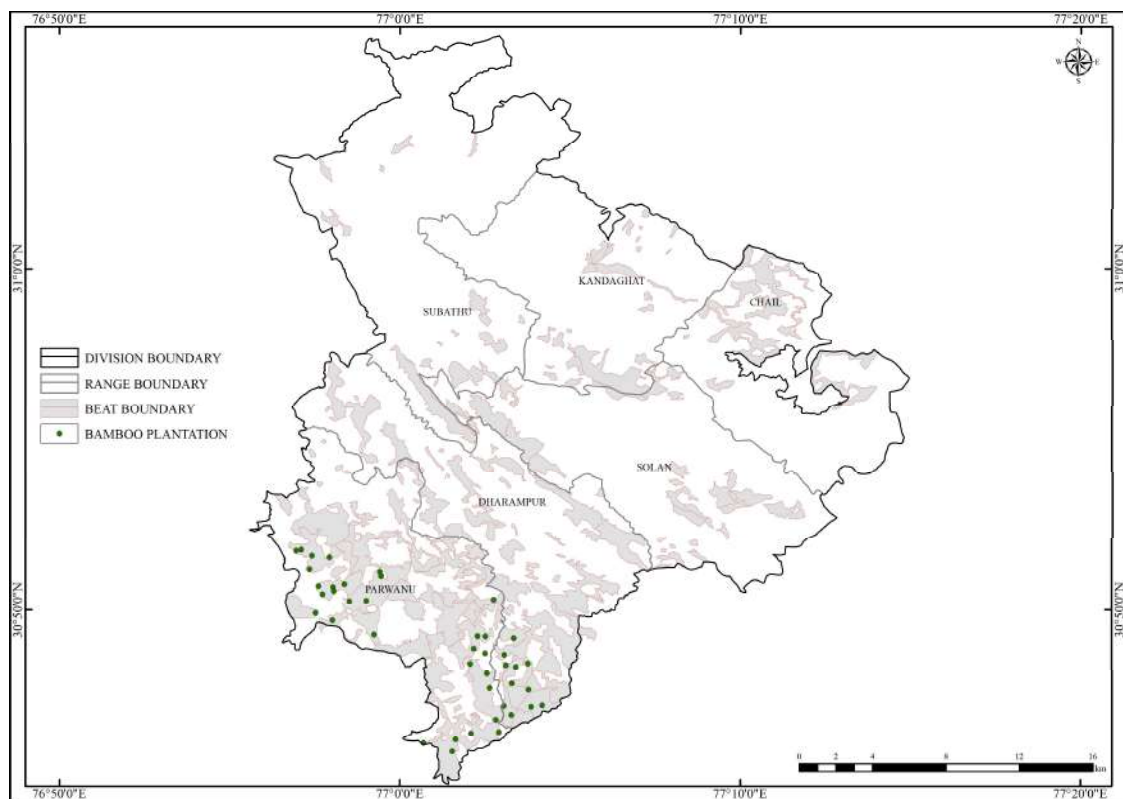


Fig. 7.1: Areas proposed for Bamboo Plantations

Table 7.9: Nursery Raising Plan for bamboo

S. No.	Range	Block	Beat	Name of Nursery	Area in Hec of Nursery	No. of Bamboo plants to be raised	Plantation area (hac)	Name of Forest	Raising Year
Parwanoo Range									
1.	Parwanoo	Parwanoo	Parwanoo	Dhamiyana	2.0	11200	14	R-52 Gumma C-2	2025-2026
2.	Parwanoo	Kasauli	Tiron	Dhamiyana	2.0	14400	18	R-53 Tiron C-3	2025-2026
3.	Parwanoo	Parwanoo	Parwanoo	Dhamiyana	2.0	28000	35	R-56 Parwanoo C-1 & C-2	2025-2026
4.	Parwanoo	Lugon	Nabhon	Lugon	0.4	3840	4.8	D-197 Pratha	2025-2026
5.	Parwanoo	Lugon	Lugon	Lugon	0.4	5600	7	D-198 Lugon Bhagour	2026-2027
6.	Parwanoo	Lugon	Barog	Lugon	0.4	2400	3	D-218 Kamlog	2026-2027
7.	Parwanoo	Parwanoo	Datiar	Dhamiyana	2.0	25600	32	D-233 Datiar C-3	2026-2027
8.	Parwanoo	Parwanoo	Datiar	Dhamiyana	2.0	8000	10	D-233 Datiar C-4	2026-2027
9.	Parwanoo	Parwanoo	Datiar	Dhamiyana	2.0	27200	34	D-233 Datiar C-5	2026-2027
10.	Parwanoo	Lugon	Barog	Lugon	0.4	4800	6	R-61 Naraini C-1	2027-2028
11.	Parwanoo	Lugon	Barog	Lugon	0.4	43200	54	R-61 Naraini C-2	2027-2028
12.	Parwanoo	Lugon	Lugon	Lugon	0.4	16000	20	D-199 Chawal Ashnala C-1	2027-2028
13.	Parwanoo	Lugon	Dadiyar	Lugon	0.4	45040	56.3	D-200 Chakli Dhanota C1b	2027-2028
14.	Parwanoo	Lugon	Dadiyar	Lugon	0.4	50960	63.7	D-200 Chakli Dhanota C1c	2027-2028
15.	Parwanoo	Lugon	Dadiyar	Lugon	0.4	5600	7	D-200 Chakli Dhanota C1d	2027-2028
16.	Parwanoo	Lugon	Dadiyar	Lugon	0.4	24320	30.4	D-207 Sath Dadhog	2027-2028
17.	Parwanoo	Kasauli	Tiron	Dhamiyana	2.0	40000	50	D-228 Ambota C-1	2028-2029
18.	Parwanoo	Kasauli	Tiron	Dhamiyana	2.0	4000	5	D-228 Ambota C-2	2028-2029
19.	Parwanoo	Parwanoo	Parwanoo	Dhamiyana	2.0	30816	38.52	R-52 Gumma C-1	2028-2029
20.	Parwanoo	Parwanoo	Parwanoo	Dhamiyana	2.0	800	1	D-227 Ananu I	2028-2029
21.	Parwanoo	Parwanoo	Parwanoo	Dhamiyana	2.0	4000	5	D-226 Ananu II	2028-2029

S. No.	Range	Block	Beat	Name of Nursery	Area in Hec of Nursery	No. of Bamboo plants to be raised	Plantation area (hac)	Name of Forest	Raising Year
22.	Parwanoo	Parwanoo	Khadeen	Dhamiyana	2.0	14400	18	D-224 Sandhog	2028-2029
23.	Parwanoo	Parwanoo	Khadeen	Dhamiyana	2.0	18240	22.8	D-223 Khadeen	2028-2029
24.	Parwanoo	Lugon	Lugon	Lugon	0.4	56320	70.4	R-45 Khadar Ki Dhar	2029-2030
25.	Parwanoo	Lugon	Barog	Lugon	0.4	16000	20	D-220 Barog C1	2029-2030
26.	Parwanoo	Lugon	Barog	Lugon	0.4	4000	5	D-221 Kiarawa	2029-2030
27.	Parwanoo	Parwanoo	Parwanoo	Dhamiyana	2.0	41600	52	D-225 Gumma	2029-2030
28.	Parwanoo	Kasauli	Tiron	Dhamiyana	2.0	12000	15	D-229 Tiron C-1	2029-2030
29.	Parwanoo	Kasauli	Tiron	Dhamiyana	2.0	6400	8	D-229 Tiron C-2	2030-2031
30.	Parwanoo	Parwanoo	Datiar	Dhamiyana	2.0	6400	8	D-233 Datiar C-6	2030-2031
31.	Parwanoo	Parwanoo	Koti	Dhamiyana	2.0	12672	15.84	D-235 Chamgah	2030-2031
32.	Parwanoo	Parwanoo	Koti	Dhamiyana	2.0	17280	21.6	D-234 Ranigaon	2030-2031
Dharmpur Range									
33.	Dharmapur	Joharji	Neri	Kiran	0.80	20000	25	D-205 Neri	2025-26
34.	Dharmapur	Joharji	Neri	Kiran	0.80	19520	24.4	D-206 Neri	2025-26
35.	Dharmapur	Joharji	Neri	Kiran	0.80	24000	30	R-44 Jhanai C1	2026-27
36.	Dharmapur	Joharji	Neri	Kiran	0.80	32000	40	R-44 Jhanai C2	2026-27
37.	Dharmapur	Joharji	Neri	Kiran	0.80	9280	11.6	D-209 Bhagor	2027-28
38.	Dharmapur	Joharji	Neri	Kiran	0.80	2400	3	D-211 Halda	2027-28
39.	Dharmapur	Joharji	Neri	Kiran	0.80	3200	4	D-212 Halda	2028-29
40.	Dharmapur	Joharji	Neri	Kiran	0.80	9600	12	R-43 Halda C2	2028-29
41.	Dharmapur	Joharji	Neri	Kiran	0.80	40000	50	R-43 Halda C3	2029-30
42.	Dharmapur	Joharji	Neri	Kiran	0.80	20000	25	D-210 Oder Jangeria	2029-30
43.	Dharmapur	Joharji	Neri	Kiran	0.80	20000	25	D-203 Quila Ajmergarh C1	2030-31
44.	Dharmapur	Joharji	Neri	Kiran	0.80	11200	14	R-48 Kalth C1	2030-31

In the above Nursery Raising plan, priority shall be given to raising nurseries for bamboo plantations in Lugon block of Parwanoo Range.

7.14 Subsidiary Silvicultural Operations

7.14.1 Cleaning

Cleanings are an essential aspect of Bamboo management and must not be lost sight of in executive selection felling and thinning. They are required to be done regularly in bamboo clumps as they are beneficial for the health and hygiene of the clumps.

- a. Cleaning makes the clumps workable by relieving congestion, thereby saving a lot of labour, time, money and loss of marketable material.
- b. They improve the growing stock, ensuring better production and quality of new clumps.
- c. They facilitate the correct enforcement of felling rules.

Cleaning should be done immediately after felling, in the same year. Since most of clumps are congested the first cleaning carried out will be labour and money intensive. Subsequently the clumps will be less congested and cleanings will be less costly. Proper control also needs to be exercised over lopping of bamboos for fodder as the cleaned clumps become liable to greater damage. Care should be taken to execute the cleaning operations on the following principles.

- a) Very large, old and very badly congested clumps which are apparently past recovery, will not be worked. Only young, good quality clumps that are likely to respond to the treatment will be chosen.
- b) Clumps that are raised above the ground or consisting of thin switches will not be touched as the whole clumps.
- c) All felling rules mentioned in para 7.11 will be strictly observed.
- d) Cleaning should be done in all clumps in need of treatment and not confined only to the congested clumps.
- e) Dry bamboos if required for support will be removed.

7.14.2 Sowing and Planting

Natural regeneration of bamboo is not satisfactory in this tract and the scant sporadic flowering of the clumps cannot be relied upon for seed production. Therefore in order to increase the percentage of bamboo in the working circle and also to bring, it is necessary to introduce bamboos artificially of the various methods of raising bamboos transplanting of nursery grown plants has been found to be most successful and economical and this needs to be followed in future too. Seed should be collected from certified sources and plants raised in the two established nurseries at Nariyal and Lugon.

7.14.3. Weeding

Weeding is an essential operation but care should be taken to ensure retention of sufficient bush and shrub growth over young bamboo plants to afford protection from frost.

7.14.4 Closure

In general, for manu production, bamboo areas should be closed to grazing and other interference for three months during the rains. In order to get successful plantations of bamboo, closure is a must. In plantations, an initial closure for 10 years should be done and all efforts should be made to restock the areas as quickly as possible, so that the closure is not extended beyond ten years.

7.15 Gregarious flowering

In case of gregarious flowering the area so flowered will be completely closed to grazing immediately after flowering. The closure shall be made for a period of ten years.

7.15.1. Treatment of gregariously flowered areas

1. Bamboo seedlings at a spacing of about 5mx5m is to be adopted and retained, while the rest are to be thinned out.
2. Cleaning, soil working and seedling is to be done around the adopted bamboo seedlings up to a radius of 50cm.
3. To maintain the continuity planting up of bamboo seedling/rhizomes is also to be resorted to especially in big gaps.
4. All the flowered clumps are to be worked up following the prescriptions of the working plans.
5. The area should be closed for grazing.
6. Elaborate fire protection measures are also to be taken up.
7. It may be mentioned that the intensity of gregarious/sporadic flowering varied as in a selection forest, the age of the clumps varies. Flowering is also dependent on the site quality and is related with the growth and storage of starch, sugar and other substances in the clump which aid flowering. In well managed forests, intensity of flowering is less in comparison to unworked forests comprising congested and malformed clumps. Intensity of flowering is also greater in areas having greater biotic interference in the form of grazing and fire when compared to protected forests.

7.16 Natural Regeneration

Profuse natural regeneration of bamboos occurs after a gregarious flowering. Under natural conditions, the seed germinates at the commencement of the rainy season, and the ground in the neighbourhood of the flowered clumps becomes carpeted with green, grass like seedlings. These spring up and survive in large numbers on bare ground, and particularly on newly exposed soils. Some of the seedlings only develop into clumps dry up and die and become inflammable in the hot season, when accidental fires may take a heavy toll if the crop is not harvested well in time. This period is very critical for the regeneration of bamboo seedlings as well as for advance growth of the tree species in the over wood.

The young seedlings do not relish heavy shade and are liable to be killed by a heavy growth of weeds but, light shade is helpful in protecting them from drought and frost, and in pulling them to grow up and from into culms. Fire and grazing are most harmful in the seedling stage, both in natural, as well as in artificial reproduction, hence protection from fire and grazing is of primary importance for ensuring the reproduction of bamboos. The natural seedlings in flowered bamboo areas take the place of the flowered crop in about 8-10 years.

7.17 Nursery and planting techniques for Bamboo (*Dendrocalamus strictus*):

Natural regeneration of bamboos is poor due to the long and erratic flowering and seedling cycle and poor seed viability. The situation is further aggravated by the threat posed by grazing and forest fires. Therefore, artificial regeneration methods are more often than not resorted to raise

bamboo plantations. Bamboos are generally propagated through seed, by offsets and clump divisions or by stem or rhizome cuttings.

7.17.1 Raising bamboo stock through seed

Bamboos are monocarpic and die after producing seeds. *D. Strictus* also flowers gregariously (sometimes sporadically too) on a cycle of 30-40 years and the seeds ripen in April May as a result of the gregarious/ sporadic flowering. Seed collection is done by cutting flowered branches and seed can be stored after beating and winnowing. The seed loses its viability within 6-8 months. Sowing of seeds in the nursery is done in August- September and it has been observed that if they are dipped in cold water or cow-dung slurry for 24 hours, germination is quick and uniform. 1.5 to 2 kg seeds are broadcast in raised nursery beds of size 10m x 1m. Seeds should be covered with a light covering of sand and watered with a fine rose can. 3-4 leaved seedlings (5cms tall) are pricked out in polybags or transplant nursery beds 10x10cm apart. Seedling is fit for planting out in following July. Bamboo nurseries are proposed to be set-up near the felling siutes to cater exclusively to raising of bamboo plants to be planted after the area is cleared.

7.18 Characters to identify culms of various ages

The following characters serve as a rough guide to identify the different culms according to their appearance in the winter months.

- a) New or one season old culms produced in the last rains have fresh looking bracts still adhering to the nodes and a coating of white waxy bloom on the internodes which comes off with the slightest touch; there are usually few or no branches.
- b) Two season old culms may still retain the bracts in some localities but if so they are withered and darkish in colour, either erect or sometimes hanging on to the nodes. The internodes are greenish in colour, with a thin bloom spread fairly uniformly and comes off when a finger is lightly rubbed over it. Freshly formed side branches are present on the nodes.
- c) Three season old culms generally have no bracts, but if present they are discoloured and weather- worn and prevented from falling by some obstruction. The bloom on the internodes is no longer uniform but is variegated with darker blotches and is not readily removed by rubbing.
- d) Four season old culms are green with little or no bloom. On cooler sites there are dark blotches on the surface of the internodes which can be rubbed off easily.
- e) Still older culms show yellow patches in the green and this is a sure sign of maturity.

The identification of culms more than two seasons old is rather difficult and can only be estimated after careful observation and experience.

7.19 Penal Provision:

As per the guidelines to regulate the Forest working by H.P State Forest Corporation circulated vide PCCF Endst. No. Ft.34-50/93(s) Vol-IX dt. 24 Oct. 1994, the penal provisions for bamboo are as under:

The damage bill for bamboo will be charged on Rs. 0.50 per culm in addition to royalty. The damage bill be submitted by the DFO's within one month of expiry of the lot. The period of

presenting the damage bills, may be extended with the approval of pricing Committee under special circumstances. In case of non- acceptance of damage bills within one month, these may be deemed to have been accepted by the Forest Corporation.

Chapter 8

NTFP (Overlapping) Working Circle

The 1988 National Forest Policy (NFP) aimed to ensure environmental stability, ecological balance, and the conservation of natural heritage, including the protection and sustainable utilization of Non-Timber Forest Products (NTFPs). It emphasized the importance of NTFPs for the rural and tribal populations, focusing on increasing their production and improving their utilization. The Policy recognises NTFP's critical role in supporting the livelihoods of forest-dependent communities, especially tribal and rural populations.

The importance of NTFP has economic, social and environmental aspects in the sustainable management of forests. They contribute significantly to the rural economy and forest-based enterprises, ensure food security, healthcare (through medicinal plants), and promotion of traditional knowledge of local communities. Their sustainable management supports forest conservation and biodiversity. It is therefore important to encourage scientific management of NTFPs to prevent over-extraction and degradation of forests. As strategy, it makes sense to promote the cultivation of NTFPs (e.g., medicinal plants, bamboo, honey) to reduce pressure on the forests and Support the development of eco-friendly technologies for NTFP-based livelihoods. Thus there is a need to emphasize on research, cultivation, sustainable harvesting and their development and conservation in the division.

8.1 Special Objectives of Management

1. To document important NTFP species found in the division.
2. To preserve and improve the quantity and quality of NTFPs in the division and manage them on a sustainable basis.
3. Encourage and promote the cultivation and marketing of NTFP on agriculture land by convergence with other agencies.

There is not much detailed information available on the occurrence of medicinal herbs and species and there are still fewer records on the yield estimates of such species. A lot needs to be done in the field of conservation, development and management of NTFPs. This would be in accordance with the National Forest Policy of 1988, where in conservation and propagation of NTFPs and their contribution towards the local economy have been given due recognition and emphasis. In Solan Forest Division, resin, medicinal plants, bamboos, Katha and grasses are the important NTFPs contributing to the local economy. Resin and bamboo are being exploited on commercial basis already and grass is being locally exploited. As there are not many Khair trees in forest lands, Katha is not extracted commercially. Information on medicinal plants is not readily available and there is a need to study and document their occurrence, yield estimates, exploitation status and marketing of valuable medicinal plants in the division.

8.2 Contribution to income and quality of life in rural areas

In the rural setup, NTFPs form an integral part of the daily lives of the villagers, varying from personal hygiene, cosmetics, nutrition, household items for use of livestock, medicine and even at times are a source of additional income to rural households. The old working plan has

estimated that a family consumes NTFPs worth Rs 3200/- per annum and if the value of fuelwood and fodder are added to it, then the figure comes to around Rs. 40,000/ year. Now after about twenty years these estimate would have been enhanced at least three times the amounts quoted above.

Table 8.1: Detail of quantity of resin extracted in past 10 years

Year	Blazes Tapped	Resin Yield (Q)	Extraction Cost per Quintal (in Rs)
2012	31634	1200.4	584.91
2013	33746	1306.46	811.18
2014	32332	1257.62	783.67
2015	42330	1644.86	899.91
2016	46270	1811.93	913.27
2017	47497	2086.3	1559.24
2018	46875	1907.46	1256.41
2019	45923	1880.19	1784.28
2020	48218	1843.23	1908.53
2021	51268	2007.46	1877.91
2022	52977	2166.28	1421.07
2023	54507	2329.24	1574.16

Source HPSFDC Solan

Table 8.2: Yield of Bamboo (in bundles) during 2001 to 2024 extracted by HPSFDC

Year	Name of Forest	Area under Bamboo (ha)	No. of Bundles extracted	Bundles extracted/ ha	Remarks
2000-01	R43 Halda tibba C3, D-120 Odder Jangiria, D-225 gumma, D-229 Tiron, D-20 Barog, R45 Khadar ki dhar, D-221 Kiarua and D-233 Datar C-6	285.40	44058	154.00	Green
2001-02	R-44 Jhan C1 and C2, R-48 Kalth C1, D206 Neri II, D-203 quila Ajmergarh, D-208 sari D-197 Pratha C1, D-198 Lugon Bagor, D-128 Kamlog, D-56 Parwanoo, D-233 datiarC-5, R-52 Gumma C! and R-53 Tiron C3	293.60	53251	181.00	Green
2002-03	D-209 Bhagor, D-200 Chakli Dhonta C1b, C1c and C1d, D-207 sathdablog, D-199 Chawal ashmala , D-228 Ambota C1 & c2, R-45 Khadar ki dhar and D-194 Pratha C3	398.40	51354	129.00	Green

2003-04	R-43 Halda Kaba C3, D-210 OaderJhangeria, R-43 Halda Kabba C2, D-225 Gumma, D-229 tiron C1 and C2, D-220Barog (instead of D-116 C1) D-221 kyarwa and D-223 Datiyar C6	223.00	13762	62.00	Green
2004-05	R-45 Khadar ki dhar, R-61 Naraini, D-199 Chawal Ashnal, D200 Dhanota Chaka, D207 sathdadhog D-225 Gumma, D-228 C1& C2, D-229 Tiron C1 & C2, D-233 Datiyar C6, D-220 Barog C1, D-197 Pratha C1, D-98 Bhagaurlyen, D-218 KamlogR56 Parwanoo C1,C2, R52 Gumma c2, D-233 Datiyar C3 C4, R-53 Tiron C3, R-48 Kalth C1, R-43 Hallda C2 R-48 Halda C3, D-209 Baghor, D210 Odder Jangiria, R-44 Jhanai C1 R-44 JhanaiC2, D-203 ajmergarh, D-206 Beri and D-208 Sari	264.80	28758	109.00	Green
		615.20	169604	276.00	Dry
Information regarding bamboo bundles extracted during the FY-2005-06 upto 2024-25 may be treated as NIL.					

Source: HPSFDC Solan

Based on the details available in the previous working plan of the Solan Forest Division which was also verified by staff of Solan Forest Division the details of major NTFP (other than resin and bamboos) have been compiled and are given in Appendix III. Resin is to be tapped from trees having diameter more than 50 cm.

The NTFPs will be given due thrust and species yielding them will be included in the plantation programme. Sufficient stock of medicinal and other plants of economic importance will be raised in nurseries for which action plan is being prepared and will be made available to the local population desirous of planting them. With many JFM schemes being under operation in the division, the stakeholders will be encouraged to include such suitable species in JFM micro plans.

Collection processing, value addition, and marketing aspects of NTFPs need to be studied and the administration should provide all necessary help in this regard for capacity building of community organizations on various aspects of NTFPs i.e. Cultivation, management, collection, refinement, value addition, storage and marketing should make growing and trading of NTFPs more remunerative.

8.3 Rehabilitation Plan

As far as the medicinal plants are concerned, this area has not received much attention. Among the NTFPs the bamboos and pine resin have been dealt with in details as separate working circles. The remaining NTFPs need to be protected, developed and conserved in the forest areas for which efforts will be made. There is a need for initiation of more action-oriented plan, bearing in mind the conservation issues of NTFP's so that the rural household incomes could be augmented. The promotion and cultivation of suitable NTFPs of medicinal and aromatic value can also provide an opportunity for utilisation of abandoned agriculture lands. Cultivation of NTFPs has the potential to provide relief from crop depredation by wild animals and can be helpful in reducing man-animal conflicts.

Chapter 9

Soil & Water Conservation (Overlapping) Working Circle

9.1 General constitution

This Working Circle is overlapping with the areas falling under Deodar, Chil, Oak, Protection and Rehabilitation Working Circles. Indiscriminate land use, irrational method of cultivation, destruction of forests and overgrazing have led to heavy soil erosion in this division. The lower reaches of the division are particularly liable to gulying and erosion on account of their weak geology. Besides this construction of large number of roads and buildings has aggravated the problem. These activities have created serious imbalance in the ecosystem. The works of soil and water conservation in this division have been done under RVP and IWDP Kandi schemes. Overlapping areas having highly eroding portions have been prescribed for treatment under this working circle.

9.2 General character of vegetation

This has been described separately in the individual working circles.

9.3 Special objectives of management

- i. To prevent land degradation by adopting soil conservation measures in a multidisciplinary integrated approach in the forest watersheds
- ii. To improve the land capability and moisture regime in the watershed by vegetative and mechanical soil conservation means.
- iii. To harvest and conserve water to improve water regime of the forest and adjoining areas.
- iv. To improve the ecology of the area.

9.4 Strategy

To achieve the above objectives, the strategy should comprise of the following actions:

- i. Effective administrative arrangements for direction, control and co-ordination of the programme.
- ii. Institutional linkage between farmers and field functionaries of the department.
- iii. To retard velocity of runoff and to impound water in the watershed along drainage lines through higher thrust for construction of strategically located structures (Light check dams etc.).
- iv. Adoption of a project approach to the treatment of catchment with suitably designed mechanical and vegetative measures..
- v. Consolidation of treatment through project approach and proper choice of work areas.
- vi. Sustainability of treatment measures.
- vii. Comprehensive watershed development and maintenance by integration of sectoral measures.

9.5 Definition of erosion

The soil loss by wind and water or gravitational creep is known as erosion. Normal erosion and accelerated erosion are the two categories commonly recognised. Accelerated erosion is erosion in excess of the normal and is chiefly due to vagaries of nature, change in nature and density of native vegetation because of human activities or otherwise. Hence the discussion that follows is mainly concerned with accelerated erosion.

Types of erosion

The natural agencies chiefly responsible for accelerated erosion are wind and water. Since wind erosion is generally restricted to arid and semi-arid regions we are here mainly concerned with the later. Erosion by water involves hydraulic action, abrasion, solution and transportation with the velocity of flow having an important bearing on its erosive power. The following categories are recognised:

- i) **Sheet erosion:** The term applies to the removal of a more or less uniform layer of surface soil. The general contour of the land surface remains unaltered and so the insidious effects go un-noticed until most of the top soil has been lost. Sheet erosion is most active on cultivated lands but is unimportant in forest areas, where unincorporated organic matter covers up the soil.
- ii) **Rill erosion:** This implies the formation of small channels in the land surface. It represents an intermediate stage between sheet and gully erosion. In forest area this type of erosion is generally seen along the extraction paths and on fire burnt areas.
- iii) **Gully erosion:** This type refers to formation of large channels or gullies which are not obliterated by ordinary tillage. It develops in situation where concentrated run off attains sufficient volume and velocity to cut deep into the soil body. Gullies have their origin in rills, skid roads, trails, cattle treads natural depressions.

9.6 Control Measures

9.6.1 Vegetation in erosion control

A vigorous plant cover is the best protection against erosion. Mechanical measures are extremely valuable but they should not be regarded as a substitute for vegetal cover. The most effective plant cover is provided by grasses, shrubs, bushes and trees, leading to multi-storeyed vegetal cover. The choice of species for planting on eroded sites should primarily be native ones and must be as per the feedback and suggestions of the locals.

Erosion Control in Pastures

In the pasture lands, overgrazing must be avoided. If the native plant cover is not depleted, proper regulation of grazing will usually be sufficient to prevent erosion. Additional restorative measures are only possible on critical area where community demands immediate control of erosion and run-off and soil conditions are favourable for forage plant growth. In such areas sowing and planting of selected tree species and even engineering works, such as contour furrows, absorption terraces and check damming of gullies are justified.

Erosion Control in Gullies

Gullies require the use of vegetation for their control. More commonly, however, mechanical measures are necessary to facilitate re-vegetation. Native species, especially those characteristic of the pioneer

communities, such as Acacias, Bamboos, *Ficus* species, Mulberry, Pines, Poplars, *Robinia* and *Siris* are usually better adapted for severe conditions of gullied lands. Of shrubs, the most useful are *Adhatoda*, *Berberis*, *Desmodium*, *Indigofera*, *Prinsepia*, *Vitex* etc. Before planting is attempted, diversion of run-off water before it enters the gullies is generally necessary. Feasible dams of various types have to be constructed so as to check further cutting and area must be closed to all grazing to avoid damage to the developing vegetation. In drier localities rooted stumps give better results. An effective method to break the velocity of run off on steep slopes where contour trenching is out of place is to create vegetal brakes. Some of most common plants, met with as wildings are *Adhatoda*, *Agave*, *Euphorbia*, *Indigofera*, *Punica*, *Prinsepia* spp.

9.6.2 Mechanical measures in erosion control

These measures are often necessary to supplement vegetation in erosion control and to aid the establishment of a plant cover. Simple and in expensive techniques as will materially reduce the velocity of run-off and provide for the safe removal of such water are to be preferred.

Contour trenches

They afford a simple means of retaining and distributing water on slopes up to 20° gradient. The work must be started from the top and the dug-out earth heaped on the lower berm of the trenches. The trenches vary in size and spacing depending on the slope, the amount of water to be impounded and the nature of the soil. Generally a checkered formation of 30x30 cm and 250 cm long trenches spaced 3 to 6m apart has proved to be effective.

Diversion ditches

They are commonly employed on relatively steep or unusually long slopes, where there is large amount of runoff water to be handled. The diverted water is conducted at non-erosive velocity and emptied into the adjoining forest or grass lands or natural drainage channels free from erosion. When no such suitable place is available, the best thing to do is to spread the flow over considerable area so as to increase infiltration and avoid erosion.

Check dams

When run off water can't be kept out of gullies, the construction of check dams becomes necessary, so as to halt further cutting until vegetation is established becomes necessary. The importance of check dams, therefore, is in their breaking velocity of runoff water and accumulation of soil material. Generally, low dams with an overall height of about 60 to 90 cm are to be preferred. However, the actual dimensions will depend on specific site conditions. Firm anchorage to the gully bottom and sides is essential so as to prevent undercutting or cutting of the sides. In order to avoid undue concentration of water at the overfall spillways should be made as broad as possible. Undercutting at the overfall is to be prevented by providing an apron built of rocks, logs or brush wood.

Control of erosion along roads

The erosion hazard along the hill roads can be materially lessened by more rational alignment, greater use of retaining wall and cribbing on cuts and fills, careful disposal of excess material, improved drainage practices, a cover of vegetation on all cut and fill slopes and avenue tree planting along the roadsides.

9.7 Selection of Area for treatment

As per All India Soil and Land Use Survey organisation specifications, in Dharampur and Parwanoo ranges of this division, categorization of sub watershed in to following categories were done in the past on the basis of magnitude and criticality of degradation. These watersheds fall under the catchment of Ghagghar River and were treated under the RVP scheme. The sub-watersheds have been categorized into Very high, High, medium, as given in Table 9.1 below.

Table 9.1: Category of Watershed based on magnitude & criticality of degradation

Grading	No.of watersheds	Area (in ha)	Treatable area (in ha)
a. Very High	8	15125	2645
b. High	-	-	-
c. Medium	-	-	-

The areas for treatment under soil and moisture conservation should be selected in accordance with the following criteria:

- 1 Very high and high priority watershed must first qualify for treatment
- 2 Watershed to be treated should be in contiguity for consolidating the measures of treatment
- 3 The programme must cover whole micro watershed

The details of sub watersheds which were identified on the basis of very high and high priority categories for treatment in this division are as below:

Table 9.2: Details of sub-watersheds in Solan forest division

S. No.	Range	Code	No.	Area (in ha.)	Treatable area (in ha)	Run-off potential index
1	Parwanoo	Ga 9k	95	787.5	170	77
2	Parwanoo	Ga 8p	217	3261.6	880	78
3	Parwanoo	Ga 9q	264	1726.1	285	79
4	Parwanoo	Ga 9p	198	1627	245	79
5	Parwanoo	Ga 9m	116	1875.5	285	80
6	Parwanoo	Ga 9n	121	1300	260	76
7	Dharampur	Ga 8n	231	2372.3	245	78
8	Dharampur	Ga 8q	316	2175	275	78
				15125	2645	

The whole of Shivalik hills is highly susceptible to erosion owing to the dry and friable nature of the soil but some forest areas are already showing visible signs of erosion and degradation. A general listing of areas which are highly vulnerable to soil erosion and mining activities in the division is given in table 9.3 below. These areas have been identified during a survey of the region and subsequent assessment by the surveyors.

Table 9.3: Range-wise wise Erosion prone and highly eroded areas of the Solan forest division

Range	No. and Name of Forest
Dharampur	R-31 SBarog C3, C5, C7
	R-32 SChunjri
	R-42 SAjmergarh C1
	R-44 SJhanai C1, C2
	D-158 SAnji
	D-164 SMaltu III
	D-166 SDhar C2
	D-167 SGadiar
	D- STiba Gulzar C2
	D-244 SChcola C5
Solan	D-93 SNandalNagali
	D-106 SNaloh
	D-107 SDhalain C1, C2
	D-132 SCharar C4, C9
Subathu	D-110 S Raikote
	D-112 SAlobra
	D-114 SKathni
Parwanoo	R-51 SGauri ki Dhar
	R-56 SParwanoo C1
	R-61 SNaraini C1, C2
	R-48 SKalath C1
	D-158 SAnji C1
	D-185 SKurla Johri C1
	D-223 SKhadeen
	D-224 SSandhog
	D-233 SDatiar C2
	D-234 SRani ka gaon
	D-235 SChamgah C1, C2
	D-236 SKurar C1, C2
	D-237 SSherla
	D-242 SGahidhar C3
	D-245 SSanawar C4
	D-246 SKasauli C1

Source: Observatoins by the field staff during Primary Surveys

9.8 Preparation of Work Plan

Prior to starting the soil conservation works in an identified sub watershed, an elaborate work plan is to be prepared. These work plans serve as a guideline for proper planning, monitoring and execution of soil conservation works. This work plan contains:

- Basic information regarding aims and objectives, watershed characteristics, locality factors, land use etc.
- Watershed problems and needs, i.e. magnitude of soil erosion problem and conservation needs.

- iii. Method of management i.e. through Engineering and Biological measures
- iv. Schedule of operation i.e. phasing of the programme.
- v. Maintenance and repair.
- vi. Cost
- vii. Source of finance.
- viii. Benefits.
- ix. Supplementary information as appendices such as soil survey report Design. Drawings and details of major structures, rates analysis of works etc.
- x. Maps index, soil survey and capability and watershed management map.
- xi. Organisation.

The water conservation structures shall be constructed on steep slopes as well to reduce the flow of runoff and help in prevention of soil erosion as well. Perennial sources of water in the region shall also be protected through such structures. The drainage map of the division shall serve as a guide for construction of the water conservation structures. The sites developed under various projects targeting SMC shall be excluded from the work plan.

9.9 Approval of work plan and funding:

The work plan for each individual sub-watershed should phase out the annual work programme and financial outlays. These plans are submitted for approval before 30th September of the year prior to the year in which these are to be implemented. The annual programme is to be submitted with in a period of one month from the receipt of tentative outlays on the prescribed format along with write up.

9.10 Status of soil conservation works under various schemes

9.10.1 River Valley Project (Flood Prone Rivers scheme)

There were in all 8 sub watersheds under River Valley Project Scheme, having very high priority status with an area of 15125 ha out of which 2645 ha was treatable. The period of these plans was from year 1994 to 1999, but works could only be started in 1995. All the sub-watershed covering area of 15125 ha has so far been partially treated. Due to enhancement of wage rate in 1995, some of the engineering works were held back for want of additional funds and these are still to be executed. To set the maximum benefits in the years to come, maintenance works are done upto 1-5 years depending upon the locality and availability of funds.

9.10.2 Giri Bata Project

The area falls in the catchment of Giri river, a main tributary of Yamuna river of the Indo-Gangetic Plains. The rivers falling in this basin are generally flood prone and thus cutting large quantities of silt load from the catchment area. Hence works for the control of this were required so that the fury of flood down below by maintaining the productivity of soils in tracts high up in the mountain area which is easily erodable due to excessive use.

The execution of works started somewhere during 1984-85. All works in works executed year wise is as per table the micro watershed were financed by the assistance of central sponsored scheme of Integrated Watershed Management in the Flood Prone River of Indo Gangetic Basin (Pabbar and Tons on the financial pattern of 50% loan and 50% subsidy. Micro watershed known as "Jaunaji-Ka-Nala" with high priority with code GC I'c' situated on right bank of Aswni Khad, the main tributary of Gin River. The size of micro watershed is 12.82 square kilometers in an area which comprises of 28 villages. The average elevation is 1542.5 metres. The detail of works executed year wise is given in table 9.4 below:

Table 9.4: Details of Works done in Micro Watershed GCIC-Giri Bata Scheme (during last working plan period and till 2024-25)

Year	Particulars of Work	No./Area (ha)	Expenditure (Rs)
1984-85	Afforestation	150 ha	8,55,398
	Minor Engineering work	120 Nos.	
	Farm Ponds	5 Nos.	
1985-86	Afforestation	165.50 ha	4,07,998
1986-87	Afforestation	110 ha	2,08,110
1987-88	Afforestation	60 ha	6,83,400
	Maintenance of old area	100 ha	
	Engineering Works	20 ha	
1988-89	Afforestation	93 ha	7,25,700
	Improvement of Grass Land	83 ha	
	Engineering Works	100 ha	
1990-91	Afforestation	40 ha	2,66,000
	Improvement of Grass Land	30 ha	
	Construction of Check Dams	11 Nos.	
	Construction of Farm Pond	1 Nos.	
1991-92	Afforestation	41 ha	7,79,200
	Improvement of Grass Land	20 ha	
	Maintenance of old area	493 ha	

After 1991-92, for this micro-watershed, saturation report was sent and no works under this scheme were carried out. Now this watershed requires the attention towards replenishment of old partially failed plantations and exhausted engineering structures.

9.10.3. TWDP (Hills-II) Kandi (1999-2000 to 2003-04)

This is an IBRD (World Bank) aided integrated project and was operative in its second phase in the Shiwalik region of Himachal Pradesh. A part of Solan forest division falls in the Ghaggar catchment and there are four watersheds falling under the Dharampur and Parwanoo ranges that were taken up by IWDP (Hills) Kandi project for treatment. The particulars of these watersheds are as follows:

Table 9.5: Sub-watersheds treated under the Kandi Project (Phase III)

S. No.	Name of Sub-watershed	Total Area (ha)	Forest Area (ha)
1	5-Ghaggar (Right bank)	2150.4	1341.9
2	7-Jabli Khad	3541.3	1224.1
3	8-Kaushalya Khad (Left bank)	2104.1	913.9
4	9-Kaushalya Khad (Right bank)	3052.13	1245.07
	Total	10847.93	4724.97

Execution of Soil Conservation works was a part of this project, the details of which are being tabulated below. Kandi Project became operative in this division during the year 1999-2000 in the 2nd phase of its

operation. The main objective of the project was to restore the productive potential of Shiwalik hills, thereby aiming to arrest soil erosion and increasing water availability, using the ideology of participatory management.

Table 9.6: Progress of Soil Conservation Works Under IWDP (Hills-II) Kandi Project

S. No.	Name of component	Year of construction	Parwanoo	Dharampur	Total
1	Dry stone structures	1999-2000	750 m ³	785 m ³	1535 m ³
2	Cratewire structures	1999-2000	535 m ³	715 m ³	1250 m ³
3	Brush wood check dams	1999-2000	1350 Rmt	1646 Rmt	2996 Rmt
1	Dry stone structures	2000-01	1035 m ³	850 m ³	1885 m ³
2	Cratewire structures	2000-01	765 m ³	636 m ³	1401 m ³
3	Brush wood check dams	2000-01		1754 Rmt	1246 Rmt
4	Road side erosion control		-do-	150 m ³	

Source: IWDP(Hills-II) Kandi

The targets for the year 2001-2002 were:

- A. Dry stone structure 1700 m³
- B. Crate wire structure 1400 m³
- C. Brushwood Check Dams 3000 rmt.

9.10.4 Integrated Wasteland Development Project (1994-95, 1998-1999)

This was an integrated waste land development project designed as part of process of planning programme encompassing utilization of waste land through integrated efforts. In first phase of planning, the project concentrated only to three blocks of the district viz. Dharampur, Solan an Kandaghat. The emphasis involved multi-developmental establishments below listed water sheds in the catchment area of different rivers/streams

Excessive deforestation, conversion of pastures and waste lands to cultivation, denudation have all resulted in disturbance of water regime. Moreover, the rainfall in the project area, particularly during rainy season is very high, but the vegetation cover is lacking which is causing severe soil erosion. Further inadequate infiltration of water into the ground and its speedy flow down the slopes has aggravated the problem. Therefore, it was felt imperative to accord highest priority to natural conservation by providing check dams at different Khuds/Nalahs and other perennial sources so that the disturbed water regime is restored to its natural equilibrium.

Name of range

Subathu

Dharampur

Kandaghat

Name of watershed identified

Kuthar Nadi

Rao Khad

Gambar Khad

Barog-PathariKhad

Bisha wala Nalah

The work of construction / raising of engineering structure to check the soil erosion was got executed through other agencies, viz, Block Development Officer. Therefore, the detail of such engineering works could not be incorporated.

9.11 Organisation and Co-ordination

In the implementation of River Valley Project Schemes, department of Forest and Department of Agriculture were involved, with the former being the nodal agency. Except for a brief period between 1981 and 1984, when the soil conservation works were carried out through a specially created Soil Conservation Department with personnel drawn from both the departments, each department had its own field set-up. Under forest sector, Soil Conservation works were executed through territorial administration units under the overall supervision of Chief Conservator of Forests (Planning and Development). Agriculture land was being treated under the overall supervision of Director of Agriculture H.P. He was assisted in this task by District Agriculture Officer and Assistant Soil and Conservation Officers in the field.

9.12 Saturation of Micro Watershed and its evaluation

With the regular flow of funds, considerable investment was made in the catchment areas as discussed above and maximum of micro watersheds had reached saturation point. Thus it was necessary to ensure that works achieved strictly in conformity with the provisions of the work plans wherein systematic and integrated treatment was envisaged in the priority areas. Periodic evaluation of such programmes can provide important inputs for planning in future.

9.13 Status of old plantations raised under Soil Conservation schemes

Some commendable work has been done in the past, especially of raising plantations, by the erstwhile Soil Conservation wing of the department in 1981-84. Though most of the plantations were of Chil, still these have come up well and are serving the cause of soil conservation well. Most of these plantations lie in the Kiari and Bisha blocks of Kandaghat range, Ouchghat block of Solan range and Rugra and Sairighat blocks of Subathu range and have been raised mostly on Shamlat lands. It is suggested that steps to bring these plantations, which now have pole sized and above crop, under scientific forest management should be taken. There is a need to notify these chunks 5 ha or more as Demarcated Protected Forests, so that these afforested areas can be included in the working plan at the time of the next revision and allotted to appropriate working circles. Some good areas are the ShivshankergarhMamlig plantations in Subathu, Dharja and Seri areas in Solan and the Badun Shikar plantation in Kandaghat.

In addition to the plantations mentioned above (Annexure 'XXIII'), there are a few areas marked as plantation and UF on the Survey of India sheets. No information regarding extent of area planted, year of planting etc. is available in the records for these areas. The correct status of these should be ascertained and if found legally appropriate these should be processed for conversion to Protected forests. Efforts should be made to locate more of such areas, which fall outside the forest areas so that these can be brought under scientific management.

9.14 Soil Conservation works proposed

Check-dams and staggered trenches are proposed to be constructed during the plan period. The areas have been selected on the basis of field visits and discussions with the forest officials presently working in the division.

Table 9.7: Proposed Soil conservation works in the forests of Solan Forest Division

S.No	Range	Name of Forests	Area (ha)	Working Circle	Work details	
1	Chail	SD39 Dhamdhar C-1	30.4	Chil W.C.	Check Dams	Staggered Trenches
2	Chail	D39 Dhamdhar C-2	30	Chil W.C.	Check Dams	Staggered Trenches
3	Chail	D47 BirniShillai C-2	93.6	Chil W.C.	Check Dams	Staggered Trenches
4	Chail	D48 BirniShillai C-1	36	Chil W.C.	Check Dams	Staggered Trenches
5	Chail	D42 Chabri C-1	47.6	Chil W.C.	-	Staggered Trenches
6	Chail	D42 Chabri C-2	40	Chil W.C.	-	Staggered Trenches
7	Chail	D43 SPowash	28.4	Chil W.C.	-	Staggered Trenches
8	Chail	D44 Cheunth C-1	40.4	Chil W.C.	-	Staggered Trenches
9	Chail	D44 Cheunth C-2	40	Chil W.C.	-	Staggered Trenches
10	Chail	D45 TibbaKathet C-1a	12	Chil W.C.	-	Staggered Trenches
11	Chail	D45 TibbaKathet C-1b	24	Chil W.C.	-	Staggered Trenches
12	Chail	D47 BirniShillai C-1	58.8	Chil W.C.	-	Staggered Trenches
13	Chail	D48 BirniShillai C-2	25.6	Chil W.C.	-	Staggered Trenches
14	Chail	D48 BirniShillai C-3	12.4	Chil W.C.	-	Staggered Trenches
15	Chail	D52 Bhojdeen C-3a	18.4	Chil W.C.	-	Staggered Trenches
16	Chail	D52 Bhojdeen C-3b	58.4	Chil W.C.	-	Staggered Trenches
17	Chail	D51 JhajhaKhariun C-1	84	Ban Oak W.C.	-	Staggered Trenches
18	Chail	D51 JhajhaKhariun C-3	42.4	Ban Oak W.C.	-	Staggered Trenches
19	Chail	D52 SBhojdeen C-1	129.2	Ban Oak W.C.	-	Staggered Trenches
20	Chail	D52 SBhojdeen C-2	90	Ban Oak W.C.	-	Staggered Trenches
21	Kandaghat	R-21Karol C1A	34.4	Ban Oak W.C.	Check Dams	Staggered Trenches
22	Kandaghat	R-21Karol C1B	42	Ban Oak W.C.	Check Dams	Staggered Trenches
23	Kandaghat	R-21Karol C1C	38.8	Ban Oak W.C.	Check Dams	Staggered Trenches

24	Kandaghat	R-21 Karol C2	58.4	Ban Oak W.C.	Check Dams	Staggered Trenches
25	Kandaghat	R-21 Karol C3A	39.6	Ban Oak W.C.	Check Dams	Staggered Trenches
26	Kandaghat	R-21 Karol C3B	32	Ban Oak W.C.	Check Dams	Staggered Trenches
27	Kandaghat	R-21 Karol C3C	34.4	Ban Oak W.C.	Check Dams	Staggered Trenches
28	Kandaghat	R-22 Karol NoII	12.4	Ban Oak W.C.	Check Dams	Staggered Trenches
29	Kandaghat	R-23 Karol NoIII	8	Ban Oak W.C.	Check Dams	Staggered Trenches
30	Kandaghat	D-53 Shungal	11.2	Ban Oak W.C.	Check Dams	Staggered Trenches
31	Kandaghat	D-54 Shadiyal	8.4	Ban Oak W.C.	Check Dams	Staggered Trenches
32	Kandaghat	D-55 Suro No 1	2	Ban Oak W.C.	Check Dams	Staggered Trenches
33	Kandaghat	D-56 Suro No 2	2.8	Ban Oak W.C.	Check Dams	Staggered Trenches
34	Kandaghat	D-58 Basha	11.2	Ban Oak W.C.	Check Dams	Staggered Trenches
35	Kandaghat	D-59 Bagetu	2.4	Ban Oak W.C.	Check Dams	Staggered Trenches
36	Kandaghat	D-61 DhanoliDochi	6.4	Ban Oak W.C.	Check Dams	Staggered Trenches
37	Kandaghat	D-62 Bisha C1	49.1	Ban Oak W.C.	Check Dams	Staggered Trenches
38	Kandaghat	D-64 Birni	2.4	Ban Oak W.C.	Check Dams	-
39	Kandaghat	D-65 BirniKasauli	7.2	Ban Oak W.C.	Check Dams	-
40	Kandaghat	D-67 Sainj	12.8	Ban Oak W.C.	Check Dams	-
41	Kandaghat	D-69 Palhech I	22.4	Ban Oak W.C.	Check Dams	Staggered Trenches
42	Kandaghat	D-70 Palhech II	3.2	Ban Oak W.C.	Check Dams	Staggered Trenches
43	Kandaghat	D-71 Karol I	5.2	Ban Oak W.C.	Check Dams	Staggered Trenches
44	Kandaghat	D-72 Karol II	16.4	Ban Oak W.C.	Check Dams	Staggered Trenches
45	Kandaghat	D-73 Karol III	10.4	Ban Oak W.C.	Check Dams	Staggered Trenches
46	Kandaghat	D-74 Karol IV	5.6	Ban Oak W.C.	Check Dams	Staggered Trenches
47	Kandaghat	D-75 Karol V	19.2	Ban Oak W.C.	Check Dams	Staggered Trenches
48	Kandaghat	D-76 Karol VI	0.8	Ban Oak W.C.	Check Dams	Staggered Trenches

49	Kandaghat	D-77 Karol VII	1.2	Ban Oak W.C.	Check Dams	Staggered Trenches
50	Kandaghat	D-78 Karol VIII	4.8	Ban Oak W.C.	Check Dams	Staggered Trenches
51	Kandaghat	D-79 Ded	14.4	Ban Oak W.C.	Check Dams	Staggered Trenches
52	Kandaghat	D-99 Salumna	23.2	Ban Oak W.C.	Check Dams	Staggered Trenches
53	Kandaghat	D-100 Dharot C2	18.8	Ban Oak W.C.	Check Dams	Staggered Trenches
54	Kandaghat	D-101 Kuryali	19.6	Ban Oak W.C.	Check Dams	Staggered Trenches
55	Kandaghat	D-57 Kumhala	4.8	Chil W.C.	Check Dams	Staggered Trenches
56	Kandaghat	D-63 Kiarighat	23.6	Chil W.C.	Check Dams	Staggered Trenches
57	Kandaghat	D-68 Hathon	6	Chil W.C.	Check Dams	Staggered Trenches
58	Kandaghat	D-100 Dharot C1	15.6	Chil W.C.	Check Dams	Staggered Trenches
59	Kandaghat	D-102 Baran Ka Cheon C1	5.6	Chil W.C.	Check Dams	Staggered Trenches
60	Kandaghat	D-102 Baran Ka Cheon C2	7.2	Chil W.C.	Check Dams	Staggered Trenches
61	Kandaghat	D-102 Baran Ka Cheon C3	6	Chil W.C.	Check Dams	Staggered Trenches
62	Kandaghat	R-20 Bisha	66	Ban Oak W.C.	-	Staggered Trenches
63	Kandaghat	D-62 Bisha C2	11.8	Ban Oak W.C.	-	Staggered Trenches
64	Kandaghat	D-62 Bisha C3	19.1	Ban Oak W.C.	-	Staggered Trenches
65	Solan	D-108 SShilly C-6	12.4	Chil W.C.	Check Dams	-
66	Solan	D-126 SManlog C-1	14.4	Chil W.C.	Check Dams	-
67	Solan	D-132 SCharar C-6	33.6	Chil W.C.	Check Dams	-
68	Solan	D-132 SCharar C-8	13.2	Chil W.C.	Check Dams	-
69	Solan	R-25 SShahogBhadrog C-1	43.2	Ban Oak W.C.	Check Dams	-
70	Solan	D-106 SNalo C-1	23.2	Ban Oak W.C.	Check Dams	-
71	Solan	D-106 SNalo C-2	13.6	Ban Oak W.C.	Check Dams	-
72	Solan	D-83 SRajgarh C-1	70.4	Ban Oak W.C.	Check Dams	-
73	Solan	D-83 SRajgarh C-2	62.8	Ban Oak W.C.	Check Dams	-

74	Solan	R-25 SShahogBhadrog	59.2	Ban Oak W.C.	Check Dams	-
75	Solan	D-80 SSeri	20.8	Ban Oak W.C.	Check Dams	-
76	Solan	D-81 SCharech C-1	31.6	Ban Oak W.C.	Check Dams	-
77	Solan	D-81 SCharech C-2	40.8	Ban Oak W.C.	Check Dams	-
78	Solan	R-27 SNauni C-1	24.4	Ban Oak W.C.	Check Dams	-
79	Solan	D-132 SCharar C-4	24.4	PCR W.C.	Check Dams	-
80	Solan	D-125 SSheel ka Dhalla C-1	12.4	Chil W.C.	-	Staggered Trenches
81	Solan	D-91 SBhawan ki Dhar	11.6	Chil W.C.	-	Staggered Trenches
82	Solan	D-93 SNandalNagali	12.4	Chil W.C.	-	Staggered Trenches
83	Solan	D-94 SNandalDamog	8.4	Chil W.C.	-	Staggered Trenches
84	Solan	D-96 SNagali-II	4	Chil W.C.	-	Staggered Trenches
85	Solan	D-97 SKiarTatool	4.4	Chil W.C.	-	Staggered Trenches
86	Solan	R-26 SNagali	33.6	Chil W.C.	-	Staggered Trenches
87	Solan	D-104 SKarol C-1	22.4	Ban Oak W.C.	-	Staggered Trenches
88	Solan	R-27 SNauni C-2	55.6	Ban Oak W.C.	-	Staggered Trenches
89	Solan	R-28 SKhaldhar C-3	34.8	PCR W.C.	-	Staggered Trenches
90	Solan	R-28 SKhaldhar C-2b	12	PCR W.C.	-	Staggered Trenches
91	Solan	D-136 SKhaldhar	16	PCR W.C.	-	Staggered Trenches
92	Solan	D-132 SCharar C-2	17.6	PCR W.C.	-	Staggered Trenches
93	Solan	D-132 SCharar C-5	18	PCR W.C.	-	Staggered Trenches
94	Subathu	D-124 Katiyara C-3	10.4	Chil W.C.	Check Dams	-
95	Subathu	D-127 Shashal C-1	21.2	Chil W.C.	Check Dams	-
96	Subathu	D-128 Kalikufar C-2	10.8	Chil W.C.	Check Dams	-
97	Subathu	D-128 Kalikufar C-4	22.8	Chil W.C.	Check Dams	Staggered Trenches
98	Subathu	D-128 Kalikufar C-5	22	Chil W.C.	Check Dams	-

99	Subathu	D-134Kothi C-1	63	Chil W.C.	Check Dams	-
100	Subathu	D-134 Kothi C-2	24.6	Chil W.C.	Check Dams	-
101	Subathu	D-124 Katiyara C-1	14.4	PCR W.C.	Check Dams	-
102	Subathu	D-124 Katiyara C-4	17.2	PCR W.C.	Check Dams	-
103	Subathu	D-129 Rano	18.8	PCR W.C.	Check Dams	-
104	Subathu	D-112 Alobra	54.4	PCR W.C.	-	Retaining wall & Breast wall to protect the nursery & Maintenance of Water ponds of D-112 alobra forest
105	Dharampur	D-158 Anji	11.2	Chil W.C.	Check Dams	-
106	Dharampur	R-31 Barog C-2 a	45.2	Chil W.C.	Check Dams	Staggered Trenches
107	Dharampur	R-31 Barog C-2 b	26.8	Chil W.C.	Check Dams	Staggered Trenches
108	Dharampur	R-31 Barog C-4a	57.2	Chil W.C.	Check Dams	Staggered Trenches
109	Dharampur	R-31 Barog C-4b	28.8	Chil W.C.	Check Dams	-
110	Dharampur	R-31 Barog C-5	62	Chil W.C.	Check Dams	Staggered Trenches
111	Dharampur	R-31 Barog C-6	51.6	Chil W.C.	Check Dams	Staggered Trenches
112	Dharampur	R-31 Barog C-8b	68	Chil W.C.	Check Dams	Staggered Trenches
113	Dharampur	D175 Bohali C-1	22.2	Chil W.C.	Check Dams	Staggered Trenches
114	Dharampur	D176 Chiroti Ki Dhar-I	38	Chil W.C.	Check Dams	Staggered Trenches
115	Dharampur	D177 Chiroti Ki Dhar	21.2	Chil W.C.	Check Dams	Staggered Trenches
116	Dharampur	D178 Chiroti Ki Dhar C-1	42.3	Chil W.C.	Check Dams	Staggered Trenches
117	Dharampur	D178 Chiroti Ki Dhar C-2	29.1	Chil W.C.	Check Dams	Staggered Trenches
118	Dharampur	D179 Shirgul Ka Tiba C-1	16	Chil W.C.	Check Dams	Staggered Trenches
119	Dharampur	D179 Shirgul Ka Tiba C-2	13.6	Chil W.C.	Check Dams	-

120	Dharampur	R39 Charoti Ki Dhar	44.4	Chil W.C.	Check Dams	Staggered Trenches
121	Dharampur	R 40 Bohli C-1	32	Chil W.C.	Check Dams	Staggered Trenches
122	Dharampur	R-40 Bohli C-2a	45.6	Chil W.C.	Check Dams	Staggered Trenches
123	Dharampur	D145Chewa kheelchunjari	12.4	Chil W.C.	Check Dams	Staggered Trenches
124	Dharampur	D146Chewa kheelchunjari	47.2	Chil W.C.	Check Dams	Staggered Trenches
125	Dharampur	D147 kainthari kana Dhyalag	19.8	Chil W.C.	Check Dams	Staggered Trenches
126	Dharampur	R38kiard c1	29.6	Chil W.C.	Check Dams	Staggered Trenches
127	Dharampur	D-157 Kadon	13.6	Chil W.C.	Check Dams	-
128	Dharampur	D-161 Sihardi C2	32	Chil W.C.	Check Dams	Staggered Trenches
129	Dharampur	D-162 Maltoo	28.4	Chil W.C.	Check Dams	-
130	Dharampur	D-165 Maltoo	41.2	Chil W.C.	Check Dams	-
131	Dharampur	D-244 Cheola C3	28.4	Chil W.C.	Check Dams	Staggered Trenches
132	Dharampur	D-244 Cheola C4	35.2	Chil W.C.	Check Dams	Staggered Trenches
133	Dharampur	R-37 Maltoo C2	28.6	Chil W.C.	Check Dams	Staggered Trenches
134	Dharampur	R-33 Gulhari C1b	41.6	Chil W.C.	Check Dams	Staggered Trenches
135	Dharampur	D-151 Gulhari	42.8	Chil W.C.	Check Dams	Staggered Trenches
136	Dharampur	D-152 Gulhari	8.8	Chil W.C.	Check Dams	Staggered Trenches
137	Dharampur	D-153 Gulhari	5.2	Chil W.C.	Check Dams	Staggered Trenches
138	Dharampur	D-115 Chabal ki Dhar	3.2	Chil W.C.	Check Dams	Staggered Trenches
139	Dharampur	D-118 Chabal ki Dhar	10.4	Chil W.C.	Check Dams	Staggered Trenches
140	Dharampur	D-119 Chabal ki Dhar	26.4	Chil W.C.	Check Dams	Staggered Trenches
141	Dharampur	R-30 Chabal C1	30.4	Chil W.C.	Check Dams	Staggered Trenches
142	Dharampur	R-30 Chabal C3	36	Chil W.C.	Check Dams	Staggered Trenches
143	Dharampur	R-30 Chabal C4	42	Chil W.C.	Check Dams	Staggered Trenches
144	Dharampur	R-30 Chabal C5b	21.4	Chil W.C.	Check Dams	Staggered Trenches

145	Dharampur	R41 Gulzar C-1	26.8	Chil W.C.	Check Dams	-
146	Dharampur	R42 Ajmer Garh C-2	47.2	Chil W.C.	Check Dams	-
147	Dharampur	D180 Shirgul Ka Tiba C-1	26	Chil W.C.	Check Dams	Staggered Trenches
148	Dharampur	D180 Shirgul Ka Tiba C-2	21.2	Chil W.C.	Check Dams	-
149	Dharampur	R-31 Barog C-1a	14.8	PCR W.C.	Check Dams	-
150	Dharampur	R-31 Barog C-1b	35.6	PCR W.C.	Check Dams	-
151	Dharampur	R-31 Barog C-3	42.8	PCR W.C.	Check Dams	Staggered Trenches
152	Dharampur	R-31 Barog C-7	50	PCR W.C.	Check Dams	Staggered Trenches
153	Dharampur	R-44 Jhanai C1	76.5	PCR W.C.	Check Dams	Staggered Trenches
154	Dharampur	R-44 Jhanai C2	63.1	PCR W.C.	Check Dams	Staggered Trenches
155	Dharampur	R-43 Halda C3	74	PCR W.C.	Check Dams	Staggered Trenches
156	Dharampur	D-208 Sari	2.4	PCR W.C.	Check Dams	Staggered Trenches
157	Dharampur	D-210 Odder jhangiriya	97.7	PCR W.C.	Check Dams	Staggered Trenches
158	Dharampur	D-211 Halda	10	PCR W.C.	Check Dams	Staggered Trenches
159	Dharampur	D-212 Halda	16	PCR W.C.	Check Dams	Staggered Trenches
160	Dharampur	D-217 MeunSanog	43.2	PCR W.C.	Check Dams	Staggered Trenches
161	Dharampur	R40 Bohali C-2b	38	PCR W.C.	Check Dams	Staggered Trenches
162	Dharampur	D-161 Sihardi C1	10	PCR W.C.	Check Dams	Staggered Trenches
163	Dharampur	R-35 Kadon	40.1	PCR W.C.	Check Dams	Staggered Trenches
164	Dharampur	R-36 Anji	10.4	PCR W.C.	Check Dams	Staggered Trenches
165	Dharampur	D-244 Cheola C5	26.8	PCR W.C.	Check Dams	Staggered Trenches
166	Dharampur	D214 Tiba Gulzar C-1	27.6	PCR W.C.	Check Dams	-
167	Dharampur	D214 Tiba Gulzar C-3	94.8	PCR W.C.	Check Dams	-
168	Dharampur	D216 BanogBhallon	90	PCR W.C.	Check Dams	-
169	Dharampur	R-31 Barog C-8a	24	Chil W.C.	-	Staggered Trenches

170	Dharampur	D-181 Shirguli ka tibba	25.12	Chil W.C.	-	Staggered Trenches
171	Dharampur	D168 Kiarad	9.2	Chil W.C.	-	Staggered Trenches
172	Dharampur	D169 Kiarad c1	27.6	Chil W.C.	-	Staggered Trenches
173	Dharampur	R32 chunjari	67.6	Chil W.C.	-	Staggered Trenches
174	Dharampur	D-155 Bhallon	3.2	Chil W.C.	-	Staggered Trenches
175	Dharampur	D-163 Maltoo	11.2	Chil W.C.	-	Staggered Trenches
176	Dharampur	D-244 Cheola C1	24	Chil W.C.	-	Staggered Trenches
177	Dharampur	D-244 Cheola C2	22.4	Chil W.C.	-	Staggered Trenches
178	Dharampur	R-37 Maltoo C1	21	Chil W.C.	-	Staggered Trenches
179	Dharampur	R-33 Gulhari C2	34	Chil W.C.	-	Staggered Trenches
180	Dharampur	D-116 Chabal ki Dhar	4.8	Chil W.C.	-	Staggered Trenches
181	Dharampur	R-30 Chabal C2a	36.4	Chil W.C.	-	Staggered Trenches
182	Dharampur	R-30 Chabal C2b	33.2	Chil W.C.	-	Staggered Trenches
183	Dharampur	R-30 Chabal C5a	38.6	Chil W.C.	-	Staggered Trenches
184	Dharampur	R-30 Chabal C6	27.2	Chil W.C.	-	Staggered Trenches
185	Dharampur	D-167 Gadiar.	23.2	Chil W.C.	-	Staggered Trenches
186	Dharampur	R-48 Kalth.C-4	32	Chil W.C.	-	Staggered Trenches
187	Dharampur	D-182 Kalth - III.	25.6	Chil W.C.	-	Staggered Trenches
188	Dharampur	D-183 Kalth - IV.	36	Chil W.C.	-	Staggered Trenches
189	Dharampur	R-48 Kalth.C-5	52.8	Chil W.C.	-	Staggered Trenches
190	Dharampur	R-49 Gadiar.	31.2	Chil W.C.	-	Staggered Trenches
191	Dharampur	D-202 Kalth _ II.C2	16.4	Chil W.C.	-	Staggered Trenches
192	Dharampur	D-203 Quila Ajmergarh.C1	40	Chil W.C.	-	Staggered Trenches
193	Dharampur	D175 Bohali C-2	11	PCR W.C.	-	Staggered Trenches
194	Dharampur	D169 Kiarad c2	12	PCR W.C.	-	Staggered Trenches

195	Dharampur	D-139 Banjni	4	PCR W.C.	-	Staggered Trenches
196	Dharampur	R-48 Kalth.C-3	16	PCR W.C.	-	Staggered Trenches
197	Dharampur	D-203 Quila Ajmergarh.C2	43.6	PCR W.C.	-	Staggered Trenches
198	Dharampur	D-202 Kalth _ II.C1	12	PCR W.C.	-	Staggered Trenches
199	Dharampur	R-48 Kalth.C-1	52.8	PCR W.C.	-	Staggered Trenches
200	Dharampur	D204 Tikari		PCR W.C.		
201	Parwanoo	D-185 Kurlajohri C2	86.3	Chil W.C.	Check Dams	Staggered Trenches
202	Parwanoo	D-186 Kalth No V C1	14.4	Chil W.C.	Check Dams	Staggered Trenches
203	Parwanoo	D-222 Banasar Top	72.4	Chil W.C.	Check Dams	Staggered Trenches
204	Parwanoo	D-239 SariDhar C1a	12	Chil W.C.	Check Dams	Staggered Trenches
205	Parwanoo	D-239 SariDhar C1b	10.8	Chil W.C.	Check Dams	Staggered Trenches
206	Parwanoo	D-245 Sanawar C1	12.4	Chil W.C.	Check Dams	Staggered Trenches
207	Parwanoo	D-245 Sanawar C2	16.4	Chil W.C.	Check Dams	Staggered Trenches
208	Parwanoo	D-190 Jabrog	87.6	PCR W.C.	Check Dams	-
209	Parwanoo	D-230 Jangeshu C1	39	PCR W.C.	Check Dams	-
210	Parwanoo	D-230 Jangeshu C2	48.6	PCR W.C.	Check Dams	-
211	Parwanoo	D-234 Ranigaun	72	PCR W.C.	Check Dams	-
212	Parwanoo	D-235 Chamgah	52.8	PCR W.C.	Check Dams	-
213	Parwanoo	D-240 Dochi C6	28.4	PCR W.C.	Check Dams	-
214	Parwanoo	R-56 Parwanoo C1	33	PCR W.C.	Check Dams	-
215	Parwanoo	R-56 Parwanoo C2	91	PCR W.C.	Check Dams	-
216	Parwanoo	D-188 Karalghat C1	48.4	Chil W.C.	-	Staggered Trenches
217	Parwanoo	D-188 Karalghat C2	54.4	Chil W.C.	-	Staggered Trenches
218	Parwanoo	D-239 SariDhar C2	22.4	Chil W.C.	-	Staggered Trenches
219	Parwanoo	D-240 Dochi C1	25.2	Chil W.C.	-	Staggered Trenches

220	Parwanoo	D-242 Gahidhar C2	20.8	Chil W.C.	-	Staggered Trenches
221	Parwanoo	D-245 Sanawar C3	16.8	Chil W.C.	-	Staggered Trenches
222	Parwanoo	R-47 Karalghat C2	36	Chil W.C.	-	Staggered Trenches
223	Parwanoo	R-57 Banasar C1a	48	Chil W.C.	-	Staggered Trenches
224	Parwanoo	R-57 Banasar C1b	43.2	Chil W.C.	-	Staggered Trenches

Table 9.8: Year-wise Proposed targets for construction of check dams

					Work details		Activities(CD-Check Dams) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activ ity	No of CD	1	2	3	4	5	6	7	8	9	1 0	Total	
1	Chai l	D39 SDhamdhar C-1	30.4	Chil W.C.	Chec k Dams	8	8										8	
2	Chai l	D39 SDhamdhar C-2	30	Chil W.C.	Chec k Dams	7	7										7	
3	Chai l	D47 SBirniShillai C-2	93.6	Chil W.C.	Chec k Dams	10	1 0										10	
4	Chai l	D48 SBirniShillai C-1	36	Chil W.C.	Chec k Dams	9	9										9	
5	Kan dagh at	R21SKarol C-1A	34.4	Ban Oak W.C.	Chec k Dams	20		2 0									20	
6	Kan dagh at	R21SKarol C-1B	42	Ban Oak W.C.	Chec k Dams	20		2 0									20	
7	Kan dagh at	R21SKarol C-1C	38.8	Ban Oak W.C.	Chec k Dams	20		2 0									20	
8	Kan dagh at	R21SKarol C-2	58.4	Ban Oak W.C.	Chec k Dams	20		2 0									20	
9	Kan dagh at	R21SKarol C-3A	39.6	Ban Oak W.C.	Chec k Dams	20		2 0									20	
10	Kan dagh at	R21SKarol C-3B	32	Ban Oak W.C.	Chec k Dams	20		2 0									20	
11	Kan dagh at	R21SKarol C-3C	34.4	Ban Oak W.C.	Chec k Dams	20		2 0									20	
12	Kan dagh at	R22 SKarolNoII	12.4	Ban Oak W.C.	Chec k Dams	15		1 5									15	

					Work details		Activities(CD-Check Dams) Year Wise										
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activ ity	No of CD	1	2	3	4	5	6	7	8	9	10	Total
13	Kan dagh at	R23 SKarolNoIII	8	Ban Oak W.C.	Chec k Dams	15		15									15
14	Kan dagh at	D53 SShungal	11.2	Ban Oak W.C.	Chec k Dams	5			5								5
15	Kan dagh at	D54 SShadiyal	8.4	Ban Oak W.C.	Chec k Dams	5			5								5
16	Kan dagh at	D55 SSuro No 1	2	Ban Oak W.C.	Chec k Dams	5			5								5
17	Kan dagh at	D56 SSuro No 2	2.8	Ban Oak W.C.	Chec k Dams	5			5								5
18	Kan dagh at	D58 SBasha	11.2	Ban Oak W.C.	Chec k Dams	5			5								5
19	Kan dagh at	D59 SBagetu	2.4	Ban Oak W.C.	Chec k Dams	5			5								5
20	Kan dagh at	D61 SDhanoliDoc hi	6.4	Ban Oak W.C.	Chec k Dams	5			5								5
21	Kan dagh at	D62 SBisha C-1	49.1	Ban Oak W.C.	Chec k Dams	10			10								10
22	Kan dagh at	D64 SBirni	2.4	Ban Oak W.C.	Chec k Dams	4			4								4
23	Kan dagh at	D65 SBirniKasauli	7.2	Ban Oak W.C.	Chec k Dams	4			4								4
24	Kan dagh at	D67 SSainj	12.8	Ban Oak W.C.	Chec k Dams	8			8								8
25	Kan dagh at	D69 SPalhech I	22.4	Ban Oak W.C.	Chec k Dams	15			15								15
26	Kan dagh at	D70 SPalhech II	3.2	Ban Oak W.C.	Chec k Dams	10			10								10
27	Kan dagh at	D71 SKarol I	5.2	Ban Oak W.C.	Chec k Dams	10			10								10
28	Kan dagh at	D72 SKarol II	16.4	Ban Oak W.C.	Chec k Dams	10			10								10
29	Kan dagh at	D73 SKarol III	10.4	Ban Oak W.C.	Chec k Dams	10			10								10

					Work details		Activities(CD-Check Dams) Year Wise												
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activ ity	No of CD	1	2	3	4	5	6	7	8	9	10	Total		
30	Kan dagh at	D74 SKarol IV	5.6	Ban Oak W.C.	Chec k Dams	10			10								10		
31	Kan dagh at	D75 SKarol V	19.2	Ban Oak W.C.	Chec k Dams	15			15								15		
32	Kan dagh at	D77 SKarol VII	1.2	Ban Oak W.C.	Chec k Dams	10			10								10		
33	Kan dagh at	D78 SKarol VIII	4.8	Ban Oak W.C.	Chec k Dams	8				8							8		
34	Kan dagh at	D79 SDed	14.4	Ban Oak W.C.	Chec k Dams	15				15							15		
35	Kan dagh at	D99 SSalumna	23.2	Ban Oak W.C.	Chec k Dams	10				10							10		
36	Kan dagh at	D100 SDharot C-2	18.8	Ban Oak W.C.	Chec k Dams	10				10							10		
37	Kan dagh at	D101 SKuryali	19.6	Ban Oak W.C.	Chec k Dams	10				10							10		
38	Kan dagh at	D57 SKumhala	4.8	Chil W.C.	Chec k Dams	5				5							5		
39	Kan dagh at	D63 SKiarighat	23.6	Chil W.C.	Chec k Dams	8				8							8		
40	Kan dagh at	D68 SHathon	6	Chil W.C.	Chec k Dams	10				10							10		
41	Kan dagh at	D100 SDharot C-1	15.6	Chil W.C.	Chec k Dams	5				5							5		
42	Kan dagh at	D102 SBaran Ka Cheon C-1	5.6	Chil W.C.	Chec k Dams	5				5							5		
43	Kan dagh at	D102 SBaran Ka Cheon C-2	7.2	Chil W.C.	Chec k Dams	5				5							5		
44	Kan dagh at	D102 SBaran Ka Cheon C-3	6	Chil W.C.	Chec k Dams	5				5							5		
45	Sola n	D108 SShilly C-6	12.4	Chil W.C.	Chec k Dams	10					10						10		
46	Sola n	D126 SManlog C-1	14.4	Chil W.C.	Chec k Dams	10					10						10		

					Work details		Activities(CD-Check Dams) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activ ity	No of CD	1	2	3	4	5	6	7	8	9	10	Total	
47	Sola n	D132 SCharar C-6	33.6	Chil W.C.	Chec k Dams	10					10						10	
48	Sola n	D132 SCharar C-8	13.2	Chil W.C.	Chec k Dams	10					10						10	
49	Sola n	R25 SShahogBhad rog C-1	43.2	Ban Oak W.C.	Chec k Dams	10					10						10	
50	Sola n	D106 SNalo C-1	23.2	Ban Oak W.C.	Chec k Dams	10					10						10	
51	Sola n	D106 SNalo C-2	13.6	Ban Oak W.C.	Chec k Dams	10					10						10	
52	Sola n	D83 SRajgarh C-1	70.4	Ban Oak W.C.	Chec k Dams	15					15						15	
53	Sola n	D83 SRajgarh C-2	62.8	Ban Oak W.C.	Chec k Dams	20					20						20	
54	Sola n	R25 SShahogBhad rog	59.2	Ban Oak W.C.	Chec k Dams	10					10						10	
55	Sola n	D80 SSeri	20.8	Ban Oak W.C.	Chec k Dams	15					15						15	
56	Sola n	D81 SCharech C-1	31.6	Ban Oak W.C.	Chec k Dams	20					20						20	
57	Sola n	D81 SCharech C-2	40.8	Ban Oak W.C.	Chec k Dams	10					10						10	
58	Sola n	R27 SNauni C-1	24.4	Ban Oak W.C.	Chec k Dams	20					20						20	
59	Sola n	D132 SCharar C-4	24.4	PCR W.C.	Chec k Dams	10					10						10	
60	Suba thu	D124 SKatiyara C-3	10.4	Chil W.C.	Chec k Dams	8						8					8	
61	Suba thu	D127 SShashal C-1	21.2	Chil W.C.	Chec k Dams	7						7					7	
62	Suba thu	D128 SKalikufar C-2	10.8	Chil W.C.	Chec k Dams	5						5					5	
63	Suba thu	D128 SKalikufar C-4	22.8	Chil W.C.	Chec k Dams	9						9					9	

					Work details		Activities(CD-Check Dams) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activ ity	No of CD	1	2	3	4	5	6	7	8	9	10	Total	
64	Suba thu	D128 SKalikufar C-5	22	Chil W.C.	Chec k Dams	9						9					9	
65	Suba thu	D134 SKothi C-1	63	Chil W.C.	Chec k Dams	7						7					7	
66	Suba thu	D134 SKothi C-2	24.6	Chil W.C.	Chec k Dams	7						7					7	
67	Suba thu	D124 SKatiyara C-1	14.4	PCR W.C.	Chec k Dams	8						8					8	
68	Suba thu	D124 SKatiyara C-4	17.2	PCR W.C.	Chec k Dams	8						8					8	
69	Suba thu	D129 SRano	18.8	PCR W.C.	Chec k Dams	5						5					5	
70	Dhar amp ur	D158 SAnji	11.2	Chil W.C.	Chec k Dams	8						8					8	
71	Dhar amp ur	R31 SBarog C-2 a	45.2	Chil W.C.	Chec k Dams	20						20					20	
72	Dhar amp ur	R31 SBarog C-2 b	26.8	Chil W.C.	Chec k Dams	15						15					15	
73	Dhar amp ur	R31 SBarog C-4a	57.2	Chil W.C.	Chec k Dams	12						12					12	
74	Dhar amp ur	R31 SBarog C-4b	28.8	Chil W.C.	Chec k Dams	15						15					15	
75	Dhar amp ur	R31 SBarog C-5	62	Chil W.C.	Chec k Dams	20						20					20	
76	Dhar amp ur	R31 SBarog C-6	51.6	Chil W.C.	Chec k Dams	18						18					18	
77	Dhar amp ur	R31 SBarog C-8b	68	Chil W.C.	Chec k Dams	15						15					15	
78	Dhar amp ur	D175 SBohali C-1	22.2	Chil W.C.	Chec k Dams	12						12					12	
79	Dhar amp ur	D176 SChiroti Ki Dhar-I	38	Chil W.C.	Chec k Dams	25						25					25	
80	Dhar amp ur	D177 SChiroti Ki Dhar	21.2	Chil W.C.	Chec k Dams	8						8					8	

					Work details		Activities(CD-Check Dams) Year Wise										
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activ ity	No of CD	1	2	3	4	5	6	7	8	9	10	Total
81	Dhar amp ur	D178 SChiroti Ki Dhar C-1	42.3	Chil W.C.	Chec k Dams	10						10					10
82	Dhar amp ur	D178 SChiroti Ki Dhar C-2	29.1	Chil W.C.	Chec k Dams	8						8					8
83	Dhar amp ur	D179 SShirgul Ka Tiba C-1	16	Chil W.C.	Chec k Dams	8						8					8
84	Dhar amp ur	D179 SShirgul Ka Tiba C-2	13.6	Chil W.C.	Chec k Dams	10						10					10
85	Dhar amp ur	R39 SCharoti Ki Dhar	44.4	Chil W.C.	Chec k Dams	15						15					15
86	Dhar amp ur	R 40 SBohli C-1	32	Chil W.C.	Chec k Dams	10						10					10
87	Dhar amp ur	R40 SBohli C-2a	45.6	Chil W.C.	Chec k Dams	10						10					10
88	Dhar amp ur	D145 SChewakheel chunjari	12.4	Chil W.C.	Chec k Dams	10						10					10
89	Dhar amp ur	D146 SChewakheel chunjari	47.2	Chil W.C.	Chec k Dams	20						20					20
90	Dhar amp ur	D147 Skainthari kana Dhyalag	19.8	Chil W.C.	Chec k Dams	12						12					12
91	Dhar amp ur	R38 Skiard C-1	29.6	Chil W.C.	Chec k Dams	24						24					24
92	Dhar amp ur	D157 SKadon	13.6	Chil W.C.	Chec k Dams	15						15					15
93	Dhar amp ur	D161 SSihardi C-2	32	Chil W.C.	Chec k Dams	30						30					30
94	Dhar amp ur	D162 SMaltoo	28.4	Chil W.C.	Chec k Dams	20						20					20
95	Dhar amp ur	D165 SMaltoo	41.2	Chil W.C.	Chec k Dams	15						15					15
96	Dhar amp ur	D244 SCheola C-3	28.4	Chil W.C.	Chec k Dams	15						15					15
97	Dhar amp ur	D244 SCheola C-4	35.2	Chil W.C.	Chec k Dams	20						20					20

					Work details		Activities(CD-Check Dams) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activ ity	No of CD	1	2	3	4	5	6	7	8	9	10	Total	
98	Dhar amp ur	R37 SMaltoo C-2	28.6	Chil W.C.	Chec k Dams	15						15					15	
99	Dhar amp ur	R33 SGulhari C-1b	41.6	Chil W.C.	Chec k Dams	10						10					10	
100	Dhar amp ur	D151 SGulhari	42.8	Chil W.C.	Chec k Dams	20						20					20	
101	Dhar amp ur	D152 SGulhari	8.8	Chil W.C.	Chec k Dams	15						15					15	
102	Dhar amp ur	D153 SGulhari	5.2	Chil W.C.	Chec k Dams	15						15					15	
103	Dhar amp ur	D115 SChabal ki Dhar	3.2	Chil W.C.	Chec k Dams	10						10					10	
104	Dhar amp ur	D118 SChabal ki Dhar	10.4	Chil W.C.	Chec k Dams	15						15					15	
105	Dhar amp ur	D119 SChabal ki Dhar	26.4	Chil W.C.	Chec k Dams	25						25					25	
106	Dhar amp ur	R30 SChabal C-1	30.4	Chil W.C.	Chec k Dams	30						30					30	
107	Dhar amp ur	R30 SChabal C-3	36	Chil W.C.	Chec k Dams	32						32					32	
108	Dhar amp ur	R30 SChabal C-4	42	Chil W.C.	Chec k Dams	20						20					20	
109	Dhar amp ur	R30 SChabal C-5b	21.4	Chil W.C.	Chec k Dams	30						30					30	
110	Dhar amp ur	R41 SGulzar C-1	26.8	Chil W.C.	Chec k Dams	5						5					5	
111	Dhar amp ur	R42 SAjmerGarh C-2	47.2	Chil W.C.	Chec k Dams	15						15					15	
112	Dhar amp ur	D180 SShirgul Ka Tiba C-1	26	Chil W.C.	Chec k Dams	10						10					10	
113	Dhar amp ur	D180 SShirgul Ka Tiba C-2	21.2	Chil W.C.	Chec k Dams	12						12					12	
114	Dhar amp ur	R31 SBarog C-1a	14.8	PCR W.C.	Chec k Dams	10						10					10	

					Work details		Activities(CD-Check Dams) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activ ity	No of CD	1	2	3	4	5	6	7	8	9	1 0	Total	
11 5	Dhar amp ur	R31 SBarog C-1b	35.6	PCR W.C.	Chec k Dams	15						15					15	
11 6	Dhar amp ur	R31 SBarog C-3	42.8	PCR W.C.	Chec k Dams	12						12					12	
11 7	Dhar amp ur	R31 SBarog C-7	50	PCR W.C.	Chec k Dams	15						15					15	
11 8	Dhar amp ur	R44 SJhanai C-1	76.5	PCR W.C.	Chec k Dams	20						20					20	
11 9	Dhar amp ur	R44 SJhanai C-2	63.1	PCR W.C.	Chec k Dams	10						10					10	
12 0	Dhar amp ur	R43 SHalda C-3	74	PCR W.C.	Chec k Dams	8						8					8	
12 1	Dhar amp ur	D208 SSari	2.4	PCR W.C.	Chec k Dams	5						5					5	
12 2	Dhar amp ur	D210 SOdderjhangiriya	97.7	PCR W.C.	Chec k Dams	15						15					15	
12 3	Dhar amp ur	D211 SHalda	10	PCR W.C.	Chec k Dams	7						7					7	
12 4	Dhar amp ur	D212 SHalda	16	PCR W.C.	Chec k Dams	8						8					8	
12 5	Dhar amp ur	D217 SMeunSanog	43.2	PCR W.C.	Chec k Dams	9						9					9	
12 6	Dhar amp ur	R40 SBohali C-2b	38	PCR W.C.	Chec k Dams	15						15					15	
12 7	Dhar amp ur	D161 SSihardi C-1	10	PCR W.C.	Chec k Dams	8						8					8	
12 8	Dhar amp ur	R35 SKadon	40.1	PCR W.C.	Chec k Dams	10						10					10	
12 9	Dhar amp ur	R36 SAnji	10.4	PCR W.C.	Chec k Dams	15						15					15	
13 0	Dhar amp ur	D244 SCheola C5	26.8	PCR W.C.	Chec k Dams	No Data Found						No Data Found					No Data Found	
13 1	Dhar amp ur	D214 STiba Gulzar C-1	27.6	PCR W.C.	Chec k Dams	15						15					15	

					Work details		Activities(CD-Check Dams) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activ ity	No of CD	1	2	3	4	5	6	7	8	9	10	Total	
132	Dharampur	D214 STiba Gulzar C-3	94.8	PCR W.C.	Check Dams	10						10					10	
133	Dharampur	D216 SBanogBhallon	90	PCR W.C.	Check Dams	25						25					25	
134	Parwanoo	D185 SKurlajohri C-2	86.3	Chil W.C.	Check Dams	6						6					6	
135	Parwanoo	D186 SKalth No V C-1	14.4	Chil W.C.	Check Dams	5						5					5	
136	Parwanoo	D222 SBanasar Top	72.4	Chil W.C.	Check Dams	8						8					8	
137	Parwanoo	D239 SSariDhar C-1a	12	Chil W.C.	Check Dams	7						7					7	
138	Parwanoo	D239 SSariDhar C-1b	10.8	Chil W.C.	Check Dams	6						6					6	
139	Parwanoo	D245 SSanawar C-1	12.4	Chil W.C.	Check Dams	6						6					6	
140	Parwanoo	D245 SSanawar C-2	16.4	Chil W.C.	Check Dams	5						5					5	
141	Parwanoo	D190 SJabrog	87.6	PCR W.C.	Check Dams	8						8					8	
142	Parwanoo	D230 SJangeshu C-1	39	PCR W.C.	Check Dams	6						6					6	
143	Parwanoo	D230 SJangeshu C-2	48.6	PCR W.C.	Check Dams	6						6					6	
144	Parwanoo	D234 SRanigaun	72	PCR W.C.	Check Dams	7						7					7	
145	Parwanoo	D235 SChamgah	52.8	PCR W.C.	Check Dams	8						8					8	
146	Parwanoo	D240 SDochi C-6	28.4	PCR W.C.	Check Dams	6						6					6	
147	Parwanoo	R56 SParwanoo C-1	33	PCR W.C.	Check Dams	6						6					6	
148	Parwanoo	R56 SParwanoo C-2	91	PCR W.C.	Check Dams	6						6					6	

Table 9.9: Yearwise Proposed targets for construction of water holding structures

					Work details		Activities(WHS) Year Wise											
S.N o.	Range	Name Of Forests	Area (ha)	Working Circle	Activ ity	No. of WHS	1	2	3	4	5	6	7	8	9	10	Total	
1	Kandaghat	R21SKarol C-1A	34.4	Ban Oak W.C.	WHS	1			1								1	
2	Kandaghat	R21SKarol C-1B	42	Ban Oak W.C.	WHS	1			1								1	
3	Kandaghat	R21SKarol C-1C	38.8	Ban Oak W.C.	WHS	1			1								1	
4	Kandaghat	R21SKarol C-2	58.4	Ban Oak W.C.	WHS	1			1								1	
5	Kandaghat	R21SKarol C-3A	39.6	Ban Oak W.C.	WHS	1			1								1	
6	Kandaghat	R21SKarol C-3B	32	Ban Oak W.C.	WHS	1			1								1	
7	Kandaghat	R21SKarol C-3C	34.4	Ban Oak W.C.	WHS	1			1								1	
8	Kandaghat	R22 SKarolNoII	12.4	Ban Oak W.C.	WHS	1			1								1	
9	Kandaghat	R23 SKarolNoIII	8	Ban Oak W.C.	WHS	1			1								1	
10	Kandaghat	D53 SShungal	11.2	Ban Oak W.C.	WHS	1				1							1	
11	Kandaghat	D54 SShadiyal	8.4	Ban Oak W.C.	WHS	1				1							1	
12	Kandaghat	D55 SSuro No 1	2	Ban Oak W.C.	WHS	1				1							1	
13	Kandaghat	D56 SSuro No 2	2.8	Ban Oak W.C.	WHS	1				1							1	
14	Kandaghat	D62 SBisha C-1	49.1	Ban Oak W.C.	WHS	1				1							1	
15	Kandaghat	D71 SKarol I	5.2	Ban Oak W.C.	WHS						0						0	
16	Kandaghat	D72 SKarol II	16.4	Ban Oak W.C.	WHS	1					1						1	
17	Kandaghat	D77 SKarol VII	1.2	Ban Oak W.C.	WHS	1					1						1	
18	Kandaghat	D99 SSalumna	23.2	Ban Oak W.C.	WHS	1					1						1	
19	Kandaghat	D57 SKumhala	4.8	Chil W.C.	WHS	1					1						1	
20	Kandaghat	D68 SHathon	6	Chil W.C.	WHS	1					1						1	
21	Solan	D132 SCharar C-6	33.6	Chil W.C.	WHS	1						1					1	
22	Solan	D132 SCharar C-8	13.2	Chil W.C.	WHS	1						1					1	
23	Solan	D83 SRajgarh C-2	62.8	Ban Oak W.C.	WHS	1							1				1	
24	Solan	D81	31.6	Ban Oak	WHS	1							1				1	

					Work details		Activities(WHS) Year Wise											
S.N o.	Range	Name Of Forests	Area (ha)	Working Circle	Activ ity	No. of WHS	1	2	3	4	5	6	7	8	9	10	Tot al	
		SCharech C-1		W.C.														
25	Solan	R27 SNauni C-1	24.4	Ban Oak W.C.	WHS	1							1				1	

Table 9.10: Proposed annual targets for construction of Staggered trenches

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	1 0	Tot al	
1	Chai l	D39 SDhamdhar C-1	30. 4	Chil W.C.	Stagger ed Trenche s	400		400									400	
2	Chai l	D39 SDhamdhar C-2	30	Chil W.C.	Stagger ed Trenche s	350		350									350	
3	Chai l	D47 SBirniShillai C-2	93. 6	Chil W.C.	Stagger ed Trenche s	550		550									550	
4	Chai l	D48 SBirniShillai C-1	36	Chil W.C.	Stagger ed Trenche s	340		340									340	
5	Chai l	D42 SChabri C-1	47. 6	Chil W.C.	Stagger ed Trenche s	470	4 7 0										470	
6	Chai l	D42 SChabri C-2	40	Chil W.C.	Stagger ed Trenche s	490	4 9 0										490	
7	Chai l	D43 SPowash	28. 4	Chil W.C.	Stagger ed Trenche s	320	3 2 0										320	
8	Chai l	D44 SCheunth C- 1	40. 4	Chil W.C.	Stagger ed Trenche s	440	4 4 0										440	
9	Chai l	D44 SCheunth C- 2	40	Chil W.C.	Stagger ed Trenche s	460	4 6 0										460	
1	Chai	D45	12	Chil	Stagger	300	3										300	

					Work details		Activities(ST- Staggered Trenches) Year Wise										
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al
0	1	STibbaKath et C-1a		W.C.	ed Trenches		00										
11	Chai l	D45 STibbaKath et C-1b	24	Chil W.C.	Staggered Trenches	390	390										390
12	Chai l	D47 SBirniShillai C-1	58.8	Chil W.C.	Staggered Trenches	460	460										460
13	Chai l	D48 SBirniShillai C-2	25.6	Chil W.C.	Staggered Trenches	400	400										400
14	Chai l	D48 SBirniShillai C-3	12.4	Chil W.C.	Staggered Trenches	280		280									280
15	Chai l	D52 SBhojdeen C-3a	18.4	Chil W.C.	Staggered Trenches	270		270									270
16	Chai l	D52 SBhojdeen C-3b	58.4	Chil W.C.	Staggered Trenches	500		500									500
17	Chai l	D51 SJhajhaKhar iun C-1	84	Ban Oak W.C.	Staggered Trenches	600		600									600
18	Chai l	D51 SJhajhaKhar iun C-3	42.4	Ban Oak W.C.	Staggered Trenches	360		360									360
19	Chai l	D52 SBhojdeen C-1	129.2	Ban Oak W.C.	Staggered Trenches	800		800									800
20	Chai l	D52 SBhojdeen C-2	90	Ban Oak W.C.	Staggered Trenches	600		600									600
21	Chai l	D49 Banjani C-1	14	Deoda r W.C.	Staggered Trenches	300	300										300
22	Chai l	D49 Banjani C-2	22	Chil W.C.	Staggered Trenches	450	450										450

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
					s													
23	Chai l	D49 Banjani C-3	16	Chil W.C.	Stagger ed Trenches	280	280										280	
24	Chai l	D50 Sakori	32.4	Deoda r W.C.	Stagger ed Trenches	470	470										470	
25	Chai l	D45 STibbaKath et C-2a	16	Chil W.C.	Stagger ed Trenches	290	290										290	
26	Chai l	D45 STibbaKath et C-2b	22.4	Chil W.C.	Stagger ed Trenches	320	320										320	
27	Chai l	D46 Chaklain C-1	6	Chil W.C.	Stagger ed Trenches	250	250										250	
28	Chai l	D46 Chaklain C-2	34.8	Chil W.C.	Stagger ed Trenches	390	390										390	
29	Chai l	D46 Chaklain C-3	8.8	Deoda r W.C.	Stagger ed Trenches	260	260										260	
30	Chai l	R16 Chaklain C-1	28.4	Chil W.C.	Stagger ed Trenches	340	340										340	
31	Chai l	R16 Chaklain C-2	50.4	Deoda r W.C.	Stagger ed Trenches	450	450										450	
32	Kan dag hat	R21SKarol C-1A	34.4	Ban Oak W.C.	Stagger ed Trenches	1000	1000										1000	
33	Kan dag hat	R21SKarol C-1B	42	Ban Oak W.C.	Stagger ed Trenches	2000	2000										2000	
34	Kan dag hat	R21SKarol C-1C	38.8	Ban Oak W.C.	Stagger ed Trenches	2000	2000										2000	

					Work details		Activities(ST- Staggered Trenches) Year Wise										
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al
35	Kandaghat	R21SKarol C-2	58.4	Ban Oak W.C.	Staggered Trenches	3000	3000										3000
36	Kandaghat	R21SKarol C-3A	39.6	Ban Oak W.C.	Staggered Trenches	2000	2000										2000
37	Kandaghat	R21SKarol C-3B	32	Ban Oak W.C.	Staggered Trenches	1000	1000										1000
38	Kandaghat	R21SKarol C-3C	34.4	Ban Oak W.C.	Staggered Trenches	1000	1000										1000
39	Kandaghat	R22 SKarolNoII	12.4	Ban Oak W.C.	Staggered Trenches	300	300										300
40	Kandaghat	R23 SKarolNoIII	8	Ban Oak W.C.	Staggered Trenches	200	200										200
41	Kandaghat	D53 SShungal	11.2	Ban Oak W.C.	Staggered Trenches	200	200										200
42	Kandaghat	D54 SShadiyal	8.4	Ban Oak W.C.	Staggered Trenches	200	200										200
43	Kandaghat	D55 SSuro No 1	2	Ban Oak W.C.	Staggered Trenches	100	100										100
44	Kandaghat	D56 SSuro No 2	2.8	Ban Oak W.C.	Staggered Trenches	100	100										100
45	Kandaghat	D58 SBasha	11.2	Ban Oak W.C.	Staggered Trenches	300	300										300
46	Kandaghat	D59 SBagetu	2.4	Ban Oak W.C.	Staggered Trenches	100	100										100
47	Kandaghat	D61 SDhanoliDo	6.4	Ban Oak	Staggered	200	200										200

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
	hat	chi		W.C.	Trenche s		0											
48	Kan dag hat	D62 SBisha C-1	49.1	Ban Oak W.C.	Stagger ed Trenche s	2000	2000										2000	
49	Kan dag hat	D69 SPalhech I	22.4	Ban Oak W.C.	Stagger ed Trenche s	1000		1000									1000	
50	Kan dag hat	D70 SPalhech II	3.2	Ban Oak W.C.	Stagger ed Trenche s	200		200									200	
51	Kan dag hat	D71 SKarol I	5.2	Ban Oak W.C.	Stagger ed Trenche s	300		300									300	
52	Kan dag hat	D72 SKarol II	16.4	Ban Oak W.C.	Stagger ed Trenche s	600		600									600	
53	Kan dag hat	D73 SKarol III	10.4	Ban Oak W.C.	Stagger ed Trenche s	400		400									400	
54	Kan dag hat	D74 SKarol IV	5.6	Ban Oak W.C.	Stagger ed Trenche s	200		200									200	
55	Kan dag hat	D75 SKarol V	19.2	Ban Oak W.C.	Stagger ed Trenche s	1000		1000									1000	
56	Kan dag hat	D77 SKarol VII	1.2	Ban Oak W.C.	Stagger ed Trenche s	200		200									200	
57	Kan dag hat	D78 SKarol VIII	4.8	Ban Oak W.C.	Stagger ed Trenche s	200		200									200	
58	Kan dag hat	D79 SDed	14.4	Ban Oak W.C.	Stagger ed Trenche s	800		800									800	
59	Kan dag hat	D99 SSalumna	23.2	Ban Oak W.C.	Stagger ed Trenche s	1000		1000									1000	

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
60	Kandaghat	D100 SDharot C-2	18.8	Ban Oak W.C.	Staggered Trenches	500		500									500	
61	Kandaghat	D101 SKuryali	19.6	Ban Oak W.C.	Staggered Trenches	500		500									500	
62	Kandaghat	D57 SKumhala	4.8	Chil W.C.	Staggered Trenches	200		200									200	
63	Kandaghat	D63 SKiarighat	23.6	Chil W.C.	Staggered Trenches	500		500									500	
64	Kandaghat	D68 SHathon	6	Chil W.C.	Staggered Trenches	300		300									300	
65	Kandaghat	D100 SDharot C-1	15.6	Chil W.C.	Staggered Trenches	400		400									400	
66	Kandaghat	D102 SBaran Ka Cheon C-1	5.6	Chil W.C.	Staggered Trenches	200		200									200	
67	Kandaghat	D102 SBaran Ka Cheon C-2	7.2	Chil W.C.	Staggered Trenches	200		200									200	
68	Kandaghat	D102 SBaran Ka Cheon C-3	6	Chil W.C.	Staggered Trenches	200		200									200	
69	Kandaghat	R20 SBisha	66	Ban Oak W.C.	Staggered Trenches	1500		1500									1500	
70	Kandaghat	D62 SBisha C-2	11.8	Ban Oak W.C.	Staggered Trenches	500		500									500	
71	Kandaghat	D62 SBisha C-3	19.1	Ban Oak W.C.	Staggered Trenches	800		800									800	
72	Solan	D125 SSheel ka Dhalla C-	12.4	Chil W.C.	Staggered	900 Rmt		900 Rmt									900 Rmt	

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
		1			Trenche s													
73	Sola n	D91 SBhawan ki Dhar	11.6	Chil W.C.	Stagger ed Trenche s	1000 Rmt		1000 Rmt									1000 Rmt	
74	Sola n	D93 SNandalNag ali	12.4	Chil W.C.	Stagger ed Trenche s	1000 Rmt		1000 Rmt									1000 Rmt	
75	Sola n	D94 SNandalDa mog	8.4	Chil W.C.	Stagger ed Trenche s	1000 Rmt		1000 Rmt									1000 Rmt	
76	Sola n	D96 SNagali-II	4	Chil W.C.	Stagger ed Trenche s	1000 Rmt		1000 Rmt									1000 Rmt	
77	Sola n	D97 SKiarTatool	4.4	Chil W.C.	Stagger ed Trenche s	1000 Rmt		1000 Rmt									1000 Rmt	
78	Sola n	R26 SNagali	33.6	Chil W.C.	Stagger ed Trenche s	2000 Rmt		2000 Rmt									2000 Rmt	
79	Sola n	D104 SKarol C-1	22.4	Ban Oak W.C.	Stagger ed Trenche s	900 Rmt		900 Rmt									900 Rmt	
80	Sola n	R27 SNauni C-2	55.6	Ban Oak W.C.	Stagger ed Trenche s	900 Rmt		900 Rmt									900 Rmt	
81	Sola n	R28 SKhaldhar C-3	34.8	PCR W.C.	Stagger ed Trenche s	1000 Rmt		1000 Rmt									1000 Rmt	
82	Sola n	R28 SKhaldhar C-2b	12	PCR W.C.	Stagger ed Trenche s	500 Rmt		500 Rmt									500 Rmt	
83	Sola n	D136 SKhaldhar	16	PCR W.C.	Stagger ed Trenche s	200 Rmt		200 Rmt									200 Rmt	
84	Sola n	D132 SCharar C-2	17.6	PCR W.C.	Stagger ed Trenche s	900 Rmt		900 Rmt									900 Rmt	

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
85	Solan	D132 SCharar C-5	18	PCR W.C.	Staggered Trenches	900 Rmt		900 Rmt									900 Rmt	
86	Subathu	D128 SKalikufar C-4	22.8	Chil W.C.	Staggered Trenches	9		9									9	
87	Dharampur	D176 SChiroti Ki Dhar-I	38	Chil W.C.	Staggered Trenches	1000rmt		1000rmt									1000rmt	
88	Dharampur	D177 SChiroti Ki Dhar	21.2	Chil W.C.	Staggered Trenches	800 rmt		800 rmt									800 rmt	
89	Dharampur	D178 SChiroti Ki Dhar C-1	42.3	Chil W.C.	Staggered Trenches	1000 rmt		1000 rmt									1000 rmt	
90	Dharampur	D178 SChiroti Ki Dhar C-2	29.1	Chil W.C.	Staggered Trenches	800 rmt		800 rmt									800 rmt	
91	Dharampur	D179 SShirgul Ka Tiba C-1	16	Chil W.C.	Staggered Trenches	600 rmt		600 rmt									600 rmt	
92	Dharampur	R39 SCharoti Ki Dhar	44.4	Chil W.C.	Staggered Trenches	1500rmt		1500rmt									1500rmt	
93	Dharampur	R 40 SBohli C-1	32	Chil W.C.	Staggered Trenches	600 rmt		600 rmt									600 rmt	
94	Dharampur	R40 SBohli C-2a	45.6	Chil W.C.	Staggered Trenches	2000 rmt		2000 rmt									2000 rmt	
95	Dharampur	D145 SChewakheelchunjari	12.4	Chil W.C.	Staggered Trenches	500 rmt		500 rmt									500 rmt	
96	Dharampur	D146 SChewakheelchunjari	47.2	Chil W.C.	Staggered Trenches	750 rmt		750 rmt									750 rmt	
97	Dharampur	D147 Skainthari	19.8	Chil W.C.	Staggered	200 rmt		200 rmt									200 rmt	

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
	pur	kana Dhyalag			Trenche s													
98	Dham pur	R38 Skiard C-1	29.6	Chil W.C.	Stagger ed Trenche s	1100 rmt		1100 rmt									1100 rmt	
99	Dham pur	D161 SSihardi C-2	32	Chil W.C.	Stagger ed Trenche s	1100 rmt		1100 rmt									1100 rmt	
100	Dham pur	D244 SCheola C-3	28.4	Chil W.C.	Stagger ed Trenche s	500 rmt		500 rmt									500 rmt	
101	Dham pur	D244 SCheola C-4	35.2	Chil W.C.	Stagger ed Trenche s	1100 rmt		1100 rmt									1100 rmt	
102	Dham pur	R37 SMaltoo C-2	28.6	Chil W.C.	Stagger ed Trenche s	1100 rmt		1100 rmt									1100 rmt	
103	Dham pur	R33 SGulhari C-1b	41.6	Chil W.C.	Stagger ed Trenche s	1000 rmt		1000 rmt									1000 rmt	
104	Dham pur	D151 SGulhari	42.8	Chil W.C.	Stagger ed Trenche s	900 rmt		900 rmt									900 rmt	
105	Dham pur	D152 SGulhari	8.8	Chil W.C.	Stagger ed Trenche s	400 rmt		400 rmt									400 rmt	
106	Dham pur	D153 SGulhari	5.2	Chil W.C.	Stagger ed Trenche s	500 rmt		500 rmt									500 rmt	
107	Dham pur	D115 SChabal ki Dhar	3.2	Chil W.C.	Stagger ed Trenche s	300 rmt		300 rmt									300 rmt	
108	Dham pur	D118 SChabal ki Dhar	10.4	Chil W.C.	Stagger ed Trenche s	400 rmt		400 rmt									400 rmt	
109	Dham pur	D119 SChabal ki Dhar	26.4	Chil W.C.	Stagger ed Trenche s	900 rmt		900 rmt									900 rmt	

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
110	Dham pur	R30 SChabal C-1	30.4	Chil W.C.	Stagger ed Trenches	1100 rmt		1100 rmt									1100 rmt	
111	Dham pur	R30 SChabal C-3	36	Chil W.C.	Stagger ed Trenches	1100 rmt		1100 rmt									1100 rmt	
112	Dham pur	R30 SChabal C-4	42	Chil W.C.	Stagger ed Trenches	800 rmt		800 rmt									800 rmt	
113	Dham pur	R30 SChabal C-5b	21.4	Chil W.C.	Stagger ed Trenches	550 rmt		550 rmt									550 rmt	
114	Dham pur	D180 SShirgul Ka Tiba C-1	26	Chil W.C.	Stagger ed Trenches	1100 rmt		1100 rmt									1100 rmt	
115	Dham pur	R31 SBarog C-3	42.8	PCR W.C.	Stagger ed Trenches	1500 rmt		1500 rmt									1500 rmt	
116	Dham pur	R31 SBarog C-7	50	PCR W.C.	Stagger ed Trenches	1500 rmt		1500 rmt									1500 rmt	
117	Dham pur	R44 SJhanai C-1	76.5	PCR W.C.	Stagger ed Trenches	1100rmt		1100rmt									1100rmt	
118	Dham pur	R44 SJhanai C-2	63.1	PCR W.C.	Stagger ed Trenches	600 rmt		600 rmt									600 rmt	
119	Dham pur	R43 SHalda C-3	74	PCR W.C.	Stagger ed Trenches	700 rmt		700 rmt									700 rmt	
120	Dham pur	D208 SSari	2.4	PCR W.C.	Stagger ed Trenches	500 rmt		500 rmt									500 rmt	
121	Dham pur	D210 SOdderjhan giriya	97.7	PCR W.C.	Stagger ed Trenches	800 rmt		800 rmt									800 rmt	
122	Dham pur	D211 SHalda	10	PCR W.C.	Stagger ed	1100 rmt		1100									1100	

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
2	pur				Trenche s			rmt									rmt	
123	Dham pur	D212 SHalda	16	PCR W.C.	Stagger ed Trenche s	500 rmt		500 rmt									500 rmt	
124	Dham pur	D217 SMeunSano g	43.2	PCR W.C.	Stagger ed Trenche s	400 rmt		400 rmt									400 rmt	
125	Dham pur	R40 SBohali C-2b	38	PCR W.C.	Stagger ed Trenche s	2000rmt		2000rmt									2000rmt	
126	Dham pur	D161 SSihardi C-1	10	PCR W.C.	Stagger ed Trenche s	100 rmt		100 rmt									100 rmt	
127	Dham pur	R35 SKadon	40.1	PCR W.C.	Stagger ed Trenche s	800 rmt		800 rmt									800 rmt	
128	Dham pur	R36 SAnji	10.4	PCR W.C.	Stagger ed Trenche s	400 rmt		400 rmt									400 rmt	
129	Dham pur	D244 SCheola C5	26.8	PCR W.C.	Stagger ed Trenche s	200 rmt		200 rmt									200 rmt	
130	Dham pur	R31 SBarog C-8a	24	Chil W.C.	Stagger ed Trenche s	1100 rmt		1100 rmt									1100 rmt	
131	Dham pur	D181 SShirguli ka tibba	25.12	Chil W.C.	Stagger ed Trenche s	1100 rmt		1100 rmt									1100 rmt	
132	Dham pur	D168 SKiarad	9.2	Chil W.C.	Stagger ed Trenche s	500 rmt		500 rmt									500 rmt	
133	Dham pur	D169 SKiarad C-1	27.6	Chil W.C.	Stagger ed Trenche s	750 rmt		750 rmt									750 rmt	
134	Dham pur	R32 Schunjari	67.6	Chil W.C.	Stagger ed Trenche s	1100 rmt		1100 rmt									1100 rmt	

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
135	Dham pur	D155 SBhallon	3.2	Chil W.C.	Stagger ed Trenches	150 rmt		150 rmt									150 rmt	
136	Dham pur	D163 SMaltoo	11.2	Chil W.C.	Stagger ed Trenches	400 rmt		400 rmt									400 rmt	
137	Dham pur	D244 SCheola C-1	24	Chil W.C.	Stagger ed Trenches	550 rmt		550 rmt									550 rmt	
138	Dham pur	D244 SCheola C-2	22.4	Chil W.C.	Stagger ed Trenches	550 rmt		550 rmt									550 rmt	
139	Dham pur	R37 SMaltoo C-1	21	Chil W.C.	Stagger ed Trenches	550 rmt		550 rmt									550 rmt	
140	Dham pur	R33 SGulhari C-2	34	Chil W.C.	Stagger ed Trenches	1100 rmt		1100 rmt									1100 rmt	
141	Dham pur	D116 SChabal ki Dhar	4.8	Chil W.C.	Stagger ed Trenches	350 rmt		350 rmt									350 rmt	
142	Dham pur	R30 SChabal C-2a	36.4	Chil W.C.	Stagger ed Trenches	800 rmt		800 rmt									800 rmt	
143	Dham pur	R30 SChabal C-2b	33.2	Chil W.C.	Stagger ed Trenches	1100 rmt		1100 rmt									1100 rmt	
144	Dham pur	R30 SChabal C5a	38.6	Chil W.C.	Stagger ed Trenches	800 rmt		800 rmt									800 rmt	
145	Dham pur	R30 SChabal C6	27.2	Chil W.C.	Stagger ed Trenches	1000 rmt		1000 rmt									1000 rmt	
146	Dham pur	D167 SGadiar.	23.2	Chil W.C.	Stagger ed Trenches	900 rmt		900 rmt									900 rmt	
147	Dham pur	R48 SKalth.C-4	32	Chil W.C.	Stagger ed	400 rmt		400 rmt									400 rmt	

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
7	pur				Trenche s													
148	Dham pur	D182 SKalth - III.	25.6	Chil W.C.	Stagger ed Trenche s	500 rmt		500 rmt									500 rmt	
149	Dham pur	D183 SKalth - IV.	36	Chil W.C.	Stagger ed Trenche s	300 rmt		300 rmt									300 rmt	
150	Dham pur	R48 SKalth.C-5	52.8	Chil W.C.	Stagger ed Trenche s	400 rmt		400 rmt									400 rmt	
151	Dham pur	R49 SGadiar.	31.2	Chil W.C.	Stagger ed Trenche s	900 rmt		900 rmt									900 rmt	
152	Dham pur	D202 SKalth _ II.C-2	16.4	Chil W.C.	Stagger ed Trenche s	1100 rmt		1100 rmt									1100 rmt	
153	Dham pur	D203 SQuila Ajmergarh.C -1	40	Chil W.C.	Stagger ed Trenche s	1100 rmt		1100 rmt									1100 rmt	
154	Dham pur	D175 SBohali C-2	11	PCR W.C.	Stagger ed Trenche s	200rmt		200rmt									200rmt	
155	Dham pur	D169 SKiarad C-2	12	PCR W.C.	Stagger ed Trenche s	400 rmt		400 rmt									400 rmt	
156	Dham pur	D139 SBanjni	4	PCR W.C.	Stagger ed Trenche s	100 rmt		100 rmt									100 rmt	
157	Dham pur	R48 SKalth.C-3	16	PCR W.C.	Stagger ed Trenche s	600rmt		600rmt									600rmt	
158	Dham pur	D203 SQuila Ajmergarh.C -2	43.6	PCR W.C.	Stagger ed Trenche s	400 rmt		400 rmt									400 rmt	
159	Dham pur	D202 SKalth _ II.C-1	12	PCR W.C.	Stagger ed Trenche s	500rmt		500rmt									500rmt	

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
160	Dharam pur	R48 SKalth.C-1	52.8	PCR W.C.	Staggered Trenches	300rmt		300rmt									300rmt	
161	Dharam pur	D204 STikari		PCR W.C.	Staggered Trenches	600 rmt		600 rmt									600 rmt	
162	Parwanoo	D185 SKurlajohri C-2	86.3	Chil W.C.	Staggered Trenches	135		135									135	
163	Parwanoo	D186 SKalth No V C-1	14.4	Chil W.C.	Staggered Trenches	135		135									135	
164	Parwanoo	D222 SBanasar Top	72.4	Chil W.C.	Staggered Trenches	125		125									125	
165	Parwanoo	D239 SSariDhar C-1a	12	Chil W.C.	Staggered Trenches	125		125									125	
166	Parwanoo	D239 SSariDhar C-1b	10.8	Chil W.C.	Staggered Trenches	125		125									125	
167	Parwanoo	D245 SSanawar C-1	12.4	Chil W.C.	Staggered Trenches	125		125									125	
168	Parwanoo	D245 SSanawar C-2	16.4	Chil W.C.	Staggered Trenches	145		145									145	
169	Parwanoo	D188 SKaralghat C-1	48.4	Chil W.C.	Staggered Trenches	125		125									125	
170	Parwanoo	D188 SKaralghat C-2	54.4	Chil W.C.	Staggered Trenches	125		125									125	
171	Parwanoo	D239 SSariDhar C-2	22.4	Chil W.C.	Staggered Trenches	125		125									125	
177	Parwanoo	D240 SDochi C-1	25.2	Chil W.C.	Staggered	115		115									115	

					Work details		Activities(ST- Staggered Trenches) Year Wise											
S. N o.	Ran ge	Name Of Forests	Are a (ha)	Worki ng Circle	Activit y	No. of ST (30cmx30cm x250cm)	1	2	3	4	5	6	7	8	9	10	Tot al	
2	oo				Trenche s													
173	Par wan oo	D242 SGahidhar C-2	20.8	Chil W.C.	Stagger ed Trenche s	225		225									225	
174	Par wan oo	D245 SSanawar C-3	16.8	Chil W.C.	Stagger ed Trenche s	225		225									225	
175	Par wan oo	R47 SKaralghat C-2	36	Chil W.C.	Stagger ed Trenche s	225		225									225	
176	Par wan oo	R57 SBanasar C-1a	48	Chil W.C.	Stagger ed Trenche s	225		225									225	
177	Par wan oo	R57 SBanasar C-1b	43.2	Chil W.C.	Stagger ed Trenche s	225		225									225	

Table 9.11: Year wise Proposed targets for construction of Van Sarovar-VS Water Pond-WP Farm Pond-FP

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise											
S. N o.	Rang e	Name Of Forests	Are a(ha)	Workin g Circle	Activity	No. of WP/FP/ VS	1	2	3	4	5	6	7	8	9	1 0	To tal	
1	Chail	D39 SDhamdhar C-1	30.4	Chil W.C.	Van Sarovar	1			1								1	
2	Chail	D39 SDhamdhar C-2	30	Chil W.C.	Van Sarovar	1			1								1	
3	Chail	D47 SBirniShillai C-2	93.6	Chil W.C.	Van Sarovar	2			2								2	
4	Chail	D48 SBirniShillai C-1	36	Chil W.C.	Van Sarovar	1			1								1	
5	Chail	D42 SChabri C-1	47.6	Chil W.C.	Van Sarovar	1							1				1	
6	Chail	D42 SChabri C-2	40	Chil W.C.	Van Sarovar	1							1				1	
7	Chail	D43 SPowash	28.4	Chil W.C.	Van Sarovar	1							1				1	

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise											
S. N o.	Rang e	Name Of Forests	Are a(ha)	Workin g Circle	Activity	No. of WP/FP/ VS	1	2	3	4	5	6	7	8	9	1 0	To tal	
8	Chail	D44 SCheunth C-1	40.4	Chil W.C.	Van Sarovar	1							1				1	
9	Chail	D44 SCheunth C-2	40	Chil W.C.	Van Sarovar	1							1				1	
10	Chail	D45 STibbaKathet C-1b	24	Chil W.C.	Van Sarovar	1				1							1	
11	Chail	D47 SBirniShillai C-1	58.8	Chil W.C.	Van Sarovar	2				2							2	
12	Chail	D48 SBirniShillai C-3	12.4	Chil W.C.	Van Sarovar	1				1							1	
13	Chail	D52 SBhojdeen C-3a	18.4	Chil W.C.	Van Sarovar	1				1							1	
14	Chail	D52 SBhojdeen C-3b	58.4	Chil W.C.	Van Sarovar	1				1							1	
15	Chail	D51 SJhajhaKhariu n C-1	84	Ban Oak W.C.	Van Sarovar	2				2							2	
16	Chail	D51 SJhajhaKhariu n C-3	42.4	Ban Oak W.C.	Van Sarovar	1				1							1	
17	Chail	D52 SBhojdeen C-1	129.2	Ban Oak W.C.	Van Sarovar	1				1							1	
18	Chail	D52 SBhojdeen C-2	90	Ban Oak W.C.	Van Sarovar	2				2							2	
19	Chail	D49 Banjani C-2	22	Chil W.C.	Van Sarovar	1				1							1	
20	Chail	D45 STibbaKathet C-2a	16	Chil W.C.	Van Sarovar	2					2						2	
21	Chail	D45 STibbaKathet C-2b	22.4	Chil W.C.	Van Sarovar	1					1						1	
22	Chail	D46 Chaklain C-2	34.8	Chil W.C.	Van Sarovar	1					1						1	
23	Chail	R16 Chaklain C-1	28.4	Chil W.C.	Van Sarovar	1					1						1	
24	Chail	R16 Chaklain C-2	50.4	Deodar W.C.	Van Sarovar	2					2						2	
25	Kand aghat	R21SKarol C-1A	34.4	Ban Oak W.C.	Water Pond/Van Sarover	2				2							2	
26	Kand	R21SKarol C-	42	Ban	Water	2				2							2	

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise										
S. N o.	Rang e	Name Of Forests	Are a(ha)	Workin g Circle	Activity	No. of WP/FP/ VS	1	2	3	4	5	6	7	8	9	1 0	To tal
	aghat	1B		Oak W.C.	Pond/Van Sarover												
27	Kand aghat	R21SKarol C-1C	38.8	Ban Oak W.C.	Water Pond/Van Sarover	2				2							2
28	Kand aghat	R21SKarol C-2	58.4	Ban Oak W.C.	Water Pond/Van Sarover	2				2							2
29	Kand aghat	R21SKarol C-3A	39.6	Ban Oak W.C.	Water Pond/Van Sarover	2				2							2
30	Kand aghat	R21SKarol C-3B	32	Ban Oak W.C.	Water Pond/Van Sarover	2				2							2
31	Kand aghat	R21SKarol C-3C	34.4	Ban Oak W.C.	Water Pond/Van Sarover	2				2							2
32	Kand aghat	D58 SBasha	11.2	Ban Oak W.C.	Water Pond	1						1					1
33	Kand aghat	D62 SBisha C-1	49.1	Ban Oak W.C.	Water Pond	2						2					2
34	Kand aghat	D67 SSainj	12.8	Ban Oak W.C.	Water Pond	1						1					1
35	Kand aghat	D69 SPalhech I	22.4	Ban Oak W.C.	Water Pond	1						1					1
36	Kand aghat	D72 SKarol II	16.4	Ban Oak W.C.	Water Pond	1						1					1
37	Kand aghat	D73 SKarol III	10.4	Ban Oak W.C.	Water Pond	1						1					1
38	Kand aghat	D75 SKarol V	19.2	Ban Oak W.C.	Water Pond	1						1					1
39	Kand aghat	D79 SDed	14.4	Ban Oak W.C.	Water Pond	1							1				1
40	Kand aghat	D99 SSalumna	23.2	Ban Oak W.C.	Water Pond	1							1				1
41	Kand aghat	D100 SDharot C-2	18.8	Ban Oak W.C.	Water Pond	1							1				1
42	Kand aghat	D101 SKuryali	19.6	Ban Oak	Water Pond	1							1				1

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise											
S. N o.	Rang e	Name Of Forests	Are a(ha)	Workin g Circle	Activity	No. of WP/FP/ VS	1	2	3	4	5	6	7	8	9	1 0	To tal	
				W.C.														
43	Kand aghat	D57 SKumhala	4.8	Chil W.C.	Water Pond/Van Sarover	1							1				1	
44	Kand aghat	D63 SKiarighat	23.6	Chil W.C.	Water Pond	1							1				1	
45	Kand aghat	D100 SDharot C-1	15.6	Chil W.C.	Water Pond	1							1				1	
46	Kand aghat	D102 SBaran Ka Cheon C-1	5.6	Chil W.C.	Water Pond	1					1						1	
47	Kand aghat	D102 SBaran Ka Cheon C-2	7.2	Chil W.C.	Water Pond	1					1						1	
48	Kand aghat	D102 SBaran Ka Cheon C-3	6	Chil W.C.	Water Pond	1					1						1	
49	Kand aghat	D60 SBadoon Shikar	28.4	Ban Oak W.C.	Water Pond	2						2					2	
50	Kand aghat	D66 SKasauli	5.6	Ban Oak W.C.	Water Pond	1						1					1	
51	Solan	R25 SShahogBhadrog C-1	43.2	Ban Oak W.C.	Water Pond	3						3					3	
52	Solan	D83 SRajgarh C-2	62.8	Ban Oak W.C.	Farm Pond	3						3					3	
53	Solan	D126 SManlog C-3	14	Chil W.C.	Farm Pond	2			2								2	
54	Solan	D132 SCharar C-7	18.8	Chil W.C.	Farm Pond	2			2								2	
55	Solan	D89 SGadhog-I	9.2	Chil W.C.	Farm Pond	1			1								1	
56	Solan	D90 SGadhog-II	13.2	Chil W.C.	Farm Pond	2			2								2	
57	Solan	D92 SDeora	25.6	Chil W.C.	Farm Pond	2			2								2	
58	Solan	D95 SNagali-I	3.6	Chil W.C.	Farm Pond	1			1								1	
59	Solan	D98 SBhawan Ki Dhar	19.2	Chil W.C.	Farm Pond	2			2								2	
60	Solan	R24 SRajgarh C-1	42.8	Ban Oak W.C.	Farm Pond	3			3								3	
61	Solan	D-83 SRajgarh C-1	70.4	Ban Oak W.C.	Farm Pond	4			4								4	
62	Solan	R28 SKhaldhar	28.4	Chil W.C.	Water Pond	3				3							3	

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise										
S. N o.	Rang e	Name Of Forests	Are a(ha)	Workin g Circle	Activity	No. of WP/FP/ VS	1	2	3	4	5	6	7	8	9	1 0	To tal
63	Solan	D138 SKhaldhar	11.2	Chil W.C.	Water Pond	1				1							1
64	Solan	D104 SKarol C-1	22.4	Ban Oak W.C.	Water Pond	3				3							3
65	Solan	D105 SMathiya C-3	7.6	Ban Oak W.C.	Water Pond	1				1							1
66	Solan	R24 SRajgarh C-2	26	Ban Oak W.C.	Water Pond	2				2							2
67	Solan	R28 SKhaldhar C-4	10	PCR W.C.	Water Pond	1				1							1
68	Solan	D132 SCharar C-3	24	PCR W.C.	Water Pond	2				2							2
69	Solan	D132 SCharar C-9	12	PCR W.C.	Water Pond	3				3							3
70	Subat hu	D128 SKalikufar C-2	10.8	Chil W.C.	Water Pond	1				1							1
71	Subat hu	D134 SKothi C-1	63	Chil W.C.	Water Pond	1				1							1
72	Subat hu	D134 SKothi C-2	24.6	Chil W.C.	Water Pond	1				1							1
73	Subat hu	D112 SAlobra	54.4	PCR W.C.	Water Pond	1											1
74	Subat hu	D124 SKatiyara C-5	19.2	Chil W.C.	Water Pond	1				1							1
75	Subat hu	D127 SShashal C-2	19.2	PCR W.C.	Water Pond	1				1							1
76	Subat hu	D127 SShashal C-3	19.6	Chil W.C.	Water Pond	1				1							1
77	Subat hu	D128 SKalikufar C-1	21.2	Chil W.C.	Water Pond	1				1							1
78	Subat hu	D128 SKalikufar C-3	16.8	Chil W.C.	Water Pond	1				1							1
79	Subat hu	D133 SKoon	10.4	Chil W.C.	Water Pond	1				1							1
80	Subat hu	D110 SRAikot	34.8	PCR W.C.	Water Pond	1				1							1
81	Dhar ampu r	D158 SANji	11.2	Chil W.C.	Water Pond	1				1							1
82	Dhar ampu r	R31 SBarog C-4a	57.2	Chil W.C.	Water Pond	5				5							5

					Soil Work	Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise											
S. N o.	Rang e	Name Of Forests	Are a(ha)	Workin g Circle	Activity	No. of WP/FP/ VS	1	2	3	4	5	6	7	8	9	1 0	To tal
83	Dhar ampu r	R31 SBarog C-4b	28.8	Chil W.C.	Water Pond	4				4							4
84	Dhar ampu r	R31 SBarog C-5	62	Chil W.C.	Water Pond	5				5							5
85	Dhar ampu r	R31 SBarog C-6	51.6	Chil W.C.	Water Pond	5				5							5
86	Dhar ampu r	R31 SBarog C-8b	68	Chil W.C.	Water Pond	6				6							6
87	Dhar ampu r	D176 SChiroti Ki Dhar-I	38	Chil W.C.	Water Pond	4				4							4
88	Dhar ampu r	D178 SChiroti Ki Dhar C-2	29.1	Chil W.C.	Water Pond	4				4							4
89	Dhar ampu r	D179 SShirgul Ka Tiba C-1	16	Chil W.C.	Water Pond	3				3							3
90	Dhar ampu r	D179 SShirgul Ka Tiba C-2	13.6	Chil W.C.	Water Pond	3				3							3
91	Dhar ampu r	R40 SBohli C-2a	45.6	Chil W.C.	Water Pond	5				5							5
92	Dhar ampu r	R38 Skiard C-1	29.6	Chil W.C.	Water Pond	4				4							4
93	Dhar ampu r	D161 SSihardi C-2	32	Chil W.C.	Water Pond	4				4							4
94	Dhar ampu r	D165 SMaltoo	41.2	Chil W.C.	Water Pond	5				5							5
95	Dhar ampu r	R33 SGulhari C-1b	41.6	Chil W.C.	Water Pond	5				5							5
96	Dhar ampu r	D151 SGulhari	42.8	Chil W.C.	Water Pond	5				5							5
97	Dhar ampu r	D152 SGulhari	8.8	Chil W.C.	Water Pond	2				2							2
98	Dhar ampu r	D153 SGulhari	5.2	Chil W.C.	Water Pond					0							0
99	Dhar	D119 SChabal	26.4	Chil	Water Pond	3				3							3

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise										
S. N o.	Rang e	Name Of Forests	Are a(ha)	Workin g Circle	Activity	No. of WP/FP/ VS	1	2	3	4	5	6	7	8	9	1 0	To tal
	ampu r	ki Dhar		W.C.													
10 0	Dhar ampu r	R30 SChabal C-1	30.4	Chil W.C.	Water Pond	3				3							3
10 1	Dhar ampu r	R30 SChabal C-3	36	Chil W.C.	Water Pond	4				4							4
10 2	Dhar ampu r	R30 SChabal C-4	42	Chil W.C.	Water Pond	4				4							4
10 3	Dhar ampu r	R30 SChabal C-5b	21.4	Chil W.C.	Water Pond	3				3							3
10 4	Dhar ampu r	R41 SGulzar C-1	26.8	Chil W.C.	Water Pond	4				4							4
10 5	Dhar ampu r	R42 SAjmerGarh C-2	47.2	Chil W.C.	Water Pond	5				5							5
10 6	Dhar ampu r	D180 SShirgul Ka Tiba C-2	21.2	Chil W.C.	Water Pond	4			4								4
10 7	Dhar ampu r	R40 SBohali C-2b	38	PCR W.C.	Water Pond	4				4							4
10 8	Dhar ampu r	R35 SKadon	40.1	PCR W.C.	Water Pond	5				5							5
10 9	Dhar ampu r	R36 SANji	10.4	PCR W.C.	Water Pond	2				2							2
11 0	Dhar ampu r	D214 STiba Gulzar C-1	27.6	PCR W.C.	Water Pond	4				4							4
11 1	Dhar ampu r	D214 STiba Gulzar C-3	94.8	PCR W.C.	Water Pond	6				6							6
11 2	Dhar ampu r	D216 SBanogBhallo n	90	PCR W.C.	Water Pond	6				6							6
11 3	Dhar ampu r	R31 SBarog C-8a	24	Chil W.C.	Water Pond	3			3								3
11 4	Dhar ampu r	D171 SBhog Seri-II	5.6	Chil W.C.	Water Pond	1				1							1
11 5	Dhar ampu	D169 SKiarad C-1	27.6	Chil W.C.	Water Pond	3				3							3

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise											
S. N o.	Rang e	Name Of Forests	Are a(ha)	Workin g Circle	Activity	No. of WP/FP/ VS	1	2	3	4	5	6	7	8	9	1 0	To tal	
	r																	
11 6	Dhar ampu r	R32 SChunjari	67.6	Chil W.C.	Water Pond	5				5							5	
11 7	Dhar ampu r	D154 SDawnla	12.8	Chil W.C.	Water Pond	2				2							2	
11 8	Dhar ampu r	D159 SANji	3.6	Chil W.C.	Water Pond	1					1						1	
11 9	Dhar ampu r	R33 SGulhari C-1a	44	Chil W.C.	Water Pond	4			2	2							4	
12 0	Dhar ampu r	R33 SGulhari C-2	34	Chil W.C.	Water Pond	4			2	2							4	
12 1	Dhar ampu r	D150 SGulhari	4.4	Chil W.C.	Water Pond	1					1						1	
12 2	Dhar ampu r	D116 SChabal ki Dhar	4.8	Chil W.C.	Water Pond	1					1						1	
12 3	Dhar ampu r	R30 SChabal C-2a	36.4	Chil W.C.	Water Pond	5			2	2	1						5	
12 4	Dhar ampu r	R30 SChabal C-2b	33.2	Chil W.C.	Water Pond	5			2	2	1						5	
12 5	Dhar ampu r	R30 SChabal C-6	27.2	Chil W.C.	Water Pond	4			2	1	1						4	
12 6	Dhar ampu r	D167 SGadiar.	23.2	Chil W.C.	Water Pond	4			2	1	1						4	
12 7	Dhar ampu r	R48 SKalth.C-4	32	Chil W.C.	Water Pond	4			2	1	1						4	
12 8	Dhar ampu r	D182 SKalth - III.	25.6	Chil W.C.	Water Pond	4			2	1	1						4	
12 9	Dhar ampu r	D183 SKalth - IV.	36	Chil W.C.	Water Pond	3			1	1	1						3	
13 0	Dhar ampu r	R48 SKalth.C-5	52.8	Chil W.C.	Water Pond	5			2	2	1						5	
13 1	Dhar ampu r	R49 SGadiar.	31.2	Chil W.C.	Water Pond	4			2	1	1						4	

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise										
S. N o.	Rang e	Name Of Forests	Are a(ha)	Workin g Circle	Activity	No. of WP/FP/ VS	1	2	3	4	5	6	7	8	9	1 0	To tal
13 2	Dhar ampu r	D202 SKalth – II.C-2	16.4	Chil W.C.	Water Pond	3				1	1	1					3
13 3	Dhar ampu r	D203 SQuila Ajmergarh.C-1	40	Chil W.C.	Water Pond	5				2	2	1					5
13 4	Dhar ampu r	R42 SAjmerGarh C-1	35.6	Chil W.C.	Water Pond	4				2	1	1					4
13 5	Dhar ampu r	D175 SBohali C-2	11	PCR W.C.	Water Pond	3				1	1	1					3
13 6	Dhar ampu r	D166 SDhar C-2	50	PCR W.C.	Water Pond	6				2	2	2					6
13 7	Dhar ampu r	D139 SBanjni	4	PCR W.C.	Water Pond	1				1							1
13 8	Dhar ampu r	R48 SKalth.C-3	16	PCR W.C.	Water Pond	2				1	1						2
13 9	Dhar ampu r	D203 SQuila Ajmergarh.C-2	43.6	PCR W.C.	Water Pond	5				2	2	1					5
14 0	Dhar ampu r	D202 SKalth – II.C-1	12	PCR W.C.	Water Pond	2				1	1						2
14 1	Dhar ampu r	R48 SKalth.C-1	52.8	PCR W.C.	Water Pond	5				2	2	1					5
14 2	Dhar ampu r	D213 SKabaBhalon	107.6	PCR W.C.	Water Pond	8				3	3	2					8
14 3	Dhar ampu r	D214 STiba Gulzar C-2	19.2	PCR W.C.	Water Pond	2					1	1					2
14 4	Dhar ampu r	D215 SKaba	43.2	PCR W.C.	Water Pond	4				2	1	1					4
14 5	Dhar ampu r	D204 STikari	22.4	PCR W.C.	Water Pond	2					1	1					2
14 6	Dhar ampu r	R41 SGulzar C-2	102.4	PCR W.C.	Water Pond	5				2	2	1					5
14 7	Parw anoo	D185 SKurlajohri C-2	86.3	Chil W.C.	Water Pond	3				2	1						3
14	Parw	D186 SKalth	14.4	Chil	Water Pond	2				1	1						2

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise											
S. N o.	Rang e	Name Of Forests	Are a(ha)	Workin g Circle	Activity	No. of WP/FP/ VS	1	2	3	4	5	6	7	8	9	1 0	To tal	
8	anoo	No V C-1		W.C.														
149	Parw anoo	D222 SBanasar Top	72.4	Chil W.C.	Water Pond	5				3	2						5	
150	Parw anoo	D239 SSariDhar C-1a	12	Chil W.C.	Water Pond	2				1	1						2	
151	Parw anoo	D239 SSariDhar C-1b	10.8	Chil W.C.	Water Pond	2				1	1						2	
152	Parw anoo	D245 SSanawar C-1	12.4	Chil W.C.	Water Pond	1				1	0						1	
153	Parw anoo	D245 SSanawar C-2	16.4	Chil W.C.	Water Pond	2				1	1						2	
154	Parw anoo	D190 SJabrog	87.6	PCR W.C.	Water Pond	2				1	1						2	
155	Parw anoo	D230 SJangeshu C-1	39	PCR W.C.	Water Pond	4				2	2						4	
156	Parw anoo	D230 SJangeshu C-2	48.6	PCR W.C.	Water Pond	3				2	1						3	
157	Parw anoo	D234 SRanigaun	72	PCR W.C.	Water Pond	2				1	1						2	
158	Parw anoo	D235 SChamgah	52.8	PCR W.C.	Water Pond	2				1	1						2	
159	Parw anoo	D240 SDochi C-6	28.4	PCR W.C.	Water Pond	2				1	1						2	
160	Parw anoo	R56 SParwanoo C-1	33	PCR W.C.	Water Pond	2					2						2	
161	Parw anoo	R56 SParwanoo C-2	91	PCR W.C.	Water Pond	2			1		1						2	
162	Parw anoo	D188 SKaralghat C-1	48.4	Chil W.C.	Water Pond	2			1		1						2	
163	Parw anoo	D188 SKaralghat C-2	54.4	Chil W.C.	Water Pond	2			1		1						2	
164	Parw anoo	D239 SSariDhar C-2	22.4	Chil W.C.	Water Pond	2			1		1						2	
165	Parw anoo	D240 SDochi C-1	25.2	Chil W.C.	Water Pond	2			1		1						2	
166	Parw anoo	D242 SGahidhar C-2	20.8	Chil W.C.	Water Pond	2			1		1						2	
167	Parw anoo	D245 SSanawar C-3	16.8	Chil W.C.	Water Pond	2			1		1						2	
168	Parw anoo	R47 SKaralghat C-2	36	Chil W.C.	Water Pond	2			1		1						2	

					Soil Work		Activities(Van Sarovar-VS Water Pond-WP Farm Pond-FP) Year Wise											
S. N o.	Rang e	Name Of Forests	Are a(ha)	Workin g Circle	Activity	No. of WP/FP/ VS	1	2	3	4	5	6	7	8	9	1 0	To tal	
16 9	Parw anoo	R57 SBanasar C-1a	48	Chil W.C.	Water Pond	2			1		1						2	
17 0	Parw anoo	R57 SBanasar C-1b	43.2	Chil W.C.	Water Pond	2			1		1						2	

9.15 Implementation

The above mentioned soil and water conservation works should be planned and designed after detailed survey of the field conditions. The design and dimensions of the structures should be on the basis of the site conditions and technical design should be approved by ACF after field visit. Generally, check dams with an average height of about 60 to 90 cm are to be preferred. However, the actual dimensions will depend on specific site conditions. Firm anchorage to the gully bottom and sides is essential so as to prevent undercutting or cutting of the sides. In order to avoid undue concentration of water at the overfall spillways should be made as broad as possible. Undercutting at the overfall is to be prevented by providing an apron built of rocks, logs or brush wood. Staggered trenches should be carefully planned and located. These should be laid perfectly along contour lines; otherwise, these may add to runoff and soil erosion. Van-sarovar, Water ponds and farm ponds should be planned after a detailed field survey. Their location is of utmost importance. These should be carefully located where they can collect maximum runoff and should necessarily have sufficient catchment for rainwater harvesting. Their water storage capacity should accordingly be designed. They can be designed in trapezium, rectangular, oval or circular shapes. Wherever possible the mechanical structures should be complimented with appropriate vegetative measure.

9.16 Monitoring and Evaluation

Monitoring and evaluation of soil conservation works in the forest areas should be carried out as part of standard management practices. This would provide a touchstone for the efficacy of the works carried out and also provide important inputs for planning future interventions. The data pertaining to rainfall, run off and sediment is required. Monitoring and evaluation works can be carried out as under:

- Silt observation posts are to be provided at strategic locations to monitor silt discharge.
- Ascertaining the flow of benefit to the stakeholders in terms of land protected, increase in production and improvement in moisture regime, etc.
- Irrigation potentials created and utilised
- Protection provided by structures and storage works.
- Returns from areas treated
- Overall benefit-cost analysis

Soil and water conservation activities play a very significant role in the development and conservation of biodiversity. These activities should always be integrated into the management practices of areas under different working circles. With a view to deriving optimum benefits from the limited resources available, the implementation of the programme needs to be targeted to areas that are highly prone to erosion, as have been identified by AISLUS. Since the process of erosion and land degradation is dynamic, timely restoration measures should be taken up in conformity with the field conditions. The DFO should take steps to ensure adoption of proper land use and land conservation practices in such tons priority watershed.

Chapter 10

Ecotourism (Overlapping) Working Circle

10.1 General Constitution

The WC is looking into the aspects that are related to increasing the potential for sustainable eco-tourism development and strengthening people's participation in forest management and utilization in one hand and capacity building aspects of field functionaries on another hand. MoEF & CC vide its letter no. F.No. 1-57/2014 WL (part-8) dated 29.10.2021 has issued "Guidelines for sustainable Ecotourism in forest and wildlife areas-2021". In these guidelines it is mentioned that

"Ecotourism shall be promoted on the basis of science-based planning. The plan shall form part of the duly approved Working Plan or Management Plan or Conservation Plan of the forest of wildlife area as the case may be, and shall include the carrying capacity analysis-based description of the eco-tourism site, time, duration, route, mode of travel and number of persons for visitations, and any support infrastructure needed"

Recently The Forest (Conservation) Amendment Act, 2023 has provided vide amendment to Section 2 of the principal act that breaking or clearing of any forestland or portion thereof for *Eco-tourism facilities included in the Forest Working Plan or Wildlife Management Plan or Tiger Conservation Plan or Working Scheme of that area* will not be a non-forestry activity and will not attract provisions of FCA, 1980.

10.2 Eco-tourism

According to the United Nations World Tourism Organization (UNWTO), Eco-tourism refers to forms of tourism which have the following main characteristics:

- All nature-based forms of tourism in which the main motivation of the tourists is the observation and appreciation of nature as well as the traditional cultures prevailing in natural areas.
- It contains educational and interpretation features.
- It minimises negative impacts upon the natural and socio-cultural environment.

Globally, ecotourism has been recognized as an influential tool for conservation of forests, biodiversity/ wildlife and scenic landscapes. It does so by creating sustainable alternative livelihoods for forest-dependent communities and by generating conservation awareness among the masses and decision-makers. In order to strengthen community control and management of the forests, it is important to generate a sustainable flow of non-extractive financial benefits of forests for the communities, to ensure that the communities take interest in the conservation of forests and wildlife.

The Eco-Tourism Policy in the state was first introduced in 2001 and has been revised several times, including in 2005, 2016, 2017 and 2024. A master plan for ecotourism activities has also been prepared for Himachal Pradesh in September 2024. The Himachal Pradesh Eco-Tourism

Society (HPECOSOS) is responsible for regulating and monitoring eco-tourism activities to ensure compliance with the policy.

The Eco-Tourism Policy of Himachal Pradesh developed and revised multiple times, aims to promote responsible tourism while benefiting local communities and the environment. The revised eco-tourism policy 2024 focuses on bringing tourists closer to nature, diversifying tourist destinations, and creating livelihood opportunities in rural areas. The policy also emphasizes environmental protection and conservation. By involving local communities, the policy would help in increased livelihood opportunities as well as their involvement in awareness building, protection and conservation.

The “Guidelines on Sustainable Eco-Tourism in Forest and Wildlife Areas” issued by the Ministry of Environment, Forests and Climate Change of the Government of India in 2021 seeks to achieve the following objectives:

- i. Promote low impact nature tourism which ensures ecological integrity of the ecotourism sites and its environment;
 - ii. Promote biodiversity, traditional ecological knowledge and heritage values of India’s wilderness;
 - iii. Promote engagement of local communities in nature tourism in a manner that enriches local economy and encourages sustainable use of indigenous materials through financially viable value chains thereby helping such local communities become “Atma Nirbhar”
 - iv. Promote partnerships amongst stakeholders for mobilising resources and developing and promoting nature tourism, as well as equitable sharing of benefits.
 - v. Enhancing the potential of India as a global eco-tourism destination
- The vision, mission, goal and objectives of promoting ecotourism activities in the State are:

10.2.1 VISION

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.

10.2.2. MISSION The mission is to make Himachal Pradesh a leading Eco-tourism destination, with attracting at least 10% of overall tourists visiting the State by the year 2030 at ecotourism destinations.

10.2.3 GOAL The goal is to promote better understanding of nature and wildlife conservation while generating income and opportunities for the local communities.

10.2.4 OBJECTIVES The following are the broad objectives of the Eco-tourism:

- i. Adopting low impact nature tourism which ensures ecological integrity.
- ii. Promoting biodiversity richness and heritage values of State's wilderness.
- iii. Engaging local communities and developing mechanisms with a view of enriching the local economy and promoting sustainable use of indigenous materials Eco-Tourism

related providing interpretation & education to the visitors.

iv. Establishing partnerships with all stakeholders for developing and promoting nature tourism.

10.3 Guiding Principles for Ecotourism

The guiding principles are laid down by Ministry of Environment, Forest and Climate Change for the development of Ecotourism which are as under:

- a) Eco-tourism planning
- b) Eco-tourism zoning
- c) Resource mobilization and community participation
- d) Eco-tourism site development
- e) Inter-sectoral synergy
- f) Promoting Eco-tourism entrepreneurship.

Further the following principles formed the basis of the Eco-tourism policy 2024 approved by the state cabinet vide Memorandum Item No. 24 on dated 22-10-2024: -

- Design, develop and operate low-impact facilities
- Focus on high ended tourists through High value, low volume eco-tourism
- Provide positive experience for both visitors and host.
- Build environmental and cultural awareness and respect
- Minimize physical, social and behavioural impacts
- Provide direct financial benefits for conservation and livelihood opportunities to local communities.
- Deliver memorable interpretative experiences to visitors
- Recognize the rights and spiritual beliefs of the local people
- All eco-tourism activities shall be in conformity with the applicable laws and regulations including but not limited to the provisions of the H.P. Eco-tourism policy, MOE& CC Guidelines on Eco-tourism in forests and wildlife areas-2021, The Van Sanrakshan Evam Samvardhan Rules 2023, Environment Protection act 1986, Wildlife protection act 1972, Scheduled tribes and other Traditional Forest Dwellers Recognition of Forest Rights Act 2006.

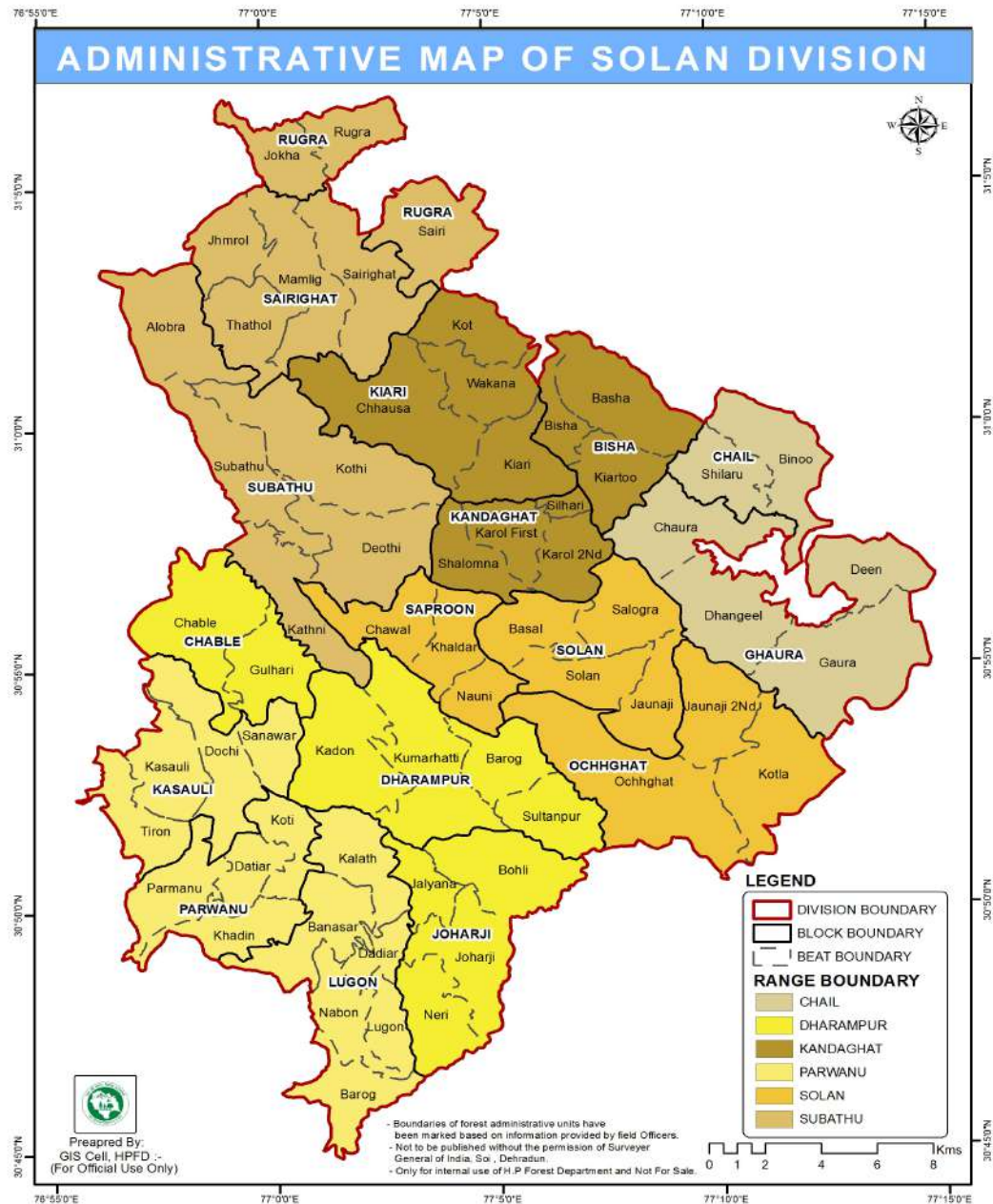
10.4 Eco-tourism potential in Solan forest division

Solan forest division has different forest types spreading from the Parwanoo range in the Shiwalik foothills to the high-altitude Chail range. Due to the proximity to Chandigarh, Punjab and Haryana, there is immense scope of ecotourism in this division. Every year tourists visit these areas for its scenic beauty. A vast majority of tourists visiting these states are primarily interested in enjoying nature in its pristine serenity.

At present following sites/FRHs are being managed under H.P. ECOSOC:

1. FRH Garkhal (Kasauli)
2. FRH Kumarhatti

These rest houses can be booked online /offline through HPECOSOC web portal. Other FRH's will be included under the umbrella of HPECOSOC in the future once the desired facilities are put up in place after taking necessary approval from State/Circle ECOSOC.



The following eco-tourism sites have been identified in Solan Forest Division which holds potential for sustainable management and development of eco-tourism activities:

Table 10.1: Sites identified for Eco-Tourism in Solan Forest Division

S. No.	Name of Range	Name of beat	Name of site	Area (ha.)	Carrying capacity (tourists/day)	Proposed potential Business model/activities
1	Chail	Deen	D-52 Bhojdeen C2	0.9	50-60	• Tenting and camping site. • Sunset view-point. • Roadside site on Chail- Nagali Road. • Light and water connection facility available nearby • Nearby tourist attractions include Kali ka Tibba temple, Chail Palace, Highest cricket ground, Baba balak nath temple.
2	Chail	Binnu	D-50 Sakori	0.8	50-60	• Tenting and camping site. • Sunset view-point. • Roadside site on Solan- Chail road. • Light and water connection facility available
3	Kandaghat	Karol -1st	R-21 Karol C1 a	0.5	15-20	• Camping site near Tikker village around 1 km away on link road from main Shimla – Kalka National Highway • Water and light facility available. • Nearby attractions include Pandav Guffa, Radha krishan temple,

						Shikhar ki devi temple, dense oak forests.
4	Solan	Jaunaji 2nd	R-24 Rajgarh C1, C2	0.4	20-25	• Trekking route upto historical Gorkha fort • Tenting and camping at historical Gorkha fort. • Sunset view point • Water will be lifted from IPH tank around 800-900 m away. • Electricity facility available from nearby area.
5	Subathu	Serighat	Serighat	1	30	• Tenting and camping site • Site on road • Water and electricity facility available from nearby area. • Adjoining to FRH Serighat
6	Dharampur	Chabbal	R-30 Chabbal ki Dhar	0.9	35	• Tenting & camping • Water and light facility available nearby. • Adjacent to Garkhal Shaktighat road. • Nearby tourist attraction include temple dhar ka devta and baba balak nath temple at Garkhal
7	Dharampur	Joharji	R-41 Gulzar C1	1	80	• Tenting & camping site • Site on Shimla-

						Nahan road approximately 15 km from kumarhatti and 3 km from Joharji. • Water and light facility available nearby.
8	Dharampur	Kumarhatti	R-32 Chunjari Chewa	1	70	• Tenting & camping site • Around 4 km on Solan Barog road from Solan and 1.2 km on nagali to chewa link road. • Water and light facility available. • Nearby tourists attractions include Shiv dhang and caves on top.
9	Dharampur	Sultanpur	R-31 Barog C5 & C7 SShivdhar	1	45	• Tenting & camping site • On Shimla Kalka National Highway at Mashon • Water and light facility available. • Nearby tourist attractions include old Shiv temple
10	Dharampur	Gulhari	R-33 C1 Gulhari Motikona	1	45	• Tenting & camping site • Water and light facility available nearby. • On Sukhi Johari to Kasauli road approximately 5 km from Shimla Kalka National highway.
11	Dharampur	Barog	Swarnim	0.4	60	• Temporary

			Vatika Shamlech			camping site • On Shimla Kalka NH 05 at Shamlech Solan • Water and light facility available nearby.
12	Parwanoo	Kasauli	Sunset View point Mashobra	1	60	• Tenting and camping site • Sunset view point • On Parwanoo-Kasauli road via Jangeshu • Water and light facility available nearby. • Nearby tourist attractions include Kasauli market, Kasauli church and monkey point.
12	Parwanoo	Sanawar	Nirvana Nature Park	1	30	• Tenting and camping site • Eco-trail • On Shimla-Kalka National highway 500 metres from Kasauli Chawk.. • Water and light facility available nearby.

The list of the sites and the activities identified as detailed above is indicative and can be changed with the approval of the Circle Level ECOSOC. In addition to this Government can provide sites on PPP mode if required after getting necessary approvals and sites can be provided to entrepreneur's/ PPP mode for temporary use/for temporary structures as per revised ecotourism policy of state.

In addition to above there are some potential trek routes existing under Solan Forest Division. These routes area being used by the tourists to explore the natural beauty and the amazing landscapes available. Some of these routes are also used by local villagers for pilgrimage to the local deity. A list of the various trek routes under Solan Forest Division is as under:

Table 10.2: Sites identified for Eco-Tourism for trekking in Solan Forest Division

S. No	Name of Range	Name of Trekking route	Distance in Km To and Fro distance	Favorable trekking season	Maximum no of trekkers per day allowed
1	Solan	Nagali to Gorkha Fort & back	2	April to June & October to January	55
2	Solan	Chambaghat to Shikhar Ki Devi Temple Karol & back	8	March to June & September to December	40
3	Solan	Galahan to Damkari & back	5	March to June & September to December	50
4	Kandaghat	Dedgharat to Khurbi devi & back	24	March to June & September to December	140

The Circle ECOSOC will identify such trekking routes in future and promote/augment to ecotourism in the area to provide livelihood opportunities to the local community. These routes will be managed through EDC's created in the area and will maintain/regulate by charging the minimum fee from the trekkers/tourism as per the rate approved by the Circle ECOSOC.

EDC's will be registered under societies Registration Act 2006 and all the EDCs in the division will work under the umbrella of Circle ECOSOC

10.5 Carrying Capacity Analysis and Impact Assessment

For sustainable ecotourism carrying capacity of visitors and vehicles those may be allowed to enter inside the identified area will be assessed and ceiling on member of visitors/vehicles will be fixed. Carrying capacity assessment will include:

- ✓ Number of persons visiting the site
- ✓ No. of vehicles entering the site
- ✓ Infrastructure
- ✓ Duration of the visit
- ✓ Duration of exposure of site to ecotourism activities.

Carrying Capacity = Area used by the tourist /Average Individual Standard

The average individual standard (often measured in square meter per person) is the space a tourist requires for an acceptable experience in an area, which will vary depending on the area, activity and management. The total number of allowed daily visits is then obtained by multiplying carrying capacity and Rotation Coefficient.

Where Rotation Coefficient = No. of daily hours' area is open for tourist's/ Average time of visit

Another way of setting carrying capacity limits is by examining in hindsight is the impact of visitors on the area in question. In other words, when managers observe a level of use above which degradation ensued, that level becomes the carrying capacity. For calculation of carrying capacity of each ecotourism site, the data w.r.t. no. of visitors/tourist visiting the particular site is required. Solan Forest Division has sought these details from the District Tourism Development Office. The carrying capacity of each ecotourism site will be calculated on the basis of this data.



Gorkha Fort, An eco-tourism site in R24 Rajgarh

Estimation of Carrying Capacity of Trekking Route (Model Calculation, Trek Path to Gorkha Fort 2 KM)

The estimation of Physical, real and effective carrying capacities has been assessed by using Cifuentes's methodology (Cifuentes 1992) which was suggested by the IUCAN (Ceballos- Lascurain 1996). The logic of the method is based on the site specific factors which reduce the level and quality of visitation and which are considered as the limitation of the area.

According to the methodology, the **Physical carrying capacity (PCC)** is defined as "the maximum number of visitors that can physically fit into a defined space, over a particular time" and formulated as follows:

$$PCC = A \times V/a \times R_f$$

Where A is the available area for public use, V/a is one visitor per 2 m², and R_f is the rotation factor (number of permissible visits per day) which is formulated as:

$$R_f = (\text{Opening period} / \text{average time of one visit.})$$

The characteristics of the trek related to PCC are: the two-way visitor flow on the

trails; linear length per visitor is 1.0m; total length of the trail is 2000m; average visitation time is 3 hours; trek is open 6 hours a day; maximum group size is 20 people; and minimum evaluative distance between the groups is 50 m.

Therefore $R_f = 6 / 3 = 2$ Visit

Twenty groups each consisting of 10 visitors can fit into the trek's total 2,000 m length with 200 m distance between them $[(20 \times 10) + (9 \times 200) = 2000 \text{ m}]$. Theoretically 20 groups are assumed to be visiting the site simultaneously. Therefore, the available area for the visitors is 200 m $(20 \times 10 = 200 \text{ m})$ and the PCC is calculated as:

$$\text{PCC} = 200 \times .5 \times 2 = \mathbf{200 \text{ visitors/day}}$$

This means that 200 visitors physically (and theoretically) can trek per day. However, it is practically impossible to admit this number of visitors in one day. The PCC only provides a base level to calculate the real carrying capacity.

Real carrying capacity (RCC) is defined as "the maximum permissible number of visits to a site, once the corrective (i.e. reductive) factors derived from the particular characteristics of the site have been applied to the PCC" and expressed by the following general formula where Cf is a corrective factor:

$$\text{RCC} = \text{PCC} - \text{Cf}_1 - \text{Cf}_2 - \dots - \text{Cf}_n$$

The following formula better explains the RCC with corrective factors in percentages:

$$\text{RCC} = \text{PCC} \times (100 - \text{Cf}_1) / 100 \times (100 - \text{Cf}_2) / 100 \times \dots \times (100 - \text{Cf}_n) / 100$$

Corrective factors are closely linked to the specific conditions and characteristics of each site and obtained by bio-physical, environmental, ecological, social and management variables. They are expressed in percentages as:

$$\text{Cf} = \text{Ml} / \text{Mt} \times 100$$

Where, Cf is the corrective factor, Ml is the limiting magnitude of the variable, and Mt is the total magnitude of the variable.

In case of this particular trek, rainfall & snowfall, erosion, accessibility and disturbance to wildlife are identified as the corrective factors (Cf) which limit the trekking on this route.

Rainfall & Snowfall: The eroded stones and the mud on trails can be very slippery particularly during rainy weather. Also mist in the air decreases the quality of photographs or videos to be taken. Further the trek route is inaccessible due to snow cover for the period of 15th December to 30 January. Limiting magnitude is calculated as 135 days/year (90 rainy days + 45 days of snow cover). The rainfall and snowfall correction factor (C_{frs}) is calculated as:

$$C_{\text{frs}} = 135 / 365 \times 100 = 39.98\%$$

Erosion: The erosion of trails is considered as a corrective factor as the main activity is trekking. In particular, steep trail sections have been subjected to erosion due to recreational use. The erodibility of any place by visitor use varies with slope range and soil types. This particular trail has 330 m section as high erosion risk and soil type is generally lime to sand. Limiting magnitude is 330 m and total magnitude is 2000m. The erosion corrective factor (C_{fe}) is calculated as:

$$C_{fe}=330 /2,000\times100= 16.5\%$$

Accessibility: Accessibility is related with the degree of difficulty of the longitudinal trail slope for hiking or trekking. In general, slopes more than 20% decrease the average walking rate and increase the difficulty in the urban context (HarrisandDines1998). The trail sections that

have less than 20% slope were considered reasonable and comfortable for trekking. Thus, slopes over 20% were used as the limiting magnitude (250 m).

The accessibility corrective factor (C_{fa}) is calculated as:

$$C_{fa}=250/ 2000 \times 100= 12.5\%$$

Disturbance to wildlife: This particular trek has a wide variety of birds. Overuse of the trek and uncontrolled behavior of visitors cause problems particularly during the mating and nesting season of the birds. Thus disturbance to wildlife is considered as a limiting factor. The mating season for the bird species April-May (2 months); so the limiting magnitude is a total of 2 months and total magnitude is 12 months. The disturbance to wildlife corrective factor (C_{fw}) was calculated as:

$$C_{fw}=2 /12\times100 = 16.66\%$$

Finally RCC is calculated by converting four corrective factors into coefficients as follows:

$$RCC = \frac{200 \times (100-39.98)}{(100-16.66)} \times \frac{100 \times (100-16.5)}{100} \times \frac{100 \times (100-12.5)}{100} \times \frac{100 \times (100-16.66)}{100} = 71 \text{ visitors /day.}$$

Effective carrying capacity (ECC) is defined as "the maximum number of visits that a site can sustain, considering the management capacity (MC)" and formulated as:

$$ECC =RCC \times MC$$

The management capacity of this particular trek is around 80%. Therefore effective carrying capacity of this trek is calculated as:

$$ECC=71 \times 0.8 = 57 \text{ visitors /day}$$

Estimation of Carrying capacity of Eco-tourism site
(Model Calculation, Proposed Eco-tourism Site – Nirvana Nature Park, Sanawar Forest)



The proposed eco-tourism site of 1 hac “**Nirvana Nature Park**” is located in **Forest Compartment D-245 Sanawar C-4** of Sanawar Beat under Parwanoo Forest Range, Solan Forest Division. The site consists of Chir Pine (*Pinus roxburghii*) forest, open clearings, gentle slopes and scenic viewpoints. This location is suitable for developing a **family-friendly, low-impact recreation zone**, different in nature from the Mashobra Sunset Viewpoint.

The site has potential for activities like **picnic, meditation, open gym, selfie point, nature trail, flower garden and seasonal shallow water pool**. However, the area lies in a **highly fire-prone pine belt** and is adjacent to a **landslide-prone slope near the National Highway**, requiring strict safety planning.

The eco-tourism model proposed here focuses on **controlled visitor numbers**, safe infrastructure, minimal construction and community involvement.

Accessibility and Visitor Route

- **Range:** Parwanoo
- **Beat:** Sanawar
- **Compartment:** D-245 Sanawar C-4
- **Total area:** 1.0 hectare (10,000 m²)
- **Usable area:** 6,000 m² (after excluding fire sensitive belt, slope edges and landslide danger zone)

Access:

Approachable from the National Highway and turn from Kasauli Chawk towards Sanawar, followed by a short forest access path.

Permissible Activities

- Picnic
- Open Gym
- Open Shallow Water Pool (seasonal)
- Selfie Point with eco-board “I LOVE HIMACHAL FOREST”
- Meditation Zone under pine canopy
- Flower Garden / Pollinator Patch
- Short Nature Trail
- Pre-fabricated eco-toilets

High-intensity, loud or night-time activities will be prohibited.

Proposed Infrastructure (Low-Impact)

- Entry Gate and Information Signage
- Ticket Counter / Entry Kiosk
- Dustbins with waste segregation
- Eco-friendly Toilet Unit
- Open Gym Equipment (6–8 units)
- Shallow Water Pool (stone-lined, safe design)
- Selfie Point Structure
- Flower Garden Beds
- Sitting Logs, Wooden Benches
- Nature Trail
- Railing/Fencing near landslide-prone edges
- Dedicated Fire-Fighting Tool Box (beat tools)

Carrying Capacity Assessment**1. Physical Carrying Capacity (PCC)**

Formula:

$$PCC = A \times (V/a) \times Rf$$

Where:

A = Usable area (m²)

V/a = Visitors per m²

Rf = Rotation factor

Values:

- A = 6,000 m²
- Visitor density = 1 visitor per 2 m²
→ V/a = 0.5 visitors/m²
- Opening hours = 7 hours (10 AM–5 PM)
- Average stay = 2 hours
→ Rotation factor Rf = 7 / 2 = 3.5

Calculation:

$$PCC = 6,000 \times 0.5 \times 3.5$$

$$PCC = 10,500 \text{ visits/day}$$

2. Real Carrying Capacity (RCC)

$$RCC = PCC \times (100 - CF1)/100 \times (100 - CF2)/100 \times (100 - CF3)/100$$

Corrective Factors:

- CF1: Fire Sensitivity of Pine Forest = 80%
- CF2: Landslide and Highway Safety Risk = 70%
- CF3: Flower Garden Protection + Water Pool Sensitivity = 55%

Calculation:

$$RCC = 10,500 \times 0.20 \times 0.30 \times 0.45$$

$$RCC = 10,500 \times 0.027$$

$$RCC = 283.5 \approx 284 \text{ visitors/day}$$

3. Effective Carrying Capacity (ECC)

$$ECC = RCC \times \text{Management Capacity Factor}$$

Because the site involves multiple zones (gym, pool, garden) and fire/highway hazards, a **Management Capacity Factor of 0.10 (10%)** is used.

Calculation:

$$ECC = 284 \times 0.10$$

$$ECC = 28.4 \approx 30 \text{ visitors/day}$$

★ Recommended Effective Carrying Capacity

➤ 60 visitors per day

This aligns with safety, fire risk, landslide risk, and manageable visitor flow.

Fire Protection Plan – Sanawar Site

1. Fire Prevention

- Removal of dry pine needles during fire season.
- Creation of fire lines around activity zones.
- No fire, no smoking, no cooking signage.
- Seasonal closure during extreme fire alert.

2. Fire Detection

- Regular patrolling by Beat staff.
- Community watch involvement.
- Visibility monitoring near NH.

3. Fire Control

- Fire beaters, rakes, blowers, water drums in a tool box.
- Quick-response support from adjoining beats.

Landslide & Highway Safety Plan

- Fencing/railing along slope edges.
- 10–15 m safety buffer from vulnerable slope.
- “Landslide-Prone Area — Entry Prohibited” signage.
- Seasonal inspection after monsoon.
- Nature Trail routed only in stable ground zone.

Implementation Strategy

Short-Term

- Entry gate, dustbins, signage, safety fencing
- Ticket counter
- Gym installation
- Fire line creation
- Tool box placement

Medium-Term

- Flower garden development
- Water pool construction
- Weekly cleanliness drive
- Training of staff for fire control

Long-Term

- Annual carrying capacity review
- Regular monitoring of slope condition
- Community partnership for café or selfie point maintenance

10.6 Ecotourism Strategies

The ecotourism strategy for all the sites being run and the sites which have been identified/additional sites will be in consonance with Ecotourism Policy of Himachal Pradesh, 2024 notified vide HP Notification No. FFE-B-C (15)-1/2024 dated 29.10.2024. A step wise strategy which helps in preparing site specific Ecotourism Plan will be followed for each site- and site-specific Ecotourism Development and management plan will be prepared. A model strategy comprises of the following components:

10.6.1. Institutional arrangements:

Himachal Pradesh Eco-Tourism Society (HP ECOSOC), registered vide No. 422 dated 30-06-2006 under the Registration rules of Societies Act 1860 to assist in delivering the mission and objectives of the policy.

Composition of the Governing Body of HP ECOSOC:

9. Composition of the Governing Body

The Governing Body will consist of members from Govt. Departments (40%) Institutions (20%) and Eminent Personalities and NGOs (40%).

Chief Minister, HP Secretariat Shimla-171001, Chairman

Forest Minister, HP Secretariat, Shimla

Tourism Minister, HP Secretariat, Shimla

Members:

- i) Principal Secretary Tourism, HP Secretariat Shimla-171002.
- ii) Principal Secretary, Finance, HP Secretariat Shimla-171002.
- iii) Principal Secretary, Rural Development HP Secretariat Shimla-171002.
- iv) Principal Secretary, Fisheries, H.P. Secretariat Shimla-171002.
- v) Principal Chief Conservator of Forests, Himachal Pradesh, Taland, Shimla
- vi) Principal Chief Conservator of Forests (Wildlife), H.P., Taland, Shimla
- vii) Chief Executive Officer of the ECOSOC.
- viii) Principal Secretary (Forests) H.P. Secretariat Shimla-171002, Member Secretary.

Institution: (not more than 5, all ex officio)

- i) Director Wildlife Institute of India, Post Box-18, Chandrabani, Dehradun-248001 Uttarakhand (Tel: 0135-2640112)
- ii) Director, G.B. Pant Institute of Himalayan Environment & Development Kosi-Katarnal, Almora, Uttarakhand (Tel. 05962-241015)
- iii) Member-Secretary, Biodiversity Conservation Society, Shamshi (Kullu).
- iv) Director, Western Himalayan Mountaineering Institute Manali.
- v) CEO of Uttarakhand Eco-Tourism Society.

Eminent Personalities and NGOs: (not more than 8, tenure 2 years)

- i) Kanwar Ajay Bahadur Singh, Nahan, District Sirmour, H.P.
- ii) Mr. Vijay Soni, President Fish & Wildlife Conservancy, Member IUCN-Species Survival Commission, 43, Golf Links, New Delhi-110003, email: vijay.wildfish@gmail.com Website: www.indianwildfish.org.
- iii) Mr. N.P. Berbaruah, Permanent Representation, World Tourism Organization Jeevan Bharati Bldg., Tower I, 7th Floor, 124 Connaught Circus, New Delhi 110001 (Tel: 011 23725445; Fax: 23725218; email: mpbczbaruah@yahoo.co.in.)

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**CEO-cum-CCF,
Eco-Tourism, Shimla**

- iv) Dr. Ganesh Balachander, Representative, Ford Foundation, 55, Lodi Estate, New Delhi 110003, Telephone: 24619441, 24648401, email: g.balachander@fordfound.org, website: www.fordfound.org, Fax: 91-11-24627147, 24617738
- v) Director, SAHARA, Village Kalwari, Tehsil Banjar, Distt. Kullu, (Tel: 94180 45363; email: saharahnp@hotmail.com).
- vi) Payson R. Stevens Village Ghiyaghi, Tehsil Banjar, Distt. Kullu, H.P. (Tel: 01903 227109; email: inm@aol.com)
- vii) Ms. Prabhavati Dwabha, Ramana's Seva Samiti, Vill. Tapovan, Laxman Jhula PIN-249192, Distt. Tehri Garhwal, Uttarakhand (Tel: 0135 2435558; email: dwabha@hotmail.com).
- viii) Shri Rajesh Ojha of Banjara Camps (Address: Banjara Camps & Retreats Pvt. Ltd., 1A, Hauz Khas village, N.Delhi-110016, Tel no. 011-26861379, 26851552/53, 9810040397), www.banjaracamps.com).
- ix) Col. Pavan Bakshi, General Manager, 11th Floor, Mohan Dev., 13 Tolstoy Marg, New Delhi-110001, Tel. no. 011 23327564/60, Fax: 011-412 2231, email: pavanbakshi@ascot-hotels.in

HPECOSOC covers the entire state. It will work with the Eco-tourism societies at Divisional/ Circle level to facilitate PPP initiatives at identified locations and provide guidance in furtherance of the principles underlying this policy.

The Circle level society is constituted as under and meets on quarterly basis to review, monitor and evaluate the implementation of various activities of all Eco-tourism projects in circle.

Chairman	CF Solan
Member secretary	DFO (HQ) Solan circle
Representative of DC	Member
Representative of Zila Parishad	Member
Representative of Gram Panchayat	Member
Representative of tourism department	Member
DFO Solan	Member
DM Forest Corporation	Member
NGO working in the field	Member

This Governing body will be responsible for submitting the annual plan of operation(APO) to the HPECOSOC.

The society will have Supervision Committees headed by the concerned DFOs who will be responsible for all the day to day operations and preparing the budget and annual plan etc. for approval of the Governing Body. The constitution of the Supervision Committee shall be as under:

DFO Solan	Chief Executive Officer
DM Forest Corporation Solan	Member
All RO's	Member
Pradhan of concerned gram panchayat	Member
SDO (I & PH)	Member
Representative of HIMURJA (Solar Energy)	Member
A.M. HPSFDC Ltd Concerned	Member
NGO/CBO (One Member)	Member

The above committee will look after the projects and activities under Solan Forest Division.

10.6.2. Creating awareness and capacity building of the principal stakeholders:

Creating Awareness:

- Promoting environmental consciousness among tourists, local communities and stakeholders about the importance of environmental conservation, biodiversity and the need for responsible tourism practices.
- Educate the tourists and locals about the diverse cultural, traditional heritage of the State and indigenous practices, fostering respect and preservation of cultural identities.
- Encourage the tourists and stakeholders to adopt sustainable practices like waste reduction, water conservation and minimizing their ecological footprint. Promote the use of renewable and biodegradable resources and ecofriendly waste disposal methodologies.
- Establish interactive tourist interpretation Centre within ecotourism zones offering information on flora and fauna, ecosystems, cultural heritage through exhibits, displays, AI techniques and multimedia presentations.

- v. Information dissemination through brochures, digital platforms at ecotourism sites to educate tourists about the ecological significance, biodiversity and conservation efforts within the region.
- vi. Organize guided tours, nature walks and interpretive trails led by trained guides to provide firsthand knowledge about nature and cultural aspects of Himachal Pradesh.

Capacity Building:

- (i) HP ECOSOC will concentrate on capacity building through experience sharing, workshops, training programmes and field visits etc., either in-house or through carefully selected organizations /entities.
- (ii) To inculcate the spirit of environmental awareness at an early age, the Division Level Societies would engage students at various levels beginning at the primary level.
- (iii) HP ECOSOC will develop appropriate training modules (continuous, practical & participatory) and training material/case studies for the various stakeholders and ensure that emergence of appropriate technologies is to be advanced.
- (iv) Certified Training programmes for nature guides, appreciation of flora/ fauna shall be organized. It shall be the endeavor of the Division Level Societies to train a pool of certified nature guides and provide them livelihood opportunities.
- (v) Division/Circle level Societies shall liaise with Community Based Organizations (CBOs) working in the field of Natural Resource Management for providing them training and other material relevant for eco-tourism.
- (vi) For their education and awareness activities, HP ECOSOC and Division Level Societies shall leverage funds through the Externally Aided Projects, the CAT Plans, Capacity Building programmes of H.P. State Tourism Development Board and resources generated from projects developed under PPP mode.

10.6.3. Community involvement

Ecotourism development results in following benefits to the community:

- Direct economic benefits in the form of resource use: Ecotourism leads to the development of Ecotourism activities and facilities like homestays, eco-lodges, camping etc creating employment, business opportunities for the local people. It also creates demand for resources vegetables-fruits or grocery items, ghee, milk, organic food items (under Pramparagat Krishi Vikas Yojana in HP) to be used in daily operation of tourist activities.
- Generating alternative employment opportunities: Ecotourism act as a tool for natural resource conservation by way of employing local community, which are otherwise depending on unsustainable use natural resources. They can be employed as lodge staff-naturalists-launch operators and other subsidiary services.
- Development of local arts and crafts: Ecotourism aims at developing local arts and crafts by way of highlighting the existing handicrafts through a souvenir shop. Such souvenir shops can be developed at the reception centers with crafts available for sale. NGOs or local level institutions can be used as a capacity builder and as an interface between the community and the customers as they are in a position to push the sales up by attractive packaging and marketing. The merchandise which can be promoted for sales can be household items, jewelry, textile, musical instruments, combs, basketry works and bamboo, wood carving, Organic food items and decorative objects.
- All the operators of Ecotourism sites will provide a certain space on the site for the exhibition and sale of local products (food, handicraft, etc.). Further the possibility of

collaboration with already established brand and federation under external aided project like JICA Forestry Project, State Handicraft and Handloom Corporation will be explored to provide marketing opportunities to the local people.

- Promote Entrepreneurship and Social Responsibility of business: Promotes more entrepreneurs, business entities near Ecotourism areas. After the success of pilot projects more homestays, business ventures can be floated and can be brought in to Develop Human Capital and Social Capital of the region. The business enterprises can sponsor conservation programmes, organize vocational training courses, health camps and education.
- Employment to Bonafide Himachali: As per the Industrial Policy of Himachal Pradesh, all the Industrial Units are supposed to employ at least 70% bonafide Himachalis at all levels. Further to encourage employment to bonafide Himachalis, The Himachal Pradesh Industrial Investment Policy, 2019, provides that existing as well as new Enterprise giving employment to Bonafide Himachlies over and above 80% on regular basis would be eligible for incentive of Rs.1000 per month per additional employment generated over and above of 50 Bonafide Himachlies for ten years from the date of production.

10.6.4 Marketing

Leverage marketing channels to promote ecotourism destinations, targeting eco-conscious travelers.

a) Branding of Ecotourism sites: for promotion of Ecotourism destinations branding of potential ecotourism sites and Forest Rest Houses branding shall be created.

b) State and Destination Specific campaigns: The HPECOSOC shall plan its own campaign to popularize the State as ecotourism and adventure tourism destination. The Circle Level Societies shall have to plan specific campaigns to showcase the unique offerings of the ecotourism sites and to promote ecotourism destinations.

c) Innovations and Digital Initiatives: The marketing of ecotourism destination requires dissemination strategies and the aid of digital technology and other conventional means. The prime task of marketing and promotion of sites shall be done by the HP ECOSOC.

10.6.5. Important Stakeholders and their functions:

a) Visitors: Responsible travel to natural areas and making available financial contribution for conservation of natural heritage and empowerment of local people.

b) Local Communities: Provide positive experiences for the visitors.

c) HP ECOSOC (Special Purpose Vehicle): Practice and promote ecotourism according to the principles of ecotourism; Capacity building of stakeholders; key interface for PPP partners.

d) Division/Circle level Societies: Managing all operations for responsible ecotourism at ground level.

e) Government Departments (Forests, Tourism, PWD, I&PH, Rural Development, Revenue): Provide positive experiences for the visitors; Minimize impact; Build environmental, cultural awareness and respect. By implementing and educating others about ecotourism, contribute to the positive and more sustainable development of the tourism industry.

f) Concerned Panchayat, BDC and Zilla Parishad: Provide positive experiences for the visitors.

g) Partners managing sites: Practice and promote ecotourism according to the principles of ecotourism.

10.7 Ecotourism sites / Potential Ecotourism Sites to be identified

- i. Areas inside and adjoining designated forests with Eco-Tourism potential be identified and listed.
- ii. Eco-Tourism development plan to be programmed and implemented with the carrying capacity.
- iii. Capacity building of eco-guides.
- iv. Records of tourist inflows and commensurate benefit to the community.

10.8 Management of Eco-tourism sites under Eco-tourism policy of Himachal Pradesh 2024

The development and management of all the sites being run and the sites which have been identified/additional sites will be in consonance with Re-Revised Ecotourism Policy of Himachal Pradesh, 2024 notified vide HP Notification No. FFE-B-C (15) 1/2024-III dated 29.10.2024. Some important articles pertaining to management, mode of operation and revenue sharing are produced as under:

10.8.1 Development and Management Strategies

The policy provides for:

- i. The State already boasts of a few van Eco Parks as nature awareness centers. It shall be the endeavor to bring all the facets of such nature tourism related assets into a common fold under the aegis of the institutional arrangements envisaged in this policy.
- ii. Development of nature parks/ van Eco Parks, nature trails etc. that are important from eco-tourism point of view shall be carried out so that not only the tourists outside the state have access to nature, state dwellers shall also have an opportunity for nature appreciation and recreation. Decisions with respect to utilization and management of these assets shall be taken by the Division/Circle level Societies.
- iii. Eco-tourism circuits shall be created, which will allow the visitors to access the existing infrastructure of Forest Rest Houses/Eco-Tourism camping sites.
- iv. HP ECOSOC shall facilitate selection of partners for Eco-Tourism sites in PPP mode after taking approval of Government of HP. The guidelines about the management of existing Eco-Tourism sites are also provided in this policy document. Adherence to guidelines will be overseen by the Division/Circle level societies.
- v. Trekking routes shall be popularized and arrangements shall be worked out to offer trekking packages to the discerning tourist, who may like to visit rural and interior areas of the State.
- vi. Eco-Tourism societies at Circle level shall endeavor to tie up with school groups and colleges for organizing camps in selected Forest Rest Houses /Eco-Tourism Camping sites operating under its aegis.
- vii. Eco Circuits shall be created by these societies to link the potential sites.

10.8.2 Mode of Operation

The policy vide article no. 6 (H) (ii) provides as:

The sites may be operated in the following modes:

- a) By the societies directly on departmental mode.
- b) By the HP Tourism Development Corporation (HPTDC)/ HP State Forest Development Corporation Ltd (HSFDC)
- c) Through Public Private Partnership (PPP) mode. These will be given directly by the HPECOSOC under the aegis of HP Forest Department.
- d) By the local communities

Even in departmental mode some services may be outsourced or given in PPP mode. Detailed terms and conditions and model agreement will be developed for the sites.

10.8.3 Types of structures allowed:

No permanent structures will be allowed. Only following types of structures will be allowed:

- a. Tents of various types
- b. Wooden structures
- c. Pre-fabricated structures which can be removed
- d. Or other eco-friendly structures

In all these cases flooring of cement or tiles or stone may be put up without building deep foundation.

10.8.4 Investment/Building of infrastructure

Infrastructure i.e. paths, roads, sewerage, water supply and all buildings/ structures may be developed in the following alternatives: -

- a. All infrastructures to be build by Societies/ Tourism Corporation/Forest Corporation
- b. Partial infrastructure by Societies and partially out –sourced/ private agencies
- c. All infrastructures by out-sourcing to private agency/PPP mode/through operators

Whoever builds the infrastructure, the ownership will lie with the forest department i.e. Government. The private party or corporations, if allowed to build infrastructure, will be on behalf of forest department and assets created will be owned by Forest department only.

The private party will build infrastructure only in land allotted. In case any work pertaining to water supply or sewerage has to be done outside the allotted area, Forest Department may be asked to do the work on payment basis or society may do it. If any infrastructure belonging to Forest Department falls in the area, it may be allowed to be used if included in the project by the forest department.

10.8.5 Time period of allocation to private parties

- a. When all investment is made by the society(ies) of forest department: 3 years extendable by 2 years

- b. Where major investment is made by the private party out sourced agency: 10 years extendable by 5 years. The time period of allocation for Tourism / Forest Corporation will also be 10 years extendable by 5 years.

10.8.6 Common facilities

In all the modes of operation, it shall be ensured that following common facilities are available to the visitors: -

- a. Booking arrangement
- b. Website
- c. Publicity

10.9 Allotment of projects

Such projects shall be allotted to the private sector as per the procedure mentioned in Eco-Tourism Policy 2024 of Himachal Pradesh briefly cited as below

1. Project Identification-Selection of new sites
2. Approval of HPIDB to Final Project Proposal
3. Approval and allotment of eco-tourism sites for further outsourcing and maintenance by operators
4. Eco-restoration
5. Distribution of revenue generated through eco-tourism

10.9.1. Project Identification-Selection of new sites

Divisional Forest Officer will initiate ecotourism planning by including Ecotourism Chapter in the approved Working Plan of the Division based on identification of eco-tourism sites, including carrying-capacity analysis, propose ecotourism activity, categorization of infrastructure support that may be allowed, and training and capacity building needs of the partners.

10.9.2 Distribution of Revenue Generated

The provisions for revenue sharing are detailed below:

1. HP ECOSOC and Division Circle Level Eco-Tourism Societies shall act as the repository of all possible sources of funding, like grants in State Tourism Department, Tourism Department of GoI, HP State CAMPA and other such sources.
2. HP ECOSOC and Division/Circle Level Eco-Tourism Societies shall generate resources from (a) levy of user charges/concession fee on eco- tourism sites in PPP mode, (b) fees from Van Eco Parks, camps, trek, trails, film shooting, rest houses etc.
3. Distribution of Revenue generated through Eco-tourism sites, Van Eco Parks, Van Chetna Kendra and Nature Awareness Centers and use of government assets such as rest houses all be at under:
 - a) State Government Share: 20% of the total revenue realized shall be deposited in Government treasury.
 - b) HP ECOSOC Share: 20% of the total revenue realized shall go to the HP ECOSOC

c) Division Circle Level Eco-Tourism Society Share: Remaining 60% revenue shall remain with the Division/Circle Level Eco-Tourism Society to implement the action plans and also for further sharing with the local Gram Panchayats/communities for which appropriate guidelines shall be framed.

d) HPSFDC Ltd/ HPTDC Share: The HPSFDC Ltd. /HPTDC shall make use of 60% share for the Promotion of Eco-Tourism as well as a proportion out of this amount shall as revenue to the Corporation. Appropriate guidelines will be framed for this purpose.

10.10 Waste Management

Any tourism activity generates a sizeable quantum of waste and, if waste collection and disposal mechanisms are not in place, the very foundation of eco-tourism is weakened with passing time. The following measures shall be taken up for solid waste management apart from providing adequate sanitation facilities with regular maintenance.

A. Waste Segregation

Segregation of waste at the site of generation is a key input that ensures success of any waste management programme. All the eco-tourism sites and food stalls within the sites shall be equipped with waste-bins with colour-code:

(i) Green for biodegradable waste – fruits and vegetable peels, left-over food waste.

(ii) Blue for recyclable dry waste – Plastic, Paper, glass, metal.

The tourists shall also be sensitized for disposing waste according to the nature of waste through hoardings, write-ups behind the tickets and the managerial staff posted for maintenance works.

B.Waste collection and disposal

Collection of waste from the sites shall be carried out regularly using the following approach:

(i) The green bio-degradable waste shall be collected by agencies in managing such waste through composting. The communities involved in management of the site shall also be adequately trained to convert the bio-degradable waste into compost and utilize it in the maintenance of vegetation in the site and for their own personal use an additional incentive. Each eco-tourism site shall be equipped with proper equipment for composting and the communities involved in management of eco-tourism sites shall be trained in utilizing the bio-degradable waste to produce compost. It shall also serve as a model for demonstration.

(ii) The blue recyclable waste shall be collected by the recycling agencies directly and taken away for recycling at proper places. Such agencies shall be identified and involved in recyclable waste management. Most of the solid waste is capable of generating income through selling it as scrap. Income from such waste, if any shall be added to the revenue of the site

and shared with the communities in accordance with the benefit sharing mechanism detailed in earlier section.

10.11 Education and Outreach

For effective use of the eco-tourism potential of the area, an effective education and interpretation plan will be prepared. Efforts will be made to put in place electronic visual tools, well equipped interpretation center, appropriate signage's, audiovisual presentation centers, interactive learning tools, and safety protocol and information material on the area for the visitors.

- Starting regular programmes in conservation education for the local schools, village communities, and the tourists. The HP Gyan Vigyan Samiti (National Literacy Mission) could also be associated with the ecotourism society of HP.
- Facilitate introduction of nature conservation education in school and college curriculum in HP.
- Encourage research and documentation for the best efforts made in ecotourism sites in HP.
- Develop schemes and plans such as nature camps, nature education and awareness for the local school/ college students and teachers around a FRH/FIH/Camp site/forest trails etc.

10.12 Monitoring

A dynamic monitoring mechanism, covering multiple biological parameters to monitor stress on wildlife vis-a-vis number and patterns of tourist visitation and their level of satisfaction, involvement of local people, scope for improvement in flow of eco-system services, etc. will be developed. At the Division Level endeavor shall be made to initiate a ranking system for the respective ecotourism sites. There shall be regular monitoring by the Division on the implementation of the guidelines spelt out in the Guidelines for Sustainable Ecotourism in forest and wildlife areas 2021. A generalized list of five indicators which can be used for monitoring and evaluation of an Ecotourism site is given as under:

- Environmental
- Socio-cultural
- Economic
- Experimental (on visitors)
- Managerial

<i>There are five general types of indicators that must be monitored in some way by an ecotourism project:</i> • Environmental (Biophysical) • Socio-cultural Aspects • Experiential • Economic • Managerial	
Environmental (Biophysical) indicators: • soil erosion at a particular site • site spreading (vegetation loss in campgrounds or along trails) • sea floor litter at mooring sites • stress on a particular wildlife species (nesting success, animal aggression against visitors, etc.) • illegal fires or campfires • landslides along a road • coliform bacteria count in river X, site X • visibility from point X • number of damaged trees in picnic area	• percent of visitors pleased with their visit to the area/site • evidence of human waste • number of return visitors • visitor perception of naturalist guides
Experiential (on visitors) indicators: • number of encounters with other groups per day • number of safety violations per month • number of complaints about noisy visitors • number of students using area for environmental education • number of illegal hunters encountered in X location	Economic indicators: • number of ecotourism entrepreneurs in neighboring communities • amount of entrance fees collected in a month • average length of stay in the site/community • overall contribution of ecotourism to site's budget (percentage) • level of tourism employment • level of investment in local public services and facilities Socio-cultural (on communities) indicators: • maintenance of traditional practices • change in population • reports of negative behavior by visitors towards residents • change in crime rate • number of visitors at local cultural events/sites • perception of guides to ecotourism activity • general perception of residents to ecotourism activity(ies) Managerial (infrastructure) indicators: • number and length of trails • amount of time spent on infrastructure maintenance • amount of graffiti found in campgrounds
adapted from Stankey et al., 1985	

The site-specific monitoring and evaluation strategy will be drafted by the Divisional Level Supervision Committee keeping in view these indicators and the strategy will be finalized by the Circle level ECOSOC.

Chapter 11

Joint Forest Management (Overlapping) Working Circle

11.1 Background

It was with the shift in National Forestry Policy in 1988 that Government of India emphasized on Joint Forest Management. The National Forest Policy of 1988 emphasizes creating a massive people's movement involving local people living near forests in the protection and development of forests. JFM has been defined as the sharing of products, responsibilities, control, and decision-making authority over forestlands between forest department and local user groups. It involves a contract specifying the distribution of authority, responsibility, and benefits.

The National Forest Policy 1988 envisages people involvement in the development and protection of forests. The requirement of fuel wood, fodder and small timber such as house-building materials, of the tribals and other villagers living in and near the forests, are to be treated as first, charge on forest produce. The policy document envisages it as one of the essentials of forest management that the forest communities should be motivated to identify themselves with the development and protection of forests from which they derive benefits.

Govt. of India facilitated the implementation of the policy by issuing guidelines in June 1990. This gave impetus to the participation of stakeholders in the management of degraded forests situated in the vicinity of villages. June 1990 guidelines emphasized that access to forest land and usufructuary benefits should be given only to the beneficiaries who get organized into a village institution, specifically for forest regeneration and protection. It further emphasizes that the benefit of people's participation should go to the village communities and not commercial or other interest, which may try to derive benefits in their names. The selection of beneficiaries should, therefore, be done from only those families, which are willing to participate through their personal effort.

Further in February 2000 Govt. of India issued guidelines for strengthening of JFM programme. A copy of this circular no.22-8/2000 dated 21.2.2000 has been reproduced as Annexure. Emphasis was laid on legal backup for JFM programme and uniform nomenclature for JFM committees at the village level as JFMCs. Other features of the 2000 guidelines are:

- Participation of women in JFM programme with at least 50% members of JFM general body to be women and presence of 50% women members should be pre-requisite for holding such general body meetings. At least 33% of the membership in the JFM executive committee should be filled from among the women members. One of the office bearer's presidents, vice-president, secretary to be filled by women member of the committee.
- Extension of JFM in good forest areas to promote regeneration, development and sustainable harvesting of NTFP without any alteration of the basic silvicultural prescriptions in the working plan.
- The micro plans/ PRA exercise should reflect the consumption and livelihood needs of the local communities as well as provision for meeting the same

sustainably. It should utilize locally available knowledge as well as aim to strengthen the local institution.

- Conflict resolution, recognition of self initiated groups, contribution and matching support by state forest department for regeneration of forest resources on long term sustainability basis and monitoring and evaluation initially at the end of 3 and 5 years at division and state level are other important features of the guidelines issued by GOI in February 2000.
- There are different nomenclatures for the JFM committees in different states. It would be better if these committees are known uniformly as JFM committee (JFMC) in all the states. Memorandum of understanding, with clearly defined roles and responsibilities for different work or areas should be separately assigned and signed between the state governments and the committees. All adults of the village should be eligible to become members of the JFM Committee.
- To promote regeneration, development and sustainable harvesting of NTFP which can be given free or on concessional rates as per existing practice in degraded areas under JFM.
- Preparation of micro plan in JFM areas
- The micro plan for the forest management should be prepared by the Forest Officers and Village Forest Protection Committee after detailed PRA exercise and should reflect the consumption and livelihood needs of the local communities as well provisions for meeting the same sustainably. It should utilize locally available knowledge as well as aim to strengthen the local institutions.
- Contribution for Regeneration of Resources: For long-term sustainability of resources, it is essential that a mechanism be created for ploughing back a certain percentage of the revenue earned from final harvest. There should be transparent mechanisms for computation of income for sharing the benefits between different stakeholders

To operationalize JFM, MoEFCC established several institutional structures:

- **Joint Forest Management Committees (JFMCs):** These are village-level institutions comprising local community members who collaborate with forest departments to protect and manage forest resources.
- **Forest Development Agencies (FDAs):** Introduced in 2001, FDAs function at the district level to coordinate the activities of various JFMCs, providing technical and financial support.
- **JFM Cell:** Established within MoEFCC in August 1998, this cell oversees the implementation and monitoring of JFM programs across the country.

11.1.1 Process Change

The central element of JFM is that of process change which has three main aspects:

- i) Change in the role of FD, from a predominantly regulatory role to one in which communities are treated as equal partners in the management of forest resources. Stakeholders would be enabled to make decisions and manage and protect the forest,

- ensuring both the appropriateness and effectiveness of the micro plan, whilst FD would remain the custodian of national interest. FD will have the role of facilitator.
- ii) Change in management systems, that would be client oriented and adaptable, based on decentralization of decision making, and improved planning, monitoring and evaluation
 - iii) Human Resource Management linked to role definition, skill gap analysis and appropriate manpower planning and management.

Need For Capacity Building:

For implementation of participatory forest management, it is important that officers and field staff are equipped with the necessary knowledge and tools that would enable them to develop good JFM practices in the field. This would create the best incentives and motivation for the expansion of JFM among staff and communities.

New Approach:

It envisages an approach and a major paradigm shift, which is in consonance with the National Forest Policy guidelines. It inter alia emphasizes the need for the shift in attitude and focuses on process change. A forester is now required to be an extension agent as well as a professional who will now work closely with the communities, facilitating their empowerment for sharing joint responsibilities and using available resources optimally. Now, a forester as an extension agent should be a very socially active person mobilizing and facilitating stakeholders, and as a professional has to listen to the communities and exert to look for solutions together with them. Thus instead of a linear top down approach, the objective now is to foster mutual understanding and cooperation. To gain any lasting results, participation of local people in decision-making is essential for building on their knowledge & skills and creating self-reliance. If communities were seen as equal partners, they would participate in all aspects of the program, in decision making, planning and training. This would concurrently ensure that the benefits do reach the local people. Thus to be effective, management would now have to be more people oriented, instead of being purely technical and dealing with them in the traditional way. Flexibility and site specific planning are the essential ingredients of the JFM programme for its meaningful implementation.

11.2 Joint Forest Management in Himachal Pradesh

As a follow-up to the National Forest Policy 1988 and Govt. of India guidelines from time to time, Himachal Govt. promoted and encouraged JFM in the state. Keeping with the above the Government of Himachal Pradesh formulated a policy vide No. Forest (c) 3-4/80-V dated 12-05-1993, supporting Joint management arrangements. Ever since village communities are being involved by the Forest Department to further the aim of protection and management of forests and continuation of forest cover. The recognition of the link between socio-economic incentives and forest development has been singularly responsible in eliciting community participation. The 1993 notification has provision to establish Village Forest Development Committees (VFDCs) at the village level for the management of forests with the involvement of the communities. Village Forest Development Societies (VFDS) are established, enabling community members to participate in forest management activities and benefit from non-timber forest products (NTFPs) and other forest-based resources. JFM in Himachal Pradesh fosters

partnerships between the Forest Department and local communities residing near forest areas. The primary objectives are to:

- Protect and regenerate degraded forest lands.
- Enhance biodiversity conservation.
- Improve livelihoods of forest-dependent communities through sustainable use of forest resources.

A significant milestone in HP's JFM journey was the launch of the 'Sanjhi Van Yojna' (SVY) in 1998, a state-sponsored program aimed at fostering community participation in forest management. This initiative was further institutionalized with the introduction of the Himachal Pradesh Participatory Forest Management Rules in 2001, facilitating the registration of Village Forest Development Societies (VFDSs) under the Societies Registration Act. Subsequently, Joint Forest Management Committees (JFMCs) were formed and federated into Forest Development Agencies (FDAs) at the divisional level, aligning with the National Afforestation Programme guidelines. By 2010, the State Forest Development Agency (SFDA) was constituted to oversee these efforts.

11.3 Community Engagement and Capacity Building

Recognizing the pivotal role of local communities in forest conservation, the HP government has implemented several initiatives to bolster community involvement:

- Mid-Himalayan Watershed Development Project (MHWDP): This initiative aims to reverse natural resource degradation, enhance agricultural productivity, and improve rural incomes through community-driven watershed management. Notably, the project includes the world's largest Clean Development Mechanism (CDM) afforestation project, contributing to carbon sequestration and climate change mitigation.
- The "Kandi Project" in Himachal Pradesh is an integrated watershed development project, with a particular focus on the Sub-Himalayan Shiwalik area. It aims to improve vegetative cover in the upper catchments, reduce soil erosion, and protect agricultural land. The project emphasizes local participation and institution-building to strengthen local capabilities for similar projects in the future.
- Japan International Cooperation Agency (JICA) assisted "Project for Improvement of Himachal Pradesh Forest Ecosystem Management and Livelihoods" is being implemented in seven districts i.e. Kinnaur, Shimla, Bilaspur, Mandi, Kullu, Kangra and Lahaul & Spiti. The project period is 10 years from 2018-19 to 2027-28. In the process of strengthening the JFM framework and promoting community-driven forest management, the forest department, HP has established approximately 900 SHGs and 460 VFDSs across seven districts under JICA projects.
- The KFW-funded Himachal Pradesh Forest Ecosystem Climate Proofing Project (HPFECPP) followed the approach of Participatory planning and implementation at the village level (micro-planning)
- Educational and Participatory Schemes: Programs such as the 'Samudayik Van Samvardhan Yojna', 'Vidyarthi Van Mitra Yojna', and 'Van Samridhi, Jan Samridhi Yojna' have been introduced to engage various community segments, including students, in afforestation and forest conservation activities.

- Integration with Panchayati Raj Institutions (PRIs): To decentralize forest governance, the responsibilities of VFDCs have been integrated with PRIs, ensuring grassroots-level participation and decision-making in forest management.

There are various schemes and projects, initiated by the H.P. government and some financed through External agencies e.g. externally aided projects that emphasize people's involvement in forestry. The Government of Himachal Pradesh has issued a notification no. Fts-II(B)15-10/87 dated 23rd August 2001, called the Himachal Pradesh Participatory Forest Management Regulations, 2001. These rules shall be applicable to such government forests and lands, including common lands where participatory management is envisaged.

11.4 JFM in Solan Forest Division

As in other parts of Himachal Pradesh, most of the rural populace in Solan Forest Division uses significant quantities of forest goods and benefits from the services provided by the forest areas. Solan district is the foremost vegetable-producing area of the state and a lot of pressure on the forests, apart from the usual demand for fuel, fodder and timber, is for extracting stakes for vegetable plants. For this use the stakes for support, there is no other cheap and locally available substitute. The other rights enjoyed by the right holders as per the provisions of the Settlements, also are a major stake in the forests besides the livelihood issues. The Sanjhi Van Yojana, a H.P. government-backed initiative and the world Bank-funded IWDP (Hills) Kandi Project have been implemented to promote people's participation in Forest management in Solan Forest division..

Several JFMC's, VFDC's have been formed in the division and under Mid-Himalayan Watershed development project but all of these JFMC's are not active. There is a general lack of enthusiasm in embracing the idea of shared management in the forestry sector among the local people. Some of the causes for this less encouraging response among people are:

- a) There is a general apathy of the youth to participatory programmes related to the rural sector because by acquiring a college education all youth strive for white collared jobs.
- b) Lack of proper education about the government programmes.
- c) The long gestation period of forestry activities and lack of worthwhile tangible benefits to the community without damaging the resource base in the short run.
- d) Too much dependence of the public on the government support and subsidies.
- e) Lack of proper legislation on participatory management and usufruct sharing.
- f) Limited scope to promote income-generating activities in the forest areas under JFM programmes
- g) Frequent changes in schemes and discontinuation of old schemes.

11.5 Past experiences in Participatory Approaches

The Social Forestry Umbrella project was a pioneering effort in which, perhaps, for the first time people were associated with forestry works and forestry was taken outside forest areas to village lands. This Project ended in 1993. A new scheme "Van Lagao, Rozi Kamao" was launched in 1992 in which plantation over 2 ha land was awarded to a person belonging to Antodaya category and in lieu of protection and care of this area, the beneficiary was to be given remuneration depending upon the survival percentage of the plantation. This scheme was also discontinued on 31-3-1993.

Later forestry related works in the division were done following the principles of participatory management under different schemes from time to time and experiences and outcomes have been summarized below:

11.5.1 Integrated Watershed Development Project (Kandi Project):

The IWDP (Hills) Kandi Project, a World Bank (IBRD) funded project was launched in the Shiwalik hills of Himachal Pradesh, Jammu and Kashmir, Punjab and Haryana during 1990-91 and the first phase ended on 31-3 1999. The IWDP (Hills-II) was the second phase of the project and aimed to consolidate the progress achieved under Phase 1. This is for a period of 5 years from 1999-2000 to 2003-04.

The main development objective of the Project was to restore the productive potential of the Shiwaliks with planning at watershed and sub-watershed basis following participatory approaches. The objective was attempted to be achieved through interventions to arrest soil erosion, increasing water availability and alleviating poverty. The Project had 3 major components- namely- Institutional strengthening, Watershed development and Protection and Project management.

The Headquarters of this integrated project that covered five catchment areas in the Shiwalik regions of Himachal Pradesh are located at Solan. In the Solan forest division part of the Ghaggar catchment with 4 sub-watersheds were taken up for treatment. These fall in the Dharampur and Parwanoo ranges of the division. The details of the sub-watersheds taken up are given in table below.

Table 11.1: Sub watershed being treated under the Kandi Project (Phase II)

S. No.	Name of Sub-watershed	Total Area (in ha)	Forest Area (in ha)
1	5-Ghaggar (Right bank)	2150.4	1341.9
2	7-Jabli Khad	3541.3	1224.1
3	8-Kaushalya Khad (Left bank)	2104.1	913.9
4	9-Kaushalya Khad (Right bank)	3052.13	1245.07
	Total	10847.93	4724.97

In order to check degradation in the ecologically fragile Shiwalika, an integrated approach was adopted on the basis of the land use and its management and activities related to Forestry, Agriculture, Horticulture Animal Husbandry, Soil & Water conservation etc were taken up under the project. Village Development Committees (VDC) were formed and works were carried out in accordance to the Village Development Plan prepared by the VDC. Each sub-watershed is divided into micro watersheds of approximately 800 ha. and for each micro-watershed microplans were prepared in consultation with the Village development committees. The Shiwalik Watershed Development Society was the umbrella organisation for watershed management in the Shiwalik hills of H.P. and also for implementing the IWDP (Hills-II) Kandi project. The focus was on linking the VDCs with panchayats to ensure sustainability after project withdrawal. The key performance indicators to monitor the objectives were:

- a) Increased availability of sub-surface/ groundwater;
- b) Reduced soil erosion;
- c) Improved vegetative coverage of treated areas;
- d) Increased community participation and formation of village user groups;
- e) Increased crop yields, milk production and horticultural production;
- f) Improvement of existing road links to markets;
- g) Increased household incomes of marginal and small farmers, the landless and women.

Forestry as major land use in the area addresses many needs of the people dependent on forests for sustenance. Therefore afforestation was a major activity in the Phase II and increasing the productivity of government, common and private lands had been visualized as an important objective in reversing the degradation process. The project supported a combination of vegetative and engineering technologies in treatment of the degraded watersheds. The forestry activities were implemented under the components mentioned below:

- a) Vegetative/ shrub barriers in contour trenches
- b) Afforestation
- c) Pasture development
- d) Replenish afforestation / forest densification

In addition, drainage line treatment, gully stabilisation, stream bank protections, water harvesting structures, earthen run-off dams and landslide treatment works were also done.

The project was implemented with mixed results. The VDCs constituted for the planning, implementation and post-project management were actively involved during the planning and implementation phases of the project. 21 such VDCs were constituted in the Solan forest division during Phase II of the Kandi Project and the watersheds treated lie in the Dharampur and Parwanoo ranges. The works were carried out as per the micro-plans prepared. Though the Project envisaged an integrated approach but lack of proper coordination among different agencies remained a major constraint. and difficulties in there was inadequate communication between the Project and the line departments. As far as people's participation in the project activities is concerned, it was visible only during the planning & implementation phase. In the post-project period, the VDCs gradually became inactive and did not take interest in the management of afforestation, pasture development and other works carried out in the forest and common land and such assets created during the project largely were left to govt agencies for their maintenance. Major learnings are that there is a need for better coordination among different agencies for convergence, capacity building of the communities and staff for participatory approaches to be adopted with responsibility, maintenance of assets created on forests and common lands be part of Village Development Plans at the Gram Panchayat level with the active participation of forest staff in such meetings on regular basis.

11.5.2 Sanjhi Van Yojana (SVY)

Sanjhi Van Yojana (SVY), a community-based afforestation scheme was launched in Himachal Pradesh on 25 December 1998. Under this scheme the communities as well as the NGOs are to be involved in the protection of the existing forest wealth as also to participate in holistic rural development. The main objectives of this scheme were:

- a. Involvement of grass-root level institutions eg. gram panchayats, Mahila Mandal, Yuvak Mandals, schools, VFDCs, NGOs etc. in eco-restoration
- b Regeneration of degraded forest areas through community participation
- c. Creation of social assets for the benefit of the communities.
- d. Increasing the productivity of the forest areas by improvement of nursery stock through adoption of modern nursery techniques.
- e. Re-orientation of forest staff for facilitating community
- f. Generation of employment opportunities in rural areas
- g. To bring more area under tree cover by encouraging rehabilitation/ plantations of private wastelands on a cost/ benefit sharing basis

No specific duration for the scheme had been proposed and depending on its success in the initial years, the scheme was supposed to be adopted as a model of natural resource management by the State Forest Department

To execute the scheme, a Village Forest Development Society (VFDS) was constituted in the villages situated on the periphery of the forests. The VFDS were registered, non-political body representing almost all families of the village, migratory graziers, antodaya/ IRDP and other landless families who are dependent on forests for their livelihood. The society was registered by the DFO(T) under the Societies Act and the process of formation of VFDS was assisted by the DFO or his representative, not below the rank of Range Forest Officer. The executive committee of VFDS had 10-15 members with the local Forest guard as the Member Secretary till such time the VFDS is enabled to handle its affairs. For this, the forest guard will pick up a co-secretary from amongst the literate persons in the village to assist him with the process and facilitate taking over soon.

Responsibilities and duties of the VFDS included the following:

- a Assist the Forest department in planning, protection, afforestation etc. as per the approved Microplan;
- b. Judicious use of all existing rights and their equitable distribution:
- C Inform the department about forest offenders;
- d. Help the Forest department in extinguishing forest fires,
- e. Persuade villagers to give available area for plantations
- f. Fair and just distribution of usufructs;
- g. Settlement of disputes between VFDS members;
- h. Protect the assets created by the VFDS;
- i. Honour all the commitments made with the department and the members of the VFDS.

Responsibilities and duties of the Forest Department:

- a) To recognise the VFDS and give weightage to recommendations
- b) To explain the contents of the Microplan to the VFDS members;
- c) To provide technical know-how to the Executive body to carry out its responsibilities
- d) To honour the commitments made with the VFDS

The areas taken up under the SVY scheme were primarily degraded forests, government lands, existing poorly stocked plantations and private lands. These were to be notified under Section 38 of the IFA. The area should not overlap with any other scheme and those with minimal conflicts would be given priority. The microplan was prepared for a period of 5-7 years and contained 60% of the total activities for the afforestation component and NTFPT, ensure participation through the creation of stakes of the communities, encourage their owning up the assets created by them, the VFDS contribute 1% of the total cost of the microplan in cash and 4% as "shramdaan" (Voluntary labour) for the various works to be executed under the microplan . Owners of private lands were to contribute 4% in cash and 6% in shramdaan or the equivalent in cash

Progress of works under the Sanjhi Van Yojana:

Under the scheme, only following VFDSs were formed in all ranges of the division during 1999. The range-wise and beat-wise details of the VFDs and the micro plan are given in the Table below:

Table 11.2: Village Forest Development Societies Formed Under Sanjhi Van Yojna in Solan Forest Division

S. No .	Range	Beat	Name of VFDS	Registration No.	Date of Registration	Total Area under Micro Plan (ha)	Total Budget per Micro Plan (Rs. In lacs)
1	Solan	Salogra	Mansar	16-425/99	17-11-99	31	8.08
2	Kandaghat	Salumna	Salumna	16-415/99	04-10-99	25	7.23
3	Parwanoo	Sanawar	Suji	16-407/99	22-09-99	30	7.45
4	Dharampur	Sultanpur	Dhillon	16-412/99	24-09-99	40	9.14
5	Subathu	Kot	Paboh-Kot	16-416/99	01-11-991	30	10.16

These VFDS registered in the division carried out works under this scheme. The ranges involved in the scheme performed activities pertaining to afforestation, soil conservation, Assisted Natural regeneration along with some entry point activities (EPAs) were carried out after the formulation of microplans which were prepared using participatory methodologies. The entry point activities generally included construction or repair of village paths, construction of small rooms in Panchayat Buildings and school buildings, augmentation of drinking water supply and irrigation channels etc. Under the soil conservation component Check-dams and spurs were constructed In a later modification of the SVJ scheme, with modified name as the "Parishicrit Sanjhi Van Yojana" was notified vide No. FFE-C (9) 1/2001 dated 23 August 2001. and the Sanjhi Van Yojana Scheme 1998, the Parishram Hamara- Van Hamara Scheme, 2000 and the Apna Van, Apna Dhan Scheme, which were proposed earlier were clubbed together to institute the Sanjhi Van Yojana Scheme, 2001. This scheme was to be governed by the Participatory Forest Management Rules, 2001. The following salient modifications were made in the new scheme:

- a. Each VFDS shall be required to make cash contribution of 15% of the annual outlay under the approved micro-plan
- b. In order to enhance the economic stake of the rural communities, forest-related income generation activities shall be promoted under this scheme, which shall commence only in the second or third year of the micro-plan.
- c. Inputs sharing arrangement has been made especially to promote social fencing, wherein the funds normally spent on fencing will be made available to the VFDS, who would be at liberty to decide how to use these funds for the protection of the plantation.

11.5.3 Integrated Afforestation and Eco-development Project

The Integrated afforestation and Eco-development project (IDP) was launched during 1999-2000 in this division. This project was for the Gin watershed covering areas of Kandaghat, Solan and Dharampur Forest ranges of the Solan Forest Division. The short term objectives of this project were regeneration and eco-development of degraded forest and adjoining areas, augmentation of the availability of wood and non-wood forest products like fuel, fodder and small timber securing people's participation in planning & implementation of the scheme, employment generation for needy sections of the society etc. The long term objectives were, eco-restoration, environmental conservation, Eco-development and checking forest degradation and loss of biodiversity.

The scheme was launched during 1998-99 but could not be implemented since the year 1999-2000. Under this scheme, a total target of 664 ha forest area treated at the cost of Rs. 38,39,200/- under various components was envisaged. Under the project seven Village Forest Development Committees (VFDCs) -3 in the Kandaghat range, 2 in Solan range and 2 in Dharampur range were formed during 1999-2000. For implementation of this scheme microplans were prepared and works were carried out accordingly in consultation with the VFDCs formed. The members of VFDCs met regularly in the presence of the forest guard, who was the Member secretary. The earmarked areas were afforested with the active participation of VFDC members by way of natural regeneration, management interventions and pasture improvement besides executing soil conservation works to check soil erosion

From the year 1999-2000 onwards the following achievements have been made by treating areas by bringing them under afforestation:

Table 11.3: Area brought under afforestation

Year	Extent Of area	Expenditure (Rs)
1999-2000	140 ha	12,44,000/-
2000-2001	160 ha	15,42,500/-
Total	300 ha	27,86,500/-

During the year 2001-02, a target of 180 ha., with a financial allotment of Rs 18,06,800/- was earmarked for execution under this project.

11.6 Joint Forest Management in Solan Forest Division

The perusal of past efforts for participatory forest management interventions in the forest division depicts that participatory forest management has been carried out from time to time under different schemes. Participatory Forest Management has been tried in the division on a limited scale from time to time under Sanjhi Van Yojna, externally funded projects and other schemes. Community participation has been considered as basic to the approaches of implementation mechanism in different projects but it lost its momentum after the project period. Somehow, it could not be mainstreamed in the working of the division. The VFDSs formed from time to time in the division have been compiled and their present status is given below.

Table 11.4: List of Joint Forest Committee/Village Forest Committee

Name of Range	S. No.	Name of JFMC	Year of formation	Area	Status
Kandaghat	1	Mahi	2002	Karol II nd	Inactive
	2	Badewla	2006	Kot	Inactive
	3	Sainj	2009	Kiartoo	Inactive
	4	TikkerKadhar	2009	Karol II nd	Inactive
	5	HathonPalech	2009	Karol I st	Inactive
	6	Baran	2006	Shalumna	Inactive
Subathu	1	Sanjhi Van Yojana KolthiKanyara	2001-02	Alobra	Inactive
	2	VFDS Gaddon	2004-05	Subathu	Inactive
	3	Van Vikas Samiti Bholapanog	2010-11	Mamligh	Active
Dharampur	1	Kiard	2004-05	Kumarhatti	Not active
	2	GhartiMaltu	2004-05	Kadon	Not active
	3	Shaimajh	08-02-2010		Not active
	4	Cheola	01-07-2020	Barog	Active
	5	Odder Jangeria	01-07-2020	Neri	Active
	6	Van Vistar Samiti Galyana	06-08-2023	Galyana, Barog, Mashon	Active
Parwanoo	1	JFMC ShilluKalan	10.06.2002	Kasauli	Inactive
	2	VFDC Sandhog	24.10.2002	Khadeen	Active
	3	VFDC Kanana	25.09.2003	Lugon	Not active
	4	VFDC Dadiyar	25.09.2003	Dadiyar	Not active
	5	VFDC Thana Nabh	25.09.2003	Dochi	Not active

	6	VFDC, RathalNakiyar	25.09.2003	Dadiyar	Not active
	7	VFDC, Hadli.	25.09.2003	Datiar	Not active
	8	FDC, Jakhroda	15.12.2011	Barog	Not active
	9				
Solan	1	Mashiwar	25-09-2003	Jaunaji II	Inactive
	2	Top kiber	25-09-2003	Chawal	Active
	3	SerBanera	25-09-2003	Kotla	In active
	4	Mansar	2006	Salogra	In active

Budgetary constraint is the primary reason for inactive JFMCs. Others schemes implemented from time to time as per the notification and allotment of funds are detailed below:

11.6.1 Samudayik Van Samvardhan Yojna 2018

The Scheme was notified vide Govt. of H.P. Notification No. FFE-B-F(5)9/2018 dated 5th September 2018 with the aim to rejuvenate the bond between rural people and nature for sustainable flow of eco-system services from the forest, strengthening participation of local communities in conservation and development of forests through plantation of useful plant spp and community management of forests.

Key components of scheme:

1. Identification of suitable open/degraded forest areas around selected villages for development into forests through active participation of user groups
2. Strengthening capacity of selected user groups in development and long term management of forests over the designated forest land.
3. Planting of suitable tree spp of local importance to ensure sustained and enhanced flow of eco-system services to the participating user groups.
4. Facilitating development of community user group based mechanisms towards sharing of eco-system services from the designated forests and building capacity of community user group for putting such mechanism in place.

The JFMC's and VFDC's already existing in the state under PFM Rule 2001 shall be strengthened under this scheme. The scheme was launched with a plan period of 25 years. The Management Plan was formulated for initial period of 5 years & shall be revised after every 5 year. Based on the approval of the management plan the JFMC/VFDS will prepare APO for each year in consultation with technical members and will submit to DFO. DFO will approve APO. Works will be executed as per APO. All payments will be made through DBT. After completion of work JFMC/VFDS will submit UC.

Activities to be undertaken:

- Plantation
- Soil conservation works
- Raising of nurseries
- Lantana eradication works

Direct benefit to the Community user group

1. Wages to members of CUG. Towards implementation of scheme.
2. Annual award to best community group.

Detail of works done under scheme

Table 11.5: works done under the scheme *Samudayik Van Samvardhan Yojna 2018*

Duration	Status Active/Inactive	Work done under schemes	Conclusion Success points
2018-19 to 22-23	Currently inactive due to non- allotment of funds under the scheme after 2020-21	Preparation of micro-plan. Micro- plan included works like lantana eradication, construction of WHS, check dams, farm ponds, plantation & nursery rising by concerned JFMC's.	5-year microplans were made and approved in two ranges Subathu and Parwanoo. Van Vikas Samiti Bholapanog in Subathu Range and VFDC Sandhog in Parwanoo range worked till 2020-21 as per the approve microplan (2018-19 to 2022-23) but due to lack of funds after 2020-21 the works under the approved micro-plan could not be completed.

The experience thus revealed that the VFDSs/ JFMCs become defunct after the project support to them is over.

11.6.2 Constraints to participatory management:

The discussion with the field staff and community members revealed that there is a general lack of enthusiasm in embracing the idea of shared management in the forestry sector among the stakeholders. Though some inroads have been made with the communities, a lot more thrust needs to be done on continuous basis to promote the spirit of the community-oriented management of forests. Some of the causes for this less encouraging response among people are:

- There is a general apathy of the youth to participatory programmes related to the rural sector because by acquiring a college education all youth strive for white collared jobs.
- Lack of proper education about the government programmes and insufficient extension activities of the department.
- The long gestation period of forestry activities and lack of worthwhile tangible benefits to the community without damaging the resource base in the short run.
- Too much dependence of the public on the government support and subsidies. Concepts of common resource pool management with the principle of caring and sharing is yet to be developed at large.

- Reluctance of government functionaries to hand over control of resources to people or even partially share their "power" with the people.
- Lack of proper legislation on participatory management and usufruct sharing.
- Limited scope to promote income-generating activities in the forest areas under JFM programmes
- Frequent changes in schemes and discontinuation of old schemes.

11.6.3 The way forward

There is need to adopt participatory forest management as part of the existing forest management paradigm. This can be promoted in the forest management of the division with continued efforts. The development and implementation of JFM and participatory forest management needs to be promoted in the division.

Community participation is an important aspect of any joint management plan. The process of community involvement starts from the identification problem analysis, planning, implementation and management of forest activities. Participatory monitoring and evaluation of the programmes also helps to encourage people's participation. The sustainability of any such practice or activity depends on the level of participation. Participation fosters ownership of the people over the resources being managed by such joint activity and ensures better results.

Participatory planning helps in

- Building the "we" feeling,
- Involve and ensure the community's participation
- Transparency
- Brings clarity; and
- Sustainability

11.6.4 Approach to be adopted in implementing JFM schemes

- Educate people on the aim and objectives of the programme/scheme before launching the programme / scheme;
- Make extensive and intensive use of PRA techniques to formulate the plan and share the derived information with the people;
- Draw up a Micro-plan with the active involvement of the local people, ensuring representation of the heterogeneity of the group;
- Execute works and use PRA techniques for monitoring as well. Involve people in all the activities.
- Exemplify the spirit of participation by well-defined, lucid usufruct sharing mechanisms and transparency in accounting and expenditure on the works.
- By integrating community knowledge and needs into forest management, JFM has the potential to achieve sustainable conservation outcomes while improving the livelihoods of forest-dependent populations.
- Entry-point Activities like involving communities in developmental activities like building roads, check dams, removal of pine litter, eradication of lantana, management of forest fires, etc. shall be taken up.

The general prescriptions of the working plan, as far as possible, should be carried out after involving local people at planning and implementation stages of the activities. The Protection-cum-rehabilitation working circle is most suitable for carrying out works under the participatory management mode. It is also suggested that species of local importance be preferred in afforestation activities. The choice of species should be discussed and finalized after meetings with the local people. Such species should have economic value and should be fast-growing, high-yielding and of multiple use so as to be able to provide returns to the community in the short period. Also sustainable harvesting of NTFP that provide raw material for local industry and craftsmanship for value addition should be promoted and encouraged. Quick-growing and high-yielding grasses and legumes e.g. Hybrid Napier, provides immediate alternatives to fodder demand and should be introduced along with tree species to sustain people's interest in the closed areas. Bamboos should be planted in gullies, nalas and moist pockets as these would serve the dual purpose of soil conservation and fuel and fodder replenishment. An all-out effort should be made to evolve a "Community-State Partnership". The community organizations and people at large should be actively involved in the works of forest development and protection as a matter of implementation strategy. Within the existing legal and policy framework the suitable models of community-based forest management should be evolved according to the specific site.

Chapter 12

Wild life management (Overlapping) working circle

12.1 Background and Introduction

Environmental stability and biodiversity conservation are the main aims of the National Forest Policy 1988. The policy recognized the importance of conserving natural heritage and protecting flora and fauna. The policy promotes sustainable use of forest resources, reducing the pressure on wildlife habitats. Forestry operations have the potential for changing conditions which create positive as well as negative impacts on biodiversity. It is possible to maintain the known range of plant and animal diversity in viable populations alongside the harvest of timber and extraction of other forest produce in well-managed forests. It is important to note that a good forest manager is also a good wildlife manager and it therefore becomes important to change the traditional forestry outlook to the holistic view. The interventions to improve the viability of habitats for wildlife are essential.

Due to the spread of education and awareness there is a growing concern for the protection and preservation of wildlife and there is a steady opposition to their killing and to the destruction of their habitat. With the increased availability of information on biodiversity, a widespread and intelligent recognition of the immense value of the myriad species of plants and animals to humankind has been established. Forests provide an excellent opportunity for man to study living beings in their natural environment. In addition to this, there are material considerations as well, especially ecological. The delicate balance of nature is maintained by these animals and plants through the intricate food web and any breach in this chain can cause overpopulation of any one species which may prove detrimental to human interests. Wildlife is a source of sport and enjoyment to people and fetches revenue to the State as well. If the people are led to know the importance and worth of wildlife they will appreciate it as an asset and put in efforts to conserve them.

Therefore, to manage and protect the wild flora and fauna of this area this working circle is being constituted.

Special object of Management - Remaining consistent with the general object of management of this working circle; the special objects of management are –

- (i) Management of the Wildlife in the forest division
- (ii) Protection and development of wild life habitat and to make the forests more suitable for the existence of wild flora and fauna.
- (iii) Making people aware of importance of the wild fauna and to seek their active participation in protection of wild flora and fauna.
- (iv) Recognizing and addressing the issue of Man – Animal conflict

12.2 Area Statement

This working circle overlaps the whole Management Plan Area of the division.

12.3 General Characteristic of Fauna

The forests of Solan Forest Division are home to diverse wildlife, including the Leopard, Ghoral, Black Bear and Barking deer as well as various bird species like the Cheer pheasant, Himalayan monal, Grey and black partridge & other common wildlife species like monkeys, langurs, wild bores, nilgai / bluebull & other reptiles etc. The detailed list of the animals found in the division has been given in the glossary and Chapter – 2B along with the occurrence and habit of important species. No authentic data is available so far as the number of animals of each existing species is concerned. The territory of wildlife is determined by their habit, geographical obstacles and natural boundaries. The animals like leopards, deer, cats, hyenas etc. have wide spread territory and it is quite natural that they keep on crossing artificial boundaries of a division. Most of the wild life migrates to and fro the adjacent forest areas. Habitat management, scientific studies & research and awareness about the importance of wildlife, play an important role in the management of wildlife.

The Chail Wildlife sanctuary created in 1976 though it was notified quite recently in October 1999, with the purpose of protecting and improving wild life and its habitat. Similarly Shilli wild life sanctuary was notified in August 1996. However, this sanctuary is now notified as Shilli Conservation Reserve on 15th July 2013 and comes under Solan Range of Solan Forest Division. Although, Chail Wildlife Sanctuary is now no longer a part of Solan Forest Division, despite this, wildlife is an inseparable part of the forests of the tract and still there is a need to protect and manage it from the ecosystem and aesthetic points of view. The various animals and birds found in the tract of this division have been mentioned in detail in the chapter II Flora and Fauna" of part I of the plan.

12.4 Problems faced by wildlife outside sanctuaries:

Wildlife does not get the same priority and significance in areas outside sanctuaries and national parks as it does in the notified wildlife areas. As a result they remain an invisible part of the forest ecosystem and whenever forests are subjected to any activity the impact of such activities on them is either undermined or ignored altogether Habitat loss, due to the diversion of forest land for other purposes, frequent forest fires, excessive lopping etc., is one of the prime impacts and as a result, the animals are either pushed deep into the forests or are left with no option but to venture out into villages. In the latter case, the carnivores resort to cattle lifting and at times pose a threat to human life too. In this process, they render themselves also vulnerable to being poached and killed. This interface has led to a genesis of human-wildlife conflict and has not served the cause of wildlife protection. Poaching of animals for meat and sometimes as trophies in the division is not very common if the number of cases registered is the criteria to go by.

12.5 Wildlife Management Problems of the division

A study (Zoological Survey of India, Citation Sharma L.K.) conducted for HP on the Population estimation and assessment of human-wildlife conflicts for conservation and management

planning of Common Leopard and Asiatic Black Bear in 2024 revealed that the cases of human-wildlife conflict with Leopard and Asiatic black bear varied across the districts in the state. However, the study mentions that incidences of such conflicts were low in district Solan. The crop depredation was mainly due to monkeys and wild boars.

Like many other areas of the state, the Solan Forest division also faces the problem of animal depredation. Such incidents are consistently increasing and pose a great challenge to Wildlife management. The following problems are the most pressing and demand immediate tackling.

a) Leopard problem

There have been many cases of damage to cattle by leopards in the division, who target these cattle in the forests or grazing lands. Instances of cattle lifting from cattle sheds are also not uncommon. Though injury and casualty in the case of human beings have not been reported during the last 8-10 years, there have been a few instances when a leopard has created panic by venturing into the dwelling houses in villages and had to be captured by setting traps and cages.

b) Monkey menace

Solan forest division receives a number of representations from farmers, panchayats and kisan sangathans that monkeys constantly raid their agricultural crops and cause damage to same posing threat to their life at times. They have attained a status of pests to agricultural fields and human habitations, mainly urban dwellings consequence on availability of ample left over human food which is easily accessible from garbage bins resulting into increased interaction leading to menace in the form of attacks and crop damage etc.

Types of conflict by Rhesus Macaques

Urban Areas

- Rioting in unguarded areas
- Pilferage from homes/shops/people
- Destruction of vegetation/home gardens /offices/communication lines
- Bites/Attacks on tourists/women/children

Rural areas

- Crop raiding
- Destruction of seedlings/seeds
- Destruction of cash-crops
- Occasional bites
- Attack on pets/guard dogs

Both urban & rural conflicts are interchangeable owing to seasonal variations and the migratory nature of the animals in conflict.

The Rhesus macaque was delisted from the Wildlife Protection Act in **2022** through the Wildlife (Protection) Amendment Act, 2022. It was removed from Schedule II of the Act, which stripped it of its previously protected status and made its management a civic issue, akin to stray animals.

To mitigate this Rhesus macaque–human conflict the veterinarians of the Wildlife Wing of HP Forest department standardized the technique and adopted method to mass-sterilize the monkey in first Monkey Sterilization Centre (MSC) of the state at Tutikandi, Shimla in February 2007. This was first such attempt by anyone in entire world to surgically manage the population of any wild population on such a large scale.

Now seven more MSC's including one at Tutikandi are functional viz Sastar (Hamirpur), Gopalpur (Kangra), Boul (Una), Slapper (Mandi), Bakani (Chamba) and Paonta Sahib (Sirmaur) with average annual target of sterilization of 10000 monkeys.

Every year Solan Forest Division receives targets of 600-700 monkeys/ year for monkey capturing, sterilization and their release. Solan division also hire monkey catchers who catch the monkeys at the prescribed rates and transport them to Monkey Sterilization Centre Tutikandi and after due sterilization transport them back and release them on the same site from where they were capture.

Table 12.1 Monkey capturing rates

No.	Category	Rate	Office order	Remarks
1	Monkeys sterilized	Rs. 700 per monkey, if total catch of monkeys is below 80% of the total population of the target troupe • Rs. 1000 per monkey, if total catch of monkeys exceeds 80% of total population of the target troupe	Office Order No. 194, Dated 27/10/16	
2	Monkeys found already sterilized	Rs. 300 per monkey	Office order 59; 18/9/18	
3	Monkeys found pregnant	Rs. 400 per pregnant female monkey	Office order 59; 18/9/18	
4	Juvenile monkeys, weaned, not sterilized	Rs. 150 per weaned monkey	Office order 59; 18/9/18	
5	Monkeys found suffering from diseases which are untreatable	Rs. 1000 per monkey	Office Order No. 137 Dated: 10/10/2017	
6	Monkeys culled as per provisions of being declared as vermin under WPA, 1972	Rs. 500 per monkey	Office Order No. 194, Dated 27/10/16	Valid till Rhesus Macaque declared as vermin by GoI

Guidelines for release of monkeys.

- a) Only monkeys identified by a veterinary surgeon as fit for release should be released.
- b) It is imperative that monkeys are released back to the same location from where they were captured. Care should be taken to ensure correct identification of monkeys and their location of capture.
- c) Although monkeys should be released after ensuring that they have been fed, they should not be fed immediately prior to their transport to the release sites as this practice may cause travel sickness leading to vomiting.
- d) The release of the monkeys is to be done by Monkey catcher in presence of Forest staff of that area to ensure the releases are in same location. e) In many areas, the release of monkeys during the early morning hours is preferred.

c) Wild boars

These animals also pose a nuisance both in agricultural fields as well as forest areas, especially plantations. In the forest areas, they dig out the plants, especially the rhizomes of bamboo while they destroy standing crops and vegetables in the agricultural lands.

It is important to restore and improve the habitat of these wild animals. Steps should be taken so that the cause for their straying into habitation is addressed. There is also a need to establish a meaningful dialogue with the state wildlife department and the Central Zoo Authority of India to find feasible remedies to the problem cited above.

12.6 Acts and rules regarding wildlife management and conservation

Wildlife protection has been included in Article 51-A as a fundamental duty of citizens of the country. The National Forest Policy of 1988 also contains a number of references on wildlife and on bio-diversity for conserving the natural heritage by preserving the natural forests that are storehouses of a variety of flora and fauna. The main legislative measure adopted for the protection of wildlife was the enactment of the Wild Life (Protection) Act. 1972 amended from time to time. The Legal Provisions for Wild Life Protection and the main features are as under:

- (a) The wild animals and plants have been classed into four different schedules, Schedule-I deals with animals with highest level of protection, Schedule-II deals with animals with a lesser but still significant degree of protection with less stringent penalties than schedule –I, Schedule-III deals with protected plant species that require protection and Schedule-IV deals with species listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which regulate their international trade.
- (b) The unauthorized hunting of wild animals has been made a punishable offence.
- (c) When any of the wild animals enlisted in Schedule-I become dangerous to human life or is disabled or diseased beyond recovery than the Chief Wildlife Warden permits any person to hunt such animal provided the Chiefwild Life Warden is satisfied that such animal cannot be captured, tranquilized or translocated .
- (d) Every wild animal other than vermin killed by mistake or hunted deliberately, or animal article, trophy or uncured trophy or meat derived from any wild animal

shall be the property of the state government. If any person has these types of wild animals or an object prepared used for committing an offence and has been seized shall also be the property of the state government. If any person has these types of wild animals or an object prepared from it then he should give information about it within 48 hours to the officer authorized in this regard. No person can keep this type of government property nor can he receive it from anybody, nor can he transfer it to anybody and nor can he destroy it without having got written permission from the Chief Wildlife Warden or any other authorized officer.

- (e) No person shall do business as a manufacturer or dealer in animal articles or do work of taxidermy or deal in trophy or uncured trophy, or deal in captive animals, or cook or serve meat of the animals as specified in Schedule – I and II.
- (f) The hunting of all wild animals under the schedule I and II has been prohibited all over the state. The restriction continues to be in force.

Wild Life Protection (Amendment) Act 1991 – Amendment has been done in the Wild Life (Protection) Act 1972 for making it more effective. The following are the salient features of this amendment:

- (a) The animal enlisted in schedule I to IV have been totally prohibited from hunting and no hunting permit can be issued for it.
- (b) Central zoo authority has been formed.
- (c) In the areas within 10 km from the boundaries of Wild Life Sanctuaries or National Park no fresh arm license will be issued without permission from the Chief Wild Life Warden.
- (e) All the domestic animals kept within 5 kms from National Parks and the Wild Life Sanctuaries will be given immunization against animal diseases.

The act has been amended from time to time and some salient points are mentioned below:

Table 12.2: Amendments in the Wildlife Protection Act (1972)

Year	Major Features in the amendment
1982	Regulation of zoos and captive breeding
1986	Stronger enforcement, powers to officers
1991	Ban on hunting, creation of CZA
2002	NBWL creation, new types of reserves
2006	NTCA and WCCB formation
2022	CITES compliance, schedule reclassification, higher penalties

The Wild Life (Protection) Act 1972 is being enforced in Himachal Pradesh since its promulgation by the Government of India. It came into force in the state in the year 1973, vide Notification no. G.S.R. 190 (E), dated 2.4.1973, Gazette of India, Extraordinary, Part II, section 3 (I) page 517. The H.P. Wild Life (Protection) Rule of 1975 provided Shooting and Hunting rules which were applicable to all the Reserved and Demarcated forests in the State (vide Notification no.6-9/73-SF dated 24.2.75). Hunting of any wild animal specified in Schedules I, II, III and IV is prohibited. However, there is a complete ban on hunting in the state since 1983

notification vide no. 6-2/73-SP-II dated 24.5.83. About a year later, the state government vide its notification No. 6-2/73-SF-IV dated 21.6.84, hunting of a few identified species has been allowed, which have been declared vermin or cause damage to crops in cultivated fields, in accordance with the provisions of the Wild Life (Protection) Act, 1972. In certain cases where a wild animal becomes a man-eater, it can be killed after seeking permission from the Chief Wildlife Warden to this effect.

Trade in wild animals, animal articles etc.

Every person is bound to declare in his control, custody or possession any animal, article or trophy to the Chief wildlife warden or an officer authorized on his behalf, who in turn will issue a certificate of ownership after proper enquiry. The DFOs have been declared authorized officers for this purpose. However the issuance of the certificate of ownership is closed after 2002.

A major change is the insertion of **Section 49M**, which mandates that every person possessing a living specimen of an animal species listed in the new **Schedule IV** (which includes species listed under the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora - CITES) must report their possession to the Management Authority (or authorized officer) through the online PARIVESH 2.0 portal.

Upon satisfactory declaration that the animal was not acquired illegally, the Management Authority will issue a **registration certificate**, which serves as proof of lawful possession. This replaces or updates the previous "certificate of ownership" framework for these specific species.

The amendment requires that any transfer of possession, birth of offspring, or death of a specimen listed in Schedule IV also be reported and registered through the same online portal within a specified period within thirty days of the event.

Application for license to commerce or to carry out a business as a manufacturer or dealer in animal articles has been completely banned and any earlier practice has been discontinued.

Compounding of offences

The chief wildlife wardens and all the wildlife wardens and DFOs in the rank of DCF are authorized to compound the compoundable offences.

Incidents of poaching and other wildlife offences are not very common in the area. Some cases of wildlife offence pertaining to the illegal possession of animal skins and poaching incidents involving barking deer (Kakkars) etc. have been reported in the past.

Grant of relief for damages

The relief rates in the cases of human-wildlife conflicts are revised from time to time by the state govt. The prevalent relief rates notified in September 2018, for losses caused to human beings and domestic livestock by Wild animals as defined in the Wildlife (Protection) Act, 1972 are as given in the table below.

Table 12.3: Relief rates under Wildlife Protection Act (1972)

S. No	Particulars	Enhanced Rates (in Rupees)
1	In case of death of human being.*	4,00,000/-

2	In case of permanent disability to human being.	2,00,000/-
3	In case of grievous injuries/partial disability to human being.	75,000/-
4	In case of simple injury to human being as per actual cost of medical treatment (max).	15,000/-
5	In case of loss of Horse, Mule, Buffalo, Ox, Yak and Camel.	30,000/-
6	In case of loss of Cow Jersey and cross breed.	15,000/-
7	In case of loss of Cow (local breed), Donkey, Churu, Churi & Pashmina Goat.	6,000/-
8	In case of loss of Sheep, Goat and Pig.	3,000/-
9	In case of loss of young ones of Buffalo, Cow Jersey, and all other breeds listed.	15,00/-

* No loss of human life has been reported in the division during the period of the last working plan and the intervening period as well.

The following guidelines need to be followed for the grant of relief:

i) Production of postmortem report in case of loss of human life, certificate in case of grievous injury, partial & permanent disability, and prescription slip as well as verification of actual cost of medical treatment in case of simple injury (including Monkey bites) from the Medical officer of a Government Institution/Govt. recognized Medical Institution, as the case may be.

ii) The verification of loss of cattle that was actually caused by wild animals can be done by the Pradhan /Up-Pradhan of Panchayat/Patwari/President Notified Area Committee/Chairman, Municipal Committee, Commissioner/Mayor/Deputy Mayor, Municipal Corporation of the area/Elected Member of the Cantonment Board area/Councilor of the area, Range Officer/Deputy Ranger/Forest Guard or any other forest officer higher in rank than a Range Officer, Veterinary Officer or Veterinary Pharmacist or officer authorized by Veterinary officer of the area.

iii) All DFOs in HP shall be the final authority to sanction all cases of relief claims on account of losses caused by the wild animals to humans and domestic livestock.

iv) The DFOs shall release 25% of the amount of relief prescribed for human loss/permanent & partial disability/grievous injury on receipt of report as interim relief immediately to the family

of the deceased/affected person after due verification in anticipation of formal sanction without delay. The balance amount will be released after receipt of the complete relief claim.

v) For immediate disbursement of relief claim, a corpus fund will be created at the level of Principal Chief Conservator of Forests (Wildlife)-cum Chief Wildlife Warden. All the budget allocations from the state as well as from State CAMPA in respect of relief shall be deposited in the aforesaid corpus fund. The PCCF (WL) will ensure the disbursement of relief amount in respect of aforesaid categories of losses on the same day on receipt of a request from the concerned DFO. The DFO concerned will ensure to send such requests by E-mail/Fax asking for funds of relief amount on the same day of incident or on the day of receipt of information of the incident from the claimant. DFO will make payment of aforesaid 25% of the relief amount immediately from the budget available with him and the same will be recouped on receipt of funds from the Chief Wildlife Warden.

vi) All claims in respect of simple injury to humans shall be restricted to actual cost of medical treatment verified by the Medical Officer of a Government Institution/Govt. recognized Medical Institution subject to a maximum of Rupees 15,000/- as prescribed above in the categories of losses.

vii) All cases of losses caused by the wild animals should be reported by the applicant to the nearest Forest Office within seven days of the incident, and claims for relief should be filed within one month to the nearest Range Forest Office under control of Divisional Forest Officer (territorial or wildlife). The claim can be filed either at the place where the loss by wild animal has occurred/reported or where the applicant resides. All time-barred cases shall be sent to the Govt. of Himachal Pradesh for approval.

viii) The relief will be granted in case of loss of livestock to the owner of the livestock. These rates would be applicable for killing of domestic animals by wild animals as defined in Wildlife (Protection) Act, 1972 in cattle sheds/cowsheds, private land, private premises and forests.

ix) The relief in case of loss of the human being will be granted in the order of preference given below:

- (a) Wife or husband, as the case may be.
- (b) Sons, unmarried or divorced daughters and children of predeceased son (equal share).
- (c) Daughters (equal share).
- (d) Grandchildren being children of his/her sons or daughters who died before him/her (equal share).
- (e) Father or Mother.
- (f) Brothers or sisters or children of the deceased brothers (equal share).
- (g) Failing all above any other next of kin entitled to a share in the estate.

Table 12.4: Wild Life Damage cases from 2012-13 to 2024-25

Year and Range	Co w	O X	Ca lf	Buffalo	Goat	Sheep	Mule/Horse/ Donkey	Injury to Human	Total No. of Cases	Total Compensation paid in (Rs)
2012-13										
Kandaghat	0	0	1	0	0	0	0	1	2	5250
Solan	1	0	0	0	0	0	0	0	1	1500
Subathu	3	0	0	0	8	0	0	4	15	21510
Dharmpur	2	0	0	0	9	0	0	1	12	10414
Parwanoo	0	0	0	0	0	19	0	0	19	7600
Chail	0	0	0	0	0	0	0	0	0	0
2013-14										
Kandaghat	1	0	0	0	0	0	0	4	5	39482
Solan	0	0	0	0	0	0	0	5	5	8700
Subathu	6	0	0	0	3	0	0	3	12	27995
Dharmpur	3	0	0	0	4	0	0	0	7	8100
Parwanoo	0	0	0	0	0	0	1	0	1	1500
Chail	0	0	0	0	0	0	0	0	0	0
2014-15										
Kandaghat	2	0	0	0	0	0	0	0	2	4000
Solan	1	0	0	0	0	0	0	2	3	6437
Subathu	4	0	1	0	4	0	0	0	9	12125
Dharmpur	2	0	0	0	3	0	0	1	6	8125
Parwanoo	0	0	0	0	0	0	0	1	1	5000
Chail	0	0	0	0	0	0	0	0	0	0
2015-16										

Kandaghat	0	0	0	0	0	0	0	0	0	0
Solan	1	0	0	0	0	0	1	0	2	7500
Subathu	3	0	0	0	8	2	0	1	14	18600
Dharmpur	2	0	0	0	2	0	0	0	4	5300
Parwanoo	0	0	0	0	0	0	0	0	0	0
Chail	0	0	0	0	0	0	0	0	0	0
2016-17										
Kandaghat	1	0	0	0	0	0	0	0	1	6000
Solan	0	0	1	0	0	0	0	0	1	1000
Subathu	4	0	0	0	11	0	0	0	15	40500
Dharmpur	1	0	0	0	0	0	1	0	2	16000
Parwanoo	0	0	0	0	0	0	0	0	0	0
Chail	0	0	0	0	0	0	0	0	0	0
2017-18										
Kandaghat	0	0	0	0	0	0	0	0	0	0
Solan	1	0	0	0	0	0	0	0	1	6000
Subathu	1	0	0	0	13	0	0	0	14	25500
Dharmpur	2	0	0	0	0	0	0	0	2	12000
Parwanoo	1	0	0	0	0	0	0	1	2	3500
Chail	0	0	0	0	0	0	0	0	0	0
2018-19										
Kandaghat	1	0	0	0	0	0	0	0	1	6000
Solan	0	0	0	0	0	0	0	0	0	0
Subathu	1	0	0	0	1	0	0	1	3	157500
Dharmpur	8	1	0	0	5	0	2	0	16	111000

Parwanoo	6	1	0	0	0	0	1	0	8	76000
Chail	0	0	0	0	0	0	0	0	0	0
2019-20										
Kandaghat	1	0	0	0	0	0	0	0	1	15000
Solan	0	0	0	0	4	0	0	0	4	12000
Subathu	0	0	0	0	0	0	1	0	1	30000
Dharmpur	0	0	0	0	4	0	0	0	4	12000
Parwanoo	4	1	1	0	0	0	0	0	6	91500
Chail	0	0	0	0	0	0	0	0	0	0
2020-21										
Kandaghat	0	0	0	0	0	0	0	0	0	0
Solan	0	0	0	0	2	0	0	0	2	6000
Subathu	2	0	0	0	4	0	0	0	6	39000
Dharmpur	0	0	0	0	0	0	0	0	0	0
Parwanoo	4	1			1				6	75000
Chail	0	0	0	0	0	0	0	0	0	0
2021-22										
Kandaghat	0	0	0	0	0	0	0	0	0	0
Solan	1	1	0	0	0	0	0	0	2	45000
Subathu	0	0	0	0	0	0	0	0	0	0
Dharmpur	0	0	0	0	0	0	0	0	0	0
Parwanoo	4	1	0	0	0	0	0	0	5	96000
Chail	1	0	0	0	0	0	0	0	1	15000
2022-23										
Kandaghat	0	0	0	0	0	0	0	0	0	0

Solan	0	0	0	0	0	0	0	0	0	0
Subathu	1	2	0	0	3	0	0	0	6	84000
Dharmpur	4	1	1	0	0	0	0	0	6	87000
Parwanoo	5	1	0	0	0	0	0	0	6	78000
Chail	0	1	0	0	0	0	0	0	1	30000
2023-24										
Kandaghat	1	0	0	0	0	0	0	0	1	15000
Solan	2	0	0	0	0	0	0	0	2	30000
Subathu	0	0	0	0	0	0	0	0	0	0
Dharmpur	2	1	0	0	0	0	0	0	3	60000
Parwanoo	0	0	0	0	0	0	0	0	0	0
Chail	0	0	0	0	0	0	0	0	0	0
2024-25										
Kandaghat	0	0	0	0	0	0	0	0	0	0
Solan	0	0	0	0	0	0	0	0	0	0
Subathu	0	0	0	0	0	0	0	0	0	0
Dharmpur	1	0	0	0	10	0	0	0	11	45000
Parwanoo	4	0	0	0	0	0	0	0	4	60000
Chail	0	0	0	0	0	0	0	0	0	0

There are no pending cases of compensation in the division.

Table 12.5: Prey-preference

year	Cow	Ox	Calf	Buffalo	Goat	Sheep	Mule/Horse/Donkey	Injury to Human
2012-13	6	0	1	0	17	19	0	6
2013-	10	0	0	0	7	0	1	12

14								
2014-15	9	0	1	0	7	0	0	4
2015-16	6	0	0	0	10	2	1	1
2016-17	6	0	1	0	11	0	1	0
2017-18	5	0	0	0	13	0	0	1
2018-19	16	2	0	0	6	0	3	1
2019-20	5	1	1	0	8	0	1	0
2020-21	6	1	0	0	7	0	0	0
2021-22	6	2	0	0	0	0	0	0
2022-23	10	5	1	0	3	0	0	0
2023-24	5	1	0	0	0	0	0	0
2024-25	5	0	0	0	10	0	0	0
Total	95	12	5	0	99	21	7	25

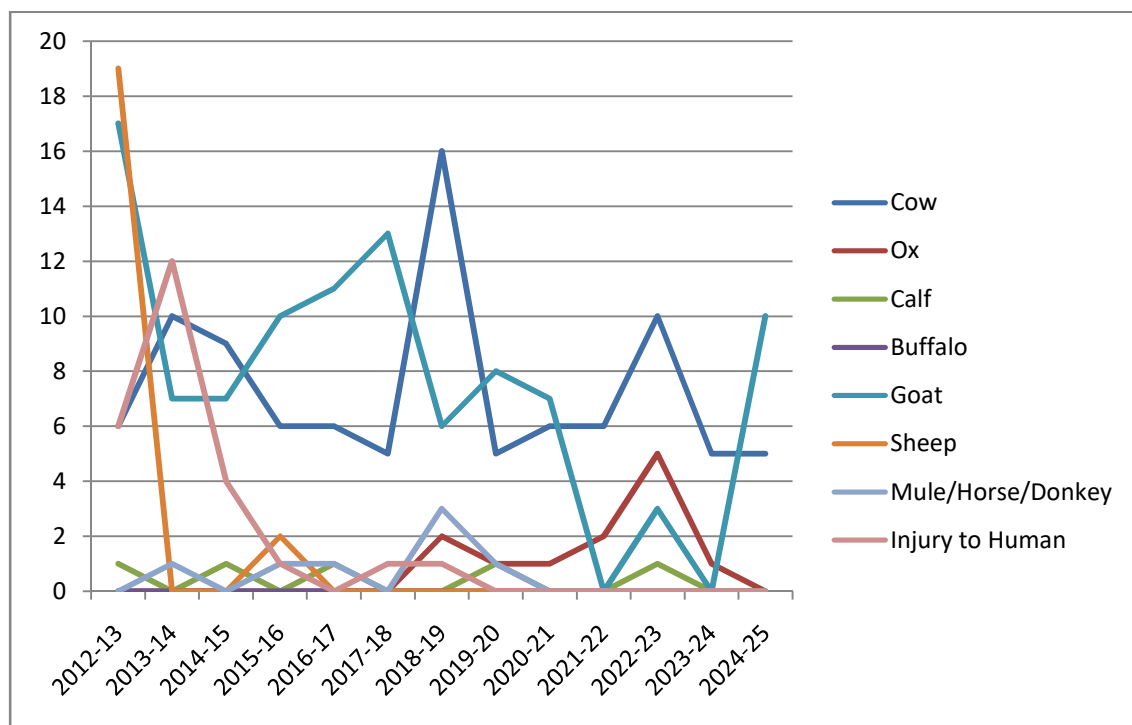


Fig.12.1: Trend in preying by wild animals in Solan Forest Division

From the trend it shows that injury to human has decreased from 2012 to 2018-19 and no incidence is reported till date after 2018. Goat and Cows are the most preferred preys. These are the main ones reared too. Thus after due efforts of the public awareness regarding human – wildlife conflict the cases of human-wildlife conflicts have significantly reduced after 2023-24.

Rewards

There is a scheme for payment of cash rewards for providing intelligence about persons indulging in poaching and illegal trade in wildlife products in the state. The rules were framed in February 1994. The information for which cash rewards would be made available should fall under either of the two categories

- a) Illegally held stocks of wild animals and wildlife products.
- b) Any activity related to poaching, illegal trade or transport, illegal export or import committed or to be committed. Related to wildlife.

The quantum of rewards to be paid in any case would depend on the nature of the information provided and is usually linked to the value of the seizure in the concerned case. It has however been stipulated that the value of the reward should not exceed 15% of the value of the case property recovered. All DFO (Territorial) and DFO (Wildlife) are authorized to make payments of such rewards, after obtaining approval from the Chief Wildlife Warden. However the cash reward scheme is not operational from past many years and needs to be revived.

Census

A recent census of common leopard and Asiatic black bear was conducted by field staff with ZSI in 2024 for population estimation and assessment of human wildlife conflicts for conservation and management planning. The census data was shared with ZSI for conservation and management planning of common leopard and Asiatic black bear. Also monkey census was conducted by field staff in December 2019, May 2024 and December 2024.

12.7 Prescriptions for Conservation and Management of Wildlife

12.7.1 Habitat Management

Enrichment of habitat can be done by manipulation of stand conditions and juxtaposition of the food, water and cover with respect to each other within the home range of animals.

Micro habitat management

The microhabitat may be of biological or geomorphologic origin. The forestry operations may have detrimental impact to these microhabitats. Types of microhabitats and practical solutions for the management are given below

- (i) Cliffs – Cliffs provide important habitat for wildlife with necessary features such as cracks, flat shelves and roof of overhang. They provide physical protection and concentrate a variety of reptiles, birds, mammals and plants. The flat shelves provide the roosting or nestling place for vultures and eagle, cracks provides home for reptiles. Roof

of overhanging cliffs usually have honey bees, nest and nestling colonies of swallow, swift, crag martins and bats. Endemic plant species of these areas (*Catamixis baccharoides*) hang on the cliff. All disturbances to such cliff should be avoided.

(ii) Cave/Den – They provide shelter from extreme weather conditions; varying degrees of darkness, solitude and protection from predators. Many carnivores use it as shelter, breeding site & secure place for raising the young. Range officer should allow the camping at such sites only after verifying the site to ensure that the cave/den is not disturbed.

(iii) Talus – Talus is the accumulation of broken rocks at the base of cliffs or other steep slopes. It is a microhabitat for frogs, lizards, snakes and small mammals. Generally boulder material from talus is carted off as construction material for maintenance of forestry roads and buildings. This practice should be stopped, so that the microhabitat should be maintained.

(iv) Burrows – Some animals burrow in earth, anthills and soft rock. It is ideal site for monitor lizard, fox, porcupine, civets and pythons. As much as possible all disturbances should be avoided near borrows.

(v) Snags and hollow trees – It is a standing dead tree. A snag provides a specific habitat for different animals and birds at different- stages of its decomposition. Many species of bird population depend on snag and hollow trees in Doon valley for their nestling site. Five to six trees per hectare of snag/hollow trees preferably soft wood species should be left during the marking of tree.

(vi) Down wood – It includes fallen trees on the ground or those partially submerged in stream water. All the down wood collection from protection working circle should stop. It will help to protect soil erosion in the streams and also support the microhabitat of the area.

(vii) Climbers – It has significant value to wildlife for food flowers, fruits, leaves, seeds, bark and roots. It also facilitates the movements of arboreal animals. Climbers except the ones that are detrimental to the tree growth in forest areas, should not be cut at least in the riparian zone.

Macro habitat management is equally important for efficient management of wildlife. Wild animals depend on movement between forest patches, feeding grounds and breeding sites. Wildlife corridors between compartments shall be identified and protected and barriers that fragment habitats (e.g. fences) will be reduced. Wildlife species vary by elevation from Chail range to Parwanoo range hence a diverse native forest types (Oak, Chil, Broad-leaved) will be promoted over monocultures to support more wildlife niches. Apart from this, invasive alien species (like lantana) will be controlled to protect and enhance the quality of habitat wildlife.

Grazing pressure from livestock alters forest understory composition affecting species such as cheer pheasant. Grazing pressure will be controlled by keeping locking period and adopting zoning grazing (time / area restrictions) to improve quality of macro-habitats. Detailed fire

management practices have been addressed in PCR Working Circle which shall also reduce the detrimental effect on forest flora and fauna. For evidence based management of habitats wildlife surveys (using camera traps) including those of large mammals (leopard and black bear) and bird counts have been done in the Solan Forest Division in the past which shows data-driven conservation. The same practices will be adopted in future also. Steps shall be taken for regulating habitat fragmentation due to land use change through satellite change detection. Management practices shall be refined through research partnership with ICFRE-HFRI and Dr, Y.S. Parmar University of Horticulture and Forestry, Nauni.

12.7.2 Linking wildlife management to conservation tourism

This is a very effective way of protecting and conserving wildlife. It goes a long way in educating the local population as well as the visitors on the importance of wildlife and aids in weaning them away from practices detrimental to wildlife conservation. With the coming of age of the concepts of eco-tourism sufficient emphasis will be laid on wildlife conservation tourism at suitable places.

12.7.3 Other measures

1. No felling should be allowed along the river and nalla banks as these zones are important habitats of wildlife. Emphasis will be on identification and protection of such areas as wildlife conservation and eco-tourism sites and preserved for their biological and ecological functions concerning wildlife.
2. The roosting and nesting/ breeding sites of important bird and mammal species in the Division will be identified and completely protected.
3. Periodic inoculation of domestic cattle frequenting the forests should be done to prevent the spread of cattle-born diseases to wild animals.
4. Extensive training on wildlife education and on the management of wildlife will be organized for the staff. Sufficient input for tackling and processing wildlife offence cases, including legal aspects will be provided to the forest staff at all levels to improve their managerial and executive capacities. The staff will be trained properly in wildlife census, habitat management, ecotourism, flora/fauna identification.
5. A periodic census of mammals and other important species will be carried out as important management input at an interval of five years. The information about wild animals should be collected from various sources and studies will be carried out for assessment of the present status of wildlife. The population of various species will be estimated and their habitat requirements should be enlisted and acted upon.
6. Creation of waterholes and protection cum rehabilitation of Water Sources for Wildlife will be carried out. Soil conservation and plantation of Napier and other grasses is needed for preventing soil erosion and acts as suitable cover for wildlife.
7. Spreading Consciousness among Local Villagers about Wild Life protection through messages regarding wildlife conservation will be spread through meetings, posters, hand-bills and other publicity material in schools, colleges and public places.
8. Preventing Damage to Agricultural Fields by Wild Animals: Efforts should be made to minimize the damage to the crops through agro-forestry, crop rotation and other possible means through convergence with departments like agriculture, horticulture and animal husbandry.

12.8 Addressing Monkey Menace

Long Term Strategy to combat monkey menace.

INVOLVEMENT OF LINE DEPARTMENTS

- Municipal Corporations/other local bodies: By aggressive management of garbage, proper implementation of legislation.
- Department of Law and Order: to strictly enforce restrictions on feeding of monkeys
- Agriculture and Horticulture Departments: by proper assessment of damage done, seasonal raiding pattern, approximate troupe size, movement pattern, etc. Moreover, these departments should research and suggest for alternative crops which are not raided by macaques. In addition, they can have valuable inputs regarding the early maturing feed varieties for the macaques which can be used by various stakeholders as alternative control measure of habitat enrichment. These departments have already commenced upon a programme of funding solar-fences around the crop fields by subsidizing the cost up to 80% of total cost. The department is also promoting sowing of tubers, marigold etc. which are not eaten by the monkeys.
- Involvement of NHAI/PWD: Since, many macaques dwell by the sides of the roads, it should be important that these authorities carry out the work of control of feeding by means of strict vigil, management of garbage, evacuation of road-side vendors who are selling bread etc.
- Publicity Department: The department can provide necessary public awareness both for the tourists and residents to make them aware of legislations and approach required for dealing with wild animals.
- Department of Industries: To help procure better technology like electrical fencing etc. keeping in view the geography of HP. 19
- Department of Animal Husbandry: Providing services of vets and para-veterinary staff.
- NGOs: These bodies play a major role in educating people and creating a wave to better control the menace by participatory movement.

PUBLIC AWARENESS CAMPAIGN

- By putting of large billboards, pamphlets etc. and utilizing media like radio and television a constant effort would be to educate the people about methods to control conflict with wild animals.
- Intensive campaigning will be made in Panchayats and urban local bodies by educating people not to feed monkeys and to dispose of household waste at designated clearing sites only.
- Volunteers will be enrolled to utilize scaring methods like use of slingshots, air guns/pistols, firecrackers etc. The names of these volunteers will be shared with community to seek their assistance at the time of distress. These volunteers will be equipped with all the possible scaring tools and will be dressed in proper gear. It is proposed that 5000 such volunteers shall be enrolled in phased manner in the state in next five years.

- **Waste Management**

Proper solid waste management plan to be prepared in conjunction with the municipal authorities.

- **Habitat Management**

Manage micro habitats for monkeys in forested areas with fruit trees.

Implications of removing Rhesus Macaque from Wildlife Protection Act 1972

Current status: The delisting of monkeys from Wildlife Protection Act, 1972 means that Rhesus macaques no longer have legal protection under the Wildlife Protection Act and are now considered a matter for civic authorities to manage.

Impact: The removal of protection makes the species vulnerable to being killed or captured for purposes like medical research, the pet trade, and other forms of exploitation as the spp. No longer have legal protection. This may lead to extinction of species in near future. On the other hand as the species does not have legal protection, monkey sterilization process adopted by forest department on front foot is no longer binding. This can lead to increase in the population simultaneously with the increase in human monkey conflict also. Therefore, it is suggested that monkeys can be kept under Schedule –II of Wildlife Protection Act, 1972.

12.9 Handling Human – Wildlife Conflict

Although man-animal conflict is not to a very large scale in the division, the process is random (point process in time) and steps need to be taken to minimize / end the conflict.

Strategies to handle Human Wildlife conflict in division.

I. AWARENESS GENERATION AND INVOLVEMENT OF PEOPLE

The overall aim will focus on a participatory approach, ensuring support of local communities and other stakeholders for conservation and management of wildlife. Awareness programmes will target the people sharing space with wild animals like leopard, black bear, in human dominated landscapes like agricultural fields, fruit orchards, etc., and also the local communities living in forest dominated landscapes. Sensitizing the media about the nuisances of the problem of human-wildlife conflict in general and leopard, black bear depredation in particular will be an essential part of the awareness strategy. Media may be managed to contribute to diffusing the tense situation surrounding conflict with objective reporting aimed at highlighting the measures to mitigate conflict.

II. TEAMWORK IN TACKLING CONFLICT

Efforts will be made to involve all departments, wings and agencies of the government to use a well coordinated mitigation approach which is scientific, field tested and practical, and inter-alia, capable of dealing with emergencies related to attacks by leopards, black bear. In this regard, it is vital to involve the Police and Revenue Departments as they are crucial for maintaining law and order in the face of extreme public reactions. Proper training of police and local administrative staff, along with forest staff and constitution of a Primary Response (PR) Team, along with awareness campaigns are essential ingredients of a successful conflict mitigation strategy.

III. ESTABLISHMENT OF EMERGENCY RESPONSE MECHANISM

Immediate response is crucial to manage all conflict situations. A trained Rapid Response Team consisting of an officer not below the rank of Range Officer, one qualified veterinarian, and a minimum of three trained support staff may be formed in the division with well equipped

tranquilizer gun and cages and will wear specially designed uniforms so that they are easily identifiable during the operation. The protocol for Emergency Response will be periodically rehearsed and reviewed to incorporate corrective measures to make it more efficient. Establishing such well advertised RR team that respond effectively and quickly to conflict situations will help diffuse the usual public outrage and retaliation that invariably follows such conflicts. It will also harness the goodwill of local communities. In the long term, the efficient working of the RR team will prevent escalation and spread of conflict. It will also prevent the situation from going out of control with people taking the law in their own hands.

IV.MANAGEMENT OF CROWD

Crowd management is crucial to any successful animal rescue operation. The RR team, more often than not, is obstructed and hindered in its activities by furious mobs, making it difficult to discharge its responsibilities. Support and cooperation of the police and civil administration will be ensured in advance to facilitate effective crowd control and to discourage formation of crowds. The area should be cordoned off with barricades, and the public alerted through a public address system. Regular updates should be made available to the administration and local public. There should be an ambulance kept ready to take care of any medical emergencies.

V. MANAGEMENT OF THE ANIMAL

Unconfined or Open Area:

- i. Open situations could mean a barren land, grassland, street, thicket, crop field with standing crop or woodland, with the leopard being either up on a tree or on the ground.
- ii. If the animal is in an open area surrounded by people, all attempts should be made to keep the crowd and local people from approaching near the animal and the animal should be allowed to escape under the cover of darkness.
- iii. Drug immobilization should be avoided in situations where the animal is in the open, even if the target presents itself in an appropriate position, since a darted animal in the open can retaliate injuring people.
- iv. To trap the animal, a suitably designed light-weight trap that minimizes injury to the animal, should be used.

Semi-confined areas:

- i. If the animal is confined in a dry well or trench, a ladder let down into the well will allow the animal to escape in the night.
- ii. Here too, the public must be kept away from the site, and the rescue team should monitor the situation until the animal escapes.

Animal Confined in a Closed Area:

- i. If the animal is confined in a closed area, for example in a house, garage, under a culvert, or caught in a snare, etc., the surrounding entrance and exits should be made secure to ensure no injury to the public.
- ii. If the area is adjoining a forested area, the animal should be allowed to escape in the night, but if it is in a high human density area, it should be tranquilized.

VI.CAPTURE AND HANDLING OF THE TRAPPED ANIMAL

Captured wild animal should not be put on display after capture. Such unintended forced close contact with humans may alter the behavior of captured animals with highly adverse consequences following their release. Ideally, such animals should be kept in covered cages.

VII.RELEASE OR TRANSLOCATION OF CAPTURED WILD ANIMAL

The decision to capture an animal should be the last option. It is very important that human intervention is restricted to the minimum to avoid future conflict. If the captured animal is to be released, it should be in the immediate vicinity of capture, i.e., within animal's home range. Leopards are highly adaptable animals, and exhibit amazing homing.

No animal captured after a deliberate attack on a human should be released into the wild.

VIII.TRANSPORTATION OF CAPTURED ANIMAL

Captured animals often get injured or stressed during transportation. Stress could be detrimental to the health of the animal, which coupled with excessive exposure to humans may adversely alter its behavior towards humans after release. The animal once captured should be kept and transported in a stress free environment, insulated from the public. It is important that humans are not allowed to come close to the caged animal, and that the cage is also completely covered with tarpaulin or other appropriate material. Tranquilized/captured animals must be transported in the trap itself (if suitable) or in a separate transportation cage. Care should be taken to avoid crowded places, and the animal's health condition frequently checked during transit.

IX.EXPEDITIOUS AND EFFECTIVE DELIVERY OF EX-GRATIA

Immediate response to loss of life, livestock, and property caused by leopards, black bear will help calm people. This will prevent violent reactions towards the problem animal in particular and wildlife in general. Payment of ex-gratia should be made fast and hassle free. The possibility of initiating self financed insurance schemes should be explored. In case of attack on humans, it is recommended that senior level officers immediately visit the site. A vehicle should be provided to take the victim to the nearest medical facility. The ex-gratia payment should be made immediately.

X.COLLECTION OF INFORMATION ON CONFLICT SPECIE

Management of a species should be based on systematic long term data. Information on conflict incidences should be collected systematically in an appropriate format to aid decision-making. Long term research, focused on estimating the population and abundance of specie in high conflict areas, should be taken up on priority. Identification of conflict prone areas, with data on conflict intensity, nature of conflict, and trends, will be collected for better preparation and pre-emption.

Chapter 13

General Financial Forecast and Financial Plan of Operations

13.1 General

The costs and prices are influenced by market forces and depend on supply and demand. It further depends on the principles of management and pattern of exploitation adopted from time to time. Therefore, it is not possible to estimate with reasonable accuracy the expenditure and revenue during the period of this working plan. The estimates given below are based on the current prices of various items of forest produce and the cost involved in carrying out the prescriptions of the plan at current rates.

13.2 Past Revenue and Expenditure:

Table 13.1: Past revenue & expenditure from 2013-14 to 2024-25 for last 12 years in Solan Forest Division is detailed as under

S. No.	Year	Revenue	Expenditure	Deficit
1.	2013-14	1668576	80252300	78583724
2.	2014-15	1325189	87185438	85860249
3.	2015-16	83963024	79730283	4232741
4.	2016-17	2830704	89895855	87065151
5.	2017-18	1594228	96701969	95107741
6.	2018-19	1516740	105095178	103578438
7.	2019-20	6767476	101809577	95042101
8.	2020-21	17256248	147577437	130321189
9.	2021-22	4572359	133798191	129225832
10.	2022-23	2864904	131138446	128273542
11.	2023-24	6977217	120313366	113336149
12.	2024-25	5169221	134442727	129273506
13.	Total	136505886	1307940767	1179900363

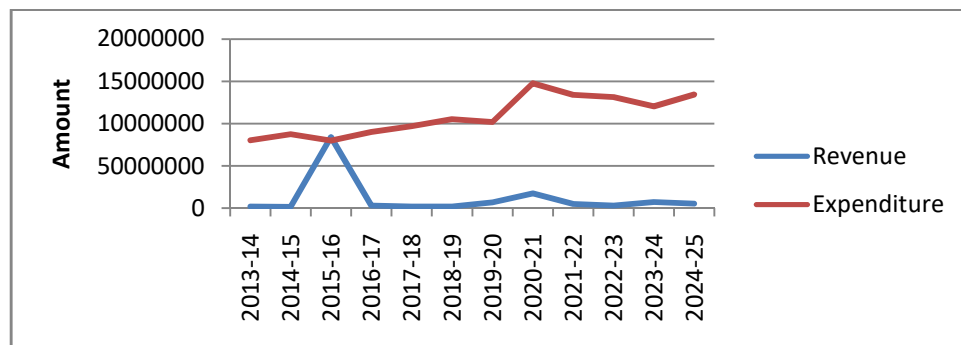


Fig. 13.1: Trends in allotment and expenditure of plan funds

Based on the budget allotment in the past plan period, a general financial forecast is prepared for various activities to be carried out under the different working circles and those given in chapter 10 of part 1 that gives the details of works to be carried out in the current working plan period. The expenditure on establishment and other works of regular and routine nature (like salaries of staff, maintenance of buildings, residences, etc.) are not a part of the table below. These are classified as fixed costs.

Table 13.2: Financial projections for plan expenditure

Financial year	Budget Estimate (Rs.)	Estimate (Rs. in cr)
2025-26	67,66,592.00	0.67
2026-27	74,43,252.00	0.74
2027-28	81,87,577.00	0.81
2028-29	90,06,334.00	0.90
2029-30	99,06,968.00	0.99
2030-31	1,08,97,665.00	1.08
2031-32	1,19,87,431.00	1.19
2032-33	1,31,86,174.00	1.31
2033-34	1,45,04,792.00	1.45
2034-35	1,59,55,271.00	1.59

13.3 Financial Projections for works to be carried out on routine basis

For plan expenses the following financial projections are proposed. They are built on the past allotments and expenditures. The average cost per unit was determined using the data of the working done in 2024-25 and 10% escalation every year cumulatively was taken as a common norm to arrive at forecasts / projections. The budget proposed for various activities is given below:

Table 13.3: Budget estimates for routine works

Task	Rate	unit	Target 2024-25	Budget Annual									
				2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
Removal of lantana 25%	30800	per hac.	5	154000	169400	186340	204974	225471	248019	272820	300102	330113	363124
Removal of lantana 50%	49600	per hac.	5	248000	272800	300080	330088	363097	399406	439347	483282	531610	584771
Removal of lantana 75%	62500	per hac.	10	625000	687500	756250	831875	915063	1006569	1107226	1217948	1339743	1473717
Removal of lantana 100%	71200	per hac.	15	1068000	1174800	1292280	1421508	1563659	1720025	1892027	2081230	2289353	2518288
Nursery Raising	23.47	per plant	80000	1877600	2065360	2271896	2499086	2748994	3023894	3326283	3658911	4024802	4427283
Maint. Of lantana cleared area	9200	per hac	135	1242000	1366200	1502820	1653102	1818412	2000253	2200279	2420307	2662337	2928571
Forest Guard Hut Maintenance	100000	per hut	1	100000	110000	121000	133100	146410	161051	177156	194872	214359	235795
Fire watchers	400	per mandays	3250	1300000	1430000	1573000	1730300	1903330	2093663	2303029	2533332	2786665	3065332
Maint. Of fire line	3500	per KM.	9	31500	34650	38115	41927	46119.2	50731	55804	61385	67523	74275
Control Burning	500	per hac.	100	50000	55000	60500	66550	73205	80526	88578	97436	107179	117897
Staggered trenches	87.15	per rmt.	522	45492	50042	55046	66550	66605	73266	80592	88652	97517	107268
Publicity and awareness	25000	per workshop	1	25000	27500	30250	33275	36603	40263	44289	48718	53590	58949
			Total	6766592	7443252	8187577	9006334	9906968	10897665	11987431	13186174	14504792	15955271

Table 13.4: Salary Expenditure: 2024-25 (Fixed costs)

S.No	Name of Post /Category	Scale	Average Pay	D.A.(42%)	C.A.	Sanction Strength	Total Amount Rs.
1	DFO	83600-203100	119300	50106	200	1	2035272
2	ACF	56100-177500	61300	25746	200	1	1046952
3	Supdt. Gr. II	43000-136000	54500	22890	200	1	931080
4	Sr. Asstt.	38500-122700	43400	18228	200	3	2225808
5	Jr. Asstt.	20600-65500	22500	9450	200	6	2314800
6	Forest Ranger	38500-122700	67800	28476	200	7	8103984
7	Dy. Ranger	38100-120400	52600	22092	200	23	26670192
8	Forest Guard	21300-67800	49000	20580	200	80	66988800
9	Driver	28900-91600	45000	18900	200	1	769200
10	Peon	18000-56900	35400	14868	200	15	9084240
11	Chowkidar	18000-56900	35400	14868	200	8	4844928
12	Mali/	18000-56900	28800	12096	200	10	4931520
13	Mali-cum-Nry. worker	18000-56900	23500	9870	200	2	805680
14	Forest Worker	18000-56900	43500	18270	200	50	37182000
15	Syce	18000-56900	35400	14868	200	1	605616
16	MPW	18000-56900	20900	8778	200	2	717072
17	Dak Runner	18000-56900	35400	14868	200	1	605616
	Total					212	169862760

13.4 Possible funding Agencies

Normally the forestry activities are funded through various schemes under district, State & Central sector. In the state, the district & state sector schemes include:

Table 13.5: Showing the funding sources

S. No.	Funding Agency	Schemes involved	Nature of works
1	Ministry of Forest & Environment, Government of India	CAMPA (NPV , CA) schemes	Miscellaneous (Plantation , soil Conservation work, Wild life conservation, Raising of nursery, Lantana Eradication, Infrastructure work in Forest Area, Development of degraded forest area, Biodiversity etc.)
2	Ministry of Forest & Environment, Government of India	CSS Scheme	a) Forest Fire Control and Management Scheme. b) Human Conflict with elephant project.
3	Government of Himachal Pradesh	Samudayik Van Samvardhan	Community based forestry works (Plantation, soil Conservation work, Lantana Eradication etc.) in forest area.

		Yojna	
4	Government of Himachal Pradesh	Ek Buta Beti Ke Naam Scheme	Distribution of 5 plants with kit to each newly born girl child.
5	Government of Himachal Pradesh	Forestry Development work	Buildings, Roads, Silvicultural operations, marking etc.

13.5 Prioritization of works

All the works prescribed in this plan are important for effective forest management. Hence funds should be made available to carry out all the prescriptions prescribed for the sustainable management of the forest. However, scarcity of financial allocation is often felt while working plan prescriptions are followed in the division. Therefore, priority of works has been fixed to guide DFO while preparing annual budget & sending his demand. It is also suggested that DFO should carry out top priority works with the available budget:

Table 13.6: Prioritized works.

Priority	Nature of works to be carried out
I	Forest Protection i.e. protection from forest fire, encroachment, illicit felling, etc.
II	Wildlife conflict management and under Project Elephant
III	Plantation and regeneration
IV	Silviculture operations
V	Soil & Water Conservation works
VI	Construction and maintenance of buildings & other infrastructure (Nursery etc.) in the Division
VII	Strengthening the knowledge of field staff by imparting training & exposure visits
VIII	Community based schemes, Samudayik Van Samvardhan Yojna etc.
IX	Development and green corridor of degraded forest area under Forest Department

Chapter 14

Miscellaneous Regulations

14.1 Petty felling

Felling of petty nature as detailed below may be carried out after the sanction of competent authority: -

- (a) Trees to be removed as salvage: Only the completely dead / dry and uprooted trees can be classified as salvage trees. All removals will be entered in control forms and will count towards the yield.
- (b) Trees required to meet the bonafide timber requirements of the local people in accordance with the provisions of Faisla -e-Janglat or trees granted in special cases as free grants by the competent authority.
- (c) Trees coming on road, transmission and canal alignments or any other development work or in ropeway spans including petty needs of contractors and persons employed/ residing in the forests. This should be done keeping in view the restrictions/provisions of Van (sanrakshan Evam Samvardhan) Adhiniyam, 1980& Forest Rights Act, 2006.
- (d) Trees required for departmental use and for supply to other departments to be given at Market rates. These fellings should be as minimum as possible and strictly according to the Silvicultural principles and as per instructions on the subject at the time of such fellings.
- (e) Green trees required for research and allied purposes like growth and yield data. All such fellings will count towards' the yield.

14.2 Deviation

All operations including plantations and fellings not covered by the provisions of the working plan will constitute a deviation. Sanction for all deviations from the prescriptions of the plan shall be obtained from the P.CCF or the competent authority well in advance.

Any large and unusual operation, variation from yield and target for plantation/regeneration and other activities provided in control forms of the working plan constitutes a deviation. Deviation beyond 25 percent of target is considered to constitute a major deviation. All deviations, which permanently alter the basis of management laid down in a working plan, will require prior sanction of the PCCF. All deviations, which do not permanently alter the basis of management and with the necessity of which he agrees, may be approved and sanctioned by the APCCF, Working Plan on behalf of the PCCF. Where there is difference of opinion between APCCF

Working Plan and the territorial Conservator of Forests, the former will refer them to the PCCF for instructions. The PCCF, as the case may be, will counter sign the deviation statement. Minor deviations can be sanctioned at the level of CCF or PCCF as the case may be, but the PCCF before sanctioning the major deviations of following nature, will necessarily take prior approval of the Ministry of Environment and Forests:

- (i) Change in Silvicultural system
- (ii) Clear felling of natural forest
- (iii) Formation of new felling series
- (iv) Large scale felling due to natural calamities

14.3 Grazing, Lopping

Grazing lopping concessions as provided in the Faisla-e-Janglat are to be enjoyed by the villagers to the extent 'that their exercise does not further deteriorate the forests. However, the situation is entirely different in the field. There is practically no control over grazing, lopping. Excessive damage is being

caused to the forest by unrestricted grazing and lopping by local people, gujars and nomadic graziers. Even Chil trees, which are not prescribed for lopping are being badly lopped. This has to be checked at all cost.

14.4 Road and Paths

The existing P.W.D and forest road/paths reach most of the forest areas. However, it has been observed that the forest roads and paths have been badly neglected in the past. No attention has been paid to repair them and their condition has worsened. Besides these all the bridle paths and inspection paths should be maintained every year depending upon the availability of funds. No new road is proposed to be constructed during this plan.

14.5 Buildings

A list of the existing buildings, both residential and office, and the rest houses is given in **Appendix IX**. There are several beats, and blocks in Solan Forest Division, where the Guardhut or the B.O quarter does not exist. They have to be constructed in a phased manner. Special attention has to be given for site selection. In the past, many guard huts have been constructed in remote areas, far away from the habitation and even basic facilities like water supply and electricity connections could not be provided there. This has caused problems to the staff. In turn, such building remains unoccupied and abandoned and within few years become dilapidated. This has to be avoided. Site selection should be done keeping in view above facts, so that the building is well located. Many also urgently needs repair. Besides, the staff quarters at Solan for field staff, Check Post buildings should be constructed to house the staff posted at various check posts including CCTV provisioning and washroom facilities. The construction of the following new buildings is suggested during this plan period. The order of priority may be decided by divisional Forest officer subject to the provision of budget.

Table 14.1: Building construction programme

S.No.	Name of Range	Particulars of building	Location
1	Chail	Forest Guard Hut Chaura	GCL Jhaja
2	Dharampur	FGD Hut Barog	Barog
3	Dharampur	FGD Hut Neri	Neri
4	Dharampur	FGd hut Jalyana	Jalyana
5	Dharampur	BO quarter Chabal	Chabal
6	Dharampur	Mali hut in Majholi Nursery	Majholi nursery
8	Kandaghat	Range Office cum residence	Kandaghat
9	Kandaghat	B.O. Office cum residence Bisha	Dhiari
10	Kandaghat	Fgd. hut Bisha	Dhiari
11	Kandaghat	Fgd. hut Basha	Ruda
12	Kandaghat	Fgd. hut Kiartoo	Kiartoo
13	Kandaghat	Fgd. hut Shalumna	Gugaghat
15	Kandaghat	Fgd. hut Karol Ist	Kandaghat
16	Solan	Type II BO Quarter	Saproon
18	Solan	Oachaghat Guard Hut	Oachghat
19	Subathu	Forest Guard Hut Kothi	GCL Kothi
20	Subathu	Forest Guard Hut Kathni	GCL Bhalli
21	Subathu	Forest Guard Hut Alobra	D-110 Raikot

22	Subathu	BO Quarter Serighat	D-113 Serighat
23	Subathu	BO Quarter Rugra	GCL Rugra
24	Subathu	Forest Guard Hut Syri	GCL Syri
25	Parwanoo	FgdDadiyar	Dadiyar
26	Parwanoo	FgdKalth	Kalth
27	Parwanoo	FgdNabhon	Nabhon

The list of following buildings is proposed to be writing off as these are in dilapidated condition.

Table 14.2: List of dilapidated buildings in Solan Forest Division

S .No.	Name of Range	Particulars of building	Year of construction
1	Chail	Fgd Hut at Mahog	1994-95
2	Chail	Inspection Hut at Shillaru (old)	Pepsu State
3	Chail	Fgd Hut at D-42 Chabri (old)	1991-92
4	Chail	Fgd Hut at Kano	Pepsu State
5	Chail	Out House at Gaura	Pepsu State
6	Chail	Forest Check Post at Gaura	2003-04
7	Dharampur	Forest Guard Hut Sultanpur	1994-95
8	Kandaghat	Fgd hut Chhausha	1963-64
9	Kandaghat	Range Inspection hut Dedgharat	1958-59
10	Kandaghat	Fgd hut Karol Ist beat at Kandaghat	1963-64
11	Subathu	Forest Guard Hut Alobra	1954-55
12	Subathu	Out houses FRH Serighat	1955-56
13	Parwanoo	FGD Hut Kimmughat	1991-92
14	Parwanoo	BO Quarter Kimmughat	1991-92

14.5.1 Forest Rest houses

To facilitate touring of Govt. Officials and also to cater the needs of tourists, this division has existing 6 rest houses. Rest house at Gaura was included after the merger of Chail range to Solan Forest Division vide Govt. Notification No FFE-B-A(1)-1/2013 Dated Shimla 31st July 2014

Rest house at Sultanpur was closed in 2022. New rest house was created in Joharji block of Dharampur range in the year 2022.

Table 14.3: List of existing rest houses

S. No.	Name of range	Name of rest house
1	Parwanoo	FRH Garkhal
2	Dharampur	FRH Kumarhatti
3	Subathu	FRH Subathu
4	Subathu	FRH Serighat
5	Dharampur	FRH Joharji
6	Chail	FRH Gaura

FRH Kumarhatti and FRH Garkhal are now available for online booking on ecotourism site via link <https://himachalecotourism.hp.gov.in/>.

14.6 Settlement

The Government of Himachal Pradesh Notification No. Fts (F/3-13) 83 loose dated 1987 constituted a State Level Committee to see and consider some issues relating to Forest Settlement Operation and to submit its report to them.

The salient features of committee's recommendations as they apply to Solan Division:

“3.4 – It is abundantly clear that variations in area figures need reconciliation in the department records. At the same time, it is essential that area shown under forest by Revenue Department and Forest Department should tally particularly in respect of reserved forests & demarcated forests.”

“5.2 Reserve Forests: - These forests are required to be entered in revenue record. Wherever in district where measurement are required to be carried out for these forests, necessary steps will have to be taken hereafter, when settlement operations are taken up hereafter . “

“5.4 Undemarcated Protected Forests :- The remaining forests under undemarcated forests are required to be surveyed, measured and demarcated after following the procedure prescribed in the Himachal Pradesh Forests (Settlement Rules), 1965 and the Himachal Pradesh Forests (Settlement) First Amendment Rules 1975.”

“5.5- Other Categories of Forests: - The other categories of forest presently being reported are as under:

Strips forest along road (i) Un-classed forests (ii) areas under section 38 of the Indian Forests Act (iii) Forests managed under Land Preservation Act (iv) Forests notified under H.P. Private Forests Act. (v) Cantonment forests. (vi) other forests. (vii) Forests areas vested in Government under the Himachal Pradesh Village Common Lands Vesting Utilization act, 1974 and Himachal Pradesh Ceiling and Land Holding act 1982.

The condition of boundary pillars is not very satisfactory. In some forests the boundary pillars constructed during recent past are in better condition, but the numbering and GPS co-ordinates are not carved on most of them. Most of the boundary pillars are found missing on spot which needs to be constructed after ascertaining their position which can be done with the help of forest kanungo. Also in forests having large extent of area, the distance between the consecutive pillars is very large which creates confusion regarding alignment of boundary. In this case small (intermediary) boundary pillars at short distances should be erected.

The extent of forest area depicted on survey sheet does not tally with the actual area on ground. Therefore, Collector (Forests) be requested to demarcate all the boundary pillars on ground to verify their location and extent. Bearing of all boundary pillars be recorded and serially numbered.

UPF's under Solan division are not properly demarcated and due to this reason, most of the field staff does not know their status and extent which leads to encroachments. Also due to dual entry in Revenue and Forest record most of forest areas have been allotted by revenue dept and in some of these the cases are subjudiced in court regarding the ownership.

14.7 Creation of new reserve and protected forests

As there is not much to be gained by converting existing DPF's to RF's, as rights and privileges are defined in both the categories of the forests. However the following UPFs should be converted into DPFs as in the absence of proper demarcation and due to absence of boundary pillars their extent and limits are unknown to field staff. Following UPFs are being proposed for conversion to DPFs

Table 14.4: UPF's proposed for conversion into DPF's

S. No.	Name of Range	Name of UPF	Area (hac)	Allotment to W.C
1	Subathu	U-3 Rano Parli	25	PCR
2	Subathu	U-4 Ranowarli	12	PCR
3	Subathu	U-5 Trashri	18	PCR
4	Subathu	U-6 Shaug	40	PCR
5	Subathu	U- 8 Chakli	20	PCR
6	Subathu	U-9 KharotaBhagat	6	PCR
7	Subathu	U-10 Kothi Bhagat	4	PCR

14.8 Planting plants of Religious, Medicinal, Food and Aesthetic

These aspects are intimately connected with our lives but, adequate attention is not being paid to them. Even the propagation techniques of many of them are yet to be standardized. Nursery techniques for some of the relevant species have been given in **Appendix XIII**

14.9 Mother Trees

Plus, trees have been identified in the Division (with GPS coordinates) for seed collection, nursery raising purpose as depicted below. Proper record of such trees should be updated in future as well.

Table 14.5: Mother trees in the Solan Forest Division

S. No	Beat/ Block	Name of Species & Local Name	Location / Land Mark	Lat	Long	Elevation	Height of treer in Mtrs	DBH	Flowring Season	Fruitin g Season	Month & duration of Seed Collectio n	Approxim ately Seed Yield
1	Kandaghat/Karol Ist	Deodar		N 30°57'14"	E077°05'46"	1520-1680	26-29m	50-52	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
2	Kandaghat/Karol Ist	Deodar		N 30°57'32"	E077°05'45"	1520-1680	23-25m	44-46	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
3	Kandaghat/Karol Ist	Deodar		N 30°57'35"	E077°05'45"	1520-1680	24-28m	43-45	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
4	Kandaghat/Karol Ist	Deodar		N 30°57'30"	E077°05'42"	1520-1680	26-29m	44-46	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
5	Kandaghat/Karol Ist	Deodar		N 30°57'31"	E077°05'43"	1520-1680	24-27m	44-46	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
6	Kandaghat/Karol IInd	Deodar		N 30°57'26"	E077°05'34"	1400-1700	24-26m	40-42	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
7	Kandaghat/Karol IInd	Deodar		N 30°56'40"	E077°05'45"	1400-1700	22-24m	40-41	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
8	Kandaghat/Karol IInd	Deodar		N30°56'40"	E077°05'45"	1400-1700	21-23m	46-47	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
9	Kandaghat/Karol IInd	Deodar		N30°56'41"	E077°05'34"	1400-1700	20-23m	53-54	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
10	Kandaghat/Karol IInd	Deodar		N30°56'45"	E077°05'30"	1400-1700	22-26m	52-53	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm

11	Kandaghat/Karol IInd	Deodar		N 30°56'40"	E 077°06'35"	1400-1700	26-29m	54-55	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
12	Kandaghat/Karol IInd	Deodar		N 30°56'42"	E 077°06'32"	1400-1700	23-25m	51-52	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
13	Kiari /wakna	Deodar		N 30°56'44"	E 077°06'36"	1620-1847	20-23m	48-49	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
14	Kiari /wakna	Deodar		N 31.00620°	E 077.09947°	1620-1847	23-26m	41-42	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
15	Kiari /wakna	Deodar		N 31.00615°	E 077.09965°	1620-1847	24-27m	44-46	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
16	Kiari /Kiari	Deodar		N 31.00559°	E 077.09914°	1600-1740	27-30m	51-52	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
17	Kiari /Kiari	Deodar		N 30.99645°	E 077.09154°	1600-1740	22-25m	41-42	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
18	Kiari /Kiari	Deodar		N 30.99908°	E 077.09225°	1600-1740	25-29m	43-44	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
19	Kiari /Kiari	Deodar		N 30.99923°	E 077.09219°	1600-1740	27-30m	43-44	April	October -Nov	October - Nov	1.5 Kgm
20	Kiari /Kiari	Deodar		N 30.99877°	E 077.09292°	1600-1740	28-31m	44-45	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
21	Bisha/Bisha	Deodar		N 30.99917°	E 077.09458°	1620-1847	30-34m	48-49	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
22	Bisha/Bisha	Deodar		N 31°00.552'	E 077°06.216'	1620-1847	20-23m	48-49	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
23	Bisha/Bisha	Deodar		N 31°00.537'	E 077°06.193'	1590-1880	16-19m	44-45	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
24	Bisha/Bisha	Deodar		N 31°00.531'	E 077°06.182'	1590-1880	13-15m	41-42	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
25	Bisha/Bisha	Deodar		N 31°00.570'	E 077°06.174'	1590-1880	16-19m	42-43	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
26	Bisha/Bisha	Deodar		N 31°00.572'	E 077°06.169'	1590-1880	20-22m	42-43	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
27	Kiari/Wakna	Deodar		N31°00.566'	E 077°06.146'	1600-1880	17-19m	43-45	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
28	Kiari/Wakna	Ban		N 31.00412°	E 077.09682°	1600-1880	20-23m	36-52	April - May	September	November	Apprpx. 15 to 20Kgm.
29	Kiari/Wakna	Ban		N 31.00442°	E 077.09685°	1600-1880	20-23m	42-43	April - May	October	December	Apprpx. 15 to 20Kgm.
30	Kiari/Wakna	Ban		N 31.00468°	E 077.09677°	1600-1880	19-22m	41-42	April - May	November	January	Apprpx. 15 to 20Kgm.
31	Kandaghat/Karol Ist	Ban		N 31.00519°	E 077.09661°	1560-1836	22-25m	34-47	April - May	December	February	Apprpx. 15 to 20Kgm.
32	Kandaghat/Karol Ist	Ban		N30°58'9"	E 077°04'35"	1560-1836	23m	50-52	April - May	January	March	Apprpx. 15 to 20Kgm.
33	Kandaghat/Karol Ist	Ban		N30°58'9"	E 077°04'35"	1560-1836	21m	45-47	April - May	February	April	Apprpx. 15 to 20Kgm.
34	Kandaghat/Karol Ist	Ban		N30°58'9"	E 077°04'35"	1560-1836	22m	40-42	April - May	March	May	Apprpx. 15 to 20Kgm.
35	Kandaghat/Karol Ist	Ban		N30°58'9"	E 077°04'35"	1560-1836	21m	42-44	April - May	April	June	Apprpx. 15 to 20Kgm.
36	Kandaghat/Karol Ist	Ban		N30°58'9"	E 077°04'35"	1560-1836	20m	40-42	April - May	May	July	Apprpx. 15 to 20Kgm.

37	Kandaghat/Karol Ist	Ban		N30°57'11"	E077°05'30"	1560-1836	24m	50-52	April - May	June	August	Apprpx. 15 to 20Kgm.
38	Kandaghat/Karol Ist	Ban		N30°57'11"	E077°05'30"	1560-1836	22m	40-42	April - May	July	September	Apprpx. 15 to 20Kgm.
39	Kandaghat/Karol Ist	Ban		N30°57'10"	E077°05'31"	1560-1836	21m	40-42	April - May	August	October	Apprpx. 15 to 20Kgm.
40	Kandaghat/Karol Ist	Ban		N30°57'11"	E077°05'30"	1560-1836	23m	42-44	April - May	September	November	Apprpx. 15 to 20Kgm.
41	Kandaghat/Karol Ist	Ban		N30°58'55"	E077°05'39"	1560-1836	23m	44-46	April - May	October	December	Apprpx. 15 to 20Kgm.
42	Kandaghat/Karol Ist	Ban		N30°57'10"	E077°05'32"	1560-1836	24m	50-52	April - May	November	January	Apprpx. 15 to 20Kgm.
43	Kandaghat/Karol Ist	Ban		N30°57'39"	E077°05'33"	1560-1836	22m	44-46	April - May	December	February	Apprpx. 15 to 20Kgm.
44	Kandaghat/Karol Ist	Ban		N30°57'8"	E077°05'34"	1560-1836	22m	44-46	April - May	January	March	Apprpx. 15 to 20Kgm.
45	Kandaghat/Karol Ist	Ban		N30°57'8"	E077°05'33"	1560-1836	21m	42-44	April - May	February	April	Apprpx. 15 to 20Kgm.
46	Kandaghat/Karol IInd	Ban		N30°57'8"	E077°05'35"	1800-2000	22m	40-42	April - May	March	May	Apprpx. 15 to 20Kgm.
47	Kandaghat/Karol IInd	Ban		N30°56'26"	E077°6'25"	1800-2000	23m	50-52	April - May	April	June	Apprpx. 15 to 20Kgm.
48	Kandaghat/Karol IInd	Ban		N30°56'25"	E077°6'25"	1800-2000	22m	43-44	April - May	May	July	Apprpx. 15 to 20Kgm.
49	Kandaghat/Karol IInd	Ban		N30°56'25"	E077°6'25"	1800-2000	20m	54-55	April - May	June	August	Apprpx. 15 to 20Kgm.
50	Kandaghat/Karol IInd	Ban		N30°56'25"	E077°6'28"	1800-2000	15m	30-32	April - May	July	September	Apprpx. 15 to 20Kgm.
51	Kandaghat/Karol IInd	Ban		N30°56'25"	E077°6'28"	1800-2000	18m	40-41	April - May	August	October	Apprpx. 15 to 20Kgm.
52	Kandaghat/Karol IInd	Ban		N30°56'26"	E077°6'25"	1800-2000	20m	33-34	April - May	September	November	Apprpx. 15 to 20Kgm.
53	Kandaghat/Karol IInd	Ban		N30°56'29"	E077°6'26"	1800-2000	21m	46-48	April - May	October	December	Apprpx. 15 to 20Kgm.
54	Kandaghat/Karol IInd	Ban		N30°56'27"	E077°6'26"	1800-2000	20m	42-44	April - May	November	January	Apprpx. 15 to 20Kgm.
55	Kandaghat/Karol IInd	Ban		N30°56'29"	E077°6'36"	1800-2000	18m	44-46	April - May	December	February	Apprpx. 15 to 20Kgm.
56	Kandaghat/Karol IInd	Ban		N30°56'28"	E077°6'32"	1800-2000	21m	48-50	April - May	January	March	Apprpx. 15 to 20Kgm.
57	Kandaghat/Karol IInd	Ban		N30°56'28"	E077°6'31"	1800-2000	20m	33-35	April - May	February	April	Apprpx. 15 to 20Kgm.
58	Kandaghat/Karol Ist	Deodar		N 30°57'14"	E077°05'46"	1520-1680	26-29m	50-52	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
59	Kandaghat/Karol Ist	Deodar		N 30°57'32"	E077°05'45"	1520-1680	23-25m	44-46	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
60	Kandaghat/Karol Ist	Deodar		N 30°57'35"	E077°05'45"	1520-1680	24-28m	43-45	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
61	Kandaghat/Karol Ist	Deodar		N 30°57'30"	E077°05'42"	1520-1680	26-29m	44-46	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm
62	Kandaghat/Karol Ist	Deodar		N 30°57'31"	E077°05'43"	1520-1680	24-27m	44-46	April	October -Nov	October - Nov	Approx. 1 to 1.5 Kgm

63	Binnu/ Chail	Cedruodear a (Deodar)	R-18 Sakori C2b	30.923842"	77.196518"	1851	23	76-77	Taken	Sept.	Novembe r	500gm
64	"	"	R-18 Sakori C2b	30.923842"	77.196518"	1851	26	65-68	"	"	"	400 gm
65	"	"	R-18 Sakori C2b	30.923842"	77.196518"	1851	25	65-66	"	"	"	350 gm
66	"	"	R-18 Sakori C2b	30.923842"	77.196518"	1851	26	73-82	"	"	"	500 gm
67	"	"	R-18 Sakori C2b	30.923842"	77.196518"	1851	20	62-63	"	"	"	450 gm
68	"	"	D-50 Sakori	30.97633"	77.19495"	1966	35	85-95	"	"	"	500gm
69	"	"	D-50 Sakori	30.97633"	77.19495"	1966	29	67-72	"	"	"	500 gm
70	"	"	D-50 Sakori	30.97633"	77.19495"	1966	32	62-70	"	"	"	400 gm
71	"	"	D-50 Sakori	30.97625"	77.19600"	2022	28	68-73	"	"	"	400 gm
72	"	"	D-50 Sakori	30.97588"	77.19563"	1993	33	64-65	"	"	"	400 gm
73	"	"	D-50 Sakori	30.97588"	77.19563"	1993	32	65-72	"	"	"	500 gm
74	"	"	D-50 Sakori	30.97588"	77.19563"	1993	28	66-67	"	"	"	450 gm
75	"	"	D-50 Sakori	30.97574"	77.19510"	2005	21	67-71	"	"	"	400 gm
76	Chaura/ Chail	(Ban) Quercusleuco trichophora	D-46 KhanniKaNa lla	30.96522"	77.15380"	1594	18	52-55	"	"	"	40-50kg
77	"	"	D-46 KhanniKaNa lla	30.96522"	77.15380"	1594	15	36-46	"	"	"	20-25 kg
78	"	"	D-46 KhanniKaNa lla	30.96522"	77.15380"	1594	15	42-48	"	"	"	15-20 kg
79	"	"	D-46 KhanniKaNa lla	30.96522"	77.15380"	1594	14	47-48	"	"	"	15-20kg
80	"	"	D-46 KhanniKaNa lla	30.96522"	77.15380"	1594	12	38-46	"	"	"	20-25kg
81	Thatol/ Serighat	Bhera	D-111 Thathol	N31°02'59"	E076°59'24"	1006 m	16 mtr	63-64 cm	Feb. March	July ,August	Nov. Dec.	3.5 kg
82	Kathni/ Subathu	Bhera	D-114 Kathani	N30°57'8"	E077°0'02"	1340m	6-7 mtr	33- 34cm	Feb. March	July ,August	Nov. Dec.	1.5 Kg
83	Kathni/ Subathu	Bhera	D-114 Kathani	N30°57'10"	E077°0'03"	1340 m	5-7 mtr	26- 27cm	Feb. March	July ,August	Nov. Dec.	1 Kg
84	Kathni/ Subathu	Amla	D-114 Kathani	N30°57'10"	E 077°0'03"	1327 m	7-8 mtr	22-23 cm	May, June	Oct. nov	Jan. Feb	100 gm
85	Alobra/ Subathu	Kambal	D-112 Alobra	31.0181366 N	76.974271 E	885 m	5 mtrs	12-13 cm	Feb. March	July ,August	Nov. Dec.	200 g
86	Alobra/ Subathu	Kambal	D-112 Alobra	31.0187833	76.9743 E	879 m	4 mtrs	14-12 cm	Feb. March	July ,August	Nov. Dec.	500 g
87	Alobra/ Subathu	Kambal	D-112 Alobra	31.0181366 N	76.97427166E	880 m	5 mtrs	17-18 cm	Feb. March	July ,August	Nov. Dec.	1 Kg
88	Neri	Behda	Baghour	30°47'863"	77°03'138"	780	14 mtr.	35- 38 III	Decemb er	Feb- March	Feb- March	400-500 gm.
89	Jalyana	Khair	Roadside DharNuner y	30°51'53.2"	77°03'31"	1266	15 mtr.	29- 31 III	May - June	Nov.	Feb- March	250-300 gm
90	Jalyana	Amla	aproach road of dhar nursery	30°50'27.8"	77°03'38.1"	1270	6 mtr.	19- 20 V	october	Nov- Dec.	Nov- Jan.	150- 200gm

91	Bohli	Bheda	near fekdekanall a village	30°49'54.37"	77°04'58.02"	1523	6 mtr.	22- 24 IV	Decemb er	Feb- March	Feb- March	2-3 kg
92	Bohli	Ban	near byJhayana village	30.856933	77.081954	1456	25 mtr	41- 42 IIA	Decemb er	Jan	Feb- March	300-400g
93	Bohli	Ban	near byJhayana village	30.856888	77.082107	1455	30mtr	38- 40 III	January	Jan	Feb- March	300-400g
94	Bohli	Ban	near byBohli	30.849416	77.091675	1440	40 mtr	43- 44 IIA	January	Jan	Feb- March	300-400g
95	Bohli	Kainth	Nearby Mashobra	30.846999	77.086909	1390	10 mtr	18- 20 V	June	July- Aug	Dec-Jan	300gm
96	Barog	Ban	Near NH road	30.894939	77.070297	1650	18 mtr	32- 34 III	Decemb er	Jan- Feb	April - may	300 -350 gm
97	Barog	Ban	Near inspection Path	30.894479	77.069748	1662	20 mtr.	40- 42 IIA	Decemb er	Jan- Feb	April - may	350-400 gm
98	Barog	Ban	Near inspection Path	30.894695	77.071377	1670	17 mtr	30- 32 III	Decemb er	Jan- Feb	April - may	300 -350 gm
99	Barog	Ban	Near inspection Path	30.894463	77.071667	1650	15 mtr.	24- 26 IV	Decemb er	Jan- Feb	April - may	250-300 gm
100	Barog	Ban	Near inspection Path	30.887732	77.08279	1560	22 mtr.	40- 42 IIA	Decemb er	Jan- Feb	April - may	350-400 gm
101	Kadon	Tyambal	Near Range office	30.898518	77.023848	1528	8 mtr.	43- 44 IIA	Nov.	Jan- Feb	may - june	450- 500gm
102	Kadon	Chil	Near water pond	30.874662	77.026425	1222	38 mtr	80- 85 ID	March	March	April- May	800 gm
103	Kadon	Siris	Near Rampuri village	30.872065	77.043649	1275	10 mtr	42- 43 IIA	Oct	March- April	may- june	2 kg
104	Kadon	Chil	Near Dharampur - Dharanji Road	30.881244	77.033685	1327	36 mtr	69- 70 IA	March	March	April- May	600gm
105	Kadon	Chil	Near Plantation area	30.892540	77.013377	1432	30 mtr	58- 60II B	March	March	April- May	450gm
106	Sultanpur	Chil	near Shiv Dhar Temple	30.889915	77.105486	1481	17 mtr	34- 36 III	March	March	april- may	2 kg
107	Sultanpur	Kachnar	near Shiv Dhar Temple	30.89431	77.101415	1442	5 mtr	15- 16 V	March	April	may- june	500 g
108	Sultanpur	Amla	near Shiv Dhar Temple	30.870685	77.138635	1344	4 mtr	14- 18 V	october	Nov- Dec.	Nov- Jan.	400 g
109	Sultanpur	Khirak	near inspection path	30.860849	77.109194	1510	10 mtr	30- 32 III	July	Sep	Aug-Sep	600g
110	Sultanpur	Kainth	near inspection path	30.861297	77.108863	1447	5 mtr	17- 18 V	Aug	sep	Oct-Nov	400-500g
111	Chabal	Chil	Near inspection path	30.92959	76.991488	1340	30mtr	61- 66 IA	March	March	April- May	1.5 kg
112	Chabal	Chil	Near inspection path	30.918882	77.005842	1348	35mtr	55- 56II B	March	March	April- May	800 gm
113	Chabal	Chil	Near Johri	30.93942	76.96467	1284	25mtr	51- 52II	March	March	April- May	700 gm

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114	Chabal	Chil	Near Water Pond	30.93553	76.96853	1367	28mtr	52-56II B	March	March	April-May	750 gm
115	Chabal	Chil	Near inspection path	30.92691	76.97837	1404	31mtr	62-63 IA	March	March	April-May	1.2 Kg
116	Joharji	Chil	Near creametorium	30.830501	77.073595	1468	100 mtr	54-55 IIB	March	March	April-May	1kg
117	Joharji	Amla	Near deed vill.	30.825977	77.074892	1440	15	20-21 IV	October	Nov-Dec.	Dec-Jan	150-200 gm
118	Joharji	Kainth	Kanchi mod bohado	30.819776	77.08158	1357	20	22-23 IV	April-May	June - July	Jan -Feb	1.5 kg
119	Joharji	Khair	Near CA 25 hac.	30.812556	77.083662	1154	35	31-32 III	May-june	November	Feb-March	250-300 gm
120	Joharji	Chil	Near Cassia Resort	30.818611	77.06784	1470	120	71-72 IB	March	March	April-May	1kg
121	Jalyana	Kachnar	Shradka mod	30.8375513	77.046559	1306	25	28-29IV	March - April	April-May	May - June	1.5 kg
122	Jalyana	Khair	Near shradvill.	30.833492	77.051968	1291	30	22-23IV	May-june	November	Feb-March	250-300 gm
123	Jalyana	Amla	Old Nursery	30.838913	77.054155	1396	20	30-31III	October	Nov-Dec.	Dec-Jan	150-200 gm
124	Jalyana	Kainth	Near ShradVill.	30.836068	77.04773	1244	22	30-31III	April-May	June - July	Jan -Feb	1.5 kg
125	Jalyana	Kainth	Near ShradVill.	30.840086	77.048851	1402	25	20-21IV	April-May	June - July	Jan -Feb	1.5 kg
126	Neri	Amla	Meunka Nallah	30.782748	77.064982	867	30	31-32III	October	Nov-Dec.	Dec-Jan	150-200 gm
127	Neri	Bahera	Jhal 28nalka Nallah	30.782982	77.063851	850	22	22-23IV	December	Feb-March	Feb-March	400-500 gm
128	Neri	Papari	Near odder vill.	30.785891	77.055346	850	20	21-22IV	December	Feb-March	April-May	200-300 gm
129	Neri	Jamun	Near kamlog bridge	30.782792	77.052407	795	35	39-40III	April	May - June	June - July	2 kg
130	Neri	Bahera	Near CA 50 Hac.	30.778939	77.051546	783	28	30-31III	December	Feb-March	Feb-March	400-500 gm
131	Kumarhatti	Ban	Near Durga seed Farm	30.868501	77.076968	1469	15 mtr	30-31III	December	Jan-Feb	April - May	300 -350 gm
132	Kumarhatti	Ban	Near Durga seed Farm	30.86828	77.076357	1513	20 mtr	34-35III	December	Jan-Feb	April - May	350-400 gm
133	Kumarhatti	Ban	Near Durga seed Farm	30.868325	77.076352	1513	17 mtr	31-33III	December	Jan-Feb	April - May	300 gm
134	Kumarhatti	Ban	Near Durga seed Farm	30.868174	77.078242	1469	16 mtr	32-33III	December	Jan-Feb	April - May	450gm
135	Kumarhatti	Chil	Near Nature Camp Chewa	30°54'14"	77°03'15"	1824	25 mtr	46-48II A	March	March	April-May	1kg
136	Gulhari	Chil	Near Inspection Path	30.918708	76.992654	1520	35 mtr	62-63IA	March	March	April-May	1.3 kg
137	Gulhari	Chil	Near Inspection Path	30.91838	76.992833	1637	31 mtr	58-59II B	March	March	April-May	1.2 kg
138	Gulhari	Chil	Near Inspection Path	30.918328	76.992133	1637	29mtr	55-56II B	March	March	April-May	700 gm

139	Gulhari	Chil	Near Inspection Path	30.914759	76.997291	1608	32mtr	57-58II B	March	March	April-May	1.4 kg
140	Gulhari	Chil	Near Inspection Path	30.915333	76.997462	1576	32mtr	61-62IA	March	March	April-May	900gm
141	Neri	Behda	Baghour	30°47'863"	77°03'138"	780	14 mtr.	35-38 III	Decemb er	Feb-March	Feb-March	400-500 gm.
142	Jalyana	Khair	Roadside DharNurnery	30°51'53.2"	77°03'31"	1266	15 mtr.	29-31 III	May - June	Nov.	Feb-March	250-300 gm
143	Jalyana	Amla	aproach road of dhar nursery	30°50'27.8"	77°03'38.1"	1270	6 mtr.	19-20 V	october	Nov-Dec.	Nov-Jan.	150-200gm
144	Bohli	Bheda	near fekdakanalla village	30°49'54.37"	77°04'58.02"	1523	6 mtr.	22-24 IV	Decemb er	Feb-March	Feb-March	2-3 kg
145	Koti/Parwano o	Amla	D-235 Chamgah	30.863591N	77.005111 E		6 mtr.	27-33 cm	June-July	Nov-Dec.	Jan-Feb	4-5 KG.
146	Koti/Parwano o	Pula	D-238 DhamianaN ry	30.86719N	77.001217 E	1110	12 mtr.	23-23 cm	Novemb er	Dec-Jan	Jan-Feb	250-300 gm
147	Koti/Parwano o	Pula	D-238 DhamianaN ry	30.867425N	77.001108E	1110	15-17mtr.	22-23cm	Novemb er	Dec-Jan	Jan-Feb	250-300gm
148	Koti/Parwano o	Pula	D-238 DhamianaN ry	30.868471N	77.00106E	1107	19-20mtr.	34-35cm	Novemb er	Dec-Jan	Jan-Feb	350-400gm
149	Koti/Parwano o	Pula	D-238 DhamianaN ry	30.868402N	77.001132E	1107	15mtr	30-37cm	Novemb er	Dec-Jan	Jan-Feb	300-350gm
150	Koti/Parwano o	Pula	D-238 DhamianaN ry	30.868372N	77.000991E	1107	15 mtr	30-37cm	Novemb er	Dec-Jan	Jan-Feb	300-350gm
151	Koti/Parwano o	Beri	D-238 DhamianaN ry	30.867392N	76.999656E	1129	10mtr	19-20cm	Aug-Sep	Nov-Dec.	Dec.3rd week	500-700gm
152	Parwanoo/Par wanoo	Arjun	R-56 Parwanoo	30.5023N	76.5641E	702	18mtr	31-32cm	Nov-Dec	Jan-Feb	Feb-Mar	10-11 KG
153	Parwanoo/Par wanoo	Guller	R-56 Parwanoo	30.5024 N	76.5643 E	727	24mtr	42-44cm	Dec-Jan	Jan-Feb	Mar-April	400-500gm
154	Parwanoo/Par wanoo	Khair	R-56 Parwanoo	30.835357N	76.947808E	815	16mtr	32-34cm	July-Aug		Dec-Jan	300-400gm
155	Dadiyar/Lugon	Amla	Near Dhadog Village upside from Road in D-200 Chakli Dhanota C-1c	N 30.817871	E 77.037413	895mtr	14 m	26-27	July-Aug	Sep.	Dec. To Jan	4-5 KG.
156	Dadiyar/Lugon	Chhal	JalyanaVill Downside from road in D-200 chaklidhanota c-1a	N 30.825653	E 77.040795	878mtr	22m	39-40cm	April-May	winter	Dec. To Jan	500-600gm
157	Dadiyar/Lugon	Jamun	BheeKakhil Road near bawdi in D-200 chakli Dhanota c-1c	N 30.830603	E 77.044393	856mtr	28m	45-46cm	Feb-March	Summe r	July to Agust	4-5 KG
158	Dadiyar/Lugon	Kambal	D-200 Chali	N 30.819221	E 77.071377	840mtr	15m	27-28cm	Feb-March	winter	Jan to feb	2-3 Kg

			Dhanota C1a Forest me Downside from Road									
159	Dadiyar/Lugon	Amaltas	in D200 Chaklidhan ota c-1a forest downside from pkka road	N 30.828074	E 77.036836	855mtr	15m	20-21cm	Feb-March	winter	feb to march	3-4Kg
160	Lugon/Lugon	Bill	upside from nursery in link road	N - 30.780359	E 77.046453	805mtr	18 m	39-40cm	Feb-March	winter	March	2-3Kg
161	Lugon/Lugon	Sirs	300 m Upside from nursery near by road	N - 30.780431	E 77.046765	816mtr	22m	25-26cm	March-April	winter	Feb March	4-5 KG.
162	Lugon/Lugon	AmalTass	1.50 km Upside From Lugonnryn ear by road side	N- 30.785455	E 77.043607	820mtr	14m	37-42cm	Sep-Oct	Nov-Dec	March	3-4Kg
163	Lugon/Lugon	Sain	D-199 ChawalAsh nala Forest Near by Chawal Village	N30.791481	E77.043265	825mtr	30m	39-40cm	Aug-Sep	oct-nov	March	3-4Kg
164	Lugon/Lugon	Bahera	R-45 Khadarkidh ar Forest Near by Chawal Village Road side	N 30.790457	E77.043026	845mtr	20m	65-70cm	Sep-Oct	Nov-Dec	Feb March	3-5 kg
165	Lugon/Lugon	Kainth	R-45 Khadarkidh ar Forest Near by Chawal Village Road side	N 30.793863	E77.040934	877mtr	12m	22-23cm	Aug-Sep	oct-nov	Nov-Dec	1-2 Kg
166	Barog/Lugon	kemb	Near Forest guard Hut barog	N 30°46.655	E 77°02.191	835mtr	20m	22-23cm	Feb-March	winter	march	3-4 kg
167	Barog/Lugon	Chhal	Lugonvill near jhajhermor d	N 30°46.510	E 77°02.631	858mtr	30m	64-65cm	Aug-Sep	oct-nov	feb-march	500-600gm
168	Barog/Lugon	Amaltas	R-61 narayni c-1 planting area 11 hact	N 30°46.210	E77°01.643	873mtr	25m	22-24cm	Sep-Oct	nov-dec	march	3-4Kg
169	Barog/Lugon	Bill	25 hact planting area near road	N 30°46.126	E 77°01.403	880mtr	13m	15-20cm	Feb-March	winter	march	2-3Kg
170	Barog/Lugon	Papdi	R-61 narayni c-1	N 30°46.126	E 0.77°01.416	879mtr	30m	55-56cm	March-April	may	may-june	800-900 gm
171	Kalth/Lugon	kainth	R-47 Karalghat c-1 near road	N 30°50.048	E 77°01.983	866mtr	19m	22-23cm	Feb-March	winter	feb-march	1-2 Kg

172	Nabhon/Lugon	Ban	Downside from bhanyani and upward from path in D-192 forest	N 30°48.949	E 77°00.869	1349mtr	22m	44-73cm	May-June	May-June	Oct to Nov	600-700gm
173	Banasar/Lugon	Ban	R-57 Banasar c-1b forest	N 30°48.910	E 77°00.815	1398mtr	20m	43-52cm	May-June	May-June	Oct to Nov	600-700gm
174	Dochi/Kasauli	Ban	D-239 Suzi C2 Near NambBawari	N 30.51851	E 76.59122	1527mtr	23mtr	62-67cm	May-June	May-June	Oct to Nov	600-700gm

14.10 Regarding NOCs on Non- Forest Govt. Land

Vide Notification No. FFE-B-F(13)-25/2012 dated Shimla 31-08-2012 Principal Secretary (Forests) to the Government of Himachal Pradesh has clarified that whenever any reference comes to the forest department pertaining to non-forest land, it must be ensured that the requesting department establishes the requirement for NOC. Normally, NOC is not required except in the case of mining, for which instructions are already available. In other cases normally clearance of the forest department is not required. If however, the relevant department requests some form of authorization/NOC from the forest department, the forest officer should inspect the area and submit a report to the concerned quarter as per the performa appended as VIII.

14.11 Amendment in HP Forest Produce Transit (Land Routes)

The rules 2013 notified vide this Department Notification No. FFE-B-A(3)-2/2013 dated 26-11-2013 and published in the Rajpatra, Himachal Pradesh on 30th November 2013 are amended vide Govt. of HP Department of forest Notification No. FFE-B-A(3)-5/2020- Dated shimla 21st October, 2023.

In rule 2 of the Himachal Pradesh Forest Produce Transit (land Routes) Rules, 2013 after clause (f) of sub rule (1), the following shall be inserted namely:-

“(g) “Pass” means any transit permit/pass issued under these rules and shall also include transit pass generated through National Transit Pass System (NTPS)”

In rule 6 of the said rules, for the words, figures and signs “Rs 500 and Rs 1000”, the words, figures and signs “Rs 1000/- and Rs 2000/- respectively , shall be substituted.

For rule 7 of the said rules, the following shall be substituted, namely:-

“7. Issue of pass for export or transport of forest Produce-(I) No pass shall be issued for any unmarked forest produce other than fuel-wood, khair-wood, bamboos, charcoal, medicinal plants, grass, other plant parts including bark, leaves, stem, roots, flowers, fruits, cones and seeds as bears the marks not registered as herein after provided:-

(i) the Divisional Forest Officer may refuse to issue a pass for export or transport if he has reason to believe or for any other valid reasons that the forest produce has not been legally obtained by the applicant. However, the refusal to issue a pass shall be made in the shape of self-speaking written order; and

(ii) the person who has been refused the issue of pass may within fifteen days of the date of refusal prefer an appeal to the Chief Conservator/Conservator of Forests in charge of the area concerned and his orders on appeal shall be final.

(2) The Electronic Transit Pass/No Objection Certificate issued through online National Transit Pass System shall also be acceptable/valid in the whole of the State of Himachal Pradesh and no fresh pass shall be required to be issued for forest produce being transported under National Transit Pass System.

5. In rule 8 of the said rules:-

(i) for sub-rule(1), the following shall be substituted, namely :-

“ NO person shall transport or cause to be transported any forest produce except that obtained from plant species specified in and obtained in accordance with provisions contained in Schedule-‘I’ of Annexure-D by land routes, without obtaining pass as per Annexure ‘A’ from the concerned Divisional Forest Officer or any officer or person so authorized;

(ii) for sub-rule(4), the following shall be substituted, namely :-

“No person shall transport or cause to be transported any forest produce except that obtained from plant species specified in and obtained in accordance with provisions contained in Schedule-‘I’ of Annexure-D by land routes, unless the timber is properly affixed with an export hammer mark by the forest officer authorized by the Conservator of Forests concerned”;

6. After rule 8 of the said rules, the following rules shall be inserted namely:-

Insertion of rules-8A and 8-B.

"8-A. Compliance if provision of Biological Diversity Act: - Any person or entity as specified in Section 7 of the Biological Diversity Act, 2002 (Act No 18 of 2003), intending to obtain pass shall ensure compliance of the provisions of the Act ibid and rules and regulation etc. framed thereunder”; and

“8-B. Revision of pass fee- The State Government may by order notify the rates of pass fees for the species listed in schedule-II of Annexure D, from time to time.

In rule 9 of the said rules:-

(i)For sub-rule (1), the following shall be substituted, namely:-

“The authority issuing pass shall specify a route by which alone forest produce may be transported within the State of Himachal Pradesh or outside the state for the forest produce obtained from plant species specified in and obtained in accordance with the provisions contained in Schedule ‘I’ of Annexure-D”, In such a manner that the forest Department of State Taxes and Excise:

Provided that such authority shall also specify the check post(s) where the forest produce shall be compulsorily checked en-route:

Provided further that no timber or other forest produce form any forest depot or intermediate depot or first section/depot of dispatch shall be loaded in vehicles, trolleys, bullock cart etc. after sun-set and before sun rise. The Divisional Forest Office concerned may further impose any restriction(s) if so warranted for controlling the movement of forest produce after sun-set and before sun-rise:

Provided further that the State Government may by order notify or amend the list of check posts of Himachal Pradesh Forest Department or barriers of State Taxes and Excise through which the forest produce shall compulsorily be transit from time to time”;

(ii) for sub-rule (2), the following shall be substituted namely:

“In case the produce is not to be exported outside the territory of Himachal Pradesh, the authority issuing the pass shall specify the route by which alone the forest produce may be transported and shall also determine the check post(s) where it shall be compulsorily checked”: and]

(iii) for sub-rule (3), the following shall be substituted namely:

“The issuing authority shall also determine the other conditions subject to which the pass shall be issued and shall also determine the period for which the pass shall remain valid. However, the validity of any pass shall under no circumstances be exceeded beyond a period of three months including any extension (s), id any granted. A Pass processing feeof Rs.500/- shall be leviable for the issue of such pass:

Provided that the pass fee of Rs. 400/- per qtl. Shall be levied in case of resin to be exported outside the State of Himachal Pradesh.

Provided further that pass processing fee in respect of forest produce obtained from species, including that listed in Schedule-II of Annexure- ‘D’ cultivated on private land in accordance with provisions contained in Schedule –III of Annexure-‘D’ shall be levied Rs.,200/-

Provided further that in respect of medicinal plants as included in Schedule-II of Annexure –‘D’ purposed to be transported to the notified Herbal/ Agriculture Mandis, permit fee shall be levied in accordance with procedure detailed in Annexure-“E”.

Amendment of annexure –B 8. For annexure –B appended to the said rules, the following shall be substituted namely:-

ANNEXURE- ‘B’

(Pass Form)
(See Rule 10)

Pass No.

Sr. No. _____ Date _____ issued by DFO Forest Division
IN FAVOUR of _____

Date and Time of Issue _____

Date and Time of Expiry _____

Spp	Details of Timber	Vol in Cum	Fuel Wood/ Charcoal in Qts	Other Forest Produce
	Description No.			
1	2	3	4	5

Remarks
Property marks
Export Hammer Marks

Name of person Incharge Produce _____
Designation _____

CheckPost(s)(Vial) _____
(one copy of pass to sent to each check post)
Vehicle(Kind and No. etc) _____

Signature of grantee
Or
Authorised agent

Amendment of Annexure –D 9. In Annexure –D , appended to the said rules, the following Schedule-1 shall be inserted , namely

Annexure –D

Schedule-I
(See rule 8 (1))

Forest Produce obtained from the following Plant Species Growing on Private Land Exempt from the requirements of Pass.

Sr. No.	Local Number of Species	Botanical Name of Species
1.	Safeda	Eucalyptus spp.
2.	Poplar	Populus spp.
3.	Bambooculms' Lathi Bans, Magger, Magger, DharainchBans	Dendrocalamusstrictus /Dendroculamushamiiltonii /Bambusanulans/ Bambusabambos
4.	Kuth*	Saussureacostus/lappa

14.12 Export of KUTH (Saussureacostus /lappa) will however be subject to fulfilment of requirement under Wildlife (Protection) Act, 1972

The removal and transportation of the forest produce obtained from plant species listed in this schedule and growing on private lands shall be in accordance with the following provision.

- i. The landowner shall intimate in writing to the concerned Range Forest Officer through the local Forest Guard of his intent to harvest the forest produce from plant species listed in this schedule along with estimate of yield before starting the harvest.
- ii. The Range Forest Officer may himself or through his representative inspect the land from which such harvest is proposed and verify the yield.
- iii. Range Officer shall issue NOC giving details of forest produce obtained from private lands using NTPS portal or provide a letter to landowner with details of the forest produce.

Land owner shall carry NOC obtained from NTPS portal or letter by Range Officer while transporting verified produce provided such NOC or letter pertains to one load whether such load be carried by a person, an animal or a vehicle.

Further, vide order no. FFE-B-A(3) – 5/2020 dated 4th January 2025, amendments were made in the H.P. Forest Produce Transit (Land Routes) Rule, 2013 notified vide this department notification no. FFE-B-A(3)-2/2013 dated 26.11.2013.

Chapter 15

Science and Research

Forestry is a scientific subject and scientific management of forests is essential for sustainable management of forests. Apart from this, primary data from forests is equally essential to support forestry research. Several research documents like books, articles etc have also been used in preparation of this working plan, prominent ones being:

1. Hand book for foresters (A Field Companion) by Dr. A.R. Maslekar
2. Misra, 1968
3. Sampling Techniques, W.G. Cochran, 1977
4. India State of Forest Reports by Forest Survey of India
5. Old working plan of the Solan Forest Division
6. Volume Tables from various publications and manuals of Forest Research Institute, Dehradun

It is very important to extract useful information from previous plans and documents to build upon and produce a strong scientific document. During the preparation of present working plan, few obstacles were encountered that were addressed using auxiliary information from other sources. In order to facilitate research in forestry and provide sound scientific information for preparation of future working plans, certain steps have been envisaged and are given in the subsequent sections.

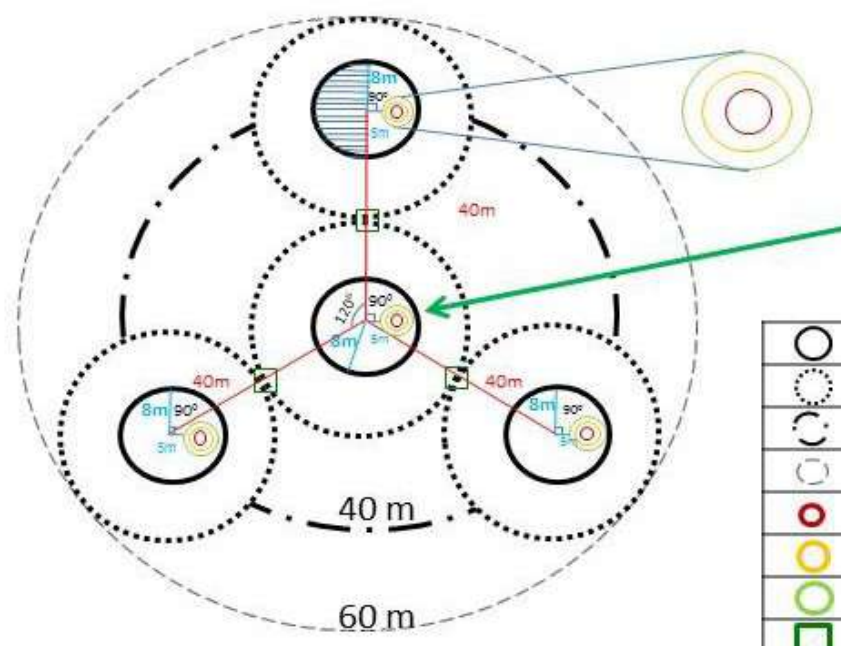
15.1 Preservation Plots

Preservation plots provide opportunities for long term monitoring of forest health and vitality. The division will mark three preservation plots in each forest type available in the division. The preservation plot shall be of 0.1 Ha. The centre of the plot shall be identified using coordinates given by GPS. In order to support the working plans to be prepared under the WP code 2023, circular plots shall be established using the following method and layout as given by Forest Survey of India:

Table 15.1: Layout of plots

Plot	Description
Sub-plot 1 (Central subplot)	Centre of the sample plot
Sub-plot 2	40 meter horizontal distance at azimuths of 360 degree from the centre of subplot 1
Sub-plot 3	40 meter horizontal distance at azimuths of 120 degree from the centre of subplot 1
Sub-plot 4	40 meter horizontal distance at azimuths of 240 degree from the centre of subplot 1

Circular plot around the plot centre	60 meter radius from the centre of subplot 1
Three concentric micro-plots of different radius	Three concentric microplots of 0.6 meter, 1.7 meter and 2.8 meter laid out at a distance of 5 meter away from the centre of all the subplots at 90 degree towards east direction.
Three square plot at a distance of 20 meter from the centre of sub-plot 1 towards sub-plot 2, 3 and 4	For soil & forest floor, three microplots of 1 X 1 meter at 20 meter distance from the centre of subplot 1 towards sub-plot 2, 3 and 4.



Source: Forest Survey of India

Fig. 15.1: Layout of plots

The 60m plot spanning the inner plots is useful for providing plot descriptions.

15.2 Sample plots

Three types of sample plots exist, namely, Temporary, Permanent and Linear Increment. While permanent plots have been discussed in section 17.1 above, the division also seeks to establish temporary and linear increment plots as below:

(i) Temporary sample plots

Temporary plots are usually established for getting data speedily for the specific purposes of estimation of biomass and productivity. They are also useful as their temporary nature allows preparing of new sampling strategies when relaying plots in future. Apart from collecting observations from these sample plots on tree

morphology, shrubs, herbs and soil, a detailed list shall also be shared with the research organizations of the region, notably, HFRI, Shimla, Dr. YSPUoHF, for fulfilling their research needs. To add to this, the research organizations shall also be requested to layout temporary research plots for their needs. Such plots shall be laid in each forest type using a systematic sampling plan.

(ii) Linear Increment Plots

Linear Increment Plots are useful for estimating increment in forest wealth, notably trees. Plots of standard size, 0.1 ha, in accordance with Misra, 1968, shall be laid, two in each forest type. Every tree in the plot shall be tagged. Observation on Diameter at Breast Height (DBH) and height shall be taken on a subset of trees, with the subset drawn randomly. The DBH section shall be marked for future reference. The second set of measurements shall be taken after 5 years. The following parameters shall be estimated:

- (a) In-growth
- (b) Accretion
- (c) Mortality
- (d) Drain

15.3 Regeneration plots

Regeneration of trees is an important phenomenon and adds to forest health. A high regeneration indicates good forest health including that of soil, as soil is an important factor supporting good regeneration. Small plots shall be established in area having trees to study regeneration. Such plots shall also be established, wherever possible, as nested plots within larger plots to save on resources. The plots shall be used to assess the following based on data like frequency, density and IVIs of different species:

- (a) Tree Regeneration through data on seedling and saplings
- (b) Monitor forest health by determining the ability of the forest to regenerate all by itself
- (c) Take management decisions by evaluating the need to assisted natural regeneration, controlling competing vegetation, enhancing protection measures, etc.
- (d) Evaluating various forest regeneration and restoration techniques with an aim to improve regeneration and restoration in future.

Nested structure shall be followed with small circular plots of 1 m radius shall be established for seedlings and saplings, large 20m x 20m plots for overall tree regeneration surveys.

15.4 Plots for assessment of Non Timber Forest Products

Non Timber Forest Products (NTFP) are an essential component of forest products and are largely the feeder for livelihoods of population of forest and forest fringe villages. However, it is important that the extraction of NTFPs is done in a sustained manner

For assessment and research in aspects of NTFP, like biodiversity and monitoring, a modified plot will be followed by using the method of Forest Survey of India as guideline which has designed a cluster plot for this purpose.

- **Central plot:** The layout consists of four subplots radiating out from a central point.
- **Four subplots (8m radius):** Each of the four subplots has an 8-meter radius and is located 40 meters from the center of the main plot.

Circular NTFP plots: Within each of the four subplots, two smaller circular plots are designated for NTFPs, placed 5 meters east of the subplot center.

Herbs (0.6m radius): The smaller circular plot has a radius of 0.6 meters for surveying herbs.

Shrubs, climbers, regeneration (1.7m radius): The concentric, larger circular plot has a radius of 1.7 meters for surveying shrubs, climbers, and regeneration.

15.5 Other research and experimental plots

The division shall look forward to collaborate with the research organizations by way of allowing them to establish plots for research studies and providing assistance in obtaining observations for monitoring and assessment of parameters. Both, permanent and temporary plots shall be established.

15.6 Research studies relevant to Solan Forest Division

Following projects have been carried out in Solan forest division with a strong focus on forest ecosystem management, biodiversity conservation, and climate change mitigation.

15.6.1 Study on Carbon Partitioning in Subtropical *Pinus roxburghii* Forest, Solan

The study was carried out by Department of Silviculture and Agroforestry, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan, India

Study Site

The research was conducted in the Solan Forest Division of Himachal Pradesh, India, covering 33 forest compartments in the Solan and Dharampur ranges. The study area spans an altitudinal range of 600 to 2260 meters above sea level, characterized by a subtropical climate with average annual rainfall of approximately 100 cm, mostly received during the southeast monsoon. Vegetation primarily consists of pure and mixed stands of subtropical chir pine (*Pinus roxburghii*) forests, with oak and deodar present at higher elevations.

Plots Laid and Sampling Design

Thirty-three forest compartments were systematically sampled for carbon assessment. Trees exceeding 10 cm diameter at breast height (DBH) were inventoried using non-destructive methods based on volume and wood density. Understorey vegetation, including shrubs and herbs, was sampled using nested plots—5 m × 5 m quadrats for shrubs and 1 m × 1 m quadrats for herbs. Detritus biomass, including standing dead trees and litter, was measured in large quadrats (31.62 m × 31.62 m). Soil samples were collected from various layers (humus, 0–20

cm, 20–40 cm, 40–100 cm) and analyzed for organic carbon content. Ecosystem's carbon is stored in the soil, accounting for approximately 77% of the total carbon stock. Vegetation contributed about 21%, primarily comprising chir pine trees, while detritus had a lesser share. Variations in carbon stocks were influenced by factors such as forest age, density, topography, and human disturbance, with younger, denser stands showing higher vegetation carbon. These findings emphasize the critical role of soil carbon in forest ecosystems and provide essential data supporting sustainable forest management and climate change mitigation initiatives in the Solan region.

Methodology

Tree biomass was calculated from measured volumes and specific gravity data. Understory biomass was determined by destructive harvest and oven drying techniques. Detritus carbon stocks were estimated through classification of decay stages and biomass measurements. Soil organic carbon content was measured using the Walkley-Black method, and bulk density data were combined with carbon concentration to quantify soil carbon stocks. Carbon mass was estimated by applying a conversion factor of 0.5 to dry biomass.

Final Results

The mean total ecosystem carbon density was calculated as 247.87 tons per hectare. Carbon was predominantly stored in the soil (mean 190.89 t/ha), constituting about 77% of the total carbon stock. Vegetation carbon stock, including trees, shrubs, and herbs, averaged 51.13 t/ha, while detritus contributed the least, averaging 5.85 t/ha. The soil-to-vegetation carbon ratio averaged 4.4, illustrating the dominant role of soil in carbon storage. Variations in carbon stocks were observed among compartments, influenced by factors such as forest age, density, altitude, and anthropogenic disturbance, with younger, denser stands showing higher vegetation carbon stocks. The highest carbon density was noted in the compartment Chabil Ki Dhar III (379.24 t/ha), while the lowest was recorded in Kaldhar I (191.34 t/ha), a site characterized by steep rocky terrain.

Conclusion

This comprehensive study highlights the predominance of soil organic carbon in subtropical *Pinus roxburghii* forests of Solan and the significant, though smaller, contribution of vegetation and detritus to total ecosystem carbon. The results underscore the importance of conserving these forests to maintain their carbon sequestration potential and support strategies aimed at mitigating climate change impacts while enhancing sustainable forest management in the region.

15.6.2 Impact of Controlled Burning on Herbs in High Altitude Zone of Chirpine Forests in Solan and Nahan Circles, Himachal Pradesh

Study Site and Plot Layout

The research was conducted at the Mangotimor site within the Solan Forest Division at approximately 1550 m elevation. Controlled burning experiments covered 2 hectares at each of the three sites studied, including Solan. Controlled burning was applied to a 1.5 ha area

designated as treatment (B1), and 0.5 ha was kept unburnt as a control (C). Forty quadrats of 1 m² size each were laid in both burnt and control areas for systematic vegetation sampling.

Work Done

The study examined the impact of controlled burning on herbaceous vegetation diversity and regeneration of tree and shrub species within chirpine forests. Phytosociological data were collected during the post-monsoon season in 2017 (October to December). Parameters such as species density, frequency, abundance, importance value index (IVI), diversity indices (Shannon-Wiener H), richness, evenness, and concentration of dominance were calculated. Natural regeneration of woody species, especially *Pinus roxburghii* and associated species like *Pyruspashia*, was also monitored.

Observations on Vegetation and Survival

- The total number of herbaceous species recorded was higher in burnt plots (30 species) compared to control plots (21 species) in Solan.
- Herb density was significantly greater in burnt areas, indicating enhanced herbaceous growth following controlled burning.
- Species such as *Carexmeiogyne*, *Chrysopogonmontanus*, and *Heteropogoncontortus* showed higher density and frequency in burnt plots. Natural regeneration of chir pine and shrubs was recorded in both treatments, with some increase in seedling and sapling density in the post-burn plots, indicating good survival and regeneration potential.
- The distribution pattern of herbs was generally contiguous, adapted to frequent fire disturbance.
- Diversity, richness, and evenness indices were higher in burnt plots, reflecting positive effects of controlled burning on herbaceous diversity and structure.

Survival Percentage

While exact survival percentage data for tree seedlings are not explicitly enumerated, natural regeneration data indicate higher seedling counts and better establishment in burnt plots compared to controls. This suggests that controlled burning in the chirpine forest ecosystem of Solan promotes regeneration and survival of native species by reducing competition and creating favorable microsites for germination and growth.

15.6.3 Land use change detection in Solan Forest Division, Himachal Pradesh, India

Site Plot Layout and Methodology

The study area covers Solan Forest Division, Himachal Pradesh, consisting of five forest ranges (Dharampur, Parwanoo, Solan, Kandaghat, Subathu) subdivided into about 256 forest compartments.

IRS LISS-III satellite images from winter months of 1998 and 2010 were used. Forest stock maps and inventory data digitized forest boundaries; a Digital Elevation Model was created from contour data. Images underwent atmospheric and geometric corrections. Supervised

classification using the Maximum Likelihood algorithm categorized land into seven classes: chir pine forest, ban oak forest, khair forest, bamboo forest, broadleaved forest, cultivation, and culturable blank. Accuracy of classification was validated with ground-truth points with overall accuracies of about 87-89% and Kappa indices of ~85-87%.

Key Results

Total area of forest compartments studied was 13,067 hectares.

From 1998 to 2010: Increase in area was noted for chir pine (+191 ha, +4.55%), cultivation (+129 ha, +13.81%), and khair forests (+77 ha, +23.40%). Decrease in area occurred for ban oak (-181 ha, -16.58%), broadleaved forests (-152 ha, -6.30%), culturable blank (-71 ha, -2.72%), and bamboo (-7 ha, -0.47%). The expansion of cultivation was linked primarily to horticultural cash crop introduction.

Forest composition changed towards more monoculture commercial species, such as chir pine and khair, with declines in ecologically important oak and broadleaved forests.

The replacement of oak by pine was notable, attributed to anthropogenic pressures and forest management practices.

Deforestation and forest degradation were exacerbated by population pressures, timber distribution rights, and government policies favoring monocultures.

Broadleaved forests and bamboo faced pressures due to local communities' demands for firewood, fodder, and commercial use.

Findings

Human activities are the primary driver of land use and forest species composition changes in the Solan region.

Increased horticulture and commercialization have altered forest cover and composition, threatening ecological stability.

Periodic land use monitoring is vital to inform balanced forestry and agricultural policies, sustain livelihoods, and protect fragile Himalayan ecosystems.

15.6.4 Effect of forest fire on soil properties and natural regeneration in Chirpine (*Pinus roxburghii*) forests of Himachal Pradesh, India

This research investigates the effect of forest fire on soil properties and natural regeneration in Chirpine (*Pinus roxburghii*) forests of Himachal Pradesh, with study sites including Solan Forest Division among others.

Study Area and Design in Solan Forest Division

The study was conducted in 2020 at six locations across three forest divisions: Solan, Hamirpur, and Dehra. In the Solan Forest Division, two sites were studied: Oachhghat and Jaunaji. At each site, adjacent burnt and unburnt forest areas (approximately 300 meters apart) were compared. The sites have moderate slopes with ferromagnesian, carbonaceous shales and dolomitic limestones forming the geology.

Human activities such as fuelwood collection, grazing, and construction influence these forests, and forest fires have occurred frequently in recent years caused mainly by human negligence.

Key Findings in Solan Forest Division

Soil Properties: Soil pH was higher in burnt areas (~6.99 mean) than unburnt (~6.49), likely due to accumulation of soluble cations from ash. Electrical conductivity was also higher in burnt soils (0.46 dSm) compared to unburnt (0.41 dSm). Organic carbon was lower in burnt soils (0.60%) relative to unburnt soils (0.75%), indicating loss of soil organic matter due to fire. Nutrients such as available nitrogen, phosphorus, and potassium were higher in burnt soils, attributed to ash nutrient inputs.

Natural Regeneration

Seedling density of Chirpine and other tree species was higher in burnt forests indicating enhanced regeneration post-fire. For example, Chirpine seedling density in burnt Oachhghat was 1.15 per 25 m² compared to 0.85 in unburnt; similarly higher seedling densities were observed in Jaunaji burnt areas. However, sapling density was higher in unburnt areas, showing that frequent fires may inhibit survival of older juveniles. Shrub seedling density was also generally higher in burnt areas, suggesting fire clears sites to favor regeneration.

Ecological Implications

Moderate fire may stimulate regeneration by clearing litter and releasing nutrients. Frequent fires can be detrimental to sapling survival and soil organic matter. Local practices such as burning pine litter to promote grass and reduce fire hazards contribute to this fire regime.

Recommendations

The study underscores the need for controlled fire management and fire prevention strategies in these forests. Raising social awareness among local communities about fire impacts is crucial. Promoting alternative uses for pine needles in agriculture or industry may reduce forest floor burning.

15.6.5 Plantation activities to assess site suitability

Apart from the research works, the following plantations have been done by ICFRE – HFRI, Shimla in the Solan Forest Division- to assess the suitability of site for plantation of following species:

Table 15.2: Plantation activities by ICFRE – HFRI, Shimla in the Solan Forest Division

S. No	Species Name (Scientific/Common)	Year of Plantation	Total Plantation Area	Numbe r of Plants	Plantation Address	Survival
1	Jatropha	2006-07	3 ha	5000	Location: Majhooli; Beat: Sultanpur; Block: Kumarhatti; Range: Dharampur; Division: Solan	90%
2	Wild Apricot	2005-06	6.25 ha	3000	Location: Barog; Beat: Barog; Block: Kumarhatti; Range: Dharampur; Division: Solan	80%
3	<i>Quercus leucotrichophora</i> (Ban Oak)	Jul-09	1 ha	800	Location: Gugaghat; Beat: Baran; Block: Kandaghat; Range: Kandaghat; Division: Solan	80%
4	<i>Myrica esculenta</i> (Kafal)	Sep-24	0.5 ha	252	Location: JaunaJi; Beat: JaunaJi 2; Block: Solan; Range: Solan; Division: Solan	50-60%

Maximum survival percent was recorded for Jatropa followed by Apricot, Oak and Myrica.

Chapter 16

Summary of Prescriptions

Prescriptions made and / or proposed in the working circles of the divisions are important to ensure implementation of the working plan. Although the prescriptions have been detailed in the concerned chapters related to working circles, the important ones have been summarized in this chapter to serve as a ready reference and also to avoid searching the individual chapters for management of forests and their components.

The following is a gist of the working circles included in the plan:

1. Chil working circle
2. Ban oak working circle
3. Deodar working circle
4. Protection-cum-rehabilitation working circle
5. Bamboo working circle
6. Plantation working circle
7. Non Timber Forest products working circle
8. Soil Water Conservation working circle
9. Eco Tourism working circle
10. Joint Forest Management working circle
11. Wildlife Management working circle

The working circle wise prescriptions are summarized in the sections that follow.

16.1 Chil Working Circle

S. No.	Prescription	Page No.
1.	Rotation Adopted as 120 years, exploitable diameter at 50 cm	264
2.	Conversion period retained as 120 years	264
3.	Regeneration period is fixed at 30 years	264
4.	Final felling of trees with Diameter > 40 cm and standing over young trees	276
5.	Retain old / mature trees on steep / vulnerable / rocky strata, at mostly vegetation less places and similar conditions and 20% of total harvestable volume	276
6.	Cleaning thinning operations in trees with low diameter	276
7.	Control of yield – yield to meet demand of right holders, and other considerations	279
8.	Felling because of special reasons – natural disasters, wind damage, transfer of forest land for non-forestry purpose	279
9.	Execution of felling in different PB areas	280
10.	Subsidiary silvicultural operations in various PB regions	285
11.	Artificial regeneration	288
12.	Closure of areas after seeding felling	288
13.	Fire protection of Chil forests	288
14.	Grazing and grass cutting	290
15.	Resin tapping	290
16.	Right holders' demand	290
17.	Salvage removals	290
18.	Regeneration surveys	290

16.2 Deodar Working Circle

S. No.	Prescription	Page No.
1.	Silvicultural system – Group Selection System	305
2.	Choice of species for planting	306
3.	Rotation	306
4.	Regeneration	306
5.	Exploitable diameter	306
6.	Allotment to periodic blocks	306
7.	Control of yield	306
8.	Subsidiary silvicultural operations – Slash disposal, planting, weeding, cleaning & climber cutting	307
9.	Protection from fire	308
10.	Regeneration survey	308

16.3 Ban-Oak Working Circle

S. No.	Prescription	Page No.
1.	Silvicultural System of management – planting and improvement fellings	314
2.	Yield from Ban – Oak (removal of dead, decaying, diseased, uprooted, fallen trees)	315
3.	Assisted Natural Regeneration and planting	315
4.	Closure and Planting Programme	316
5.	Prescribed Silvicultural Works – singling, pruning, coppicing and cutting	316
6.	Seed production	319
7.	Nursery practice	320
8.	Artificial propagation – Direct sowing, Planting	320
9.	Natural Regeneration	320
10.	Lopping cycle	321
11.	Exercise of rights and privileges	321

16.4 Protection-cum-rehabilitation working circle

S. No.	Prescription	Page No.
1.	Silvicultural System – no prescription. Removal of dry and fallen trees	330
2.	Subsidiary silvicultural operations – closure of area, site preparation, treatment maps, nurseries, sowing and planting, weeding, cleaning, protection from fire, control burning, grazing, grass cutting, monitoring and evaluation	332
3.	Lantana Eradication	334
4.	Fire Prevention Measures	343
5.	Programme for Control Burning	349
6.	Illicit felling	356
7.	Eviction of encroachment on forest land	359

16.5 Plantation Working Circle

S. No.	Prescription	Page No.
1.	Planting techniques – Zone-wise recommended species	365
2.	Fire Protection measures	367
3.	Nursery techniques – site selection, design, layout, equipment	369
4.	Root trainers	369

16.6 Bamboo Working Circle

S. No.	Prescription	Page No.
1.	Culm Selection-Cum-Clump Improvement silvicultural system	381
2.	Calculation of rotation	382
3.	3-year felling cycle	383
5.	Bamboo Plantation Proposal	387
6.	Nursery Raising Plan	394
7.	Subsidiary Silvicultural Operations	396
8.	Treatment of gregariously flowered areas	397
9.	Nursery techniques	397
10.	Raising bamboo through seeds	398
11.	Identifying culms of various ages	398

16.7 Non Timber Forest Products Working Circle

S. No.	Prescription	Page No.
1.	Resin to be tapped from trees having Diameter > 50 cm	403
2.	Rehabilitation plan	403

16.9 Soil and Water Conservation Working Circle

S. No.	Prescription	Page No.
1.	Strategy	405
2.	Control measures for soil erosion – vegetation, prevention of over-grazing, gullies, check-dams	406
	Preparation of Work Plan	409
3.	Tabulation of Soil Conservation Works	414
4.	Targets for construction of Check Dams	423
5.	Targets for construction of water holding structures	432
6.	Targets for construction of staggered trenches	433
7.	Targets for construction of <i>Van Sarovar</i> , Water ponds, Farm Ponds	447
8.	Implementation of works related to soil and water conservation	457
9.	Monitoring and evaluation of progress	457

16.10 Eco-Tourism Working Circle

S. No.	Prescription	Page No.
1.	Proposed eco-tourism sites	460
2.	Approach towards sustainable eco-tourism activities in the division	462
3.	Capacity Building of Community members	463

16.11 Joint Forest Management Working Circle

S. No.	Prescription	Page No.
1.	Activities to be undertaken – Plantations, Soil Conservation, Raising of nurseries	476
2.	Eradication of Lantana and other invasive species	478
3.	Sensitizing communities through PRA	478
4.	Development of Micro-plans	478
5.	Benefit sharing mechanism	478

16.12 Wildlife Management Circle

S. No.	Prescription	Page No.
1.	Micro Habitat Management	493
2.	Macro Habitat Management	494
3.	Other measures	495
4.	Addressing monkey menace	496
5.	Handling Man – Wildlife Conflict	496

Chapter 17

Trees outside Forests

Trees outside Forest areas have been identified as a strong component of forestry resources that not only help in maintaining green cover but also contribute to the livelihoods of farmers and agro-forestry practitioners. They also contribute to the issues discussed in climate change, namely, carbon sequestration, REDD Plus, etc. They are also instrumental in forest protection by providing fuel-wood and fodder from areas outside forests leading to a reduction in forest degradation. The forest department has not planted any Trees outside Forest (ToF) areas and neither manages them. However, the details of the ToF are given on the sections below to highlight the existence of forest tree species outside the forest areas that certainly add to the ongoing efforts to increase tree cover in the division.

17.1 Assessment of Trees Outside Forests

An assessment of Trees outside Forests (ToF) was done by Forest Survey of India and estimates for districts prepared. However, the data pertaining to the ranges of the Solan Forest Division were analyzed and averages are given in the tables below:

Table 17.1 (a): ToF in Parwanoo Range

Tree species	DBH (cm)	Crown width (cm)
<i>Acacia catechu</i>	15.85	32
<i>Emblia officinalis</i>	12	25
<i>Grewia optiva</i>	10.421	15.579
<i>Terminalia bellirica</i>	20	23
Papdi	24.667	34.667
<i>Mallotus philippensis</i>	15.75	18.25
<i>Psidium guajava</i>	8.5	35
<i>Mitragyna parvifolia</i>	10	25
<i>Syzygium cumini</i>	12	35
<i>Ficus religiosa</i>	118	155
<i>Cassia fistula</i>	27	35

Table 17.1 (b): ToF in Subathu Range

Tree species	DBH (cm)	Crown width (cm)
<i>Albizia procera</i>	131	8
<i>Bauhuina variegata</i>	44.75	2
<i>Prunus Padus</i>	52.4	2.7

<i>Toona ciliata</i>	33.933	5.403
<i>Greveia oppoitifelia</i>	36	3
<i>Celtis australis</i>	27.243	5.214
<i>Pinus roxburghii</i>	63.125	4.162
<i>Pirus pashia</i>	37.833	2.833
<i>Albizia spp</i>	25	1
<i>Bombax ceiba</i>	64.5	3.5
<i>Lannea coromandelica</i>	49	5
<i>Ziziphus mauritiana</i>	32.5	4.375
<i>Eucalyptus globulus</i>	51	9
<i>Pistacia integerrima</i>	24.417	5.3
<i>Ficus altriculata</i>	29	10
<i>Acacia catechu</i>	33.986	1.585
<i>Emblia phyllanthus</i>	26.4	1.46
<i>Mallotus phillipensis</i>	31	2.333
<i>Albizia julibrissin</i>	51	3
seneha	28	7
Rihane	24	3
Pulla	25.5	6
<i>Kydia caycina</i>	23	10
<i>Morus alba</i>	32.75	6.25
<i>Grewia opporitifolia</i>	27.333	3.333
<i>Sapium insigne</i>	29	4
<i>Zanthoxylum armatum</i>	18	5
<i>Ficus corica</i>	22	5
Chuli (<i>Albizia spp</i>)	30	.
<i>Melia azadirach</i>	19	.
<i>Ficus palmata</i>	27	.
<i>Grewia optiva</i>	24.429	.
Kaleju	28	.
<i>Ficus auriculata</i>	36	4

Table 17.1 (c): ToF in Chail Range

Tree species	DBH (cm)	Crown width (cm)
<i>Bombax ceiba</i>	27.333	52
<i>Celtis australis</i>	34.778	135.778
<i>Ficus religiosa</i>	59	120
<i>Grewia optiva</i>	20.75	40

<i>Melia azadirach</i>	27	80
<i>Pistacia integerrima</i>	19.5	42
<i>Pyrus communis</i>	25	20
<i>Quercus griffithi</i>	15	22
<i>Sapindus mukorossi</i>	43	82
<i>Toona ciliata</i>	31.933	99.733
<i>Ziziphus zuzuba</i>	15	10

Table 17.1 (d) ToF in Dharampur Range

Tree species	DBH (cm)	Crown width (cm)
<i>Bauhinia variegata</i>	9	13
<i>Pinus roxburghii</i>	27.75	64.312
<i>Pistacia integerrima</i>	53	117.5
<i>Prunus padus</i>	9.667	24.333
<i>Quercus leucotrichophora</i>	16.889	37.111

Table 17.1 (e): ToF in Kandaghat Range

Tree spp	DBH (cm)	Crown width (cm)
<i>Sapium insigne</i>	14.667	31.333
<i>Grewia oppositifolia</i>	15.659	19.317
Ber	21	27.5
Bottle brush	16.8	30.1
Chir	26.409	23.409
Chui	24.538	38.462
<i>Punica granatum</i>	10.25	8.375
<i>Ficus spp</i>	20	36.2
Jagrinda	22	42.8
Kachnar	21.842	25.421
Kainth	14.556	26.667
Kakkar	26.593	43.63
Khair	14.52	16.28
Khanoor	21.4	43.7
Kharik	20.73	27.784
<i>Melia azadirach</i>	21	46
Misc	10.333	21.667
Mor pankhi	9	32.6

Padag	18.143	38
Silveroak	26	48.5
Simal	17.5	23
Siris	19.667	45.833
Tun	22.6	38.44

Table 17.1 (f): ToF in Solan Range

Tree species	DBH (cm)	Crown width (cm)
<i>Acacia catechu</i>	10.667	26.667
<i>Acer spp</i>	16.02	33.49
<i>Albizia chinensis</i>	15.333	42.667
Bamboo	400	80
<i>Bauhinia variegata</i>	10.5	18.357
<i>Cedrus deodara</i>	25.286	38.571
<i>Celtis australis</i>	18.485	32.353
<i>Erythrina suberosa</i>	20	28
<i>Ficus spp</i>	21.156	35.375
<i>Grewia optiva</i>	24.842	22.211
<i>Juglans regia</i>	17	30
<i>Machilus odoratissima</i>	15.526	37.368
<i>Melia azadirach</i>	8.667	27.222
<i>Morus alba</i>	16	20
<i>Myrica nagi</i>	23	50
<i>Pistacia integerimma</i>	20.538	45.641
<i>Pisnus roxburghii</i>	24.304	37.529
<i>Prunus armenica</i>	13.667	30.667
<i>Prunus communis</i>	17.167	29.167
<i>Prunus padus</i>	7.75	21.25
<i>Prunus spp</i>	9.133	27.667
<i>Punica granatum</i>	8.658	24.079
<i>Pyrus communis</i>	15.556	31.389
<i>Pyrus pashia</i>	14.816	31.447
<i>Quercus leucotrichophora</i>	23.811	44.595
<i>Rhus semialata</i>	22	3
<i>Salix alba</i>	10	20
<i>Sapium insigne</i>	8.333	23.333
<i>Toona ciliata</i>	23.788	50.303
<i>Machilus odoratissima</i>	13.476	34.643
<i>Zanthoxylum armatum</i>	16.5	28.75

17.2 Current status of Trees outside Forests in Solan District

Additionally, Forest Survey of India has estimated the ToF for the entire Solan District. The estimates are given in the tables 17.2 and 17.3.

Table 17.2: Distribution of estimated trees and trees/ha (Species and diameter-class wise) for Rural Area

S. No.	Species	Diameter Class (cm)			Total	Trees/ha
		10-30	30-50	< 50		
1	<i>Acacia arabica</i>	77,303	9,276	6,184	92,763	0.73
2	<i>Acacia catechu</i>	1,989,724	179,084	16,406	2,185,214	17.25
3	<i>Albizzia lebbek</i>	71,118	37,106	0	108,224	0.85
4	<i>Azadirachta indica</i>	126,136	29,782	0	155,918	1.23
5	<i>Bauhinia retusa</i>	264,716	13,055	0	277,771	2.19
6	<i>Bombax ceiba</i>	107,962	41,710	4,037	153,709	1.21
7	<i>Cedrela toona</i>	827,843	242,228	26,524	1,096,595	8.66
8	<i>Celtis australis</i>	363,406	30,321	9,706	403,433	3.18
9	<i>Dalbergia sissoo</i>	334,198	64,756	0	398,954	3.15
10	<i>Eucalyptus species</i>	268,240	53,665	4,982	326,887	2.58
11	<i>Ficus carica</i>	41,571	9,448	0	51,019	0.4
12	<i>Ficus religiosa</i>	16,148	3,092	7,816	27,056	0.21
13	<i>Ficus semicordata</i>	49,129	9,449	0	58,578	0.46
14	<i>Ficus species</i>	31,985	7,421	1,752	41,158	0.32
15	<i>Grewia oppositifolia</i>	1,269,054	41,262	7,129	1,317,445	10.4
16	<i>Lannea coromandelica</i>	75,764	18,464	1,752	95,980	0.76
17	<i>Leucaena leucocephala</i>	343,219	14,533	3,092	360,844	2.85
18	<i>Mallotus philippinensis</i>	204,078	9,276	0	213,354	1.68
19	<i>Mangifera indica</i>	485,535	71,701	32,691	589,927	4.66
20	<i>Melia azadirachta</i>	44,073	8,759	0	52,832	0.42
21	<i>Morus species</i>	165,043	25,288	5,789	196,120	1.55

22	<i>Pinus roxburghii</i>	983,286	547,301	129,867	1,660,454	13.11
23	<i>Pistacia integerrima</i>	319,962	94,308	4,037	418,307	3.3
24	<i>Quercus leucotrichophora</i>	105,131	27,828	0	132,959	1.05
25	<i>Quercus species</i>	216,447	49,474	0	265,921	2.1
26	<i>Syzygiumcumini</i>	373,107	46,310	4,844	424,261	3.35
27	Rest of species	2,873,572	288,059	27,984	3,189,615	25.18
Total		12,027,750	1,972,956	294,592	14,295,298	112.84

Presently, 26 identified tree species have been listed as existing outside forest areas with a mixed category. Almost 14,300,000 trees belonging to three diameter classes namely 10 – 30, 30 to 50 and above 50 are present with density being estimated as 112.84 trees per hectare. The tree species constitute a mix of end-uses like timber, non-timber products, fodder and fruits.

Table 17.3: Potential production of trees outside forests in Solan district

S. No.	Species	Potential Production (m³)
1	<i>Cedrela toona</i>	23020.95
2	<i>Eucalyptus spp.</i>	21923.56
3	<i>Acacia catechu</i>	16667.85
4	<i>Pinus roxburghii</i>	15947.23
5	<i>Mangifera indica</i>	10668.97
6	<i>Celtis australis</i>	6834.01
7	<i>Pistacia integerrima</i>	6046.95
8	<i>Syzygium cumini / jambolanum</i>	4909.72
9	<i>Bombax ceiba</i>	4476.01
10	<i>Acacia arabica</i>	4053.12
11	<i>Dalbergia sissoo</i>	3866.16
12	<i>Salix alba</i>	2978.44
13	<i>Pyrus pashia</i>	2364.38
14	<i>Azadirachta indica</i>	2201.29
15	<i>Melia azadirachta</i>	2048.2
16	<i>Albizzia lebbek</i>	1782.62
17	<i>Morus species</i>	1720.33

18	<i>Zizyphus mauritiana</i>	1241.93
19	<i>Quercus species</i>	1160.99
20	<i>Prunus cornata</i>	1114.07
21	<i>Mallotus philippinensis</i>	1094.06
22	Rest of the Species	5700.61
Total		141821.45

17.3 Increase in Trees outside Forests

The Solan Forest Division aims at providing an impetus to the enhancement of tree cover outside forest areas to provide sustainability to the efforts of forest conservation and, side by side, provide the resources required by the rural economy. Efforts to instill the practice of agro-forestry among farmers of the villages in the division shall be made. Tree plantation in farm boundaries and village lands (*Shamlaat*) shall be undertaken. The species to be planted will cover a broad spectrum of fodder and fuelwood species.

Adequate protection measures shall be undertaken to ensure the planted trees in agro-forestry, farm-forestry and other areas outside the forests thrive and reach the dimensions of commercial extraction or utilization as per the end-use of the tree species. Special drives to identify potential tree-growers shall be undertaken and areas marked for undertaking plantation activities.

Chapter 18

Monitoring and Evaluation

Success of Working Plan largely depends upon Monitoring and Evaluation of the prescriptions and tasks outlined in the plan. Regular and periodic monitoring will be taken up after planning the monitoring process. The monitoring framework shall be similar to end-of-the-period assessment and preparation of the next working plan to synchronize the estimates.

Monitoring and assessment of the working plan during its implementation shall be carried out using the control forms given in the Working Plan code 2014.

18.1 Parameters to be observed for the purpose of monitoring, assessment and reporting

The main points of monitoring are given below:

- (i) Felling
- (ii) Thinning
- (iii) Plantation
- (iv) Subsidiary Silvicultural operations
- (v) Rotational lopping
- (vi) Soil and water conservation
- (vii) Grazing
- (viii) Protection of forests from fires
- (ix) Harvesting of NTFPs
- (x) Bamboo harvesting
- (xi) Construction of boundary pillars
- (xii) Weed eradication
- (xiii) Fuel-wood removals

18.2 Formats for collection of data on monitoring parameters

(i) Silvicultural Operations

Table: Area of Silvicultural operations carried out

Year	Range	Compartment	Species	Felling		Thinning		Lopping	
				Area	Qty	Area	Qty	Area	Qty

The above format to be filled in for all the major species (Chil, Deodar, Ban Oak and Broad Leaved). The area should indicate the extent of area in which the trees undergoing silvicultural operations exist. Wherever possible, the approximate quantity of woody mass obtained from silvicultural operations to be given.

(ii) Grazing

Year	Range	No. of permits given	Area	No. of livestock

Area under the permit and estimated no. of livestock to be mandatorily included.

(iii) Forest Fires

Year	Range	Compartment	No. of incidences	Area covered	Estimated loss

(i) Harvesting of NTFP

Year	Range	Compartment	Species	Quantity harvested	Royalty received (mention if harvested under rights)

(ii) Boundary pillars

Year	Total length of boundary		Total no. of boundary pillars		% forest secured	Change in % forest secured
	Natural	Man-made	Estimated	Constructed /maintained		

(i) Eradication of weeds

Year	Range	Compartment	Weed present	Area cleared	Method used

(ii) Soil and Water Conservation

Range	Structure	No. existed	New constructed	Total no. of structures

(vii) Fuewood removals

Year	Range	Compartment	Quantity removed	Royalty received (mention if removals are under rights)

(viii) Harvesting of bamboos

Year	Range	Compartment	Quantity removed	Royalty received (mention if removals are under rights)

Chapter 19

Climate Change

19.1 Environment

The word environment is derived from a French word "environia" which means to surround. It is defined as the surroundings in which life forms live and operate, referring to all the elements of the physical and biological world, as well as the interactions between them. It comprises both abiotic and biotic environments. It controls the life of all the three components of life forms, namely, animals, humans and plants. Humans interact with the environment more rapidly than other life forms. Environment is the condition in which an organism has to survive or maintain its life process, affecting its growth and development. Environment surrounds the life forms on the earth and affects their lives. Atmosphere, hydrosphere, lithosphere and biosphere are the main constituents of environment, soil, water, air, organisms and solar energy being the main components.

Environment can broadly be classified into two types namely, micro and macro. Apart from this, another classification can be physical and biological. Micro-environment refers to the immediate local environment of the organism while macro refers to all the physical and biological conditions which surround the organism externally. Physical environment refers to all the abiotic factors or conditions like temperature, light, rainfall, soil, minerals etc. including the atmosphere, the lithosphere and the hydrosphere. On the other hand, biological environment includes all biological factors or living forms such as plants, animals and micro-organisms.

19.2 What is Climate Change?

Climate change refers to changes, often long term, in climatic parameters such as changes in temperature, precipitation, snowfall (where applicable), and general weather trends. This is caused by many internal and external factors. Climate change has evolved into a global problem in the last few decades. Changes in climatic changes affect life on Earth in a wide variety of ways. Earth is experiencing warming over the past two million years, for which climate change is responsible. The increase in temperature causes drastic changes in the Earth like change of seasons, flowering patterns of vegetation, precipitation, etc. directly affecting agriculture. Deforestation, burning of fossil fuels and other anthropogenic activities are the most important determinants of global warming and changes in climate that are irreversible. It is predicted that the increase in global temperature may, in future, affect life forms leading to extinction of several flora and fauna species. Changing rainfall patterns, extreme weather events, and ocean acidification are putting pressure on species already threatened by other human activities.

Impact of climate change on flora and fauna

Some of the consequences of changes in climate are elucidated below:

1. Forced migration of species.
2. Threat to native species by expansion of invasive species
3. Habitat loss
4. Alteration in life cycle of plants and animals
5. Depletion in Wildlife
6. Accelerate extinction of plant and animal species
7. Abrupt changes in micro-climates
8. Reduction in biodiversity
9. Poor eco-system resilience
10. Increase in frequency of extreme events like flash floods
11. Increase in level of seas risking coastal areas

19.3 Strategy to combat climate change and mitigate its effects

Adaptation planning

Adaptation planning can lead to adjustment to the impacts of climate change, including actions taken to reduce the negative impacts of climate change, or to take advantage of emerging opportunities. Some of the most promising ways to mitigate climate change “Nature Based Solutions” like conservation, restoration, and improved management of land, leading to an increase in carbon sequestration and reduction in greenhouse-gas emissions. Effect of climate change on biodiversity also needs to be identified and strategies developed to address this vulnerability without destroying the local ecosystem.

Protection of habitats

Habitat loss has significant and negative effects on biodiversity through its impact on species abundance, genetic diversity, species richness, species distribution apart from indirect negative effects that it has on soil and other eco-system parameters. Land degradation is a significant contributor to climate change. Deforestation, destruction of wetlands and land use change release massive amounts of carbon into the atmosphere, which may worsen the already alarming global warming. Forests are recognized for their role in regulating climate and greenhouse gases by becoming a sink for carbon. There is therefore a need to protect threatened species and ecosystems with the added benefit of preserving these carbon reserves, and ensuring that they function healthily and perform this important service. Sequestered carbon helps to slow down

climate change. There is need to control or restrict over-grazing and over exploitation of the natural resources of the protected areas by the surrounding dwellers/villagers for sustainability. Increasing their awareness and providing them with alternative livelihoods can be a positive step in this direction.

Scientific guidance, consultation of the experts

Biodiversity is affected by climate change at different levels from low land to high mountains and from small rivers to deep seas. It has already led to extinction of species while making others endangered. Extinctions can disrupt fundamental ecological processes. Regular field surveys are required to monitor status of biodiversity and habitat of the protected areas and update them with scientific reports by the experts (ecologists, field biologists, scientists, etc.) for sustainable habitat protection and management of the protected areas. This data will be useful for studying the impact of climate change and future planning of protected area. Field staff also needs to be educated, trained, and made aware of the benefits of conservation.

19.4 Solan Forest Division and Climate Change

The climatic data in respect of Solan has been detailed in chapter 1 of Part 1 of this volume. Salient features are mentioned below:

1. The trend in precipitation indicates that there is a decrease in rainfall in the initial part of decade then it shows an increase. This is probably due the variation in the altitude in this Division and possible micro-climatic disturbances.
2. The trend in temperature shows a slight increase in the area with a very slight upward trend which is monotonic in nature, with rate of increase slowing down slightly in the mid of the series.
3. The number of rainy days shows a marked downward trend during the decade indicating days of dry spell.

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