



WORKING PLAN FOR WEST NASHIK DIVISION

PERIOD 2019-20 TO 2028-29

VOLUME- I

BY

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CONSERVATOR OF FORESTS
WORKING PLAN, NASHIK**

**G. MALLIKARJUNA, IFS
DEPUTY CONSERVATOR OF FORESTS
WORKING PLAN, NASHIK**



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VOLUME I

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मुख्य वनसंरक्षक (कार्य आयोजना), नागपूर यांचे कार्यालय.

सि.पी.ॲंड बेरार शाळेजवळ, रविनगर, सिव्हिल लाईन्स, नागपूर
दूरध्वनी क्र. (०७९२) २५६५०५९ फॅक्स क्र. (०७९२) २५६५०५९

कर्मांक कक्ष-१४/काआ/ ११९ /२०१९-२०

नागपूर-४४० ००९, दिनांक ५/०२/२०

विषय- पश्चिम नाशिक वनविभागाचे श्री. एन.आर.प्रवीण, भा.व.से. व श्री.जी.मल्लिकार्जुन, भा.व.से. लिखित कार्यआयोजना सन २०१९-२० ते २०२८-२९ या कालावधीचा प्रारूप कार्यआयोजनेस मंजूरीबाबत.

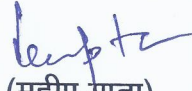
संदर्भ- अपर प्रधान मुख्य वनसंरक्षक (मध्य), पर्यावरण, वन एवं. जलवायु परिवर्तन मंत्रालय, भारत सरकार, नागपूर यांचे पत्र क्र.१२-३/२००२(FOR)/ ६१५७ दि. ०३/०२/२०२०.

उपरोक्त संदर्भित पत्रा अन्वये केंद्र शासनाने श्री. एन.आर.प्रवीण, भा.व.से. व श्री.जी.मल्लिकार्जुन, भा.व.से. लिखित पश्चिम नाशिक वनविभागाचे कार्यआयोजनेस सन २०१९-२० ते २०२८-२९ पर्यंत मंजूरी प्रदान केलेली आहे. सोबत संदर्भित पत्राची छायांकित प्रत सहपत्रित करण्यात येत आहे.

संदर्भित पत्रात नमुद केलेल्या अटीच्या अधिन राहून दिलेल्या निर्देशाप्रमाणे आवश्यक ती कार्यवाही करावी व सदर कार्यआयोजनेस तातडीने अमलात आणावे.

तसेच केंद्र शासनाने मंजूरी प्रदान केलेल्या पश्चिम नाशिक वनविभागाचे कार्यआयोजनेच्या खंड-१ व खंड-२ ची प्रत्येकी १ प्रत या कार्यालयाचे ग्रंथालयात ठेवण्याकरिता सादर करावी. आणि कार्यआयोजना खंड-१ व खंड-२ ची एक प्रत इंदिरा गांधी वनअकादमी, देहरादून यांनाही पाठवावी व सदर कार्यआयोजनेचे Soft Copy सुद्धा या कार्यालयास सादर करावी.

सहपत्र- वरील प्रमाणे


(महीप गुप्ता)
मुख्य वनसंरक्षक
कार्य आयोजना-पूर्व, नागपूर

प्रति,

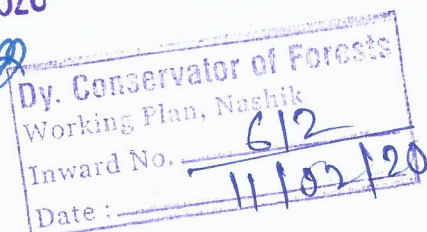
उप वनसंरक्षक
कार्यआयोजना विभाग,
नाशिक

प्रतिलिपी :- प्रधान मुख्य वनसंरक्षक (उत्पादन व व्यवस्थापन) म. रा. यांना माहितीस्तव सादर.

प्रतिलिपी :- अपर प्रधान मुख्य वनसंरक्षक (का.आ.पश्चिम) पुणे यांना माहितीस्तव सादर.

प्रतिलिपी :- मुख्य वनसंरक्षक, (प्रादेशिक) नाशिक यांना सहपत्रासह माहिती व आवश्यक कार्यवाहीस्तव सस्नेह अग्रेषित.

प्रतिलिपी- उपवनसंरक्षक (प्रा) पश्चिम नाशिक यांना सहपत्रासह माहिती व आवश्यक कार्यवाहीस्तव अग्रेषित.


Dy. Conservator of Forests
Working Plan, Nashik
Inward No. 612
Date: 11/02/20

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10 FEB 2020



मुख्य वनसंरक्षक
कार्य आयोजना , यांचे कार्यालय
नागपूर

आवक क्र. 280 2080

दिनांक 4/2/2020 भारत सरकार

GOVERNMENT OF INDIA
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
MINISTRY OF ENVIRONMENT, FOREST
& CLIMATE CHANGE

Regional Office (WCZ)
Ground Floor, East Wing
New Secretariat Building
Civil Lines, Nagpur - 440001
E-mail: apccfcentral-ngp-mef@gov.in

F.No. 12-3/2002 (FOR) / 6157

Date: 03.02.2020

To,

The Secretary (Forests),
Revenue and Forest Department,
Government of Maharashtra,
Mantralaya,
Mumbai- 400032.

Sub:- Approval of Working Plan of West Nashik Forest Division for the period 2019-20 to 2028-29- regarding.
Sir,

I am directed to refer to the PCCF (P&M), Maharashtra office letter No. Desk-14/WP/W. Nashik/1653/2018-19 dated 08.03.2019 on the above subject seeking prior approval of the Central Government under Forest (Conservation) Act, 1980 and PCCF (Production and Management), Nagpur letter No. Desk-14/W.Nashik/635/2019-20 dated 22.10.2019 forwarding additional information as sought by this Office vide letter of even number dated 19.06.2019 and to say that DWPR of West Nashik Forest Division has been examined in the Regional Office in light of relevant provisions of the Forest (Conservation) Act, 1980, Rules and Guidelines framed there under.

After careful examination of the DWPR of West Nashik Forest Division written by Shri N.R. Praveen, IFS and Shri G. Mallikarjuna, IFS; the Central Government hereby accords approval to the said Working Plan for the period of 2019-20 to 2028-29 in accordance with the powers vested under Forest (Conservation) Act, 1980 and subject to the following conditions:

1. The currency of the Working Plan shall be for a period of 10 years i.e. from 2019-20 to 2028-29. Necessary corrections may be made in the final copy of the Plan.
2. The orders of Hon'ble Supreme Court in the matter of Godavarman Thirumulkpad Vs Union of India in W.P. (Civil) No. 202/95 and related interlocutory applications shall be strictly adhered to. Any prescription or operation at variance with the Hon'ble Supreme Court's order shall be kept in abeyance till the order is in force or otherwise modified.
3. Further, in compliance with order to Hon'ble Supreme Court's Order dated 22.09.2000, the Government of Maharashtra shall ensure that regeneration of forests is commensurate with felling carried out under this Working Plan.
4. No felling shall be carried out without allocating necessary fund for implementation of regeneration operation so as to make regeneration commensurate with felling. In the events of failure in regeneration or any shortfall in carrying out regeneration operation, no further felling shall be undertaken until the failure/ shortfall is made up.
5. As per Ministry's order dated 23.02.2018, all the felling proposals as per the Working Plan/ Working Schemes received from the State Governments shall be placed before the

(Signature)

Regional Empowered Committee of the concerned Regional Office for examination and advice Regional Office on the issue. The Addl. Director General (Central) of the Regional Office will be competent authority to approve the proposals on the recommendations of the REC as per the existing Rules/ Acts and will ensure strict monitoring of felling and regeneration as per approved Working Plan/ Working Scheme. Felling to be done by State Government only after seeking permission from Regional Office, Nagpur.

6. Period of last Working Plan was up to 2016-17. Present Working Plan is approved from 2019-20. Intervening period will be considered as per the prescription of last Working Plan and whatever work has been carried out may be got regularized/will be considered as part of last Working Plan, after taking approval of the competent authority wherever needed.
7. No fruit bearing naturally grown trees shall be clear felled for any purpose whatsoever.
8. Standard thinning and silvicultural operations under the strict supervision of Assistant Conservator of Forests and above will be allowed as per norms to improve the health of growing stock while executing the prescriptions of the Working Plan.
9. Prescriptions of micro plans for JFM (if made) should not deviate from the broad framework/guidelines of the Working Plan and shall be in accordance with various orders of Hon'ble Supreme Court.
10. Felling carried out on forest land after seeking approval of the Central Government under Forest (Conservation) Act, 1980 will not be treated as deviation. However, proposed felling in the forest division shall be restricted proportionately in the current/ future years to compensate this removal.
11. No deviations shall be made from the prescriptions of Working Plan read with the conditions stipulated herein without prior approval of the Central Government under Forest (Conservation) Act, 1980. However, deviations of positive nature i.e. out of turn plantation carried out outside the worked area under any project, schemes and compensatory afforestation may be approved by the competent authority of the State Government to time.
12. Midterm review of Working Plan shall be undertaken after five years so as to make any changes, if needed to meet the objectives, with the approval of Regional Office, Nagpur.
13. The exploitable girth of tree species and period of felling cycle shall not be lower than the approved in previous Working Plan.
14. In the vicinity of Nalas and water bodies felling shall not be undertaken. Soil and Moisture conservation works in view of prevailing climate change and water crisis shall be carried out on priority basis.
15. No commercial felling shall be carried out along the 2 km strip of all perennial Rivers of State; further, no commercial felling shall be carried out along the strip of 500 meters of all seasonal Rivers.
16. Felling shall not be undertaken near the known resting/nesting places of wild animals and birds.
17. Removal of dead and diseased trees will be undertaken under the supervision of an officer not below the rank of Assistant Conservator of forests.
18. All kind of felling including that of dead and diseased trees and for granting of right and concession as well as all illicit felling should be compiled along with the estimation of their stand volumes as per the same volume table use for the assessment of growing stock. This report shall be prepared annually working circle and compartment wise by the territorial Sub- DFO and shall be submitted to the C.F, Working Plan for this purpose within 02

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months of the end of control year. Such removal shall be accounted for against the prescribed felling yield of the relevant year.

19. To ensure sustainable management of Non Timber Forest Produce (NTFP), scientific assessment of estimated quantity has to be done before their removal as per the prescription of Working Plan.
20. Status of rare, endangered and near extinct species shall be monitored closely and adequate measures will be taken for their protection and conservation.
21. Execution of Working Plan shall be in conformity with the National Forest Policies.
22. A definite plan has to be made to remove encroachment and plant the vacated area by planting suitable local species as per Government of India and Hon'ble Supreme Court Orders/Guidelines in the matter.
23. Eco-tourism shall/ may be undertaken on sustainable basis. No permanent structures shall be allowed at such sites. Temporary structures made up of local forest produce may be allowed for public. Such sites will be declared Plastic free zones and these eco-tourisms sites will be managed by the forest department as per the prescriptions of the Working Plan and without violating FC Act.
24. Demarcation and consolidation of Forest Boundaries will be done adequately.
25. Gregarious flowering of bamboo, if any, must be reported to ICFRE and other institutes as mandated and the situation be dealt with standard protocol.
26. Exotic species should not be planted in Plan areas.
27. Proper mechanism has to be put in place to control illegal felling, grazing and fire. Proper fire protection plan shall be prepared and executed meticulously.
28. Only 50% of normal yield, if silviculturally available, will be allowed for removal in case of Teak, Dhawada, Bhirra, Chichawa, Salai, Mowai, Rohan, Shiwan, Shisham, Surya, Karai, Mokha, Palas, Dhaman, Bhilawa, etc. In case of Haldu, Ain, Bija, Tiwas, Kalam, Lendia, Garadi, Khair it will be 33% if silviculturally available.
29. Efforts should be made to undertake artificial regeneration of local species in such a way that it serves both the purpose of biodiversity conservation as well as meeting the demand of fuel wood, fodder and the timber.
30. Babul forest will not be expanded at the cost of local species.
31. Lac cultivation, if any, will be practiced as per the provisions of Forest (Conservation) Act, 1980.
32. Documents and appendices mandated in National Working Plan Code will be incorporated in the Working Plan.
33. Attempts shall be made to grow trees outside forest areas to meet the local demand of small timber, fuel wood and fodder.
34. Proper mechanism is to be place in an adequate manner that such case NTFPs are collected in sustainable manner.
35. Socio-economic survey is to be conducted within first year of implementation of plan and the same be appended with the Working Plan.
36. Grassland will not be expanded at the expense of natural tree cover.
37. While managing forests provisions of the Biodiversity Act, 2002 shall be fully complied.
38. Cutback operation shall be undertaken as per standard norms.

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39. Prescriptions on Wildlife Management should be vetted by the CWLW and a certificate of the same be attached to the plan at the time of final printing.
40. No regularization of existing encroachment should be done without following due procedure. And an appendix may be added giving details of the encroachment of the forest area in the division.
41. Grazing to be properly regulated and grazing fee should be levied.
42. All the Unclassed Forest, Acquired CA areas and Acquired Private Forests should be notified as RF/ PF in time-bound manner and be carried out at the earliest.
43. Stock maps of the division (compartment wise) may be submitted both in hard and soft copies to this Office for future reference within one month of the approval.
44. The Central Government reserves the right to review, modify, withdraw, add this approval at any time if any of the conditions of approval are not implemented. Relevant modification in the Working Plan are required to be carried out so as to keep it in conformity with the orders, circulars and guidelines issued by the Central Government or the Apex Court under Forest (Conservation) Act, 1980 or any other statute and National Forest Policy from time to time.

NOTE: The above mentioned approval is subject to submission of final Working Plan within 6 months including information on following chapters as per National Working Plan Code, 2014:

1. **Chapter 2.7 (Trees Outside Forests)** in the Division in collaboration with Forest Survey of India.
2. The information shared with the Regional Office (WCZ), MoEF & CC, Nagpur w.r.t Growing Stock and Carbon Estimation of the Division shall also be incorporated in the final Working Plan.

This issues with the approval of DDGF (Central), Regional Office (WCZ), MoEF & CC, Nagpur.

Yours faithfully,



(Dr. E Arockia Lenin)
Scientist – 'C'

Copy to:

1. The Additional Director General of Forests (FC) Ministry of Environment, Forest & Climate Change, Indira Paryavaran Bhawan, Jor Bagh, New Delhi-110003.
2. The Principal Chief Conservator of Forests (HoFF) Govt. of Maharashtra, Van Bhawan, Ramgiri Road, Civil Lines, Nagpur-440001.
3. Guard File.



(Dr. E Arockia Lenin)
Scientist – 'C'

ACKNOWLEDGEMENT

The success and final outcome of this Working Plan required many guidance and assistance from many people and I am extremely fortunate to have got this all along with the completion of this Plan. Whatever we have achieved is purely due to the support of a beautiful team of Working Plan division, Nashik (the list is provided on the following page), and I am immensely grateful to all our team members.

I wish to express my sincere gratitude to Mr. P.N. Patil, IFS, and Mr. N. R. Praveen, IFS, who were heading the Working Plan division, Nashik, before me for all their strenuous field and office work, and providing necessary support and guidance in completion of this Plan.

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G. Mallikarjuna, IFS
DCF (Working Plan), Nashik

WORKING PLAN TEAM

“Teamwork makes the Dream work.”

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Sub-divisional Forest officer (SOFR)	Mrs. L.R. Aade, Mr. M.P. Bhalerao and Mr. B.L. Gite
Range Forest Officer (WP)	Mr. M.T. Sharma
Range Forest Officer (SOFR)	Mr. L.M. Taral, Mr. A.M. Angaitkar, Mr. R.H. Zagde, Mr. S.V. Wadekar and Mrs. S.S. Ekhande
Ranger Surveyor (WP)	Mr. M.Y. Charoskar, Mr. S.D. Jadhav and Mr. M.L. Koskewar
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Accountant	Mr. D.B. Suryawanshi and Mrs. R. B. Bidgar
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Driver	Mr. S.S. Bairagi, Mr. D.S. Ahire and Mr. A.T. Patil
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Peon	Mr. D.H. Tandale

I am immensely grateful to all our team members.

WORKING PLAN OF WEST NASHIK FOREST DIVISION

EXECUTIVE SUMMARY

1. Introduction

The forest ecosystems are complex webs of organisms that include plants, animals, fungi, bacteria, etc. These are essential for life on earth and provide habitat for a vast array of plants and animals. Forests take many forms, depending on their latitude, soil, rainfall, and prevailing temperatures. They supply oxygen, timber, and provide places for recreation. Forests on top perform a critical role in mitigating climate change because they act as a carbon sink. But forests are being devastated and degraded at alarming rates. Deforestation enters many forms, including fires, clearing for agriculture, ranching, and development, unsustainable logging for timber and degradation due to climate change. This impacts people's livelihoods and threatens a broad range of plant and animal species.

In the past, timber production was traditionally regarded as the dominant function of sustainable forests. However, in recent years this perception has shifted to more multi-faceted functions and services, like recreation, health, and well-being, biological diversity, maintenance of ecosystem services and the mitigation of climate change. Because of the increasing importance of forests and its resources in the general well-being of mankind, many international conventions and treaties contain provisions to regulate activities related to forests.

The United Nations Forum on Forests viewed the Sustainable forest management (SFM) as the overarching principle for forest policy at both the national and international levels and outlined future priorities in the form of the four Global Objectives on Forest (GOFs):

- 1) **Global objective 1:** Reverse Forest Loss: Reverse the loss of forest cover worldwide through sustainable forest management, including protection, restoration, afforestation, and reforestation, and increase efforts to prevent forest degradation.
- 2) **Global Objective 2:** Enhance Forest-Based Benefits: Enhance forest-based economic, social and environmental benefits, including by improving the livelihoods of forest-dependent people.
- 3) **Global Objective 3:** Increase Sustainably Managed Forests: Increase significantly the area of protected forests worldwide and other areas of sustainably managed forests, as well as the proportion of forest products from sustainably managed forests.

- 4) **Global objective 4: Mobilize Financial Resources:** Reverse the decline in official development assistance for sustainable forest management and mobilize significantly increased new and additional financial resources from all sources for the implementation of sustainable forest management.

Nashik possesses a unique personality of its own, due to its mythological, historical, social and cultural importance. The city is situated on the banks of the Godavari River, naturally making it one of the holiest places in the world. Nashik district is situated towards the Northwest part of the Maharashtra State. There are two forest divisions and one forest sub-division in Nashik district. They are West Nashik division, East Nashik division and Malegaon sub-division. This Plan contains the area of West Nashik forest division. The tract dealt lies between 19° 35' and 20° 50' North Latitude and 73° 16' and 74° 56' East Longitude. It comes within the civil territories of Nashik, Sinner, Igatpuri, Trimbakeshwar, and part of Dindori, Niphad and Surgana talukas of Nashik district. The headquarters of West Nashik forest division is at Nashik. The boundaries of West Nashik forest division are given below:

Table 1: Boundaries of West Nashik division

Directions	Name of division/district
North	East Nashik division and Gujrat state
East	East Nashik division and Ahmednagar division
West	Jawhar Division and Gujarat state
South	Shahapur division and Sangamner sub-division

2. PRESENT STATUS OF FORESTS AND FOREST ADMINISTRATION

2.1 Forest area: The forest areas of West Nashik division display areas with varied topography. The western portion is hilly and intersected by ravines, while the eastern part is having flat areas. The total forest area of the West Nashik forest division as per Form No.1 is 126304.399 ha, out of this, 31451.140 ha has been handed over to FDCM. In the year 2016-17, an area of 290.153 ha has been transferred to East Nashik forest division. Hence, the net area in charge of the West Nashik forest division is 94853.259 ha. The Range wise distribution of forest area is given below:

Table 2: Range-wise area Statement

Sl. No	Range	Area (in Ha)						
		Reserved Forest	Protected Forest	CA area	Acquired Forest	Total	Area handed over to FDCM	Net Area
1	2	3	4	5	6	7	8	9
1	Barhe	10903.622	4167.578	0.000	0.000	15071.200	0.000	15071.200
2	Nanashi	7743.506	615.534	6.970	100.490	8466.500	594.746	7871.754
3	Peint	16081.336	5477.216	2.970	132.310	21693.832	11578.757	10115.075
4	Harsul	14889.359	10017.465	0.000	3209.073	28115.897	13342.743	14773.154
5	Trimbak	9630.986	0.000	0.000	831.090	10462.076	0.000	10462.076
6	Nashik	10918.684	150.000	46.450	0.000	11115.134	2132.228	8982.906
7	Igatpuri	17166.130	0.000	0.000	159.890	17326.020	3802.666	13523.354
8	Sinnar	13879.969	0.000	4.000	169.771	14053.740	0.000	14053.740
	Total	101213.592	20427.793	60.390	4602.624	126304.399	31451.140	94853.259

2.2 Administrative units: West Nashik forest division earlier had four subdivisions and six Ranges. In the year 2007, two new Ranges *i.e.*, Trimbak and Nanashi were formed. So, as prevalent today, there are four subdivisions, eight Ranges, 36 Rounds and 126 Beats in West Nashik forest division.

2.3 Forest types: The occurrence of various forest types is primarily determined by the distribution of rainfall. The steep ridge of Western Ghat traps the major rainfall from the advancing South-west monsoon. On the east of the ridge lies the rain shadow zone. Consequently, we obtain a broad spectrum of forest types ranging from sub-groups Semi-evergreen to Thorn forest in the West Nashik forest division. These sub-groups are further branched into various forest types as classified by the Champion and Seth as under:

- 1) West Coast Semi-Evergreen Forest (2A/C2)
- 2) Southern Tropical Moist Deciduous Forest (3B)
 - a) Moist Teak Forest (3B/C1b)
 - b) Southern Moist Mixed Deciduous Forest (3B/C2)
- 3) Southern Tropical Dry Deciduous Forests (5A)
 - a) Dry Teak Forest (5A/C1)
 - b) Dry Mixed Deciduous Forest (5A/C3)
- 4) Southern Tropical Thorn Forests (6A/C1)
- 5) Western Sub-Tropical Hill Forest (8A/C2)

2.4 Regeneration: A comprehensive study was performed to study the regeneration status of forests in the West Nashik forest division by SoFR unit Nashik. Data on regeneration status are collected along with the enumeration of the forest crop in four 3m X 3m sub-plots within the

enumeration plots. The seedlings are enumerated in the regeneration sub-plots.

- a) On analysis of the regeneration data of the Division, it is observed that the regeneration status is poor. This is an appalling situation that needs to be tackled head-on.
- b) The regeneration survey, along with the whole forest resource survey for the Division, was carried out as per the New Working Plan Code 2014. This is the first such survey for the SoFR unit.
- c) The regeneration status in forests of West Nashik forest division, *i.e.*, a number of seedlings, is low to be considered a healthy forest.

2.5 Growing stock: Growing stock consists of the volume of all living trees in a given area of forest that has more than a 30 cm girth at breast height. It is typically measured in solid cubic metres (m³) and includes the stem from ground level. Growing stock provides information on existing wood resources but also a basis for estimating the amount of carbon contained. The details of the growing stock of standing crop in West Nashik forest division are as below:

Table 3: Details of Growing stock of standing crop

Sl. No.	Name of Working Circle	Details	Total	General utility species	Special utility species	Minor forest produce	Other species
1	Afforestation W.C	volume/ha	15.25	1.36	0.97	4.18	8.74
		trees/ha	28.66	5.69	1.51	7.54	13.92
2	Improvement W.C.	volume/ha	34.56	4.49	6.52	6.43	17.18
		trees/ha	59.54	15.86	4.06	10.09	29.53
3	Kuran W.C.	volume/ha	5.88	0.29	0.73	0.81	4.05
		trees/ha	23.73	2.09	1.40	1.63	18.61
4	Plantation W.C	volume/ha	14.51	1.61	2.42	3.43	7.06
		trees/ha	40.22	11.40	2.08	6.59	20.15
5	Protection W.C	volume/ha	10.18	0.55	1.58	3.87	4.18
		trees/ha	20.14	2.26	1.56	5.94	10.38
Total weighted average		volume/ha	43.47	2.67	3.75	4.95	45.65
		trees/ha	42.92	10.51	2.74	8.16	21.51

2.6 Labour Supply: The primary activities of the forest department in West Nashik forest division are Afforestation, Soil and moisture conservation, Forest protection, NTFP collection, and the collection and transportation of timber to the depot, etc. Out of the above, the Afforestation and Soil and moisture conservation works provide more employment to labourers. On the whole, the availability of labour for forestry activities is

satisfactory. The availability of skilled labour for bamboo working, timber harvesting, etc., is not locally available in the area. As Nashik is one of the agriculturally progressive districts and, so during peak agriculture season, labour availability will be extremely difficult.

2.7 Impact of past systems of management

In less than 100 years after the forests were brought under systematic management, the conditions of the once rich, dense forests have deteriorated to such an extent that intensive afforestation, soil, and water conservation measures were required to be prescribed in the previous working plans to increase the growing stock. The reasons for the decrease in density of forests over the period of time are given below:

- a) The large scale encroachments and its regularization at different time span and allotment of large chunk of forest areas for agriculture in the name of High Power committee (HPC), Eksali plots, etc., has taken away large chunk of good forest areas for agriculture.
- b) The continued encroachment and its regularisation under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, and incidences of illicit fellings in forests have further deteriorated the forests of this division.
- c) In general, the whole coupe area is not treated as per the prescriptions of the Working Plan. In most of the cases, only a partial area of the coupe is treated either by afforestation or soil and moisture conservation measures.
- d) Prescriptions like closures for the worked area, rotational grazing, etc., couldn't be implemented because of the non-cooperation of local people resulting in the failure of natural regeneration in the areas worked under the working plans.
- e) The materials removed from the forest areas by the local people residing within and on the periphery of forests, for meeting their bonafide demands largely remained unrecorded.
- f) Rab burning is another major problem of this area which adversely affects the growth of trees and the recruitment of new seedlings.
- g) It is observed that the total estimated number of trees per hectare in the current enumeration (Oct-2014 to May-2018) is decreased as compared to the previous (April-2002 to March-2003) tree enumeration. The details of the change are given below:

Table 4: Statement showing estimated changes in Growing stock between the Previous and the Current tree enumeration

Sl. No	Name of Working Circle	No. of trees per ha.	Sl. No.	Name of Working Circle	No. of trees per ha.
Aril 2002 to March 2003			October 2014 to May 2018		
1	Reafforestation W.C.	23.73	1	Afforestation W.C.	28.66
2	Improvement W.C.	63.20	2	Improvement W.C.	59.54
3	Fodder protection W.C	5.46	3	Kuran W.C.	23.73
4	Pasture W. C.	7.71	4	Plantation W.C.	40.22
5	Protection W. C.	23.30	5	Protection W.C.	20.14
6	Fuelwood W. C.	89.95			
Weighted Average		46.07	Weighted Average		42.92

- h) Changing socio-economic conditions in the area and implementation of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 and the lapses in the implementation of working plan prescriptions have put much pressure on forests of this division which resulted in large scale deterioration of forest resources in the area. Therefore, these forests need to be put under Improvement through intensive soil and moisture conservation works, treatment of Natural regeneration in good regeneration areas, artificial regeneration in understocked areas, development of Grass and fodder through artificial planting, consolidation of forests areas through proper boundary demarcation, good protection measures, efficiency improvement of field staff through regular workshops and trainings, etc., need to be given priority in the future.

3. FUTURE MANAGEMENT

3.1 Working circles and their distribution: Forest compartment is a section of forest with homogeneous growth conditions and tree species. The compartment has been used as a unit of management and accordingly the distributions of areas to various working circles have been done. The allocation of compartments is based on the preponderance of suitability to a specific working circle. Compartments having relatively good tree cover are allotted to the Improvement working circle (IWC). Areas having sparse tree crops, open areas without tree growth and isolated small forest patches are included in the Afforestation Working Circle (AWC). Four area-specific working circles are prescribed and separate chapters regarding essential subjects like Soil and water conservation, Biodiversity and wildlife conservation, NTFP Management, etc., have been provided in this working

plan. The prescriptions provided in these chapters shall be applicable to the whole of the division. The details of working circles are as given below:

Table 5: The allocation of forest areas under various working circles

Sl.No.	Name of Working circle	Area allotted (Ha)
1	Improvement working circle	49347.193
2	Afforestation working circle	17519.221
3	Protection working circle	11388.756
4	Grass and Fodder working circle	6136.657
5	Bamboo (Overlapping) working circle	9031.00

3.2 Treatments prescribed: The treatments have been prescribed based on the objectives of management, which in turn determined based on the environmental factors, biodiversity conservation and characteristics of the growing stock, etc.

- 1) Existing protection forests will be preserved. In addition, soil and moisture conservation works will be carried out to improve the moisture content and prevent soil erosion and siltation of the water bodies.
- 2) Suitable tending and soil working operations will be carried out to stimulate the growth of natural seedlings. Afforestation activities will be undertaken to enhance green cover on open forest patches. Artificial plantation of local palatable grass seedlings will be undertaken to create good pasture lands.
- 3) Open forest areas and traditional pastures will be managed with the active participation of local communities for improving the productivity of the land so as to meet the bonafied needs of fodder and firewood.
- 4) The chief threats to sustainable growth of forests like encroachment, fire, uncontrolled grazing, poaching, illicit cutting, etc., shall be minimized by employing the newly present technology.

3.3 The General Approach of the Treatments

- 1) The forests on steep and precipitous slopes will be protected from all forms of fellings. A 20-metres broad strip on either side of streams and watercourses will be protected from harvesting. These forests form catchments for principal rivers like Godavari, Vaitarana, etc. Suitable soil and moisture conservation measures will be prescribed to stabilize the terrain and improve the health of the watershed.

- 2) Special habitat management for wildlife conservation will receive absolute priority. An adequate buffer will be provided to wildlife rich sites while preparing treatment maps for coupe management. Snag, den trees and sunken logs shall be sufficiently protected, to meet the habitat requirement of birds and lesser animals. Wildlife requirements shall be the paramount consideration for habitat management in forest areas rich in wildlife.
- 3) Preference will be accorded to natural regeneration management. Natural regeneration and promising coppice growth will receive suitable tending and soil working to stimulate their growth and development. In the areas with poor natural regeneration, Aided Natural Regeneration (ANR) needs to be carried out. Areas treated under natural regeneration shall be protected from fire and grazing. Artificial regeneration will be implemented as a supplementary activity, at places, where natural regeneration is inadequate or is unlikely to succeed.
- 4) Sustainable use of forest resources will remain the guiding principle for managing the supply and demands of forest products and services. Management of forests close to villages will be developed for accommodating the bonafied demands of local people for firewood, fodder, non-wood forest produce, etc. Non-Timber Forest Produce (NTFP) offers immense potential for sustainable economic development of local communities. Therefore, sustainable NTFP production will be provided absolute priority in forest management.
- 5) The Government and non-government agencies will be engaged in the promotion of ecologically sound and economically feasible alternatives like wood saving technology, stall-feeding, livestock improvement, etc.
- 6) Involving local people in forest management remain the key to the success of the conservation of natural resources. Adequate awareness needs to be generated among local people about the importance of conservation of natural resources. Management of forests close to villages shall primarily be undertaken through JFM committees.
- 7) Reducing biotic pressure on forests like illicit felling, unsustainable grazing, fire and encroachment near villages will remain an utmost priority. Local people will be engaged as far as possible in forest management activities like forest protection, afforestation and augmentation of other natural forest resources in the village.
- 8) A sizeable chunk of forest area has been honeycombed due to the recognition of rights under the provisions of the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006. Efforts need to be taken to finalize all legitimate claims in a time-bound manner and proper demarcation of these areas both on

the ground as well as on Division/Range maps for better protection and regulation of forests.

- 9) Boundary demarcation will be carried out in a time-bound manner for ensuring the territorial integrity of forests.

3.4 Monitoring and reporting mechanism: Monitoring, assessment and reporting in West Nashik forest division shall be done as per the following mechanism:

Table 6: Monitoring mechanism

PCCF (HoFF), M.S.			
Monitoring	APCCF (Personnel)- Guardian APCCF	Over all control of WP activities	PCCF (P&M)
Direction division	CCF (Territorial), Nashik	Direction division	APCCF (WP), West, Pune
Field level implementation	DCF, ACFs, RFOs, Foresters and Forest Guards	Monitoring of WP activities	DCF (WP), Nashik

3.5 Road map of Forest management in West Nashik forest division

The following principles shall remain the key for effective management of forest resources in West Nashik forest division:

- 1) Consolidation of forest areas through proper boundary demarcation and boundary pillars: Land is becoming more and more scarce resource each day. This precious natural resource need to protect effectively for larger good. So, every piece of forest land shall need to be surveyed using advanced techniques of survey like DGPS and Total station survey followed by fixing of permanent pillars along the forest boundary.
- 2) Watershed management-the way to sustainability: Forest lands serve as an economic and environmental resource, with both perspectives needed to achieve sustainable development. The economic resource includes wood products, food for animals and other products from forests that are consumed by humans. The environmental resource includes biodiversity, wildlife habitat, climatic benefits, water quantity and quality, and aesthetics. Watershed management provides a framework for managing such multiple resources in an integrated manner.

- 3) Restoration of forest landscapes through quality plantations: Forest degradation is the reduction of the capacity of a forest to provide goods and socio-cultural and environmental services. It involves a change process that negatively affects the characteristics of a forest. This change process is caused by disturbances that are mostly human induced. This need to be arrested through effective silvicultural practices like assisted natural regeneration and enrichment planting. The species selection and use of good quality seedlings of known source is the key for success of afforestation programmes. Taking of bamboo plantations aggressively by using vegetative propagation or tissue culture seedlings helps in faster restoration of degraded sites.
- 4) Balancing of production and conservation forestry: Indian forestry revolves around social and environmental elements of sustainable forest management (SFM). The demand for wood and wood products will continue to increase in the future. The present need is met mainly from the Agroforestry sector and balance demand through imports. The forests of the country are catering to 16% of the human and 18% of the cattle population's needs. India is also maintaining around 20% of the forest area under a Protected area network for providing ecological security. The Trees outside forest (TOF) is having lot of potential in fulfilling the demand for forest products and also helps in reducing burden on forests. The strengthening in the capacity of the rural poor for improving their income is crucial for checking the degradation of forests. Therefore, effective planning for balanced production and conservation forestry at each village is key for achieving sustainable forest management goals.
- 5) Protection of forest and wildlife: The forests are under pressure from all corners of the society and getting degraded each day. Protection of forests from encroachment, illicit felling, poaching, fires, overgrazing, etc., need to be effectively implemented through both preventive and control measures. The protection of natural habitat of wildlife species is necessary for its conservation. The maintenance of connectivity across forest landscapes is required for wildlife dispersal and its long term existence.
- 6) Strengthening of participatory forest management through Joint Forest Management: A key lesson of the JFM experience in our country is that involving local communities in forest management can lead to more effective forest protection. Another lesson is successful conservation depends on cooperation from local people and forestry officials and on legal and institutional backing from the state. These lessons need to be incorporated luxuriously in our planning for forest management. For this to happen, the JFM strategy requires a change of attitude from both the forest departments and rural communities.

Rural communities have had to organize themselves in innovative ways, overcome village and inter-village conflicts, and work together with forest officials. Foresters have had to communicate with local people and share the responsibility for decision making.

- 7) Consolidation and development of FRA areas: Consolidation of forest areas under IFR (Individual forest rights) through proper demarcation remain the primary thing to be done for the development of forest lands with IFR. Hand holding, knowledge services and linkages with welfare schemes of Government departments need to be provided for the development of forest lands under IFR and CFR so that the potential of such lands will be utilized to the optimum level in increasing the green cover.
- 8) Management of Human-wildlife conflict: Human-wildlife conflict occurs when growing human population overlap with established wildlife territory, creating competition for space and resources. As this conflict inflicts direct and indirect consequences on people and animals, its mitigation is an important priority in these landscapes. Mitigation measures vary significantly depending on location and type of conflict. Regardless of approach, the most successful solutions are those that include local communities in the planning, implementation and maintenance.

I. INTRODUCTION

Forests comprise biologically diverse systems, representing some of the wealthiest biological areas on Earth. They typically offer a considerable variety of suitable habitats for all types of plants, animals, and micro-organisms. Forest biodiversity is interlinked to the complex web of other socio-economic factors, naturally providing an incredible array of essential goods and valuable services that range from timber and non-timber forest resources to mitigating climate change and genetic resources. Simultaneously, forests provide livelihoods for people worldwide and play significant economic, social, and cultural roles in the lives of many indigenous communities. However, forest biodiversity is increasingly threatened largely as a result of human activity like deforestation, fragmentation, industrialization, and other stressors.

In the past, timber production was traditionally regarded as the dominant function of sustainable forests. However, in recent years this perception has shifted to a more multi-functional and balanced view. Other forest functions and services, like recreation, health, and well-being, biological diversity, maintenance of ecosystem services and the mitigation of climate change are increasingly recognized as integral components of sustainable forest management and forest biological diversity. Because of the increasing importance of forests and its resources in the general well-being of mankind, many international conventions and treaties contain provisions to regulate activities related to forests. Important global Conventions related to forests are given below:

Table 1: Important Global conventions related to forests

Sl. No.	Convention	Adoption	Entry into force
1	Climate Change Convention	09/05/1992	21/03/1994
2	Convention on Biological Diversity	05/06/1992	29/12/1993
3	Desertification Convention	17/06/1994	26/12/1996
4	Ramsar Convention on Wetlands	02/02/1971	21/12/1975
5	World Heritage Convention	16/11/1972	17/12/1975
6	Convention on International Trade in Endangered Species	03/03/1973	01/07/1975
7	Ozone Layer Convention	22/03/1985	22/09/1988
8	Indigenous and Tribal Peoples Convention	27/06/1989	05/09/1991
9	International Tropical Timber Agreement	26/01/1994	01/01/1997
10	World Trade Organization	15/04/1994	01/01/1995

The changing scenario of forest resource management at national and global level with regard to biodiversity, climate change, and carbon sequestration and REDD+, it is imperative to standardize the effective monitoring and assessment of forest resources and provide new qualitative and quantitative information at forest division level which may be properly integrated and upscaled to state and national level. The assessment may include a broad range of parameters that will provide a holistic view of land use, use change and forestry in the country. This valuable information can be utilized wisely to properly plan, design and implement correctly national and global policies and specific strategies for the effective management of forests. Furthermore, a number of significant developments took place in the forestry sector like evolvement of Criteria and Indicators for sustainable management of forests; recognition of rights of forest-dependent people under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 and focused management of NTFPs including medicinal and aromatic plants which warranted marked attention in sustainable forest management planning process. To provide a standardized framework by including all key aspects of forest management, National Working Plan code 2014 was issued by the Ministry of Environment, Forest and Climate Change (MoEFCC). This working plan was prepared as per the published guidelines of the new Code. There are many gaps in fulfilling the requirements of the code as our earlier plans were concentrated purely on a few important forest management interventions which were relevant at that point in time. The specific prescriptions provided in this Plan will undoubtedly help in properly bringing our effective management in standard lines with National and Global Initiatives.

A). VISION STATEMENT

The vision of Maharashtra Forest Department is as given below and this working plan is prepared within the broad framework of the Forest Department's vision:

Globally as well as nationally, Forest Conservation is increasingly being viewed as a formidable instrument in sequestering carbon and thereby offset adverse climate change. Maharashtra Forest Department, being the custodian of the State's rich and diverse bio-diversity, is committed to a conservation-centric management and protection strategy. Wildlife focused ecotourism management hinges on sustainability. Production, be it timber or non-timber forest produce is managed with sustainability at its core. Joint Forest Management to secure

natural resources as well as livelihood security remains a significant people-centric activity. Attempts are on to hone local artisans' skill in producing value-added articles out of non-timber forest produce like bamboo and cane. Augmenting green cover on non-forest areas to achieve national targets of 33% of land area under green cover remains a forefront agenda. Intensive use of Information and Communication Technology supplemented by e-governance is under effective use to monitor ongoing forestry activities. Extensive use of the digital platform to project a realistic picture of forest conservation constitutes the central theme.

B). GOALS OF FOREST MANAGEMENT

- 1) Ensure Ecosystem stability.
- 2) Increase the forest cover.
- 3) Conserve the Gene pool and Biodiversity.
- 4) Enhance the productivity of resources.
- 5) Ensure equity of the various stakeholders in using the forest resource.
- 6) Increase the share of the forestry sector in the state's economy.

C). OBJECTIVES OF MANAGEMENT

a). Sectoral

- 1) To recommend the State and Central government about the policies related to the greening projects in Maharashtra and elsewhere.
- 2) To provide Research and Development support to the forestry sector.
- 3) To generate and disseminate knowledge and information relevant to the forestry sector to various stakeholders
- 4) To regulate the activities of the various players involved in the development of the forestry sector.
- 5) To undertake co-ordinated planning with the other government departments and agencies for the overall development of Forestry resources and forest dependent communities.
- 6) To develop a proactive interface with the political and executive arm of the government and public for the progressive development of Forestry.
- 7) To act as a nodal agency for Forestry related matters at different levels of administration.

b). Institutional

- a) To develop professionally skilled manpower across the forest cadres.
- b) To ensure technology integration at different levels of forest administration.
- c) To promote and build a strong research base and, an effective institution for sustainable forest resource management.

c). Operational

- 1) To properly maintain accurate and reliable data and valuable information on forest resources and its periodical monitoring.
- 2) To ensure effective and efficient management of forest estates under the control of Forest department.
- 3) Continuous improvement of forest resources by effective soil and water conservation measures.
- 4) To identify unique biodiversity rich habitats, their mapping and taking special conservation efforts for their development.
- 5) To promote efficient utilization and value addition of forest produce including promotion of possible substitutes.

D). SWOT ANALYSIS FOR PRESCRIPTION OF STRATEGIES FOR ACHIEVING THE GOALS AND OBJECTIVES

SWOT analysis is a strategic planning technique used to help a person or organization identify strengths, weaknesses, opportunities, and threats related to project planning. It is designed for use in the preliminary stages of decision-making processes and can be used as a tool for evaluation of the strategic position of an organization. The name is an acronym for the four parameters the technique examines:

- a) Strengths: Characteristics of the business that give it an advantage over others.
- b) Weaknesses: Characteristics of the business that place the business at a disadvantage relative to others.
- c) Opportunities: Elements in the environment that the business could exploit to its advantage.
- d) Threats: Elements in the environment that could cause trouble for the business.

This SWOT analysis is attempted based on the internal and external factors that sustain the impact on the achievement of the goal of the working plan and also, the whole spectrum of factors that would carry out their role in its success like, Human and capital resources, Climatic factors, externalities, etc.

STRENGTHS	WEAKNESSES
a) An effective legislation and policy. b) Well-regimented administration and competent staff. c) A well-intended course of action in place to maintain forest cover. d) The area with the forest department is well-spread. e) The presence of good infrastructure likes nurseries, depots, etc. f) Broader awareness of conservation among public. g) People involved in responsible forest management at different levels. h) Abundant flora and fauna. i) Properly documented Working Plans over many decades. j) Finances to Forest Department have improved over the last few years.	a) Lack of motivation and innovation. b) Notable lack of legal awareness and its effective implementation among grass-root level. c) Red-tapism and resistance to instantly change. d) Inability to naturally create/properly maintain dense forests. e) Inability to create good Plantations. f) Lack of achieving knowledge on Working Plan prescriptions. g) Funds deficiency and untimely release of funds. h) Inadequate wireless communication, wifi/internet, etc., in forest areas. i) Inability to tap local population goodwill in forest management as most Joint Forest management committees are not up to the visible mark. j) Many RET species are not tackled.

OPPORTUNITIES	THREATS
a) Cooperation from District Administration and other line departments. b) Availability of reporting and monitoring systems based on the latest technology. c) Funding for plantations from PSUs, Private Parties, etc, through tripartite agreements. d) More significant emphasis on training of staff on contemporary technology and exposure visits. e) Creation of the legal cell. f) Effective treatment of watersheds through programmes like Jalyukt Shivar, DPAP, etc. g) Creation of assets and necessary infrastructure mainly for grass-root level from CAMPA. h) Active involvement of informed public and NGOs in forest conservation. i) Proper documentation of Biodiversity for socio-economic benefits to forest dependant communities.	a) Lack of technology transfer on silvicultural improvements. b) Forest fires. c) Drought conditions. d) Staff over-burdened with unproductive non-forestry works. e) Lack of control over encroachment, grazing, Illicit felling, etc. f) Joint Forest Management villages are divided socially and politically. g) The spread of disease, epidemics, etc. h) Pressure from external forces for works outside the Working Plan prescriptions.

E) EXPECTED OUTCOME

As per the prescriptions that have been set for the treatment of the forests of the West Nashik forest division, the following are some of the outcomes that are expected to be achieved during the implementation of this Plan.

- 1) Consolidation of forest areas: During the effective implementation of the working plan, the pristine boundary of the whole forest will be demarcated.

- 2) The extent of Forest Cover: While it is precisely our National Forest policy to have atleast 33% of the geographical area under forest (in the plains). To achieve 33% forest cover, the distinct possibility lies in Trees outside forest (TOF). As Nasik district is significantly developed in Agriculture, the potential lands outside the forests need to be tapped for increasing the tree cover through Agroforestry.
- 3) Plantations: It is expected that the degraded forest areas will be regenerated through the Improvement and Afforestation Working Circles, and the augmentation of grasslands will be undertaken in Grass and fodder management Working Circles, in this plan.
- 4) Regeneration: Because of the implementation of the plan, the forests are expected to be healthier and allow better regeneration due to interventions under different working circles like Improvement, Afforestation, Protection and, Grass and Fodder working circles.
- 5) Health and vitality: At the end of the plan period, it is expected that the forests of the West Nashik forest division are more buoyant and revitalized with better regeneration, the better composition of the crop, lesser disturbance of fire, grazing, illicit felling, etc., resulting in better healthy forests.
- 6) Wildlife: It is naturally expected that at the end of the plan period the intact area of forests will be adequately covered with at least one waterhole in every 10 sq km. The proper documentation and academic study of the faunal and floral diversity of the West Nashik forest division will be done.
- 7) Biodiversity: Because of the effective implementation of this Plan, proper Biodiversity appreciation and effective conservation will naturally get a fillip in the West Nashik forest division. It is envisaged to include proper documentation and status study of medicinal plants, the lower life-forms (fungi, algae, ferns, moss and lichens), entomological study, herpetological study, etc., during the course of the implementation of the plan. At the end of the plan, Biodiversity Committee (BMC) will be established in all JFM villages in the West Nashik forest division and Peoples Biodiversity Register (PBR) will be prepared.
- 8) Soil and Water Conservation: Throughout the plan period, the areas under diverse forms of regeneration are expected to be treated for soil and moisture conservation on the 'ridge to valley' principle.

F). ABSTRACT OF PLAN PRESCRIPTIONS

Chapter No. (Vol-I, Part-II)	Para No.	Prescribed Activity
A	B	C
1.Improvement WC	2.6.10.1	Coupe Demarcation and Treatment Map preparation a) Coupe demarcation and treatment map: One year in advance. b) Treatment map shall indicate A,B,C,D areas. c) A type: Protection area (A1: Steep slopes, A2: 20 metres wide strips on both sides of the streams, A3: excessively erosion prone areas) d) B-type: Under stocked areas (density less than 0.4) e) C-type: Congested Pole crop f) D-type: Well stocked areas (density more than 0.4)
	2.6.10.4	Marking a) Marking will be done one year in advance. b) A type area: No marking c) B type area: All dead trees and live high stumps. d) C type area: The congested pole crop shall be marked for thinning. e) D type area: All fruit bearing species shall be reserved. f) All dead and malformed trees retaining 2 trees per ha and all live high stumps shall be marked for felling. g) Matured trees that have developed hollowness and show visual sign of decay will be marked for felling.
	2.6.2	Silvicultural System a) Improvement felling to maintain good

		hygiene of the crop. b) Adequate growing space is provided to trees of valuable species. c) The improvement felling supplemented by tending of naturally regenerated crop will aid in transition of middle aged stem to maturity. d) The species whose population in the 'stand' dynamics is less than 1% shall be retained till they reached the rotation age.
	2.6.12	Regeneration a) Natural Regeneration: NR of seed origin of valuable species to be preferred and managed through cultural operations. b) Artificial Regeneration: Depending on site suitability, plantations of local species shall be taken up. c) Strict protection from fire and grazing. d) Tending operation for Natural regeneration in the 'D' type area and plantation management in the 'B' type area shall be taken up.
2.Afforestation WC	3.6.10.1	Coupe Demarcation and Treatment Map a) Demarcation and treatment map will be prepared one year in advance. b) Treatment map would show A,B,C,D areas c) A type area: Protection area (A1: Steep slopes, A2: 20 metres wide strips on both sides of stream, A3: excessively erosion prone areas) d) B-type area: Under stocked areas (density less than 0.4) e) C-type area: Congested Pole crop f) D-type area: Well stocked areas (density more than 0.4)
	3.6.2	Silvicultural System a) Only hygienic fellings prescribed (Dead,

		dying, diseased trees and live high stumps) b) Plantation work in B type areas. c) Planting of good quality seedlings prescribed (atleast 12-15 months old). d) Not more than 50 ha plantation per Range per year for effective monitoring. e) JFMCs to be actively involved.
	3.6.12	Regeneration a) Tending of Natural regeneration is prescribed to be given preference over plantation. b) Cultural operations for natural regeneration in 'D' type areas and plantation management in 'B' type areas are prescribed. c) Artificial regeneration in open areas.
3. Protection WC	4.6.11.1	Coupe Demarcation and Treatment Map a) Demarcation and treatment map: One year in advance b) Treatment map shall indicate A,B,C,D areas. c) A type area: Protection area (A1: Steep slopes, A2: 20 metres wide strips along the streams, A3: excessively erosion prone areas) d) B-type area: Understocked and blank areas (density less than 0.4) e) C-type area: Group of naturally grown poles. f) D-type area: Well stocked forest patches.
	4.6.11.3	Treatment a) A type area: Harvesting of standing trees is strictly prohibited. b) B type area: No harvesting. All seedling and saplings of valuable species more than 1 metre in height will be nursed as future crop.

		c) C type area: Group of pole crop will be maintained as future crop. d) D type area: No harvesting of green trees.
	4.6.2	Silvicultural System a) Silviculture system is proposed on the pattern of watershed management. b) Harvesting of green trees is prohibited.
	4.6.12	Regeneration a) Natural Regeneration: All seedlings and saplings of valuable species more than one metre height will be nursed as future crop. b) Strict protection from fire and grazing
4.Grass and Fodder WC	5.6.11	Coupe Demarcation a) The coupe due for closure to grazing will be demarcated one year in advance.
	5.6.2	Treatment a) Removal of invasive weeds. b) SMC work as per site requirement. c) In suitable blank areas, regeneration of grass through plantation of nursery raised grass seedlings and area closure is prescribed. d) JFMCs to be actively involved. e) Distribution of grass seedling to public on concessional rate.
5.Bamboo (Overlapping) WC	6.6.10	Method of marking of bamboo culms a) The crop will be managed on a clump basis <i>i.e.</i>, each clump will be treated independently as per the requirement. b) The clumps shall be worked as per the standard silvicultural rules for the harvesting of Bamboo. c) Each coupe will be harvested once in every three years.
	6.6.13	Other regulations for improvement

		a) Soil and moisture conservation around the bamboo clumps. b) Strict fire protection.
6.NTFP management	6.7	a) Augmentation of NTFPs through afforestation. b) Development of data base of NTFPs. c) Value addition to NTFPs to enhance the livelihood to local people.
7.Joint Forest management	8.6.13	a) JFM micro plans are to be dovetailed with broad prescriptions of approved working plan. b) Maintenance of forest boundary, removal of encroachments, control over illicit cutting, illegal grazing, and forest fire and wildlife offences shall receive priority apart from regularly undertaken works such as SMC and Plantations. c) Transparency in JFM programme has to be ensured through transparent payment mechanisms. d) Villages which have not received funds should also be accorded importance.
8.Wildlife management	11.6.10	a) Creation of data base of wildlife. b) Deliniation and mapping of special habitat areas. c) Habitat improvement works like waterhole development, meadow development to be taken up in suitable areas. d) Vaccination of livestock present in forest fringes. e) Intelligence gathering to check wildlife trade. f) Regular sensitization of staff about wildlife crimes and its control. g) During marking, at least 2 dead trees per ha is to be kept as snags for wildlife.

10. Miscellaneous Regulation	15.3 15.7	a) Procedure of demarcation of coupes, treatment map preparation and marking of trees. b) Reconciliation of the forest areas in revenue records. c) Coupe control forms and deviation proposals.

II. GLOSSARY OF TERMS

Aspect	The direction towards which a slope faces.
Base Line	A line which is used as a base for implementation of forestry works.
'Baked zones' or 'Bole bed'	Reddened clay-rich horizons between basalt flows.
Bidi	Handmade cigarette wrapped in Tendu leaf.
Bir	An area reserved to grow grass.
Burad	Person who makes mats, baskets etc, of bamboos
Catchment area	The total area draining into a given waterway, lake or reservoir.
Census	A complete enumeration and classification of a population.
Cleaning	A tending operation done in a sapling crop, involving the removal or topping of inferior growth including individuals of the favored species, climbers etc., when they are interfering with the better grown individuals of the favored species.
Climatic Factors	Light, atmospheric temperature, pressure, humidity, winds and other features of climate that influence vegetation.
Controlled grazing	Conservative grazing through controlling the period and incidence by the movement of livestock in different parts of the area in prescribed sequence.
Cut back	To cut flush with the ground.
Demarcate	The setting out and marking the limits of a forest or any part of it.
Density (Crop)	The relative completeness of the tree stocking expressed as a decimal coefficient, taking normal number of trees, basal area or volume as unity.
Deviation	A departure from the prescription of a working plan.
Dholi	Containers to store grain.
Doh	A deep pond in a river or stream.
Enumeration	The counting, singly or together, of individuals of one or more species in a forest crop and their classification by species, height, age and girth class.
Felling series	A forest area forming the whole or part of working circle and delimited so as (1) to distribute felling and regeneration to suit local conditions and (2) to

	maintain or create a normal distribution of age classes. The yield is calculated separately for each felling series which should have an independent representation of age classes.
Geru	Red ochre or red earth.
Ghat	A road with a steep gradient.
Ghee	Clarified buffalo-milk butter.
Grazing capacity	The amount of grazing that an area can support under controlled grazing expressed as number of animals or equivalent cow units per acre.
Gully	Channel
Injaili species	Miscellaneous species
Jamindari	An estate belonging to a Zamindar.
Jhiras	Temporary small wells dug in nalas during summer.
Juar	Cultivated millets (<i>Sorghum vulgare</i>).
Kacha (roads)	Temporary (roads).
Kankar	Lime nodules.
Katha	Catechu.
Kharif	Monsoon crop.
Khories	Valleys in between two hills or hillocks.
Malki lands	Lands belonging to private individuals.
Mouza	A village area.
Murum	A reddish hard soil.
Naka	Barrier on road for checking forest produce in transit.
Nala	A water course.
Nagli	Finger millet grown by tribals.
Sampling unit	The unit of assessment or measurement in a sample. It may be the individual, any given number of individuals, a given area of ground, etc.
Subsidiary silvicultural operations	A general term for all operations carried out immediately after the main felling.
Thorn Forest	A forest in which the dominant vegetation is chiefly small thorny trees and shrubs.
Unclassed forest	Forest land owned by Government but not constituted into a reserved, village or protected forest.
Watershed	The dividing line between catchment areas.

III. LIST OF FLORA

Sl.No.	Local Name	Botanical Name	Family
TREES			
1	Ali	<i>Morinda tinctoria</i>	Rubiaceae
2	Aliv	<i>Meyna laxiflora</i>	Rubiaceae
3	Ain (sadada)	<i>Terminalia alata</i>	Combretaceae
4	Amba	<i>Mangifera indica</i>	Anacardiaceae
5	Ambada	<i>Spondias pinnata</i>	Anacardiaceae
6	Amba-payer	<i>Ficus virens</i>	Moraceae
7	Anjan	<i>Hardwickia binata</i>	Fabaceae
8	Apta	<i>Bauhinia racemosa</i>	Fabaceae
9	Arjun sadada	<i>Terminalia arjuna</i>	Combretaceae
10	Asand	<i>Bridelia retusa</i>	Phyllanthaceae
11	Awalkanti, Aonla	<i>Phyllanthus emblica</i>	Phyllanthaceae
12	Babul	<i>Acacia nilotica</i>	Mimosaceae
13	Bakula	<i>Mimusops elengi</i>	Sapotaceae
14	Bahawa	<i>Cassia fistula</i>	Caesalpiniaceae
15	Bakan-Nimb	<i>Melia azadirachta</i>	Meliaceae
16	Baranga	<i>Kydia calycina</i>	Malvaceae
17	Bate, Kalasiras	<i>Albizia lebeck</i>	Mimosaceae
18	Beheda	<i>Terminalia bellirica</i>	Combretaceae
19	Bel	<i>Aegle marmelos</i>	Rutaceae
20	Biba	<i>Semecarpus anacardium</i>	Anacardiaceae
21	Bhoma	<i>Glochidion hohenackeri</i>	Phyllanthaceae
22	Bija/Bibla	<i>Pterocarpus marsupium</i>	Fabaceae
23	Bondara	<i>Lagerstroemia parviflora</i>	Lythraceae
24	Bor	<i>Ziziphus mauritiana</i>	Rhamnaceae
25	Bothi, Varing	<i>Eriolaena quinquelocularis</i>	Sterculiaceae
26	Buralicode	<i>Wrightia arborea</i>	Apocynaceae
27	Chamol	<i>Bauhinia lawii</i>	Caesalpiniaceae
28	Chinch	<i>Tamarindus indica</i>	Caesalpiniaceae
29	Darara	<i>Erythrina suberosa</i>	Papilionaceae
30	Dhaman	<i>Grewia tilifolia</i>	Tiliaceae

31	Dhawda, Dhamoda	<i>Anogeissus latifolia</i>	Combretaceae
32	Gangudi	<i>Grewia tenax</i>	Tiliaceae
33	Ghatbor	<i>Zizyphus xylopyra</i>	Rhamnaceae
34	Ghubata	<i>Acacia polycantha</i>	Mimosaceae
35	Gol, Karamatigol	<i>Trema orientalis</i>	Ulmaceae
36	Haldu/ Hed	<i>Haldina cordifolia</i>	Rubiaceae
37	Hirda	<i>Terminalia chebula</i>	Combretaceae
38	Hiwar	<i>Acacia leucophloea</i>	Mimosaceae
39	Humb	<i>Miliusa tomentosa</i>	Annonaceae
40	Ichhan (Pandra Khair)	<i>Acacia ferruginea</i>	Mimosaceae
41	Jambul, Jamun	<i>Syzygium cumini</i>	Myrtaceae
42	Kad, Kadhari, Kandol	<i>Sterculia urens</i>	Sterculiaceae
43	Kakad	<i>Garuga pinnata</i>	Burseraceae
44	Kalakuda, (Kodai)	<i>Wrightia tinctoria</i>	Apocynaceae
45	Kalamb	<i>Mitragyna parviflora</i>	Rubiaceae
46	Kalasiras	<i>Albizia Lebbeck</i>	Mimosaceae
47	Kansar	<i>Albizia amara</i>	Mimosaceae
48	Kamala, Kumkum	<i>Mallotus philipensis</i>	Euphorbiaceae
49	Karanj	<i>Pongamia pinnata</i>	Fabaceae
50	Kawat	<i>Limonia acidissima</i>	Rutaceae
51	Khair	<i>Acacia catechu</i>	Mimosaceae
52	Safed Siras	<i>Albizzia procera</i>	Mimosaceae
53	Kuda (Safed)	<i>Holarrhena antidysentrica</i>	Apocyanaceae
54	Kumbhi	<i>Careya arborea</i>	Lecythidiaceae
55	Kuda	<i>Wrightia tinctoria</i>	Apocyanaceae
56	Kusum	<i>Schleichera oleosa</i>	Sapindaceae
57	Mango	<i>Mangifera indica</i>	Anacardiaceae
58	Medsing	<i>Dolichandron falcata</i>	Bignoniaceae
59	Modhal, Moi	<i>Lannea coromandelica</i>	Anacardiaceae
60	Modwak	<i>Kydia calycina</i>	Malvaceae
61	Mokha	<i>Schrebera swietenoides</i>	Oleaceae
62	Neem/Nimb	<i>Azadirachta indica,</i>	Meliaceae
63	Nilgiri	<i>Eucalyptus camaldulensis</i>	Myrtaceae
64	Palas	<i>Butea monosperma</i>	Fabaceae
65	Pangara	<i>Erythrina stricta,</i>	Fabaceae

66	Papada	<i>Holoptelea integrifolia</i>	Ulmaceae
67	Payer, Pipri	<i>Ficus amplissima</i>	Moraceae
68	Phanas	<i>Artocarpus heterophyllus</i>	Moraceae
69	Ritha	<i>Sapindus laurifolius</i>	Sapindaceae
70	Sag/Sagwan	<i>Tectona grandis</i>	Verbenaceae
71	Salai	<i>Boswellia serrata</i>	Burseraceae
72	Semal	<i>Bombax ceiba</i>	Bombacaceae
73	Shevga	<i>Moringa oliefera</i> ,	Moringaceae
74	Shindi	<i>Phoenix sylvestris</i>	Palmaceae
75	Shisham	<i>Dalbergia latifolia</i>	Fabaceae
76	Shivan	<i>Gmelina arborea</i>	Verbenaceae
77	Siras (Kala)	<i>Albizzia lebbek</i>	Mimosaceae
78	Sissoo	<i>Dalbergia sissoo</i>	Fabaceae
79	Sonchafa	<i>Michelia champaca</i>	Mognoliaceae
80	Tendu	<i>Diospyros melanoxylon</i>	Ebenaceae
81	Tetu	<i>Oroxylon indicum</i>	Bignoniaceae
82	Tiwas/Tinsa	<i>Ougenia oojeinensis</i>	Fabaceae
83	Umbar	<i>Ficus racemosa</i>	Moraceae
84	Wad	<i>Ficus bengalensis</i>	Moraceae
85	Wagat	<i>Capparis zeylanica</i>	Capparaceae
86	Waras/Varas	<i>Heterophrasma quadriculata</i>	Bignoniaceae
SHRUBS			
1	Achra	<i>Dyschoriste dalzellii</i>	Acanthaceae
2	Ambadi	<i>Hibiscus aculeatus</i>	Malvaceae
3	Amoni	<i>Rhus mysorensis</i>	Anacardiaceae
4	Anantvel	<i>Hemidesmus indicus</i>	Asclepiadaceae
5	Ati, Murudsheng	<i>Helicteres isora</i>	Sterculiaceae
6	Awal, Tarvad	<i>Senna auriculata</i>	Caesalpiniaceae
7	Barkudi	<i>Grewia damine</i>	Tiliaceae
8	Bharangi	<i>Clerodendrum serratum</i>	Verbenaceae
9	Bhui ringni	<i>Solanum xanthocarpum</i>	Solanaceae
10	Bor	<i>Ziziphus mauritiana</i>	Rhamnaceae
11	Chandrajyoti	<i>Jatropha curcas</i>	Euphorbiaceae
12	Chanyabor	<i>Ziziphus nummularia</i>	Rhamnaceae

13	Chilhar	<i>Caesalpinia decapetala</i>	Caesalpinaceae
14	Shembarti	<i>Acacia pennata</i>	Fabaceae
15	Umbrella Thorn	<i>Vachellia tortilis</i>	Fabaceae
16	Pachurna	<i>Securinega virosa</i>	Euphorbiaceae
17	Dewawali	<i>Cassia suffruticosa</i>	Caesalpinaceae
18	Dhaiti	<i>Woodfordia fruticosa</i>	Lythraceae
19	Gal/Gel	<i>Catunaregam spinosa</i>	Rubiaceae
20	Gultura/Ganeri	<i>Lantana camara</i>	Verbenaceae
21	Hirna	<i>Indigofera trita</i>	Fabaceae
22	Henkal	<i>Gymnosporia spinosa</i>	Celastraceae
23	Jaol	<i>Tamarix dioica</i>	Tamaricaceae
24	Kadu Jire	<i>Vernonia anthelmintica</i>	Asteraceae
25	Karvand	<i>Carissa congesta</i>	Apocynaceae
26	Karvi	<i>Carvia callosa</i>	Acanthaceae
27	Kati Koranti	<i>Barleria prionitis</i>	Acanthaceae
28	Bhokoda	<i>Casearia graveolens</i>	Salicaceae
29	Papat	<i>Pavetta indica</i>	Rubiaceae
30	Pandrakuda	<i>Holarrhena antidysenterica</i>	Apocyanaceae
31	Pandharphali	<i>Securinega leucopyrus</i>	Phyllanthaceae
32	Phadya Niwadung	<i>Opuntia dillenii</i>	Cactaceae
33	Dhordavana	<i>Artemisia nilagirica</i>	Asteraceae
34	Ranbhendi	<i>Thespesia lampas</i>	Malvaceae
35	Rui	<i>Calotropis gigantea</i>	Asclepiadaceae
36	Tarwad	<i>Cassia auriculata</i> ,	Caesalpinaceae
37	Toran	<i>Ziziphus rugosa</i>	Rhamnaceae
38	Velatur	<i>Dichrostachys cinerea</i>	Mimosaceae
39	Vowding	<i>Embelia tsjeriam cottam</i>	Primulaceae
40	Yenkal/Bharati	<i>Maytenus emarginata</i>	Celastraceae
41	Zingaroot	<i>Urena lobata</i>	Malvaceae
HERBS			
1	Agya	<i>Girardinia diversifolia</i>	Urticaceae
2	Alsi	<i>Dalbergia volubilis</i>	Fabaceae
3	Aghada	<i>Achyranthes aspera vari</i>	Amaranthaceae
4	Ambushi	<i>Oxalis corniculata</i>	Oxalidaceae
5	Anderphod	<i>Leea macrophylla</i>	Vitaceae

6	Babli	<i>Heracleum grandis</i>	Apiaceae
7	Badadha	<i>Arisaema murrayi</i>	Araceae
8	Ranborat	<i>Echinochloa colona</i>	Poaceae
9	Barbada	<i>Indigofera cordifolia</i>	Fabaceae
10	Bohra/Kaligunj	<i>Cardiospermum halicacalum</i>	Sapindaceae
11	Borupdi	<i>Indigofera glandulosa</i>	Fabaceae
12	Buikarvi	<i>Hygrophila serpyllum</i>	Acanthaceae
13	Buishirid	<i>Euphorbia fusiformis</i>	Euphorbiaceae
14	Burad/shedya	<i>Paspalidium flavidum</i>	Poaceae
15	Burandu	<i>Ageratum conyzoides</i>	Asteraceae
16	Chichur-kanda	<i>Habenaria grandifloriformis</i>	Orchidaceae
17	Chidsi/ Chimandara	<i>Eragrostis unioides</i>	Gramineae
18	Corata	<i>Barleria lawii</i>	Acanthaceae
19	Dador	<i>Sesbania bispinosa</i>	Fabaceae
20	Dagadipala	<i>Tridax procumbens</i>	Asteraceae
21	Dongarjeera	<i>Pimpinella heyneana</i>	Apiaceae
22	Gatrack	<i>Boerhavia diffusa</i>	Nyctaginaceae
23	Gokhru	<i>Tribulus terrestris</i>	Zygophyllaceae
24	Gomett	<i>Solena amplexicaulis</i>	Cucurbitaceae
25	Haryakand	<i>Geodorum demiflorum</i>	Orchidaceae
26	Jalmukhi	<i>Rotala densiflora</i>	Lythraceae
27	Kachquiri/Kawitch	<i>Mucuna pruriens</i>	Fabaceae
28	Kal-lavi	<i>Gloriosa superba</i>	Liliaceae
29	Kangani	<i>Solanum nigrum</i>	Solaraceae
30	Kartoli	<i>Momordica dioca</i>	Cucurbitaceae
31	Khorpad	<i>Aloe vera</i>	Asphodelaceae
32	Khurasini	<i>Guizotia abyssinica</i>	Asteraceae
33	Medwan	<i>Dioscorea oppositifolia</i>	Dioscoreaceae
34	Phat-phati	<i>Crotalaria filipes</i>	Fabaceae
35	Pivla dhotra	<i>Argemona mexicana</i>	Papaveraceae
36	Pivli tilwan	<i>Cleome viscosa</i>	Cleomaceae
37	Rangas	<i>Crotalaria medicaginea</i>	Fabaceae
38	Ranjenda	<i>Zinnia peruviana</i>	Asteraceae
39	Rankel/Kawder	<i>Ensete superbum</i>	Musaceae

40	Tarota	<i>Senna tora</i>	Caesalpinaceae
CLIMBERS			
1	Amarvel	<i>Cuscuta reflexa</i>	Cuscutaceae
2	Aradhashish	<i>Ventilago denticulata</i>	Rhamnaceae
3	Bandgul	<i>Dendrophthoe falcata</i>	Loranthaceae
4	Bokadvel/Ghatmol	<i>Aspidoptryx cordata</i>	Malpighiaceae
5	Butgandivel	<i>Clematis hedy sarifolia</i>	Ranunculaceae
6	Kadukand	<i>Dioscorea bulbifera</i>	Dioscoreaceae
7	Kawalvel/Nivali	<i>Tylophora dalzelli</i>	Asclepiadaceae
8	Mahulvel	<i>Bauhinia vahlii</i>	Caesalpinaceae
9	Mukani/Ranudid	<i>Vigna radiata</i>	Fabaceae
10	Palasvel	<i>Butea superba</i>	Fabaceae
11	Ramdatan	<i>Smilax macrophylla</i>	Liliaceae
12	Randhodka	<i>Luffa acutangula</i>	Cucurbitaceae
13	Sathawari	<i>Asparagus racemosus</i>	Asparagaceae
14	Toran	<i>Zizyphus rugosa</i>	Rhamnaceae
GRASSES			
1	Balgadhan	<i>Cyperus rotundus</i>	Poaceae
2	Belakuda	<i>Eragrostis tenella</i>	Poaceae
3	Fulora	<i>Themeda quadrivalvis</i>	Poaceae
4	Gavati Chaha	<i>Cymbopogon citratus</i>	Poaceae
5	Goundwel	<i>Andropogon pumilus</i>	Poaceae
6	Haryali	<i>Cynodon dactylon</i>	Poaceae
7	Kahandol	<i>Chrysopogon fulvus</i>	Poaceae
8	Kalikusali/Kusal	<i>Heteropogon contortus</i>	Poaceae
9	Kasti	<i>Bambusa arundinacea</i>	Poaceae
10	Kathara	<i>Bothriochloa pertusa</i>	Poaceae
11	Kunda	<i>Ischaemum pilosum</i>	Poaceae
12	Manvel	<i>Dendrocalamus strictus</i>	Poaceae
13	Marvel	<i>Dichanthium annulatum</i>	Poaceae
14	Mesi	<i>Chloris barbata</i>	Poaceae
15	Paonya	<i>Sehima sulcatum</i>	Poaceae
16	Rosha	<i>Cymbopogon martinii</i>	Poaceae
17	Shedya	<i>Sehima nervosum</i>	Poaceae
18	Thuda	<i>Ischaemum rugorum</i>	Poaceae

IV. LIST FAUNA

Sl. No.	Scientific name	Common name
WILD ANIMALS		
1	<i>Panthera pardus</i>	Panther
2	<i>Hyaena hyaena</i>	Striped Hyaena
3	<i>Canis aureus</i>	Jackal
4	<i>Vulpes bengalensis</i>	Khokad
5	<i>Felis chaus</i>	Jangle cat
6	<i>Canis lupus</i>	Wolf
7	<i>Semnopithecus entellus</i>	Common Langur
8	<i>Tetracerus quadricornis</i>	Chowsingha
9	<i>Muntiacus muntjak</i>	Barking deer
10	<i>Lepus nigricollis</i>	Sasa
11	<i>Hystrix indica</i>	Salu
12	<i>Funambulus palmarum</i>	Khar
13	<i>Cervus unicolor</i>	Sambar
14	<i>Canis lupus</i>	Llandga
15	<i>Harpester edwardsi</i>	Mongoose
16	<i>Macaca mulatta</i>	Monkey
REPTILES		
1	<i>Naja naja naja</i>	Indian cobra
2	<i>Varanus inelicus</i>	Dhaman
3	<i>Bungurus caeruleus</i>	Common Krait
4	<i>Vipera russelli</i>	Russel viper
5	<i>Chaemeleon vulgatis</i>	Chamaeleon
6	<i>Varanus bengalensis</i>	Ghorpad
BIRDS		
1	<i>Francolinus pictus</i>	Painted partridge
2	<i>Francolinus pondicerianus</i>	Grey francolin
3	<i>Perdicula asiatica</i>	Jungle bush quail
4	<i>Gallus sonneratii</i>	Grey jungle fowl
5	<i>Centropus sinensis</i>	Crow pheasant
6	<i>Gyps bengalensis</i>	White backed Vulture
7	<i>Gyps tenuirostris</i>	Slender billed vulture
8	<i>Lanius schach</i>	Rufous-backed shrike
9	<i>Accipiter nisus</i>	Sparrow hawk
10	<i>Tyto alba</i>	Barn owl
11	<i>Strix leptogrammica</i>	Brown wood owl

12	<i>Psittacula manillensis</i>	Rose ringed parakeet
13	<i>Alcedo atthis</i>	Common kingfisher
14	<i>Merops orientalis</i>	Green bee eater
15	<i>Milvus migrans</i>	Pariah Kite
16	<i>Pavo cristatus</i>	Indian peafowl
17	<i>Dinopium benghalense</i>	Blackrumped Woodpecker
18	<i>Haliastur indus</i>	Brahminy kite
19	<i>Ploceus philippinus</i>	Baya weaver bird
20	<i>Amauornis phoenicurus</i>	Waterhen
21	<i>Spilopelia chinensis</i>	Spotted dove
22	<i>Pycnonotus jocosus</i>	Red whiskered bulbul
23	<i>Pycnonotus cafer</i>	Red vented bulbul
24	<i>Acridotheres tristis</i>	Common myna
25	<i>Eudynamys scolopaceus</i>	Asian Koel
26	<i>Turdoides striata</i>	Jungle Babbler
27	<i>Dicrurus macrocercus</i>	Black Drongo
28	<i>Ardea cinerea</i>	Grey heron
29	<i>Ardeola grayii</i>	Indian pond heron
30	<i>Casmerodius albus</i>	Cattle egret
31	<i>Casmerodius albus</i>	Large egret
32	<i>Egretta garzetta</i>	Little egret
33	<i>Ciconia episcopus</i>	White naked stork
34	<i>Phalacrocorax carbo</i>	Great cormorant
35	<i>Pseudibis papillosa</i>	Black ibis
36	<i>Dendrocygna javanica</i>	Lesser whistling duck
37	<i>Tadorna tadorna</i>	Common shelduck
38	<i>Anas acuta</i>	Pintail
39	<i>Hieraaetus pennatus</i>	Booted eagle
40	<i>Aquila pomarina</i>	Lesser spotted eagle
41	<i>Spilornis cheela</i>	Crested serpent eagle
42	<i>Porphyrio porphyrio</i>	Purple moorhen
43	<i>Limnospiza himantopus</i>	Black winged stilt
44	<i>Vanellus malabaricus</i>	Yellow wattled lapwing
45	<i>Sterna curritia</i>	River tern
46	<i>Columba livia</i>	Brown rock pigeon
47	<i>Streptopelia tranquebarica</i>	Red collared dove
48	<i>Athene brama</i>	Spotted owlet
49	<i>Caprimulgus mathruntensis</i>	Sykes nightjar

50	<i>Tachymarpits melba</i>	Alpine swift
51	<i>Coracips bengalensis</i>	Indian roller
BUTTERFLIES		
1	<i>Castalius rosimon</i>	Common Pierrot
2	<i>Pareronia hippie</i>	Common Wanderer
3	<i>Neptis hylas</i>	Sailor
4	<i>Sarangasa dasahara</i>	Common small Flat
5	<i>Junonia aflites</i>	Grey Pancy
6	<i>Taica da nyseus</i>	Red Pierrot
7	<i>Euthalia aconthea</i>	Barron
8	<i>Junonia lemonias</i>	Lemon Pancy

V. OTHERS

V.1 LICHENS

Lichens are a complex life form where a symbiotic partnership exists between a fungus and an alga. The dominant partner represents the fungus, which produces the lichen the majority of its characteristics, from its thallus shape to its fruiting bodies. The algae found in lichens are more diverse- green algae, yellow-green algae and even brown algae. The most common species is the green alga. The algal partner photosynthesizes and provides food for the fungus, so it can grow and spread. The combined lichen has properties different from those of its component organisms. Lichens come in many colours, sizes, and forms. The properties are sometimes plant-like, but lichens are not plants. Lichens may include tiny, leafless branches (fruticose), flat leaf-like structures (foliose), flakes that lie on the surface like peeling paint (crustose), and a powder-like appearance (leprose), or other growth forms.

In the Western Ghats portion of Maharashtra, about 91 species of Lichens are endemic to the region. The crustose lichen dominates in the Western Ghats followed by Foliose lichens and Fruticose lichens. Parmeliaceae remains the dominant family in the Western Ghats of Maharashtra, while Graphis represent the dominant genus.

List of Lichens: No systematic study of Lichens has been conducted in the West Nashik division. During the operation of this Plan, it is prescribed to document all Lichens found in the area. As of now, the list of Lichens is unavailable.

V.2 FUNGI

Fungi are a diverse group of organisms that are in their own kingdom (Fungi), separate from plants. Fungi do not contain chlorophyll or any other means of producing their own food so they rely on other organisms for nutrition. Fungi are widely known for their role in the decomposition of organic matter. They are also necessary for the survival of the ecosystem around them, like partnering with plants and trees for nutrients and survival.

The common fungal species found in the soils of Nashik district are *Aspergillus carbonarius*, *Aspergillus flavus*, *Aspergillus niger*, *Aspergillus ustus* and *Rhizopus stolonifer*.

List of fungi: No systematic study of fungi has been conducted in the West Nashik division. During the operation of this Plan, it is prescribed to document all fungi found in the area. As of now, the list of fungi is unavailable.

V.3 ALGAE

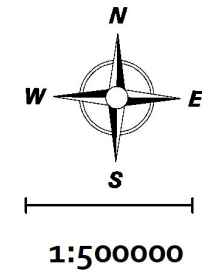
Algae are in kingdom Protista, separate from plants and fungi. There are several types of algae: green, brown, red and gold. They can survive in saltwater and freshwater on their own, and in any environment when part of a lichen relationship. The main Algae found in Nashik districts are given below:

Table V.1: List of Algae found in Nashik district

Sl. No.	Class	Genera and species	Characteristics
1	Chlorophyceae	<i>Spirogyra algae</i> 1) <i>S. communis</i> 2) <i>S. nitida</i> 3) <i>S. condensata</i>	Filamentous charophyte green algae with the helical or spiral arrangement of the chloroplasts. It is frequently found in freshwater habitats.
2		<i>Sirogonium algae</i> <i>S. melanosporum</i>	Filamentous charophyte green algae. Each cell contains 2–10 chloroplasts in a ribbon, in contrast to the closely allied genus <i>Spirogyra</i> , which contains chloroplasts in a coil.
3		<i>Zygnema algae</i> <i>Z. sterile</i>	Freshwater filamentous thalloid alga. <i>Zygnema</i> grows as a free-floating mass of filaments, although young plants may be found anchored to streambeds with a holdfast. The filaments form a yellow-green to the bright green coloured tangled mat. They are composed of elongate barrel-shaped cells, each with two star-shaped (stellate) chloroplasts arrayed along the axis of the cell.
4	Charophyceae	<i>Chara algae</i>	Charophyte green algae and

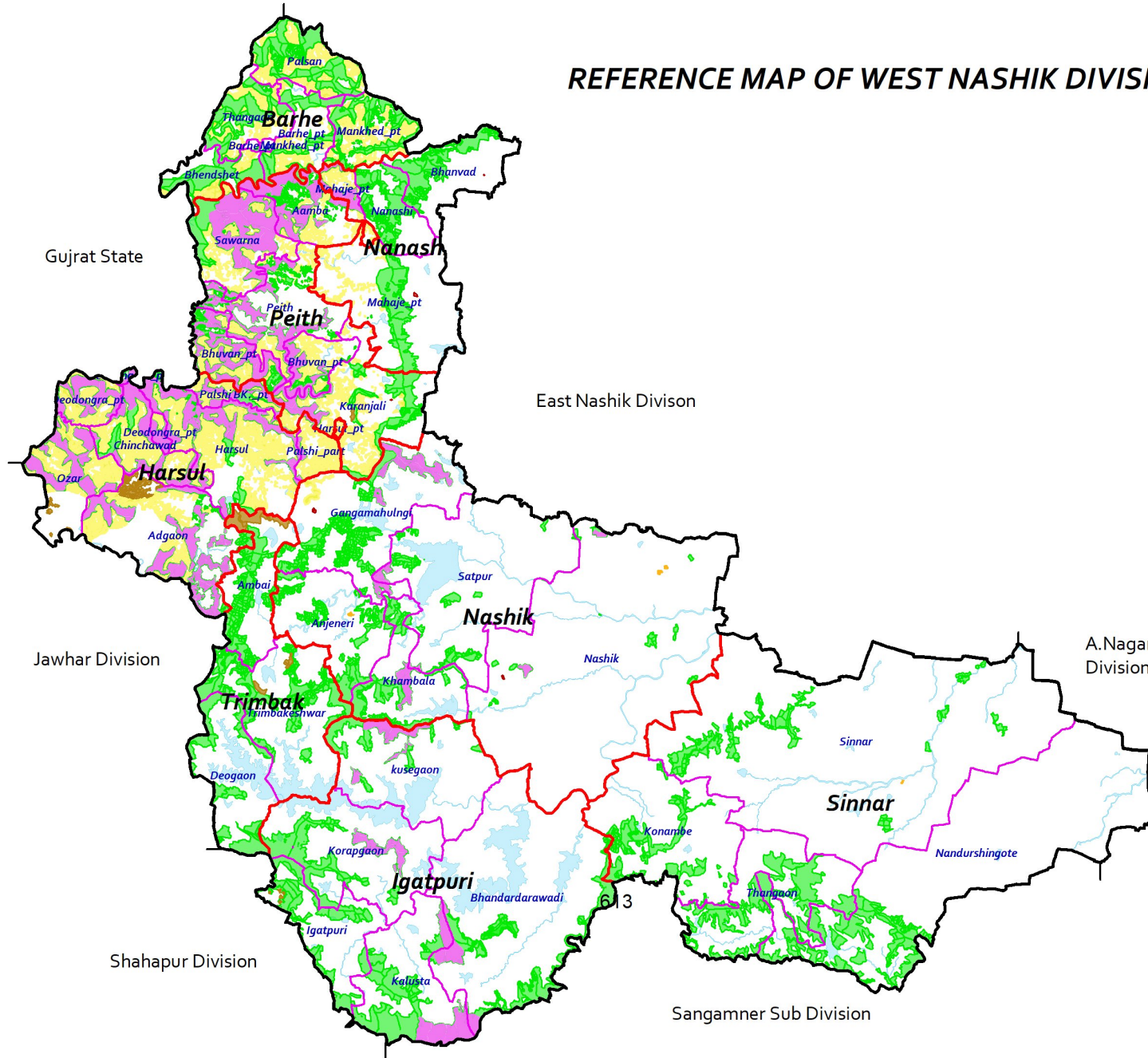
		1) <i>C. zeylanica</i> 2) <i>C. brachypus</i>	they are multicellular and superficially resemble land plants because of stem-like and leaf-like structures. They are found in fresh water, particularly in limestone areas, where they grow in submerged water which attached to the marshy bottom. They prefer less oxygenated and hard water. They are covered with calcium carbonate deposits and are commonly known as stoneworts.
5		<i>Nitella algae</i> 1) <i>N. furcate</i>	Chlorophyte green algae occur more or less in clean water, subaquatic meadows in shallow water growing in soft mud.

REFERENCE MAP OF WEST NASHIK DIVISION

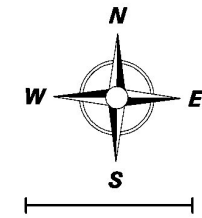


LEGEND

-  Division_Boundary
-  Range_Boundary
-  Round_Boundary
-  ReserveForestArea
-  ProtectedForest
-  Private Area
-  CALandArea
-  FDCM_Area
-  DRAINS



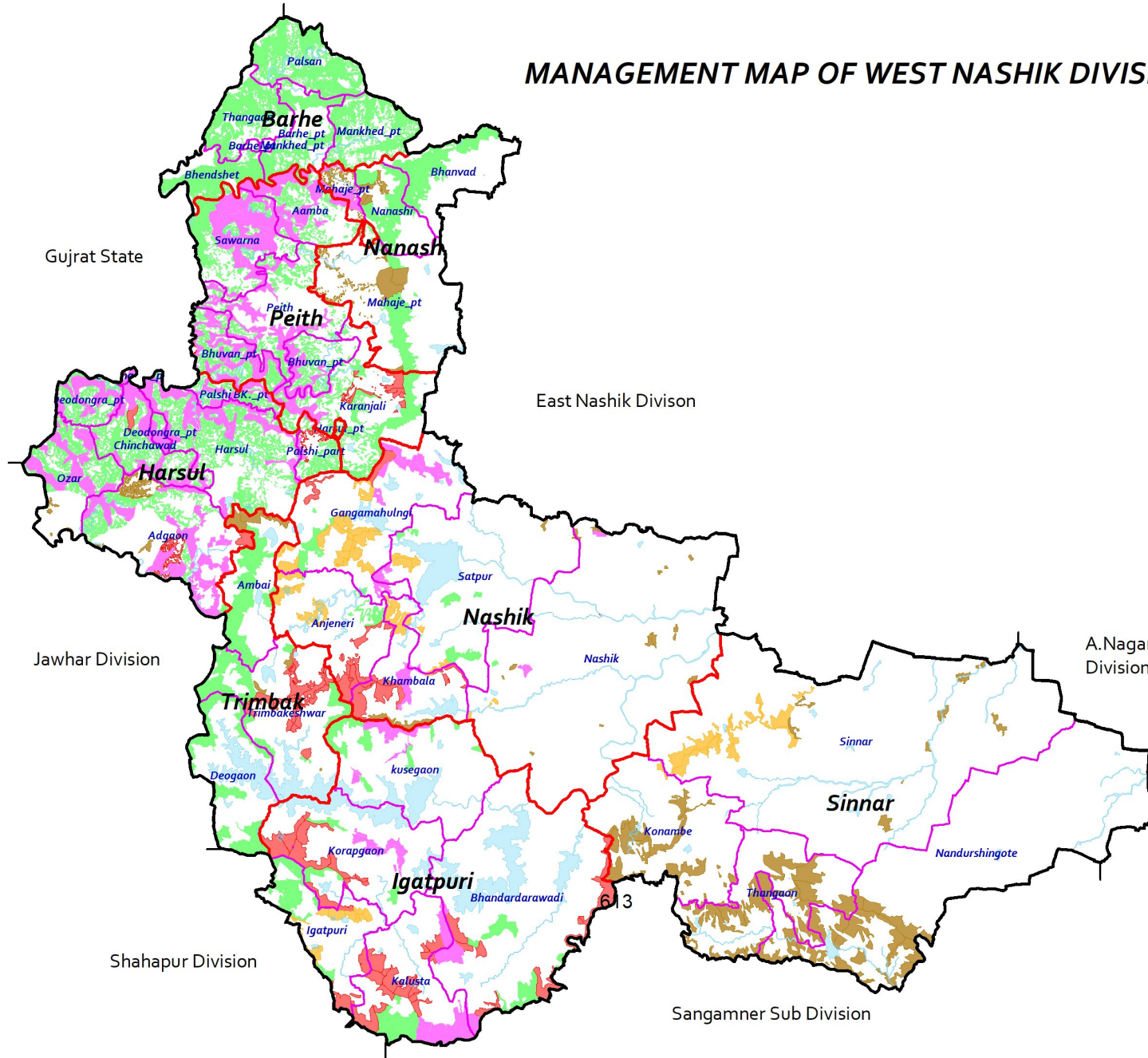
MANAGEMENT MAP OF WEST NASHIK DIVISION



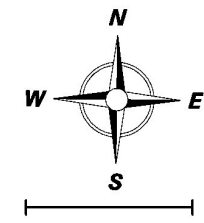
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LEGEND

- Division_Boundary
- Range_Boundary
- Round_Boundary
- Afforestation W.C.
- Fodder W.C.
- Protection W.C.
- Improvement W.C.
- FDCM Area
- DRAINS



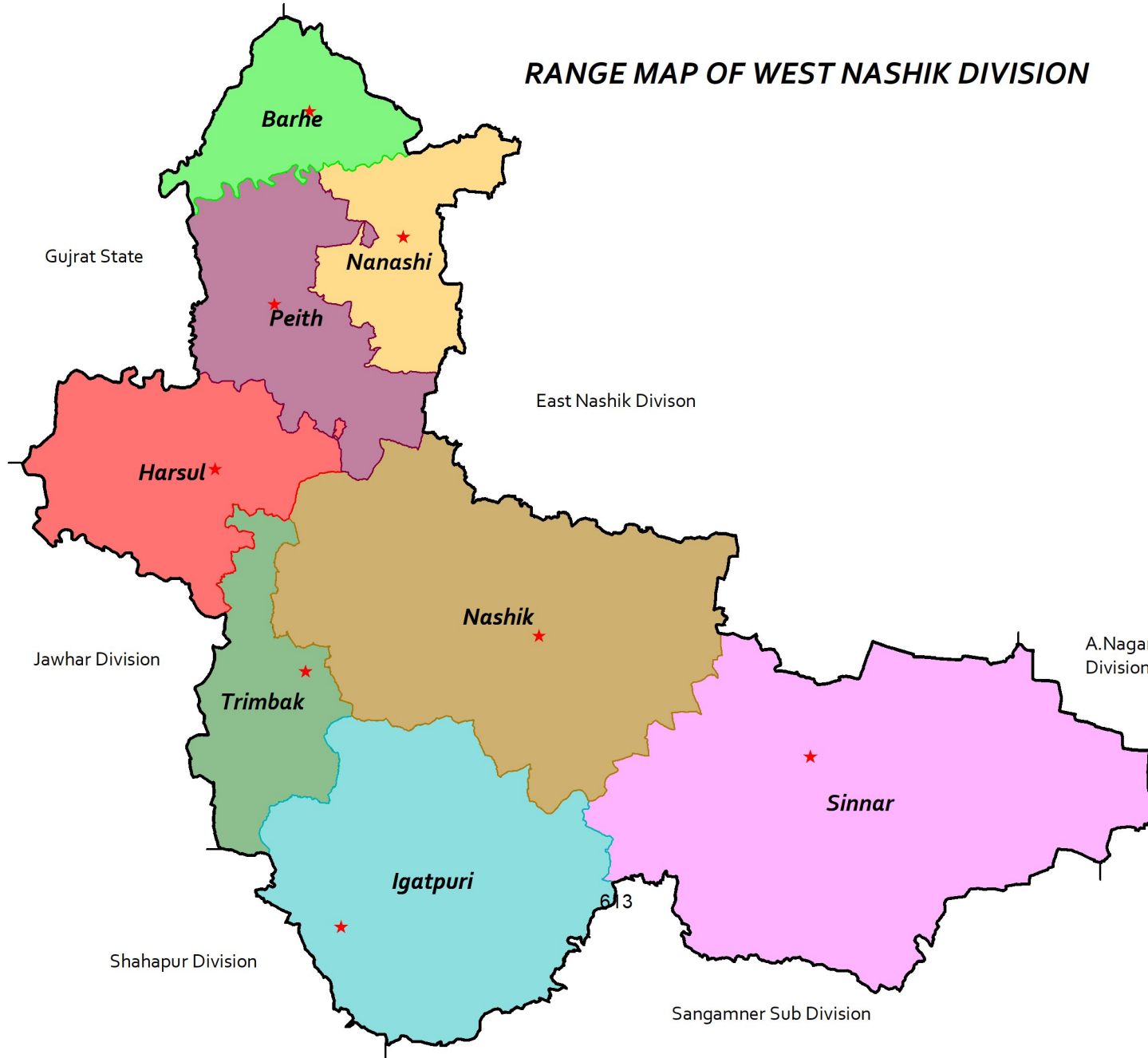
RANGE MAP OF WEST NASHIK DIVISION



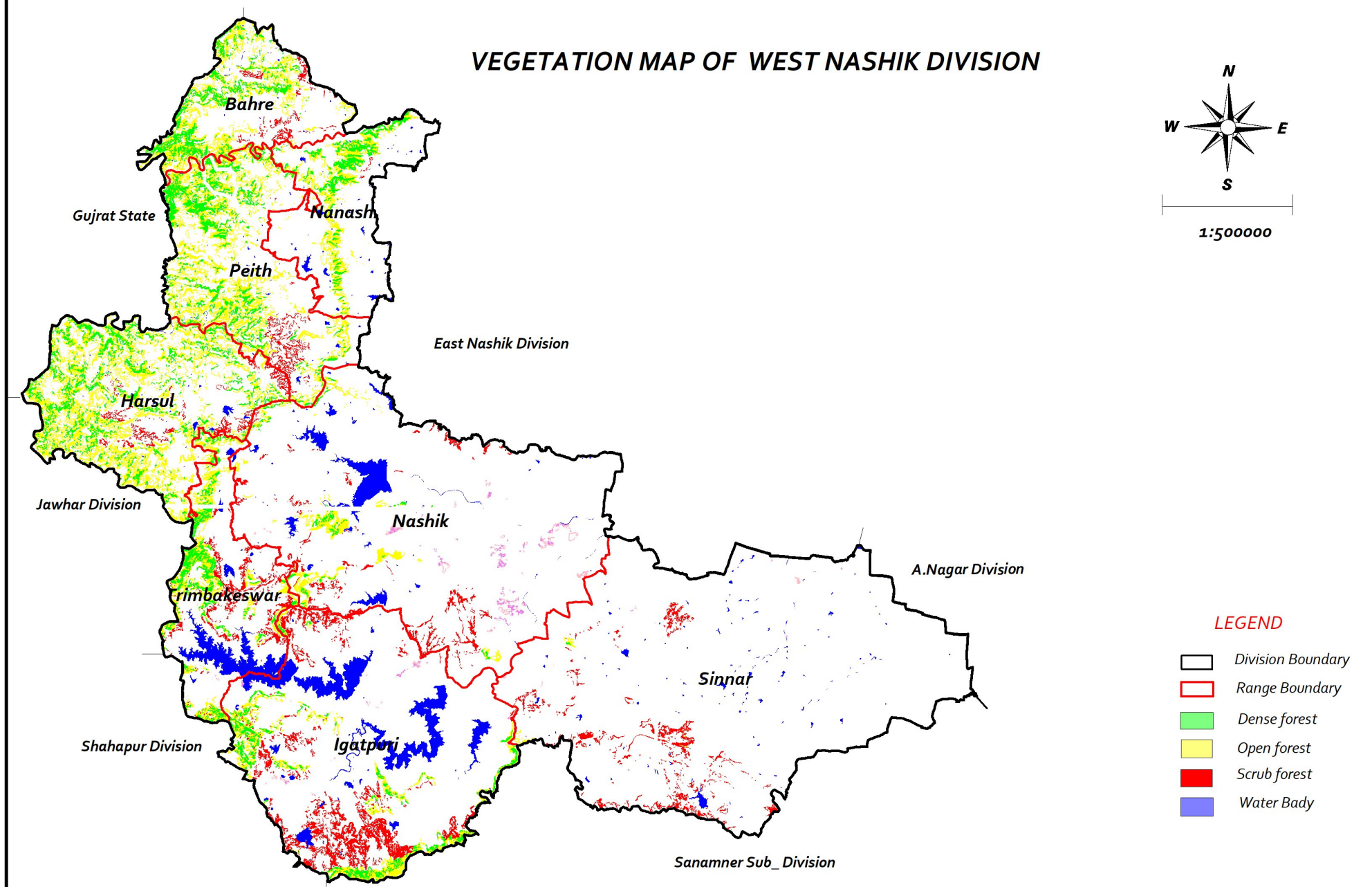
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LEGEND

-  Division_Boundary
-  Range_Boundary
-  Rangr H. Q.
-  Bahre_Range
-  Peith_Range
-  Nanashi_Range
-  Harsul_Range
-  Nashik_Range
-  Trimbak_Range
-  Igatpuri_Range
-  Sinnar_Range
-  DRAINS



VEGETATION MAP OF WEST NASHIK DIVISION





PART-I



**SUMMARY OF FACTS ON WHICH
PROPOSALS ARE BASED**

CHAPTER-1

THE TRACT DEALT WITH

1.1 NAME AND SITUATION

Nashik possesses a unique personality of its own, due to its mythological, historical, social and cultural importance. The city is situated on the banks of the Godavari River, naturally making it one of the holiest places in the world. Nashik district is situated towards the Northwest part of the Maharashtra State.

Nashik embraces a fascinating historical past, wherein mythology Lord Rama, the King of Ayodhya, made Nashik his humble abode during his years in exile. It was equally appreciated as the 'Land of the brave' during the regime of Chhatrapati Shivaji Maharaj. There were on top some vineyards and much garden cultivation. Yeola remains a significant center for weaving silk and cotton goods. From India's independence in 1947 up to 1960, Nashik district constitutes the essential part of Bombay State, which was later split into the states of Maharashtra and Gujarat.

Nashik is equally known as Mini Maharashtra, because the climate and soil conditions of Surgana, Peint and Igatpuri typically resemble with Konkan; Niphad, Sinnar, Dindori, and Baglan blocks are like Western Maharashtra; and Yeola, Nandgaon and Chandwad blocks are like Vidarbha Region. Marathi is the official and predominant language spoken. Various local dialects are spoken fondly in minor parts in the northern side of the district that includes Ahirani and Bhili. With religious places like Nashik and Trimbakeshwar, ancient Indian language Sanskrit is spoken and widely understood.

The principal crops like wheat, paddy, and other cereals are grown in various parts of the district along with Bajra and Maize. Paddy is primarily grown in Tribal belt *i.e.* Igatpuri, Peint, and Surgana Blocks. Vegetables and Onion comprise the main cash crops. Because of the considerable variety of delicious vegetables and its ample supply to Mumbai, the District is popularly known as "*Backyard of Mumbai*". In addition, the Grape (*Vitis vinifera*) has acquired dominance on the agricultural economy of the District. After the establishment of sugar factories; Sugarcane (*Saccharum officinarum*) has acquired a prime position in the agriculture economy of the District. Due to water shortage, the farmers have shifted to Pomegranate (*Punica granatum*)

from sugar cane and grape crops in some places. Some progressive farmers are cultivating flowers in greenhouses through innovative technologies.

The Nashik-Trimbakeshwar Simhastha (Kumbha Mela) is traditionally held after every twelve years at Nashik. The places of historical and local interest in Nashik district are Trimbakeshwar, Saptashrungi Mata (Wani), Vipassana International Academy (Dharmagiri), Pandav Caves, Jain Caves, Dadasaheb Phalke Smarak, Indian Institute of Research in Numismatic Studies, Kalpavruksha Science Museum, etc.

1.1.1 WEST NASHIK FOREST DIVISION

There are two forest divisions and one sub-division in Nashik district. They are West Nashik division, East Nashik division and Malegaon sub-division. This Working Plan includes the area of West Nashik forest division. The tract dealt lies between 19° 35' and 20° 50' North Latitude and 73° 16' and 74° 56' East Longitude. It comes within the civil territories of Nashik, Peint, Sinnar, Igatpuri, Trimbakeshwar, and part of Dindori, and Surgana talukas of Nashik district. The headquarters of West Nashik forest division is at Nashik.

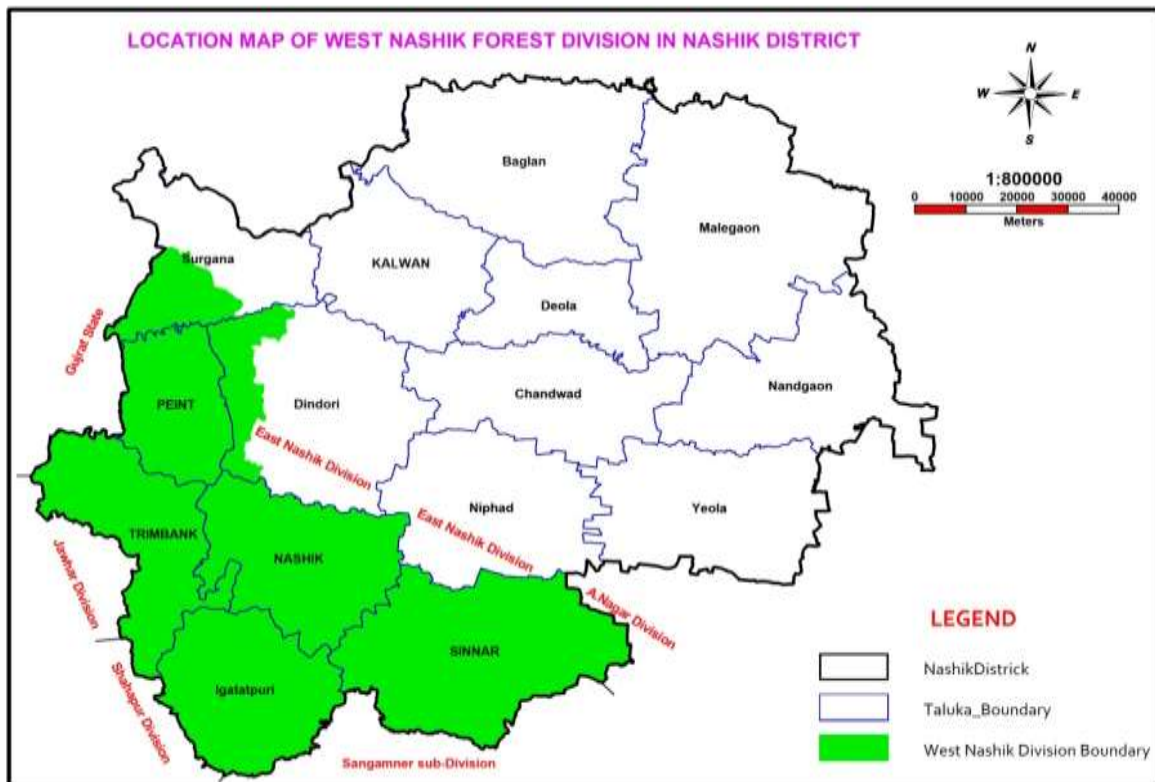
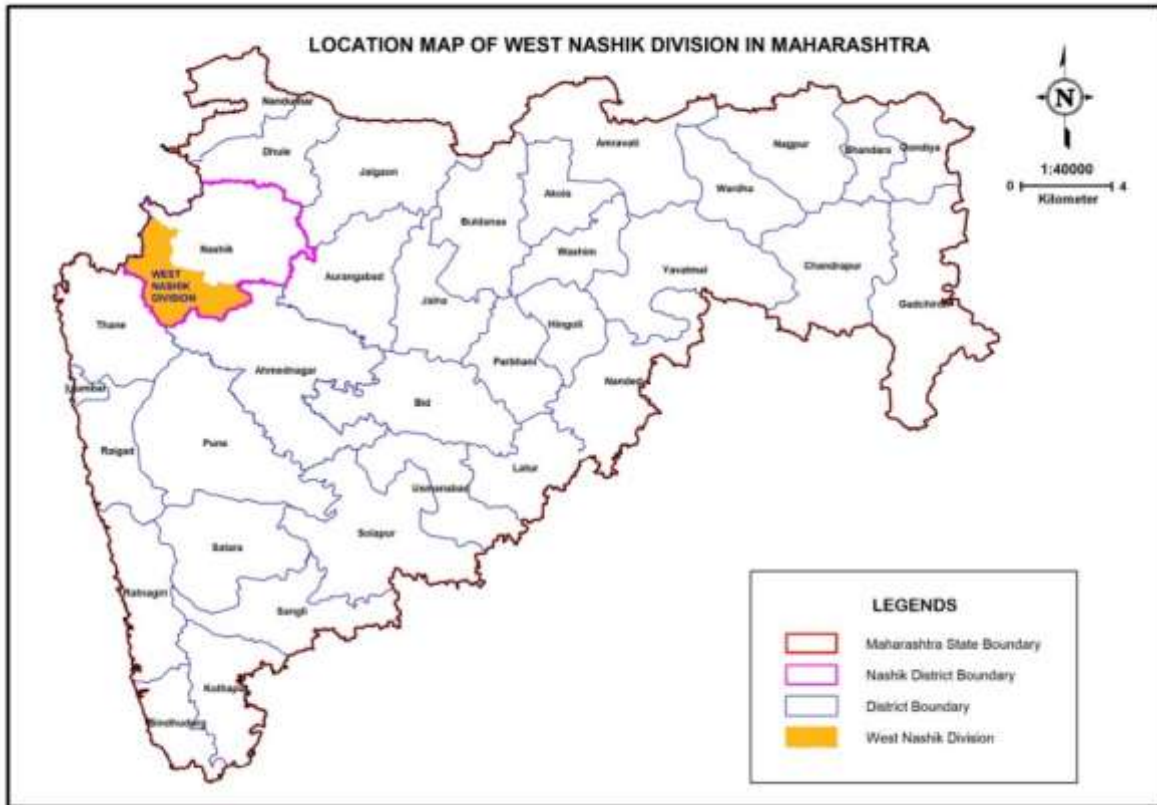
The boundaries of West Nashik forest division are given below:

Table 1.1: Boundaries of West Nashik forest division

Sl.No.	Directions	Name of division/district
1	North	East Nashik division and Gujrat state
2	East	East Nashik division and Ahmednagar division
3	West	Jawhar Division and Gujarat state
4	South	Shahapur division and Sangamner sub-division

1.2 CONFIGURATION OF THE GROUND

The Western Ghats or Sahyadri range stretches from north to south across the western portion of the district. The western portion is hilly and intersected by ravines, and here only the most classic kind of cultivation is possible. The western slope of the Ghats is drained by several rivers, including the Daman Ganga River, which drains westwards to the Arabian Sea. Broadly the hills can be categorized into three noteworthy ranges:



- 1) **Selbari Range**, which may be inclusive of the Dholbari range alternately called Selbari-Dholbari range.
- 2) **Satmala Range** also designated the Satmala-Ajanta range.
- 3) **Trimbakeshwar Range** constitutes the Trimbak-Anjaneri hills.

The Selbari Range, which runs east and west, forms the chief divide of the plateau region. Peninsular India's mightiest river Godavari originates in the Trimbakeshwar Range and resumes its journey eastwards through the district. The Satmala-Chandwad Range represents a watershed, such that, the rivers emerging to its south drain into the Godavari. These include the Kadva and Darna both of which are principal tributaries of the Godavari.

Table 1.2: The important rivers of Nashik District

Sl. No.	Name of the River	Length (km)	Talukas through it flows
1	Godavari	111	Nashik, Niphad
2	Girna	114	Surgana, Kalwan, Baglan, Nandgaon
3	Vaitarana	40	Igapuri
4	Darna	80	Igatpuri, Nashik, Niphad
5	Kadwa	74	Dindori
6	Manaid	48	Nandgaon
7	Mosam	98	Baglan, Malegaon

[Source: <http://www.nashik.nic.in>]

1.3 GEOLOGY, ROCK AND SOIL

The entire area of the district is underlined by the basaltic lava flows of Upper Cretaceous to Lower Eocene age.

1.3.1 ROCKS

1.3.1.1 Hard Rock (Deccan Trap Basalt): Basaltic lava flows typically occupy about 90% of the area of the district. These flows are normally horizontally disposed over a broad stretch and produce a table-land type of topography also known as a plateau. These fluid flows naturally occur in layered sequences and are represented by a massive unit at the bottom and the vesicular unit at the visible top of the flow. These flows are separated from each other by

marker bed known as 'bole bed.' The groundwater in Deccan Trap Basalt occurs predominantly in the topmost weathered and fractured parts down to 20-25 metres depth. At places, potential zones are encountered at deeper levels in the form of fractures and inter-flow zones.

1.3.1.2 Soft Rock (Alluvium): Alluvium occurs in lesser areas in the form of discontinuous patches along the banks and flood-plains of principal rivers like Godavari, Vaitarna and their tributaries. In alluvium, the granular detrital materials like sand and gravel typically occurring as thin layer yields water. It consists of reddish and brownish clays with intercalations of sand, gravel, and Kanker.

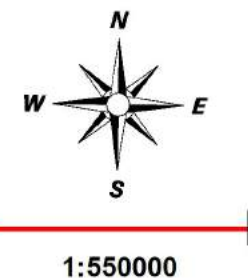
1.3.2 SOILS AND MINERALS

The soils of the district represent the weathering products of Basalt and include various shades red, brown and black colour. There are three eco-regions present in West Nashik division. The soils developed from basalts on spur of Western Ghat under hot humid climate are dark reddish brown colour with argillic horizon and qualified for Typic Rhodustalfs. The other group of soils those developed on interfluvies under sub-humid zone are very deep, dark reddish brown, clayey and qualify for Typic Ustropepts. Soils on piedmont plain experiencing semiarid climate are very deep, moderately well drained, and clayey and, are placed in sub-group Chromic Haplusterts. Although the soil derived from the same parent rock, the following three diverse varieties can be distinguished upon depth, colour, and structure:

1.3.2.1 Red Soil: Reddish to dark reddish brown soil mixed with murrum is found on moderate slopes. The soil is developed over iron rich basalt which might have imparted red colour to the soil as the rock is exposed to weathering and leaching under hot humid climate. These are well drained with moderate, medium sub-angular blocky structure. Vegetation comprising tropical moist deciduous forest with dominant species like Teak, Ain, Dhawda, Mahua, etc. The crops like ragi (nachani) and black gram are cultivated in patches. Elevation, erosion, Phosphorus-fixation and moisture stress appear to be the constraints to farming. Progressive increase of clay down the solum indicates clay illuviation. A typical soil of this kind can be seen in the forests situated near Peint and Harsul Ranges.

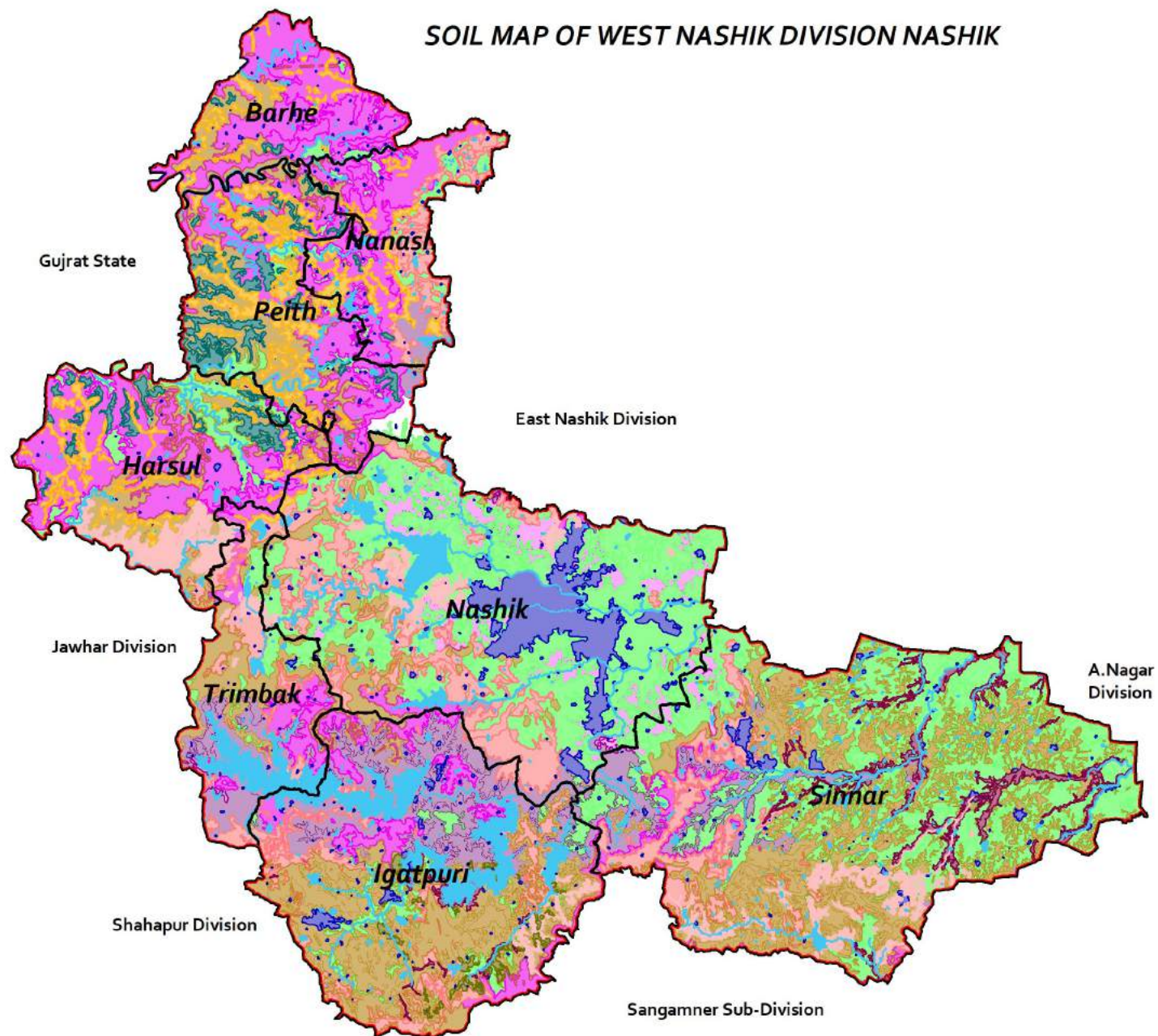
1.3.2.2 Brown Soil: These soils are developed over alluvium in interfluvies. Soils have dark reddish brown colour. These soils are well drained

SOIL MAP OF WEST NASHIK DIVISION NASHIK



LEGEND

- Division Boundary
- Range Boundary
- Water body Mask
- Sandy loam
- Sandy clay loam
- Sandy clay
- RiverisLand
- Loamy sand
- loamy
- Habitation Mask
- Gravelly Sandy Loam
- Gravelly Sandy Clay Loam
- Gravelly loam
- Gravelly Clay loam
- Clay loam
- Clayey



with moderate, medium sub-angular blocky structure. Bushy vegetation with tall grasses constitute the natural vegetation of the area. Groundnut and minor millets are cultivated in patches. Erosion and phosphorus fixation are the major constraints in farming. This type of soil is frequently seen in Harsul, Igatpuri and Trimbak Ranges.

1.3.2.3 Black Soil: These soils are situated on very gently sloping plain of alluvium brought down by Godavari river. Acacia species and Neem are the dominant vegetation in this tract. The soils are of dark shade and moderately well drained. Soil structure is moderate, medium subangular blocky in the upper horizon and thereafter changes to strong coarse angular blocky. Grape is cultivated in this soil. Micronutrient deficiency is the problem in these soils and, development of salinity cannot be overlooked. This type of soils are seen in Nashik and Sinnar Ranges.

1.4 CLIMATIC PARAMETERS

The climate of the district is, on the whole, is agreeable. The climate of West Nashik division is characterized by general dryness throughout the year except during the south-west monsoon season. The various climatic parameters are explained below:

- a) **Temperature:** The summer season lasts for three months from March to May with an average daily temperature of 35^o to 40^o C. The winter season lasts for three months from December to February with an average daily temperature of 12^o to 30^o C. The average figures of temperature are given in Appendix I.1
- b) **Raifall:** The chief source of rainfall is south-west monsoon and shows marked monthly variation. The rainy season starts from June to October and the most rainy days concentrated during 15th July to 31st August. Rainfall is minimum in the south-eastern part of the division and increases towards the west and attains a maximum around Igatpuri in the western ghat. The entire Sinnar taluka can be categorized as drought-prone area. The figures for monthly rainfall are given in Appendix I.2.
- c) **Humidity:** This area experiences extreme seasonal variation in humidity. The more humid period is from May till October. The least humid period is from November to February. Unlike temperature, daily variations in humidity is gradual. Relative humidity ranges from 43% to 62%.

- d) **Wind:** The average hourly wind speed experiences extreme seasonal variation over the course of the year. The windier part of the year is from May to August, with average wind speed of more than 10.40 miles/hr. The calmer period is from September to April, with average hourly wind speed of 6.10 miles/hr.
- e) **Vegetation:** West Nashik forest division abounds in forest wealth. The western part of the division includes lush forests of moist deciduous forests. Teak and its associate trees are found in considerable numbers in these forests. As one moves from west to east across the division, the vegetation changes to Thorn forests. The forests are inhabited by wild animals like Leopards, Wolves, Hyenas, Blackbucks and birds like Vultures, Bulbul, Grey Hornbill, Koel, Kingfisher, Peacocks, etc.

CHAPTER-2

MAINTENANCE/INCREASE IN THE EXTENT OF FOREST AND TREE COVER

Forest cover represents one of the functional categories of terrestrial land cover. In general, forest cover refers to the relative land area that is covered by forests or the forest canopy or open woodland. Forest cover is crucial for soil health, the water cycle, and climate and air quality. But it is severely threatened by extensive deforestation as a direct consequence of agriculture, logging, and mining, all of which can be attributed to human overpopulation. Forest cover can be progressively increased by reforestation and afforestation efforts, but the loss of old-growth forests is irreversible in terms of its ecological services. Efforts to maintain forest cover and prevent conversion to non-forest uses helps to maintain the ability of that land to sequester carbon into the biomass thereby helps in mitigation of climate change.

2.1 AREA OF FORESTS UNDER DIFFERENT LEGAL CLASSES

2.1.1 Area description

The total forest area of West Nashik forest division as per Form No. 1 is 126594.552 ha, out of this, 31451.140 ha has been handed over to Forest Development Corporation Ltd Maharashtra (FDCM). In the year 2016-17, an area of 290.153 ha has been transferred to East Nashik forest division. The compliance report submitted by the Chief Conservator of Forest, Nashik in this regard is appended as Appendix No. II.51. Hence, the net area in charge of the West Nashik forest division is 94853.259 ha. Earlier the area is to be calculated through Planimeter but now the area is finalized as per the 7/12 extract (Revenue record) of each gut number and survey numbers, which is again cross-checked with the digital boundary of the division. The village-wise area details are given in Appendix No. II.1.

The Range-wise distribution of Reserved forest, Protected forests, and other category of forests are given in the following Table 2.1.

Table 2.1: Range-wise forest area statement

Sl. No.	Range	Area (in Ha)						
		Reserved Forest	Protected Forest	CA area	Acquired Forest	Total	Area handed over to FDCM	Net Area
1	2	3	4	5	6	7	8	9
1	Barhe	10903.622	4167.578	0.000	0.000	15071.200	0.000	15071.200
2	Nanashi	7743.506	615.534	6.970	100.490	8466.500	594.746	7871.754
3	Peint	16081.336	5477.216	2.970	132.310	21693.832	11578.757	10115.075
4	Harsul	14889.359	10017.465	0.000	3209.073	28115.897	13342.743	14773.154
5	Trimbak	9630.986	0.000	0.000	831.090	10462.076	0.000	10462.076
6	Nashik	10918.684	150.000	46.450	0.000	11115.134	2132.228	8982.906
7	Igatpuri	17166.130	0.000	0.000	159.890	17326.020	3802.666	13523.354
8	Sinnar	13879.969	0.000	4.000	169.771	14053.740	0.000	14053.740
	Total	101213.592	20427.793	60.390	4602.624	126304.399	31451.140	94853.259

2.1.2 Legal position

The Reserved Forests dealt with under this plan were notified as per Section 20 of the Indian Forest Act 1927 and notifications were published in this effect during years from 1879 to 1924. The protected forests in the former Peint mahal were acquired and declared as protected forests under Government Resolution No.3454 dated 08/05/1904. They were placed under the charge of the Forest Department vide Government Resolution, Revenue Department No.3842 dated 19/05/1922. More isolated additions have been made to the Reserved and Protected forests under various resolutions. A list of Notifications under which the forests covered under this plan was declared as Reserved Forests is given in Appendix-I.8. The list of Notifications of protected forests is given in Appendix-I.9. Areas de-reserved from the year 1968-69 to 2003-04 are given in Appendix-I.10 and Appendix I.28.

2.1.3 Administrative units

The forests of West Nashik division are administered by the Deputy Conservator of Forest. Further, for territorial administration it is divided in to Sub-divisions, Ranges, Rounds and Beats. Earlier, West Nashik division had four sub-divisions and six Ranges. In the year 2007, two new Ranges *i.e.*, Trimbak and Nanashi were formed. So, as prevalent today, there are four sub-divisions and eight Ranges in West Nashik forest division.

Table 2.2: The administrative units of West Nashik forest division

Sl.No.	Sub-division	Ranges	Rounds	Beats
1	Nashik	Nashik	5	16
		Trimbak	3	11
2	EGS	Igatpuri	5	18
		Sinnar	4	14
3	Campa	Harsul	6	19
		Peint	5	20
4	FLCS	Nanashi	3	11
		Barhe	5	17
Total	4 subdivisions	8 Ranges	36	126

2.2 FOREST AREA UNDER DIFFERENT WORKING CIRCLE

Planning remains an active process requiring careful thought about what could or should happen in the future and involves the coordination of all relevant activities for the purpose of achieving specified goals and objectives. To achieve the goals and objectives of the Working plan, the forest area is divided into various Working circles. The working circle is defined as a forest area (forming the coherent whole or part of a working plan area) organized with a particular object and typically worked under one silvicultural system and one specific set of working plan prescriptions. The area distributed under various Government orders over the period of time are excluded from the management under Working Plan prescriptions but general prescriptions for their management is provided in Miscellaneous Regulations. The area under the different Working Circles in West Nashik Division is given in the following table:

Table 2.3: Area Allocation to different Working Circles

Sl. No.	Name of Working circle	Area allotted (Ha)
1	Improvement Working circle	49347.193
2	Afforestation working circle	17519.221
3	Protection working circle	11388.756
4	Grass and Fodder working circle	6136.657
	Total	84391.827

Range-wise allocation of the area to various Working circles is shown in the table below:

Table 2.4: Range-wise area allocation to different Working circles

Sl. No.	Range	Working Circle (area in Ha)				Total
		Improvement	Afforestation	Protection	Grass & Fodder	
1	Barhe	12847.211	0.000	0.000	0.000	12847.211
2	Nanashi	5027.378	1688.800	0.000	0.000	6716.178
3	Peint	7513.755	0.000	555.590	0.000	8069.345
4	Harsul	9467.981	3198.741	738.262	0.000	13404.984
5	Trimbak	7731.760	823.870	1661.266	0.000	10216.896
6	Nashik	1417.260	786.607	2578.556	3426.266	8208.689
7	Igatpuri	5341.848	0.000	5855.082	782.383	11979.313
8	Sinnar	0.000	11021.203	0.000	1928.008	12949.211
	Total	49347.193	17519.221	11388.756	6136.657	84391.827

2.3 PERCENTAGE OF FOREST WITH SECURED BOUNDARIES

The reserved forests are demarcated by Cairns of loose stones erected at suitable intervals along the boundary lines. Boundary lines and Cairns in this division are not properly maintained. The Protected forests are also demarcated in a similar way but the boundary marks between forests and Malki lands are not clear. The process of recognition of rights under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 has more considerably augmented the problems related to the consolidation of forest boundaries. The implementation of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 is still going on. Therefore, there is a need for a clear demarcation of RF boundaries along with FRA plots with new pillars. It is necessary for ensuring the consolidation and management of forests. It also helps in minimizing the disputes with local tribals. The boundaries of protected forest areas are not completely demarcated due to scattered patches. The impact of the implementation of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 has contained sizeable chunks of PF areas. So, clear demarcation of PF areas along with FRA plots needs to be done on priority. The boundaries of other classes of forests have not done in the past. Therefore, they also need to be demarcated on priority.

Table 2.5: Details about the Forest boundary lines

Sl. No.	Range	RF boundary (km)	PF boundary (km)	CA area boundary (km)	Acquired forest boundary (km)	Total boundary length (km)
1	Barhe	352.974	767.858	0.000	0.000	1120.832
2	Peint	660.843	1033.220	0.753	21.924	1716.740
3	Harsul	329.283	2337.923	0.000	273.280	2940.486
4	Nanashi	192.329	153.515	1.449	9.073	356.366
5	Nashik	472.737	23.913	7.348	0.000	503.998
6	Trimbak	376.365	0.000	0.000	38.120	414.485
7	Igatpuri	534.486	0.000	0.000	10310	544.796
8	Sinnar	663.447	0.000	1.280	11.870	676.597
	Total	3582.464	4316.429	10.830	364.577	8274.300

2.4 LAND USE, LAND USE CHANGE AND FORESTRY (LULUCF)

The condition of the forests and forest cover over the preceding decade during the implementation of the Plan based on the State of Forest Report (SFR) 2017 of the Forest Survey of India (FSI), Dehradun is as follows:

Table 2.6: Status of forest cover during the implementation of the Plan (Area in Sq Km)

SFR Report	Geographical area (Sq km)	Very dense	Moderately dense	Open forest	Total	Percent of Geographical area	Change	Scrub
2017	15530	0	350	718	1068	6.88	-16	330
2015	15530	0	351	738	1089	7.01	0	319
2013	15530	0	351	738	1089	7.01	0	319
2011	15530	0	351	738	1089	7.01	0	319
2009	15530	0	351	738	1089	7.01	0	319

There is a marked decrease in the moderately dense forests and Open forest by 16 sq km in the Nashik district. The primary reason for this marked decrease is the implementation of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. The possible misuse of this Act cannot be ruled out unless the specific deadline for submission of legitimate claims and its time-bound disposal is done properly. Hence, top priority needs to be given for settlement of the legitimate claims under the above Act through a time-bound programme. Once the claims are properly

disposed of, then the gradual consolidation of forest boundaries clearly demarcating FRA areas along with forest boundaries need to be done correctly on priority.

2.5 THREATS TO THE FOREST

The chief threats to the forests of the West Nashik forest division are summarized below:

- 1) **Dwindling Forest Cover due to encroachment:** The most significant problem of the West Nashik division is the fast dwindling forest cover. The forest cover in this division is severely threatened by encroachment for conversion to agriculture. Even the slopes are cultivated resulting in accelerating the soil erosion. This will have negative influences on climate and contributes to a loss of biodiversity. The economic activity is adversely affected by siltation, flooding, soil degradation and reduced timber supplies. Thus in the long run, it will threatens the livelihood of people.
- 2) **Low Productivity:** Productivity of Indian forests is very low as compared to other countries. For example, the annual productivity of Indian forests is only 0.5 cubic metre per hectare while it is 1.25 cubic metres per hectare in the USA, 1.8 cubic metres per hectare in Japan and 3.9 cubic metres per hectare in France. Like any other forests in our country, the West Nashik forests are also facing the same problem of low productivity. If analyzes the Growing stock data of West Nashik division, there is a decrease in Growing stock of about 10% in the last decade.
- 3) **Nature of forests and their uneconomical utilization:** The forests in Barhe, Peint, and Harsul were supporting good quality Teak forests. But due to heavy illicit felling and its cross-border smuggling led to its degradation to a vast extent. The forests in Trimbak and Igatpuri are extremely thin on plains and good quality forests are restricted to valleys. The forests of Nashik, Nanashi and Sinnar haunt mostly open forests. Due to inaccessible, slow-growing and lack of gregarious stands, make their utilization uneconomical for commercial exploitation. Even for getting more Ecological engineering, the improvement of these stands is necessary.
- 4) **Forest fires:** Large volumes of vegetative biomass in West Nashik forest division are destroyed every year by forest fires. Forest fires are most destructive in the dry season. The mountain topography and

insufficiency of properly trained personnel are a big handicap for effective control of forest fires.

- 5) **Grazing:** Forest grazing reportedly has negative impacts on forest ecosystems, such as soil erosion, depletion of nutrients, and soil compaction. These forests are subjected to the excessive pressure of grazing by livestock mainly sheep and goats from the surrounding villages. Considerable damage has already been caused to the forests which have adversely impacted the regeneration.
- 6) **Obsolete methods of lumbering and sawing:** The methods of lumbering, sawing, etc., practiced in the West Nashik forest division are extremely obsolete and the Depot management needs many improvements. This system leads to many wastages and low forest productivity. Enormous quantities of inferior wood that could be put to better use through seasoning and preservation treatment remain unutilized or go waste. This system leads to much wastage and low forest productivity.
- 7) **Lack of scientific techniques:** Scientific techniques of growing forests are equally lacking in the State. Not much attention is given to Research on raising good quality forest plantations, Silvi-pasture techniques, Agroforestry models, etc. Maharashtra is one of the agriculturally progressive States and there is enormous scope for increasing tree cover and grass fodder outside the forest area. Urgent attention to bridging these gaps in research to find suitable scientific techniques is necessary. Also, scientific interventions are needed for improving the quality of forest stands consisting of a substantial number of malformed trees or species which are slow-growing and poor yielders.
- 8) **Rights and concessions of forest-dependent communities:** Like any other forests in our country, in West Nashik forest tracts also tribals and local people have been granted customary rights and concessions for grazing as well as removing fuelwood and minor forest products. With the constantly increasing human population, these practices have led to a reduction in forest yield. In addition, there has been an encroachment on these forests by the local people inhabiting the forest fringe areas.

2.6 DISTRIBUTION OF DIFFERENT FOREST TYPE

There are many physical factors of an area influencing and inter-relating to forest growth and quality. They are rainfall, temperature, slopes, aspect, elevation, soil, etc. A broad spectrum of forest types ranging from sub-groups Semi-evergreen to Thorn forest occur in West Nashik division. These sub-

groups are further categorized into various forest types as classified by the Champion and Seth:

- 1) West Coast Semi-Evergreen Forest (2A/C2)
- 2) Southern Tropical Moist Deciduous Forest (3B)
 - a. Moist Teak Forest (3B/C1b)
 - b. Southern Moist Mixed Deciduous Forest (3B/C2)
- 3) Southern Tropical Dry Deciduous Forests (5A)
 - a. Dry Teak Forest (5A/C1)
 - b. Dry Mixed Deciduous Forest (5A/C3)
- 4) Southern Tropical Thorn Forests (6A/C1)
- 5) Western Sub-Tropical Hill Forest (8A/C2)

2.7 TREE COVER OUTSIDE FOREST AREA

2.7.1 Introduction: Trees outside the forest (TOF) are established in areas outside forest areas. TOF includes trees in agroforestry systems, orchards, and small woodlots. They may grow in pastoral areas, on farms, along rivers, canals, and roadsides, or in towns, gardens and parks.

Trees outside the forest constitute a substantial source of wood and non-wood forest product, and perform a crucial ecological role. Planted trees and shrubs in fields help to check runoff and erosion and control flooding, as well as helping to purify water and protect against the wind. Trees lining rivers and streams help to maintain biodiversity, providing spawning beds for fish and shade which reduces eutrophication. In urban areas, trees provide significant aesthetic and environmental services in addition to providing shade and considerably increasing the livability of cities.

2.7.2 Status of TOF in Urban area

Urban trees can help to mitigate some of the negative impacts and social consequences of urbanization and hence make cities more resilient to these changes. The Nashik Municipal Corporation (NMC) traditionally do take-up plantation programme every year in Nashik city. Because of their continued efforts, the city is naturally having a good tree cover. Currently, the Nashik Municipal Corporation (NMC) has completed a comprehensive survey of trees in Nashik City. The specific details of tree enumeration in Nashik City are given below:

Table 2.7: Details of TOF in Nashik Municipal Corporation area

Sl. No.	Details of species	Total number of trees
1	Exotic species	3147184
2	Native species	1648103
	Total	4795387

2.7.3 Status of TOF in Rural area

Forest trees contribute to the rural economy in a number of ways; directly as a user of land and resources to transform biological and other inputs into a range of outputs; indirectly through its linkages with upstream suppliers and downstream processing sectors. Rural men and women in many areas have long been involved in the conservation and cultivation of trees on agricultural lands and forested areas. In addition, forests and trees deliver an essential contribution to food security by helping to maintain the environmental conditions needed for agricultural production. They stabilize the soil, prevent erosion, enhance the land's capacity to store water, and moderate air and soil temperatures. The benefits of increasing tree cover on agricultural land go far beyond carbon sequestration, particularly because of the potential positive impacts on soil health.

As of today, the systematic data of TOF in the rural area of the West Nashik division is unavailable. Whatever the data is there, it is from Social Forestry division about their efforts taken in raising plantations on non-forest lands. The details from other players are unavailable. Therefore, a systematic study of Trees outside forest was carried-out by the SoFR unit of Nashik Working Plan division as per the protocol developed by the Forest Survey of India (FSI), Dehradun and the results are provided in Appendix II.54.

The details of plantations done by the Social Forestry division in the last 10 years are given below:

Table 2.8: Details of plantations done by Social Forestry wing

Sl. No.	Year	Plantation done	
		Block plantations (Ha)	Linear plantations (km)
1	2007-08	994.57	0.00
2	2008-09	906.20	0.00
3	2009-10	212.00	0.00
4	2010-11	536.74	0.00
5	2011-12	0.00	21.00
6	2012-13	0.00	28.50
7	2013-14	0.00	63.71
8	2014-15	14.13	39.50
9	2015-16	5.00	28.50
10	2016-17	10.85	60.00
11	2017-18	180.35	0.00
	Total	2859.84	241.21

2.8 SHIFTING CULTIVATION (JHUMMING)

Shifting cultivation is the process of cultivating forest land temporarily and then abandoning it usually for a long period so the soil recuperates its fertility and reverts to its natural state. Shifting cultivation is not practiced in West Nashik forest Division.

CHAPTER-3

MAINTENANCE, CONSERVATION AND ENHANCEMENT OF BIODIVERSITY

The diversity may be intraspecific (within species) and interspecific (in between the species) but these are adequately supported by an ecosystem. It is perceived that the diverse living forms of the ecosystem are modulated with global environmental changes. There are three inter-related hierarchical levels of biodiversity namely, **genetic diversity, species diversity, and community or ecosystem diversity**. The biological organisms on earth are of immense diversity, living in diverse habitats and possessing diverse qualities and are vital to human existence providing food, shelter, clothing, medicines, etc. But with an increased demand for rapid population growth, biodiversity is gradually depleting. A number of plants and animal species have already become extinct and many are endangered. Biodiversity is being depleted by the loss of habitat, over-exploitation of resources, human sponsored ecosystems, climatic changes, pollution, invasive exotic species, diseases, shifting cultivation, poaching of wildlife, etc. Conservation of biodiversity is protection, upliftment and scientific management of biodiversity so as to maintain it at its threshold level and derive sustainable benefits for the present and future generations. Primarily the conservation of biodiversity includes three fundamental objectives:

- a) To maintain essential ecological processes and life-supporting systems
- b) To preserve the diversity of species, and
- c) To make sustainable utilization of species and ecosystems.

3.1 FOREST COMPOSITION AND DISTRIBUTION

The occurrence of various forest types is primarily determined by the distribution of rainfall. The steep ridge of Western Ghat traps the major rainfall from the advancing South-west monsoon. On the east of the ridge lies the rain shadow zone. Consequently, there is a broad spectrum of forest types ranging from sub-groups Semi-evergreen to Thorn forest in West Nashik forest division. These sub-groups are further branched into various forest types as classified by the Champion and Seth as under:

- 1) West Coast Semi-Evergreen Forest (2A/C2)
- 2) Southern Tropical Moist Deciduous Forest (3B)
 - a. Moist Teak Forest (3B/C1b)

- b. Southern Moist Mixed Deciduous Forest (3B/C2)
- 3) Southern Tropical Dry Deciduous Forests (5A)
 - a. Dry Teak Forest (5A/C1)
 - b. Dry Mixed Deciduous Forest (5A/C3)
- 4) Southern Tropical Thorn Forests (6A/C1)
- 5) Western Sub-Tropical Hill Forest (8A/C2)

3.1.1 West coast Semi-evergreen forests (2A/C2)

These forests are situated in a heavy rainfall zone *i.e.* 2000 to 2500 mm. This type occurs in Harsul range. The compact block of forests from Kalmusta in the South to Varasvahir on the North belongs to this type of forest. The tree growth on the plateau and the upper slope is inferior in quality and density and chiefly consists of Amba and Jambul. In these areas, the evergreen species predominate. It can be further classified into two local types as follows:

3.1.1.1 Amba-Jambhul-Bhoma-Karwand local type

The forest situated on the upper slopes and plateau lands belong to this type. These forests consist of scrubby vegetation of inferior miscellaneous species. Large grassy blanks occur in this type of forest.

- a) **Overwood:** It consists of the following species: Amba (*Mangifera indica*), Hirda (*Terminalia chebula*), Jambhul (*Syzygium cumini*), Kinhai (*Albizia procera*), Koshimb (*Schleichera oleosa*), Pangara (*Erythrina variegata*), Sadada (*Terminalia tomentosa*), Sawar (*Bombax ceiba*), Shirus (*Albizia lebbeck*), Umbar (*Ficus racemosa*), etc. Natural regeneration of superior and inferior miscellaneous species is not satisfactory due to heavy biotic interference.
- b) **Underwood:** It consists of Ambada (*Spondias pinnata*), Apta (*Bauhinia racemosa*), Asan (*Bridelia retusa*), Awala (*Embllica officinalis*), Bahava (*Cassia fistula*), Bhokar (*Cordia myxa*), Bhoma (*Glochidion hohenackeri*), Bhutkes (*Elaeodendron glaucum*), Bondara (*Lagerstroemia parviflora*), Chamel (*Bauhinia foveolata*), Chanda (*Macaranga peltata*), Dhaman (*Grewia tiliifolia*), Hed/Haldu (*Adina cordifolia*), Humb (*Miliusa tomentosa*), Safed khair (*Acacia ferruginea*), Kalamb (*Mitragyna parviflora*), Kakad (*Garuga pinnata*), Kadwai (*Hymenodictyon obovatum*), Karmal (*Dillenia pentagyna*), Kumbhi (*Careya arborea*), Shemat (*Lannea coromandelica*), Palas (*Butea monosperma*), Shendri (*Mallotus*

philippensis), Wad (*Ficus benghalensis*), Waras (*Heterophragma quadriloculare*), etc. Bamboos are absent in this type of forests.

- c) **Undergrowth:** The undergrowth consists of the following species; Bhutari (*Panicum trypheron*), Burandi (*Blumea lacera*), Dhaiti/Dowari (*Woodfordia fruticosa*), Ghela (*Randia dumetorum*), Ghatbor (*Ziziphus xylopyrus*), Karwand (*Carissa carandas*), Karvi (*Strobilanthes callosa*), Khuri (*Ixora pavetta*), Kirmira (*Casearia esculenta*), Murud Sheng (*Helicteres isora*), Nirgudi (*Vitex negundo*), Pangala (*Pogostemon parviflorus*), Tarota (*Senna tora*), etc.
- d) **Climbers:** The main species of climbers are as follows: Abhaivel (*Canavalia ensiformis*), Chilhar (*Biancaea decapetala*), Gudvel (*Gymnema sylvestre*), Kusarvel (*Jasminum malabaricum*), Gendal/Nandanvel (*Cissus repanda*), Palasvel (*Butea superba*), etc.
- e) **Grasses:** The main species of grasses are Karni/Tigori (*Chrysopogon fulvus*), Kali-kusal (*Heteropogon contortus*), Rosha (*Cymbopogon schoenanthus*), etc.

3.1.1.2 Sadada-Amba-Waras-Khuri sub type

The West Coast Semi-evergreen type situated in the villages and sheltered pockets belong to Sadada-amba-waras-khuri subtype. The vegetation in this type is akin to the Moist Deciduous Forests with a few evergreen species.

- a) **Overwood:** It consists mainly of Sadada (*Terminalia tomentosa*), Kalamb (*Mitragyna parvifolia*), Amba (*Mangifera indica*), Dhawada (*Anogeissus latifolia*), etc. In addition, the species forming the overwood are Behada (*Terminalia bellirica*), Bondara (*Lagerstroemia parviflora*), Hed (*Adina cordifolia*), Hirda (*Terminalia chebula*), Kakad (*Garuga pinnata*), Kinhai (*Albizia procera*), Koshimb (*Schleichera oleosa*), Pangara (*Erythrina variegata*), Sawar (*Bombax ceiba*), and Shiras (*Albizia lebbek*), etc. Natural regeneration of superior and inferior miscellaneous species is not satisfactory due to heavy biotic interference.
- b) **Underwood:** The underwood consists of Ambada (*Spondias pinnata*), Apta (*Bauhinia racemosa*), Asan (*Bridelia retusa*), Awala (*Emblia officinalis*), Bahava (*Cassia fistula*), Bhokar (*Cordia myxa*), Bhoma (*Glochidion hohenackeri*), Bhutkus (*Elaeodendron glaucum*), Chamel (*Bauhinia foveolata*), Chanda (*Macaranga peltata*), Humb (*Miliusa tomentosa*), Safed khair (*Acacia ferruginea*), Jambhul (*Syzygium cumini*), Kadwai (*Hymenodictyon obovatum*), Karwa (*Dillenia pentagyna*), Kumbhi

(*Careya arborea*), Modhal (*Lannea coromandelica*), Moha (*Madhuca longifolia*), Palas (*Butea monosperma*), Papad (*Holoptelea integrifolia*), Payar (*Ficus rumphii*), Shendri (*Mallotus philippensis*), Umber (*Ficus racemosa*), Waras (*Heterophragma quadriloculare*), Manvel (*Dendrocalamus strictus*), Kashti (*Bambusa arundinacea*), etc.

- c) **Undergrowth:** The undergrowth consists of Dhaiti (*Woodfordia fruticosa*), Gal (*Randia dumetorum*), Ghatbor (*Ziziphus xylopyrus*), Karwand (*Carissa carandas*), Khuri (*Ixora pavetta*), Kirmira (*Casearia esculenta*), Murud Sheng (*Helicteres isora*), Nirgudi (*Vitex negundo*), etc.
- d) **Climbers:** The main species of climbers are Chilhar (*Biancaea decapetala*), Kawalvel (*Gymnema sylvestre*), Kusarvel (*Jasminum malabaricum*), Nandanvel (*Cissus repanda*), Palasvel (*Butea superba*), etc.
- e) **Grasses:** The main species of grasses are Bhutari (*Panicum trypheron*), Burandi (*Blumea lacera*), Karni/Tigori (*Chrysopogon fulvus*), Kali -kusal (*Heteropogon contortus*), Rosha (*Cymbopogon schoenanthus*), etc.

3.1.2 Southern Tropical moist deciduous forests (3B)

This type occurs in all over the division. The well-stocked forests are in patches. The rainfall ranges from 1500 mm to 2000 mm. The forests can be divided into two subtypes; Moist Teak Forest (3B/C1b) and Southern Moist Mixed Deciduous Forest (3B/C2).

3.1.2.1 Moist Teak Forest (3B/C1b): It can be further classified into two local types as below:

3.1.2.1.1 Teak-Sadada-Kudi-Aliv local type: This subtype is found in reserved as well as protected forests of Peint, Harsul, Barhe, Igatpuri and Nashik ranges. It includes a significant portion of the forests of these ranges and teak is one of the dominant species. The forests of this subtype can be seen near Sawarna and Amba in Peint range; Rakshashbhuvan and Palsan in Barhe range; near Ozarkhed and Deodongra in Harsul range; and plains in Igatpuri range and Khambala in Nashik range. The crop is deteriorated due to encroachment on forest areas.

- a) **Overwood:** The over wood consists of Teak (*Tectona grandis*) with its associates like Sadada (*Terminalia tomentosa*), Hed (*Adina cordifolia*), Kalamb (*Mitragyna parvifolia*), Shisham (*Dalbergia latifolia*), Khair (*Acacia catechu*), and Dhawada (*Anogeissus latifolia*). Additionally, the species forming the over wood are Behada (*Terminalia bellirica*), Bibla

(*Pterocarpus marsupium*), Bondara (*Lagerstroemia parviflora*), Kakad (*Garuga pinnata*), Sawar (*Bombax ceiba*), Shiras (*Albizia lebbeck*), Tiwas (*Ougeinia oojeinense*), etc. The condition of the tree in over wood is deteriorating due to the illicit cutting, encroachment, grazing and forest fire. Lot of area is honeycombed due to the recognition of individual forest rights (IFR) under the Scheduled Tribes and Other Forest Dwellers (Recognition of Forest Rights) Act 2006. Nagli cultivation is covering most of the approachable and open areas in Barhe, Peint and Harsul ranges in particular and other ranges in general. Areas, where plantation has been taken in the past, are mostly under IFR and under cultivation of Nagli and other local crops. Regeneration of inferior miscellaneous species is witnessed in the sheltered and moist pockets. The potential of natural regeneration of the forest is significant and if absolute protection is provided it possesses the potential to get regenerated naturally.

- b) **Underwood:** The underwood consists of Apta (*Bauhinia racemosa*), Asan (*Bridelia retusa*), Awala (*Emblica officinalis*), Bahava (*Cassia fistula*), Bhokar (*Cordia myxa*), Dhaman (*Grewia tiliifolia*), Humb (*Miliusa tomentosa*), Jambhul (*Syzygium cumini*), Kahandol (*Sterculia urens*), Karwal (*Dillenia pentagyna*), Kuda (*Holarrhena pubescens*), Kudi (*Wrightia tinctoria*), Kumbhi (*Carea arborea*), Moha (*Madhuca longifolia*), Palas (*Butea monosperma*), Payar (*Ficus rumphi*), Petari (*Dalbergia paniculata*), Shendri (*Mallotus philippensis*), Tembru (*Diospyros melanoxylon*), Tetu (*Oroxylum indicum*), Umber (*Ficus glomerata*), Waras (*Heterophragma quadriloculare*), Bamboo (*Dendrocalamus strictus*), etc.
- c) **Undergrowth:** The undergrowth consists of Burando (*Blumea lacera*), Dhaiti (*Woodfordia fruticosa*), Gal (*Randia dumetorum*), Galgugar (*Flacourtia indica*), Ghatbor (*Ziziphus xylopyrus*), Guthura (*Lantana camara*), Karvi (*Strobilanthes callosa*), Karwand (*Carissa carandas*), Khuri (*Ixora pavetta*), Kirmira (*Casearia esculenta*), Murud Sheng (*Helicteres isora*), Ranbhendi (*Thosposia lampas*), Tarota (*Senna tora*), etc.
- d) **Climbers:** The main species of climbers are Chilhar (*Biancaea decapetala*), Kadkagan (*Celastrus paniculatus*), Nandanvel (*Cissus repanda*), Palasvel (*Butea superba*), Ukshi (*Calycopteris floribunda*), etc.
- e) **Grasses:** The following main species of grasses occur in the area are Bhuti (*Apluda mutica*), Dongri-gavat (*Chrysopogon fulvus*), Kali-kusal (*Heteropogon contortus*), Phulora (*Themeda triandra*), etc.

3.1.2.1.2 Teak-Dhavada-Palas-Karwand Sub-type: These sub-types are found scattered all over the Division and occupy portions of hills. The forests are generally inferior to that described under Teak-Sadada-Kudi local type.

- a) **Overwood:** The overwood consists of following species: Behada (*Terminalia bellirica*), Bibla (*Pterocarpus marsupium*), Bondara (*Lagerstroemia parviflora*), Dhawada (*Anogeissus latifolia*), Hed (*Adina cordifolia*), Hirda (*Terminalia chebula*), Kakad (*Garuga pinnata*), Kalamb (*Mitragyna parvifolia*), Khair (*Acacia catechu*), Koshimb (*Schleichera oleosa*), Pangara (*Erythrina variegata*), Sadada (*Terminalia tomentosa*), Sawar (*Bombax ceiba*), Shiras (*Albizia lebbek*), Shisham (*Dalbergia latifolia*), Teak (*Tectona grandis*), and Tiwas (*Ougeinia oojeinense*), etc. The density of the overwood is deteriorating due to the illicit cutting, encroachment, grazing and forest fire. Lot of area is honeycombed due to the recognition of individual forest rights (IFR) under the Scheduled Tribes and Other Forest Dwellers (Recognition of Forest Rights) Act 2006. Nagli cultivation is covering most of the approachable and open areas in Barhe, Peint and Harsul ranges in particular and other ranges in general. Areas, where plantation has been taken in the past, are mostly under IFR, and cultivation of Nagli and other local crops. Natural regeneration of teak, superior and inferior miscellaneous species is not satisfactory due to biotic reasons. The potential of natural regeneration of the forest is extremely significant and if absolute protection is provided it possesses the potential to get regenerated naturally.
- b) **Underwood:** The underwood consists of Amba (*Mangifera indica*), Apta (*Bauhinia racemosa*), Asan (*Bridelia retusa*), Awala (*Emblica officinalis*), Bahava (*Cassia fistula*), Bamboo (*Dendrocalamus strictus*), Bhokar (*Cordia myxa*), Chamel (*Bauhinia foveolata*), Dhaman (*Grewia tiliifolia*), Humb (*Miliusa tomentosa*), Jambhul (*Syzygium cumini*), Kahandol (*Sterculia urens*), Karwal (*Dillenia pentagyna*), Kinhai (*Albizia procera*), Kuda (*Holarrhena pubescens*), Kudi (*Wrightia tinctoria*), Kumbhi (*Careya arborea*), Moha (*Madhuca longifolia*), Palas (*Butea monosperma*), Papada (*Holoptelea integrifolia*), Payar (*Ficus rumphii*), Tembruni (*Diospyros melanoxylon*), Umber (*Ficus glomerata*), Warang (*Kydia calycina*), Waras (*Heterophragma quadriloculare*), etc.
- c) **Undergrowth:** The undergrowth consists of Bor (*Ziziphus mauritiana*), Dhaiti (*Woodfordia fruticosa*), Gal (*Randia dumetorum*), Galghugar (*Flacourtia indica*), Ghatbor (*Ziziphus xylopyrus*), Gulthur (*Lantana camara*), Karwand (*Carissa carandas*), Karvi (*Strobilanthes callosa*), Kirmira (*Casearia esculenta*), and Murud Sheng (*Helicteres isora*), etc.
- d) **Climbers:** The main species of climbers are Chilhar (*Caesalpinia decapetala*), Manvel (*Combretum ovalifolium*), Nandanvel (*Cissus repanda*), and Palasvel (*Butea superba*), etc.

- e) **Grasses:** The main species of grasses are Dongari gavat (*Chrysopogon fulvus*), Kali-kusal (*Heteropogon contortus*), Marvel (*Dichanthium annulatum*), and Phulora (*Themeda triandra*), etc.

3.1.2.2 Southern Moist Mixed Deciduous Forest (3B/C2): It can be further classified into two local types as follows:

- a) **Overwood:** The over wood consists predominantly of miscellaneous species like Kakad (*Garuga pinnata*), Modhal (*Lannea coromandelica*), Sadada (*Terminalia tomentosa*), and Dhawada (*Anogeissus latifolia*). In addition, the species occurs in the overwood are Bibla (*Pterocarpus marsupium*), Bondara (*Lagerstroemia parviflora*), Khair (*Acacia catechu*), Kinhai (*Albizia procera*), Pangara (*Erythrina variegata*), Sawar (*Bombax ceiba*), Shisham (*Dalbergia latifolia*), Shiras (*Albizia lebeck*), Shiwan (*Gmelina arborea*), Teak (*Tectona grandis*) and Tiwas (*Ougeinia oojeinensis*). The crop is mostly middle-aged and regeneration of most species is absent. Regeneration is suffering due to biotic reasons.
- b) **Underwood:** The underwood consists of Amba (*Mangifera indica*), Apta (*Bauhinia racemosa*), Asan (*Bridelia retusa*), Awala (*Emblica officinalis*), Bahava (*Cassia fistula*), Dhaman (*Grewia tiliifolia*), Kahandol (*Sterculia urens*), Kudi (*Wrightia tinctoria*), Kumbhi (*Careya arborea*), Moha (*Madhuca longifolia*), Palas (*Butea monosperma*), Payar (*Ficus rumphii*), Tembru (*Diospyros melanoxylon*), Waras (*Heterophragma quadriloculare*), etc.
- c) **Undergrowth:** The undergrowth consists of Bor (*Ziziphus mauritiana*), Burando (*Blumea lacera*), Dhaiti (*Woodfordia fruticosa*), Gal (*Randia dumetorum*), Ghatbor (*Ziziphus xylopyrus*), Gulthur (*Lantana camara*), Karvi (*Strobilanthes callosus*), Karwand (*Carissa carandas*), Kharata (*Streblus asper*), Tarota (*Senna tora*), etc.
- d) **Climbers:** The main species of climbers are Chilhar (*Biancaea decapetala*), Gulvel (*Tinospora cordifolia*), Kadkangan (*Celastrus paniculatus*), Palasvel (*Butea superba*), etc.
- e) **Grasses:** The following main species of grasses occur in the area are Dongari gavat (*Chrysopogon fulvus*), Kali-kusal (*Heteropogon contortus*), Marvel (*Dichanthium annulatum*), Phulora (*Themeda triandra*), etc.

3.1.2.2.1 Sadada-Dhavda-Awali-Dhaiti local type: This subtype spreads over a major portion of the mixed deciduous forests.

3.1.2.2.2 Kakad-Modhal-Waras-Lavro Sub-type: This subtype is present in a minor portion of the mixed deciduous forests. It is typically found on depleted soil and on steep slopes.

3.1.3 Southern Tropical dry deciduous forests (5A)

These forests are situated in the moderate rainfall zone (1500 to 1750 mm). Most of the area of these forests is at present blank or understocked. Trees are generally small and stunted. In the past, this area must have carried good teak and miscellaneous forests, but today, devoid of tree growth. The remaining vestiges of good forest are near Khambala in the Nashik range and are indicative of the same. These forests suffered too much from heavy felling, heavy grazing and frequent fires, etc. Due to excessive biotic interference which resulted into dry conditions, xerophytic species like Shatavari (*Asparagus racemosus*), Sabar (*Euphorbia antiquorum*), Shedyia (*Opuntia stricta*), Jaol (*Tamarix dioica*), Bhuringani (*Solanum nigrum*), Vilayat (*Jatropha curcas*), etc., are coming up prominently. Following sub-types are found within these forests; (a) Dry Teak forest (5A/C1) and (b) Southern dry mixed deciduous forest (5A/C3).

3.1.3.1 Dry Teak forest (5A/C1): These sub-types are encountered in the north-eastern side of the Nashik Range and are confined to flat and undulating areas where the depth of the soil is good. Forests are of inferior quality and blank to under-stocked, and the regeneration of teak is poor.

- a) **Top Canopy:** Behada (*Terminalia bellirica*), Bondara (*Lagerstroemia parviflora*), Dhawada (*Anogeissus latifolia*), Safed khair (*Acacia ferruginea*), Khair (*Acacia catechu*), Modhal (*Lannea coromandelica*), Sadada (*Terminalia alata*), Salai (*Boswellia serrata*), Shiras (*Albizia lebbek*), Shivan (*Gmelina arborea*), Teak (*Tectona grandis*), etc.
- b) **Second Storey:** Amba (*Mangifera indica*), Apta (*Bauhinia recemosa*), Bahava (*Cassia fistula*), Bhutkesh (*Elaeodendron glaucum*), Ghatbor (*Zizyphus xylopyra*), Hiwar (*Acacia leucophloea*), Kuda (*Wrightia tinctoria*), Palas (*Butea monosperma*), etc.
- c) **Shrubs:** Gultur (*Lantana camara*), Dhaiti (*Woodfordia fruticosa*), Gal (*Randia dumetorum*), Karwand (*Carissa carandas*), Tarwad (*Senna auriculata*), etc.
- d) **Herbs:** Tarota (*Senna tora*).
- e) **Grasses:** Kusal (*Heteropogon contortus*), Phulora (*Themeda triandra*), Marvel (*Dichanthium annulatum*), etc.

3.1.3.2 Southern dry mixed deciduous forests (5A/C3): This type occurs all over the central portion of the division. This type consists typically of miscellaneous species like Ain, Dhawada, Khair, Behada, etc. The forests are poor mainly due to biotic factors like repeated illicit cutting, lopping, grazing and fires, etc. The forests are in general open and understocked, and regeneration of miscellaneous species is poor due to excessive biotic pressure.

- a) **Top Canopy:** Behada (*Terminalia bellirica*), Dhawada (*Anogeissus latifolia*), Safed khair (*Acacia ferruginea*), Khair (*Acacia catechu*), Pangara (*Erythrina variegata*), Sadada (*Terminalia tomentosa*), Teak (*Tectona grandis*), etc.
- b) **Second Storey:** Amba (*Mangifera indica*), Apta (*Bauhinia recemosa*), Ghatbor (*Ziziphus xylopyra*), etc.
- c) **Shrubs:** Gultur (*Lantana camara*), Dhaiti (*Woodfordia fruticosa*), Karvi (*Strobilanthes callosus*), Karwand (*Carissa carandas*), etc.
- d) **Herbs:** Burando (*Blumea lacera*), Tarota (*Senna tora*), etc.
- e) **Grasses:** Kusal (*Heteropogon contortus*), Phulora (*Themeda triandra*), Tambadgota (*Andropogon pumilus*), etc.
- f) **Climbers:** Chilhar (*Biancaea decapetala*).

3.1.4 Southern Tropical thorn forest (6A/C1)

This type of forest is situated in the Sinnar range where the rainfall is exceptionally sparse (350 to 500 mm). The forests are mostly blank and situated on poor sites having shallow soil depth. Areas are overgrazed and badly hacked and hence pronounced xerophytic ecological association is found wherein growing stock is very stunted and malformed. The trees have short bole and the density is very low. Grassy blanks and rocky outcrops are common. The forests being scattered and surrounded by cultivation on all sides are subjected to grazing and illicit felling for firewood. These two factors combined with poor site quality, frequent fires, and soil erosion have contributed to the lack of reproduction of primary species and deterioration of the forests. The general floristic remains as follows:

- a) **Top Canopy:** Not found.
- b) **Second Storey:** Sadada (*Terminalia tomentosa*), Dhawda (*Anogeissus latifolia*).
- c) **Shrub:** Henkal (*Gymnosporia spinosa*), Amoni (*Rhus mysorensis*), Hiwar (*Acacia leucophloea*), Karwand (*Carissa carandas*), Tarwad (*Senna auriculata*), Supli (*Clitoria ternatea*), Gultura (*Lantana camara*), Bor

(*Ziziphus mauritiana*), Sabarkandi (*Euphorbia neriiifolia*), Nagphani (*Opuntia stricta*), etc.

d) **Herbs:** Tarota (*Senna tora*), Gokhru (*Tribulus terrestris*), etc.

e) **Grasses:** Kusali (*Heteropogon contortus*), Marvel (*Dichanthium annulatum*), Tambadgota (*Andropogon pumilus*), Rosha (*Cymbopogon schoenanthus*), Phulora (*Themeda quadrivalvis*), etc.

3.1.5 Western sub-tropical hill forest (8A/C2)

Forests belonging to this type are located in western parts of Nashik and Igatpuri ranges where the rainfall is intense. The forests bear evergreen to semi-evergreen species like Amba (*Mangifera indica*), Jambhul (*Syzygium cumini*), Karap (*Memecylon edule*), etc. This type of forest occurs in a narrow strip on gentle slopes where the soil conditions are good. This type can be divided into following sub-type depending upon the vegetation:

3.1.5.1 Amba-Jambhul subtype: This sub-type is principally found on the plateau portion in patches and more restricted sites. There is a predominance of evergreen species in this type of forest.

a) **Top Canopy and Second Storey:** Amba (*Mangifera indica*), Asan (*Bridelia retusa*), Jambhul (*Syzygium cumini*), Kakad (*Garuga pinnata*), Koshimb (*Schleichera oleosa*), Khuri (*Ixora pavetta*), Modhal (*Lannea coromandelica*), Palas (*Butea monosperma*), Pangara (*Erythrina variegata*), Sadada (*Terminalia tomentosa*), Waras (*Heterophragma quadriloculare*), etc.

b) **Bamboo:** Kashti (*Bambusa arundinacea*) and Manvel (*Dendrocalamus strictus*).

c) **Shrubs:** Bhoma (*Glochidion hohenackeri*), Karwand (*Carissa congesta*), Karvi (*Strobilanthes caliosus*), etc.

d) **Herbs:** Tarota (*Senna tora*).

e) **Grasses:** Kusal (*Heteropogon contortus*).

f) **Climbers:** Chilhar (*Biancaea decapetala*), Kadkangan (*Celastrus paniculatus*).

3.1.5.2 Amba-Karap sub type: This subtype is generally found near Kurungwadi and Ambewadi of Igatpuri range. The percentage of evergreen species particularly Amba (*Mangifera indica*) and Karap (*Memecylon edule*) is significantly high. These types of forests are found in narrow strips.

- a) **Top Canopy and Second Storey:** Amba (*Mangifera indica*), Asan (*Bridelia retusa*), Bhuri (*Ixora pavetta*), Jambhul (*Syzygium cumini*), Kakad (*Garuga pinnata*), Karap (*Memecylon edule*), Koshimb (*Schleichera oleosa*), Modhal (*Lannea coromandelica*), Palas (*Butea monosperma*), Pangara (*Erythrina variegata*), Sadada (*Terminalia tomentosa*), Waras (*Heterophragma quadriloculare*), etc.
- b) **Bamboo:** Kuda (*Ochlandra talboti*).
- c) **Shrubs:** Bhoma (*Glochidion hohenackeri*), Karwand (*Carissa congesta*), Karvi (*Strobilanthes caliosus*), etc.
- d) **Herbs:** Tarota (*Senna tora*).
- e) **Grasses:** Kusal (*Heteropogon contortus*).
- f) **Climbers:** Chilhar (*Biancaea decapetala*), Kadkangan (*Celastrus paniculatus*), etc.

3.2 PLANT SPECIES DIVERSITY

Species diversity is defined as the number of species and abundance of each species that live in a particular location. The number of species that live in a certain location is called species richness. Abundance is the number of individuals of each species. The key factor for the existence of a diversity of plant life is to representing adaptive changes that allow distinct species to thrive in the diverse varied environments of the world. There are numerous reasons why species diversity is essential. Each species performs a role in the ecosystem and for example, bees remain primary pollinators. Species diversity contributes to ecosystem health. Each species is like a thread holding together an ecosystem. If a species disappears, an entire ecosystem can start unraveling. Species diversity is crucial for ecosystem health.

As per the flora published by the Botanical Survey of India, the combined number of species (including subspecies and varieties) in Maharashtra is 2716 and for Nashik District, the number of species is 952. Therefore, the contribution of the flora of Nashik District to that of Maharashtra state is 35%. Out of 952 species, 692 are dicotyledons and 260 are monocotyledons.

The study of plant diversity of West Nashik division is undone. But the comprehensive study of plant diversity of Anjaneri Conservation Reserve in West Nashik division has been carried out by the team headed by Dr. Sharad Kamble, Assistant Professor and Head, Department of Botany, Maratha Vidya Prasarak Samaj's Arts, Commerce and Science College, Tryambakeshwar, Nashik. The details of the study are given in Appendix-I.13.

The observations of the plant diversity study of Anjaneri area are as given below:

- 1) Anjaneri is a type locality of flowering plant, *Ceropegia anjanerica*, which is a species restricted in its distribution to this fort. Along with this endemic species, Anjaneri additionally provides habitat for a significant number of Rare, Endangered and Threatened (RET) species including *Habenaria panchganensis*, *Ceropegia panchganensis*, etc.
- 2) As many as 311 plant species (Trees-16%, Climbers-19%, Shrubs-7%, Herb-58%) have been recorded from Anjaneri hill. They have been enlisted in Appendix-I.13. Out of 311 plant species, 95 plant species recorded are important either as RET (Rare, Endangered and threatened) or Endemic criteria of conservation due to their threat levels.
- 3) The study showed that 61% of the total plant species found in Anjaneri had ethno-botanical uses. Therefore, they are critical to local communities for their bonafide use. Out of the 61% useful species, 46% possessed medicinal value, and 3% retained edible uses as food, while 12% were used for other purposes traditionally. This study also underlines a threat of overexploitation of these indigenous species.
- 4) Besides the medicinal and edible species, there are also some species like *Curuma pseudomontana* (Shildavan), *Desmodium gangaticum*, *Dioscorea bulbifera*, *Dioscorea pentaphylla* (Mor), *Heracleum grande* (Baphali), *Terminalia bellarica* (Beheda), *Terminalia chebula* (Hirda), *Tinospora cordifolia* (Gulvel), *Pinda cocanensis* (Pind), etc., are commercially extracted and therefore their population is declining drastically. These commercially extracted species additionally require good protection to maintain their rate of regeneration in the wild.
- 5) A proper management plan, therefore, needs to be developed along with the local communities for the sustainable use of these essential resources.
- 6) The threats to the biodiversity of Anjaneri are grazing, illegal extraction of firewood and medicinal plants, intensive tourism and mismanaged yatra.

3.3 STATUS OF BIODIVERSITY CONSERVATION IN FORESTS

With its varied climate and terrain, and characterised by at least 10 distinct bio-geographical regions, India supports a bewildering variety of forest types and harbours three global terrestrial biodiversity hotspots. Most of the terrestrial biodiversity currently resides in the forest, as other terrestrial habitats have lost their legitimate state. However, despite a benign forest policy

and an established regulatory regime, forest degradation and biodiversity loss continue because of the increasing requirements of the burgeoning human population, land-use change and the spread of invasive exotic species. The extent and loss of biodiversity must be continuously monitored, and people attracted to participate in biodiversity conservation and rehabilitation on a massive scale. In this direction, Anjaneri Conservation Reserve was constituted for its ecological, faunal and floral significance vide Revenue and Forest Department notification dated 31/01/2017. It is, furthermore, a critical place for the purpose of supporting white-backed and long-billed vultures.

3.3.1 Anjaneri Conservation Reserve: Anjaneri Hill ($19^{\circ} 53' 39.12''$ to $19^{\circ} 56' 19.02''$ N Latitude and $73^{\circ} 34' 48.20''$ to $73^{\circ} 34' 28.56''$ E Longitude) situated towards the west of Nashik city. It is 20 km from Nashik on Nashik-Jawhar-Dahanu state Highway. It is a culturally significant site and a part of Shirdi-Nashik-Trimbakeshwar pilgrimage circuit. The area of “Anjaneri Conservation Reserve” is 569.36 Ha (5.69 Sq Km) comprise of the compartments 234(P) and 241(P) and 241. The comprehensive Management plan of this conservation Reserve need to be prepared in accordance with the Wild Life (Protection) Act 1972 and the Biological Diversity Act 2002. Among the important Schedule-I species found in Anjaneri are Leopard, White-backed Vulture, Long-billed vulture, etc.

The highest point on Anjaneri is around 1300 MSL. The fort has 3 extensive plateaus at the elevation of 800 MSL, 1100 MSL and 1280-1300 MSL respectively. Along with cultural significance, Anjaneri maintains a unique biodiversity with respect to plants, birds, reptiles, mammals, amphibians, etc. The tall cliffs surrounding the fort remain protected nesting sites for Critically Endangered Long Billed Vultures (*Gyps indicus*). Besides, many species of Geckos, Frogs, Toads, Dragonflies, Damselflies, Spiders, Scorpions, etc., were recorded on the fort during visits of the experts of Ecological Researcher. Comprehensive work needs to be undertaken to address these taxa. Anjaneri is one of the important biodiversity areas of the Northern Western Ghats.

3.3.2 In situ conservation of Medicinal plants: In-situ conservation represents the process of protecting an endangered plant or animal species in its native habitat. A humble beginning is done at Anjaneri where the naturally occurring plant species of medicinal value were protected and other species like Shivan (*Gmelina arborea*), Bel (*Aegle marmelos*), Hirda (*Terminalia chebula*), Arjun (*Terminalia arjuna*), Awala (*Emblica officinalis*), Moha (*Madhuca longifolia*), Ritha (*Sapindus mukorossi*), Charoli (*Buchanania lanzan*), Palas

(*Butea monosperma*), Behada (*Terminalia bellirica*) and Padal (*Stereospermum tetragonum*) were planted to enrich the area.

Table 3.1: Details of enrichment plantation of medicinal plants

Sl.No.	Year	Range	Village	Compartment	Area (Ha.)
1	2010-11	Nashik	Anjaneri	234, 236	10.00
		Total			10.00

3.3.3 Ex-situ conservation of medicinal plants: Ex-situ conservation is the technique of conservation of all levels of biological diversity outside their native habitats. Efforts were taken to artificially supplement the medicinal plants like Shivan (*Gmelina arborea*), Bel (*Aegle marmelos*), Hirda (*Terminalia chebula*), Neem (*Azadirachta indica*), Arjun (*Terminalia arjuna*), Awala (*Emblica officinalis*), Moha (*Madhuca longifolia*), Behada (*Terminalia bellirica*), Shikekai (*Acacia concinna*), Adulsa (*Justicia adhatoda*), Jambhul (*Syzygium cumini*), Karanj (*Pongamia pinnata*), Gunj (*Abrus precatorius*), Kanchan (*Bauhinia variegata*) and Shatavari (*Asparagus racemosus*) at various places of West Nashik forest division. Medicinal plant plantations were taken up in this division under financial assistance from the National Medicinal Plants Board (NMPB).

3.3.3.1 Dashmool plantations: Dashmool comprises of Brihat panchamool viz., Shivan (*Gmelina arborea*), Bel (*Aegle marmelos*), Tetu (*Oroxylum indicum*), Padal (*Stereospermum tetragonum*), Arni (*Premna serratifolia*) and Laghu panchamool viz., Salvan (*Desmodium gangeticum*), Pithvan (*Uraria picta*), Gokhru (*Tribulus terrestris*), Brihati (*Solanum indicum*) and BhuiRINGANI (*Solanum xanthocarpum*). The combination of these ten roots is utilised widely in Ayurveda for many health conditions related to nerves, muscles, bones, and joints. It has potent anti-inflammatory, antioxidant and moderate analgesic actions. It is a part of several Ayurveda medicines and solely used for pain disorders, and inflammatory diseases related to a musculoskeletal system including osteoarthritis, gouty arthritis, and rheumatoid arthritis, etc. In order to expand the population of these plants, Dashmool plantations have been taken up in West Nashik forest division.

Table 3.2: Details of Dashmool Plantation in West Nashik forest division

Sl. No.	Year	Range	Village	Compt. No	Area (Ha.)
1	2009-10	Harsul	Dalpatpur	150	15.00
2	2009-10	Sinnar	Khambale	365	10.00
3	2010-11	Sinnar	Khambale	365	15.00
4	2010-11	Harsul	Dalpatpur	150	7.00
5	2010-11	Nashik	Ganga Mhalungi	202	13.00
6	2010-11	Nashik	Ganga Mhalungi	204	10.00
7	2011-12	Sinnar	Khambale	365	10.00
8	2012-13	Nashik	Rohila	204	30.00
		Total			110.00

Table 3.3: Resource Augmentation of Medicinal Plants

Sl. No.	Year	Range	Village	Comptt. No	Area (Ha.)
1	2011-12	Nashik	Malegaon	206	20.00
2	2011-12	Trimbak	Sapgaon	240	30.00
3	2011-12	Trimbak	Shrighat	342	30.00
4	2011-12	Nanashi	Devsane	43	20.00
5	2012-13	Nashik	Sapte	206	30.00
6	2012-13	Nashik	Wasali	223	20.00
7	2012-13	Sinnar	Dapur	267	30.00
8	2012-13	Sinnar	Konambe	267	30.00
9	2012-13	Sinnar	Hivre	273	30.00
10	2012-13	Sinnar	Vinchur/Dalvi	248	30.00
11	2012-13	Harsul	Kulwandi	Sy.No. 63, 64, 94, 97, 99 and 100	30.00
		Total			300.00

3.3.3.2 Plantation of Triphala species

Under the triphala plantation scheme, about 7.59 lakhs, 1.14 lakhs and 0.25 lakhs seedlings of Awala (*Emblica officinalis*), Behada (*Terminalia bellirica*) and Hirda (*Terminalia chebula*) respectively were planted for the enrichment of NTFP species.

Table 3.4: Details of survival of Triphala plantations

Sl.No.	Year	Awala		Hirda		Behada	
		Planted	Survival	Planted	Survival	Planted	Survival
1	2008	59844	40476	605	337	4735	2429
2	2009	200435	165009	5707	4217	42039	35504
3	2010	50320	26455	2500	1540	200	100
4	2011	90797	55514	4845	2797	7440	4817
5	2012	139641	106107	3374	2872	25824	18715
6	2013	141275	108522	2725	1844	17110	10556
7	2014	77621	64624	5715	4677	17300	14512
	Total	759933	566707	25471	18284	114648	86633
			74.57%		71.78%		75.56%

3.4 STATUS OF SPECIES PRONE TO OVER EXPLOITATION

Overexploitation means harvesting species from the wild at rates faster than natural populations can recover. Continued over-exploitation can lead to the destruction of the resources including extinctions. The status of species prone to over-exploitation in the division needs further studies with the help of the conservation experts and subject experts. However, from the survey, the following species are observed to be prone to over-exploitation especially in Anjaneri Conservation Reserve. Studies also need to be undertaken to quantify the amount of extraction of all medicinal plants from Anjaneri hill.

Table 3.5: Species prone to over exploitation in Anjaneri

Sl.No	Range	Area	Species
1	Nashik	Anjaneri Conservation Reserve	<i>Curuma pseudomontana</i> (Shildavan)
2			<i>Desmodium gangaticum</i>
3			<i>Dioscorea bulbifera</i>
4			<i>Dioscorea pentaphylla</i> (Mor)
5			<i>Heracleum grande</i> (Baphali)
6			<i>Terminalia bellarica</i> (Behada)
7			<i>Terminalia chebula</i> (Hirda)
8			<i>Tinospora cordifolia</i> (Gulvel)
9			<i>Pinda cocanensis</i> (Pind)

3.5 CONSERVATION OF GENETIC RESOURCES

Forest genetic resources (FGR) are the heritable materials maintained within and among trees and other woody plant species that are of actual or

potential economic, environmental, scientific or societal value. They are crucial to the adaptation and protection of our ecosystems, landscapes and production systems, yet are subject to increasing pressures and unsustainable use. Conservation and sustainable management of FGR are, therefore, a must to ensure that present and future generations continue to benefit from forests and trees. The contribution of forests and trees to meeting the present and subsequent challenges of food security, poverty alleviation, and sustainable development depends on the availability of rich diversity between and within tree species. Genetic diversity is needed to ensure forest trees can survive, adapt and evolve under changing environmental conditions. It also maintains the vitality of forests and provides resilience to stresses like pests and diseases. Furthermore, genetic diversity is needed for artificial selection, breeding and domestication programmes for the development of adapted varieties or to strengthen valuable traits. Forest genetic resources are essential for forest-dependent communities who rely on a substantial part of their livelihoods on timber and non-timber forest products for food security, domestic use, and income generation.

The study of the forest genetic resources in West Nashik forest division is undone. This gap needs to be bridged during the course of implementation of this Plan taking the assistance from the experts of the Colleges and Universities present in Nashik.

3.6 FAUNA AND THEIR HABITATS

The wildlife found in the forests of West Nashik division is given below:

- A. **Carnivores:** Panther (*Panthera pardus*), Striped Hyaena (*Hyaena hyaena*), Jackal (*Canis aureus*), Khokad (*Vulpes bengalensis*), Jungle cat (*Felis chaus*), Wolf (*Canis lupus*), etc.
- B. **Herbivores:** Chowsingha (*Tetracerus quadricornis*), Barking deer (*Muntiacus muntjak*), Sasa (*Lepus nigricollis*), Salu (Sayal) (*Hystrix indica*), Khar (*Funambulus palmarum*), Sambar (*Cervus unicolor*), Llandga (*Canis lupus*), Mongoose (*Harpester edwardsi*), Monkey (*Macaca mulatta*), Common Langur (*Semnopithecus entellus*), etc.
- C. **Reptiles:** Indian cobra (*Naja naja naja*), Dhaman (*Varanus inelicus*), Common Krait (*Bungurus caeruleus*), Russel viper (*Vipera russelli*), Chameleon (*Chaemeleon vulgatis*), Ghorpad (*Varanus bengalensis*), etc.
- D. **Birds:** Painted partridge (*Francolinus pictus*), Grey francolin (*Francolinus pondicerianus*), Jungle bush quail (*Perdicula asiatica*), Grey jungle fowl

(*Gallus sonneratii*), Crow pheasant (*Centropus sinensis*), White backed Vulture (*Gyps bengalensis*), Slender billed vulture (*Gyps tenuirostris*), Rufous-backed shrike (*Lanius schach*), Sparrow hawk (*Accipiter nisus*), Brown wood owl (*Strix leptogrammica*), Rose ringed parakeet (*Psittacula manillensis*), Common kingfisher (*Alcedo atthis*), Green bee-eater (*Merops orientalis*), Pariah Kite (*Milvus migrans*), Indian peafowl (*Pavo cristatus*), Black-rumped Woodpecker (*Dinopium benghalense*), Brahminy kite (*Haliastur indus*), Baya weaver bird (*Ploceus philippinus*), Waterhen (*Amaurornis phoenicurus*), Spotted dove (*Spilopelia chinensis*), Red whiskered bulbul (*Pycnonotus jocosus*), Red vented bulbul (*Pycnonotus cafer*), Common myna (*Acridotheres tristis*), Asian Koel (*Eudynamis scolopaceus*), Jungle Babbler (*Turdoides striata*), Black Drongo (*Dicrurus macrocercus*), etc.

- E. **Butterflies:** Common Pierrot (*Castalius rosimon*), Common Wanderer (*Pareronia hippie*), Sailor (*Neptis hylas*), Common small Flat (*Sarangasa dasahara*), Grey Pancy (*Junonia aflites*), Red Pierrot (*Taica da nyseus*), Barron (*Euthalia aconthea*), Lemon Pancy (*Junonia lemonias*), etc.

3.7 THREATS AND CHALLENGES TO WILDLIFE

Fewer natural wildlife habitat areas remain each year. Moreover, the habitat that remains has often been degraded to bear little resemblance to the wild areas which existed in the past. Habitat loss due to destruction, fragmentation, and degradation constitute the primary threat to the survival of wildlife. The major threats and challenges to wildlife at a broader scale are explained below:

- 1) **Habitat destruction:** It is the main cause of wildlife extinction in India. The habitat loss is due to deforestation for extended cultivation, construction of dams, mining operations and others. When the natural habitat of animals is destroyed, it leads to a decline in their primary food supply and breeding and nesting grounds.
- 2) **Climate change:** Global warming is making burning days hotter, rainfall and flooding heavier, hurricanes and droughts more severe. This intensification of weather and climate extremes will represent the most visible impact of global warming in our routine lives. It is also causing unpredictable changes to the landscape of our world, adding stress to wildlife species and their habitat. Since many types of plants and animals have specific habitat requirements, climate change could cause terrible loss of wildlife species.

- 3) **Hunting and poaching:** Hunting and poaching cause a constant threat to wildlife. Both organized as well as unorganized poaching is going on in our country though strict regulations are provided under the Wildlife (Protection) Act 1972. It is a daunting challenge to Forest authorities to effectively address these challenges which are changing every day with alternative techniques especially in wildlife organized crimes.
- 4) **Pollution:** Pollutants released into the environment are ingested by a bewildering variety of organisms. Pesticides and toxic chemicals being widely used, making the environment toxic to certain plants, insects, and rodents. Every day the extent of release of pollutants to nature is increasing, which needs to be effectively regulated.
- 5) **Overexploitation:** The increasing population of human beings remains a constant threat to wildlife. More people on the globe refer to more consumption of food, water, and fuel, therefore more waste is generated. Overexploitation is the overuse of wildlife and plant species by people for food, clothing, pets, medicine, sport, and many other purposes. People have always depended on wildlife and plants for food, clothing, medicine, shelter and many other needs. More resources are being consumed than the natural world can supply. The danger is that if too many individuals of a species are taken from their natural environment, the species may no longer be able to survive. The loss of one species can affect many other species in an ecosystem.
- 6) **Road kill:** Over last few decade, road kill have become a new enemy of Indias's wildlife, as number of wild animals are killed by motor vehicles on highways. Lack of prey pushing the wild animals towards habitations along the roads passing through the jungle.
- 7) **Changing cropping pattern in agriculture:** With the advent of irrigation system, the cropping pattern has undergone drastic changes towards commercial crops like sugarcane. These agriculture fields provided safe shelter with enough small prey to carnivores like Leopards. This has increased the frequency of interactions between the man and wildlife and resulted in loss of livestock and human life in the rural areas. In retaliatory measures, many times the wildlife gets killed either by poisoning or electrocution.

3.7.1 Wildlife offence cases

The details of wildlife-related offences in the West Nashik forest division in the last decade are given below:

Table 3.6: Details of wildlife cases

Year	Causes of Wildlife death						Total
	Fell in well	Road accident	Electricution	Dog attack	Hunting	Others	
2007-08	1	4	0	0	0	2	7
2008-09	1	7	1	0	0	7	16
2009-10	4	0	0	0	0	6	10
2010-11	2	3	0	0	1	8	14
2011-12	0	2	0	0	0	7	9
2012-13	0	1	0	0	1	7	9
2013-14	0	3	1	3	4	3	14
2014-15	1	5	0	0	0	7	13
2015-16	0	10	4	0	0	12	26
2016-17	3	10	1	0	0	7	21
Total	12	45	7	3	6	66	139

Wildlife death due to road accidents is increasing day by day. The reason represents the development of the road network at an increased pace. Undoubtedly, the connectivity is improving in the region, but necessary underpasses at strategic places of wildlife crossing shall be provided. The provisions of underpasses for free wildlife movement need to be incorporated in the project from the beginning. Next threat to wildlife in this division is unprotected wells in agriculture fields. Necessary precautions need to be taken during the implementation of this Plan for construction of parapet walls around the wells to prevent the wildlife death by drowning. As far as hunting is concerned, judicious use of secret funds for the development of a network of informers remains the key.

3.7.2 Man-Animal conflict

Leopards live in close proximity to human habitations with surprisingly low levels of conflict. They are capable of living and breeding even in degraded forests, plantations and croplands, and manage to survive on a variety of small wild prey, domestic dogs, livestock and feral animals. Rural folk in many of these areas are often remarkably tolerant to the presence of these wild and potentially vicious predators, but the threat to human and his livestock even if rare is real. To tackle these kinds of situations, the Government of Maharashtra has evolved a policy of compensating for the loss of livestock as well as for the injury to and loss of human life. This is summarized below:

3.7.2.1 Compensation for the loss of Livestock

The present rates of compensation for loss of livestock due to Wildlife as per the GR No.WLP-0718/C.No.267F-1 of 11/07/2018 is as follows:

Table 3.7: The Present Rates of compensation for loss of Livestock

Sl.No.	Particulars	Amount to be paid
1	Death of Cow, Buffalo, Bullock by wildlife	75% of the market price or Rs.60000/- whichever is less
2	Death of Sheep, Goat, other livestock by wildlife	75% of the market price or Rs.10000/- whichever is less
3	Cow, Buffalo, Bullock became permanently handicapped	50% of the market price or Rs.12000/- and whichever is less
4	Injury to Cow, Buffalo, Bullock and Goat	Treatment cost (Government or Zilla Parishad Hospital) or 25% of the market price or Rs.4000/- whichever are less.

The compensation to livestock damage has to be given as per the instructions issued by the State Government from time to time.

3.7.2.2 Ex-gratia for the injury to and loss of Human life

In law, an ex-gratia payment is a payment made without the giver recognising any liability or legal obligation. It is done from a sense of moral obligation. The Government of Maharashtra has introduced Ex-gratia payment through Government Resolution dated 27.01.1986. The scheme covers death as well as injury including minor injury caused to any individual in an attack by a wild animal. Any such attack by Tiger, Panther, South Bear, Bison, Wild Pigs, Wolf, Hyena, Jackal and wild dogs is covered under the scheme. Present rates of ex-gratia have been fixed through Government Resolution No. WLP-0718/C.No.267F-1 of 11/07/2018. These remain as follows:

The ex-gratia to injury to and loss of human life has to be given as per the instructions issued by the State Government from time to time.

Table 3.8: Ex-gratia for the Injury and loss of Human life

Sl.No.	Particulars	Amount to be Paid
1	Death	Rs.15.00 lakhs.
2	Permanent disability.	Rs.5.00 lakhs.
3	Major injury	Rs.1.25 Lakh.
4	Minor injury	Upto Rs.20000
Note: Cost of medication preferably in Government hospital but in case of non-availability, private medication.		

Table 3.9: Details of Wildlife compensation paid in West Nashik division

Year	Cattle kill		Human Attack		
	Cases	Compensation Sanctioned (Lakhs)	Cases		Compensation Sanctioned (Lakhs)
			Casualty	Injury	
2007-08	48	1.35	--	3	0.537
2008-09	87	4.94	--	--	--
2009-10	20	1.08	--	3	0.015
2010-11	141	7.24	--	3	0.085
2011-12	59	3.07	1	2	2.014
2012-13	54	2.76	--	4	0.181
2013-14	73	3.03	--	--	--
2014-15	156	10.05	--	3	0.223
2015-16	80	5.204	2	2	16.226

3.8 PROTECTION AND MANAGEMENT OF FAUNA

3.8.1 Protection of fauna

3.8.1.1 Legal Protection before 1952

After the promulgation of the Indian Forest Act 1927, rules relating to wildlife regulations were framed under section 26(I) and 76(d). These were essential to regulate the hunting of wild animals. Wild Birds and Animal Protection Act 1912 as amended in 1935 also ensured protection to certain animals and a check on hunting of others. The shooting block system of hunting was started from 1927. Under the provisions of the two acts, the

Conservator of Forests in consultation with the Deputy Conservator of Forests concerned used to declare areas supporting the abundant game as open to hunting. The Deputy Conservator of Forests accordingly used to issue shooting permits, where the conditions like the type of game and their number allowed to be hunted were used to be mentioned.

The Bombay Wild Animals and Wild Birds Protection Act, 1951 though did not propose a significant change in the management of game in the Reserved and the Protected Forests, yet it incorporated following significant provisions:

- 1) Its provisions were equally applicable outside the Reserved and the Protected Forests.
- 2) Arms license holders for sports were to register themselves with the Wildlife Preservation Officer.
- 3) This Act prescribed a closed season for hunting and classified game into four categories, *viz.*, Small game, big game, special big game, and pet animals.
- 4) It also sought to regulate transactions in trophies and other wildlife products.
- 5) Wildlife Advisory Board was constituted under this act to advise the government on various important matters concerning wildlife.

3.8.1.2 Legal protection after 1952

At the national level, the Indian Board for wildlife was constituted in 1952. Its prime object was to devise ways and means for conservation of wildlife through co-ordinated legislative and practical measures and sponsoring setting up of National Parks and Wildlife Sanctuaries. A comprehensive and unified National and State Park Act, 1971 was passed. It provided for the appointment of an Advisory Committee to advise in regard to the constitution and declaration of National Parks and Sanctuaries and formulation of policy for their administration and management. The Parliament subsequently enacted the Wildlife (Protection) Act, 1972, which came into force in the State of Maharashtra with effect from 1st June 1973. With this, other acts relating to any matter contained in this Act and in force in the State stood repealed. This act as amended from time to time as well as the various regulations and guidelines issued under this Act by the Central and the State Government provide for the establishment of a network of national parks and sanctuaries representing various habitats and for providing protection to all type of wildlife

in the state. These provisions also address issues relating to the management of wildlife outside the protected areas. Following rules have so far been enacted under the relevant sections of this act:

- a) The Wildlife (Stock Declaration) Rules, 1973
- b) The Wildlife (Transactions and Taxidermy) Rules, 1973
- c) Wildlife (Protection) (Maharashtra) Rules, 1975
- d) The Wildlife (Protection) Rules and Licensing (Additional Matters for Consideration) Rules, 1983.
- e) Wildlife (Specified Plants-Condition for Possession by Licensee) Rules, 1995
- f) Recognition of Zoos Rules, 1992.
- g) Declaration of Wildlife Stock Rules, 2003.
- h) Maharashtra wildlife Rules 2014.

Besides the above specific statutory framework available for wildlife management, provisions contained in the Indian Forest Act, 1927, Forest (Conservation) Act, 1980 and the Environment (Protection) Act, 1986 may progress a lasting way in protecting and conserving the biodiversity of this division.

3.8.2 Management of Fauna

3.8.2.1 Waterhole creation

Water holes are an important habitat component for a variety of wildlife. They provide drinking water for many species and equally serve as breeding habitat for many amphibians. Efforts for the construction of waterholes for wildlife have started in this division where 18 water holes were constructed in the last seven years in addition to Jalyukta shivar works. The details of the waterholes constructed are given in the table below:

Table 3.10: New water holes created in West Nashik division

Sl.No.	Year	Range	Water holes created
1	2011-12	Harsul	3
2	2013-14	Trimbak and Igatpuri	2 and 8
3	2014-15	Trimbak, Barhe and Harsul	2, 2 and 1
	Total		18

3.8.2.2 Vulture conservation

India supports nine species of vultures in the wild. Out of which White backed Vulture (*Gyps bengalensis*) and long billed Vulture (*Gyps indicus*) found in West Nashik division. The population of these Vultures in the wild has declined drastically over the recent decade. Because of the evidence of widespread and rapid population decline, both vulture species were listed by IUCN (the World Conservation Union) in 2000 as 'Critically Endangered', which represents the highest category of protection.

The ecological, social and cultural significance of vultures in India may be summed up as: scavenging on animal carcasses of animals and thereby helping maintain the environment cleanses, and the disposal of dead bodies as per the religious practices of the Parsi community. Vultures represent the primary removers of carrion in India. Removal of a major scavenger from the ecosystem will affect the equilibrium between populations of other scavenging species and/or result in an increase in putrefying carcasses. In some areas, the population of feral dogs remains the dominant scavenging species in the absence of vultures, has been observed to have increased. Both increases in putrefying carcasses and changes in the scavenger populations have associated disease risks for wildlife, livestock and humans. In the recent past, the concept of Vulture restaurants has started in many countries for providing secure feeding sites for Vultures. A vulture restaurant comprises a site where carrion is deposited for endangered vultures to feed on. Vulture restaurants can also be called feeding sites, feeding schemes, and vulture safe zones.

In the year 2011-12, a Vulture Restaurant was started at Khoripada village in Harsul Range. The carrion is transported from adjacent villages and kept at the Vulture Restaurant. The Vultures came and feed on the Carrions inside the Vulture restaurant. The combined efforts of forest staff and the Joint Forest Management Committee (JFMC) members of Khoripada have resulted in the rise of the Vulture population in and around Khoripada village. This conclusion is supported by a study conducted by the NGO, Nature Conservation Society of Nashik.

3.8.2.3 Rescue teams

A Rescue Team of existing forest staff, fully equipped with all essential accessories *i.e.* tranquilizing equipment, trap cages and medicines with skilled

manpower are always ready at Nashik to address the crisis situations arising out of human-animal conflict and other issues related to wildlife.

3.8.2.4 Wildlife census 2014

In the year 2014, the census of wild animals had done in West Nashik division. A total of 1212 wild animals were recorded including Leopard (64), Hyaena (48), Wild boar (193), Monkey (444), Fox (13), Rabbit (302), Peacock (129) and others (Wolf, Junglecat-19). As per census data 2014, about 81.27%, wildlife population was observed in Igatpuri Range which is highest in the division, and an exceptionally low population of 0.25% observed in Peint Range. The regular census of the wild animals should be carried out in the forest area, and its results should be analyzed. Any significant deviation in the census data should be viewed seriously.

3.8.2.5 Eco-sensitive Zones

Eco-Sensitive Zones (ESZs) are areas notified by the Ministry of Environment, Forests and Climate Change (MoEFCC), Government of India around Protected Areas. The purpose of declaring ESZs is to create some kind of “shock absorbers” to the protected areas by regulating and managing the activities around such areas. They also act as a transition zone from areas of high protection to areas involving lesser protection.

The objectives for their demarcation remain as follows:

- 1) To manage and regulate the activities around the protected areas with the intention of creating some kind of ‘shock absorbers’.
- 2) To provide for a transition zone between the highly protected and relatively less protected areas.
- 3) To provide the effect to Section 3(2)(v) of the Environment (Protection) Act 1986 which restricts the operation of industries or processes to be carried out in certain areas or to maintain certain safeguards to operate industries.

In West Nashik division, Eco-sensitive zone need to be declared around Anjaneri Conservation Reserve.

CHAPTER-4

MAINTENANCE AND ENHANCEMENT OF FOREST HEALTH AND VITALITY

Healthy forests are essential for sustainable forest management. But forests like other ecosystems are subject to a number of threats that can cause tree crop mortality or reduce their ability to provide an extensive range of goods and services. Forests are subject to a variety of disturbances that are themselves strongly influenced by climate. Disturbances like fire, drought, landslides, species invasions, insect, and disease outbreaks, and climatic events like hurricanes, windstorms and ice storms influence the composition, structure and functions of forests (Dale *et al.*, 2001). Climate change is expected to affect forests' susceptibility to disturbances, as well as the frequency, intensity, duration, and timing of such disturbances. For example, increased fuel loads, longer fire seasons and the occurrence of more severe weather conditions as a consequence of a changing climate are expected to result in increased forest fire activity (Mortsch, 2006). All of these impacts on trees and forests will inevitably cause widespread effects on the productive function of forest ecosystems, which in turn affect local economies. The causes of the negative impacts on forest health and vitality vary from place to place, and the magnitude and duration of the impacts are difficult to assess.

4.1 STATUS OF REGENERATION

Species is one of the significant analytical characteristics of the plant community (Malik *et al* 2014). A *plant community* is an assemblage of plant species growing together in a particular location with a specific association with each other. *Species richness* is a simple and easily interpretable indicator of biological diversity (Peet 1974). *Regeneration potential* represents the ability of a species to complete the life cycle. Regeneration remains a key process for the existence of species in a community under varied environmental conditions (Khumbongmayum *et al* 2005). In forest management, the regeneration study not only depicts the current status but also hints about the possible changes in forest composition in the future (Malik and Bhatt, 2016, Sharma *et al.*, 2014). Survival and growth of seedlings/saplings determine the successful regeneration (Good and Good 1972), which is conceivably the single most essential step toward achieving long-term sustainability of forests (Malik and Bhatt, 2016).

Keeping in view the aforesaid facts, a detailed study was made to study the regeneration status of forests in West Nashik forest division by SoFR unit Nashik. Data on regeneration status is collected along with the enumeration of the crop in four 3m x 3m sub-plots in the enumeration plots. The seedlings are enumerated in the regeneration sub-plots. The data is analyzed and used to devise prescriptions for the regeneration of forest areas by both natural and artificial means. The focus is on the tending of existing natural regeneration. The plantation is proposed merely as a supplementary activity limited to the extent to fill the deficiency in natural regeneration on the degraded and vacant areas.

Table 4.1: Regeneration status

Sl. No.	Range	Regeneration/ha	Species
1	Barhe	216	Kuda, Palas, Sadada, Tendu, teak, etc
2	Nanashi	198	Kuda, Apta, Palas, Sadada, etc
3	Harsul	312	Kuda, Palas, Beheda, Aonla, Teak, etc
4	Igatpuri	440	Alvi, Kuda, Apta, Asand, Sadada, Gliricidia,
5	Nashik	421	Bibla, Hivar, Gliricidia, Sadada, Teak, etc
6	Peint	124	Kuda, Kandhol, Beheda, Sadada, etc
7	Trimbak	486	Palas, Lokhandi, Sadada, Dhawda, etc
8	Sinnar	108	Palas, Gliricidia, Apta, Juda, etc

Analysis:

- 1) On analysis of the regeneration data of West Nashik division, it is observed that the regeneration status is poor. This is an appalling situation that needs to be tackled head-on.
- 2) The regeneration survey, as with the whole survey for the Division, was carried out as per the New Working Plan Code. This is the first such survey for the SoFR unit.
- 3) The regeneration status of these forests, i.e., a number of seedlings, is low to be considered a healthy forest.
- 4) These figures clearly indicate that:
 - a. Regeneration is abysmally poor except Trimbak and Igatpuri Ranges.

- b. Whatever the regeneration is found is more of shrubs and other inferior tree species. The proportion of regeneration of valuable tree species is exceedingly poor.
 - c. Whatever little regeneration is available is unable to grow beyond the sapling stage due to biotic pressure.
 - d. A considerable number of seedlings either dies out after attaining 1-2 metre height or could not grow beyond 1-2 metre height due to grazing and fire.
- 5) The data present us with a grim picture. Many reasons may be attributed to this calamity like:
- a. Encroachment is one of the root cause for poor regeneration where good forest areas were cleared for cultivation. This activity has removed many potential seed bearers.
 - b. One of the prime reasons for the lack of regeneration after encroachment represents fire. The menace of the fire has been recognized by everyone, but the impact is, however, to be thoroughly analyzed and understood. The seriousness with which the Forest Department is taking on fire requires a rethink.
 - c. Grazing constitutes another menace that has adversely affected the regeneration in the area, which needs to be addressed earnestly.
 - d. Tahal cutting is another serious problems of these forests. It restricts the seed formation results in poor recruitment of new seedlings in the forest area.

4.2 AREA AFFECTED BY FOREST FIRE

Forest fires are as ancient as the forests themselves. They pose a threat not only to the forest wealth but also to the entire regime of fauna and flora, and extremely disturbing the biodiversity and, the ecology and environment of a region. During summer, when there is no rain for months, the forests become littered with dry senescent leaves and twigs, which could burst into flames ignited by the slightest spark. The forest fires may be of following types:

- 1) **Surface Fire:** A forest fire may burn primarily as a surface fire, spreading along the ground consuming the surface litter (senescent leaves and twigs and dry grasses, etc.) on the forest floor and is engulfed by the spreading flames.
- 2) **Underground Fire:** The fires of low intensity, consuming the organic matter beneath and the surface litter of forest floor are sub-grouped as

underground fire. These fires usually spread entirely underground and burn for some metres below the surface.

- 3) **Ground Fire:** There is no marked distinction between underground and ground fires. The smouldering underground fires sometimes change into a Ground fire. This fire consumes root and other material on or beneath the surface *i.e.* burns the herbaceous growth on the forest floor together with the layer of organic matter in various stages of decay.
- 4) **Crown Fire:** A crown fire is one in which the crown of trees and shrubs burn, often sustained by a surface fire. A crown fire is particularly very dangerous in a bamboo forest because of the availability of good combustible material. On hill slopes, if the fire starts downhill, it spreads up fast as heated air adjacent to a slope tends to flow up the slope spreading flames along with it. If the fire starts uphill, there is less likelihood of it spreading downwards.

In West Nashik division, forest fires are typical of Surface fires. The hilly and rugged terrain present in the division requires extra efforts by the field staff to control the forest fire. Forest fires are usually seasonal. They typically start in the dry season and can be prevented by adequate precautions. The fire was prevented in the summer through the removal of forest litter all along the forest boundary. This was called "*Forest Fire Line*". This line used to prevent the fire from breaking into the forest from one compartment to another. The collected litter was burnt in isolation. Principally, the fire spreads only if there is a continuous supply of fuel (dry vegetation) along its path. The most effective way to manage a forest fire is, therefore, to prevent it from spreading, which can be done by developing firebreaks in the shape of small clearings or ditches in the forests. Ordinarily, the grazers set fire to the forests. The incidence of forest fire in good forest area is infrequent. This is because of the fact that during the fire season all leaf litter is swept for Rab burning and fire hazards is reduced to a minimum.

It is admitted fact that forest fire is under-reported. A point to be noticed with concern remains the way in which reporting is done, e.g. "Leaf litter is burnt, no loss to the government." This manner of reporting reflects ignorance of the damage fire does to the regeneration, the carbon sequestered in the deadwood and litter, the soil organisms, food and cover of birds, lizards and other lower life-forms of the forests. This manner of reporting should be dealt away with forthwith. The details of forest fire incidences in last 10 years are given below:

Table 4.2: Details of forest fire incidences

Year	No. of beats affected	No. of fire incidences	Area burnt (in Ha)	Remarks
2007-08	30	64	252.55	The fire incidences are more in Igatpuri, Nashik, Sinnar and Trimbak Ranges
2008-09	65	49	361.25	
2009-10	41	60	325.15	
2010-11	53	61	436.12	
2011-12	57	106	458.80	
2012-13	73	99	715.30	
2013-14	58	92	206.13	
2014-15	96	116	332.35	
2015-16	49	73	206.42	
2016-17	80	98	379.86	
Total	602	818	3673.93	

4.3 AREA DAMAGED BY NATURAL CALAMITIES

The damage to forests by Natural calamities is uncommon in West Nashik division. Isolated damages due to frost in nurseries do present but not well documented. Damage by the uprooting of trees by occasional stormy wind is negligible. However, these forests are at times subjected to damage by heavy rains of sheer intensity.

4.4 AREA PROTECTED FROM GRAZING

Grazing presents another severe problem in the area. The cattle population is extremely large in this area. The quality of cattle is inferior, and the stall-feeding is absent. Natural pasture land is unavailable in West Nashik division. The Grazing land present has come up only due to the removal of vegetation. To add to the problem, the scope of the increasing area under cultivated forage is rather limited because of the preference is given to the production of "human food." Maintaining the importance of livestock in the lives of many people, it is, therefore, important to rejuvenate the grazing areas especially forest grazing lands. It should be performed in a scientific manner after a thorough region-specific survey on the suitability of a particular vegetation type, among other things. Grazers should also be forced to develop the optimal use of renewable natural resources. For regulating grazing, grazing settlement has been done but it is being unfollowed and regulated as per the

carrying capacity of the area. The heavy encroachment on forest land is responsible to a vaster extent for enhancing the grazing problem.

4.5 LOPPING PRACTICES

In this division, on the hilly tract, the traditional cultivation of Nagli (Finger millet) is being done. For this, the land preparation is done by burning to prevent germination of any weed seeds after rains over that patch. For burning such patches, the lopping of tree branches is carried-out in the name of **Tahal cutting**. During the course of this operation, all branches of the trees are cut and trees look like thick poles standing over the forest area everywhere. Tahal cutting causes injuries to the trees and affects their growth and regeneration. In fact, Tahal cutting was recognized as one of the privileges of the local people from the Rabi (Protected) forests only. However, this is being done all over the area irrespective of the legal status of the forests. During the month of April and May, the entire area remains full of smoke coming from the burning of Rab. Necessary awareness about the ill-effects of Tahal cutting need to be created among the communities.

4.6 AREA INFESTED BY INVASIVE WEED SPECIES IN FORESTS

Climbers cause considerable damage in the forest, where the conditions are favourable for their growth by twining around the boles and spreading over the crowns of the trees. Grasses and shrubby weeds, if not kept under control cause considerable damage to young plants and in addition, cause a fire hazards in the forest. *Lantana* is invading in big patches of open areas all over, hindering the natural regeneration of valuable species. Dense patches of Karvi also hinder the natural regeneration of the forest tree species. *Loranthus* infection is noticed and is scattered throughout the forest. It is typically found on the branches of Salai, Mango, Moha, Sadada, Dhawda, etc.

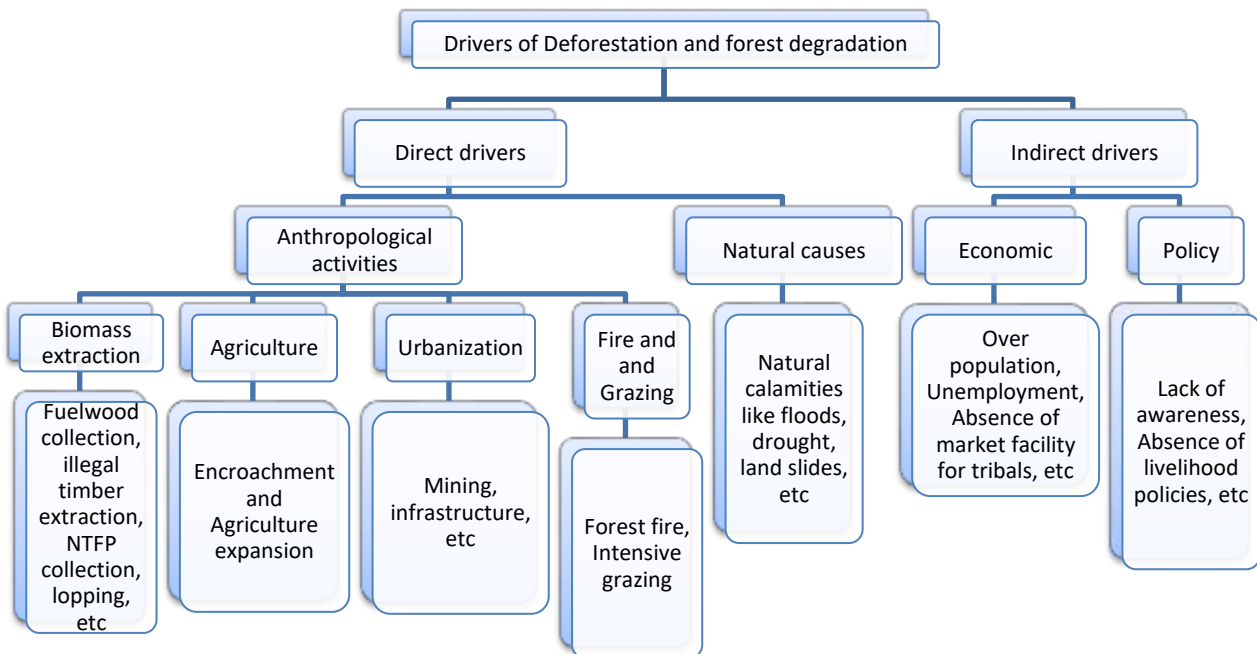
4.7 INCIDENCES OF PESTS AND DISEASES

Attacks of teak defoliator (*Hyblaea puera*) and the leaf skeletoniser (*Hapalia machaeralis*) occur almost every year in teak stands, but the damage is seldom of a severe nature. *Fomes* and *Ganoderma* of Polyporaceae, sporadically occur on decayed heartwood of semi-evergreen species.

4.8 FOREST DEGRADATION AND ITS DRIVERS

The forest dynamics and transitions can be studied well by understanding the drivers of deforestation and forest degradation at regional as well as national level. Depending upon the causes there are two varied types of drivers *i.e.* proximate/direct drivers and underlying/indirect drivers.

- a) The direct drivers of deforestation comprise the anthropogenic activities that directly affect the loss of forest, which can be grouped into different categories like agriculture expansion, expansion of infrastructure and wood extraction (Geist and Lambin, 2001). Agricultural expansion has been identified as a key driver of deforestation in the tropics (Gibbs *et al.*, 2010), drivers vary regionally and temporally (Rudel *et al.*, 2009; Boucher *et al.*, 2011).
- b) The indirect drivers of deforestation comprise the Economic issues (like population growth, unemployment, etc.) and Policy issues of the Centre and State.
- c) Development and implementation of policies adequately addressing the issues of livelihood of forest-dependent communities and the protection of the environment can fulfill a significant role in the conservation of forests.



4.9 POLLUTION CONTROL AND PROTECTION OF ENVIRONMENT

Nasik remains a fast-growing city in the industrial sector. It is typically having its own vast history of industries. The Maharashtra Industrial Development Corporation (MIDC) has developed an industrial zone in a distinctive area like Ambad, Satpur, Gonde, Igatpuri, and Sinnar. HAL (Hindustan Aeronautics Ltd.), Mahindra and Mahindra, Bosch (MICO), VIP, CEAT, ABB, Crompton Greaves, SIEMENS, Kirloskar Oil Engine and Glaxo, remain steadfastly notable industries in Nasik.

Table 4.3: Industries operating in Nashik district

Sl. No.	Category	Number of Enterprises		
		Manufacturing	Service	Total
1	Micro	5634	3697	9331
2	Small	2732	2496	5228
3	Medium	29	4	33
	Total	8395	6197	14592
4	Large scale Projects	178	0	178

The above industries are said to be in the non-forest areas. Some industries also present in Municipal Corporation area. However, their effect on the forest areas and the water resources of the forest cannot be ruled out in the form of both air and water pollutions. There is habitually a tendency of industries to discharge their waste/effluents into water bodies haphazardly. Strict measures like maintaining of green belts inside as well as around the industrial areas and effluent treatment plants in all industrial estates need to be strictly regulated. Also, action should be taken against those industries that violate the norms of pollution levels.

CHAPTER-5

CONSERVATION AND MAINTENANCE OF SOIL AND WATER RESOURCE

Forests and trees deliver an essential contribution to food security by helping to maintain the environmental conditions needed for agricultural production. They stabilize the soil, prevent erosion, enhance the land's capacity to store water, and moderate air and soil temperatures. The importance of these effects has frequently been overlooked in the past, with the clearance of tree vegetation and the subsequent loss of millions of hectares of productive land. As the forests continue to be cleared, exposing the land to direct attack from the wind and rain. Soil erosion and land degradation are still undermining natural resource base. Soil erosion comprises a form of soil degradation which involves the wearing away of topsoil. This natural process is caused by the dynamic activity of erosive agents, *i.e.*, water, ice (glaciers), snow, wind, plants, animals and humans.

As forests are cleared and the land becomes increasingly degraded through misuse, water supplies suffer. In an environment with vegetative cover, the soil acts as a gigantic sponge, accumulating a vast quantity of water that is used by plants and trees and then released gently into streams and rivers. Degradation limits the storage capacity of this sponge, leading to water shortages during dry seasons and, to brief destructive floods in humid seasons, during which very little water is absorbed by the soil. The rate at which soil erosion occurs depends critically on the land's vegetative cover. If we withdraw it, the soil begins to crumble and bare soil offers no protection against the ravages of the wind and rain. The ground cover and litter layer beneath the forest canopy provides conceivably the most proper protection against erosion and are even more important than trees themselves in preventing erosion. The reforestation of erosion-prone areas can prevent these destructive effects.

5.1 AREA TREATED UNDER SOIL AND WATER CONSERVATION MEASURES

The area in West Nashik forest division can be divided into two; one with excessive rainfall and the other rain shadow. Soil erosion represents a vital problem of agricultural development in the district, particularly in the western talukas (Igatpuri, Trimbak, Surgana and Peint Talukas). It is hilly and the steeply sloping area receiving very high rainfall (above 2500 mm), is having extremely poor and thin soil layers. Cultivation takes place even on gentle

slopes. Therefore, physical erosion has resulted in a considerable loss of fertile soil cover. Therefore, it is necessary to conserve the soil by adopting suitable soil and water conservation measures on 'ridge to valley' concept. After the enactment of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, these areas witnessed a surge in the clearing of forest areas to get benefits under the above Act. This will be going to impact on the degradation of both forest and agriculture lands in a massive way. There is a pressing need for restoration of these lands through coordinated efforts from the Forest department, Tribal Development Department, Agriculture Department, and District administration.

5.1.1 Jalyukta shivar

Maharashtra government has launched the programme "Jalyukta Shivar Abhiyaan" in a bid to make Maharashtra a drought-free state by 2019. The project involves taking up of extensive soil and water conservation measures like deepening and widening of streams, construction of cement and earthen dams, work on nala and digging of ponds, etc. The key aim of Jalyukta Shivar Abhiyan is to establish belief in a farmer that "every drop of rainwater is owned by me and it should percolate in my land."

This flagship programme of the Maharashtra state aims to conserve moisture insitu. It works with the village as a unit for deciding the interventions and aims to make the village saturated with water by taking up the extensive soil and water conservation measures. This programme is implemented based on the micro-watershed principle.

The Objectives of Jalyukta Shivar programme is:

- 1) The increasing area under irrigation in the state; increasing assured water for farming and efficiency of water usage.
- 2) Harvesting maximum rainwater in the surrounding of the village itself.
- 3) Creating decentralized water storages.
- 4) Creating public concern/awareness about the balanced use of water.
- 5) Initiating new projects to create water storage capacity.
- 6) Sensitizing people about water harvesting/increasing public participation.
- 7) Reinstating/increasing the water storage capacity of existing and under utilised water sources (small dams/village tanks/percolation tanks/cement dam).

- 8) Increasing the level of groundwater.

5.2 DURATION OF WATER FLOW IN THE SELECTED SEASONAL STREAMS

The water flow in rivers like Godavari, Vaitarna, and their tributaries lasts till the end of October. But the water stored in different reservoirs allows water even till the end of February.

Central Ground Water Board monitors water levels in 57 GWMW (Ground water monitoring wells) stations in the district. These GWMW are measured four times in a year *viz.*, January, May (Premonsoon), August and November (Postmonsoon) in the year 2011.

- 1) Depth to Water Level (Premonsoon): The premonsoon depth to water levels monitored during May 2011 ranges between Ground level (Harsul) and 19.24 metres below ground level (Ravalgaon). The water levels in a significant part of the district traversing entire western, central, northeastern and eastern parts are between 5 and 10 metres bgl (below ground level). Shallow water levels within 5 metres bgl occur in southwestern parts of the district in parts of Peint, Trimbakeshwar and Igatpuri talukas.
- 2) Depth to Water Level (Postmonsoon): The depth to water level during postmonsoon ranges between 0.20 metres bgl (Khambale) and 18.42 metres bgl (Satana). The water levels between 5 and 10 metres bgl have been observed in significant parts of the district in the southern, northern and central parts of the district. The shallow water levels within 5 metres bgl are observed in southwestern and Northwestern parts of the district covering parts of Nasik and Igatpuri talukas. Extremely shallow water levels within 2 metres bgl are observed in western and southwestern parts in Peint, Trimbak and Igatpuri talukas.
- 3) Water Level Trend (2002-2011): The trend of water levels for premonsoon and postmonsoon periods for the last ten years (2002-2011) has been computed. Analysis of long-term water level trend data indicates that rise in water levels in the premonsoon period has been recorded at 37 National Hydrograph Network Station (NHNS) and its ranges from 0.01 (Vasali) to 3.12 m/year (Thengode) and fall in water levels has been observed in 16 NHNS and it ranges between negligible (Tinghri) to 1.19 m/year (Shirpurwade-Baglan). During the postmonsoon period rise in water levels has been recorded at 32 GWMW ranging from negligible

(Karajgaon) to 1.27 m/year (Sakara) while at 22 GWMW falls in water level have been recorded and it ranges between negligible (Chachadgaon) and 1.00 m/year (Tinghri). Thus in critical parts of the district, both during premonsoon and postmonsoon seasons declining water level trends have been recorded.

5.3 WETLANDS IN FOREST AREAS

In Nasik district, Nandur-Madhmeshwar Sanctuary and Gangapur Reservoir are known wetlands. Nandur-Madhmeshwar Sanctuary is in East Nashik division whereas the Gangapur reservoir is in West Nashik division. The reservoir is spread over 4,000 ha. About 27 species of the birds were observed in the Gangapur reservoir, out of which 13 were migratory; among them, nine represent migratory waterfowl. Approximately 7,000 birds were observed here. Fishing and aquaculture practices are carried out extensively in this reservoir.

5.4 WATER LEVEL IN THE WELLS IN THE VICINITY (UPTO 5 KM) OF FOREST AREA

The yields of the wells represent the functions of the permeability and transmissivity of the aquifer encountered. This varies with location, diameter, and depth of wells. There are primarily three types of groundwater structures *i.e. dug wells, bore wells and tube wells* in the area. Their yield characteristics are presented in Table 5.1. Dug wells are generally used for both domestic water requirements and minor irrigation purposes in the district. The depth of dug wells in the Basaltic area of the district ranges from 12 to 15 metres and the yield varies from 45 to 90 m³/day, depending upon the local hydrogeological conditions. Borewells drilled down to 70 metres depths, tapping weathered and vesicular basalt are found to yield 18 to 68 m³/day. The discharge of Piezometers ranges from 0.14 to 1.73 as seen from CGWB data. This variation of yields in the single type of aquifer is due to lateral/spatial variation in permeability of the formation/aquifer material. The dug wells constructed in Alluvium have been ranging in depth from 8-12 metres with diameters of 2-3 metres, whereas the borewells range in depth from 15 to 20 metres and the yield of both the dug wells and borewells range from 13 to 22 m³/day.

Table 5.1: Yields of Wells

Sl. No.	Formation	GW Abstraction Structure	Depth Range (m bgl)	Yield Range (m ³ /day)
1	Alluvium	Dugwell	8 to 12	13 to 22
		Shallow Tubewell	15 to 20	
2	Basalt	Dugwell	12 to 15	45 to 90
		Borewell	50 to 70	18 to 68

5.5 STATUS OF AQUIFERS

Seasonal water level fluctuation between premonsoon and postmonsoon of 2011 have been computed by the Central Ground Water Board (CGWB). Water level fluctuation in the range of 0.19 (Kona) to 1.14 metres (Thengode) is observed in the district. The rise in water levels in the range of 2 to 4 metres is observed in notable parts of the district in the northeast to the southwest patch. The rise of 0 to 2 metre is observed in isolated patches in the northern part of the district in Baglan taluka and the southern part of the district in Sinnar taluka.

Groundwater development depends on many factors *viz.*, water availability, crop water requirement, socio-economic fabric, and on the yield of the aquifers existing in that area. Groundwater in the district is predominantly used for irrigation as it is the major groundwater utilizing sector. The groundwater development in the district is mostly through dug wells. Groundwater bears considerable significance for agricultural development in the district. Groundwater development in some parts of the district has attained a critical stage resulting in a decline of groundwater levels. Like so, there is a need to adopt an integrated approach of the development of groundwater resources dovetailed with groundwater augmentation to provide sustainability to groundwater development.

In the Basaltic area, the artificial recharge structures feasible are check dams, gully plugs, percolation tanks, nala bunds, etc. The structures like gully plugs and contour bunds are most favourable in hilly areas, particularly in parts of Sinnar and Peint talukas and, parts of Trimbak and Igatpuri taluka. Existing dug wells can equally be used for artificial recharge; however, the source water should be properly filtered before being put in the wells. The most feasible artificial recharge structure suitable for alluvial areas restricted along

the banks of chief rivers and their tributaries are shallow recharge wells on the riverbed of the tributaries. Percolation tanks are equally suitable, wherever source water availability is present. The sites for artificial recharge structures need to be located where the hydrogeological conditions are favourable, *i.e.*, where sufficient thickness of the de-saturated/unsaturated aquifer exists and water levels are more than 5 metres deep.

The scope exists for the construction of a suitable artificial recharge structure in the district. The structure recommended particularly for the hilly area occupying parts of Sinnar taluka and almost entire Peint, Trimbak and Igatpuri taluka are contour bunds, gully plugs, Nala bunds, and check dams, etc. For other hard rock areas of the district, Nala bunds, check dam, Kolhapur type (KT) weirs, and percolation tanks at suitable sites are suggested. The existing dug wells may equally be used for artificial recharge of groundwater by ensuring that the water used for recharge should be free from silt and other impurities.

CHAPTER-6

MAINTENANCE AND ENHANCEMENT OF FOREST RESOURCE PRODUCTIVITY

A forest represents a natural, self-sustaining community characterized by a vertical structure established by the presence of trees. Forest can exist in many diverse regions under a broad range of conditions, but all true forests share these physical characteristics. Because the forest comprises a natural community, no forest is static in time. That is because forest communities respond to external influences; most forests are in a state of constant flux. Depending upon the systems within which forest communities exist, such factors include climatic, edaphic, physiographic and biotic factors. At any time, a forest remains a collection of past responses to outside influences and internal competitive interactions. Therefore, the present status of any forest, indeed of any natural community, reflects what has gone on in the past.

Growing stock is considered as a primary indicator of forest health and productivity. The precise information on growing stock which represents the measure of the substance of its tree wealth and, includes distribution of stems in different girth classes is required for strategic planning of the forestry sector at various levels.

6.1 GROWING STOCK OF WOOD

Growing stock consists of the volume of all living trees in a given area of forest that has more than a 30 cm girth at breast height. It is typically measured in solid cubic metres (m³) and includes the stem from ground level. Growing stock provides information on existing wood resources but also a basis for estimating the amount of carbon contained.

Inventory of forest crop in West Nashik division was carried out by the SoFR unit, Nashik. The enumeration data were analyzed by the Chief Statistician, PCCF office, Nagpur. The inventory technique developed by the Forest Survey of India (FSI), Dehradun is followed for Growing stock estimation of West Nashik division (fsi.nic.in/isfr2017/isfr-growing-stock-2017). This technique includes that the Survey of India (SOI) topo-sheets of 1:50000 (size 15^lX15^l) scale is divided into 36 grids of 2.5^l X 2.5^l. Further, each grid is divided into four sub-grids of 1.25^l X 1.25^l forming the sampling frame. Subsequently,

two of the sub-grids are at randomly selected to lay out the sample plots. The sampling design is given in Figure 6.1:

The growing stock of forest crop of West Nashik division is enumerated by following above sampling design. The details of the growing stock of standing crop in West Nashik division are as given below:

Table 6.1: Details of Growing stock of standing crop

Sl. No.	Name of Working Circle	Details	Total	General utility species	Special utility species	NTFP species	Other species
1	Afforestation W.C	volume/ha	15.25	1.36	0.97	4.18	8.74
		trees/ha	28.66	5.69	1.51	7.54	13.92
2	Improvement W.C.	volume/ha	34.56	4.49	6.52	6.43	17.18
		trees/ha	59.54	15.86	4.06	10.09	29.53
3	Kuran W.C.	volume/ha	5.88	0.29	0.73	0.81	4.05
		trees/ha	23.73	2.09	1.40	1.63	18.61
4	Plantation W.C	volume/ha	14.51	1.61	2.42	3.43	7.06
		trees/ha	40.22	11.40	2.08	6.59	20.15
5	Protection W.C	volume/ha	10.18	0.55	1.58	3.87	4.18
		trees/ha	20.14	2.26	1.56	5.94	10.38
Total weighted average		volume/ha	19.29	1.99	2.93	4.49	9.89
		trees/ha	42.92	10.51	2.74	8.16	21.51

Note:	
Category of Species	Name of Species
A: Species of General Utility	Bibla, Bondara, Kakad, Sadada, Teak.
B: Species of Special Utility	Dhawada, Hiwar, Kalamb, Khair, Kudai, Sawar
C: Species of Minor Forest Produce	Apta, Awala, Amba, Behada, Bor, Chinch, Hirda, Jambhul, Moha, Neem, Nilgiri, Palas, Shiras.
D: Other Species	Acasia, Asand, Babhul, Bhuskut, Gliricidia, Maharukh, Umbar, Waras etc.

The details of Growing stock as per the report of Global Forest Resources Assessment 2015 by Food and Agriculture Organization (FAO) is given below along with the Growing stock of forests in the West Nashik division.

Table 6.2: Growing stock comparison with National and Worlds forests growing stock

Sl.No.	Details of forest	Category	Unit of measurement	Quantity	Source
1	World's forest	Total G.S.	billion m ³	531.00	Global Forest Resources Assessment Report 2015 by FAO
		G.S/ha	m ³	129.00	
2	Forests of Asia	Total G.S.	billion m ³	55.00	
		G.S/ha	m ³	93.00	
3	Indian forests	Total G.S.	million m ³	4218.38	SFR 2017 Report by FSI
		G.S/ha	m ³	54.97	
4	Maharashtra forests	Total G.S.	million m ³	252.60	
		G.S/ha	m ³	41.01	
5	West Nashik forests	Total G.S.	million m ³	14.23	Inventory by SOFR unit Nashik
		G.S/ha	m ³	16.86	

- 1) The growing stock depends on species, climate, topography, soil, etc. So, we cannot compare with Worlds or Asian forests figures. But these figures will definitely inform us where we stand as far as Growing stock of our forests is concerned and planning for its improvement.
- 2) The volume of economically primary species like teak is very less and the crop is dominated by miscellaneous species as far as volume of the crop is concerned. This area supports good teak forests and efforts need to be taken to improve the density of teak and its economically significant associate species through interventions like an artificial plantation.
- 3) The proportion of NTFP species is also not very encouraging. Intervention needed for improving the stock of local NTFP species.
- 4) The total crop density represents 43.92 trees/ha while crop volume is 16.86 m³/ha. It is because of heavy biotic pressure on forests prevalent in this area.

6.2 GROWING STOCK OF BAMBOO

Bamboos are a very important non-timber forest resources found in forest areas. They are fast growing, widely present, renewable, versatile and low cost natural resource. With the growing demand for timber, the bamboo are viable substitute for timber in our country. They play an important role in carbon sequestration and biodiversity conservation. The estimation of Growing stock of bamboo in West Nashik division was done by the random sampling of selected Clumps in Compartments having a good bamboo crop. The details of the study are given below:

Table 6.3: Bamboo estimation details

Sl. No.	Range	Compartment	Clumps studied	No. of Culms				Damaged Culms	Avg height (m)	Remarks
				Current year	1 to 2 year	Above 2 year	Total			
1	Igatpuri	290	16	306	312	113	731	117	12	
2	Igatpuri	336	19	538	425	331	1294	335	12	
3	Igatpuri	391	15	438	307	93	838	259	12	
4	Igatpuri	289	16	364	225	92	681	74	12	
5	Trimbak	240	16	320	215	67	602	69	10	
6	Harsul	181	15	64	0	0	64	0	6	Old plantation
7	Peint	75	13	276	158	32	466	0	11	
8	Peint	21	13	317	116	66	499	58	12	Old plantation
9	Barhe	20	16	153	41	8	202	43	8	
10	Barhe	20	17	302	87	14	403	67	9	
11	Nashik	73	10	58	3	2	63	17	4	

Analysis:

- 1) The bamboo crop is restricted to very few compartments due to biotic pressure. Most of these bamboo clumps are unmanaged regularly may be due to the non-availability of skilled labour.

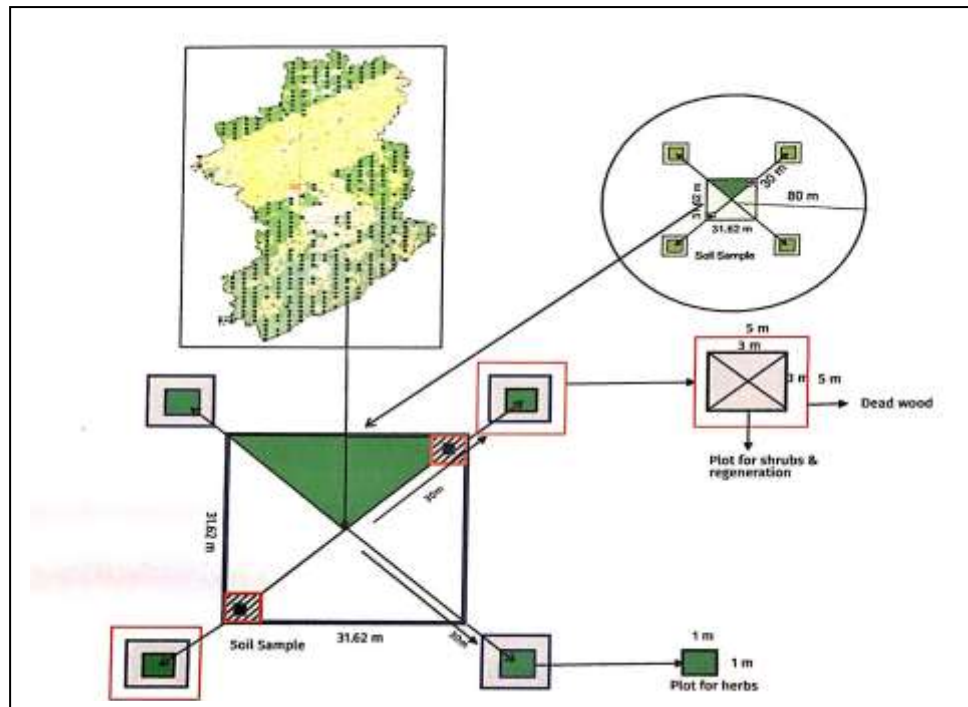


Fig 6.1: Lay-out of forest inventory plot

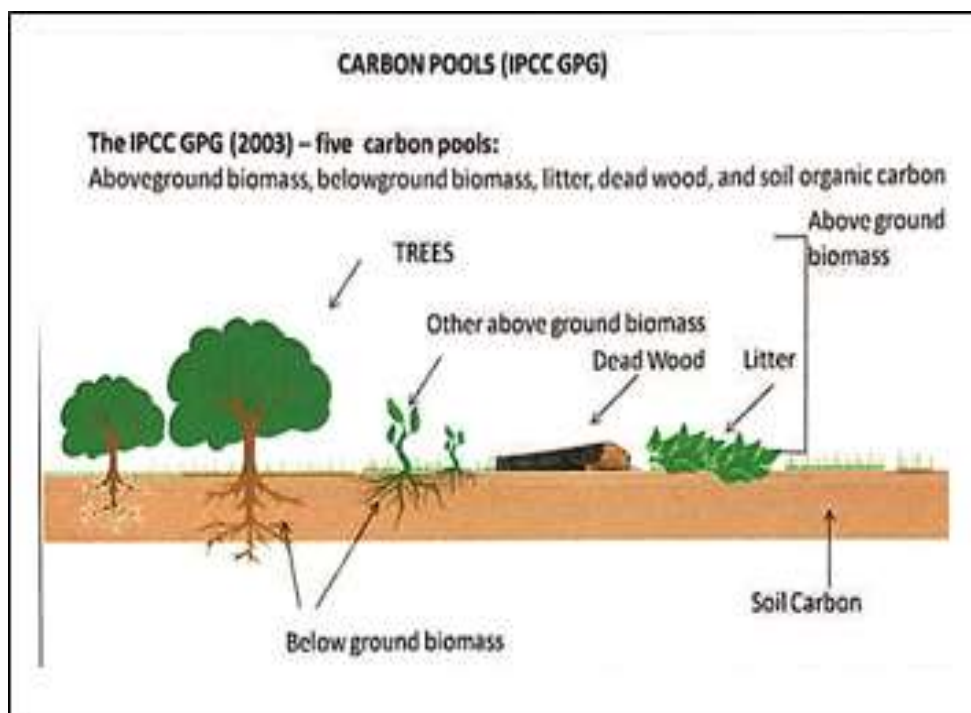


Figure 6.2: Carbon pools as per IPCC GPG

- 1) The bamboo clumps become congested and need to be worked directly to alleviate the congestion and provide space for the emergence and growth of new culms.
- 2) The damaged culms are in good numbers in all Clumps and need to be removed forthwith; otherwise, it may create a fire hazard.
- 3) Regular working is necessary for maintaining the hygiene of the clumps and also to derive revenue from bamboo extraction.
- 4) The forests of West Nashik division represent potential sites for bamboo growth. Being most of the areas in West Nashik division comes under PESA, aggressive efforts are required to increase bamboo crop in forest area to provide economical benefits to the local communities.

6.3 INCREMENT IN VOLUME OF IDENTIFIED TIMBER SPECIES

In preference, the variation in Growing stock from the last Enumeration is given below. The data regarding the volume of identified species are unavailable for comparison.

Table 6.4: Comparative statement of density of trees of earlier and current enumeration

Sl. No	Name of Working Circle	Past Enumeration (trees/ha)	Sl. No.	Name of Working Circle	Current enumeration (trees/ha)
	(Aril 2002- March 2003)			(Oct-2014 to May-2018)	
1	Reafforestation W. C.	23.73	1	Afforestation W. C.	28.66
2	Improvement W.C.	63.20	2	Improvement W.C.	59.54
3	Fodder protection W.C	5.46	3	Kuran W.C.	23.73
4	Pasture W. C.	7.71	4	Plantation W.C.	40.22
5	Protection W. C.	23.30	5	Protection W.C.	20.14
6	Fuelwood W. C.	89.95			
Weighted Average		46.07	Weighted Average		42.92

- 1) Compared to earlier enumeration, there is a decrease in Growing stock during the current enumeration.
- 2) It shows the degradation of the crop over a period of time.
- 3) The biotic pressure on forests is progressively increasing with time.

6.4 EFFORTS TOWARDS ENHANCEMENT OF FOREST PRODUCTIVITY THROUGH QUALITY PLANTATION ACTIVITIES

During the Plan period, there has been no particular occasion where qualitative improvement in plantation activities has been taken up. The plantations were done as per the traditional way. Plantations using the latest technology in terms of high-tech nurseries for raising quality planting material, drip irrigation, chain-link fencing, etc., have been provided recently in both Natural regeneration and artificial afforestation models by the Forest department. These interventions will help in improving the Growing stock in the future.

The grass and fodder plantation has been taken up by way of grass beds prepared by ploughing and seed sowing. But the desired results are unseen. There is a need for considering an alternative technique for raising grass and fodder plantations.

6.5 CARBON STOCK

Forests and climate are intimately intertwined. Forests constitute both sources and sinks of carbon. A growing forest captures carbon from the atmosphere and a mature forest is a storehouse of carbon. According to the Global Resource Assessment Report 2015 of FAO (FAO, 2015), the total forest carbon stock of the world is 296 Gigatonnes (73 tonnes/ha). Forests play a significant role in the mitigation and adaptation of climate change. Forests sequester and store more carbon than any other terrestrial ecosystem and represent a valuable natural brake on climate change. Carbon sequestration by forests has attracted much interest as a mitigation approach, as it has been considered a relatively inexpensive means of addressing climate change immediately.

Good practices Guidance (GPG) developed by the Intergovernmental Panel on Climate Change (IPCC) are a universally accepted sourcebook for all issues related to forest carbon stocks.

The carbon sequestered in the forest ecosystem is classified into five pools by GPG. The living portion of biomass carbon is classified into two pools: the aboveground biomass (AGB) and below-ground biomass (BGB), which stores a significant amount of carbon. The dead organic matter (DOM) is also classified into two pools: 'dead wood and litter.' The fifth pool is Soil organic matter (SOM) which contains a substantial amount of carbon.

Table 6.5: Carbon Pools description

	Pool	Description
Living Biomass	Above Ground biomass (AGB)	All living biomass above soil including stem, stump, branches, bark, seeds and foliage.
	Below Ground biomass (BGB)	All living biomass of live roots, fine roots of less than 2 mm diameter are often cannot be distinguished empirically from soil organic matter or litter.
Dead organic matter	Dead wood	Includes all non-living woody biomass not contained in the litter, either standing or lying on the ground. Dead wood also includes dead roots and stumps larger than or equal to 10 cm in diameter.
	Litter	Includes all non-living biomass with a diameter less than a minimum diameter chosen by the country (5 cm in India), lying dead, in various states of decomposition above the mineral or organic soil.
Soil	Soil organic matter (SOM)	Includes organic carbon in mineral and organic soils (including peat) to a specific depth chosen by the country (30 cm in India) and applied consistently through the time series.

Carbon stock in the forests of West Nashik division has been calculated using the above technique and the details of calculation is provided in Appendix I.47. The working circle-wise Carbon stock in West Nashik division is given below:

Table 6.6: Working Circle-wise Carbon Stock

Sl. No	Working Circle	Avg. Growing Stock per ha (m ³ /ha.)	Total area of WC (Ha)	Total Growing Stock (m ³)	Total Carbon Stock (Metric ton)
1	Improvement WC	34.56	39251.36	1356409.39	447615.10
2	Afforestation WC	52.20	21099.14	1102366.82	363781.05
3	Protection WC	10.18	11377.88	115849.55	38230.35
4	Kuran WC	5.89	2778.90	16359.38	5398.59
5	Plantation WC	14.51	11764.91	170755.85	56349.43
Total		117.39	86272.19	2761740.98	911374.52

6.6 CARBON SEQUESTRATION AND MITIGATION

Carbon sequestration occurs both naturally and as a result of anthropogenic activities and typically refers to the storage of carbon that possesses the immediate potential to become carbon dioxide gas. In response to growing concerns about climate change resulting from increased carbon dioxide concentrations in the atmosphere, considerable interest has been drawn to the possibility of increasing the rate of carbon sequestration through changes in land use and forestry and also through geo-engineering techniques like carbon capture and storage.

6.6.1 Carbon Sources and Carbon Sinks: Anthropogenic activities like the burning of fossil fuels have released carbon from its long-term geologic storage as coal, petroleum and natural gas and have delivered it to the atmosphere as carbon dioxide gas. Carbon dioxide is also released naturally, through the combustion and decomposition of plants and animals. The amount of carbon dioxide in the atmosphere has increased since the beginning of the industrial age, and this increase is caused primarily by the burning of fossil fuels. Carbon dioxide is an effective greenhouse gas that absorbs infrared radiation emitted from Earth's surface. As carbon dioxide concentrations rise in the atmosphere, more infrared radiation is retained, and the average temperature of Earth's lower atmosphere rises. This process is referred to as global warming.

Reservoirs that retain carbon and prevent it from entering Earth's atmosphere are known as carbon sinks. For example, deforestation remains a source of carbon emission into the atmosphere, but forest regrowth represents a form of carbon sequestration, the forests themselves serving as carbon sinks. Carbon is transferred naturally from the atmosphere to terrestrial carbon sinks

through photosynthesis; it may be stored in aboveground biomass as well as in soils. Beyond the natural growth of plants, other terrestrial processes that sequester carbon include the growth of vegetation on cleared land, land-management practices that absorb carbon and increased growth due to elevated atmospheric carbon dioxide levels and enhanced nitrogen deposition. It is significant to note that carbon sequestered in soils and aboveground vegetation could be released again to the atmosphere through land-use or climatic changes. For example, combustion (which is caused by fires) or decomposition (which results from microbe infestation) can cause the release of carbon stored in forests to the atmosphere. Both processes join oxygen in the air with carbon stored in plant tissues to produce carbon dioxide gas.

If the terrestrial sink becomes a significant carbon source through increased combustion and decomposition, it contains the potential to add enormous amounts of carbon to the atmosphere and oceans. Globally, the combined amount of carbon in vegetation, soil, and detritus is about 2,200 gigatons (1 gigaton = 1 billion tons), and it is estimated that the amount of carbon sequestered annually by terrestrial ecosystems is approximately 2.6 gigatons. The oceans themselves also accumulate carbon, and the amount found just under the surface is about 920 gigatons. The amount of carbon stored in the oceanic sink exceeds the amount in the atmosphere (about 760 gigatons). Of the carbon emitted to the atmosphere by human activities, only 45 percent remains in the atmosphere; about 30 percent is taken up by the oceans, and the remainder is incorporated into terrestrial ecosystems.

6.6.2 Carbon Sequestration and Climate Change Mitigation: The Kyoto Protocol under the United Nations Framework Convention on Climate Change (UNFCCC) allows countries to receive credits for their carbon-sequestration activities in the area of land use, land-use change, and forestry as part of their obligations under the protocol. Such activities could include afforestation (conversion of non-forested land to forest), reforestation (conversion of previously forested land to forest), improved forestry or agricultural practices, and re-vegetation. According to the Intergovernmental Panel on Climate Change (IPCC), improved agricultural practices and forest-related mitigation activities can deliver a significant contribution to the removal of carbon dioxide from the atmosphere at a relatively reasonable cost. These activities could include improved crop and grazing land management, for instance, more efficient fertilizer use to prevent the leaching of unused nitrates, tillage practices that minimize soil erosion, the restoration of organic soils, and the restoration of degraded lands, etc.

6.6.3 Carbon Capture and Storage: Some policymakers, engineers, and scientists seeking to mitigate global warming have proposed innovative technologies of carbon sequestration. These technologies include a geo-engineering proposal called carbon capture and storage (CCS). In CCS processes, carbon dioxide is first separated from other gases contained in industrial emissions. It is then compressed and transported to a location that is isolated from the atmosphere for long-term storage. Suitable storage locations might include geologic formations like deep saline formations (sedimentary rocks whose pore spaces are saturated with water containing elevated concentrations of dissolved salts), depleted oil and gas reservoirs, or the deep ocean. Although CCS typically refers to the capture of carbon dioxide directly at the source of emission before it can be released into the atmosphere, it additionally also include techniques like the use of scrubbing towers and “artificial trees” to remove carbon dioxide from the surrounding air. There are many economic and technical challenges in implementing carbon capture and storage on a large scale. So, the carbon sequestration through vegetative means is easy to implement, and the direct benefits can be provided to the community.

CHAPTER-7

OPTIMIZATION OF FOREST RESOURCE UTILIZATION

Forest resources provide various materials that meet basic human needs like food and health-care. However, the use of these resources and the manners of their removal from the forest has remained a fundamental problem when considering sustainability. The efficient utilization of forest resources would lead to sustainable resource use in forest management. The result would lead to a constant supply of needed resources. Forest resources refer to all products from the forest, and its values could be quantified in relation to their benefits to man. The assessment of forest resources and its removal need to be studied before providing prescriptions for subsequent management.

7.1 RECORDED REMOVAL OF TIMBER

The prescriptions provided in the earlier Working Plan were mostly related to improvement of the forest crop and hence, only improvement fellings were proposed. The details of timber harvested are given below:

Table 7.1: Details of timber harvested

Sl. No.	Year	Species	Quantity (cu. M.)	Revenue (Rs in Lakhs)
1	2007-08	Teak	443.883	146.19
		Miscellaneous	17.195	1.47
2	2008-09	Teak	443.845	143.07
		Miscellaneous	50.820	2.07
3	2009-10	Teak	474.798	108.65
		Miscellaneous	19.057	1.05
4	2010-11	Teak	125.382	33.69
		Miscellaneous	20.867	2.56
5	2011-12	Teak	73.601	20.93
		Miscellaneous	5.626	0.42
6	2012-13	Teak	41.887	13.60
		Miscellaneous	5.328	0.36
7	2013-14	Teak	30.666	79.47
		Miscellaneous	16.727	2.14
8	2014-15	Teak	16.816	3.01
		Miscellaneous	19.615	2.36
	Total	Teak	1650.878	548.61
		Miscellaneous	155.235	12.43

The above quantity of timber removed during the last Plan period mainly constitutes the timber harvested in the form of improvement fellings and the materials recovered from forest offence cases.

7.2 RECORDED REMOVAL OF FUEL WOOD

The fuelwood obtained mainly from the improvement fellings and forest offence cases. The revenue obtained from fuelwood is given below:

Table 7.2: Recorded removal of Fuelwood

Sl. No.	Year	Quantity (m³)	Revenue (Lakhs)
1	2007-08	472.425	2.78
2	2008-09	392.175	4.06
3	2009-10	48.846	1.52
4	2010-11	16.000	0.05
5	2011-12	14.835	0.12
6	2012-13	0	0
7	2013-14	0	0
8	2014-15	0	0
	Total	944.281	8.53

7.3 RECORDED REMOVAL OF BAMBOO

In the previous Plan, a total 9234.496 ha area has been allotted to Bamboo (Overlapping) working circle. The area allotted comprises potential area for bamboo development as there was good bamboo crop existed earlier. As of today good bamboo crop is present in compartment 240 and 347 of Trimbak Range, 214 in Nashik Range and 289, 290 and 291 in Igatpuri Range. Other than these compartments the bamboo is sparsely distributed. Intensive efforts need to be taken for increasing the bamboo density through quality bamboo plantations. In the year 2007-08, the gregarious flowering of Bamboo took place in Peint Range of this Division. From that area, flowered Bamboo clumps were harvested, and the yield and revenue realized are as shown in the table below.

Table 7.3: Recorded removal of bamboo

Sl.No	Village	Year	Compartment	Yield	Revenue (Rs.)	Remarks
1.	Kayara (Bormal)	2011	75	30000	239200.00	Bamboo flowering in 2007-08
2.	Pathardi (Pandav Lene)	2007	225	300	2050.00	
		2010	225	2094	42755.00	

7.3.1 Interventions in Bamboo gregarious flowering areas

The treatment administered to the area in which bamboo flowering occurred are enumerated below:

Table 7.4: Details of bamboo flowering and treatment given

Sl. No.	Village	Compartment	Bamboo clumps	Area (Ha)	Treatment given
1	Kayre	74	5580	278.941	Every year fire lines were taken in and around the compartments and the naturally grown bamboo seedlings were nurtured through soil working.
2	Kayre	75	5882	970.593	
3	Kayre	76	3855	257.653	
4	Nalshet	76	825	55.664	
5	Rajbari	76	40	14.153	
6	Gandole	Sy No. 5, 24, 28, 30, 34, 41	560	149.354	
7	Chaukada	Sy No. 6, 8, 9/1	52	23.611	
8	Savarna	Sy No. 100, 107, 144, 166, 120	180	74.062	

7.4 RECORDED REMOVAL OF LOCALLY IMPORTANT NTFPS INCLUDING MAPS (MEDICINAL AND AROMATIC PLANTS)

The important Non-timber forest produces (NTFP) present in the West Nashik division are Moha (*Madhuca longifolia*), Hirda (*Terminalia chebula*), Behada (*Terminalia bellirica*), Awala (*Emblica officinalis*), Cashew (*Anacardium occidentale*), Kadhi patta (*Murraya koengi*), Kadujira (*Vernonia anthelmintica*), etc. The distribution of these Non Timber forest produce is not evenly distributed in West Nashik division. The NTFP crop is in the degraded state due to unregulated harvesting by local people. There is good potential to improve the crop to benefit the communities by taking up NR treatment and controlled harvesting through the Joint Forest Management Committees (JFMC). The data

regarding the collection of all NTFP is not available due to the absence of procurement by the Tribal Development Corporation (TDC). The data regarding the collection of Apta leaves is given below and apart from this, local villagers collect other NTFPs for their bonafide use.

Table 7.5: The details of Apta leave collection

Sl. No.	Year	Quantity (Qtl)	Revenue (Lakhs)
1	2007-08	155	0.48
2	2008-09	155	0.48
3	2009-10	160	0.49
4	2010-11	160	0.51
5	2011-12	160	0.54
6	2012-13	160	0.58
7	2013-14	180	0.59
8	2014-15	190	0.60
	Total	1320	4.27

Fruits of Hirda, Behada, Awala, etc., are marketable items. Similarly, fruits, flowers, and leaves of certain shrubs and trees are utilised for a variety of bonafied usage. The current level of collection is quite erratic and, therefore, a poor indicator of their potential in the tract. Collection of species, which are not covered under the monopoly procurement by government agencies, should be allowed by the Joint Forest Management Committees or Village Panchayats for better protection of NTFP trees. To increase its stock, all NTFP trees be numbered and allotted to the JFM committee. The members of committees who have been assigned with the job of protection and nurture of above trees, they should protect them from fire. The Range Forest Officer is supposed to monitor this activity of the JFM committee regularly and make proper documentation.

Removal of NTFPs shall be within the sustainable limits of production. Felling of trees and lopping off branches shall not be permitted for NTFPs collection. Destructive removal shall not be permitted, in any case. Digging up of plant roots, branch cutting, debarking, etc., will be considered as destructive removal.

7.5 DEMAND AND SUPPLY OF TIMBER AND NON-TIMBER FOREST PRODUCE

Non timber forest products (NTFP), that include many of traded and locally used forest products of biological origin, employ hundreds of collectors and many village traders in this region especially in tribal belts. As inadequate access to information and marketing support was found undermining the incomes of rural communities and entrepreneurs, and constraining the NTFP subsector development. Developing market access will act as a catalyst to promote community micro-enterprises for their market promotion. Both supply and demand factors hinder more vibrant NTFP markets. On the supply side, producers often lack access to credit, technology, and skills. On the demand side, markets are often enshrouding in informal arrangements where traders have monopsony or oligopsony status. In combination, supply and demand side constraints mean that producers are typically demoted to the lowest step of the value added ladder. Where NTFPs are collected, over production as a result of falling per unit prices can lead to the depletion of the resource base which, in turn, threaten collectors livelihood. The creation of well functioning NTFP markets where producers add more value will require both supply and demand side interventions.

7.6 IMPORT AND EXPORT WOOD AND WOOD PRODUCTS

In general, the local production level of wood and wood products in Nashik district cannot meet the local demand. Hence, lot of wood is imported from other districts and also from other countries. There is no record available with West Nashik division about the import and export of wood and wood products into or from Nashik.

7.7 IMPORT AND EXPORT OF NTFPS

There is lot of bamboo used as stakes for vegetatble and fruit cultivation in Nashik district. Hence, bamboo is brought from Vidarbha region to meet the domestic requirements. Nothing on the record is available on the import and export of any of the non-timber forest produce from the Nashik district with the West Nashik division.

7.8 REMOVAL OF FODDER

The fodder is harvested by the local people for their bonafide use only. No commercial harvesting of fodder is recorded in West Nashik division.

7.9 VALUATION OF THE PRODUCTS

The value of timber sold from Mhasrul depot of West Nashik division from 2007-08 to 2017-18 is given below:

Table 7.6: Details of revenue earned through sale of timber at Mhasrul depot

Sl. No.	Year	Species	Quantity sold (m ³)	Revenue (Rs in lakhs)	Rate per m ³ (Rs)
1	2007-11	Teak	233.939	75.30	32188.00
		Miscellaneous	23.425	0.99	4209.00
2	2012-16	Teak	41.887	13.60	32486.00
		Miscellaneous	5.328	0.39	6719.00
3	2017-18	Teak	10.716	5.29	49371.00
		Miscellaneous	26.029	5.16	19839.00

CHAPTER-8

MAINTENANCE AND ENHANCEMENT OF SOCIAL, ECONOMIC, CULTURAL AND SPIRITUAL BENEFITS

Forests provide a broad range of economic and social benefits to humankind. These include contributions to the general economy. They additionally include the hosting and protection of sites and landscapes of significant cultural, spiritual or recreational value. Maintaining and enhancing these functions are an integral part of sustainable forest management. Information on the status of and trends in socio-economic benefits are therefore essential in evaluating progress towards sustainable forest management. Economic benefits are typically measured in monetary terms and may include income from employment in the sector, the value of the production of goods and services from forests, and the contribution of the sector to the national economy, energy supplies, and international trade. In addition, the economic viability or sustainability of the sector can be assessed by measures like the profitability of forest enterprises or the level of investment. The social functions of forests are often more delicate to measure and can vary considerably among countries, depending on their level of development and traditions. Indicated the difficulties of measuring the social benefits of forests, social functions are often measured in terms of inputs rather than outputs (e.g. the area or proportion of forests used to provide various social functions). The variety of cultural and spiritual values ascribed to the forests are as numerous and diverse as the communities and cultures of the region. Forests feature in all aspects of culture; language, history, art, religion, medicine, politics, and even social structure itself.

8.1 NUMBER OF JFM COMMITTEES AND AREA PROTECTED BY THEM

Joint Forest Management (JFM) remains the official and customary term in India for partnerships in forest management involving both the state forest departments and local communities. The policies and objectives of the Joint Forest Management are detailed in the Indian comprehensive National Forest Policy of 1988 and the Joint Forest Management Guidelines of 1990 of the Government of India.

The Government of Maharashtra vide Government Resolution dated 16/03/1992 adopted the JFM approach for degraded forest areas. Thereafter,

the scope of JFM was extended to good quality forests also through the Government Resolution dated 25/04/2003. Later, on 5/10/2011, the JFMCs were provided legal backing by transferring them under the umbrella of the Mumbai Gram Panchayat Act 1959.

West Nashik Division has embraced the Joint Forest Management as one of the tools of forest management from 1992. Ever since the peoples/community's participation in the conservation of forest and wildlife resources has been an integral part of management. The number of JFMCs formed is 394 as per Government Resolution dated 16th March 1992, and these Committees cover an area of 1,16,935.31 hectare having 59530 members.

Table 8.1: The details of Joint Forest Management Committees

Year	Name of Range								Total
	Nasik	Sinnar	Igatpuri	Harsul	Peint	Barhe	Nanashi	Trimbak	
2000	-	02	-	-	-	-	-	-	02
2001	-	15	01	-	-	-	02	-	18
2002	-	15	-	-	-	-	01	04	20
2003	-	04	-	-	01	-	-	03	08
2004	01	02	-	-	02	-	-	-	05
2005	01	-	01	-	02	-	-	-	04
2006	23	01	35	22	46	19	18	07	171
2007	01	01	-	02	02	08	-	10	24
2008	03	01	20	04	08	19	02	02	59
2009	-	-	-	01	-	-	-	-	01
2010	-	-	-	-	-	-	-	-	-
2011	02	-	-	01	-	-	-	01	04
2012	05	05	05	05	11	03	05	05	44
2013	01	03	02	06	01	02	01	01	17
2014	-	03	02	03	03	01	03	02	17
Total	37	52	66	44	76	52	32	35	394

Table 8.2: The Range wise distribution of JFMCs

Sl.	Range	JFMCs	Area (Ha)		Sl.	Range	JFMCs	Area (Ha)
1	Nashik	37	9056.849		5	Harsul	44	24718.114
2	Trimbak	35	9630.986		6	Peint	76	19144.522
3	Sinnar	52	15273.963		7	Barhe	52	14582.511
4	Igatpuri	66	16211.215		8	Nanashi	32	8317.15
						Total	394	116935.31

8.2 STATUS OF EMPOWERMENT OF JFMCS

In order to encourage more significantly the institution of JFM, particular schemes have been introduced to reduce the biotic pressure on forest and improve the success of plantations like Distribution of LPG/Biogas, Distribution of improved cattle in lieu of scrub cattle, Protection of plantations, etc., (Revenue and Forest department, GR dated 10/12/2012).

Sant Tukaram Vangram Award is given at both districts and State level to the best performing JFMC. This initiative helps in motivating the local villagers to participate more enthusiastically in forest conservation works. The specific details of this Award received JFMCs in West Nashik division is given below:

Table 8.3: Sant Tukaram Vangram Award conferred JFMCs

Sl No	Year	Taluka	Range	Name of JFMCs	Award Accorded	Award Amt (Rs.)
1	2006-07	Igatpuri	Igatpuri	Take Harsh	Third	7500.00
2	2007-08	Peint	Peint	Garmal	Second	15000.00
3	2008-09	Peint	Peint	Gandola	First	51000.00
4	2008-09	Trimbak	Harsul	Chikhal-Pada (Hattipada)	Third	11000.00
5	2009-10	Dindori	Nanashi	Gawalipada	Second	31000.00
6	2009-10	Peint	Peint	Kayre	Third	5500.00
7	2010-11	Dindori	Nanashi	Shurgarpada (Mahaje)	Second	31000.00
8	2011-12	Dindori	Nanashi	Ambegan	First	51000.00
9	2012-13	Trimbak	Harsul	Chinchwad (Khoripada)	First	51000.00
10	2013-14	Dindori	Nanashi	Shurgarpada (Mahaje)	First	51000.00
11	2014-15	Dindori	Nanashi	Zarli	Third	5500.00

In West Nashik Forest Division, JFM committees were established in 394 villages as per Government Resolution dated 16th March 1992. Then, as per Government Resolution dated 5th October 2011, 207 committees have been rejuvenated but as on today, only 72 committees are operational in active mode. The Active committees as per Government Resolution dated 10th July 2012 (Convergence G.R.), the supply of LPG, Biogas, and supply of milch cattle by replacing scrub cattle and payment for plant protection were provided to 57 JFMCs. The details are as follows:

Table 8.4: Details of benefits provided to JFMCs

Sl.No	Particular	Categories	Year			Total
			2012-13	2013-14	2014-15	
1	LPG	ST	1873	189	341	2403
		SC	24	275	62	361
		Other	0	0	144	144
				Total		2908
2	Biogas	ST	0	12	0	12
		SC	0	0	0	0
		Other	0	0	0	0
				Total		12
3	Replacement of Scrub cattle	ST	0	57	0	57
		SC	0	5	0	5
		Other	0	0	0	0
				Total		62
4	Plant Protection	ST	144	2	0	146
		SC	0	0	0	0
		Other	0	0	0	0
				Total		146

8.3 LABOUR WELFARE

The JFM villagers have priority over others in all the activities of the Forest Department for semi-skilled and unskilled labour. Works of plantations, natural regenerations, and boundary pillars repairs, fire line cuttings, and all other works of the Forest Department are carried-out through the JFM members wherever the Committee exists.

8.4 USE OF INDIGENOUS KNOWLEDGE

The list of local people possessing indigenous traditional knowledge about eliminating human diseases by using forest plant species in West Nashik division is provided below:

Table 8.5: List of local Vaidyus in West Nashik division

Sl.No	Range	Village	Name of the Person	Diseases	Species used
1	Peint	Borichi bari	Nivas Tuakaram Gavit	Urine stone	Kurudu, Umbar
				Jaundice	Sapu mango
				Stomach pain	Karvand, Phangla,
				Piles	Kartule
				Isab	Arjun Sadada, Neem,
				Blunt Trauma	Aambe Halad, Ragat Rohada
2	Harsul	Khoripada	Shankar Rama Shinde	Piles, Urine Stone, Jaundice, Cancer, Paralysis etc.	Hirda Behada, Awala, Gulvel, Arjun sal, Palas flower, Tetu, Bibwa, Madumasni,
				For domestic animal diseases	Neem, bal hirda, dashmul, harikand, safed musali, shatawari, nirgudi etc.
3	Barhe	Barda	Kashinath Gumbade	Scorpion bite, Urine stone, bone fracture, Paralysis,	Information not provided by the said persons
		Khirtmal	Gangaram Bhime		
		Gawat	Chandar hari Gaikwad		
		Kalmane	Mahadu Khavadi		

The Department has developed its concerted effort in properly documenting the indigenous technical knowledge of the local people in the District. The West Nasik Division had arranged a meaningful workshop regarding Medicinal Plants and their practical uses in 2011-12. But it needs to be continued every year.

8.5 EXTENT OF CULTURAL/SACRED GROVES

There are no recorded sacred groves in West Nashik Division.

8.6 ECOTOURISM AREAS AND ACTIVITIES

Many Ecotourism spots were developed in West Nashik division and some important places among them are the Dugarwadi waterfall (Kachurli JFMC, Trimbak Range), Mohadari Van Udyan (Malegaon JFMC, Sinnar Range), Ghatandevi (Awalkhed JFMC, Igatpuri Range) and Anjaneri (Anjaneri JFMC, Nashik Range). These Ecotourism spots are being successfully managed by the JFMCs and serve as a source of earning for these JFMCs.

Table 8.6: Ecotourism activities in West Nashik division

Sl. No.	Range	Ecotourism sites	People visited	Revenue earned (Rs)(Entry Fee)
1	Trimbak	Dugarwadi Water Fall	3900	33740.00
2	Nashik	Anjeneri	100000	44633.00
3	Igatpuri	Ghatandevi	11000	79625.00
4	Sinnar	Mohodari Van Udyan	5000	20750.00
		Total	119900	178748.00

8.7 SOCIAL CUSTOMS

Nashik is situated at the foothills of Western Ghats, on the bank of river Godavari. Nashik is home to many temples and religious sites of the Hindu, Jain and Muslim religions. It hosts numerous religious pilgrimages and festivals, including the Nashik-Trimbakeshwar Sinhastha. Nashik is also known for its abundant fruits and vegetables. The yield of grapes, strawberries and onions in this region is among the highest in the country. The people here are known for their culture, art, literature, and food.

The tribal population is in good numbers in the West Nashik division. The Kokana, Mahadev Koli, Bhill, Warli and Katkari are leading tribes of Nashik. Essentially, these tribal belts are lacking in development and dependent on forests for their livelihood.

8.8 STATUS OF COMPLIANCE OF FOREST RIGHT ACT (FRA)

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 was notified in the Gazette of India on 2nd January, 2007. For implementation of the said Act, the Ministry of Tribal Affairs, Government of India has notified the Rules for recognition of forest rights on 1st January, 2008. These Rules were further amended by the Government of India *vide* notification dated 6th September, 2012.

8.8.1 Salient Provisions of the Forest Rights Act, 2006

8.8.1.1 Forest Rights

Section 3 (1): The following rights that secure individual or community tenure or both shall be the forest rights under the Act. They are:

- a) Right to hold and live in the forest land under the individual or common occupation for habitation or self-cultivation for a livelihood by a member or members of a forest-dwelling Scheduled Tribe or other traditional forest dwellers;
- b) Community rights like nistar, by whatever name called, including those used in the erstwhile Princely States, Zamindari or such intermediary regimes;
- c) Right of ownership, access to collect, use, and dispose of minor forest produce which has been traditionally collected within or outside village boundaries;
- d) Other community rights of uses or entitlements like fish and other products of water bodies, grazing and traditional seasonal resource access of nomadic or pastoralist communities;
- e) Rights including community tenures of the habitat and habitation for primitive tribal groups and pre-agricultural communities;
- f) Rights in or over disputed lands under any nomenclature in any State where claims are disputed;
- g) Rights for the conversion of Patta or leases or grants issued by any local authority or any State Government on forest lands to titles;
- h) Rights of settlement and conversion of all forest villages, old habitation, unsurveyed villages and other villages in forests, whether recorded, notified or not into revenue villages;

- i) Right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use;
- j) Rights recognised under any State law or laws of any Autonomous District Council or Autonomous Regional Council or which are accepted as rights of tribals under any traditional or customary law of the concerned tribes of any State;
- k) The right of access to biodiversity and community right to intellectual property and traditional knowledge related to biodiversity and cultural diversity;
- l) Any other traditional right customarily enjoyed by the forest dwelling Scheduled Tribes or other traditional forest dwellers, as the case may be, which are not mentioned in clauses (a) to (k) but excluding the traditional right of hunting or trapping or extracting a part of the body of any species of wild animal.
- m) Right to in situ rehabilitation including alternative land in cases where the Scheduled Tribes and other traditional forest dwellers have been illegally evicted or displaced from forest land of any description without receiving their legal entitlement to rehabilitation prior to the 13th day of December 2005.

8.8.1.2 Duties of holders of forest rights

Section 5: The holders of any forest right, Gram Sabha and village level institutions in areas where there are holders of any forest right under this Act are empowered to:

- a) Protect the wildlife, forest, and biodiversity;
- b) Ensure that adjoining catchment area, water sources, and other ecologically sensitive areas are adequately protected;
- c) Ensure that the habitat of forest dwelling Scheduled Tribes and other traditional forest dwellers is preserved from any form of destructive practices affecting their cultural and natural heritage;
- d) Ensure that the decisions taken in the Gram Sabha to regulate access to community forest resources and stop any activity which adversely affects the wild animals, forest and the biodiversity are complied with.

8.8.1.3 Authorities and procedure for vesting of forest rights

- a) Section 6(1): The Gram Sabha shall be the authority to initiate the process of determining nature and extent of individual or community forest rights or both that may be given to the forest dwelling Scheduled Tribes and other traditional forest dwellers within the local limits of its jurisdiction under this Act by receiving claims, consolidating and verifying them and preparing a map delineating the area of each recommended claim in such manner as may be prescribed for the exercise of such rights and the Gram Sabha shall, then pass a resolution to that effect and thereafter forward a copy of the same to the Sub-Divisional Level Committee.
- b) Section 6(3): The State Government shall constitute a Sub-Divisional Level Committee to examine the resolution passed by the Gram Sabha and prepare the record of forest rights and forward it through the Sub-Divisional Officer to the District Level Committee for a final decision.
- c) Section 6(5): The State Government shall constitute a District Level Committee to consider and finally approve the record of forest rights prepared by the Sub-Divisional Level Committee.
- d) Section 6(6): The decision of the District Level Committee on the record of forest rights shall be final and binding.
- e) Section 11: The Ministry of the Central Government dealing with Tribal Affairs or any officer or authority authorized by the Central Government in this behalf shall be the nodal agency for the implementation of the provisions of this Act.

8.8.1.4 Section 3(2)

Notwithstanding anything contained in the Forest (Conservation) Act, 1980, the Central Government shall provide for diversion of forest land for the following facilities managed by the Government which involve felling of trees not exceeding 75 trees per hectare, namely:

- 1) Schools
- 2) Dispensary or hospital
- 3) Anganwadis
- 4) Fair price shops
- 5) Electric and telecommunication lines
- 6) Tanks and other minor water bodies
- 7) Drinking water supply and water pipelines

- 8) Water or rainwater harvesting structures
- 9) Minor irrigation canals
- 10) Non-conventional source of energy
- 11) Skill upgradation or vocational training centres
- 12) Roads and
- 13) Community centres

Provided that such diversion of forest land shall be allowed only if the forest land to be diverted is less than one hectare in each case, and the clearance of such developmental projects shall be subject to the condition that the same is recommended by the Gram Sabha.

The details of diversion of forest land under section 3(2) of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 are provided in Appendix I.29.

8.8.2 Status of Implementation of the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

The details of Individual Forest Rights (IFR) cases sanctioned in West Nashik division are as below:

Table 8.7: Details of IFR cases in West Nashik division

Sl. No.	Range	Eligible cases	Area sanction (Ha)
1	Barhe	1002	458.20
2	Harsul	826	517.11
3	Igatpuri	399	355.22
4	Nanashi	994	654.58
5	Nasik	239	186.13
6	Peint	1604	759.68
7	Sinnar	251	301.38
	Total	5315	3232.30

The process of finalization of individual claims and community forest rights is still under progress at Gram sabha, Sub-divisional level committee (SDLC) and District level committees (DLC). Hence the forest area to be recognized under this Act is bound to change with time until there is a fixed

deadline for submission of legitimate claims. Once the claims have been finalized, the area sanctioned under FRA shall be surveyed and demarcated by the TILR.

8.8.3 Implementation of Panchayats (Extension to Scheduled Areas) Act 1996 (PESA)

The Provisions of the Panchayats (Extension to Scheduled Areas) Act, 1996 are enacted by the Government of India for ensuring self-governance through traditional Gram Sabhas for people living in the Scheduled Areas of India. Scheduled Areas are areas identified by the Fifth Schedule of the Constitution of India. The details of the PESA and Non-PESA areas in West Nashik Division are as given below:

Table 8.8: PESA and Non-PESA area in West Nashik division

Sl No	Range	Area under PESA (Ha)	Area under Non PESA (Ha)	Total Area (Ha)
1	Nashik	8692.171	2422.963	11115.134
2	Igatpuri	14195.527	3130.493	17326.020
3	Trimbak	10462.076	0.000	10462.076
4	Harsul	28115.897	0.000	28115.897
5	Peint	21693.832	0.000	21693.832
6	Nanashi	8466.500	0.000	8466.500
7	Barhe	15071.200	0.000	15071.200
8	Sinnar	0.000	14343.893	14343.893
	Total	106697.203	19897.349	126594.552

8.9 OTHER RIGHTS AND CONCESSIONS

No right, except the “rights of way and access to water source” exists in these forests.” The usual concessions enjoyed by the villagers remain like a collection of small dead wood, thorns, grass, karvi stalks, leaves, fruits, moha flowers and grazing their cattle. The PESA areas present in West Nashik division are having all rights over the notified Non-timber forest produce for its harvesting, processing, and sale. Earlier some special privileges are assigned for areas falling under Nashik, Igatpuri, Dindori, Surgana and Peint talukas of West Nashik division and are as given below:

- 1) Privileges common to the Nashik district - Removal of Mahua (Moha) flower and fruit for the gatherers' own use or for sale.
- 2) Cutting and removal of reeds in addition to grass and dead leaves allowed under general privilege for use of rab. No lopping of trees is allowed for this purpose.
- 3) Collection and removal for the gatherers' own use and for sale, all minor products.
- 4) Removal of Karvi by head loads or cartloads for agricultural purposes.

8.10 DEPENDENCY OF LOCAL PEOPLE FOR NTFPS

Primarily the local people collect the NTFPs for their subsistence. A limited quantity of it may be disposed of at local markets to fulfill their daily needs.

8.11 OTHER ASPECT

There is no transhumant (The action or practice of moving livestock from one grazing ground to another in a seasonal cycle, typically to low-lands in winter and high-lands in summer.) population of grazing community present in West Nashik Forest Division. The local people collect and store fodder grasses for the summer season.

8.11.1 Van Dhan Jan Dhan Yojana

This initiative of Maharashtra Forest Department envisages the sale of herbal products prepared by local tribal at independent outlets. There are 14 such shops have already started in the whole of the State. This is for strengthening livelihood opportunities of local peoples possessing traditional knowledge about medicinal herbs and also to provide genuine herbal products to the public to improve their health. One of such shops shall need to be started at Nashik.

CHAPTER-9

ADEQUACY OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

9.1 EXISTING POLICY AND LEGAL FRAMEWORK AND THEIR COMPLIANCE

9.1.1 POLICIES

Conservation and sustainable use of biological resources based on local knowledge systems and practices are ingrained in the Indian ethos and way of life. Formal policies and programs for conservation and sustainable use of biodiversity resources date back to several decades. The concept of conservation of biodiversity is enshrined in the Indian Constitution in Article 48A and 51A (g). Major Central Acts relevant to biodiversity are the Indian Forest Act, 1927, the Wildlife (Protection) Act, 1972, the Forest (Conservation) Act, 1980, and the Environment (Protection) Act, 1986. The various Central Acts are supported by a number of State Laws and Statutes concerning forests and other natural resources.

The present policy and laws in the country and the State are invoked for the management of the forests of West Nashik division. The National Forest Policy of 1988 remains an essential guide for the management strategy of this Plan. The Indian Forest Act 1927 and its Amendments is the Principal Law governing the administration of the forests in the Division.

9.1.1.1 National Forest Policy 1988

The Indian National Forest Policy of 1988 emphasized the maternal role of forests in maintaining ecological balance and environmental stability. The principal aim of the Forest Policy must be to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium which is vital for sustenance of all life forms, human, animal, and plant. The derivation of direct economic benefit must be subordinated to this principal aim.

(a) Basic objectives

- 1) Maintenance of environmental stability through preservation and, where necessary, restoration of the ecological balance that has been adversely disturbed by serious depletion of the forests of the country.

- 2) Conserving the natural heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biological diversity and genetic resources of the country.
- 3) Checking soil erosion and denudation in the catchment areas of rivers, lakes, and reservoirs in the interest of soil and water conservation, for mitigating floods and droughts.
- 4) Checking the extension of sand dunes in the desert areas of Rajasthan and along the coastal tracks.
- 5) Increasing substantially the forest/tree cover in the country through massive afforestation and social forestry programmes, especially on all denuded, degraded and unproductive lands.
- 6) Meeting the requirements for fuelwood, fodder, minor forest produce and small timber of the rural and tribal populations.
- 7) Increasing the productivity of forests to meet essential national needs.
- 8) Encouraging efficient utilization of forest produce and maximizing substitution of wood.
- 9) Creating a massive people's movement with the involvement of women, for achieving these objectives and to minimize pressure on existing forests.

(b) Essentials of Forest management

- a) Existing forests and forest lands should be fully protected and their productivity improved. Forest and vegetal cover should be increased rapidly on hill slopes, in catchment areas of rivers, lakes and reservoirs and ocean shores and on semi-arid, and desert tracts.
- b) Diversion of good and productive agricultural lands to forestry should be discouraged in view of the need for increased food production.
- c) For the conservation of total biological diversity, the network of national parks, sanctuaries, biosphere reserves, and other protected areas should be strengthened and extended adequately.
- d) Provision of sufficient fodder, fuel, and pasture, especially in areas adjoining forest, is necessary in order to prevent depletion of forests beyond the sustainable limit. Since fuelwood continues to be the predominant source of energy in rural areas, the programme of afforestation should be intensified with special emphasis on augmenting fuelwood production to meet the requirement of the rural people.
- e) Minor forest produce provides sustenance to tribal populations and to other communities residing in and around the forests. Such products

should be protected, improved and their production enhanced with due regard to the generation of employment and income.

(c) Strategy to implement the provisions of the policy

- 1) About one-third of the aggregate geographical area of the country to be brought under forest cover. In hills and mountainous regions, about two-thirds of the aggregate area must be kept under forest cover to prevent soil erosion and land degradation and to preserve the stability of the fragile ecosystems.
- 2) To encourage the planting of trees along roads, railway lines, canals and streams, and over the unutilized lands of State entities, lands under institutional or private ownership.
- 3) Formation of Green belts in and around urban areas, industrial zones, etc., to check soil erosion and desertification as well as to improve the micro-climate of the region.
- 4) Village and community lands must be encouraged to grow tree crops and fodder resources. The revenue generated from such resources must be distributed with the panchayats and local communities.
- 5) Land laws should be modified to encourage individuals and institutions to take up tree-farming and grow fodder plants, legumes, etc., on their lands. Appropriate regulations must be put in place to oversee the felling of trees in private lands.

9.1.1.2 National Wildlife Action Plan (2017-2031)

The Union Ministry of Environment, Forests and Climate Change (MoEFCC) have unveiled the third National Wildlife Action Plan for 2017-2031 to chalk out the future road map for wildlife conservation. The plan was unveiled on the inaugural day of the Global Wildlife Programme (GWP) conference. It is the third action plan after first released from 1983 to 2001 and second from 2002 to 2016 that had a protected area-centric approach to wildlife conservation.

The key focus areas of this plan include the integration of climate change into wildlife planning, conservation of the coastal and marine ecosystem, mitigation of human-wildlife conflict, and focus on wildlife health among others. Details of some of the important focus areas are as underneath:

- 1) Climate Change impact: It is the first wildlife action plan to recognize concerns related to climate change impact on wildlife. It has stressed on integrating actions for its mitigation and adaptation into wildlife management planning processes. It recommended assisted migration of wildlife and anticipatory planting along ecological gradients, as climate change may result in the die-off of certain tree species that are unable to adapt to more recent environmental conditions.
- 2) Approach: It adopts the landscape approach in conservation of all wildlife that retains an ecological value to the ecosystem and to mankind irrespective of where they occur. It places significant emphasis to the recovery of threatened species of wildlife while conserving their habitats which include inland, aquatic, coastal and marine ecosystems.
- 3) Human-animal conflict concerns: It addresses rising human-animal conflict owing to shrinkage, fragmentation, and deterioration of habitats generating animosity against wild animals and protected areas.
- 4) People's support: It underscores an increasing need for people's support for the conservation of wildlife. It recommends eco-development, education, innovation, training, extension, and conservation awareness and outreach programs.
- 5) Participation of the private sector: It emphasizes the increased role of the private sector in wildlife conservation. It insists that the Government will ensure that adequate and sustained funding including Corporate Social Responsibility (CSR) funds are made available for implementation of the plan.

9.1.1.3 United Nations Strategic Plan for Forests 2017–2030

The agreement on the first-ever UN Strategic Plan for Forests was forged at a special session of the UN Forum on Forests held in January 2017 and provides an ambitious vision for global forests in 2030. The plan was adopted by the UN Economic and Social Council on 20th April 2017 and was subsequently adopted by the UN General Assembly on 27th April 2017.

- 1) The Strategic Plan features a set of six Global Forest Goals and 26 associated targets to be reached by 2030, which are voluntary and universal.
- 2) It includes a target to increase forest area by 3% worldwide by 2030, signifying an increase of 120 million hectares, an area over twice the size of France.

- 3) It builds on the vision of the 2030 Agenda and recognizes that real change requires decisive, collective action, within and beyond the UN System.

9.1.1.4 Global objectives on Forests agreed at sixth session of UNFF 2006

The sixth session of the United Nations Forum on Forests held on 27th May 2005 and 13-24th February 2006 at New York, USA. The delegates of United Nations Member States decided at the sixth session of the United Nations Forum on Forests to set shared global objectives on forests; and agree to work globally and nationally to achieve progress towards their achievement.

Sustainable forest management (SFM) as the overarching principle for forest policy at both the national and international levels and outlined future priorities in the form of the four Global Objectives on Forest (GOFs):

- 1) **Global objective 1:** Reverse Forest Loss: Reverse the loss of forest cover worldwide through sustainable forest management, including protection, restoration, afforestation, and reforestation, and increase efforts to prevent forest degradation.
- 2) **Global Objective 2:** Enhance Forest-based Benefits: Enhance forest-based economic, social and environmental benefits, including by improving the livelihoods of forest-dependent people.
- 3) **Global Objective 3:** Increase Sustainably Managed Forests: Increase significantly the area of protected forests worldwide and other areas of sustainably managed forests, as well as the proportion of forest products from sustainably managed forests.
- 4) **Global objective 4:** Mobilize Financial Resources: Reverse the decline in official development assistance for sustainable forest management and mobilize significantly increased new and additional financial resources from all sources for the implementation of sustainable forest management.

9.1.1.5 REDD⁺

Deforestation and forest degradation account for approximately 17 percent of carbon emissions, more than the entire global transportation sector and second only to the energy sector. It is now explicit that to constrain the impacts of climate change within limits that society will reasonably be able to

tolerate, global average temperatures must be stabilized within two degrees Celsius. This will be practically impossible to achieve without reducing emissions from the forest sector, in addition to other mitigation actions. To achieve this objective, the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+) was launched in 2008.

- a) “REDD+ is a climate change mitigation solution being developed by Parties to the United Nations Framework Convention on Climate Change (UNFCCC)”.
- b) REDD+ builds on the convening role and technical expertise of the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP).
- c) REDD+ incentivizes developing countries to maintain their forests standing by offering result based payments for actions to reduce or remove forest carbon emissions.
- d) UN-REDD program assists countries to develop the capacities needed to achieve the UNFCCC’s REDD+ requirements so that they can qualify to receive result based payments under the Convention.
- e) UN-REDD Programme supports nationally led REDD+ processes and promotes the informed and meaningful involvement of all stakeholders, including indigenous peoples and other forest-dependent communities, in national and international REDD+ implementation.
- f) REDD+ promotes a financial value for the carbon stored in forests by offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. Developing countries would receive results-based payments for results-based actions. REDD+ goes beyond simply deforestation and forest degradation and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

9.1.1.6 Bhopal India Process

The 1988 National Forest Policy focused on the maintenance of environmental stability, conservation of natural heritage by preserving the natural forests and meeting the essential needs of people, and also maintaining the relationship between the tribals and other dependent people, thus encompassing ecological, economic and social aspects of forest management. There is, however, an urgent need to monitor and ensure proper

implementation of these policy implications. The quantifiable approach like criteria and indicators to monitor and implement these objectives of sustainability is imperative. The initiative, recognized as the Bhopal-India process, has over the years endeavored to formulate a working framework for the achievement of the goals of sustainability specific to the national forestry conditions.

The criteria and indicators approach presents a tool for assessing the magnitude and direction of change in given forestry situations, and this provides critical information to the forest managers and other actors for forest-related decision-making. It is a necessary framework to assist countries to collect, store and disseminate reliable science-based forest information needed to monitor and assess forest conditions. Criteria define and characterize the essential elements, as well as a set of conditions or processes, by which sustainable forest management may be assessed. These are instruments through which progress towards sustainable forest management may be evaluated and reported.

The indicators of the Bhopal-India process were finalized through a workshop in March 2005, when a set of eight criteria and 43 indicators have been evolved. The criteria and indicators approach has over the years endeavored to provide a working framework for the achievement of a site-specific set of sustainability indicators of forests. The criteria of the Bhopal-India process encompass all aspects of sustainability, i.e. ecological, economic and socio-cultural. Hence, the criteria will remain the same whether it is for the national or forest management unit (FMU) level. The Criteria and Indicators for Sustainable Forest Management are provided in Appendix-I.30.

9.1.1.7 National Agroforestry Policy 2014

Agroforestry is defined as a land-use system that integrates trees and shrubs on farmlands and rural landscapes to enhance productivity, profitability, diversity, and ecosystem sustainability. It is a dynamic, ecologically based natural resource management system that through the integration of woody perennials on farms and in the agricultural landscape diversifies and, sustains production and develops social institutions. Agroforestry can become an essential tool to build the resilience of farmers and rural people against threats of climate change and natural calamities. This can also help in greening the rural employment and rural development

opportunities by providing agroforestry tree produce based economic opportunities.

A). The major policy goals

- 1) Setting up a National Agroforestry Mission or an Agroforestry Board to implement the National Policy by promoting coordination, convergence, and synergy among various elements of agroforestry scattered in various existing missions, programs, schemes and agencies pertaining to agriculture, environment, forestry, and rural development sectors of the Government.
- 2) Improving the productivity, employment, income, and livelihood opportunities of rural households, especially of the smallholding farmers through agroforestry
- 3) Meeting the increasing demand for timber, food, fuel, fodder, fertilizer, fiber, and other agroforestry products; conserving the natural resources and forest; conserving the environment and providing environmental security; and
- 4) Increasing the forest/tree cover, there is a need to increase the availability of these from outside the natural forests.

B). Basic Objectives

- a) To encourage and expand tree plantation in a complementary and integrated manner with crops and livestock to improve productivity, employment, income, and livelihoods of rural households, especially the small farmers.
- b) To protect and stabilize ecosystems, and promote resilient cropping and farming systems to minimize the risk during dire climatic events.
- c) To fulfill the raw material requirements of wood-based industries and reduce the import of wood and wood products to save foreign exchange.
- d) To supplement the availability of agroforestry products (AFPs), like the fuel-wood, fodder, non-timber forest produce and small timber of the rural and tribal populations, thereby reducing the pressure on existing forests.
- e) To increase forest/tree covers to promote ecological stability, especially in vulnerable regions.
- f) To develop capacity and strengthen research in agroforestry and promote a massive people's movement for achieving these objectives and to minimize pressure on existing forests.

9.1.2 LEGAL FRAMEWORKS

9.1.2.1 Indian Forest Act, 1927

The first codification, which came on the statute book in relation to the administration of forest in India, was the Indian Forest Act 1865. Thus, the history of forest law in India is more than a century prior. The 1865 act was a precursor to the Forest Act of 1878, which secured the colonial governments control over the forestry. Later, the Indian Forest Act, 1927 was enacted that was largely based on the Indian Forest Act of 1878.

The Indian Forest Act 1927 sought to consolidate and reserve the areas having forest cover or significant to wildlife, to regulate movement and transit of forest produce, and the duty leviable on timber and other forest produce. It also defines the procedure to be followed for declaring an area to be a Reserved Forest, a Protected Forest or a Village Forest. It defines a forest offense, the acts prohibited inside a Reserved Forest and penalties leviable on violation of the provisions of the Act. The state of Maharashtra has adopted the Indian Forest Act 1927 and later amended it time to time as per the requirements.

9.1.2.2 Forest (Conservation) Act, 1980

Deforestation causes ecological imbalance and leads to environmental deterioration. Deforestation had been taking place on a massive scale in the country and it had caused widespread concern. The Government passed the Forest (Conservation) Act, 1980 which remains a landmark in the history of the protection of Forests. This historical Act consists of five sections but has proved extremely effective and successful in the conservation of the forests. The primary objective of the Act is to provide for the conservation of forests and for matters connected thereto. The Act deals with the restriction on the de-reservation of forests or the use of forest-land for non-forest purposes. It provides that notwithstanding anything contained in any other law for the time being in force in a State, no State Government or other authority shall make, except with prior approval of the Central Government, any order directing:

- 1) That any reserved forest declared under any law for the time being in force in that State or any portion thereof, shall cease to be reserved;
- 2) That any forest land or any portion thereof may be used for any non-forest purpose; that any forest land any portion thereof may be assigned by way of the lease or otherwise to any private person or to any

authority, corporation, agency or any other organization not owned, managed or controlled by the Government;

- 3) That any forest land or any portion thereof may be cleared of trees which have grown naturally in that land or portion, for the purpose of using it for re-afforestation.

9.1.2.3 Wild Life (Protection) Act, 1972

The Wildlife (Protection) Act was passed in 1972 to protect the wildlife and their habitats. The significant provisions in the act can be summed up as follows:

- 1) It provides for the appointment of Wildlife Advisory Board, Wildlife warden, their powers, duties, etc.
- 2) Under the Act, the comprehensive listing of endangered wildlife species was produced for the first time and prohibition of hunting of the endangered species was mentioned.
- 3) Protection to some endangered plants.
- 4) The Act provides for setting up of the National Parks, Wildlife Sanctuaries, etc.
- 5) The Act provides for the constitution of the Central Zoo Authority.
- 6) There is provision for trade and commerce in some wildlife species with the license for sale, possession, transfer, etc.
- 7) The act imposes a ban on the trade or commerce in scheduled animals.
- 8) It provides for legal powers to officers and punishment to offenders.
- 9) It provides for the captive breeding program for endangered species.

9.1.2.4 The Biological Diversity Act, 2002

The Biological Diversity Act 2002 and Biological Diversity Rules 2004 provide for the conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of the benefits arising out of the use of biological resources and knowledge associated with it. Its key provisions aimed at achieving the above are:

- 1) Prohibition on transfer of Indian genetic material outside the country, without specific approval of the Indian Government;
- 2) Prohibition on anyone claiming an Intellectual Property Right (IPR), like a patent over biodiversity or related knowledge, without permission of the Indian Government;

- 3) Regulation of collection and use of biodiversity by Indian nationals, while exempting local communities from such restrictions;
- 4) Measures for sharing of benefits from the use of biodiversity, including the transfer of technology, monetary returns, joint Research and Development, joint IPR ownership, etc.;
- 5) Measures to conserve and sustainably utilize biological resources, including habitat and species protection, Environmental Impact Assessment (EIA) of projects, integration of biodiversity into the plans, programs, and policies of various departments/sectors;
- 6) Provisions for local communities to have a say in the use of their resources and knowledge, and to charge fees for this; Protection of indigenous or traditional knowledge, through appropriate laws or other measures like registration of such knowledge;
- 7) Regulation of the use of genetically modified organisms; Setting up of the National, State, and Local Biodiversity Funds, to be used to support conservation and benefit-sharing;
- 8) Setting up the Biodiversity Management Committees (BMC) at the local village level, the State Biodiversity Boards (SBB) at the state level and the National Biodiversity Authority (NBA).

9.1.2.5 The Scheduled Tribes and Other Forest Dwellers (Recognition of Forest Rights) Act, 2006

To address the adverse living conditions of many tribal families living in forests was on account of non-recognition and vesting of pre-existing rights, the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, has been enacted to recognize and vest the forest rights and occupation of forest land in forest-dwelling Scheduled Tribes and other traditional forest dwellers, who have been residing in such forests for generations, but whose rights could not be recorded.

This Act not merely recognizes the rights to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood but also grants several other rights to ensure their control over forest resources which, inter-alia, include the right of ownership, access to collect, use and dispose of minor forest produce, community rights like nistar; habitat rights for primitive tribal groups and pre-agricultural communities; right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use.

The Act also provides for diversion of forest land for public utility facilities managed by the Government, like schools, dispensaries, fair price shops, electricity and telecommunication lines, water tanks, etc., with the recommendation of Gram Sabhas. Under Section 3(1)(h) of the Act, the rights of settlement and conversion of all forest villages, old habitations, un-surveyed villages and other villages in the forest, whether recorded, notified, or not, into revenue villages have been recognized as one of the forest rights of forest-dwelling Scheduled Tribes and other traditional forest dwellers on all forest lands.

9.1.2.6 Environment (Protection) Act, 1986

- 1) The Environment (Protection) Act, 1986 authorizes the central government to protect and improve environmental quality, control and reduce pollution from all sources, and prohibit or restrict the setting and/or operation of any industrial facility on environmental grounds. The Environment (Protection) Act was enacted in 1986 with the objective of providing for the protection and improvement of the environment. It empowers the Central Government to establish authorities charged with the mandate of preventing environmental pollution in all its forms and to address specific environmental problems that are peculiar to distinct parts of the country. The Act was last amended in 1991.
- 2) The Environment (Protection) Rules 1986 lay down procedures for setting standards of emission or discharge of environmental pollutants.
- 3) The objective of Hazardous Waste (Management and Handling) Rules, 1989 is to control the generation, collection, treatment, import, storage, and handling of hazardous waste.
- 4) The Manufacture, Storage, and Import of Hazardous Rules define the terms used in this context and sets up an authority to inspect, once a year, the industrial activity connected with hazardous chemicals and isolated storage facilities.
- 5) The Manufacture, Use, Import, Export, and Storage of hazardous Micro-organisms/ Genetically Engineered Organisms or Cells Rules, 1989 were introduced with a view to protecting the environment, nature, and health, in connection with the application of gene technology and micro-organisms.

9.1.3 Judicial Activism and Biodiversity Conservation

Like any other developing country, in India, there has been environmental degradation due to over-exploitation of resources, depletion of traditional resources, industrialization, and urbanization and population explosion. However, India has never been oblivious to this fact. Being acutely concerned with the growing biodiversity degradation in the country and aware of International developments in the field of environmental law, the Indian Judiciary has delivered a significant contribution to the development of environmental jurisprudence by resorting to international conventions and agreement. The Indian judiciary many times has taken recourse to the principles regarding environmental protection to overcome administrative indifferences and fix the lacunae in the current legislation. The judiciary has also sought the help of international laws and principles to reinforce strength and widen the jurisprudence of environmentalism in India. Judiciary in India, more precisely, the Supreme Court and the High courts have played a critical role in the protection of the environment and conservation of biodiversity. Parliament has enacted various laws to address the problems of biodiversity degradation. In such a situation, the superior courts have performed a pivotal role in interpreting the laws related to the conservation of biodiversity. In addition, one of the most significant parts of the Indian Constitution is that enforcement of the fundamental rights through writs and public interest litigations. The growth of the concept of environmental protection and conservation of biodiversity in India has been largely influenced and accelerated by the Public Interest Litigation (PIL). It has generated the tremendous awakening amongst people about environment protection and biodiversity conservation, has ushered in the evolution of innovative judicial techniques to arrest biodiversity degradation and has transformed the jurisprudence of public law review.

9.2 STATUS OF APPROVED WORKING PLAN AND COMPLIANCE

The working plan written by B. P. Singh and Dr. V. D. Chafekar was in operation from 2007-08 till 2016-17. Most of the prescriptions were implemented but not fully due to various factors; like (1) disturbance to forests of this division that has happened due to the implementation of the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Rights) Act 2006, (2) lack of planning both at field level and division level, (3) lack of availability of funds at right time, (4) abrupt introduction of new schemes, etc during the operation of the above plan.

Under the 50 crore plantation programme, plantations have been taken outside the due annual coupes. The systematic approach prescribed in the working plan has been disturbed due to this kind of ad hoc interventions. In the future, these kinds of ad hoc interventions as possible could not be encouraged and the prescriptions shall be followed as per the sequence provided in the Working Plan.

9.3 NUMBER OF FOREST OFFENCES

The forest offences that have been registered under the various categories in the last ten years are given below:

Table 9.1: The details of forest offences

Year	Illicit Cutting	Encroachment	Illegal Transport	Wild Life	Forest Fire	Grazing	Other	Total
2007-08	549	13	11	7	64	43	10	697
2008-09	350	1	3	16	49	55	19	493
2009-10	273	8	2	10	60	71	17	441
2010-11	249	9	6	14	61	68	24	431
2011-12	231	18	1	9	106	54	21	440
2012-13	229	12	2	9	99	79	15	445
2013-14	337	15	2	14	92	64	23	547
2014-15	252	7	1	13	116	63	26	478
2015-16	153	0	3	26	73	51	10	316
2016-17	174	5	0	21	98	167	12	477

9.4 STATUS OF RESEARCH AND DEVELOPMENT

Not much research work is being carried out in the Division. The Research Wing of the Forest Department is not containing any Research plots in the Nashik district. This research-gap demands attention and a systematic plan for conducting resource inventory and its analysis need to be done in the upcoming days. A comparative statement of all flora, fauna and its change over the time period needs to be recorded. In addition, the details of the collection of medicinal plants and information about the traditional knowledge need to be recorded.

9.5 HUMAN RESOURCE CAPACITY BUILDING EFFORTS

Human Resource Management represents the strategic approach to the effective management of people in an organization such that they help to maximize employee performance to assist overall development in the organization. An organization must have proper employee management to realize its goals and objectives. Strategic human resource management ensures that there are proper staffing, regular monitoring, and appraisal of staff performance, proper incentive, and proper discipline among employees.

The training comprises a key component of the motivation of employees. The employees who feel they are developing their skills tend to be happier in their jobs, who results in an increase in the net efficiency of the organization. Like any organization, the forest department also has an HRM program that is both short-term and long-term. These training programs include the Mid-career Training program, Workshop for ICT Application, Computerization of Forest Department through PDA Orientation course, Induction Training course for newly appointed Forest Guard, policy and legal training, etc. But with changing times, the employees in the forest department need, in addition to others, the training on communication, team-building, mob management, intelligence gathering, etc. The details of staff undergone training in West Nashik division are given below:

Table 9.2: Details of staff undergone training during the plan period

Sl No.	Designation of employee	No of employees attend the Training					Total
		2010-11	2011-12	2012-13	2013-14	2014-15	
1	DCF	0	1	0	0	0	1
2	ACF	1	1	2	1	3	8
3	RFO	0	4	0	4	1	9
4	Forester	0	3	20	26	7	56
5	Surveyor	0	0	1	1	0	2
6	Forest Guard	0	37	99	54	24	214
7	Accountant	0	3	0	0	0	3
8	Clerk	0	3	0	0	0	3
9	Driver	0	0	0	2	0	2
10	Peon	0	0	0	2	0	2
	Total	1	52	122	90	35	300

9.6 FOREST RESOURCE ACCOUNTING

Forest resource accounting is an important instrument of sustainable forest management (SFM). It facilitates estimation of the economic value of tangible and intangible forest benefits.

The Hon'ble Supreme court of India issued order about the Net Present Value for different Eco-class of forests on 28/03/2008 in writ petition No. 202/1995 T.N. Godavarman Thirumulpad Vs Union of India and Others. The important points of the said judgement are given below:

- 1) The Eco-classes of forests are;
 - a. Eco-Class I: Consisting of Tropical Wet Evergreen Forests, Tropical Semi Evergreen Forests and Tropical Moist Deciduous Forests
 - b. Eco- Class II: Consisting of Littoral and Swamp Forests
 - c. Eco-Class III: Consisting of Tropical Dry Deciduous Forests
 - d. Eco-Class IV: Consisting of Tropical Thorn Forests and Tropical Dry Evergreen Forests
 - e. Eco-Class V: Consisting of Sub-tropical Broad Leaved Hill Forests, Sub-Tropical Pine Forests and Sub-Tropical Dry Evergreen Forests
 - f. Eco-Class VI: Consisting of Montane Wet Temperate Forests, Himalayan Moist Temperate Forests, Himalayan Dry Temperate Forests, Sub Alpine Forest, Moist Alpine Scrub and Dry Alpine Scrub.
- 2) Based on the ecological importance of forest falling in different eco-value and canopy density classes, relative weightage factors have also been taken into consideration. By using these relative weightage factors, the equalized forest area in eco-value Class-I and very dense forest corresponding to forest falling in different eco-value and density classes have been compiled.
- 3) For calculating the average net percent value per hectare of forest in India, the following monetary value of goods and services provided by the forest have been considered:
 - a. Value of timber and fuel wood
 - b. Value of Non Timber Forest Products (NTFP)
 - c. Value of fodder
 - d. Value of Eco-tourism
 - e. Value of bio-prospecting
 - f. Value of Ecological services of forest
 - g. Value of Flagship Species

- h. Carbon Sequestration Value
- 4) Based on this, the NPV was fixed and the following recommendations have been made:
- a. For non-forestry use/diversion of forest land, the NPV may be directed to be deposited in the Compensatory Afforestation Fund as per the rates (in Rs) given below:

Eco-value class	Very dense forest	Dense forest	Open forest
Class-I	10,43,000	9,39,000	7,30,000
Class-II	10,43,000	9,39,000	7,30,000
Class-III	8,87,000	8,03,000	6,26,000
Class-IV	6,26,000	5,63,000	4,38,000
Class-V	9,39,000	8,45,000	6,57,000
Class-VI	9,91,000	8,97,000	6,99,000

- b. The use of forest land falling in National Parks/Wildlife Sanctuaries will be permissible only in totally unavoidable circumstances for public interest projects and after obtaining permission from the Hon'ble Court. Such permissions may be considered on payment of an amount equal to ten times in the case of National Parks and five times in the case of Sanctuaries respectively of the NPV payable for such areas.
- c. The use of non-forest land falling within the National Parks and Wildlife Sanctuaries may be permitted on payment of an amount equal to the NPV payable for the adjoining forest area. In respect of non-forest land falling within marine National Parks/Wildlife Sanctuaries, the amount may be fixed at five times the NPV payable for the adjoining forest area.

The details of revenue obtained from sale of timber, fuelwood, NTFP, etc., are given in Appendix I.23 and I.24.

9.7 BUDGETARY ALLOCATIONS TO THE FORESTRY SECTOR

It is clearly evident from the above narrations that the prescriptions provided in the Working Plan and works to be done could not be implemented completely due to the shortage of funds. The Budget provision and expenditure incurred during the execution of the Working Plan of West Nashik Division are given below:

Table 9.3: The details of Budget during the Plan period

Sl. No	Year	Fund Requirement (lakhs)	Fund Received (lakhs)
1	2007-08	6.990	0.000
2	2008-09	447.280	162.585
3	2009-10	1536.220	106.692
4	2010-11	1352.110	200.733
5	2011-12	2905.330	292.805
6	2012-13	1582.751	363.427
7	2013-14	1839.035	255.375
8	2014-15	1947.660	123.780
9	2015-16	2018.752	205.487
10	2016-17	2164.235	216.982
	Total	15800.363	1927.866

9.8 EXISTENCE OF MONITORING, ASSESSMENT AND REPORTING MECHANISM

Monitoring and evaluation are critical for effective working of an Organization. Monitoring and evaluation are ways of systematically measuring and assessing various activities and results in the Organization. Their purpose is to check on the progress of implementation and outputs systematically from time to time. Like any other Organization, the Maharashtra Forest Department is also having a strong monitoring mechanism for effective control of its projects and programmes. The monitoring, assessment and reporting mechanism regarding the overall administrative control and the working plan activities of the West Nashik division is given below:

Table 9.4: Monitoring mechanism

PCCF (HoFF), M.S.			
Monitoring	APCCF (Personnel)- Guardian APCCF	Over all control of WP activities	PCCF (P&M)
Direction division	CCF (Territorial), Nashik	Direction division	APCCF (WP), West, Pune
Field level implementation	DCF, ACFs, RFOs, Foresters and Forest Guards	Monitoring of WP activities	DCF (WP), Nashik

9.9 PUBLIC AWARENESS AND EDUCATION

The public awareness about forests and forest resources proves important for several reasons; it fosters a sense of connection to the natural world, promotes sustainable development and encourages conservation of irreplaceable natural resources and vulnerable plant and animal species. The public awareness and education essentially serves as an educational tool, helping people around the world understand the economic, aesthetic and biological importance of preserving resources and reducing or eliminating the harmful impacts of man-made alterations. The public awareness and education helps people understand the consequences of human activities on various forest resources and identify remedial solution.

General awareness is carried out by the West Nashik Division and the Social Forestry Wing of the Department in the District. As per information from the DFO (Social Forestry), a total of 78 schools in the West Nashik division have Eco-clubs as part of the National Green Army Scheme of the Government of India. In each of the Clubs, there are around 40-60 members. In these schools, regular year-round programmes are held and all-important days related to the Environment and Forests are celebrated enthusiastically. Regular field visits, projects, etc., are also taken up. The Division also celebrates Van Mahotsav and Wildlife Week on an annual basis. During this period various Competitions like Essay/Drawing/ Extempore Speech are held at schools. From 2016-17 beyond, Maharashtra forest department has taken a massive Greening of Maharashtra programme where a plantation of 50 crore plants has been done during the period 2016-17 to 2019-20. This programme has generated a massive social movement for the Greening of Maharashtra. This momentum needs to be continued in the future also.

9.10 ADEQUATE MANPOWER IN FOREST DIVISION

9.10.1 Staff: Human resource refers to the personnel of the organization that is regarded as a significant asset in terms of skills and abilities. The Human Resource plays a key role in developing, reinforcing and changing the culture of an organization. The present staff position in the West Nashik division is satisfactory.

Table 9.5: Staff position in West Nashik division

Sl.	Group	Designation	Pay Scale (Rs)	Sanction	Filled	Vacant
1	A	DCF	15600-39100	1	1	0
		ACF	9300-34800	4	3	0
2	B	Range Forest Officer	9300-34800	11	10	1
		Office Superintendent	9300-34800	1	1	0
3	C	Chief Accountant	9300-34800	1	1	0
		Accountant	5200-20200	13	12	1
		Jr. Statistical Asst.	5200-20200	1	0	1
		Surveyor	5200-20200	2	2	0
		Clerk	5200-20200	20	14	6
		Forester	5200-20200	46	39	7
		Forest Guard	5200-20200	181	79	2
		Police Constable	5200-20200	2	0	2
		Jeep Driver	5200-20200	5	5	0
		Tractor Driver	5200-20200	0	0	0
4	D	Naik	4440-7440	1	1	0
		Daptari	4440-7440	0	0	0
		Peon	4440-7440	4	3	1
		Watchman	4440-7440	10	5	5
		Waterman	4440-7440	0	0	0
		Sweeper	4440-7440	1	1	0
		Tractor Cleaner	4440-7440	0	0	0
5	D	Forest Labour	4440-7440	123	123	0

9.10.2 Labour Supply

The primary activities of the forest department in the West Nashik division are Afforestation works, Soil and moisture conservation works, Forest protection, NTFP collection, and the collection and transportation of a small amount of timber to the depot. Out of the above, the Afforestation along with Soil and moisture conservation works provide more employment to labourers. On the whole, the availability of labour for forestry activities is unsatisfactory except for the Tribal belt. The availability of skilled labour for bamboo working, timber harvesting, etc., is not locally available in the area. As Nashik is one of the agriculturally progressive districts and so during peak agriculture season, labour availability will be extremely difficult.

CHAPTER - 10

FIVE YEAR PLANS

10.1 INTRODUCTION

The Indian economy was premised on the concept of planning. This was carried through the five year plans, developed, executed and monitored by the Planning Commission and the NITI Aayog. Every five-year plan is developed with a specific goal in mind. But there is under no circumstances one solitary objective of the plan. The plan is supposed to work towards the perspective plan and must cover a few critical objectives. However, it is not possible or practical to accord similar importance to all aspects of a plan. There is basically five generalized goals of a five-year plan, wherein one or two are given the most importance in a particular plan. In fact, some of the goals are actually conflicting.

The First Five Year Plan and various post-war development schemes, which were initiated for rehabilitation and development of degraded forests, were enlarged and consolidated into a National Development Plan. However, the thrust areas in these Five Year Plans kept reordering according to priorities felt at that point in time. While forestry and wildlife management programmes found reflection in the national planning right from the First Five Year Plan. The programmes regarding environmental protection were completely overlooked and were initiated only in the Fourth Five Year Plan.

10.2 FOREST MANAGEMENT UNDER FIVE-YEAR PLANS

In absence of forest division level, critical data related to grants received under various five year plans, an overview of the development of the forestry sector under various five year plans is given below. This information will help in percolating the knowledge in brief to all our staff about the path of development of the forestry sector in our country after Independence.

10.2.1 The First Five-Year Plan (1951-56)

The First Five Year Plan placed considerable emphasis on the development of forests. The aim of the Plan was to provide for the expansion and improvement of areas under forests, for meeting the increased demand for timber and forest products in the foreseeable future as well as for the planning of long-range development of forest resources. Besides these, revenue derived

from forests was, furthermore, a key consideration for which forests had to be managed. A most significant step in this direction was the enunciation of the New National Forest Policy of India in 1952, revising the old forest policy of 1894 to bear it in the line with the requirements of the economy. The policy emphasized the protective as well as productive roles of forests and suggested, as a desirable ultimate objective, that one-third of the land area (around 33%) should be under forests including 60% of the land in hilly regions and 20% in the plains. Programmes of forest development in the States during the First Five-Year Plan primarily represent a continuation of programmes which had been initiated under post-war development schemes during the period from 1947-51. These included schemes for afforestation and plantation, improvement of forest communications, preparation of working plans, application of modern systems of intensive forest management, the introduction of modern logging techniques, demarcation of newly acquired areas with a view to their rehabilitation, improving the growing stock and strengthening of forest administration. In view of the urgent need for conserving India's precious heritage of wildlife, conservation of wildlife was considered an integral part of forest management. Owing to this, the Indian Board for Wildlife was constituted in 1952 which has performed effective work for the cause of preservation of wildlife in the country. An overall provision of Rs 7.64 crores was made in the plan (for both Centre and States) for forestry and wildlife conservation programmes.

The First Five Year Plan also drew attention to the critical role of forests in soil conservation. Consequently, the Central Soil Conservation Board was set up by the Ministry of Food and Agriculture in 1953 with the mandate of carrying out research in soil and water conservation as well as assisting the States in carrying out soil conservation programmes. Besides expenditure on various centrally administered items, the Board sanctioned a total expenditure of Rs 47 lakh for soil conservation programmes.

10.2.2 The Second Five Year Plan (1956-61)

The Second Five Year Plan aimed primarily at the enlargement of the processes initiated in the First Plan and provided for the considerable increases in the pace of forest development. Besides maintaining the work initiated during the First Five Year Plan, programmes of the Second Plan included measures for afforestation and improvement of more deprived areas in the forests and extension forestry, the formation of plantations of species of commercial and industrial value, promotion of methods for increased

production and availability of timber and other forest produce in the foreseeable future, conservation of wildlife, amelioration of the conditions of staff and labour in the forests, increased volume of forest research, increased provision of technical personnel and essential coordination and guidance in the implementation of forest development schemes all over the country. A sum of Rs 21.21 crores was provided in the plan (for both Centre and States) for the development of forestry and wildlife. Soil conservation work was, in addition, to be undertaken in a concentrated manner and a provision of Rs 20 crores was made in the plan for the same.

10.2.3 Third Five Year Plan (1961-66)

While intensifying the programmes initiated under the first two Five Year Plans, the Third Plan placed considerable emphasis on measures which would help achieve the long-term agricultural and industrial requirements of the country and ensure more economic and efficient utilization of the available forest products including inferior timber and wood residues. The primary objective was to increase the output through better techniques of timber extraction, to develop forest communications and to bring about the increased use of preservation and seasoning processes. The plan stated it is essential to develop the forest wealth of the country on a long-term basis not only for providing adequate fuel and timber for the rural areas but also for meeting the requirements of construction and various industries including paper, rayon, plywood, matches, and tanning".

Major forest development programmes included in the plan were economic plantations for industrial and commercial purposes, plantations of quick-growing species, village and extension forestry. While regarding the conservation of biodiversity as an essential aspect of forest development, the plan included programmes for the development and establishment of five zoological parks, five national parks, and ten wildlife sanctuaries. The plan provided an outlay of Rs 45.85 crores for various programmes of forest development in States and Union Territories including a sum of Rs 6.7 crores for Centre and centrally sponsored schemes. The plan also initiated various programmes related to soil conservation and an outlay of about Rs 72 crores have been provided for their execution.

10.2.4 Forth Five Year Plan (1969-74)

The Fourth Five Year Plan had stated three key objectives in the area of forestry, namely, to increase the productivity of forests, to link forest development with various forest-based industries and to develop forests as support to the rural economy. In view of the large scale demand for timber and various forest products for industrial purposes, the plan envisaged efforts at creating large scale plantations of valuable quick-growing species and species of economic and industrial importance. A critical objective was to achieve self-sufficiency in forest products, especially for vital forest-based industries. Accordingly, steps were proposed to bridge the gap between demand and supply by fuller utilization of forest resources other than wood like bamboo and grasses and by encouraging the use of non-conventional woods and small-sized timber.

As far as conservation of wildlife was concerned, the plan recommended specialized training in ecology and conservation. Special training programmes in wildlife conservation, management and research were accordingly instituted in the Forest Research Institute (FRI) at Dehradun. While recognizing that protection and effective management of habitats was crucial for the conservation of the rich wildlife of the country, two new centrally-sponsored schemes; the Project Tiger and Development of National Parks and Sanctuaries also came into existence in 1973. The total outlay for forestry programmes (including wildlife) in the Fourth Plan was Rs 89.42 crores in the Centre, States and Union Territories including a sum of Rs 1.39 crores for Centrally Sponsored Schemes.

10.2.5 Fifth Five Year Plan (1974-79)

During the Fifth Five Year Plan, focus shifted from conservation-oriented forestry to a dynamic program of production forestry. The primary objective laid down in the Plan was to initiate measures for increasing production of industrial wood and other forest products by clear felling and creating large scale man-made forests with the help of institutional financing. The second vital objective was to develop farm forestry and improvement of degraded forests to increase the fuel and timber supply in rural areas. The major programmes of forest development included in the Fifth Five Year Plan were large scale commercial plantations, plantations of fast-growing species, social forestry, forest consolidation, surveys and statistics, communications and logging. It was also proposed to build up a system of meaningful forest surveys

along with a proper information system to assess the present growing stocks, increments and potential increments by forest divisions, natural regions and States. However, the Plan also drew attention towards large scale deforestation in the country and laid emphasis on intensive forest development and ensured forest areas are not deforested for the extension of crop areas. To compensate for the forest area already lost, efforts were proposed to afforest equivalent areas out of wastelands. As far as conservation of wildlife was concerned, the plan intended to strengthen the wildlife administration on one hand and to carry out systematic surveys and enumeration of various wildlife species on the other. Special efforts were proposed to protect the tiger population in nine selected areas where no commercial forestry operation would be carried out. A sum of Rs 208.84 crores was tentatively allocated for both Centre and States for forestry and wildlife conservation programmes in the plan.

10.2.6 Sixth Five Year Plan (1980-85)

The objective of forestry sector programmes laid down in the Sixth Five Year Plan was the conservation of existing forests and launching of a countrywide afforestation and social forestry programmes. During the plan period, various acts were enacted, and institutions were set up for the protection of the environment and forests. For instance, the Forest (Conservation) Act was enacted in 1980 with the primary objective of checking the diversion of forest land for non-forestry purposes. Similarly, for the efficient implementation of activities in the forestry sector through modern management technologies, the Indian Institute of Forest Management was established in March 1981 at Bhopal. Moreover, the Forest Survey of India (FSI) was established in June 1981 (on the recommendations of the National Commission on Agriculture) for carrying out systematic surveys of forest resources of the country. While recognizing the vitality of biological organisms, the Sixth Plan laid emphasis on the protection and conservation of natural ecosystems and stated that "the preservation of the country's genetic diversity and conservation of its species and ecosystems for sustainable utilization is of crucial importance for future survival and development of our people." Accordingly, the Wildlife Institute of India was set up during the plan in 1982-83 with the objectives of building scientific knowledge on wildlife reserves, carrying out research and providing information and advice on scientific wildlife management. A sum of Rs 692.49 crores was provided in the Plan for both Centre and States for forestry and wildlife conservation programmes.

10.2.7 Seventh Five Year Plan (1985-90)

It was for the first time during the Seventh Five Year Plan that the role and importance of forestry sector for the economic development of the country in terms of protection of the ecosystems and supply of various forest products were understood properly. The task of bringing one-third of the geographical area of the country under tree cover became a vital need and all possible efforts were made to achieve the target. A revised National Forest Policy was formulated during the Plan in December 1988 which stressed the management of forests for conservation and meeting local communities' needs and made commercial exploitation and revenue generation secondary objectives (Saigal, 2005). The policy also encouraged people's participation in the protection and management of forests. In this manner, a decentralized system of forest management was initiated during the Seventh Plan with the introduction of the JFM programme in 1990. The objectives and strategy laid down in the plan included conservation of ecologically fragile ecosystems and preservation of biological diversity in terms of flora and fauna; Increasing substantially the vegetative cover by massive afforestation through Social Forestry, Farm Forestry and other plantation programmes for fulfilling the basic needs of the people in respect of fuelwood, fodder, minor forest produce, and small timber. Ensuring close linkages between forestry programmes and welfare of the tribal and other communities traditionally dependent upon forests is emphasized. Further special priority was given on forestry research and education, and implementation of the Wildlife Action Plan for wildlife conservation. A sum of Rs 1859.10 crores was provided in the Plan in the Centre, States and Union Territories for forestry and wildlife conservation programmes.

Despite various forest conservation programmes initiated during the Seventh Five Year Plan, the scenario of forests continued to cause concern. Destruction and degradation of forests took a heavy toll on the country's soil and water resources. An estimated 6000 million tonnes of topsoil with essential nutrients were flowing into the sea every year. Loss of topsoil, vegetative cover and unregulated surface runoff with the poor recharge of aquifers adversely affected the society.

10.2.8 Eighth Five Year Plan (1992-97)

The Eighth five year Plan also initiated various programmes and schemes regarding the protection and conservation of forests. Under the forestry conservation programme, the Eighth Plan established the National

Afforestation and Eco-Development Board (NAEB) in 1992. A number of afforestation schemes like Integrated Afforestation and Eco-Development Project Scheme, Fuelwood and Fodder Project Scheme, Non-Timber Forest Produce Scheme, etc., were initiated under NAEB for reclaiming degraded forest areas adjoining forests. In addition, the Government of India also set up a new Department of Wastelands Development under the Ministry of Rural Development in July 1992 with the mandate to develop non-forest wastelands. The plan additionally included the programme of Development of National Parks and Sanctuaries for Biodiversity Conservation. An overall provision of Rs 4910 crores was made in the plan for forestry and wildlife conservation programmes for both Centre and States.

10.2.9 Ninth Five Year Plan (1997-2002)

The Ninth Five Year Plan recognized the importance of forests in maintaining ecological balance, preserving the life support system on earth as well as in achieving the goal of sustainable development. However, the shrinking forest area in the country due to the population pressure and various development activities like agriculture, irrigation, power projects, industry, roads, etc., was also a matter of deep concern for the country. Thus, while indicating concern on the tremendous pressure on forest resources, the Plan stressed massive afforestation programmes, control over hacking and grazing and provision of cheap fuel through alternative technologies. A National Forestry Action Plan was also launched during the plan in 1999 to address critical issues in the forestry sector. The plan also laid emphasis on the conservation of biodiversity in the country. The crucial issues that had emerged in the Convention on Biodiversity were considered from two perspectives-national requirements and actions and international negotiation needs, commitments and actions. The need for comprehensive legislation had been clearly recognized and the process of drafting the same had commenced. A separate biodiversity cell was also proposed to be set up in the Ministry of Environment and Forests in the Ninth Plan. The important schemes initiated during the plan for biodiversity conservation included fifty-two new research projects related to the biosphere reserves, conservation and management of mangroves and wetlands and eco-development projects in seven tiger reserves. A provision of Rs 8189.09 crores was made in the Plan for both Centre and States for the execution of various programmes under forestry and wildlife.

10.2.10 Tenth Five Year Plan (2002-07)

The Tenth Five Year Plan further emphasized the important role of forests in achieving environmental and economic sustainability as well as in maintaining life support systems on earth. However, the plan also showed concern on the consistent undervaluation of forests in economic and social terms. It was found that 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 had not been fully realized. Accordingly, the Plan proposed to give a thrust to integrated forest protection which includes all components of protection and sustainable management of forests. The Approach Paper of Tenth Five Year Plan had stipulated the need to bring 25% of the area under forest and tree cover by 2007 and 33% by 2012. The plan emphasized a coordinated and balanced strategy for forest and wildlife management and rural development while integrating local community's knowledge, skills, and practices into conservation strategy, planning, and management. More focused interventions were required for maintaining natural forests for ecosystem protection and sustaining the global and local forest values. The programmes related to forest protection initiated in the plan were universalization of the Joint Forest Management (JFM) program, strengthening and enhancing the protected area network, effective management of protected areas, agroforestry development, conservation and development of medicinal plants, promotion of shelterbelt plantations to reduce the adverse impacts of natural calamities, improving the productivity of forest plantations, research and technology development to improve productivity and production of new products, control of poaching and illegal trade of wild animals and plant species, and development of national parks and sanctuaries, etc. A new scheme named Protection of Wildlife outside Protected Areas (PWOPA) was also proposed for the Tenth Plan. It was also proposed to merge all afforestation programmes of the National Afforestation and Eco-development Board (NAEB) into a single scheme called National Afforestation Program (NAP). This 100% Centrally Sponsored Scheme (CSS) was started in 2002-03 for regeneration and eco-development of degraded forests and adjoining areas on watershed protection and conservation of natural resources through active involvement of people and checking land degradation, deforestation, and loss of biodiversity. A sum of Rs 14344 crores was provided in the Plan for the execution of various programmes under forestry and wildlife sectors in the Centre, States, and Union Territories.

10.2.11 Eleventh Five Year Plan (2007-12)

The strategy of the Eleventh Plan for forestry sector development was to provide an environment for achieving sustainable forestry and wildlife management with a specific focus on the socio-economic targets. Accordingly, the plan initiated various programmes for developing forestry and improving the status of green cover. To achieve the target of increasing forest cover by 5% of the total geographical area, the plan emphasized the rehabilitation of degraded forests through the Joint Forest Management Committees (JFMC) by linking forests to livelihood and increasing the participatory process through the National Afforestation Program. Intensive management of existing commercial plantations with scientifically designed inputs was emphasized in the plan for optimum productivity. To build sustainable forest management capacity of the states, two programmes of the Ministry of Environment and Forests viz., Integrated Forest Protection and Strengthening Forestry Divisions were proposed to be reoriented during the Eleventh Plan. The plan has also initiated various programmes for the preservation of wildlife and forest biodiversity. These include initiatives for mitigation of wildlife-human conflicts; involving and compensating local communities; management of habitats outside protected areas; rehabilitation of displaced communities; and strengthening and protection of indigenous knowledge while improving research and monitoring system. A sum of Rs 15583.02 crores was tentatively envisaged in the Plan (for both Centre and States) for forestry and wildlife conservation programmes.

10.2.12 Twelfth Five Year Plan (2012-2017)

- 1) The vision of 12th Five year plan is “Managing Environment, Forests, Wildlife and challenges due to Climate Change for faster and equitable growth, where ecological security for sustainability and inclusiveness is restored, equity in access to all environmental goods and ecosystem services is assured through the institutionalization of people’s participation; AND A future in which the nation takes pride in the quality of its environment, forests, the richness of its biodiversity, and efforts by the State and its people to protect, expand and enrich it, for intra and inter-generational equity and welfare of the local and global community”.
- 2) Three “Core Indicators” identified in the Plan for the sector on “Environment and Sustainability” are; (1) Increase in green cover (as measured by satellite imageries) by 1 million ha every year during the Twelfth Five Year Plan, (2) Addition of 30,000 MW of renewable energy

capacity in the Twelfth Plan and (3) Reduction in emission intensity of GDP in line with the target of 20 to 25 percent reduction over 2005 levels, by the year 2020.

- 3) Forest cover has been given a weightage of 7.5 percent in the devolution formula. This may motivate the States to enhance not only the extent but also the quality of forest cover, as the weightage is for moderate dense and very dense forests.
- 4) The MoEFCC may take the initiative to set up a high-powered body called the National Environment and Forestry Council (NEFC), with the Prime Minister as Chairperson, the Minister of Environment, Forest and Climate Change as Vice Chairperson, aided and advised by a group of experts. This body may, in addition, have representation from the Ministries of External Affairs, Science and Technology, Agriculture, Commerce, Urban and Rural Development, Tribal Affairs and so on. Such a high-powered body would provide useful and valuable guidance for environmental sustainability. In the same way, State Environment and Forestry Councils (SEFCs) may also be set up in each State to align the working of different departments with that of the Environment and Forest department, so as to ensure environmental sustainability while implementing various development projects.
- 5) Several steps have been taken by the MoEFCC for streamlining the process of granting Environment Clearances (ECs) and Forest Clearances (FCs).
- 6) A National Environment Restoration Fund (NERF) may be created by the MoEFCC from voluntary contributions and user fees for access to specified natural resources. Penalties levied for violation of environment-related Acts may also be deposited in the NERF. The NERF may be used for cleaning up of polluted rivers and sites contaminated with toxic and hazardous waste.
- 7) The principles of “Participatory Forest Management” being practiced in various States and UTs may be strengthened further by taking up suitable capacity-building measures. Emphasis may be given on improving the socio-economic status of village-level Joint Forest Management Committees (JFMCs) through value addition to sustainably extracted forest produce and marketing of value-added forest products, in particular, NTFPs (Non-Timber Forest Products). An increase in the share of value-added NTFPs, particularly bamboo-based products, in the national and international markets may bring substantial economic benefits to many members of village-level JFMCs.

10.3 NITI AAYOG (National Institution for Transforming India)

- 1) The NITI Aayog, also known as National Institution for Transforming India, represents a policy think tank of the Government of India, established with the aim to achieve Sustainable Development Goals and to enhance cooperative federalism by fostering the involvement of State Governments of India in the economic policy-making process using a bottom-up approach. NITI Aayog was formed via a resolution of the Union Cabinet on January 1, 2015.
- 2) Radically redefining Centre-State relationship, NITI Aayog has, for the first time, ensured that all States take the lead in providing policy interventions to the Union Government. A platform for cooperative federalism, NITI Aayog facilitates the working together of the Union and States as equals.
- 3) As a premier think-tank of the Government of India, NITI Aayog provides critical knowledge, innovation, and entrepreneurial support to the country. NITI Aayog aims to build strong States that will come together to build a strong India.
- 4) NITI Aayog will monitor, coordinate and ensure implementation of the globally accepted Sustainable Development Goals. The SDGs are aimed at eradicating all forms of poverty. Goal 15 is about the sustainable management of forests and terrestrial ecosystems.
- 5) Goal 15 is "Protect, restores and promotes the sustainable use of terrestrial ecosystems sustainably manages forests, combat desertification, halt and reverse land degradation and halt biodiversity loss".

10.4 ROAD MAP OF FOREST MANAGEMENT IN THE WEST NASHIK FOREST DIVISION

The following principles shall remain the key for effective management of forest resources in the West Nashik forest division:

- 1) Consolidation of forest areas through proper boundary demarcation and boundary pillars: Land is becoming more and more scarce resource each day. This precious natural resource need to protect effectively for larger good. So, every piece of forest land shall need to be surveyed using advanced techniques of survey like DGPS and Total station survey followed by fixing of permanent pillars around the forest boundary.

- 2) Watershed management-the way to sustainability: Forest lands serve as an economic and environmental resource, with both perspectives needed to achieve sustainable development. The economic resource includes wood products, food for animals and other products from forests that are consumed by humans. The environmental resource includes biodiversity, wildlife habitat, climatic benefits, water quantity and quality, and aesthetics. Watershed management provides a framework for managing such multiple resources in an integrated manner.
- 3) Restoration of forest landscapes through quality plantations: Forest degradation is the reduction of the capacity of a forest to provide goods and socio-cultural and environmental services. It involves a change process that negatively affects the characteristics of a forest. This change process is caused by disturbances that are mostly human induced. This need to be arrested through effective silvicultural practices like assisted natural regeneration and enrichment planting. The species selection and use of good quality seedlings of known source is the key for success of afforestation programmes. The species that are having lot of potential in this tract are Teak, Khair and Bamboo.
- a. Teak: Teak is the prime timber species of Maharashtra. Like in Vidarbha region, the locality factors in West Nashik division also supports teak and its associates. Earlier good teak forests were present in this area but due to human centric activities like illicit cutting, encroachment and lopping practices led to its degradation. Looking at the demand for teak in both domestic and international markets, there is indeed a need for increasing the production of teak timber. Hence, taking up of pure teak plantations on suitable sites using teak stumps need to be given priority in all afforestation programmes.
 - b. Khair: Another potential species for this area is Khair. Though Khair is chiefly used as a source of Katha, it is also useful timber. The heartwood being naturally durable, it is also a valuable economic structural timber. Hence, on account of its hardness and value of wood, khair is an ideal species for afforestation in this area.
 - c. Bamboo: Bamboo forests are the best option for both landscape restoration and the supply of various goods and services. As bamboo is fast growing, offers opportunity for reclamation of degraded areas in short period. Bamboo's versatility as a substitute for hardwoods reduces pressure on natural forests for timber. In the past like teak, bamboo was also widely distributed in

this tract. Due to biotic pressure and gregarious flowering, good bamboo is now restricted to few compartments and sparsely distributed in other areas. The proportion of PESA area being more in West Nashik division; the bamboo regeneration in these forests will provide direct economic benefits to local communities. The use of vegetative propagated or tissue culture seedlings of bamboo helps in development of good quality bamboo forests. Hence, necessary steps shall be undertaken to raise both pure bamboo plantations and selecting bamboo (at least 20%) as one of the species in all mixed plantations.

- 4) Balancing of production and conservation forestry: Indian forestry revolves around social and environmental elements of sustainable forest management (SFM). The demand for wood and wood products will continue to increase in the future. The present need is met mainly from the Agroforestry sector and balance demand through imports. The forests of the country are catering to 16% of the human and 18% of the cattle population's needs. India is also maintaining around 20% of the forest area under a Protected area network for providing ecological security. The Tree outside forests (TOF) is having lot of potential in fulfilling the demand for forest products and also helps in reducing burden on forests. The strengthening in the capacity of the rural poor for improving their income is crucial for checking the degradation of forests. Therefore, effective planning for balanced production and conservation forestry at each village level is key for achieving sustainable forest management goals.
- 5) Protection of forest and wildlife: The forests are under pressure from all corners of the society and getting degraded each day. Protection of forests from encroachment, illicit felling, poaching, fires, overgrazing, etc., need to be effectively implemented through both preventive and control measures. The protection of natural habitat of wildlife species is necessary for its conservation. The maintenance of connectivity across forest landscapes is required for wildlife dispersal and its long term existence.
- 6) Strengthening of participatory forest management through Joint Forest Management: A key lesson of the JFM experience in our country is that involving local communities in forest management can lead to more effective forest protection. Another lesson is successful conservation depends on cooperation from local people and forestry officials and on legal and institutional backing from the state. These lessons need to be incorporated luxuriously in our planning for forest management. For this

to happen, the JFM strategy requires a change of attitude from both the forest departments and rural communities. Rural communities have had to organize themselves in innovative ways, overcome village and inter-village conflicts, and work together with forest officials. Foresters have had to communicate with local people and share the responsibility for decision making.

- 7) Consolidation and development of FRA areas: Consolidation of forest areas under IFR (Individual forest rights) through proper demarcation remain the primary thing to be done for the development of forest lands with forest rights under IFR. Hand holding support, knowledge services and linkages with welfare schemes of Government departments need to be provided for the development of forest lands with forest rights under IFR and CFR so that the potential of such lands will be utilized to the optimum level in increasing the green cover.
- 8) Management of Human-Animal conflict: Human-Animal conflict occurs when growing human population overlap with established wildlife territory, creating competition for space and resources. As this conflict inflicts direct and indirect direct and indirect consequences on people and animals, its mitigation is an important priority in these landscapes. Mitigation measures vary significantly depending on location and type of conflict. Regardless of approach, the most successful solutions are those that include local communities in the planning, implementation and maintenance.

CHAPTER-11

PAST SYSTEMS OF MANAGEMENT

The study of past systems of management helps to understand today's management theory and practice. Moreover, it assists us to perceive what did and did not work in the past. It will give us a road map for prescribing subsequent management.

11.1 GENERAL HISTORY OF THE FORESTS

There is a lengthy history of the management of forests in the Nashik district. An effort has been made to describe in short about the forest management in this tract in the following para:

- 1) **Before 1837:** There is no record available about systematic harvesting of timber from the wooded areas of Peint but as teak was used as a house building material and for other purposes also, it must have been extracted in some quantities during the regime of Hindu managers of the areas under the Raja of Baglan. Quite soon after 1636, this Rajah became Mohomedans after being captured by an officer of the Moghal Emperor, where they were first sentenced to death but subsequently issued remission, as a reward for relieving the Emperor's daughter of Asthma.
- 2) **1837 to 1878:** The previous ruler Laxdir died in 1837. He had no son and so his daughter assumed the title of Begum on his behalf. From 1839 to 1878, the British Officers managed the affairs of the Estate. During this period, income from forests became a constant part of the Estate revenue. From the year 1861-62 to 1863-64 average annual revenue of about Rs. 16,000/- was obtained from plains and uplands. Since then, massive areas of the forests were cleared for cultivation, but that was a doubtful gain since timber formed the chief wealth of the tract.
- 3) **1878 to 1906:** After the death of the Begum in 1878, when the Estate was attached to Nashik District, sporadic felling of teak and other valuable species were carried out in these forests till the end of the century.
- 4) **After 1906:** From 1906 onwards systematic management of these forests started. Since then the forests have been worked under various Working Plans.

- a. The forests of Nashik and Igatpuri ranges of West Nashik Division were settled and constituted as Reserved Forests during the years from 1879 to 1924.
- b. No systematic management was carried out in Above Ghat Forests until the working plan by J. Dodgson's been introduced in 1906-07. The forests of Nashik Range were worked under the Coppice with the Standard system. With the introduction of the Working Plans, general forest protection improved considerably. Adequate provision was not made for increasing the stocking by the introduction of valuable species. Standards left in the coupes were unproven good seed bearers whilst they interfered with the growth of the coppice and many of them were matured or over matured when selected. Grazing was intensive and was causing damage to the forests.
- c. In the case of forests of Igatpuri range, the best teak areas were harvested departmentally prior to 1888. Each year number of trees to be harvested was decided upon and, the timber so extracted was sold on the site by auction. As there was no demand for firewood or charcoal, the fuelwood species were allowed to remain uncut. Considerable revenue was derived through the sale of grass and fee collected by the issue of grazing permits. The DFO Nashik revised the previous method of working, and he prepared a provisional working plan for Bhandardara reserves in Igatpuri range. The areas were divided into compartments, wherein rotationally one compartment was harvested annually.
- d. In 1898 Mr. Fagan, the then Divisional Forest Officer, Working Plans Central Circle, drew up the provisional plan for regulation of the fellings in the whole of the Igatpuri and Sinnar Ranges inclusive of the teak and fuelwood forests. The forest was divided into a number of blocks and compartments and each compartment was harvested annually and closed thereafter for ten years for regeneration. The silvicultural system adopted was "Coppice-with-Standards" in which promising sound trees were allowed to survive till the subsequent rotation and reserved as standard to act as seed-bearers. The regeneration was secured by coppice shoots from the felled stumps and by natural dispersal of seeds. After 1912, Mr. Gonsalve revised the plan, and he differentiated the areas into teak and miscellaneous (injaili). The teak area was divided into 6 blocks with a 40 years felling cycle and miscellaneous (injaili) area was divided into 11 blocks with a felling cycle of 30 years. Teak

Working Circle was worked under 'Coppice with Standard' system in which 30 to 40 standards above 45 cm (16") girth per acre was reserved and all young trees below 30 cm (12") in girth were also reserved. Miscellaneous (Injaili) area was worked under "Improvement Fellings." The results of the above working could not produce the desired results. People illicitly cut the reserved standards and the coppice reproduction did not come up as desired.

- e. During 1933-34, a provisional plan was introduced, and the whole area was divided into 8 felling series and managed under the clear felling system on 60 years rotation. By the end of 1941-42, only one to nine coupes was worked. In this plan, no distinction was made between teak and miscellaneous (injaili) area and blank areas. Clear felling was followed by partial artificial regeneration. No coupe was sold out as barren and low-density areas were included in the coupe, which made the coupe uneconomical for harvesting. This mistake was rectified in the plan written by Mr. Kotwal by separating all the low-density areas from the workable areas, and low-density areas were included in Pasture Working Circle. Steep sloppy areas were also clear felled in the process and the result was that they became degraded.
- f. The working plans for Nashik and Igatpuri Range were revised by Shri. U. B. Patil and brought into force in 1977-78, which was revised by Shri. A. D. Shejale.

11.2 PAST SYSTEMS OF MANAGEMENT AND THEIR RESULTS

The past systems of management of the West Nashik division forests can be broadly classified into three parts:

- 1) Working plans for Below Ghat forests of Nashik
- 2) Working plans for Above Ghat forests of Nashik
- 3) Consolidated Working plans including both Below and Above Ghat forests of Nashik

11.2.1 Below Ghat forests of Nashik

11.2.1.1 Dodgson's Working Plan

This plan was in force for a period from 1906 to 1925 (for 14 to 19 years),

working being restricted to certain blocks from 1920 onwards and finally stopped in 1925. This plan dealt only the reserved forests, as the protected forests were in charge of the Revenue Department. The whole area was divided into 36 blocks with an average area of each block varying from 1416.40 hectares to 1618.74 hectares (3500 to 4000 acres). Each block was further divided into 30 compartments and the felling cycle was 30 years.

The objective of management was to introduce a system of working that would tend to bring the crop into a more normal condition for subsequent treatment under a regular high forest system with necessary arrangements for the enjoyment of concessions granted to the local population. As the aim was to prepare a crop to be worked under a long rotation of 120 years under a high forest system, the method adopted was to remove all unsound trees and sound teak trees over 16" in diameter. In addition, miscellaneous (injaili) species were also removed in such a manner that the proportion of teak and miscellaneous (injaili) species in the resultant crop will be at a proportion of 1/3rd and 2/3rd respectively. Although the felling prescribed resembled light selection felling, it was more of improvement felling. The working in most of the blocks was stopped in 1920 by the order of the Conservator of Forests, Northern Circle, Nashik as the desired results were unseen.

The prescriptions of the above Plan did not give desired results because of field difficulties in its implementation and absence of regulatory control on contractors. Neither the teak coppice developed nor the crop consisting of the desired proportion of teak and miscellaneous was (injaili) achieved.

11.2.1.2 Departmental fellings

When the work under the previous plan was restricted (in the year 1920), departmental fellings in Badgi and Musla were introduced and good saleable timber logs were transported to Nashik and the material which was considered not fit for sale as round timber was sawn in the mills installed at above two places. These sawmills at Badgi and Musla, however, were subsequently closed in 1929 and 1931 respectively.

Due to clear felling after securing the reservation for advance growth, all the unsound and over mature stock was removed that has resulted in the crop composing of coppice shoots and middle-aged stems. Examination of the areas worked under the modified felling indicated that the clear felling was done in small patches and in the rest of the area, selection felling was done.

11.2.1.3 Walker's Working Plan

In 1927, Mr. Walker prepared the Working Plan for the period from 1930-31 to 1952-53. It contained the reserved forests as well as the protected forests, whose management had been transferred to the Forest Department in 1922. Earlier the reserved forests and the protected forests of Talasari and Mokhada of Thane District were additionally included but later on, they were excluded from the scope of this plan and transferred to the Thane Division. The plan was brought into force in the year 1930-31. A vital portion of the reserved forests was included in the Teak Reserves Working Circle and Ghat Fuel Working Circle. However, due to difficult topography and low value of the material, no working is done in Ghat area.

Selection-cum-improvement felling with the object of bringing the desired mixture of 50% of teak and 50% of miscellaneous (Injaili) species was prescribed. Suitable patches were to be clear felled to take up plantations. Rotation of 60 years was fixed with the expectation of producing trees of about 1 metre to 1.2 metres girth. Rotation period was divided into three periods each of 20 years. Felling was prescribed for the Periodic Block-1, covering the approximately 1/3rd area under the plan. The necessary provision for the supply of timber to Saw Mills at Badgi and Musla were equally made. In other blocks, Improvement felling was prescribed and they were put under Periodic Block-II.

The protected forests were handed over to the Forest Department by the Government Resolution No. 3842 dated 19-5-1922. This working circle was comprised of all the protected forests in Peint Mahal and those in the Talasari and Mokhada of Thane District. However, Talasari and Mokhada were later transferred to Thane. Above protected forests were put under the Protection Forests Working Circle. Teak, Tiwas and Shisham being reserved species, the method of treatment adopted was selection felling so far as these species were concerned. Rotation of 60 years was fixed, and the area was divided into 3 periods. Owing to the scattered nature of these forests, these areas were undivided into Blocks and compartments. The Felling series and coupes were constituted according to the villages in which the protected forests were situated. As the forests were subjected to the exercise of privileges, no closure of the areas to grazing remain possible and hence artificial regeneration was unprescribed but cleaning operations of teak coppice and saplings of superior miscellaneous (injaili) species were prescribed. Thinning was prescribed in those areas which were worked before the introduction of the plan.

Bamboo both Kashti and Manvel were sold on permits. Apta, Tendu leaves, Hirda fruits and Chilhar were sold by auction either on a yearly or five-year contract.

Results:

- a) Due to the closure of Musla and Badgi Saw Mills in 1923 and 1929 respectively, all the reserved forests allotted to P.B-I were worked under 20 coupes. Due to either non-availability of teak in sufficient quantity or the inferior quality of teak, the substantial number of coupes remained unworked in the Dindori block.
- b) The objective of producing a crop containing 50% Teak and superior miscellaneous (Injaili) species like Khair, Tiwas, Shisham, and 50% of inferior miscellaneous (injaili) species was unachieved due to the elaborate and complex nature of prescriptions. Because of this teak suffered considerably and its proportion in young pole crops was decreased. Due to the dominance of inferior miscellaneous (injaili) species, the value of the crop was reduced and also it suppressed the coppice reproduction of Teak and superior miscellaneous (injaili) species. Thinning was neglected throughout, resulting in congestion of the crop. The improvement fellings were carried out mainly with the object of collecting sufficient revenue rather than fulfilling the object of improving the crop.
- c) Due to better accessibility of the forests and the presence of better quality Teak in the crop, most of the coupes were worked. The composition of these forests varied greatly and the resultant crop developed well. In all these areas, miscellaneous (injaili) species yielding Rab were unmarked for felling because of that the development of Teak took a back foot.

11.2.1.4 Mundkur's Working Plan

Mr. Mundkur revised Mr. Walker's Plan in the year 1953-54 for the period from 1953-54 to 1968-69. His plan was implemented in 1953-54. In this plan, three working circles constituted under Walker's Plan were retained. In addition, Overlapping Bamboo Working Circle and Minor Forest Produce Working Circle were also constituted.

(a). Selection-cum-Improvement working circle: This Working Circle included all the reserved forests of Peint, Barhe and Harsul Ranges of the West

Nashik Division. The areas allotted to this working circle were divided into three groups i.e. (i) areas worked under Dodgson's Plan, (ii) area worked under Walker's Plan, and (iii) areas remain unworked. To improve the crop condition under the category (i) and (iii), the sequence of fellings were so arranged that areas in these categories came up for immediate working. Taking into consideration the nature of terrain and experience from the past working, Selection-cum-Improvement Felling was considered to be the best suited for the area. Clear felling was recommended for areas with moderate and gentle slopes. Clear felled areas were to be planted with teak and other superior species. Gap planting in gaps larger than 66 ft x 66 ft in Selection-cum-Improvement Felling areas was also recommended. The species recommended for planting were Mallotus, oil seed-bearing species and other economically useful species like Khair, Sawar, and Hed, etc. Teak stump planting was prescribed where rab material was available and the gaps were profuse. The rotation of 80 years was fixed, and a felling cycle of 40 years was adopted. As the crop was of uneven nature and the proportion of Teak varied from place to place, the yield was regulated by area only. The area allotted to the Working Circle was divided into 23 felling series. The harvestable girths of 120 cm for Khair and Tiwas, and 105 cm for other superior miscellaneous (injaili) species were fixed. First mechanical thinning with cleaning in the 5th year, the second mechanical thinning in the 11th year and first silvicultural thinning in the 26th year after the main felling were prescribed. A thinning program was also drawn up for the areas worked departmentally in the past, during the currency of Dodgson's Plan for sawmills and also for areas irregularly worked during the currency of Walker's Plan.

(b). The Protected forest working circle: This Working Circle included all the protected forests dealt with under Walker's Plan. They were situated in the Peint mahal and part of Surgana mahal. Teak remains the principal species forming about 21.6% of the crop, superior miscellaneous (injaili) species constituting 23.7% and the rest 54.7%. The method of treatment prescribed has been Selection fellings so far as Teak, Tiwas and Shisham were concerned. Inferior species were to be removed wherever they interfered with Teak and other superior species. In congested groups consisting of poles and middle-aged teak trees, thinning was prescribed. The rotation adopted remains 80 years with a felling cycle of 40 years. The yield was regulated by area only. Total 3 felling series were formed and the harvestable girth limit for Teak was kept as 120 cm whereas, for Tiwas and Khair, it was kept as 90 cm, and for other miscellaneous (injaili) species 105 cm harvestable girth was fixed. Subsidiary Silvicultural operations included cleanings in the 5th year, 1st

thinning in the 11th year and second in the 26th year. The most important privilege enjoyed by the people was lopping for tahal.

(c). Ghat fuel working circle: This Working Circle comprised of Reserved Forests dealt under Walker's Plan and Nashik below Ghat Blocks No. I to III. The forests were of the semi-evergreen type and were situated on the crest of the Western Ghats extending down the slopes to the bottom of the valleys. The forests were inferior in quality and were critical for working. The method of treatment prescribed was improvement-cum-selection fellings. 1/8th of the coupe area was to be planted with Teak, Sadada, Mango, Jambhul, and Hirda, etc. No rotation was worked out but the felling cycle was fixed at 30 years. The yield was regulated by the area. Three felling series were formed and one thinning in the 15th year was prescribed.

(d). Bamboo working circle: This was an overlapping working circle, which included forest areas bearing bamboo. Manvel (*Dendrocalamus strictus*) comprise the most abundant and widely distributed species. Kasthi (*Bambusa arundinacea*) was found over limited areas. Six felling series, two in each of the three ranges Peint, Barhe and Harsul were formed. Each felling series was divided into three coupes coinciding with a felling cycle of 3 years. The yield was regulated by the area. Rules were framed to regulate the extraction of Bamboos.

(e). Minor Forest produce working circle: This was another overlapping working circle comprising of all the areas dealt under the plan. The minor forest produce species of commercial importance like Apta (*Bauhinia racemosa*), Temburni (*Diospyros melanoxylon*), Hirda (*Terminalia chebula*) fruits, Chilhar (*Caesalpinia sepiaria*) bark, Kahandol (*Sterculia urens*) gum were given priority. There was good demand for Apta leaves, Hirda fruits and Chilhar barks and they were harvested but Temburni leaves and Kahandol gum were unharvested. The minor forest produce was sold by auction. Besides the previous items, Moha flowers and fruits were collected by local people.

(f). Results:

- 1) In Walker's Plan, the method of treatment prescribed was "Selection-cum-Improvement-cum-Clear felling." This system was considered unsuitable, as it did not produce the desired results. However, Mr. Mundkur prescribed a similar system with some modifications. Perhaps, considering the terrain, this was the most convenient system, which was

expected to fulfill the object of management.

- 2) The marking rules did not provide any safeguard to protect the future yield, with the result that almost all the trees over selection girth were removed in marking. This resulted in the depletion of big-sized trees.
- 3) The combination of Selection-cum-Improvement fellings with clear felling and no proper stress on planting; greatly impoverished the forests through the removal of trees of valuable species to a considerable extent.
- 4) In the case of Ghat Fuel Working Circle, the difficult terrain and the low value of the crop did not permit to work all the coupes during the currency of Mundkur's Plan. Only a few coupes were worked, and only saleable material was removed. Cleanings and thinning in the Ghat Fuel Working Circle were not carried out. The Ghat fuel forests remained in the same condition as they were at the beginning of the plan or deteriorated further.
- 5) Thinning carried out as per prescriptions of Mundkur's Plan in areas which were worked under Dodgson's Plan and areas which were irregularly worked for sawmills did considerably improve the crop. Climber cutting operations were not carried out.
- 6) The cleaning and thinning operations remained confined to plantations only and little attention was paid to cultural operations in the rest of the areas. This resulted in the congestion of the crop. Although the plan prescribed certain spacement at a certain age, these prescriptions were unfollowed.
- 7) The working of these forests resulted in fulfilling the requirements of the local populations as regards tahal. But no attempts were made to introduce the tahal yielding species.
- 8) These forests derived handsome revenue due to Teak trees in a more considerable proportion. As the marking rules did not provide control over the harvesting of trees above selection size to safeguard future yield, there was heavy harvesting of Teak.
- 9) 18% coupe area was to be planted with Teak in some villages. However, the teak plantation on that scale was unfound. Some efforts in this direction were made in Harsul range. Some of these plantations came up well.

11.2.1.5 Bhadbhade's Working Plan

Mundkur's Plan was revised by Shri. M.A. Bhadbhade and introduced in 1969-70. He classified forests on the functional basis as per Government Resolution of 1968 as Protected Forests and Tree/Reserved Forests. He formed

six working circles:

(a). Ghat working circle: Improvement felling under the felling cycle of 20 years was prescribed for Ghat Working Circle. Three felling series was formed. Felling on steep slopes and slope above 25° as well as in understocked areas was excluded. The harvestable girth fixed for Mango and Hed was 120 cm, for Teak, Jambhul and Kalamb was 105 cm and for Sadada, Dhawda, Awali, and Kumbh was 75 cm. Thinning in the congested crop was prescribed in favour of economically valuable species like Teak, Sadada, Hed, Kalamb, etc. Out of 54 coupes, only 13 coupes were worked. The plantation was raised over 130 hectare only which was far less than the plantation prescribed.

(b). Conversion working circle: To convert the crop into a uniform even-aged crop of valuable species, clear felling followed by artificial regeneration was prescribed in the conversion working circle. Rotation and conversion period was fixed at 60 years. The whole area of this working circle was divided into three periodic blocks with 20 years as the regeneration period. Total 17 felling series were formed and each felling series was divided into 60 coupes. The yield was regulated by the area. In PB-I, the areas with precipitous and extremely steep slopes more than 25° and areas with groups of young poles of Teak and other valuable species were excluded from felling. The area selected for the plantation was to be clear felled and planted with Teak and Bamboo. In PB-II, judicious thinning combined with improvement felling was prescribed and the whole area was to be covered within a period of 20 years. In PB-III, cultural operations and thinning were prescribed and 27529.355 hectare area was earmarked to the FDCM from this Working Circle in 1974.

(c). Pulpwood plantation working circle: All areas suitable for Eucalyptus and Bamboo plantations were to be clear felled and planted. Improvement felling was prescribed. The rotation was of 15 years for Eucalyptus and a three-year felling cycle for Bamboo was adopted. Subsequently, this circle was merged with the Conversion working circle. No cleaning and thinning were considered necessary for Eucalyptus. Plantation of Teak and miscellaneous species were raised over the area of 594 hectare.

(d). Protected forest working circle: Selection-cum-Improvement felling on the rotation of 80 years was prescribed. Felling cycle was fixed at 40 years and the yield was regulated by area. The whole area was divided into 13 felling series and each series further divided into 40 coupes. The areas selected for plantation were to be clear felled and planted with Teak. The harvestable girth

for Teak was fixed at 120 cm. First thinning was prescribed in the 11th year and second in the 25th year. Only a 77.70 % plantation target was achieved in the working circle. The regeneration of Bamboo after the gregarious flowering was properly established.

(e). Bamboo overlapping working circle: Selection fellings of mature culms in each clump, with a felling cycle of three years, was prescribed. Six felling series was formed. Artificial regeneration was prescribed where natural regeneration of Bamboo was not adequate. Bamboo coupes were not worked as per working plan prescriptions in the year 1969-70 to 1970-71. From 1976-77 to 1979-80, the gregarious flowering took place in Bamboo Overlapping Working Circle. During 1980-81 to 1986-87, Bamboo was worked departmentally in Peint.

(f). Minor forest produce: Minor Forest Produce units were to be sold either by auction or by permit.

(g). Other general prescriptions: The coupes of Conversion Working Circle and Pulpwood Plantation Working Circle were to be worked either departmentally or through the Forest Labour Cooperative Societies (FLCS). Closure to the grazing of harvested coupes was prescribed for the period of six years from the year of felling in Ghat Working Circle and Protected Forest Working Circle. The planted areas were to be closed for grazing in Conversion Working and Plantation Working Circle, for a period of six years from the year of working.

11.2.2 Above Ghat Forests of Nashik

11.2.2.1 Nashik Teak above Ghat plan by J. Dodgson (1906 to 1935-36)

Coppice with the standard system was prescribed for Teak forests with a felling cycle of 30 years.

11.2.2.2 Working plan for Sinnar and Igatpuri Ranges by A.G. Gonsalve (1912-13 to 1932-33)

Coppice with the standard system was prescribed for these forests with a felling cycle of 40 years.

11.2.2.3 Results of working the forests under aforesaid Working Plans

Whole forests were worked under “Coppice with Standard system.” After the introduction of the working plan, general forest protection improved considerably. But an adequate provision was not made for stock improvement through the introduction of valuable local species. Standards left in the coupes did not prove good seed bearers, as many were mature or over-mature when selected. Overgrazing was one of the key obstacles to effective forest management during that period.

11.2.2.4 H.W. Starte’s working plan for Nashik Ghat forests

This working plan dealt with reserved forests of Nashik above Ghat Forest areas of East Nashik Division (Baglan, Kalwan, Nandgaon, Malegaon, Chandor and Dindori Ranges) and only Nashik Range of the West Nashik Division. The working plan included an area of 218520 hectare (529975 acres 37 ¼ guntas) and came into force from 1936-37. Following five working circles was constituted to achieve the objects of management specified in the Working Plan:

(a). Teak working circle: This Working Circle consisted of the mixed deciduous forests in which Teak represent the predominant species. The silvicultural system adopted comprises the clear felling system in suitable portions of the annual coupes with a vigorous policy of regenerating Teak and miscellaneous (injaili) species. The object of management was to reproduce Teak trees of 75 cm (30’) girth within the rotation of 45 years. The felled coupes that have been severely undamaged by the fire were closed to grazing for a period of 7 years and those coupes, which were burnt, were closed for a period of 10 years from the year of the felling of the coupes.

(b). Scrub working circle: This Working Circle consisted of mixed deciduous forests of the drier type in which Anjan, Tiwas, or other miscellaneous (injaili) species predominate. The silvicultural system adopted comprises the judicious combination of clear felling and improvement felling. A rotation of 45 years was provisionally fixed. No harvesting girth limits were fixed since the primary object of management was to protect and increase the existing growth. The felling series, which contained good Anjan growth, were closed to grazing for a period of 10 years. The annual coupes from the remaining felling series were closed for a period of 5 years only from the year of

commencement of felling.

(c). Kuran working circle: This Working Circle comprised of a number of kurans that were managed for (a) grazing or (b) grass cutting only. This working circle was partly overlapping. Overlapping kurans were also subject to the normal period of closure (as mentioned above) in which they felled whenever the time came for working on the annual coupes of which they were part.

(d). Miscellaneous working circle: This Working Circle comprised of (i) 98.450 acres special grazing area which was set aside for simple grazing without being subjected to silvicultural operations, and (ii) 26.044 acres of an unworkable area which could be unworked due to inaccessibility and precipitous slope.

(e). Results:

The same mistake of including understocked areas in Teak and Scrub Working Circle was made as was done in the previous plan.

- 1) The proportion of the area to be artificially planted was unfixed. In fact, these areas did not contain advance growth of Teak and other superior miscellaneous (injaili) species. The intact area of the coupe could have been proposed for artificial plantation.
- 2) Grazing without any regulation was permitted in non-kuran areas of the miscellaneous working circle and no silvicultural operations were prescribed for improvement in these areas.
- 3) In many cases, clear-felling was done on steep hills though the same were to be restricted up to areas having moderate slopes as per prescriptions of the plan. The clear felled areas of the coupe could not be regenerated with valuable species because no efforts were made to raise the plantations of Teak in such patches.
- 4) In most of the coupes which remained unworked due to poor and sparse tree growth, no silvicultural operations like Artificial Regeneration etc., were carried out though the same was prescribed in the plan. As a result of this, the stocking in the forest area could not be improved.
- 5) Heavy illicit cutting and unauthorised cultivation rendered much of the forest areas devoid of tree growth and useless for immediate artificial regeneration due to degradation of site factors.

11.2.2.5 E.K. Kotwal's revised Working Plan for Igatpuri forests (1942-43)

The revised working plan for Igatpuri forests by E.K.Kotwal came into force from 1942-43. In this working plan, four working circles have been constituted and the prescriptions in which were as follows:

(a). Teak working circle: This working circle comprised of Teak bearing areas and, areas which were fit for the introduction of Teak after clear felling. The silvicultural system adopted was "Clear felling-cum-selection-cum-improvement" and the rotation was arbitrarily fixed in 50 years. Each annual coupe was demarcated in two types; (a) Area fit for clear felling, and (b) Area to be worked under the selection-cum-improvement system. Clear felling was restricted to gentle slopes only. The areas on steep hill slopes were worked under the selection-cum-improvement system for avoiding erosion hazard. The annual coupe was closed to grazing for a period of 12 years from the year of working.

(b). Semi-evergreen protection working circle: The majority of the forests included in this working circle were semi-evergreen and evergreen in nature. The silvicultural system adopted was selection-cum-improvement with a felling cycle of 40 years. 100 trees per hectare were to be retained as a ground cover. Dead, dying, over-mature and suppressed trees were to be removed. The annual coupe was closed to grazing for a period of 10 years from the year of commencement of felling.

(c). Pasture working circle: This working circle comprised of those areas, which have been completely stripped off all tree growth by continuous maltreatment. The working circle was divided into 4 felling series with a felling cycle of 20 years. Each Felling series was divided into 5 sub-blocks each consisting of 4 coupes. The sub-block was, therefore, the unit of grazing. During 20 years of felling cycle, one sub-block was closed continuously for 4 years and during that period the remaining 4 sub-blocks would, in turn, remain closed during the monsoon period (1st June to 31st October). Sub-blocks, which were closed for 4 years, were maintained as a cutting kuran.

(d). In-harvestable working circle: This working circle composed of precipitous slopes, which were excluded from working from the soil conservation point of view and inaccessibility of the site.

Results:

- 1) In Teak Working Circle no specific percentage of the area to be planted was given. In fact, the Teak planting should have been prescribed over the entire clear felled area. In the Semievergreen working circle, the object of working was to prevent runoff of water and erosion of soil. This object could have been achieved by introducing the improvement fellings over these areas but instead, the areas were proposed to be worked under Selection-cum-Improvement system.
- 2) In the Teak Working Circle, the clear-felled areas were not planted with Teak. Most of the trees cut were not good coppicers and so such clear felled areas could not be properly restocked. Similarly, most of the coupes were unworked because they contained sparse tree growth. When artificial regeneration was clearly prescribed for these areas, the territorial staff should have undertaken the plantation in the sparsely stocked coupe for planting.
- 3) In Semi-Evergreen-Working Circle only 100 trees per hectare were retained, and rest of the crop clear felled. The retention of only 100 trees per hectare resulted in the drastic opening of the canopy. Similarly, the clear-felled tree species were not good coppicers and this resulted in creating blanks in these areas.
- 4) In Pasture Working Circle, the grazing could not be controlled, as there was no restriction to the admission of cattle in the forest area for grazing.

11.2.2.6 Mr. U.B.Patil's Working Plan (1977-78 to 1986-87)

He revised Kotwal's plan during 1974-76 and formed following five working circles:

(a). Conversion working circle: Clear felling and planting suitable areas with Teak and other valuable timber species were prescribed with a conversion period of 40 years. The area was divided into two-periodic blocks viz., PB-I and PB-unallotted. The yield was regulated by the area. The combined area of the working circle was 4889.236 hectares and was divided into five felling series. The coupes were started for working from 1977-78 to 1986-87. In PB-I areas, 30 coupes were due for working but only 25 coupes were worked and the plantation over 295 hectares was raised. In PB-unallotted, out of 40 coupes, none was worked.

(b). *Eucalyptus* working circle: The areas suitable for raising *Eucalyptus* plantation were to be planted with *Eucalyptus* and remaining areas with species like Mango, Jambul, Hirda, etc. No felling in the areas was prescribed as most of the areas were devoid of tree growth. The aggregate area of 9966.443 hectare was divided into six felling series with a rotation of 15 years. The coupes were worked from 1977-78 up to 1986-87, 10 coupes were due for work. Out of 60 coupes due for working, 30 coupes were worked. Instead of *Eucalyptus*, mixed plantations on 922.54 hectare and grass plantations on 290 hectare were raised by Intensive Development of Fodder Resources (IDFR). This entire area later got assigned to the FDCM Nashik Project division.

(c). Afforestation working circle: The areas were divided into 7 felling series with a period of 20 years. Planting of suitable tree species like Neem, Shiras, Sissoo, Anjan, etc., was prescribed, where soil depth is 20 cm and above. Agave planting was prescribed in the remaining areas. The closure to grazing and fire control for a period of 10 years in planted areas were prescribed. In this Working Circle, there were Seven Felling series. The combined area of the working circle was 6338.890 hectares. There were 20 coupes in each felling series. 10 coupes were due for working since 1977-78 and all the 10 coupes were worked. The area tackled was 3260.786 hectare and plantation raised over 750 hectares.

(d). Pasture working circle: The area was divided into 49 grazing series, which were further divided into three similar pastures. Out of the three pastures, one pasture was to be closed completely to grazing for a period of 10 years in the rotation. Soil conservation works were prescribed in the areas prone to erosion or already eroded areas in the exclusive pastures. Sowing of grass seeds and planting of seedlings along contours were prescribed. In all, there were 49 grazing series in this Working Circle and the combined area of the working circle was 15551.817 hectare. In each grazing series, there were three pastures. This area was earmarked for the Intensive Development of Fodder Resources (IDFR) to develop into grass reserves. DFO West Nashik also planted the area with mix species like Kaju, Acacia, Gliricidia, Kashti, Subabul, etc. The total planted area was 1264.87 hectare and out of which only 260 hectares was grass plantation.

(e). Kuran working circle: The areas capable of producing good quality grasses in large quantities have been constituted into kurans. The area was divided into cutting kurans and grazing kurans. Cutting kurans were to be

fenced with barbed wire or cattle proof trench. The areas were to be divided into 5 sections, and a minor portion of land from each section was to be planted with superior quality grasses. Unwanted bushy growth and grasses were to be cut from such areas. Soil conservation works were suggested, and grazing was totally prohibited. Grazing kurans were to be closed for grazing from 1st April to the end of August and the kuran remained open for grazing during the remaining period.

The combined area of this working circle was 4757.899 hectare. The area of cutting kuran was 1795.392 hectare and the plantation raised in the cutting kuran was 1469.00 hectare. Out of this total plantation of 1469.00 hectare, 142.00 hectare plantation was raised by DFO West Nashik and 1327.00 hectare plantation was raised by Intensive Development of Fodder Resources (IDFR). The area of grazing kuran was 2642.830 hectare. The plantation raised in this grazing kuran was 542.00 hectare. Out of which, 102 hectare plantation was raised by DCF West Nashik and 440.00 hectare planting was raised by IDFR. The continuous area of this working circle was earmarked for IDFR.

11.2.2.7 Working by I.D.F.R.

The Intensive Development of Fodder Resources (IDFR) Division was created in 1979-80 for developing grass reserves. The combined area allotted to this division till 1987-88 was 5447.37 hectares. While formulating the schemes by IDFR, it was contemplated that the grasses planted on Grass Seed Beds, Uralis, Grass plots, V-shaped furrows would serve as nuclei for the propagation of quality grasses. But it was observed that the nuclei had not served the said purpose. Artificial planting of quality grasses remained restricted to the Uralis and Grass beds only. In some places, it was observed that the locally established grasses suppressed quality grasses planted on Grass Seed Beds, Uralis and 'V' shaped furrows.

11.2.2.8 General observation about status of regeneration

The forests were subjected to over-harvesting. Clear felling was basically guided by commercial consideration. Primary attention was not given to regenerate the areas. The areas clear felled and artificially regenerated failed due to a lack of effective protection. The tree cover continued to deplete at a rate much faster than it was replenished. This resulted in large-scale degradation and erosion. The degradation already reached a critical stage in many places, and it was necessary that further management must be to ensure

environmental stability and maintenance of ecological balance.

11.2.3 CONSOLIDATED WORKING PLANS

11.2.3.1 A.D. SHEJALE'S PLAN FOR BOTH ABOVE AND BELOW GHAT FORESTS:

The first consolidated Working Plan for both above and below Ghat Forests of Nashik was prepared by Shri A.D. Shejale for the period from 1990-91 to 1999-2000. The combined area covered under this plan was 92908.839 hectares. Nine Working Circles were constituted to achieve the objects of management as specified in the Working Plan.

(a). Protection working circle: This Working Circle included the forests situated on the upper hill slopes. The areas allotted to Protection Working Circle in Mr. Patil and Mr. Bhadbhade's plan were retained and other such areas were additionally included. The aggregate area allotted to this working circle was 18481.243 hectares. Felling was strictly prohibited in this Working Circle and the preservation of the existing vegetation was prescribed. Besides, soil and moisture conservation measures were also prescribed. Seed dibbling in blank areas was also suggested. Protection from fire and grazing was advocated.

(b). Improvement working circle: This Working Circle included the part of Conversion Working Circle of a previous plan for Peint, Barhe, Harsul, Nashik and Igatpuri Ranges. Both Moist Deciduous and Dry Deciduous forests were covered. The combined area of the Working Circle was 22030.752 hectare. The silvicultural system adopted was improvement felling and plantation in understocked areas. Removal of dead trees and tending of a group of young poles and taking plantations included in improvement felling while in the understocked areas artificial plantations were prescribed. The dressing of illicitly cut stools and tending of rootstocks were prescribed. Felling on exposed rocks, shallow soils, along nalla banks and surrounding natural blanks was prohibited. Planting of local species was stressed. Cut back operations, cleaning in the 5th year and thinning in the 10th year were also prescribed. Protection from fire and grazing of the worked coupe for a period of 10 years from the year of the plantation was prescribed. Evicting encroachment and taking plantation were also prescribed.

(c). Afforestation working circle: This included forest areas containing

a crown density below 0.4. The aggregate area included in this Working Circle was 14486.917 hectare. 38 Plantation series were formed and each series was divided into 10 annual coupes with an average area of 40 hectares. Improvement fellings in well-stocked patches, planting in blanks and understocked areas and intensive soil conservation measures were prescribed. It was prescribed to classify the area into A, B, C, and D types to provide treatment. For taking up plantations, zonation was suggested. Three weeding and soil working in the 1st year, two weedings and soil working in the 2nd year and one weeding and soil working in the 3rd year were prescribed. Application of fertilizer in 1st year at the time of first and second weeding was suggested. Casualty replacement in the 2nd year with well-grown poly pot seedlings was prescribed. Cleaning in 5th year, protection from fire and closure to grazing for 10 years from the year of planting was prescribed.

(d). Fuelwood working circle: This Working Circle exclusively included protected forests, locally known as Rabbi in Peint, Harsul and Barhe ranges. The combined area covered under this Working Circle was 22558.887 hectare. The forests included belonging to the Southren Tropical Moist Deciduous Forests. The quality varies from IVa to III and is as good as the best Reserved Forests. Improvement felling and planting in understocked areas and gaps were prescribed. The yield was expected from improvement felling and thinning. People's participation was mentioned to be adopted. Each village was formed as an independent felling series irrespective of the area of the forest. Felling cycle of 5 years was suggested. Annual coupes were not laid. Cut-back operations, weeding, and soil working in the plantation, causality replacement, and closure to grazing and effective fire protection for 5 years were prescribed.

(e). Intensive fodder production working circle: This included those areas, which were with the Intensive Development of Fodder Resources (IDFR) Division. These areas possess the potential for producing good quality grasses. The aggregate area covered under this working circle was 8262.194 hectares. Fencing of kurans with TCM (Trench cum mound) and barbed wire, taking effective fire tracing, closing permanently to grazing were prescribed. Harvesting grasses by local bodies were suggested. Soil and Moisture Conservation measures were prescribed.

(f). Pasture working circle: This included degraded forest areas not capable of producing Timber or Fuel. The combined area covered under this working circle was 7088.846 hectares. Areas were confined in Igatpuri and Nashik ranges. Protection from heavy grazing, effective fire protection, anti-

erosion measures and improvement of quality and quantity of fodder grasses in these areas were prescribed. Rotational grazing was advocated.

(g). Minor forest produce (Overlapping) working circle: This was an overlapping working circle and included the entire area. To improve the minor forest species, seed sowing in suitable localities in the Improvement and Protection Working Circles was advocated. Gum tapping from *Sterculia urens* (Kahandol) trees was prescribed.

(h). Wildlife (Overlapping) working circle: This working circle involved the entire area. More significant emphasis was given for the increasing population of migratory water birds. Protecting them and keeping their nesting places undisturbed were prescribed.

(i). Miscellaneous working circle: This included encroachment (1972-78) area and the list was given. However, no prescription was mentioned.

Results: The plan was only partially implemented. No harvesting works were done during the Plan period. Some works were carried out in the Improvement Working Circle. Mostly SMC and Afforestation works were taken up during the plan period under various schemes and projects (*viz.* World Bank aided Maharashtra Forestry Project).

11.2.3.2 B.P. SINGH AND V.D. CHAFEKAR PLAN (2007-08 TO 2016-17)

This is the second consolidated plan which was prepared for the period 2007-08 to 2016-17. In total five working circles and three overlapping working circles have been constituted to prescribe specific treatment to achieve the stated objectives. Brief detail about these working circles is explained below:

(a). Protection working circle: This Working Circle included forests situated mostly on upper hill slopes, which are very steep and precipitous. Due to the steepness of the slope, the areas are mostly devoid of tree growth, and vegetation occurs only in inaccessible valleys. Vast stretches of exposed rocks with little or no soil cover were part of this working circle. The special object of management of this working circle was to prevent soil erosion by preserving the existing vegetative cover. No harvesting was prescribed and even the extraction of dead trees was not provided as it would enhance the danger of soil erosion. The existing vegetation in these areas was to be preserved so that they act as soil cover and prevent soil erosion. However, in areas which were eroded or

liable to erosion, plugging of gullies and small nalas was prescribed and construction of loose boulder structures of the approved design was prescribed at suitable sites.

(b). Improvement working circle: This Working Circle covered the best forest areas of the division spread in Barhe, Peint, Harsul, Igatpuri and Nashik Ranges. Areas in Barhe, Peint and Harsul are the richest in so far as site quality and type of forests are concerned. Over the period of time, the crop has deteriorated and as such it requires improvement. Therefore, such areas have been put together under this working circle with the main objective to make improvements in the condition of the crop. The special objects of management included the enrichment of the growing stock by artificial regeneration and tending of natural regeneration without changing the climax status of the forests and achievement of normality of the growing stock in the shortest possible time to derive maximum sustained yield in future.

(c). Afforestation working circle: The combined area of the Working Circle was 21099.141 hectares and included areas in Nashik, Sinnar and Igatpuri Ranges. This Working Circle included areas under Afforestation working circle, Intensive Fodder production working circle and Fuel woodworking circle in the previous plan except those allotted to Plantation working circle and Improvement working circles. Additionally, it included the newly added areas like new Protected Forest and Compensatory Land, Private Forests finally Acquired under 1975 Act, and Reserved Forests have taken from the Revenue Department in Nashik, Sinnar and Igatpuri Ranges. The special objects of management in this working circle were to improve the stocking by artificial regeneration and produce fuelwood, poles, bamboos and small timber for fulfilling needs of the local population, to conserve soil and moisture in the area for promoting natural regeneration and to restore the ecological balance by increasing the tree cover.

(d). Kuran working circle: The Working circle included the areas capable of producing good quality grasses. As there was immense potential for dairy development in the region, this working circle was expected to provide good quality fodder to local people. The areas covered under this working circle included three ranges namely Nashik (698.666 hectares), Igatpuri (125.636 hectares) and Sinner (1954.597 hectares). The objects of management of this working circle were to improve the quality of fodder grasses in the kuran by introducing suitable grass species of better varieties and to step up the production of quality grasses for meeting the demand for fodder.

(e). Plantation working circle: This working circle included successful plantations that have been taken up during earlier plans right from the starting of the regular management of the forests till 2001. This Working Circle exclusively included all old successful plantations of both teak and miscellaneous species. The areas included in this Working Circle were not in a consolidated block but are rather in scattered patches spread over in all ranges. The special objects of management included timely silvicultural operations in Teak and Mixed plantations to improve the overall crop and site conditions.

(f). NTFP (Overlapping) working circle: The objects of management under this working circle were to ensure scientific collection of NTFPs, to identify and assess various NTFP resources in the division, to adopt appropriate measures to improve the productivity of NTFPs and conserve the rare and endangered NTFP plant species.

(g). Wildlife (Overlapping) working circle: The objective of this working circle was to ensure the maintenance of the viable population of wild animals by providing protection, shelter, food, and water to them, to identify pockets of good bird population and provide specific protection to them and to conserve the important rare and endangered flora and fauna found in the track.

(h). Bamboo (Overlapping) working circle: The prescriptions under this working circle aimed at improving the crop by way of administering suitable silvicultural treatments, to accommodate the local demands for bamboos to the possible extent and to improve stocking of local Bamboo species and introducing *Dendrocalamus stocksii* species (found in Konkan Western Ghats) in the suitable areas through artificial regeneration.

(i). JFM (Overlapping) working circle: This working circle provided prescriptions for strengthening of existing JFM network and preferring more areas under JFM by encouraging the participation of local people.

Results:

- 1) All coupes were unworked as per the schedule during the plan period in different working circles due to a shortage of funds and labour problems.
- 2) The plantation was taken up in some of the areas depending upon the availability of grants.
- 3) Ecotourism activities were started through JFM at four places; one each

in Trimbak, Nashik, Sinnar and Igatpuri Ranges

- 4) Plantation of Dashmool species was taken up over an area of 110 hectare in different Ranges of the division.
- 5) Anjaneri Conservation Reserve was declared over an area of 569.36 hectare for the conservation of endemic flora and fauna of the area.
- 6) As the areas allotted to plantation working circle were in scattered patches and it included mostly Gliricidia plantations, not much improvement was done in these areas.
- 7) Many disturbances to good forest areas of the division have occurred during the plan period due to the implementation of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. Honeycombing of the forest area has happened during this period.

11.2.4 Analysis of past systems of management and conclusions drawn thereon

In less than 100 years after the forests were brought under systematic management, the conditions of the once rich, dense forests have deteriorated to such an extent that intensive afforestation, soil, and water conservation measures were required to be prescribed in the previous working plans to increase the growing stock. The reasons for the decrease in density of forests over the period of time are given below:

- 1) The large scale encroachments and its regularization at different time span and allotment of large chunk of forest areas for agriculture in the name of High Power committee (HPC), Eksali plots, etc., has taken away large chunk of good forests areas for agriculture.
- 2) The continued encroachment and its regularisation under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, and incidences of illicit fellings in forests have further deteriorated the forests of this division.
- 3) In general, the whole coupe area is not treated as per the prescriptions of the Working Plan. In most of the cases, only a partial area of the coupe is treated either by afforestation or soil and moisture conservation measures.
- 4) Prescriptions like closures for the worked area, rotational grazing, etc., couldn't be implemented because of the non-cooperation of local people resulting in the failure of natural regeneration in the areas worked under the working plans.

- 5) The materials removed from the forest areas by the local people residing within and on the periphery of forests, for meeting their bonafide demands largely remained unrecorded.
- 6) Rab burning is another major problem of this area which adversely affects the growth of trees and also causes forest fires.
- 7) The lapses in the implementation of prescriptions, changing socio-economic conditions in the area and implementation of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, have put much pressure on forests of this division which resulted in large scale deterioration of forest resources in the area. Therefore, these forests need to be put under Improvement through intensive soil and moisture conservation works, treatment of Natural regeneration in good regeneration areas, artificial regeneration in understocked areas, development of Grass and fodder through artificial planting, consolidation of forests areas through proper boundary demarcation, good protection measures, efficiency improvement of field staff through regular workshops and trainings, etc., have given priority in the present Plan.

11.3 SPECIAL WORKS OF IMPROVEMENT UNDERTAKEN

- 1) **Greening of Maharashtra (50 crore plantation programme):** Maharashtra Government has completed the 50 crore plantation program from 2017-18 to 2019-20. During the implementation of this program, a lot of emphases have been given for involving the public across all walks of life and also other line departments in addition to the Forest department. This programme has created a big people movement for Greening of Maharashtra. A lot of enthusiasm has been seen among all stakeholders in this mission.
- 2) **Soil and moisture conservation works:** Maharashtra Government also started the Jalyukta shivar programme for taking up intensive soil and moisture conservation works. Under this programme, a lot of SMC works have been undertaken in forest areas, and this will definitely help in improving the Soil-moisture regime of the area in the long run.
- 3) **Green army:** Under Article 48A of the Directive Principles of State Policy, the State shall endeavor to protect and improve the environment and safeguard the forests and wildlife of the country. In addition, under 51A(g) of the Fundamental Duties of Indian Constitution, it shall be the duty of every citizen to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for

living creatures. The State Government of Maharashtra has taken up the 50 crore plantation program intended to increase the forest cover in the state from the current 20% to the nationally mandated 33% of Maharashtra's land area. Insufficient manpower with the Forest Department call for the initiative of Green Army. To ensure partnership from people of all walks of life, an initiative has been taken for an on-line channel for public engagement, partnership, sharing and dissemination.

- 4) **Vulture conservation:** The vulture conservation program has been started long back in the West Nashik division. In the year 2011-12, a Vulture Restaurant was started at Khoripada village in Harsul Range. The carrion is brought from adjacent villages and kept at the Vulture Restaurant. The Vultures came and feed on the Carrions inside the Vulture restaurant. The combined efforts of forest staff and the Joint Forest Management Committee (JFMC) members of Khoripada have resulted in the rise of the Vulture population in and around Khoripada village. This conclusion is supported by a study conducted by a NGO, the Nature Conservation Society of Nashik.

11.4 PAST YIELD, REVENUE AND EXPENDITURE

11.4.1 Yield and Revenue

Table 11.1: Details of yield and Revenue

Sl. No.	Year	Timber		Fuel wood	
		Quantity (cmt)	Revenue (in lakhs)	Quantity (cmt) Revenue (in lakhs)	Revenue (in lakhs)
1	2007-08	461.078	147.66	472.425	2.78
2	2008-09	494.665	145.14	392.175	4.06
3	2009-10	493.855	109.70	48.846	1.52
4	2010-11	146.249	36.25	16.000	0.05
5	2011-12	79.227	21.35	14.835	0.12
6	2012-13	47.215	13.96	0.00	0.00
7	2013-14	47.393	81.61	0.00	0.00
8	2014-15	36.431	5.37	0.00	0.00
	Total	1806.113	561.04	944.281	8.53

11.4.2 Expenditures: The funds made available for working plan activities is given below:

Table 11.2: The funds made available for working plan activities

Sl. No	Year	Funds (lakhs)
1	2007-08	0.000
2	2008-09	162.585
3	2009-10	106.692
4	2010-11	200.733
5	2011-12	292.805
6	2012-13	363.427
7	2013-14	255.375
8	2014-15	123.780
9	2015-16	205.487
10	2016-17	216.982
	Total	1927.866

CHAPTER-12

STATISTICS OF GROWTH AND YIELD

12.1 SAMPLING PLAN OF TREE ENUMERATION

SoFR unit, Nashik, from October 2014 to May 2018 has completed the enumeration of forest resources in the West Nashik division. The entire forest division's area was carefully considered for sampling enumeration plan. The trees are enumerated in girth classes from 30 cm and above. The girth was scientifically measured at breast height (gbh). This data was correlated with Stock Maps prepared by field units and also compared with forest cover map published by the Forest Survey of India (FSI), Dehradun before the compartments were allotted to various working circles.

The statistical sampling method namely "Systematic Line Plot Sampling with Random Start" was used wisely for tree enumeration. The grid size is of 25"x25" (25 seconds x 25 seconds) i.e. 56.25 ha. In each grid, 0.1 ha plot was enumerated. The complete enumeration of trees, natural regeneration, grass and medicinal species were carried out in these plots. In the same way, qualitative measurements were also carried out.

After a comparative analysis of data by the Chief Statistician, PCCF office, Nagpur, stock per hectare was calculated and the results are being reported in the form of following statements:

- 1) Estimated growing stock; Number of sound trees in population area.
- 2) Estimated growing stock; Number of sound trees per hectare.
- 3) Percentage distribution of total stock of species among girth classes.
- 4) Percentage of stock of species in a girth class to the total stock in that particular girth class.
- 5) Estimated growing stock - volume in m³/ha.

12.1.1 Change in Growing stock

It is observed that the total estimated number of trees per hectare in the current enumeration (Oct-2014 to May-2018) is decreased as compared to the previous (April-2002 to March-2003) tree enumeration. The details of the change are given below in Table 12.1.

Table 12.1: Statement showing estimated changes in Growing stock

Sl. No	Name of Working Circle	No. of trees/ha	Sl. No.	Name of Working Circle	No. of trees/ha.
April 2002 to March 2003			October 2014 to May 2018		
1	Reafforestation W.C.	23.73	1	Afforestation W.C.	28.66
2	Improvement W.C.	63.20	2	Improvement W.C.	59.54
3	Fodder protection W.C	5.46	3	Kuran W.C.	23.73
4	Pasture W. C.	7.71	4	Plantation W.C.	40.22
5	Protection W. C.	23.30	5	Protection W.C.	20.14
6	Fuelwood W. C.	89.95			
Weighted Average		46.07	Weighted Average		42.92

12.1.2 Girth-wise distribution of trees

Working circle wise and girth class-wise estimated number of sound trees per hectare is as follows:

Table 12.2: Estimated percentage distribution of trees

Sl. No	Working Circle	Girth class-wise (in cm) estimated percentage of number of trees			
		15 to 30	31 to 45	Remaining Girth Classes	Total estimated No. of trees
1	Afforestation W.C	0	46.28	53.72	100
2	Improvement W.C.	0	25.83	74.17	100
3	Kuran W.C.	0	64.69	35.31	100
4	Plantation W.C.	0	44.06	55.94	100
5	Protection W.C.	0	31.62	68.38	100
Weighted Average		0	35.39	64.61	100

12.1.3 Growing stock in different Working circles

The distribution of Growing stock in various working circles was analyzed for both the number of trees and the volume of growing stock and the details are given in Table 12.3 and 12.3(A).

Table 12.3: Working Circle-wise Number of sound trees per hectare

Sl. No.	Working Circle	Total	General utility species	Special utility species	Minor forest produce species	Other species
1	Afforestation.W.C	28.66	5.69	1.51	7.54	13.92
	% of stock to total stock	100	19.86	5.26	26.31	48.57
2	Improvement W.C.	59.54	15.86	4.06	10.09	29.53
	% of stock to total stock	100	26.64	6.82	16.94	49.60
3	Kuran W.C.	23.73	2.09	1.40	1.63	18.61
	% of stock to total stock	100	8.82	5.89	6.87	78.42
4	Plantation W.C	40.22	11.40	2.08	6.59	20.15
	% of stock to total stock	100	28.34	5.16	16.38	50.12
5	Protection W.C	20.14	2.26	1.56	5.94	10.38
	% of stock to total stock	100	11.24	7.73	29.51	51.52
Total weighted average		42.92	10.51	2.74	8.16	21.51
% of stock to total stock		100	24.46	6.39	19.03	50.12

Table 12.3(A): Working Circle-wise Volume (m³/ha)

Sl. No.	Working Circle	Total	General utility species	Special utility species	Minor forest produce species	Other species
1	Afforestation.W.C	152.25	1.36	0.97	4.18	8.74
	% of stock to total stock	100	8.92	6.36	27.41	57.31
2	Improvement W.C.	34.56	4.49	6.52	6.43	17.18
	% of stock to total stock	100	12.99	18.87	18.61	49.71
3	Kuran W.C.	5.88	0.29	0.73	0.81	4.05
	% of stock to total stock	100	4.93	12.41	13.78	68.88
4	Plantation W.C	14.51	1.61	2.42	3.43	7.06
	% of stock to total stock	100	11.10	16.68	23.64	48.66
5	Protection W.C	10.18	0.55	1.58	3.87	4.18
	% of stock to total stock	100	5.40	15.52	38.02	41.06
Total weighted average		19.29	1.99	2.93	4.49	9.89
% of stock to total stock		100	10.32	15.19	23.28	51.27

12.2 SPECIES-WISE GROWING STOCK DISTRIBUTION IN DIFFERENT WORKING CIRCLE

12.2.1 Afforestation Working Circle: The local distribution of species of varied importance in Afforestation working circle is given in the table below:

Table 12.4: Category-wise Species distribution in Afforestation working circle

Sl. No.	Category of Species	Name of Species	% to total growing stock
1	A: Species of General Utility	Bibla, Bondara, Kakad, Sadada, Teak.	19.86
2	B: Species of Special Utility	Dhawada, Hiwar, Kalamb, Khair, Kudai, Sawar	5.26
3	C: Species of Minor Forest Produce	Apta, Awala, Amba, Behada, Bor, Chinch, Hirda, Jambhul, Moha, Neem, Nilgiri, Palas, Shiras.	26.31
4	D: Other Species	Acasia, Alive, Asand, Babhul, Bhuskut, Gliricidia, Maharukh, Umbar, Waras etc.	48.57

12.2.2 Improvement Working Circle: The local distribution of species of varied importance in Improvement working circle is given in the table below:

Table 12.5: Category-wise Species distribution in Improvement working circle

Sl. No.	Category of Species	Name of Species	% to total growing stock
1	A: Species of General Utility	Bibla, Bondara, Kakad, Shisam, Teak, Tiwas.	26.64
2	B: Species of Special Utility	Dhawada, Kalamb, Khair, Sawar.	6.82
3	C: Species of Minor Forest Produce.	Amba, Apta, Awala, Behada, Bel, Chandan, Chinch, Hirda, Jambhul, Moha, Nilgiri, Palas, Ritha, Shiras, Tendu.	16.94
4	D: Other Species	Acasia, Alive, Asand, Bahawa, Bhokar, Gliricidia, Hed, Humb, Pangara, Sadada, Subabul, Umbar, Wad, etc.	49.60

12.2.3 Kuran Working Circle: The local distribution of species of varied importance in Kuran working circle is given in the table below:

Table 12.6: Category-wise Species distribution in Kuran working circle

Sl.No	Category of Species	Name of Species	% to total growing
1	A: Species of General Utility	Teak.	8.82
2	B: Species of Special Utility	Dhawada, Hiwar, Khair, Sawar.	5.89
3	C: Species of Minor Forest Produce	Bor, Neem, Shiras, Tendu.	6.87
4	D: Other Species	Anjan, Babhul, Gliricidia, Pangara, Subabhul, Waras etc.	78.42

12.2.4 Plantation Working Circle: The local distribution of species of varied importance in Plantation working circle is given in the table below:

Table 12.7: Category-wise Species distribution in Plantation working circle

Sl. No.	Category of Species	Name of Species	% to total growing
1	A: Species of General Utility	Bibla, Bondara, Teak	28.34
2	B: Species of Special Utility	Dhawada, Hiwar, Kalamb, Khair, Sawar.	5.16
3	C: Species of Minor Forest Produce	Amba, Apta, Behada, Bor, Chinch, Hirda, Jambhul, Neem, Moha, Nilgiri, Palas, Shiras, Tendu	16.38
4	D: Other Species	Acasia, Alive, Asand, Babhul, Gliricidai, Hed, Kakad, Modal, Payar, Sadada, Subabul etc.	50.12

12.2.5 Protection Working Circle: The local distribution of species of varied importance in Protection working circle is given in the table below:

Table 12.8: Category-wise Species distribution in Afforestation working circle

Sl. No.	Category of Species	Name of Species	% to total growing stock
1	A: Species of General Utility	Bibla, Bondara, Kakad, Teak, Tiwas	11.24
2	B: Species of Special Utility	Dhawada, Hed, Hiwar, Kalamb, Kudai, Sawar,	7.73
3	C: Species of Minor Forest Produce	Amba, Apta, Behada, Bor, Hirda, Jambhul, Moha, Neem, Palas, Shiras, Tendu.	29.51
4	D: Other Species	Acasia, Alive, Asand, Modal, Pangara, Sadada, Umbar, Waras, Wad etc.	51.52

12.3 CHANGES IN DISTRIBUTION OF TEAK

The local change in the distribution of teak in the different working circle is given in the table below:

Table 12.9: Availability of Teak in Previous (April 2002 to March-2003) Enumeration (No. of sound trees per ha.)

Sl. No	Name Working Circle	Total growing Stock	Teak/Ha	% of stock of trees
1	Reafforestation W. C.	23.73	0.21	0.87
2	Improvement W.C.	63.20	22.12	34.99
3	Forest protection W.C	5.46	0.91	16.74
4	Pasture W. C.	7.71	0.02	0.31
5	Protection W. C.	23.30	5.76	24.71
6	Fuelwood W. C.	89.95	17.73	19.70
	Weighted Average	46.07	8.69	18.86

Table 12.9(A): Availability of Teak in current (October 2014 to May 2018) enumeration (No. of sound trees per hectare)

Sl. No.	Working circle	Total growing stock	Teak/Ha	% of stock of Teak
1	Afforestation W.C.	28.66	1.12	3.91
2	Improvement W.C.	59.54	13.41	22.52
3	Kuran W.C.	23.73	2.09	8.81
4	Plantation W.C.	40.22	10.83	26.92
5	Protection W.C.	20.14	1.51	7.50
Total weighted average		42.92	8.08	18.82

12.4 LOCAL VOLUME TABLE

The development of a volume table requires volume equations for the species in question. There are three types of volume equations based on the number of variables and objectives. Each type is formulated by means of regression analysis:

- a) Local volume equation: Local volume equations are applicable for a small forest or land area and are based on only one variable, i.e. DBH. The basic assumption is that trees of a given species, at a given location, with the same DBH, will have the same height and form. This assumption is only valid as long as site conditions are homogenous.
- b) Regional volume equation: This type of equation is normally based on two variables (e.g. DBH and height) and covers a larger geographical area. Regional volume equations are standard volume equations with limited application. Care needs to be taken that the trees measured, for the formulation of this equation, are truly representative of the variation encountered in the region.
- c) General or standard volume equation: This is an even broader equation and covers the full distribution of the species. It is normally based on two variables such as DBH and height.

A local volume equation can be easily prepared from a standard or regional volume equation by analysing the DBH/height relationship of the species for the given location.

Local volume table prepared by the Forest Survey of India (FSI), Dehradun for this region local dominant tree species is given below:

Table 12.10: Local volume table

Species	Girth class-wise Volume								
	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-150	above 150
Khair	0.052	0.156	0.348	0.517	0.730	0.930	1.130	1.320	1.320
Haldu	0.075	0.148	0.269	0.450	0.683	1.000	1.372	1.750	1.750
Dhawada	0.906	1.333	1.705	2.126	2.917	3.131	3.400	3.900	3.900
Sawar	0.021	0.085	0.200	0.375	0.593	0.880	1.393	1.840	1.840
Asana	0.045	0.134	0.248	0.476	0.552	0.900	1.205	1.495	1.495
Shisam	0.059	0.148	0.331	0.515	0.695	0.875	1.060	1.240	1.240
Tendu	0.053	0.195	0.330	0.469	0.615	0.750	0.890	1.035	1.035
Kakad	0.056	0.164	0.255	0.402	0.524	0.800	1.083	1.450	1.450
Lendia	0.076	0.183	0.325	0.520	0.786	1.075	1.375	1.665	1.665
Bondara	0.076	0.183	0.325	0.520	0.786	1.075	1.375	1.665	1.665
Mode	0.039	0.110	0.214	0.376	0.552	0.827	1.125	1.450	1.450
Mundi	0.057	0.110	0.207	0.421	0.572	0.825	1.175	1.675	1.675
Bibla	0.028	0.125	0.262	0.448	0.725	1.025	1.365	1.710	1.710
Teak	0.025	0.117	0.341	0.460	0.710	1.021	1.375	1.780	1.780
Behada	0.090	0.162	0.393	0.493	0.662	1.025	1.345	1.710	1.710
Saja	0.051	0.152	0.324	0.527	0.752	0.994	1.483	2.510	2.510
Kuda	0.052	0.120	0.211	0.324	0.469	0.725	1.070	1.675	1.675
Others	0.105	0.215	0.373	0.556	0.784	1.049	1.365	1.763	1.763

12.5 STATISTICAL ANALYSIS

Statistical analysis is concerned with the organization and interpretation of data according to well-defined, systematic, and mathematical procedures and rules. The goal of statistical analysis in forest department is to identify trends and find patterns in the development of forest vegetation of an area like

forest division. These results of such analysis are used as a basis for providing future prescriptions for the development of the forest crop.

The Statistical personnel of the office of the Chief Forest Statistician, PCCF office, Maharashtra State, Nagpur has carried out the statistical analysis of the data. The percentage standard error is calculated for each Working Circle is given in the following table 12.11

Table 12.11: Working circle-wise standard error

Sl. No.	Name of working circle	Population area in ha	Sample area in ha	Intensity of sampling %	% Standard Error
1	Afforestation W.C.	21595.443	41.10	0.19	12.77
2	Improvement W.C.	39251.364	68.70	0.18	18.11
3	Kuran W.C.	2773.777	4.30	0.16	23.26
4	Plantation W.C.	11764.906	19.30	0.16	14.19
5	Protection W.C.	11383.000	2.20	0.19	22.33
	Total	86768.49	154.60	0.18	

12.6 STOCK MAPPING

Forest stock maps are precisely defined as the maps which naturally contain detailed spatial information on forest type, density, encroachments, cultivation, human habitats, and regeneration status and typically provide a fundamental idea about available resources. The status of forest vegetation typically includes categorization of the forest into density classes, species distribution, assessment of the growing stock, growth data for various species and age distribution. Stock mapping was typically done during this plan preparation by the Deputy Conservator of Forest, West Nashik Forest Division, and official records compared with the enumeration data as well as satellite imageries. With help of GIS-compatible Software entire data pertaining to watershed, soil, vegetation, road, range, beat, division boundaries, stock maps, prominent features like village, tank, rest houses, headquarters of range, round, beats, tahsils, etc., have been digitized and maintained in the form of various layers.

12.7 STATISTICS OF FOREST CARBON STOCK

Table 12.12: Details of Carbon stock in plant parts

Sl. No.	Range	No. of Sample Plots	Category	Green Weight (gm)	Carbon Content (gm)
1	2	3	4	5	6
1	Harsul	12	Grass+Leaf Littre	1870	818.00
			Dead Wood	1000	500.00
			Stem	1140	476.50
			Root	1310	537.50
			Branches	760	318.00
			Twigs	50	22.50
			Leaves	65	17.50
			Humus	200	85.00
Total				6395	2775.00
2	Peint	16	Grass+Leaf Littre	1259	1495.00
			Dead Wood	890	445.00
			Stem	50	22.50
			Root	10	4.00
			Branches	0	0
			Twigs	0	0
			Leaves	180	76.50
			Humus	940	275.00
Total				3329	2318.00
3	Sinnar	106	Grass+Leaf Littre	68320	28089.00
			Dead Wood	120	60.00
			Humus	520	245.00
Total				68960	28394.00
4	Nanashi	26	Grass+Leaf Littre	4145	1840.00
			Humus	980	440.00
Total				5125	2280.00
5	Barhe	69	Grass+Leaf Littre	29175	12847.50
			Dead Wood	9013	4506.50
			Stem	4615	1110.00
			Root	2965	1350.00
			Branches	2625	1191.00
			Twigs	1110	487.00
			Leaves	1635	687.50
			Humus	2190	849.00
Total				53328	23028.50

Sl. No.	Range	No. of Sample Plots	Category	Green Weight (gm)	Carbon (gm)
6	Nashik	84	Grass+Leaf Littre	20575	5964.50
			Dead Wood	850	425.00
			Stem	3040	1158.00
			Root	3795	896.00
			Branches	2590	910.00
			Twigs	1630	477.00
			Leaves	4200	1751.00
			Humus	0	0
Total				36680	11581.50
7	Igatpuri	52	Grass+Leaf Littre	5142	1592.00
			Dead Wood	970	485.00
			Stem	405	146.00
			Root	2060	848.50
			Branches	60	23.50
			Twigs	410	132.50
			Leaves	755	232.00
			Humus	0	0
Total				9802	3459.50
8	Trimbak	35	Grass+Leaf Littre	4232	1946.00
			Dead Wood	1855	927.50
			Stem	1175	410.00
			Root	1250	560.00
			Branches	1910	912.50
			Twigs	1845	620.00
			Leaves	1330	415.00
			Humus	0	0
Total				13597	5791.00

PART-II



Anjaneri Hill



Trimbakeshwar Temple



Vipassana Centre, Igatpuri



Pandavleni Caves

FUTURE MANAGEMENT

CHAPTER-1

BASIS OF PROPOSALS

1.1 OBJECTIVES OF MANAGEMENT

This Working Plan is precisely prepared for the scientific management of the Forests and Wildlife of West Nashik forest division. The forests of West Nashik division covers varied topography and soil types which ranges from hilly terrain to plain areas and red soil to black cotton soil respectively. The primary management objective for the forests of the West Nashik Division is to thoughtfully provide site-specific treatments so as to optimize the Growing Stock to provide a sustained yield of forest produces and other ecological services.

The principal aim of the Working Plan is to ensure environmental stability and maintenance of ecological balance including atmospheric equilibrium which is vital for sustenance of all life forms, humans, animals, and plants. The Objectives of Management are:

- 1) Maintenance of environmental stability through preservation and where necessary, restoration of the ecological balance that has been adversely disturbed by serious depletion of forests.
- 2) Conserving the natural heritage of the landscape by preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biodiversity and genetic resources of the region.
- 3) Checking the soil erosion and denudation in the catchment area of the rivers, lakes, and reservoirs through soil and water conservation for mitigating flood and droughts and for retardation of siltation of reservoirs.
- 4) Increasing the forest/tree cover in the region through massive afforestation and social forestry programmes, especially, on all suitable forest and non-forest lands.
- 5) Meeting the requirements of fuel wood, fodder, minor forest produce and small timber of the rural and tribal populations residing in forest fringe areas.
- 6) Increasing productivity of forests to meet essential National needs and encouraging efficient utilization of forest produce and maximizing substitution of wood.

- 7) Creating a massive people's movement with the involvement of children and women, among other stakeholders.

1.2 METHOD OF TREATMENT TO BE ADOPTED

Silviculture is the art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society such as wildlife habitat, timber, water resources, restoration, and recreation on a sustainable basis. This is accomplished by applying different types of silvicultural treatments such as thinning, harvesting, planting, pruning, prescribed burning and site preparation. Intermediate treatments (thinning) are designed to enhance growth, quality, vigor, and composition of the stand after establishment or regeneration and prior to final harvest. Regeneration treatments (harvesting) are applied to mature stands in order to establish a new age class of trees.

All vegetation activities including regeneration, improvement of existing forest crop, wildlife habitat improvement, and timber harvesting must have a silvicultural prescription. A silvicultural prescription is a document which has a planned series of treatments designed to change current stand structure and composition of a stand to one that meets management goals. The prescription normally considers ecological, economic, and societal objectives and constraints. The general methods of treatments proposed are as given below:

- a) Existing forests and forest lands should be adequately protected and their productivity to be improved to provide a sustained yield of forest resources and ecological services.
- b) The forests on hills and slopes will be protected from all forms of fellings. These forests form catchments for principal rivers like Godavari, Vaitarna, etc. Suitable soil and moisture conservation measures are prescribed to stabilize the terrain and improve the health of the watershed.
- c) The forests on steep and precipitous slopes will be protected from fellings. A 20-metre broad strip on either side of streams and watercourses will equally be protected from harvesting in a similar manner.
- d) Special habitat management for wildlife conservation will receive absolute priority. Riparian zones and sites, important for wildlife management, will receive enhanced protection and treatment. An adequate buffer will be provided to such sites while preparing treatment

maps for coupe management. Snag, den trees and sunken logs shall be sufficiently protected, to meet the habitat requirement of birds and lesser animals. Wildlife requirements shall be the paramount consideration for habitat management in forest areas rich in wildlife.

- e) Preference will be accorded to management of natural regeneration. Natural regeneration and promising coppice growth will receive suitable tending and soil working to stimulate their growth and development. In the areas with poor natural regeneration, Aided Natural Regeneration (ANR) needs to be carried out. Areas treated under natural regeneration shall be protected from fire and grazing. Artificial regeneration will be implemented as a supplementary activity, at places, where natural regeneration is inadequate or is unlikely to succeed.
- f) Sustainable use of forest resources will remain the guiding principle for managing the supply and demands of forest products and services. The government and non-government agencies will be engaged in the promotion of ecologically sound and economically feasible alternatives like wood saving technology, stall-feeding, population control of cattle and livestock improvement, etc.
- g) Pasture lands will primarily be managed to provide quality fodder by introducing fodder trees species and superior grasses. Rotational grazing will be prescribed to allow the pasture plants and soil, the essential time to recover. Soil and moisture conservation works will be taken along with planting for improvement of soil water regimes.
- h) Minor forest produce provides sustenance to the tribal population and other indigenous population residing in and around the forests. Such produce should be protected, improved and their production should be enhanced with sufficient regard to generation of employment and income.
- i) Involving local people in forest management remains the key to the success of the conservation of natural resources. Adequate awareness needs to be generated among local people about the importance of conservation of natural resources. Management of forests close to villages shall primarily be done through JFM committees.
- j) Local people will be engaged as far as possible in forest management activities like forest protection, afforestation, and augmentation of other natural resources in the village.
- k) Reducing biotic pressure on forests like illicit felling, unsustainable grazing, fire and encroachment on forest patches near villages will remain an utmost priority.

- l) Schemes and projects which interfere with forests on the steep slopes, catchments of rivers, lakes and reservoirs, geologically unstable terrain and other ecologically sensitive areas should be severely restricted.
- m) The rights and concessions enjoyed by the tribal and other rural poor living within and near the forests should be sufficiently protected. Their domestic requirements of fuel wood, fodder, and minor forest produce should be the first charge on forest produce.
- n) A sizeable chunk of the forest area has been honeycombed due to the recognition of rights under provisions of the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006. Efforts need to be taken to finalise all legitimate claims in a time-bound manner and proper demarcation of these areas both on the ground as well as on Division/Range maps for better protection and regulation of forests.
- o) Boundary demarcation will be carried out by employing advanced survey technologies like Total station survey and DGPS in a time-bound manner for ensuring the territorial integrity of forests.

1.3 CONSTITUTION OF WORKING CIRCLES

A compartment has been used as a unit of management for the scientific management of forests. The distributions of areas to various working circles have been done by taking the compartment as a unit. The allocation of compartments is based on the preponderance of suitability to a specific working circle. Four area-specific working circles are prescribed and separate chapters regarding essential subjects like soil and water conservation, biodiversity and wildlife conservation, NTFP Management, etc., have been provided in this working plan. The prescriptions given in these chapters shall be applicable to the whole of the division.

Compartments having relatively good tree cover are allotted to the Improvement working circle (IWC). This working circle is expected to improve the crop condition during the course of this plan and expected to provide small size timber in the future. Areas having sparse tree crops, open areas without tree growth and isolated small forest patches are included in the Afforestation Working Circle (AWC). In such areas, the focus would be on the tending of existing Natural regeneration. In natural regeneration management, the seedlings of seed origin of desirable species will be given preference over the coppice. If seed origin Natural regeneration is not available, then coppice will equally be treated. Wherever necessary, if Natural regeneration is insufficient

then, it will be supplemented by artificial regeneration. The involvement of the local community is considered vital for the management of these areas. The compartments primarily of refractory nature and excessive biotic pressures will be proposed to be managed under Grass and Fodder Management Working Circle to accommodate the needs of Wildlife and also local people.

Table 1.1: The allocation of forest areas to various working circles

Sl. No.	Name of Working circle	Area allotted (Ha)
1	Improvement working circle	49347.193
2	Afforestation working circle	17519.221
3	Protection working circle	11388.756
4	Grass and Fodder working circle	6136.657
5	Bamboo (Overlapping) working circle	9031.000

Table 1.2: Area comparison between the Earlier and the Present Plan

As per Old Working Plan			As per present Working Plan		
Sl. No.	Working circle	Area (Ha)	Sl. No.	Working circle	Area (Ha)
1	Improvement working circle	39251.364	1	Improvement working circle	49347.193
2	Afforestation working circle	21099.141	2	Afforestation working circle	17519.221
3	Protection working circle	11377.878	3	Protection working circle	11388.756
4	Plantation working circle	11764.906	4	Grass and Fodder working circle	6136.657
5	Kuran working circle	2778.899	5	Bamboo (Overlapping) working circle	9031.00
6	Bamboo (Overlapping) working circle	9234.496			

1.4 PERIOD OF WORKING PLAN AND NECESSITY FOR INTERMEDIATE REVISION

This plan will be implemented for a period of 10 years from the year 2019-20 to 2028-29. However, the mid-term review shall be carried out as per SCC Meeting Minutes No. Desk-14/WP/SCC Meeting/95/2016-17, Dt.03.03.2016 held on 16.03.2016. The mid-term review of the Working Plan should be undertaken for mid-course correction by the State Consultative Committee under the chairmanship of PCCF (HoFF) with APCCF, Regional office (MoEFCC), Nagpur as the representative of MoEFCC. For mid-review, the Chief Conservator of Forests (Territorial), Nashik should come forward with a proposal for review with the effects of the implementation of Working Plan prescriptions on the 5th year. In the same way, based on the performance of the Working Plan prescriptions, the Plan period may be extended up to 10 years beyond the stipulated plan period by designated authority on the recommendations of the Standing Consultative Committee (SCC) authorized for this purpose.

CHAPTER-2

IMPROVEMENT WORKING CIRCLE

2.1 NAME OF WORKING CIRCLE

The forest stand improvement includes activities or treatments that improve the composition, structure, condition, health, and growth of forest crops. Such activities may include removing diseased or dying trees, thinning, pruning and post-harvest treatments on natural regenerating stands. These practices are intended to perform three things: increase the value of the stand, improve the growth and form of trees, and manipulate stand composition. This Chapter covers the Improvement working circle, where the prime objective is to obtain the qualitative and quantitative improvement of forest crops. The area of this Working Circle has been clearly marked on the GIS-based map of 1:50000. A copy of the same on a lesser scale on the A4 size is provided following page.

2.2 GENERAL CONSTITUTION OF WORKING CIRCLE

The improvement works carried out in this Improvement working circle helps to increase diameter growth rates and crown expansion by reducing competition for the target trees. Forest health also benefits from these treatments as poor formed, unhealthy or diseased trees are culled to provide more growing space to the vigorous trees. These treatments will additionally allow maintaining important tree species that might otherwise be lost without management. As young stands transition to older stands, trees that require direct sunlight to persist may be crowded out. Implementing forest stand improvement will allow maintaining valuable timber and wildlife species in the forest.

This Working Circle typically includes the best forest areas of the division. Forest areas capable of producing the medium to large-sized timber but not considered fit for harvesting due to the preponderance of young to middle-aged crop has been included in this working circle. Over a period of time, the crop has deteriorated due to excessive biotic pressure. The Improvement Working Circle (IWC) covers an area of 49347.193 hectares. The distribution of areas by Ranges is given in the table below:

Table 2.1: Range-wise area allocation to Improvement Working Circle

Sl. No.	Range	Total area (Ha)
1	Barhe	12847.211
2	Nanashi	5027.378
3	Peint	7513.755
4	Harsul	9467.981
5	Trimbak	7731.760
6	Nashik	1417.260
7	Igatpuri	5341.848
	Total	49347.193

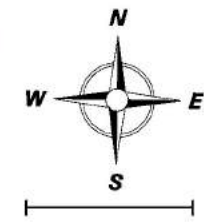
2.3 GENERAL CHARACTERISTICS OF VEGETATION

The forests included in this Working Circle are both Teak and Mixed forests with Moist Deciduous and Dry Deciduous types. In Barhe, Peint and Harsul ranges, the primary species in the crop is Teak. The quality of the forests is IV. The crop is mostly middle-aged and the crown density of the crop is broadly around 0.4. However, it is significantly deteriorating rapidly due to the problems of encroachment and other biotic pressure. In the protected forest, density is low, and the extent of the illicit cutting is more. In other ranges, the quality of the forests is mainly IV. The density is less than 0.4 and the crop is mostly middle-aged and the regeneration status is poor due to encroachment, illicit cutting, grazing, and forest fire.

Table 2.2: Species wise distribution in Improvement working circle

Sl. No.	Category of Species	Name of Species	% to total growing stock
1	A). Species of General Utility	Bibla, Bondara, Kakad, Shisham, Teak, Tiwas.	26.64
2	B). Species of Special Utility	Dhawada, Kalamb, Khair, Sawar.	6.82
3	C). Species of Minor Forest Produce.	Amba, Apta, Awala, Behada, Bel, Chinch, Hirda, Jambul, Moha, Nilgiri, Palas, Ritha, Shiras, Tendu.	16.94
4	D). Other Species	Acacia, Asand, Bahawa, Bhokar, Gliricidia, Hed, Humb, Pangara, Sadada, Subabul, Umber, Wad, etc.	49.60

MAP OF IMPROVEMENT W.C.WEST NASHIK DIVISION



1:500000

LEGEND

- Division_Boundary
- Range_Boundary
- Round_Boundary
- Improvement W.C
- DRAINS

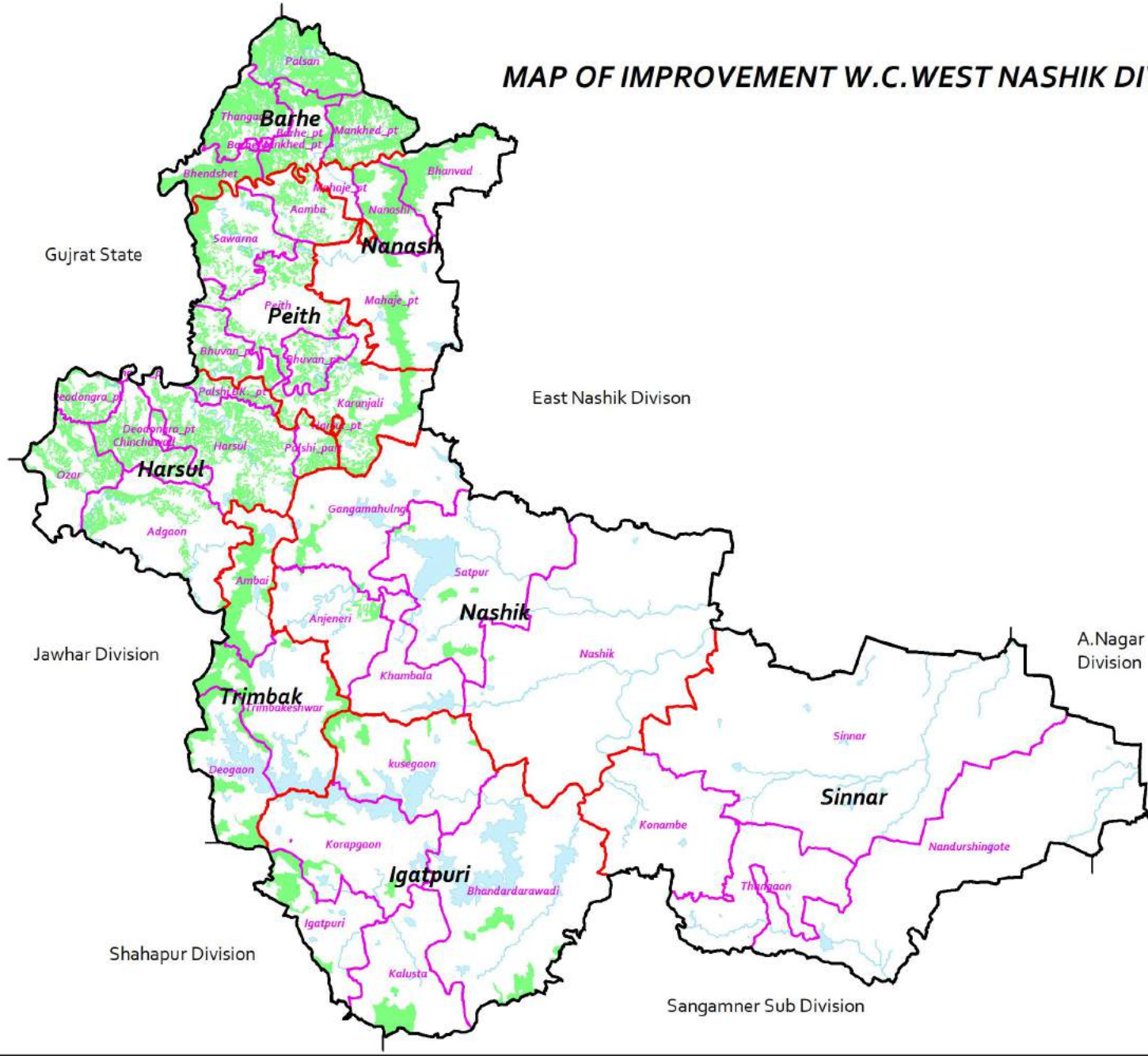


Table 2.3: Girth class wise distribution of Growing stock in population area under IWC

Group/ Species	Girth class (in cm)								Total
	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-150	
Species of General Utility	243964	154263	94271	46849	27424	18283	14854	22282	622190
Species of Special Utility	24568	30282	27425	24568	21711	14854	4570	11427	159405
Species of NTFP	92555	86273	48563	37136	22283	19997	16567	71988	395362
Other Species	242247	241676	175973	132551	110840	79416	63989	111984	1158676
Grand Total	603334	512494	346232	241104	182258	132550	99980	217681	2335633

2.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS

The continuous area of this working circle is divided into 20 treatment series with 20 coupes each. The details are provided in Appendix II.3.

2.5 BLOCKS, COMPARTMENTS AND JFM AREA

Details of the allotment of compartments to Improvement Working Circle have been provided in Appendix II.3.

2.6 SPECIAL OBJECTIVES OF MANAGEMENT

- 1) To enrich the growing stock by artificial regeneration and careful tending of natural regeneration without changing the climax status of the forests.
- 2) To reasonably achieve normality of the growing stock in the briefest possible time to derive maximum sustained yield in the foreseeable future.
- 3) To properly check soil erosion and conserve soil moisture; this is essential for creating conditions conducive for rejuvenation and growth of Natural Regeneration.

2.6.1 ANALYSIS OF THE CROP

- a) **Stock mapping:** The stock maps were prepared by the territorial staff and were correlated with the enumeration results of SoFR Unit, Nashik and latest forest cover map of the Forest Survey of India (FSI), Dehradun.
- b) **Age and density:** The crop of forest areas under this working circle is primarily young to middle-aged containing a density around 0.4.

2.6.2 SILVICULTURAL SYSTEM

The excellent quality dense forests having young to middle-aged crop are aimed to progress towards maturity as future productive selection forests. To achieve that, the hygiene operation of improvement felling needs to be carried out and adequate growing space to be provided to trees of valuable species like Teak, Ain, Haldu, Shivan, Tiwas, Khair, etc. The species representing less than 1% in the stand dynamics shall be retained until they reach the rotation age. The improvement felling supplemented by the tending of natural regeneration will aid in the transition of middle-aged stems to maturity.

2.6.3 ROTATION PERIOD: The rotation period has not been fixed.

2.6.4 HARVESTABLE DIAMETER: Not applicable as the operation is not for obtaining a yield, but for improvement of the crop.

2.6.5 REDUCING FACTORS AND REDUCED AREAS: Not applicable.

2.6.6 FELLING CYCLE: The felling cycle is called as the Treatment cycle. The treatment cycle is fixed in 20 years.

2.6.7 DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCK (PB): The chief prescriptions are provided for the improvement of the forest crop. The area under this working circle is divided into annual coupes and the coupes are worked annually.

2.6.8 CALCULATION OF YIELD: The silvicultural tending operations will be regulated by area.

2.6.9 TABLE OF FELLING: The abstract of the table of treatment is given in Appendix II-3.

2.6.10 METHOD OF EXECUTING THE FELLING

The method of execution of prescriptions related to Improvement Working circle is explained below:

2.6.10.1 Coupe Demarcation: The demarcation of annual coupes shall be typically carried out one year in advance of the main working as per prescriptions described in the Chapter-15 Miscellaneous Regulations.

2.6.10.2 Treatment Map: The treatment map shall be prepared by the Range Forest Officer and verified by the Assistant Conservator of Forests. All the treatment type areas shall be shown distinctively on the map, including the areas suitable for planting and areas having adequate promising Natural regeneration.

2.6.10.3 Treatment Prescribed: The appropriate treatment proposed for different area types shall be precisely marked on the treatment map. The treatment prescribed for different area types is as follows:

Treatments prescribed	
1). A-Type Areas (Protection areas): No felling is prescribed.	
A1 type areas, which typically have slope more than 25°	a). Soil and moisture conservation measures shall be taken up as per the prescriptions provided in Chapter-10 Forest Watershed Development. b). No harvesting is prescribed in these areas. c). Creation of live-hedges by planting of <i>Agave americana</i> (Agave) or <i>Opuntia ficus-indica</i> (Cactus) or <i>Euphorbia ligularia</i> (Saber), etc., along the contours. Once the live-hedge develops in the area, bush sowing of seeds of local tree species will be carried-out.
A2 type areas i.e. 20 metres wide strip on both sides of streams and other water courses	a). Planting of Jamun (<i>Syzygium cumini</i>), Arjun (<i>Terminalia arjuna</i>), etc., along the Nala and other water courses.
A3 type areas susceptible to	a). Soil and moisture conservation measures shall be taken up as per the prescriptions provided in

excessive erosion	Chapter-10 Forest Watershed development. c). Planting of poly pot raised grass seedlings on V-shape furrows.
2). B-Type Areas (Under-stocked Areas)	
a). Soil and moisture conservation works as described in Chapter-10 Forest Watershed Development are prescribed.	
b). The site with the clear open/poor stocked patches and found suitable for the plantation will be taken up for enrichment through artificial planting of valuable local species.	
3). C-Type Areas (Pole crop)	
The C-type area includes areas with sufficient pole crop of valuable species and additionally includes areas of old plantations of Subabul (<i>Leucaena leucocephala</i>) and Gliricidia (<i>Gliricidia sepium</i>) species.	
a). Necessary thinning in congested Subabul (<i>Leucaena leucocephala</i>) and Gliricidia (<i>Gliricidia sepium</i>) plantations.	
b). Thinning shall be carried out in young pole crop to bring down the stem numbers by maintaining the average spacing of 1/3 rd of the crop height.	
b). The pole crop that can be retained as future crop shall be marked for retention.	
4). D -Type Areas (Well-stocked Areas)	
Areas typically containing a density of 0.4 or over showing adequate regeneration (of 600 or above-established seedlings) are considered as well-stocked areas. The following operations are carried out:	
a). Singling and spacing out of natural regeneration will be carried out among seedlings of teak and other valuable species. Spacing operations shall leave nearly 600 seedlings per hectare. If the natural regeneration is less than 600, then Aided natural regeneration (ANR) shall be undertaken.	
b). The natural regeneration shall be encouraged by soil working and mulching around them in accordance with the specific guidelines provided from time to time.	
c). Singling of coppice shoots to retain one promising shoot is prescribed.	

2.6.10.4 Marking Rules and Prescriptions

The prescriptions regarding marking technique as described in the Chapter-15 Miscellaneous Regulations shall be followed. Marking shall be carried out under the constant supervision of the Range Forest Officer and under the guidance of Assistant Conservator of Forests concerned. The Deputy Conservator of Forests, West Nashik division shall himself inspect the majority of coupes to ensure proper marking and guard against excessive marking if any. The following rules are proposed to be observed strictly for marking in various area types:

Sl.No.	Area type	Marking Rules
1	A-Type Areas	a). No tree shall be marked for felling
2	B-Type Areas	a). All dead trees after retaining 2 trees/ha as snags and dens for nesting and resting of wildlife shall be marked. b). All live high stumps shall be properly marked. c). All multiple coppice saplings/poles, retaining one promising shoot/pole per stool, shall be carefully marked.
3	C-Type Areas	a). The congested pole crop shall be marked for thinning to maintain the good hygiene of the crop. b). The congested pole crop shall be marked for thinning to maintain spacing equal to 1/3 rd of the crop height. c). Unwanted undergrowth interfering or likely to interfere with the seed-based Natural Regeneration of teak and other valuable species shall be removed. Singling of coppice will be done.
4	D-Type Areas	a). All fruit-bearing species and minor forest produce yielding species shall be reserved. b). All dead and malformed trees after retaining 2 trees per hectare and all live high stumps shall be marked for felling. c). Mature trees that have developed hollowness and show visual sign of decay will be marked for felling. d). All but one vigorously growing coppice pole

		per stool shall be marked for felling. e). However, in this working circle, no commercial felling except for improvement felling shall be carried out.

In addition to above, the following points shall be taken care while carrying out marking:

- 1) No fruit bearing naturally grown trees shall be clear felled for any purpose whatsoever.
- 2) Standard thinning and silvicultural operations under the strict supervision of the Assistant Conservator of Forests and above will be allowed as per the norms to improve the health of growing stock while executing the prescriptions of the Working Plan.
- 3) In the vicinity of Nalas and water bodies, felling shall not be undertaken. Soil and moisture conservation works in view of prevailing climate change and water crisis shall be carried out on a priority basis.
- 4) No commercial felling shall be carried out along the 2 km strip of all perennial rivers of the tract. Further, no commercial felling shall be carried out along the strip of 500 metres of all seasonal rivers.
- 5) Felling shall not be undertaken near known resting/nesting places of wild animals and birds.
- 6) Removal of dead and diseased trees will be undertaken under the supervision of an officer, not below the rank of the Assistant Conservator of Forests.
- 7) Cut back operations shall be undertaken as per the standard norms.

2.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

- 1) **Nursery preparation in advance:** The nursery for all plantations shall be developed one year before demarcation and marking. This will help in getting at least 12 to 15 months old seedlings for plantation activity. The Deputy Conservator of Forests, West Nashik division shall do necessary planning accordingly, which advances a sustained way of raising successful plantations. While raising seedlings at Nursery, after three months from the date of germination of seeds, seedlings shall be spaced-out in the nursery at a spacing of 1ft X 1ft. This will give free space for the development of sturdy seedlings. For this activity, more nursery space will be required, and therefore necessary arrangements for space

shall be made at Range level in consultation with the concerned Assistant Conservator of Forests. The nursery estimates for raising poly pot seedling and teak stump are provided in Appendix II.10.

- 2) **Natural Regeneration:** The operation like proper identification of Natural regeneration, their spacing-out, soil working around the seedlings, etc., shall be carried out as per site requirement.
- 3) **Thinning:** Thinning is proposed to be carried out in patches of dense pole crops by maintaining the average spacing of $1/3^{\text{rd}}$ of the crop height as prescribed in C-Type areas.
- 4) **Cleaning**
 - a. Cleaning in plantations shall be carried out every year with the help of plantation chowkidar.
 - b. All climbers will be cut over the whole area of the coupe, if necessary except the species which have NTFP values.
 - c. Damaged and malformed saplings will be cut back.

2.6.12 REGENERATION

2.6.12.1 Natural Regeneration: Natural regeneration shall be given preference over the plantations. The existing Natural Regeneration shall be tended. Plantations shall be taken as a supplementary activity to Natural Regeneration in the understocked areas. The model estimate of Aided natural regeneration (ANR) is provided in Appendix II.13.

(a). Singling of coppice shoots: One healthy and promising coppice shoot will be retained on the stumps and the rest be removed. Such coppice shoots should also be close enough to the ground so that it would not topple after gaining volume and would be able to develop the root system of its own subsequently. However, coppice shoots interfering with promising saplings of seed origin should be removed.

(b). Coppice management of damaged and malformed saplings: The saplings and poles of up to 45 cm GBH consist of one-third of the stem damaged and malformed shall be coppiced by cutting flush to the ground. Such coppicing, however, should not expose the ground, causing erosion and lead to soil loss.

(c). Tending of natural regeneration: All seedlings and saplings of valuable species more than one metre in height will be nursed as the future crop. Spacing-out operations, if required, will be carried out to leave at least

600 saplings per hectare. The Aided Natural Regeneration shall be carried out if the natural regeneration is less than 600. The natural regeneration shall be assisted and encouraged by soil working and mulching around them.

2.6.12.2 Artificial Regeneration: Areas with clear open patches and fit for plantation will be taken up for artificial regeneration. The following methods are used for taking up artificial regeneration. The various plantation models suitable for this division are explained below:

- 1) **Teak stump planting:** The teak root-shoot or stump is chiefly used as planting material in raising teak plantations. The teak stumps will be planted at 2m X 2m spacing. The teak stump plantation model estimate is provided in Appendix II.14.
- 2) **Pit planting:** The digging of 1111 or 2500 pits of size 45x45x45cm will be done and then good quality seedling of local species of about 12 to 15 months old will be planted in it depending on site suitability. However, the number of plants to be planted in any given site shall be decided as per site quality. The pit plantation model estimates are provided in Appendix II.11 and II.13.
- 3) **Planting in trenches:** Digging of staggered trenches or Continuous contour trenches or combination of two of size 2m X 60cm X 30cm or 2m X 60cm X 45cm depending on site suitability will be undertaken. Then planting of seedlings of suitable local species in refilled trench will be carried out. This type of planting will help in the conservation of soil and moisture in the area which will provide congenial conditions for the development of seedlings. The trench plantation model estimates are provided in Appendix II.12. This model shall be followed in rain shadow areas of the division.
- 4) **Live-hedge planting followed by bush sowing:** The live-hedge planting shall be undertaken along the contour in sloppy areas. About 2500 plants of *Agave americana* (Agave) or *Opuntia ficus-indica* (Cactus) or *Euphorbia ligularia* (Saber), etc., would be planted per hectare. This will help in the conservation of soil and moisture in the area. After five years when the live-hedge is completely established in the area, bush sowing of seeds of Ficus family-like Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Pimpri (*Ficus amplissima*), Payar (*Ficus arnottiana*), Umber (*Ficus racemosa*), or other local species, etc., shall be undertaken. In addition, the live-hedge planting shall be undertaken along the TCM (Trench-cum-mound) around the plantations. The live-hedge plantation model estimate is provided in Appendix II.17.

- 5) **Grass and fodder plantations:** The digging of 5000 rmt 'V' shape furrow at 2 metre distance shall be undertaken along the contours. This will help in the conservation of soil and moisture in the area. The planting of 5000 grass seedlings per hectare will be done at a one-metre distance along the V-shaped furrows. In addition to 5000 grass seedlings, seed sowing of legumes between two V-shape furrows and planting of 278 fodder tree species per hectare at 6m X 6m distance are prescribed. The grass and fodder plantation estimates are provided in Appendix II.16.

2.6.12.3 Planting technique: The seedlings shall be transported to the plantation sites in the first week of July. While doing planting, dip the seedlings in a mixture of 100 litre of water mixed with 500 gm Turmeric powder (Haldi powder), 250 gm Asafoetida (Hing) and 250 gm Camphor (Kapur). This mixture acts as an anti-fungal agent and also holds soil moisture.

In the natural teak area, pure teak plantations using teak stumps shall be undertaken. In mixed plantations, teak, khair and timber yielding teak associate species shall be planted minimum 50 percent. In addition, the mixed plantations shall comprise bamboo species 20 per cent, fruit-yielding and NTFP species up to 20 per cent, Ficus species up to 10 percent each. The extent of the plantation should not be exceeding 50 ha per Range for effective management purposes. An officer not below the rank of Assistant Conservator of Forests should approve the site selection.

2.6.12.4 Choice of Species: Valuable local species suitable for the site and favoured by the local village communities and JFMCs will be preferred in plantations. The species that need to be given priority in the Western part of the division except rain shadow areas in Sinnar and Nashik Ranges are Teak (*Tectona grandis*), Ain (*Terminalis tomentosa*), Khair (*Acacia catechu*), Tiwas (*Ougeinia oogenesis*), Dhawada (*Anogeissus latifolia*), Awla (*Emblica officinalis*), Hirda (*Terminallia chebula*), Behada (*Terminalia bellirica*), Salai (*Boswellia serrata*), Mahua (*Madhuca longifolia*), Shivan (*Gmelina arborea*), Papad (*Holeptelia integrifolia*), Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Umber (*Ficus racemosa*), Chinch (*Tamarindus indica*), Bahawa (*Cassia fistula*), Wild mango (*Mangifera indica*), Bael (*Aegle marmelos*), Apta (*Bauhinia racemosa*), Jamun (*Syzygium cumini*), Sirus (*Albizia lebbek*) etc. The plant species to be given priority in Sinnar and part of Nashik Ranges are Sadada (*Terminalia tomentosa*), Dhawada (*Anogeissus latifolia*), Neem (*Azadirachta indica*), Anjan (*Hardwickia binata*), Khair (*Acacia catechu*), Vavla (*Holeptelia integrifolia*), Sissoo (*Dalbergia sissoo*), Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*),

Umber (*Ficus glomerata*), Chinch (*Tamarindus indica*), Babul (*Acacia nilotica*), Vilayati chinch (*Pithecellobium dulce*), Maharukh (*Ailanthus excelsa*), Pimpri (*Ficus amplissima*), Payar (*Ficus arnottiana*), Awla (*Emblica officinalis*), etc.

2.6.12.5 Principles of Regeneration

- 1) A-type areas with slope more than 25° should be planted with species like *Agave americana* (Agave) or *Opuntia ficus-indica* (Cactus) or *Euphorbia ligularia* (Saber) to develop a live-hedge along the contour. This will help in soil and water conservation in the area. Along the Nala banks and other water courses, planting of poly pot seedling of Jamun (*Syzygium cumini*), Arjun (*Terminalia arjuna*), etc., shall be undertaken.
- 2) In B-1 type areas, tending of Natural Regeneration is prescribed to be given preference over plantations. The areas having promising NR patches shall be identified and marked on the treatment map, followed by cultural operations. In view of the poor regeneration status across the Division, areas with promising natural regeneration may be unavailable, but wherever exists, the prescriptions is that Natural Regeneration should be supported with Aided Natural Regeneration through either teak stumps or trench model or pit model depending on site suitability.
- 3) Plantations shall be undertaken through either teak stumps or pit model or trench model depending on site suitability in the B2-type areas (but not in natural blanks wherein geology, soil, and water regime does not support tree growth) which have good soil depth and are well-drained. The choice of species is carefully selected as per site suitability. Improved nursery practices shall be adopted to raise quality seedlings.
- 4) In natural blanks, grass plantation through V-shaped furrows is prescribed depending on site suitability.
- 5) The D-type areas having good natural regeneration will be nurtured further through tending and cultural operations. If the natural regeneration is less, it should be supported with Aided Natural Regeneration.
- 6) The plantation models are given in various Appendices in Volume-II can be followed with suitable changes as per site requirement.
- 7) Depending on the site suitability, seed sowing of plant species including shrubs and herbs of NTFP values shall be undertaken in the whole of the coupe area and the required financial provisions need to be made in plantation estimates.
- 8) It shall be ensured that no seedling is planted within 3 metres distance from an established seedling or existing trees. The standing trees have an

influence zone of spreading shadow. So, pits should not be dug either in the shadow or in the influence zone of the standing trees. Influence zone for various sizes of trees is given below:

Table 2.4: Zone of Influence of trees

Girth class (cm)	<30	30-60	60-90	90-120	>120
Influence zone (m)	2	3	4	5	6

2.6.12.6 Conversion of *Gliricidia* plantations into high quality forests

The good *Gliricidia* plantations need to be converted to more valuable species by clearing (uprooting) alternatively a strip of 35 metre along the contour. About 5.5 metre spacing shall be provided on sides adjacent to retained *Gliricidia* crop to reduce competition. In clear felled strips, artificial plantation of suitable local species will be done. The pattern of felling of *Gliricidia* and then taking up new afforestation work is as below:

Gliricidia plantation	Clearfelled strips			Gliricidia plantation	Clearfelled strips			Gliricidia plantation
	5.5 metre ----- Last row spacing from unfelled area	24 metre gap Artificial new Plantation of 3X3 m or 2X2 m	5.5 metre ---- Last row spacing from unfelled area		5.5 metre ---- Last row spacing from unfelled area	24 metre gap Artificial new Plantation of 3X3 m or 2X2 m	5.5 metre --- Last row spacing from unfelled area	

2.6.12.7 Tackling of small forest patches of area less than 10 hectare

The small isolated patches are vulnerable to encroachment. They need to clearly demarcate on the ground followed by protection through chain-link fencing. These lands shall be used for raising plantation of *Ficus spp* (Vad, Pipal, Umber, etc), so that they act as micro-habitat for avifauna.

2.6.13 ASSOCIATED REGULATIONS AND MEASURES

2.6.13.1 Closure to Grazing and Fire Protection: Protection from fire and grazing is essential for the success of natural and artificial regeneration. All annual coupes will be provided strict fire protection and will remain closed to grazing, till the completion of the maintenance of plantations.

2.6.13.2 Soil and moisture conservation works: Soil and moisture conservation measures on the watershed principle shall be taken up in this working circle for the effective conservation of soil and water. These activities help in fostering good micro-climate for better development of vegetation. The prescriptions provided in Chapter 10 'Forest Watershed Development' shall be diligently followed for taking up the soil and water conservation works in this working circle.

CHAPTER-3

AFFORESTATION WORKING CIRCLE

3.1 NAME OF WORKING CIRCLE

Afforestation remains an essential tool for ecosystem restoration. The afforestation can restore previously forested areas and help to remove carbon dioxide from the atmosphere and stores in its biomass. Hence, the term afforestation is most often used in conjunction with discussions of carbon sequestration. This Chapter covers the Afforestation working circle, where the prime objective typically involves the possible enhancement of forest cover through the improvement of Natural regeneration and afforestation as per the site requirements. The area of this Working Circle has been clearly marked on the GIS-based map of 1:50000. A copy of the same is provided on a lesser scale on the A4 size following page.

3.2 GENERAL CONSTITUTION OF WORKING CIRCLE

Degradation of the forest ecosystem remains a critical environmental problem around the world and has become extremely severe in recent decades. Therefore, a need for a comprehensive approach to afforestation is essential, where it includes carbon sequestration, biodiversity conservation, soil protection, as well as the sustainable provision of raw material for forest industries and other goods and services in a balanced way. The open forest areas having a density of less than 0.4 with sparse vegetation and inadequate natural regeneration and shrubby growth have been included in this Working Circle. Afforestation Working Circle (AWC) includes 17519.221 ha of the forest area.

The following criteria have been applied for allocation of compartments to the Afforestation Working Circle:

- a) Compartments retaining a considerable proportion of area under forest blanks.
- b) Compartments possessing inferior quality open forests, which need to be afforested.

The allotment of these compartments has been carried out on the basis of the recent Forest Cover map published by the Forest Survey of India (FSI), Dehradun and its ground verifications. This is a crucially important Working

Circle in which the forest areas that are in the possession of the Forest Department will be reclaimed to enhance the forest cover in the Division and the District.

Table 3.1: Range-wise area allocation to Afforestation Working Circle

Sl. No.	Range	Total area (Ha)
1	Nanashi	1688.800
2	Harsul	3198.741
3	Trimbak	823.870
4	Nashik	786.607
5	Sinnar	11021.203
	Total	17519.221

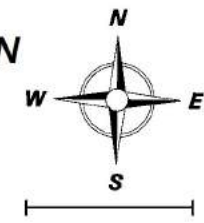
3.3 GENERAL CHARACTERISTICS OF VEGETATION

The forests of this Working Circle belong to Moist teak, Southern moist mixed deciduous, Dry teak, Dry mixed deciduous and Southern tropical thorn forests. The forest is in the degraded state mainly due to encroachment, illicit cutting and overgrazing. The quality of forests is broadly IV. Natural regeneration is poor, and the canopy density of the vegetation varies from zero to 0.3. Excessive grazing pressure has resulted in compaction of the soil with little sub-soil moisture. The species-wise and girth class-wise distribution of Growing stock in Afforestation working circle is given below:

Table 3.2: Species wise distribution in Afforestation working circle

Sl. No.	Category of Species	Name of Species	% of growing stock
1	A)Species of General Utility	Bibla, Bondara, Kakad, Sadada, Teak.	19.86
2	B)Species of Special Utility	Dhawada, Hiwar, Kalamb, Khair, Kudai, Sawar	5.26
3	C)Species of Minor Forest Produce	Apta, Awala, Amba, Behada, Bor, Chinch, Hirda, Jambul, Moha, Neem, Nilgiri, Palas, Shiras.	26.31
4	D)Other Species	Acacia, Asand, Babul, Bhuskut, Gliricidia, Maharukh, Umber, Waras etc.	48.57

MAP OF AFFORESTATION W.C.WEST NASHIK DIVISION



1:500000

LEGEND

- Division_Boundary
- Range_Boundary
- Round_Boundary
- Afforestation_W.C.
- DRAINS

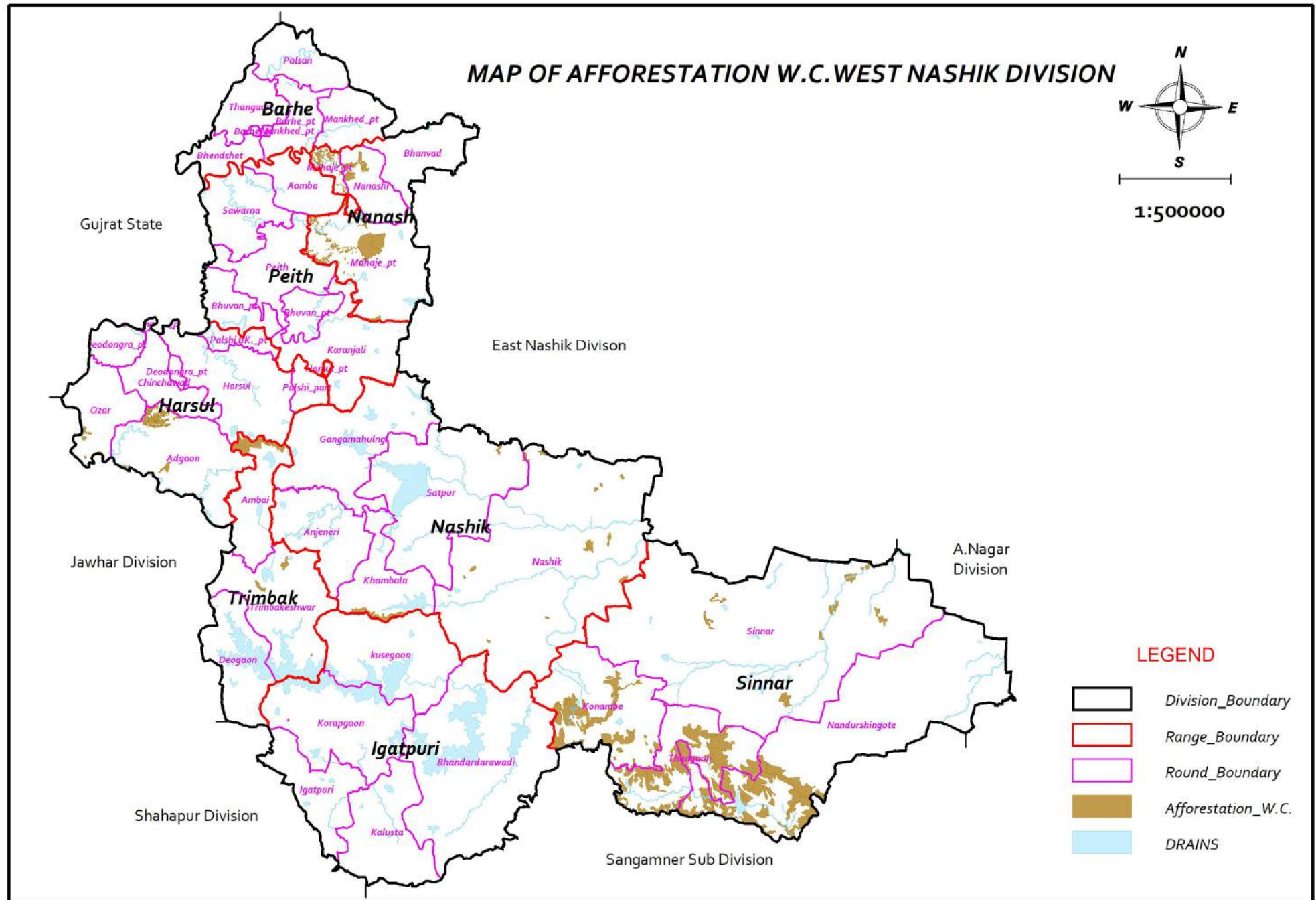


Table 3.3: Girth class wise distribution of Growing stock in population area under AWC

Group/ Species	Girth class (in cm)								
	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-150	Total
Species of General Utility	63051	29423	12610	9983	3678	1050	2101	1051	122947
Species of Special Utility	15237	8932	3152	1050	1575	525	0	2102	32573
Species of Minor Forest	60952	23644	20491	9457	8406	5779	17338	16813	162880
Other Species	147124	66732	34153	23644	12082	3151	1576	12084	300546
Grand Total	286364	128731	70406	44134	25741	10505	21015	32050	618946

3.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS

The area of this working circle has been divided into 10 treatment series. Each treatment series has been further divided into 20 annual coupes. Details are provided in Appendix II.4.

3.5 BLOCKS, COMPARTMENTS AND JFM AREA

Details of the compartments allotted to the Afforestation working circle have been provided in Appendix II.4.

3.6 SPECIAL OBJECTIVES OF MANAGEMENT

- 1) To restore the vegetative cover of degraded and open areas, and increase their productivity by tending of natural regeneration and supplementing with plantations as per site requirement.
- 2) To check the loss of topsoil by adopting suitable soil and moisture conservation measures and to increase the water absorption capacity of the soil.

- 3) To actively involve Gram Panchayats and other village institutions like JFM committees in restocking of degraded areas.
- 4) To improve the quantity and quality of NTFPs tree species by artificial regeneration.

3.6.1 ANALYSIS OF THE CROP

As the human needs grew by the population growth and advances in civilization; people have been exploiting nature and converting forests for agriculture and other non-forestry purposes. As the global environmental issues due to industrialization are growing more seriously, there is an urgent need for the mankind to resolve them by way of afforestation. The forests areas allotted to this working circle were having good vegetation in the past. But the human centric activities like encroachment, illicit felling, grazing, forest fire, etc., have degraded these forest lands. Afforestation will help in improvement of these degraded areas through enhancing the tree cover. Further more, the afforestation activity helps in the following:

- a) By mitigating soil compaction, the ground allows for greater water infiltration and storage, which reduces surface run-off and soil erosion.
 - b) Conserve the natural water storage system and regulation of water cycle.
 - c) As a diverse mix of native species are planted, it helps to restore imperiled species and declining biodiversity.
 - d) By increasing the tree density, more carbon can be sequestered by the growing forest.
 - e) Makes the land more hospitable to wildlife by providing food and shelter, and creating connectivity to other forested areas.
 - f) Involving the local communities with the tree planting provides much needed bonding between forests and people. This helps in longterm sustenance of conservation of forest resources.
-
- a) **Stock mapping:** The stock maps were prepared by territorial staff and were correlated with the enumeration results of SoFR Unit and forest cover map of the Forest Survey of India (FSI), Dehradun.
 - b) **Age and density:** The crop of forest areas under this working circle is primarily young to middle-aged containing density below 0.4.

3.6.2 SILVICULTURAL SYSTEM

- 1) The area will be regenerated with suitable tree species depending on the site conditions.
- 2) Tending of existing natural regeneration (the saplings, coppice shoots and poles), supplemented by plantations.
- 3) In view of the vicinity of these areas to habitations, fuelwood and fodder availability will be expanded through the plantation of fuelwood and fodder species by involving JFM committees.
- 4) Intensive soil and moisture conservation measures to provide feasible growing conditions for both natural and artificial regeneration.

3.6.3 ROTATION PERIOD: No rotation period is fixed.

3.6.4 HARVESTABLE DIAMETERS: Not Applicable

3.6.5 REDUCING FACTORS AND REDUCED AREAS: Not Applicable

3.6.6 FELLING CYCLE: As no felling is prescribed, the felling cycle is perceived as the Treatment cycle in this Plan. The treatment cycle is fixed as 20 years. The area of this working circle will be covered in a period of twenty years.

3.6.7 DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCK (PB): Not Applicable.

3.6.8 CALCULATION OF THE YIELD: The silvicultural tending operations will be regulated by area. No yield is prescribed for this working circle. Only the removal of dead trees (after retaining 2 dead trees/ha as snags) is prescribed.

3.6.9 TABLE OF FELLING: Details of the annual coupe are provided in Appendix II.4.

3.6.10 METHOD OF EXECUTING THE FELLING

3.6.10.1 Demarcation of coupe: The demarcation of annual coupes shall be typically carried out one year in advance of the main working as per prescriptions described in the Chapter-15 Miscellaneous Regulations.

3.6.10.2 Treatment Map: The treatment map shall be prepared by the Range Forest Officer and verified by the Assistant Conservator of Forests. All the treatment type areas shall be shown distinctively on the map, including the

areas suitable for planting and areas having adequate promising Natural regeneration.

3.6.10.3 Treatments prescribed: The appropriate treatments prescribed for various treatment type areas shall be as follows:

Treatments prescribed	
1). A-Type Areas (Protection Areas): No harvesting is prescribed	
A1 type areas, which occupy the slope more than 25°	a). Soil and moisture conservation measures shall be taken up as per the prescriptions provided in Chapter-10 Forest Watershed Development. b). Creation of live-hedges by planting of <i>Agave americana</i> (Agave) or <i>Opuntia ficus-indica</i> (Cactus) or <i>Euphorbia ligularia</i> (Saber), etc., along the contours. Once the live-hedge develops in the area, bush sowing of seeds of local tree species shall be undertaken.
A2 type areas, i.e., 20 metres wide strip on both sides of streams	a). Planting of Jamun (<i>Syzygium cumini</i>), Arjun (<i>Terminalia arjuna</i>), etc., along the Nala and other water courses.
A3 type includes areas susceptible to excessive erosion.	a). Soil and moisture conservation measures shall be taken up as per the prescriptions provided in Chapter-10 Forest Watershed Development. b). Planting of poly pot grass seedlings on V-shape furrow.
2). B-Type Areas (Under-stocked Areas)	
This type of area includes: i). The open forests with or without natural regeneration. These areas shall be indicated in the treatment map clearly. ii). The areas which were earlier planted but the plantations have failed.	
Zone-I: Soil depth below 10 cm	a). Soil and moisture conservation measures. b). Planting of poly pot grass seedlings on V-shape furrow. c). Tending of natural regeneration.
Zone-II: Soil depth 10-30 cm	a). Artificial regeneration through teak stump planting, pit planting or planting in refilled trenches depending on site suitability. b). The shallow-rooted plant species shall be selected for afforestation. c). Tending of natural regeneration. d). Soil and moisture conservation measures.
Zone-III: Soil	a). Artificial regeneration through either teak stump

depth above 30 cm	planting, planting in refilled trenches or pit planting depending on site suitability. b). Tending of natural regeneration. c). Soil and moisture conservation measures.
3). C -Type Areas (Young crop)	
The C-type area includes areas with sufficient pole crop of valuable species and additionally includes areas of old plantations of Subabul (<i>Leucaena leucocephala</i>) and Gliricidia (<i>Gliricidia sepium</i>) species.	
a). Necessary thinning in congested Subabul (<i>Leucaena leucocephala</i>) and Gliricidia (<i>Gliricidia sepium</i>) plantations. b). Thinning shall be carried out in young pole crop to bring down the stem numbers by maintaining the average spacing of 1/3 rd of the crop height. b). The pole crop that can be retained as future crop shall be marked for retention.	
4). D - Type Areas (Well-stocked Areas)	
The D-type area includes well-stocked areas with density equal or more than 0.4 and shall be separately shown in the treatment map.	
D-1 areas: Areas having more than 600/Ha of natural regeneration.	a). Silvicultural thinning in favour of economically and ecologically important local plant species are prescribed to improve the floristics of the area. b). The matured Gliricidia plantations shall be replaced with the plantations of local species as per the conversion plan provided in subsequent paras.
D-2 area: Areas having less than 600/Ha of natural regeneration.	a). The natural regeneration of the area needs to be supplemented by artificial regeneration with native valuable plant species. b). The matured <i>Gliricidia sepium</i> plantations shall be replaced with the plantations of local species as per the conversion plan provided in subsequent paras.

3.6.10.4 Extent of plantation

The requirement of the site would be the prime consideration for deciding the extent of plantation. The entire coupe area needs to be worked in the due year as per the type of area. In addition to these plantations, other activities like SMC works, grass plantations, seed sowing, etc., need to be given adequate priority. The plantations under various funding sources (like MGNREGS, FDA, DPDC, etc.), shall invariably be undertaken in areas under due coupes in that particular year of operation.

3.6.10.5 Tackling of small forest patches of area less than 10 hectare

The small isolated patches are vulnerable to encroachment. They shall be demarcated on the ground followed by protection through chain-link fencing. These lands shall be managed for raising plantation of *Ficus species* like Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Pimpri (*Ficus amplissima*), Payar (*Ficus arnottiana*), Umber (*Ficus racemosa*), etc., so that they act as micro-habitat for avifauna.

3.6.10.6 Marking Rules and Prescriptions

The prescriptions regarding marking technique as described in the Chapter-15 “Miscellaneous Regulations” shall be followed, with modifications, proposed in the following paragraphs. Marking shall be carried out under the constant supervision of the Range Forest Officer and under the guidance of Assistant Conservator of Forests concerned. The following rules shall be observed strictly for marking the trees in diverse areas:

Area type	Marking rules
1). A-Type Areas	a). No tree shall be marked for felling.
2). B- Type Areas	a). No standing tree shall be marked for felling except dead, dying and diseased trees after retaining atleast 2 dead trees/ha as snags. b). All live high stumps shall be cut close to the ground to encourage coppice. c). In the case of Coppice, in each stool, one most promising and vigorous shoot closer to the ground will be retained and rest marked for removal. d). All malformed advance growth of teak up to 30 cm girth shall be cut back to encourage coppice. e). Areas that do not contain sufficient natural regeneration will be artificially regenerated by suitable local species as per the site requirement. f). The undesirable undergrowth which is preventing the growth of natural regeneration of desired species will be removed. g). In case, the areas selected contain old unsuccessful plantations, such areas shall be treated merely after examining the factors responsible for the failure and upon taking prior approval from the officer in charge of

	territorial circle.
3). C -Type Areas	a). The congested pole crop shall be marked for thinning to maintain spacing equal to 1/3rd of the crop height. b). Poles of seedling origin shall be preferred for retention over the poles of coppice origin. c). Dead, dying and diseased poles shall be marked for thinning. d). Multiple poles shall be thinned to retain one promising pole per stump/stool.
4). D-Type Areas	a). All dead, dying and diseased trees shall be marked for felling after retaining two dead trees per hectare as snags. b). All live high stumps shall be cut back to the ground level to encourage coppice. c). All but one promising coppice pole per stool shall be marked for felling. Malformed teak advance growth shall be cut back to encourage coppice. d). No fruit-bearing trees shall be marked for felling.

In addition to above, the following points shall be taken care while carrying out marking:

- 1) No fruit bearing naturally grown trees shall be clear felled for any purpose whatsoever.
- 2) Standard thinning and silvicultural operations under the strict supervision of the Assistant Conservator of Forests and above will be allowed as per the norms to improve the health of growing stock while executing the prescriptions of the Working Plan.
- 3) In the vicinity of Nalas and water bodies, felling shall not be undertaken. Soil and moisture conservation works in view of prevailing climate change and water crisis shall be carried out on a priority basis.
- 4) No commercial felling shall be carried out along the 2 km strip of all perennial rivers of the tract. Further, no commercial felling shall be carried out along the strip of 500 metres of all seasonal rivers.
- 5) Felling shall not be undertaken near known resting/nesting places of wild animals and birds.
- 6) Removal of dead and diseased trees will be undertaken under the supervision of an officer, not below the rank of the Assistant Conservator of Forests.
- 7) Cut back operations shall be undertaken as per the standard norms.

3.6.10.7 Sequence of Working: Demarcation of a coupe, preparation of treatment map, marking, felling (dead trees), PPO works will be done in the sequence of operations as provided in Appendix II-4.

3.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

- 1) **Nursery preparation in advance:** The nursery for all plantations shall be developed one year before demarcation and marking. This will help in getting at least 12 to 15 months old seedlings for plantation activity. The Deputy Conservator of Forests, West Nashik division shall do necessary planning accordingly, which advances a sustained way of raising successful plantations. While raising seedlings at Nursery, after three months from the date of germination of seeds, seedlings shall be spaced-out in the nursery at a spacing of 1ft X 1ft. This will give free space for the development of sturdy seedlings. For this activity, more nursery space will be required, and therefore necessary arrangements for space shall be made at Range level in consultation with the concerned Assistant Conservator of Forest. The nursery estimates for raising poly pot seedling and teak stump preparation are provided in Appendix II.10.
- 2) **Natural Regeneration:** The operation like proper identification of Natural Regeneration, their spacing-out, soil working around the seedlings, etc., shall be carried out as per site requirement.
- 3) **Thinning:** Thinning is proposed to be carried out in patches of dense pole crops by maintaining the average spacing of 1/3rd of the crop height as prescribed in C-Type areas. Dead, dying and diseased poles shall be marked for thinning.
- 4) **Cleaning**
 - a. Cleaning in plantations shall be carried out every year with the help of plantation chowkidar.
 - b. All climbers will be cut over the whole area of the coupe, if necessary except the species which have NTFP values.
 - c. Damaged and malformed saplings will be cut back.

3.6.12 REGENERATION

3.6.12.1 Natural Regeneration: Natural regeneration shall be given preference over the plantations. The existing Natural Regeneration shall be tended. Plantations shall be undertaken as a supplementary activity to Natural

Regeneration in the understocked areas. The model estimate for Aided natural regeneration (ANR) is provided in Appendix II.13.

(a). Singling of coppice shoots: One healthy and promising coppice shoot will be retained on the stumps and the rest be removed. Such coppice shoots should also be close enough to the ground so that it would not topple after gaining volume and would be able to develop the root system of its own subsequently. However, coppice shoots interfering with promising saplings of seed origin should be removed.

(b). Coppice management of damaged and malformed saplings: The saplings and poles consist of one-third of the stem damaged and malformed shall be coppiced by cutting flush to the ground. Such coppicing, however, should not expose the ground, causing erosion and lead to soil loss.

(c). Tending of natural regeneration: All seedlings and saplings of valuable species more than one metre in height will be nursed as the future crop. Spacing operations, if required, will be carried out to leave at least 600 saplings per hectare. The Aided Natural Regeneration shall be carried out, if the natural regeneration is less than 600. The natural regeneration shall be assisted and encouraged by soil working and mulching around them.

3.6.12.2 Artificial Regeneration: Areas with clear open patches and fit for plantation will be taken up for artificial regeneration. The following methods are used for taking up artificial regeneration. The various plantation models suitable for this Division are explained below:

- 1) **Teak stump planting:** The teak root-shoot or stump is chiefly used as planting material in raising teak plantations. The teak stumps will be planted at 2m X 2m spacing. The teak stump plantation model estimate is provided in Appendix II.14.
- 2) **Pit planting:** The digging of 1111 or 2500 pits of size 45x45x45cm will be done and then good quality seedling of local species of about 12 to 15 months old will be planted in it depending on site suitability. However, the number of plants to be planted in any given site shall be decided as per site quality. The pit plantation model estimates are provided in Appendix II.11 and II.13.
- 3) **Planting in trenches:** Digging of staggered trenches or Continuous contour trenches or combination of two of size 2m X 60cm X 30cm or 2m X 60cm X 45cm depending on site suitability will be undertaken. Then

planting of seedlings of suitable local species in refilled trench will be carried out. This type of planting will help in the conservation of soil and moisture in the area which will provide congenial conditions for the development of seedlings. The trench plantation model estimates are provided in Appendix II.12. This model shall be followed in rain shadow areas of the division.

- 4) **Live-hedge planting followed by bush sowing:** The live-hedge planting shall be undertaken along the contour in sloppy areas. About 2500 plants of *Agave americana* (Agave) or *Opuntia ficus-indica* (Cactus) or *Euphorbia ligularia* (Saber), etc., would be planted per hectare. This will help in the conservation of soil and moisture in the area. After five years, once the live-hedge is completely established in the area, bush sowing of seeds of Ficus family-like Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Pimpri (*Ficus amplissima*), Payar (*Ficus arnottiana*), Umber (*Ficus racemosa*), etc., shall be undertaken. In addition, the live-hedge planting shall be undertaken along the TCM (Trench-cum-mound) around the plantations. The live-hedge plantation estimate is provided in Appendix II.17.
- 5) **Grass and fodder plantations:** The digging of 5000 rmt 'V' shape furrow at 2 metre distance shall be undertaken along the contours. This will help in the conservation of soil and moisture in the area. The planting of 5000 grass seedlings per hectare will be performed at a one-metre distance along the V-shaped furrows. In addition to 5000 grass seedlings, sowing of legumes in between two V-shape furrows and planting of 278 fodder tree species per hectare at 6m X 6m distance are prescribed. The grass and fodder plantation estimate is provided in Appendix II.16.

3.6.12.3 Planting technique

The seedlings shall be transported to the plantation sites in the first week of July. While doing planting, dip the seedlings in a mixture of 100 litre of water mixed with 500 gm Turmeric powder (Haldi powder), 250 gm Asafoetida (Hing) and 250 gm Camphor (Kapur). This mixture acts as an anti-fungal agent and also holds soil moisture.

In the natural teak area, pure teak plantation using teak stump shall be undertaken. In mixed plantations, teak, khair and timber yielding teak associate species shall be planted minimum 50 percent. In addition, mixed plantations will have Bamboo species 20 percent; fruit-yielding and NTFP forest species 20 per

cent and; seedlings of *Ficus* species 10 percent. The extent of the plantation should not be exceeding 50 hectare for effective management. An officer not below the rank of Assistant Conservator of Forests should approve the site selection.

3.6.12.4 Choice of species

Valuable local species suitable for the site and favoured by the local village communities and JFMCs will be preferred in plantations. The species that need to be given priority in the Western part of the division except rain shadow areas in Sinnar and Nashik Ranges are Teak (*Tectona grandis*), Ain (*Terminalia tomentosa*), Khair (*Acacia catechu*), Tiwas (*Ougeinia oogenesis*), Dhaora (*Anogeissus latifolia*), Awla (*Emblica officinalis*), Hirda (*Terminallia chebula*), Behada (*Terminalia bellirica*), Salai (*Boswellia serrata*), Mahua (*Madhuca longifolia*), Shivan (*Gmelina arborea*), Papad (*Holeptelia integrifolia*), Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Umber (*Ficus racemosa*), Chinch (*Tamarindus indica*), Bahawa (*Cassia fistula*), Wild mango (*Mangifera indica*), Bael (*Aegle marmelos*), Apta (*Bauhinia racemosa*), Jamun (*Syzygium cumini*), Sirus (*Albizia lebbek*) etc. The plant species to be given priority in Sinnar and part of Nashik Ranges are Sadada (*Terminalia tomentosa*), Dhawda (*Anogeissus latifolia*), Neem (*Azadirachta indica*), Anjan (*Hardwickia binata*), Khair (*Acacia catechu*), Vavla (*Holeptelia integrifolia*), Sissoo (*Dalbergia sissoo*), Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Umber (*Ficus glomerata*), Chinch (*Tamarindus indica*), Babul (*Acacia nilotica*), Vilayati chinch (*Pithecellobium dulce*), Maharukh (*Ailanthus excelsa*), Pimpri (*Ficus amplissima*), Payar (*Ficus arnottiana*), Awla (*Emblica officinalis*), etc.

3.6.12.5 Principles of Regeneration

- 1) A-type areas should be planted with species like *Agave americana* (Agave) or *Opuntia ficus-indica* (Cactus) or *Euphorbia ligularia* (Saber), etc., to develop a live-hedge along the contour. This will help in soil and water conservation in the area. Once the live-hedge gets fully developed in the area, bush sowing of suitable tree species need to be done. Along the Nala banks and other water courses, planting of poly pot seedling of Jamun (*Syzygium cumini*), Arjun (*Terminalia arjuna*), etc., shall be undertaken.
- 2) In B-1 type areas, tending of existing Natural Regeneration is prescribed to be given preference over plantations. The areas having promising NR patches shall be identified and marked on the treatment map, followed

by cultural operations. In view of the poor regeneration status across the Division, areas with promising natural regeneration may be unavailable, but wherever exists, the prescriptions is that Natural Regeneration should be supported with Aided Natural Regeneration through either teak stumps or pit model or trench model depending on site suitability.

- 3) Plantations shall be undertaken through either teak stump model or pit model or trench model depending on site suitability in the B2-type areas (but not in natural blanks wherein geology, soil, and water regime does not support tree growth) which have good soil depth and are well-drained. The choice of species is carefully selected as per site suitability. Improved nursery practices shall be adopted to raise quality seedlings.
- 4) In natural blanks, grass plantation through V-shaped furrows is prescribed depending on site suitability.
- 5) The D-type areas having good natural regeneration will be nurtured further through tending and cultural operations. If the natural regeneration is less, it should be supported with Aided Natural Regeneration.
- 6) The plantation models are given in various Appendices in Volume-II can be followed with suitable changes as per site requirement.
- 7) Depending on the site suitability, seed sowing of plant species including shrubs and herbs of NTFP values shall be undertaken in the whole of the coupe area and the required financial provisions need to be made in plantation estimates.
- 8) It shall be ensured that no seedling is planted within 3 metres distance from an established seedling or existing trees. The standing trees have an influence zone of spreading shadow. So, pits should not be dug either in the shadow or in the influence zone of the standing trees. Influence zone for various sizes of trees is given below:

Table 3.4: Zone of Influence of trees

Girth class (cm)	<30	30-60	60-90	90-120	>120
Influence zone (m)	2	3	4	5	6

3.6.12.6 Conversion of *Gliricidia* plantations into high quality forests

The good *Gliricidia* plantations need to be converted to more valuable species by clearing (uprooting) alternatively a strip of 35 metres along the contour. About 5.5 metre spacing shall be provided on sides adjacent to

retained *Gliricidia* crop to reduce competition. In clear felled strips, artificial plantation of suitable local species will be done. The pattern of felling of *Gliricidia* and then taking up new afforestation work is as below:

Gliricidia plantation	Clearfelled strips			Gliricidia plantation	Clearfelled strips			Gliricidia plantation
	5.5 metre ---- Last row spacement from unfelled area	24 metre gap Artificial new Plantation of 3X3 m or 2X2 m	5.5 metre ---- Last row spacement from unfelled area		5.5 metre ---- Last row spacement from unfelled area	24 metre gap Artificial new Plantation of 3X3 m or 2X2 m	5.5 metre --- Last row spacement from unfelled area	

3.6.12.7 Institutional framework for execution of afforestation works

- 1) Agency of Implementation: For the success of afforestation works, the role of local communities is extremely important. Therefore, afforestation works under this working circle are to be entrusted to JFMCs as per area allotted to them and the forest department should provide technical guidance. Already, the Government of Maharashtra has identified JFMCs as implementing agency for MGNREGS works. As per the local conditions, only in those areas where JFMCs are not formed due to local issues or not functioning properly, then plantations can be taken up departmentally.
- 2) MGNREGS Scheme can be effectively used for raising tall seedlings. This would bring in suitable convergence between the Non-plan/Plan budget resources and funds from a special scheme like MGNREGS.
- 3) For the protection of such plantations, JFMCs should be asked to select protection labour from among their members as per the guidelines of Government Resolution of 10th July 2012. This model would enable effective protection and management of plantations.
- 4) The treatment map shall be prepared for each working coupe depending on site conditions. The treatment map should invariably be verified by the Assistant Conservator of Forests before estimates are technically approved.
- 5) In all sites suitable for teak, pure teak plantations shall be taken up under Artificial Regeneration.

3.6.13 ASSOCIATED REGULATIONS AND MEASURES

- a) **Closure to Grazing and Fire Protection:** Protection from fire and grazing is essential for the success of natural and artificial regeneration. All annual coupes will be provided strict fire protection and will remain closed to grazing, till completion of the maintenance of plantations.
- b) **Soil and moisture conservation works:** Soil and moisture conservation measures on the watershed principle shall be taken up in this working circle for the effective conservation of soil and water. These activities help in fostering good micro-climate for better development of vegetation. The prescriptions provided in Chapter-10 'Forest Watershed Development' shall be diligently followed for taking up the soil and water conservation works in this working circle.

CHAPTER-4

PROTECTION WORKING CIRCLE

4.1 NAME OF WORKING CIRCLE

Forests have long been seen as important sources of clean drinking water. Forested catchments supply a substantial proportion of all water used for domestic, agricultural and industrial needs. Forests remain a key component of watershed management. Despite their importance, forests receive enormous threats due to overexploitation. The sustainable development of natural vegetation by land protection, aggressive afforestation, forest conservation, and sound management are necessary for continuous supply of water resources. This Chapter covers the Protection working circle, where the core objective is to preserve the forests from the drivers of forest degradation. The area of this Working Circle has been clearly marked on the GIS-based map of 1:50000. A copy of the same is given on a lesser scale in the A4 size following page.

4.2 GENERAL CONSTITUTION OF WORKING CIRCLE

This Working Circle includes forests situated mostly on upper hill slopes, which are very steep to precipitous. Due to the steepness of the slope, the areas are mostly devoid of tree growth, and vegetation occurs merely in sheltered and inaccessible valleys. Vast stretches of exposed rocks with little or no soil cover are noticeable. These areas include catchments of significant rivers like Godavari and Vaitarna. It extends over to 11388.756 ha of forest areas. Protection and soil conservation treatment in these forests is necessary for site protection, preserving the steep and precipitous slopes and reducing silt load to the major dams or water bodies in the division.

Following criteria have been proposed for the allocation of forest areas or compartments to this working circle:

- 1) The compartments having more than half of its areas on the steep slope or in the stream buffer.
- 2) The compartments which are close to and in the catchments of the major dams and water bodies.
- 3) The compartments showing visible signs of intensive soil erosion.

Table 4.1: Range-wise area allocation to Protection Working Circle

Sl. No.	Range	Total area (Ha)
1	Peint	555.590
2	Harsul	738.262
3	Trimbak	1661.266
4	Nashik	2578.556
5	Igatpuri	5855.082
	Total	11388.756

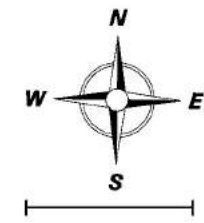
4.3 GENERAL CHARACTERISTICS OF VEGETATION

The tree growth is confined to the Western slopes along the ridge of the Western Ghat and at places in sheltered valleys. The quality of the crop is IV. Wherever tree vegetation is present, it belongs to either Western Subtropical Hill Forests or West Coast Semievergreen Forest. The tree growth on the plateau and upper slopes are inferior in quality and less dense. It consists primarily of evergreen species. In the valleys, the tree growth may perchance represent a post-climax of the Moist Deciduous Forests. In the eastern part of the division, the areas are blank and devoid of tree growth due to the precipitous slope and biotic factors. Natural regeneration is scanty or absent. The primary species occurring in the crop are Sadada, Amba, Jambul, Koshimb, Hed, Kalam, Payar, etc.

Table 4.2: Species wise distribution of growing stock in Protection working circle

Sl. No.	Category of Species	Name of Species	% to total growing stock
1	A)Species of General Utility	Bibla, Bondara, Teak	28.34
2	B)Species of Special Utility	Dhawada, Hiwar, Kalamb, Khair, Sawar.	5.16
3	C)Species of Minor Forest Produce	Amba, Apta, Behada,Bor, Chinch, Hirda, Jambul, Neem, Moha, Nilgiri, Palas, Shiras,Tendu	16.38
4	D)Other Species	Acacia, Alive, Asand, Babul, Gliricidia, Hed, Kakad, Modal, Payar, Sadada, Subabul etc.	50.12

MAP OF PROTECTION W.C.WEST NASHIK DIVISION



1:500000

LEGEND

- Division_Boundary
- Range_Boundary
- Round_Boundary
- Protection.W.C
- DRAINS

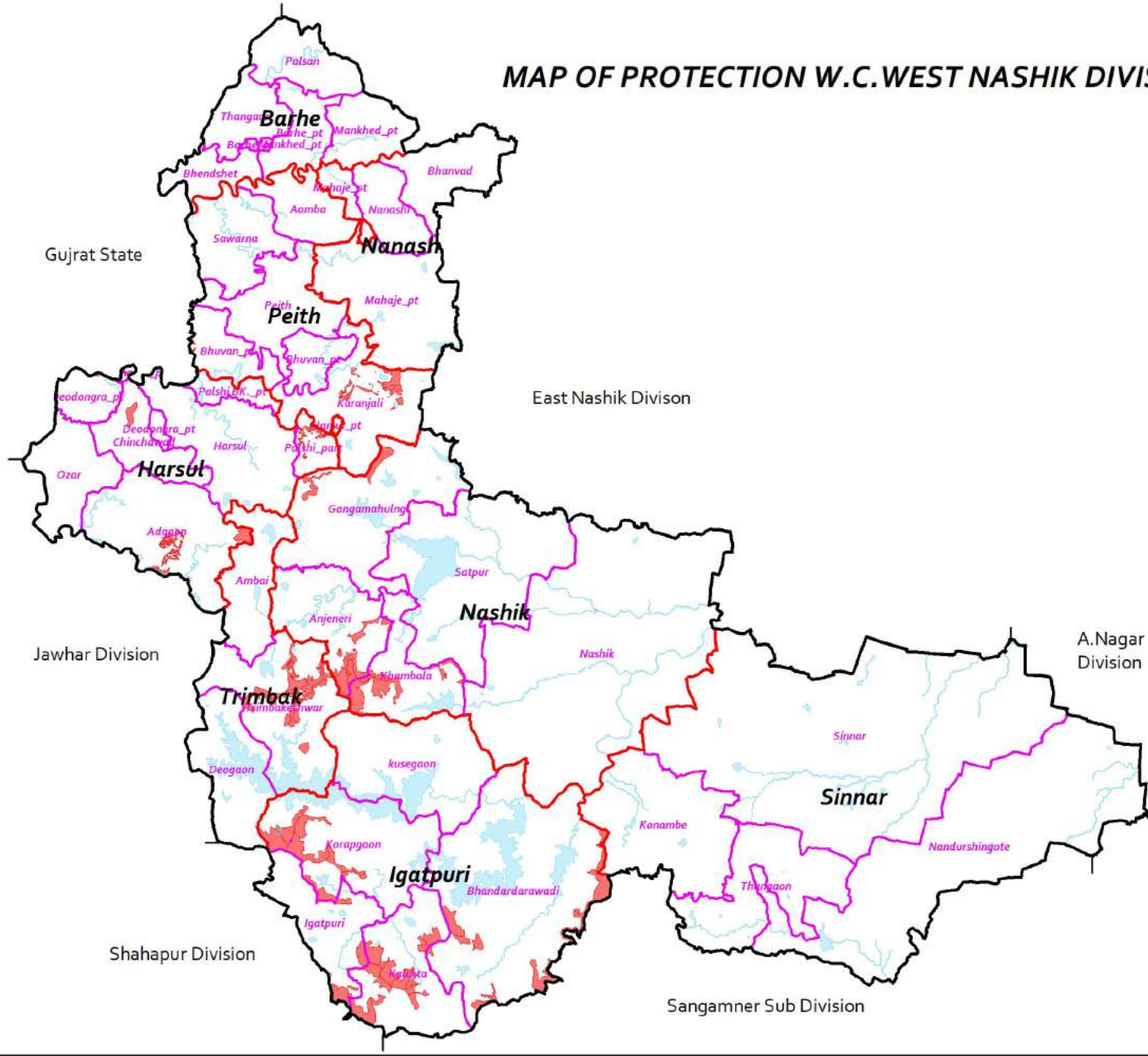


Table 4.3: Girth class wise distribution of Growing stock in PWC

Group/ Species	Girth class (in cm)								Total
	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-150	
Species of General Utility	9665	5907	4296	3759	537	1611	0	0	25775
Species of Special Utility	4833	3759	1611	3759	1611	2148	0	0	17721
Species of Minor Forest Produce	15035	15035	9665	5370	2685	3759	3759	12350	67658
Other Species	42955	20405	26310	8592	5907	6981	537	6443	118130
Grand Total	72488	45106	41882	21480	10740	14499	4296	18793	229284

4.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS

The area of this working circle is divided into 10 treatment series and 10 coupes. Details of treatment series and coupes are given in Appendix II-5.

4.5 BLOCKS, COMPARTMENTS AND JFM AREA

The details of the compartment in Protection working circle have been provided in the Appendix II-5.

4.6 SPECIAL OBJECTIVES OF MANAGEMENT

- 1) To preserve and increase the vegetation cover to help in enhancing the water regime of the forest tracts.
- 2) To check the soil erosion and to arrest the runoff by implementing soil and water conservation measures in the forest catchments; so as to increase the longevity of streams and water bodies.
- 3) To create a live-hedge along the contour to provide the vegetative barrier across the slope.

4.6.1 ANALYSIS OF THE CROP

The forests play an important hydrological role with respect to water yield, flooding incidence and sustained dry-season flows. The removing of forest vegetation from the landscape will result in increased volumes of stream flow due to correspondingly reduced evaporative losses, with the bulk of the increase in flows manifesting itself during times of base flow. The area subject to advanced soil degradation and accelerated surface erosion is known to be associated with strongly diminished rainfall infiltration and therefore with greatly enhanced storm runoff volumes. These large increases in surface runoff are due to less infiltration in absence of forest sponge effect. The roots of trees in natural forests of high biodiversity value, along with the top layer of soil, absorb moisture during rains, thus releasing water during non-rainy seasons. The flow of water in streams during the summer months is thus maintained, making the flow perennial. If the trees are damaged, the water-holding capacity of the forests diminishes and the rainy season will have more of runoff, which in turn means more soil and moisture losses. Soil losses from catchments result in siltation of reservoirs. Hence, maintenance of natural regeneration and aggressive afforestation coupled with soil and water conservation measures are essential for sustainable water supply for the ever increasing human population and mitigating hostile environmental conditions resulting from drought.

- a) **Stock mapping:** Conventional Stock Mapping has been done by the staff of the West Nashik division. Forest cover maps of the Forest survey of India (FSI), Dehradun have in addition been used for verification.
- b) **Age and density:** The crop is primarily young to middle-aged with scattered patches of the young crop.
- c) **Enumeration:** Enumeration has been carried out by the SoFR unit, Nashik as per the procedure laid down in the National Working Plan Code, 2014.

4.6.2 SILVICULTURAL SYSTEM

The silvicultural system is proposed on the pattern of watershed management *viz.*, Ridge to valley principle. Soil and moisture conservation works shall be undertaken to prevent soil erosion, siltation of reservoirs and to enhance the vegetation cover and groundwater table. Harvesting of green trees is prohibited. These areas are proposed to receive absolute protection from grazing and fire.

4.6.3 ROTATION PERIOD: No Rotation period is fixed.

4.6.4 HARVESTABLE DIAMETER: Not Applicable

4.6.5 REDUCING FACTORS AND REDUCED AREAS: Not Applicable

4.6.6 FELLING CYCLE: Treatment cycle is fixed at 10 years.

4.6.7 DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCK (PB): Not Applicable

4.6.8 CALCULATION OF THE YIELD: Not Applicable

4.6.9 TABLE OF FELLING: Not Applicable

4.6.10 METHOD OF EXECUTING THE FELLING: Not Applicable

4.6.10.1 Coupe demarcation

The annual coupes shall be demarcated one year in advance as per the prescriptions provided in Chapter-15 Miscellaneous Regulations.

4.6.10.2 Treatment Map

The treatment map shall be prepared by the Range Forest Officer and verified by the Assistant Conservator of Forests. All the treatment type areas shall be shown distinctively on the map, including the areas suitable for planting and areas having adequate promising Natural regeneration, etc.

4.6.10.3 Treatments prescribed

The appropriate treatments prescribed for various treatment type areas shall be as follows:

Treatments prescribed	
1). A-Type Areas (Protection Areas): No harvesting is prescribed	
A1 type areas, which occupy the slope more than 25°	a). Soil and moisture conservation measures shall be taken up as per the prescriptions provided in Chapter-10 Forest Watershed Development.

	b). Creation of live-hedges by planting of <i>Agave americana</i> (Agave), <i>Opuntia ficus-indica</i> (Cactus) and <i>Euphorbia ligularia</i> (Saber), etc., along the contours. Once the live-hedge gets developed in the area, bush sowing of seeds of local tree species shall be undertaken.
A2 type areas, i.e., 20 metres wide strip on both sides of streams	a). Planting of Jamun (<i>Syzygium cumini</i>), Arjun (<i>Terminalia arjuna</i>), etc., along the Nala and other water courses.
A3 type includes areas susceptible to excessive erosion.	a). Soil and moisture conservation measures shall be taken up as per the prescriptions provided in Chapter-10 Forest Watershed Development. b). Planting of poly pot raised grass seedlings on V-shape furrows.
2). B-Type Areas (Under-stocked Areas)	
This type of area includes: - The open forests with or without natural regeneration. These areas shall be indicated in the treatment map clearly. - The areas which were earlier planted but the plantations have failed. The treatments prescribed are: - Soil and moisture conservation measures. - Artificial regeneration through teak stump planting, pit planting or planting in refilled trenches depending on site suitability. - Tending of natural regeneration. - Planting of poly pot grass seedlings on V-shape furrow along the contour.	
3). C-Type Areas (Young crop)	
The C-type area includes areas with sufficient pole crop of valuable species and additionally includes areas of old plantations of <i>Gliricidia</i> (<i>Gliricidia sepium</i>) species.	

- a). The pole crop will be retained as future crop.
- b). The coppice shoot will be tended to retain one promising coppice shoots per stump.

4). D - Type Areas (Well-stocked Areas)

The D-type area includes well-stocked areas with density equal or more than 0.4.

The treatments prescribed are:

- a) No harvesting of green trees is prescribed.
- b) The coppice shoots will be tended to retain one promising coppice shoots per stump.
- c) Soil and water conservation works shall be undertaken as per site requirement on Ridge to valley principle.
- d) Spacing operations should cause nearly 600 saplings per hectare.

4.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

- 1) **Nursery preparation in advance:** The nursery for all plantations shall be developed one year before demarcation and marking. This will help in getting at least 12 to 15 months old seedlings for plantation activity. The Deputy Conservator of Forests, West Nashik division shall do necessary planning accordingly, which advances a sustained way of raising successful plantations. While raising seedlings at Nursery, after three months from the date of germination of seeds, seedlings shall be spaced-out in the nursery at spacing of 1ft X 1ft. This will give free space for the development of sturdy seedlings. For this activity, more nursery space will be required, and therefore necessary arrangements for space shall be made by the Range Forest Officer in consultation with the concerned Assistant Conservator of Forests. The nursery estimates for raising poly pot seedling and teak stump preparation are provided in Appendix II.10.
- 2) **Natural Regeneration:** The operation like proper identification of Natural Regeneration, their spacing-out, soil working around the seedlings, etc., shall be carried out as per site requirement.
- 3) **Cleaning**

- a. Cleaning in plantations shall be carried out every year with the help of plantation chowkidar.
- b. All climbers will be cut over the whole area of the coupe, if necessary except the species which have NTFP values.
- c. Damaged and malformed saplings will be cut back.

4.6.12 REGENERATION

4.6.12.1 Natural Regeneration: Natural regeneration shall be given preference over the plantations. The existing Natural Regeneration shall be tended. Plantations shall be undertaken as a supplementary activity to Natural Regeneration in the understocked areas. The model estimate for Aided natural regeneration (ANR) is provided in Appendix II.13.

(a). Singling of coppice shoots: One healthy and promising coppice shoot will be retained on the stumps and the rest be removed. Such coppice shoots should also be close enough to the ground so that it would not topple after gaining volume and would be able to develop the root system of its own subsequently. However, coppice shoots interfering with promising saplings of seed origin should be removed.

(b). Coppice management of damaged and malformed saplings: The saplings and poles consist of one-third of the stem damaged and malformed shall be coppiced by cutting flush to the ground. Such coppicing, however, should not expose the ground, causing erosion and lead to soil loss.

(c). Tending of natural regeneration: All seedlings and saplings of valuable species more than one metre in height will be nursed as the future crop. Spacing operations, if required, will be carried out to leave at least 600 saplings per hectare. The Aided Natural Regeneration shall be carried out, if the natural regeneration is less than 600. The natural regeneration shall be assisted and encouraged by soil working and mulching around them.

4.6.12.2 Artificial Regeneration: Areas with clear open patches and fit for plantation will be taken up for artificial regeneration. The following methods are used for taking up of artificial regeneration. The various plantation models suitable for this Division are explained below:

- 1) **Teak stump planting:** The teak root-shoot or stump is chiefly used as planting material in raising teak plantations. The teak stumps will be

planted at 2m X 2m spacing. The teak stump plantation model estimate is provided in Appendix II.14.

- 2) **Pit planting:** The digging of 1111 or 2500 pits of size 45x45x45cm will be done and then good quality seedling of local species of about 12 to 15 months old will be planted in it depending on site suitability. However, the number of plants to be planted in any given site shall be decided as per site quality. The pit plantation model estimates are provided in Appendix II.11 and II.13.
- 3) **Planting in trenches:** Digging of staggered trenches or Continuous contour trenches or combination of two of size 2m X 60cm X 30cm or 2m X 60cm X 45cm depending on site suitability will be undertaken. Then planting of seedlings of suitable local species in refilled trench will be carried out. This type of planting will help in the conservation of soil and moisture in the area which will provide congenial conditions for the development of seedlings. The trench plantation model estimates are provided in Appendix II.12.
- 4) **Live-hedge planting followed by bush sowing:** The live-hedge planting shall be undertaken along the contour in sloppy areas. About 2500 plants of *Agave americana* (Agave), *Opuntia ficus-indica* (Cactus) and *Euphorbia ligularia* (Saber), etc., would be planted per hectare. This will helps in the conservation of soil and moisture in the area. After five years when the live-hedge is completely established in the area, bush sowing of seeds of Ficus family-like Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Pimpri (*Ficus amplissima*), Payar (*Ficus arnottiana*), Umber (*Ficus racemosa*), etc., shall be undertaken. In addition, the live-hedge planting shall be undertaken along the TCM (Trench-cum-mound) around the plantations. The live-hedge plantation estimate is provided in Appendix II.17.
- 5) **Grass and fodder plantations:** The digging of 5000 rmt 'V' shape furrow at 2 metre distance shall be undertaken along the contours. This will help in the conservation of soil and moisture in the area. The planting of 5000 grass seedlings per hectare will be performed at a one-metre distance along the V-shaped furrows. In addition to 5000 grass seedlings, sowing of legumes in between two V-shape furrows and planting of 278 fodder tree species per hectare at 6m X 6m distance are prescribed. The grass and fodder plantation estimate is provided in Appendix II.16.

4.6.12.3 Planting technique

The seedlings shall be transported to the plantation sites in the first week of July. While performing planting, dip the seedlings in a mixture of 100 litre of water mixed with 500 gm Turmeric powder (Haldi powder), 250 gm Asafoetida (Hing) and 250 gm Camphor (Kapur). This mixture acts as an anti-fungal agent and equally holds soil moisture.

In the natural teak area, pure teak plantations using teak stumps shall be undertaken. In mixed plantations, teak, khair and timber yielding teak associate species shall be planted minimum 50 percent. In addition, the mixed plantations shall comprise bamboo species 20 per cent, fruit-yielding and NTFP species up to 20 per cent, Ficus species up to 10 percent each. The extent of the plantation should not be exceeding 50 ha per Range for effective management purposes. An officer not below the rank of Assistant Conservator of Forests should approve the site selection.

4.6.12.4 Choice of species

Valuable local species suitable for the site and favoured by the local village communities and JFMCs will be preferred in plantations. The species that need to be given priority in the Western part of the division except rain shadow areas in Sinnar and Nashik Ranges are Teak (*Tectona grandis*), Ain (*Terminalis tomentosa*), Khair (*Acacia catechu*), Tiwas (*Ougeinia oogenesis*), Dhawda (*Anogeissus latifolia*), Awla (*Emblica officinalis*), Hirda (*Terminallia chebula*), Behada (*Terminalia bellirica*), Salai (*Boswellia serrata*), Mahua (*Madhuca longifolia*), Shivan (*Gmelina arborea*), Papad (*Holeptelia integrifolia*), Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Umber (*Ficus racemosa*), Chinch (*Tamarindus indica*), Bahawa (*Cassia fistula*), Wild mango (*Mangifera indica*), Bael (*Aegle marmelos*), Apta (*Bauhinia racemosa*), Jamun (*Syzygium cumini*), Sirus (*Albizia lebbek*) etc. The plant species to be given priority in Sinnar and part of Nashik Ranges are Sadada (*Terminalia tomentosa*), Dhawda (*Anogeissus latifolia*), Neem (*Azadirachta indica*), Anjan (*Hardwickia binata*), Khair (*Acacia catechu*), Vavla (*Holeptelia integrifolia*), Sissoo (*Dalbergia sissoo*), Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Umber (*Ficus glomerata*), Chinch (*Tamarindus indica*), Babul (*Acacia nilotica*), Vilayati chinch (*Pithecellobium dulce*), Maharukh (*Ailanthus excelsa*), Pimpri (*Ficus amplissima*), Payar (*Ficus arnottiana*), Awla (*Emblica officinalis*), etc.

4.6.12.5 Method of Regeneration

- 1) A-type areas should be planted with species like *Agave americana* (Agave), *Opuntia ficus-indica* (Cactus) and *Euphorbia ligularia* (Saber) to develop a live-hedge along the contour. This will help in soil and water conservation in the area. Once the live-hedge gets fully developed in the area, bush sowing of seeds of suitable tree species need to be done. Along the Nala banks and other watercourses, planting of poly pot seedling of Jamun (*Syzygium cumini*), Arjun (*Terminalia arjuna*), etc., shall be undertaken.
- 2) In B-1 type areas, tending of existing Natural Regeneration is prescribed to be given preference over plantations. The areas having promising NR patches shall be identified and marked on the treatment map, followed by cultural operations. In view of the poor regeneration status across the Division, areas with promising natural regeneration may be unavailable, but wherever exists, the prescription is that Natural Regeneration should be supported with Aided Natural Regeneration through either teak stumps or pit model or trench model depending on site suitability.
- 3) Plantations shall be undertaken through either teak stumps or pit model or trench model depending on site suitability in the B2-type areas (but not in natural blanks wherein geology, soil, and water regime does not support tree growth) which have good soil depth and are well-drained. The choice of species is carefully selected as per site suitability. Improved nursery practices shall be adopted to raise quality seedlings.
- 4) In natural blanks, grass plantation through V-shaped furrows is prescribed depending on site suitability.
- 5) The D-type areas having good natural regeneration shall be nurtured further through tending and cultural operations. If the natural regeneration is less, it should be supported with Aided Natural Regeneration.
- 6) The plantation models are given in various Appendices in Volume-II can be followed with suitable changes as per site requirement.

4.6.13 ASSOCIATED REGULATIONS AND MEASURES

- a) **Closure to grazing, Fire protection and other regulations:** Protection from fire and grazing is essential for the success of natural and artificial regeneration. All annual coupes will be provided strict fire protection, and will remain closed to grazing, till completion of the maintenance of plantations.

- b) **Soil and moisture conservation measures:** Soil and moisture conservation measures on the watershed principle shall be taken up in this working circle for the effective conservation of soil and water. These activities help in fostering good micro-climate for better development of vegetation. The prescriptions provided in Chapter-10 'Forest Watershed Development' shall be diligently followed for taking up the soil and water conservation works in this working circle.
- c) **Water body:** Each water body/reservoir represents a unique ecological site having endowed with varied and rich biodiversity as well as natural and scenic beauty. Due to the proximity of water, there is a considerable diversity of flora and fauna around these water bodies as well as along the watercourses. These forest areas also support a substantial number of NTFP species, which are of great significance for the livelihood needs of the local people. Therefore, these sites are ideally suitable for developing Ecological Centres (Eco-centres) for the purpose of disseminating information and to understand the complex issues and concerns associated with sustainable forestry. These Eco-centres will accommodate the ecotourism needs of the community of this region and will, in addition, open up employment opportunities and alternative means of livelihood for local people. The involvement of local people and NGOs in the development and management of these areas as focal points of nature interpretation and ecotourism will pave the way to generate goodwill among the local communities about forests and wildlife.

CHAPTER-5

GRASS AND FODDER MANAGEMENT WORKING CIRCLE

5.1 NAME OF WORKING CIRCLE

Grasslands are open areas of land where grasses or grasslike plants represent the dominant species. Grasslands are important because of their diversified role in the ecosystem like provision of forage for livelihood, protection, and conservation of soil and water resources, furnishing habitat for wildlife, both flora, and fauna, and enhance the aesthetics of the landscape. However, the grasslands are under tremendous pressure from grazing, habitat fragmentation, the proliferation of invasive weeds and climate change. This Chapter covers Grass and Fodder working circle, where the prime objective is the conservation and improvement of Grass and fodder in suitable forest areas. The area of this Working Circle has been clearly marked on the GIS-based map of 1:50000. A copy of the same is given on a lesser scale in the A4 size following page.

5.2 GENERAL CONSTITUTION OF WORKING CIRCLE

The Working circle includes the areas capable of producing good quality grasses. These areas are suitable for fodder development due to existing edaphic factors. The tree population is extremely less in these areas. There is an immense demand for good quality grass and fodder in the region due to flourishing dairy development. The aggregate area allotted to this working Circle is 6136.657 ha.

Table 5.1: Range-wise area allocation to Grass & Fodder Working Circle

Sl. No.	Range	Total area
1	Nashik	3426.266
2	Igatpuri	782.383
3	Sinnar	1928.008
	Total	6136.657

5.3 GENERAL CHARACTERISTICS OF VEGETATION

The areas allotted to this working circle contain degraded soils and are with excessive biotic pressure. They are, therefore, open (density ranges from 0.2 to 0.3) containing brushwood and bushes along with the grasses. Trees are

stunted, malformed and hacked and are found scattered throughout. Tree species found are Teak, Dhawada, Hiwar, Khair, Sawar, Bor, Neem, Shiras, Tendu, Anjan, Babul, Gliricidia, Pangara, Subabul, Waras, etc. *Lantana camara* and *Hyptis suaveolens* weed infestation have been observed in the tract. These weeds are spreading rapidly in the areas which were managed as pasture lands and grassland in the past. Hence, the availability of palatable grasses has reduced.

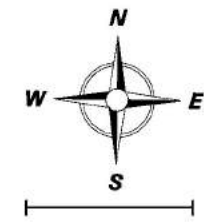
Table 5.2: Species wise distribution in Grass & Fodder working circle

Sl. No.	Category of Species	Name of Species	% to total growing stock
1	A)Species of General Utility	Teak	8.82
2	B)Species of Special Utility	Dhawada, Hiwar, Khair, Sawar.	5.89
3	C)Species of NTFP	Bor, Neem, Shiras, Tendu.	6.87
4	D)Other Species	Anjan, Babul, Gliricidia, Pangara, Subabul, Waras etc.	78.42

Table 5.3: Girth class wise distribution of Growing stock in population area under G&FWC

Group/ Species	Girth class (in cm)								
	31-45	46-60	61-75	76-90	91-105	106-120	121-135	136-150	Total
Species of General Utility	2580	1935	645	645	0	0	0	0	5805
Species of Special Utility	1935	1290	0	0	0	0	0	645	3870
Species of NTFP	1290	1290	0	1290	0	0	0	645	4515
Other Species	36769	3870	2580	5161	2580	645	0	0	51605
Grand Total	42574	8385	3225	7096	2580	645	0	1290	65795

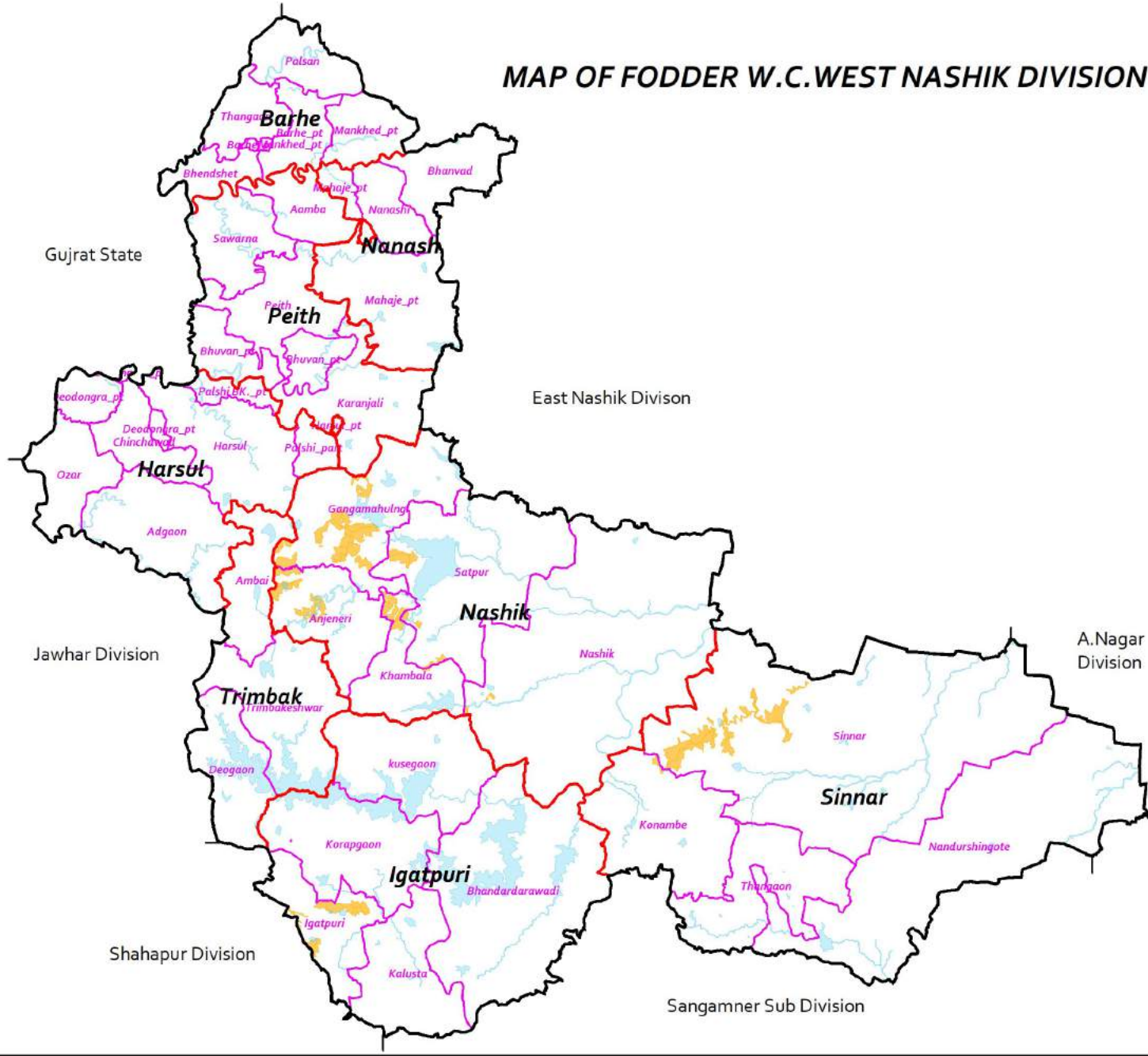
MAP OF FODDER W.C.WEST NASHIK DIVISION



1:500000

LEGEND

- Division_Boundary
- Range_Boundary
- Round_Boundary
- Fodder_W.C.
- DRAINS



5.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS

The working circle has been divided into 10 treatment series and each such series will allow 10 coupes. Details of series and coupes are given in Appendix II-6.

5.5 BLOCKS, COMPARTMENTS AND JFM AREA

The blocks and compartments allotted to Grass and fodder working circle are shown in Appendix II-6.

5.6 SPECIAL OBJECTIVES OF MANAGEMENT

- 1) To supplement the fodder requirement of wild animals.
- 2) To augment fodder production for achieving the bonafide requirement of the forest dependent communities.
- 3) Introduction of suitable palatable indigenous varieties of grasses, legumes, and fodder tree species in selected areas.
- 4) To restore the site through Soil and Moisture conservation works.
- 5) To make each Forest Ranges self-sufficient in grass seeds and root slips through systematic nursery planning.

5.6.1 ANALYSIS OF THE CROP

Forests and grasslands provide vital ecosystem services (e.g., water and climate regulation) in support of agriculture, food security and nutrition. Furthermore, these lands offer vast potential to contribute to climate change adaptation by ensuring long-term contributions to community resilience, livelihoods and poverty alleviation, at the same time capturing mitigation benefits through carbon sequestration. However, this potential is constrained by practices that degrade the land and water systems upon which food production ultimately depends.

The grasslands present in West Nashik division include natural landscapes as well as areas dominated by grasses that have formed as a result of deforestation and degradation on former forestlands. Perennial species are key to economic and resource sustainability as they provide drought forage in variable rainfall climates, protect the organic soil layer, play an important role in nutrient cycling, maintain soil health, etc. The restoration of these grassland can provide a range of ecosystem-derived environmental, social and economic benefits.

There are a number of conditions that constrain the development and implementation of grassland restoration approaches. Brief analyses and discussion of current barriers to forest and grassland restorations are presented below:

- 1) Technical barriers: Technical barriers to restoration of grasslands are threefold:
 - a. Access to information and knowledge of appropriate and proven rehabilitation techniques.
 - b. Lack of access to planting materials, equipment and infrastructure.
 - c. Local ecological conditions, including degraded soil, human-induced events such as fire, climatic conditions, competition by invasive species, unfavourable courses of succession, and biotic pressures such as grazing.
- 2) Economic and financial barriers: Developing approaches to forest and grassland restoration that optimize financial and livelihood benefits as well as generate improvements in biodiversity has proved challenging. Restoration is often financially less attractive than other land-use alternatives, and there is a recognized need to reduce the costs of restoration to improve its economic viability.
- 3) Social barriers: Social conditions and land-use practices that create unfavourable conditions for forest and grassland restoration include:
 - a. Demographic pressures on land use
 - b. Social conflicts among interest groups
 - c. The prevalence of rural poverty

The following activities were carried-out to assess the existing vegetation present in this working circle:

- a) **Stock mapping**: Conventional Stock Mapping has been done by the West Nashik division staff. The forest cover map of the Forest Survey of India (FSI), Dehradun was used for verification of stock maps.
- b) **Age and Density**: Areas are mostly open and blank, and density ranges between 0.1 to 0.3
- c) **Enumeration**: Enumeration has been done by the SoFR unit of Nashik as per the procedure laid down in the National Working Plan Code, 2014. Present enumeration primarily values tree crops. However, for the proper management of grass and fodder resources and for their further development, different valuation method is required to be used. It should

include the valuation of soil type suitable for grassland management and its moisture content. This will help in deciding the grass species most suitable for a site to produce optimum production. The extent of grazing and other biotic pressures, as well as their effect on grass composition and yield, shall also be considered as factors for such valuation.

5.6.2 SILVICULTURAL SYSTEM

Based on the grass and pasture resources of the site as well as the objectives of the management, the silvicultural systems to be followed are as under and all these interventions can go together as per site requirement.

- 1) **Natural augmentation of grasslands:** The closure of grasslands for grazing and weed eradication will help in the natural augmentation of grasslands. Periodical closure of areas containing an adequate quantity of palatable natural grass reserve helps in its rejuvenation. All obnoxious weeds and thorny shrubs and bushes shall be uprooted. The non-palatable grasses shall be eradicated in the pre-flowering stage only. Soil and moisture conservation works like CCTs, Nala-bunding and gully plugging, etc., may be taken up extensively for improving the site. It will require complete and permanent closure from grazing but with a provision of drawing fodder resources from it on 'cut and carry' basis. They are to be cut merely after the dispersal of grass seeds. The grasslands accordingly developed are allowed for grass cutting on a rotational basis.
- 2) **Artificial grass plantation:** If the area is very degraded and not possessing an adequate quantity of native palatable grass for successful restoration of grassland, then artificial plantation of the native palatable grass and fodder species shall be taken up along with suitable soil and moisture conservation measures. After successful establishment of artificial grass plantations, the area will be opened for rotational grazing.
- 3) **Rotational Grazing:** The areas shall be regulated for controlled grazing as per prevailing grazing rules. Pasture lands have been divided into pasture series and each series will allow three coupes, namely A, B, and C. Then, the whole coupe area shall be fenced by chainlink fencing. Each coupe shall remain closed to grazing for two years and then, opened for grazing in the 3rd year. The coupe will be demarcated one year before the due date of closure. The period of the closure will be prominently displayed at the convenient places. The closure provides necessary rest for the natural rejuvenation of grasslands.

- 4) **Encourage grass plantation in private areas:** Like the distribution of plants to people at the concessional rate during the Van-Mahotsav period, the poly pot grass seedlings of good nutritional value shall be distributed to the public on the concessional rate. They can be utilized for the cultivation of their own fodder in agriculture fields. This will progress a long way in reducing the grazing pressure on the forest area.

5.6.3 ROTATION PERIOD: Rotational grazing on a cycle of 3 years is practiced and the grass can be harvested on cut and carry basis after two years from the date of artificial grass plantation.

5.6.4 HARVESTABLE DIAMETERS: Not applicable

5.6.5 REDUCING FACTORS AND REDUCED AREAS: Not applicable

5.6.6 FELLING CYCLE: Treatment cycle is fixed at 3 years.

5.6.7 DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCK (PB): Not applicable

5.6.8 CALCULATION OF THE YIELD: The yield is fixed by area.

5.6.9 TABLE OF FELLING: Not applicable

5.6.10 METHOD OF EXECUTING THE FELLING

The prescriptions for the management of grasslands include the following steps:

- 1) **Demarcation of coupe:** The coupe due for closure to grazing will be demarcated one year in advance, by cutting 3 metre broad lines and erecting barbed wire/chain link fencing around it. The 3 metre clear line will also act as firelines and provide protection to the grasslands from the forest fires. The period of the closure will be prominently displayed at the convenient places.
- 2) **Closure of grasslands:** Elimination of the grazing which is one of the directly responsible factors for the deterioration of the grasslands induces a progressive succession in grassland development. It can, therefore, serve as an extremely effective method of improving degraded grasslands. Closure for a period of two years will be effective when the remnants of better species are still scattered in the area to serve as seed

sources. But if the deterioration has already proceeded to the adverse condition then the artificial augmentation of palatable grass species needs to be done through the planting of poly pot raised grass seedlings after closure.

- 3) **Weed control/bush control:** Both herbaceous and shrubby weeds invasion deteriorates the grasslands. It is important to eradicate the undesirable weeds and shrubby growths that may compete with desirable grasses and legumes. Eradicating perennial weeds is to remain a continuous process in deteriorated grasslands. To eradicate the weeds, various methods are applicable like manual cutting, mechanised means (by the use of implements), digging out, burning (in case of severe infestation), etc. The herbaceous weed eradication shall be done at flowering stage itself before seed setting.
- 4) **Regular harvesting of grass:** Regular harvesting of grasses from grasslands will encourage renewed growth of grass after the next monsoon rains. The removing unutilized herbage residues of the previous year causes renewed growth of vegetation that will develop unhindered and become available to grazing animals or harvesting.
- 5) **Conservation of soil and moisture:** The proper conservation of both soil and water is an integral part of all good grassland management systems. When properly grazed and eroding forces are kept in check, then no special conservation measure could be needed. But when grasslands have been mismanaged by neglect and overgrazing for many years, soil and water conservation measures become essential for any improvement plan. On degraded grassland, the first measure of improvement could be to prevent any further erosion of the soil. Where the erosion has already progressed to the stage of gully formation, boulder checks will have to be put across the gully channels. A number of small boulder checks being more effective than a few massive ones. Erosion can be controlled by preventing excessive removal of herbage, adopting contour bunding, CCT, etc.
- 6) **Grassland restocking:** On highly degraded grasslands, the most certain and rapid way of regeneration is restocking. Sufficient preliminary information should also be gathered on the choice of species, the seed quality, prevailing soil, and moisture conditions, and method of restocking, etc., if the program is to be successful. The planting of the nursery raised poly pot seedlings of palatable grass species shall be used for restocking. The restocked area needs to be closed for grazing for a period of two years to encourage sufficient seed dispersal in the area. In addition, trees and shrubs are important features of these types of

grassland. These trees are browsed and may be lopped for fodder. Trees provide valuable shade in hot seasons and they provide shelter in winter. The most promising fodder tree species for this area is Anjan (*Hardwickia binata*), Kinai (*Albizia procera*), Bor (*Ziziphus mauritiana*), etc. Hence, the planting of fodder species should become an integral part of grassland augmentation.

- 7) **Grazing management:** Since a limited number of well-fed animals are more reasonable than a considerable number of half-starved ones, stringent control of the number of animals let in for grazing remains the first principle of all grazing systems. In fixing the number of animals, the carrying capacity of the grassland should be taken into consideration. This is defined as the number of animals that can graze in a unit area without over-grazing or under-grazing in an average season. The over-grazing on account of selective grazing habit of animals, desirable species tend to get depleted much faster than the less palatable species. To eliminate this risk, grazing must be deferred since it will seldom possible to stop grazing over the continuous area when no other alternative areas are present. The practical method is to defer grazing in a part of the grassland and to allow grazing in the other part in a 'rotational' system. As mentioned earlier, Pasture lands have been divided into pasture series and each series will allow three coupes, namely A, B, and C. Each coupe shall remain closed to grazing for two years. This will provide time for rejuvenation of grasslands before opened for grazing (Details of cattle units to be allowed for grazing in forest area is provided in Para 13.6.10.2 of Chapter-13, Forest Health and Vitality).

5.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

- 1) **Pruning of fodder trees:** Management of fodder trees is one of the essential aspects of Silvi-pasture areas. Growth of fodder trees varies across species and hence, the pruning or lopping of fodder trees should start after the complete establishment of species in the field. The lopping of foliage shall be allowed only on cut and carry basis for stall feeding. The cutting height should not be less than 1.00 to 1.50 m from the ground level. The cutting frequency of 6 to 12 weeks shall be followed. The extent of lopping should be fixed every year depending on the growth conditions of the fodder trees. This shall be decided by conducting a

sampling study and, the specified quantity will be strictly regulated to avoid over-harvesting.

- 2) **Regular harvesting of grass from pastures:** The grasses mainly perennial undergo two stages during the growing season; the reproductive stage and the vegetative stage. When the grass starts growing in the spring, its key objective is to reproduce, resulting in a seed head. Once it has produced a seed head, it will transmit the energy from the reproductive stage to the vegetative stage. At that point, the plant wants to accumulate enough energy in the roots to survive through winter. After the setting of the seed head, the quality of the grass will be significantly low. The removal of the stem and seed head at this stage will stimulate new growth. It is critical to give the grass plants a chance to rest after being grazed. Therefore, the grazing management is carried out on a cycle of 3 years i.e., after every year of grazing, the grazing block will be closed for two years. During the closure period, the grass will be completely harvested after seed production either mechanically or manually to stimulate a new flush of grass.

5.6.12 REGENERATION

5.6.12.1 Natural augmentation: Natural augmentation shall be given preference over artificial planting. This shall be achieved through effective closure of grasslands from grazing for two years. This will help in better seed dispersal and its establishment in the area. Taking up adequate soil and moisture conservation measures in these areas will aid in providing congenial conditions for the speedy establishment of grass species.

5.6.12.2 Artificial grass planting: Earlier many efforts have been engaged to develop grasslands through grass seed sowing in the area. But in absence of effective closure of the area due to excessive grazing pressure, the results were not thoroughly satisfactory. In addition, the competition with existing grass flora of the region and insect damage to the seeds sown had suffered a negative impact on the development of grasses from seed sowing. To avoid such early hindrances, the nursery raised poly pot grass seedlings shall be used for grass plantation and will help in the faster establishment of grass seedlings in the area. Therefore, it is prescribed that the artificial grass plantation shall be taken up through planting of the nursery raised poly pot grass seedlings of better palatable values.

- 1) **Area treatment:** All weeds present in the area shall be uprooted. The digging of 5000 rmt 'V' shape furrow at a 2-metre distance shall be undertaken along the contours. This will help in the conservation of soil and moisture in the area.
- 2) **Choice of Species:** The forage species to be given priority during artificial augmentation are as given below:
 - a. **Grasses:** Dongri (*Chrysopogon fulvas*), Pavanya (*Sehima sulcatum*), Sheda (*Sehima nervosum*), Anjan (*Cenchrus ciliaris*), Kala Dhaman (*Cenchrus setigerus*), Marvel (*Dichanthium annulatum*), Guinea grass (*Panicum maximum*), etc., are most suited for the semi-arid area.
 - b. **Legumes:** Hamata (*Stylosanthes hamate* and *Stylosanthes scabra*), Widltur or ghoshyachi vel (*Atylosia scarabaeoides*), Siratro (*Macroptilium atropurpureum*), Chara Bhuimung (*Arachis glabrata*), Gokarna (*Clitoria ternatea*), Horse gram/Kulith (*Dolichus biflorus*), Dashrath grass (*Desmanthus virgatus*), etc.
 - c. **Fodder trees:** Anjan (*Hardwickia binate*), Kinai (*Albizia procera*), Bor (*Ziziphus mauritiana*), etc.
- 3) **Planting of Grass Seedlings:** The planting of 5000 grass seedlings per hectare will be done at a one-metre distance along the V-shaped furrows. In addition to 5000 grass seedlings, sowing of legumes in between two V-shape furrows and planting of 278 fodder tree species per hectare at 6m X 6m distance are prescribed. The seedlings shall be transported to the plantation site in the first week of July. While doing planting, dip the seedlings in a mixture of 100 litre of water mixed with 500 gm Turmeric powder (Haldi powder), 250 gm Asafoetida (Hing) and 250 gm Camphor (Kapur). This mixture acts as an anti-fungal agent and also holds soil moisture. After planting of grass and fodder seedlings, the seeds of the legume will be sown once the monsoon spreads in the area. The Grass and fodder plantation model is provided in Appendix II.16.
- 4) **Application of Fertilizers:** To assist the grass seedlings to establish, two weedings and one soil mulching are proposed as grasses are very difficult to establish in a new environment. After first weeding, the application of chemical fertilizers (50kg each Nitrogen and Phosphorus per hectare) is necessary.
- 5) **Benefits of the introduction of legumes in the pasture:** Legumes are an important component of plant diversity that modulates nitrogen (N) cycling in many terrestrial ecosystems. Legume species were more and more commonly introduced to degraded grassland for human-aided restoration because of the following reason:

- a. Legumes have the ability to fix atmospheric nitrogen in their root nodules, thereby enhances the nitrogen fertility in the soil.
- b. Legumes are generally high in crude protein and help in providing protein nutrition to the animals.
- c. The total yield of grass-legume mixtures is usually increased over straight grass pastures.
- d. Legumes improve the soil tilth by creating deep root channels thereby improving the soil porosity and water-holding capacity of the soil.
- e. The legume-grasses combination will increase the biodiversity of the area as they support a wider population of insects, which in turn attracts more wildlife to the area.
- f. Because of the availability of grass-legume mix in the forest areas, the wild herbivores like Blackbuck, Chinkara, etc., gets sufficient forage. So, the chances of crop damage in agriculture fields will be automatically controlled.
- g. The seed rate per hectare of legumes is given below:

Sl. No.	Name of legume species	Seed Rate (Kg/ha)
1	<i>Arachis glabrata</i> (Chara Bhuimug)	20.00
2	<i>Clitoria ternatea</i> (Gokarna)	1.50 to 2.00
3	<i>Dolichus biflorus</i> (Horse gram/Kulith)	40.00
4	<i>Macroptelium atropurpureum</i> (Seratro)	2.00
5	<i>Desmanthus virgatus</i> (Dashrath Grass)	20.00

5.6.13 ASSOCIATED REGULATIONS AND MEASURES

- 1) **Establishment of Grass and wild legume nursery:** In each Range, a part of the existing nursery area shall be demarcated for maintaining mother beds for grass and legumes species of fodder importance. The seeds from a known source shall be used for the cultivation of both grasses and legumes. After the development of mother beds, the seeds will be used for raising of grass seedlings in the nursery. The legume seeds will be used for seed sowing in pastures. While using grass seeds for sowing, an equivalent quantity of sawdust should be used for easy handling as the grass seeds are very small in size. Grass seed collection should be done in October-November. The grass nursery period will be from February to June. The nursery model estimate for raising polypot grass seedlings is provided in Appendix II.10(f).

- 2) **Seeding of grasses:** To allow seeding of fodder grasses, the coupe shall be closed to the cutting of grass from 1st June to 30th November, after which the grass will be allowed to be removed by cutting. Data on such removals should be maintained with the department and JFMCs.
- 3) **Fire Protection:** The areas shall be secured from the fire through firelines all around the grasslands and with the active involvement of local people.
- 4) **Inspections:** The area closed to grazing shall be inspected frequently by all field officers from the Beat Guard to Deputy Conservator of Forests, West Nashik division to see the closure is adequately enforced.
- 5) **Water management:** The development of perennial water sources present in the area needs to remain given priority. In addition, if the natural water sources are not adequate, then artificial water holes shall be created in the grasslands. The waterholes with borewell fitted to handpumps/solar pumps shall be taken up in grasslands.
- 6) **Sources of quality grass seeds:**
 - a. Indian Grassland and Fodder Research Institute (IGFRI), Jhansi and Dharwad (for Sheda, Dongri, Marvel, Guinea and Signal grass).
 - b. Central Arid Zone Research Institute (CAZRI), Jodhpur (for Kala Dhaman and Anjan)
 - c. Forest Research Station, Jalna and Jalgaon (for Sheda and Dongri).
 - d. Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri

CHAPTER-6

BAMBOO (OVERLAPPING) WORKING CIRCLE

6.1 NAME OF WORKING CIRCLE

Bamboo remains a renewable and versatile natural resource, characterized by high strength and low weight. Bamboo is the world's fastest-growing woody plant. It is universally recognized as one of the most important non-timber forest resources due to the notable socio-economic benefits of bamboo-based products. This Chapter covers the Bamboo (Overlapping) working circle, where the prime objective represents the qualitative and quantitative improvement of the bamboo crop in the forests of the West Nashik division. It is an overlapping working circle where the bamboo prescriptions are followed in parallel with other prescriptions given in previous chapters. The area of this Working Circle has been clearly marked on the GIS-based map of 1:50000. A copy of the same is produced on a lesser scale in the A4 size following page.

6.2 GENERAL CONSTITUTION OF THE WORKING CIRCLE

Bamboo is characterized by woody, mostly hollow culms with internodes and branches at the nodes of the culm. They are part of the grass subfamily called Bambusoideae, which is in the Poaceae family. Its socio-economic importance for the rural population is increasingly being realized and has occupied a significant role in the lives of forest dependent communities. The yield of raw material from bamboo can be harvested faster than from trees. The depletion of this resource, due to population pressure, has renewed interest in this group of plants. This is an Overlapping Working Circle consisting of those forests, which bear an excellent crop of bamboo and the potential area for the growth of the bamboo crops. These areas lie primarily in the Barhe and Peint Ranges of the division. Besides, bamboo areas in Nashik, Sinnar and Igatpuri Ranges have additionally been included under this working circle. The combined area included in this working circle is 9031.00 ha.

6.3 GENERAL CHARACTERISTICS OF THE VEGETATION

Two types of bamboo are observed in this tract, *Dendrocalamus strictus*, locally known as Manvel is found in major portion and *Bamboosa arundinacea*, locally known as Kashti is found in fairly lesser quantity, particularly in the Barhe and Peint forests. Natural bamboos and bamboos raised from aerial

seeding are found in the Igatpuri Range. In Nashik, there is a natural crop of bamboo in Velunja and Varasvahir areas. Bamboo species having spines and the tendency of bushy growth is found near Trimbak in localized patches. The gregarious flowering took place in bamboo areas of the Barhe, Peint, and Harsul from the year 1959 to 1964. The condition of the crop is not good except in a few patches. The crop has been unjustly managed by the local villagers. The non-working of clumps equally contributed to the deterioration of the crop. It requires specific silvicultural treatments. As of today, except in a few compartments, the density of bamboo crops is very sparse.

Table 6.1: Range-wise area allocation to Bamboo (Overlapping) Working Circle

Sl. No.	Range	Area (Ha)
1	Nashik	3144.479
2	Barhe	1989.569
3	Igatpuri	2001.819
4	Peint	1177.012
5	Sinnar	718.116
	Total	9036.995

6.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS

Details of the compartment allotted to this working circle have been given in Appendix II-7.

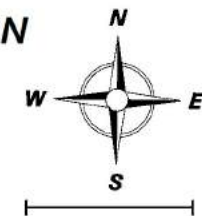
6.5 BLOCKS, COMPARTMENTS AND JFM AREAS

The compartments allotted to this working circle are given in Appendix II-7. The area of this Working Circle has been divided into 5 felling series and each felling series further divided into three coupes. The details of the felling series, coupes and sequence of working are given in Appendix II-7.

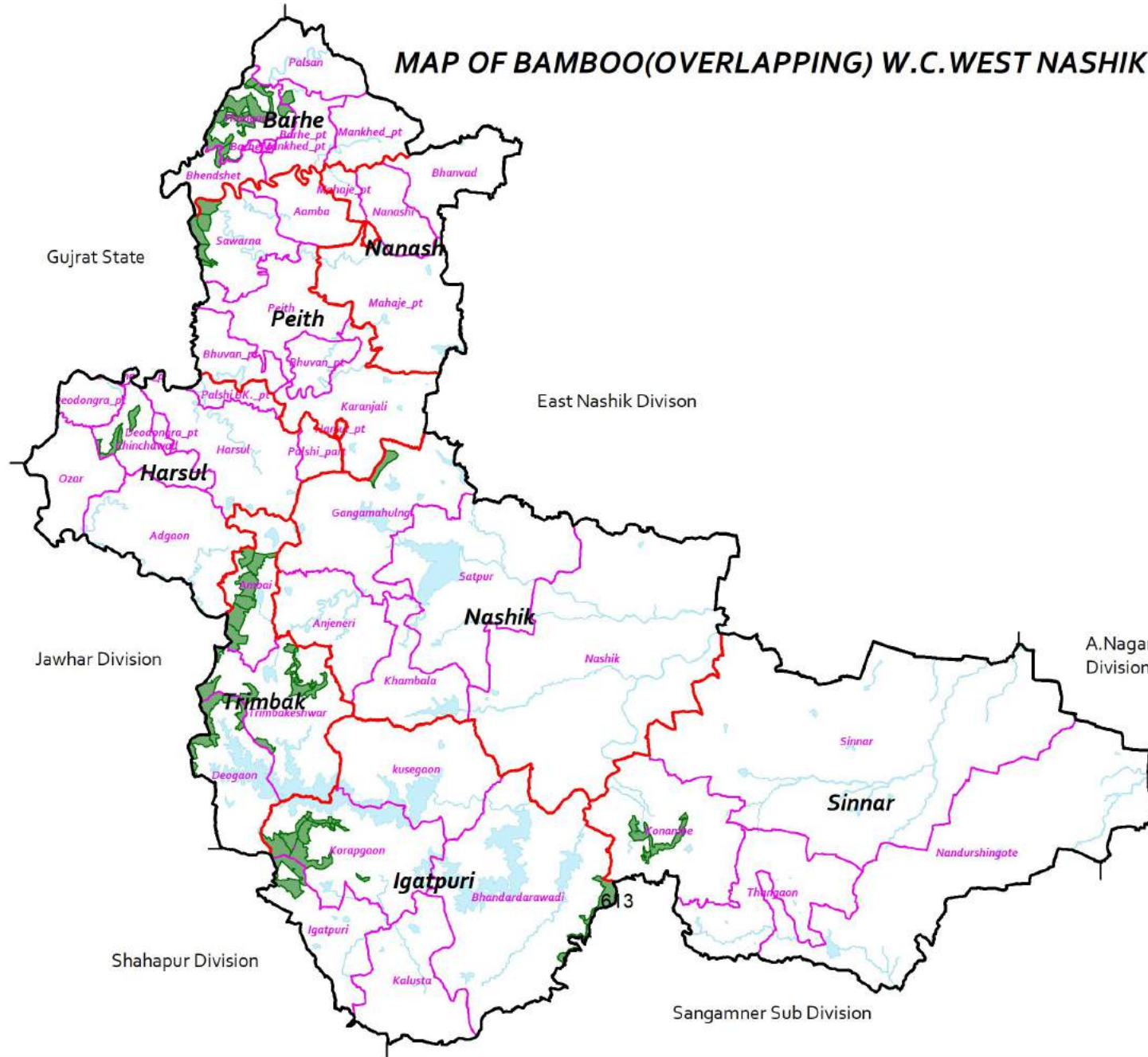
6.6 SPECIAL OBJECTIVES OF MANAGEMENT

- 1) To improve the bamboo crop by application of suitable silvicultural treatments to obtain sustained yield.
- 2) To fulfill the local demands for bamboo to the possible extent.
- 3) To promote bamboo cultivation and its utility as a source of livelihood amongst the communities.

MAP OF BAMBOO(OVERLAPPING) W.C.WEST NASHIK DIVISION



1:500000



LEGEND

- Division_Boundary
- Range_Boundary
- Round_Boundary
- Bamboo overlapping W.C.
- DRAINS

6.6.1 ANALYSIS OF THE CROP

Bamboo represents a sustainable and renewable resource because it continuously spreads vegetatively. This allows the formation of forests much faster compared to most other tree species. Unlike other types of commercial forestry crops where trees must be clear felled and replanted, in bamboo plantations only mature stems are harvested while younger stems are allowed to grow. Development of bamboo can help fight deforestation, illegal logging and forest degradation. But the gap between demand and supply of bamboo is increasing daily due to the destruction of natural bamboo resources. Therefore, there is a pressing need to find suitable method for large-scale propagation of bamboo. Aggressive approach need to undertaken for increase of Bamboo plantations to reclaim the degraded forest areas of this tract as they provide revenue to local communities. Bamboos can be propagated either by using seed or vegetative method (using rhizomes, culms, etc). The propagation of bamboo using seed is seldom used because of the rare and irregular flowering of most bamboos. Also, bamboo seeds are short-lived and difficult to store without sophisticated storage facility. There are two advantages of vegetative propagation of bamboo; this method reproduces the mother plant identically (clones) and the refined techniques of vegetative propagation like tissue culture and macro-propagation are cost-effective and very efficient. Hence, vegetative propagation of bamboo is best way for taking up successful plantations.

6.6.2 SILVICULTURAL SYSTEM: Selection felling of matured culms from the available Clumps in due coupes is prescribed.

6.6.3 ROTATION PERIOD: Rotation of 3 years is fixed.

6.6.4 HARVESTABLE DIAMETERS: Not Applicable

6.6.5 REDUCING FACTORS AND REDUCED AREAS: Not Applicable

6.6.6 FELLING CYCLE: The harvesting of bamboo will be done in a cutting cycle of three years. Each cutting series is divided into three coupes viz., A, B and C. One of the coupes from each felling series will be worked annually. The sequence of working is provided in Appendix II-7.

6.6.7 DIVISION INTO PERIODS AND ALLOTMENT OF PERIODIC BLOCKS: Not applicable

6.6.8 CALCULATION OF THE YIELD: Yield regulation is undescribed.

The silvicultural operations will be regulated by area.

6.6.9 TABLE OF FELLING: The details of annual coupe are given in Appendix II.7.

6.6.10 METHOD OF EXECUTING THE FELLING

The crop will be managed on a clump basis i.e., each clump will be treated independently as per the requirement. The clumps shall be worked as per the standard silvicultural rules for the harvesting of Bamboo. The felling rules are explained below:

- 1) The harvesting of bamboo will be done on a cutting cycle of 3 years. Each cutting series will be divided into three annual coupes *viz.*, A, B and C. One of the coupes from each of the cutting series will be worked annually.
- 2) No harvesting works shall be permitted between 15th June and 30th September. During this period, the sprouting of new bamboo culms takes place and they need to be protected from harvesting.
- 3) No clump shall be considered fit for harvesting unless it contains more than 12 mature culms (One year as well as more than one-year-old culms among them). There must have at least a few culms of two years old.
- 4) No culms below the age of two years shall be cut/harvested.
- 5) Following culms shall be removed from all clumps:
 - a. All dead, decayed and dry bamboo
 - b. Culms whose half or more of the top part is broken or damaged
 - c. Twisted or malformed culms
- 6) In a mature clump, the following types of culms (Green and live) shall be retained:
 - a. All culms below the age of two years
 - b. From the culms of more than one year old, culms equal in number to the current season's (i.e. less than one-year-old) culms or 12 whichever is more are retained and the remaining culms of age more than two years will be considered available for harvesting
- 7) The cutting height of culms will be between 15 to 45 cm above ground level i.e., above the first internode above the ground. The cutting shall be slant with a pointed instrument.
- 8) In case of any flowering, no culm from the flowered clump shall be cut/felled in the year of flowering.

- 9) Harvesting of bamboo shall be done in a manner so as to ensure the retained culms are evenly spaced and that some mature culms i.e., more than two years old are retained at the periphery for the purpose of support to the new culms.
- 10) Following acts will be strictly prohibited:
 - a. Digging of rhizomes
 - b. Lopping of bamboo culms for fodder
 - c. Use of tender bamboo culms for bundling
- 11) Climbers interfering with the growth of bamboo clumps shall be removed.
- 12) After cutting, the debris will be stacked at a distance not less than 2 metre away from the outer periphery of each clump. Cutting shall be supervised by a forest officer, not below the rank of the Range Forest officer (RFO) under the guidance of concerned Assistant Conservator of Forest (ACF) fully conversant with the rules of bamboo cutting.

6.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

- a) **Bamboo nursery:** The Deputy Conservator of Forests, West Nashik shall prepare a systematic long-term plan for continuous development of Bamboo rhizomes of Manvel (*Dendrocalamus strictus*) and Manga (*Dendrocalamus stocksii*) species from known source for sustainable development of Bamboo in this area. For this, the Bamboo beds shall be developed in all forest nurseries in West Nashik division, so as to get minimum of 50000 to 60000 bamboo rhizomes annually. The model estimate for developing Bamboo beds is provided in Appendix II.10.
- b) **Demarcation:** The coupes due for the working will be demarcated in April/May (before the onset of the monsoon) in the required year by erecting poles at suitable intervals. Poles should bear the compartment number, coupe number, and name of the felling series.
- c) **Treatment:** After the demarcation, the entire coupe due for the working will be thoroughly inspected by the Range Forest Officer and; treatment map shall be prepared by him and the sample will be laid on the ground. The Assistant Conservator of Forests will examine the whole area and sample plots before approving the treatment map. Through sampling, enumeration of bamboo will be done in a coupe and accordingly estimate will be prepared. The treatment map will clearly show the established clumps and any blank or suitable compact blocks for bamboo planting.

- d) **Soil and moisture conservation works:** To enhance the bamboo growth, half-circle contour trenches shall be dug on the upper part of the clump and the dug-out soil shall be spread over the bamboo clump. The trenches help in moisture conservation and the soil working will act as mulching. The soil mulching of bamboo clumps shall be carried out immediately after the bamboo harvesting to enhance the growth of new bamboo shoots. The site-specific estimates shall be prepared for these works.

6.6.12 REGENERATION

The annual coupe where the stocking of natural Bamboo is poor shall be identified for the artificial regeneration of Bamboo. The bamboo species like Manvel (*Dendrocalamus strictus*) and Manga (*Dendrocalamus stocksii*), etc., will be planted during artificial regeneration. The bamboo plantation models are given in Appendix II.15 shall be followed. If any changes need to be done in estimates as per site requirement, necessary approval needs to be taken from the Chief Conservator of Forests (T) Nashik. The bamboo seeds of known origin shall be used for the plantation. If seeds of known origin are unavailable, then Deputy Conservator of Forests, West Nashik division shall make arrangements for vegetatively propagated or tissue culture raised bamboo seedlings from the known origin. Accordingly, the necessary expenditure of vegetatively propagated or tissue culture shall be added to the estimate. In no case, the seeds of unknown origin shall be used for plantations.

The bamboo plantations should comprises of the minimum 30 per cent of the total plantations target of the Division. As this tract provides excellent conditions for Bamboo cultivation, by taking up its plantations continuously every year will help in increasing the forest area under Bamboo crop. The increase in Bamboo crop will definitely reduce the pressure on forests to a great extent.

6.6.13 ASSOCIATED REGULATIONS AND MEASURES

- a) Protection from fire and grazing is essential for the success of natural and artificial regeneration. All annual coupes will be provided strict fire protection and will remain closed to grazing.
- b) Soil and moisture conservation works shall be carried out as per prescriptions are given in Chapter-10 Forest Watershed Development depending on site requirements.

CHAPTER-7

NON TIMBER FOREST PRODUCE

7.1 NAME OF WORKING CIRCLE

Non-timber forest products (NTFPs) are any product other than timber and fuelwood that is produced in forests. Interest in NTFPs grew gradually during the 1980s, in response to calls for managing forests sustainably for the benefit of the society and particularly the rural population. NTFPs include plants managed for food, beverages, forage, fuel, medicine, fibres and biochemical; animals products like honey, lac and silk, etc. This Chapter covers Non timber forest produce, where the prime objective represents the qualitative and quantitative improvement of NTFPs in the forests of the West Nashik division. The prescriptions provided in this Chapter are applicable for the whole of the West Nashik division.

7.2 GENERAL CHARACTERISTICS OF WORKING CIRCLE

Based on the changes that are currently taking place, the future of NTFPs as raw materials from the natural forests appears bleak, which is not to say that NTFPs will overlook their importance in contributing to subsistence economies. Over-harvesting and an increase in opportunity cost in relation to NTFPs supply from the natural forest for many products become more and more unreliable. Increasing demand will result in diminishing resource supply and trigger the process of domestication. Ample opportunities exist for enhancing export earnings by developing appropriate facilities for processing, storing, packaging and marketing of NTFPs (Gupta, 1994). Many technologies are present and need only be adapted for local use to revive a widespread use of naturally occurring raw materials. Though the distribution of NTFP species likes Mahua, Tendu, etc., are not very good in this area when compare to Vidarbha region. Though, there is good amount of other NTFPs present in this area. The primary focus of this Chapter is to provide prescriptions for important NTFPs like Kadhipatha, Cashew, Wild mango, Hirda, Behada, etc., available in relatively good numbers and also general prescriptions for conservation of medicinal plants occurring in this tract.

7.3 GENERAL CHARACTERISTICS OF VEGETATION

Important NTFP species available in the West Nashik division are Kadhi patha, Kaju, Wild Mango, Khair, Kadujira, Nirgudi, etc.

1). Kadhi Patta (*Muraya koengi*): Kadhi Patta is available in Compartment 613 and 614 (Old Compartment 290). Earlier the Kadhi Patta was distributed in vaster area but due to uncontrolled and over harvesting, it is present only in above two Compartments. The details of sample study are given below:

Samle plot: 31.62m X 31.62m (0.10 Ha)					
Range	Beat	Compartment	Area (Ha)	Avg. No. of plants	Average height
Igatpuri	Adsare	613 and 614	708.510	335	20-160 cm

2). Wild mango (*Mangifera indica*): Wild mango trees are available in good number all over the division. The sample study was conducted in compartments that are having relatively good wild mango trees. The details of sample study are given below:

Sample plot: 31.62m X 31.62m (0.10 Ha)								
Range	Beat	Compt. & Area (Ha)	Girth class (cm)					Total
			30-45	45-60	60-75	75-90	Above 90	
Nashik	Ladchi	480 (308.269)	2	5	2	0	3	12
	Satpur	508 (152.107)	2	2	1	1	5	11
	Anjaneri	513 & 514 (445.896)	1	0	3	3	9	16
Igatpuri	Tringalwadi	666 & 667 (556.766)	0	1	2	4	19	26
Harsul	Shirasgaon	404 (251.075)	0	0	4	3	10	17
Nanashi	Nanashi (N)	284 to 286 (984.423)	0	0	1	1	33	35

3). Kadu Jira (*Vernonia anthelmintica*): Kadu Jira is confined to Peint and Hasul Ranges. Due to overexploitation, the crop is not developing properly. There is a lot of potential for augmentation of this species. As this species sells at the higher price, if the production is increased subsequently, it will be beneficial to the local communities.

4). Cashew (*Anacardium occidentale*): Cashew is available only in Compartment 669 (Old Compartment 324) of Igatpuri Range and Compartment 464 and 470 (Old Compartment 342) of Trimbak Range. The details of sample study are given below:

Sample plot: 31.62m X 31.62m (0.10 Ha)								
Range	Beat	Compt. No.	Area (Ha)	Girth class (cm)				
				30-45	45-60	60-75	75-90	Total
Igatpuri	Igatpuri	669	169.027	09	15	09	01	34
Trimbak	Deogaon	464	328.423	07	24	07	00	38
Trimbak	Take Deogaon	470	219.260					

7.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS: The prescriptions given in this chapter are applicable to whole of the West Nashik division.

7.5 BLOCKS, COMPARTMENTS AND JFM AREA: The prescriptions in this Chapter applicable to all compartments in the West Nashik division.

7.6 SPECIAL OBJECTIVES OF MANAGEMENT

- 1) To manage the marketable NTFPs on sustained basis in the division and to ensure reasonable returns to the local villagers especially the tribal communities.
- 2) To improve stocking of various NTFP species in the forest areas and enhance collection of various NTFPs by improved collection techniques.
- 3) To train the local communities on techniques of value addition and marketability of various NTFPs found in the division to get enhanced economic returns.
- 4) To generate employment and improve the economy of the local people and thereby improving their socio-economic conditions.

7.6.1 ANALYSIS OF THE CROP

7.6.1.1 Salient feature of NTFPs and its trade

- 1) There is a lack of actual production records for the majority of products and reliable data on the value of NTFPs used domestically in the West Nashik division.
- 2) Despite a continuing dependence of many rural people and industries on NTFPs, most products are overexploited. While the diminishing natural

resource in this tract is mainly due to forest encroachment and destructive NTFPs harvesting methods.

- 3) The absence of regulated and systematic markets for NTFPs leads to inefficiency in marketing and very low returns on labour to collectors.
- 4) Most NTFPs are characterized by limited quantities, seasonal availability, quality control problems and inelastic supply. This constrains the commercial development for many products and confines their sustainable use mainly to the subsistence sector where there is no incentive to harvest more of a product than can be utilized by a household or a community.
- 5) NTFP activities are in many situations perceived as a sponge, and their use is transitional, giving way to other enterprises and products as the economy improves (FAO, 1995a).
- 6) The NTFP sector has been described as a low wage trap in India, where alternative income generating opportunities are unavailable; products are collected and sold indeed when prices are lowered. Government-run marketing and co-operative schemes have also failed to get better prices for NTFP collectors.
- 7) Normally a group of medicinal herbs/shrubs/parts of trees are used in preparation of any medicine. Those groups include medicinal plants from across various regions like Western Ghats, Himalayas, Satpudas, etc. So, mostly the industries allow the raw materials in groups from particular agency rather than procuring from diverse areas due to cost effectiveness and time constraint. This opportunity is effectively utilized by the middle-man. An extremely complex chain of supply of raw materials is involved in Ayurvedic industries. There is a need for more extensive consultations among Forest Department, Ayurvedic industries and local people across the regions for producing an effective sustainable model.

7.6.1.2 Status of NTFP crop in West Nashik division: The distribution of NTFP species in different Working circles is given in Table 7.1:

- 1) Based on the estimation figures of NTFPs, it is evident that the distribution of NTFP tree species is good if not desired. Efforts need to be taken to increase the area under NTFPs wherever the concentration of those species is present.
- 2) The above estimation includes only tree species. Systematic efforts need to be taken at the Divisional level to collect the data of valuable shrubs and herbs of important NTFPs.

Table 7.1: Estimated percentage of NTFP tree species to total Growing stock in different Working circles

Sl. No.	Working Circle	NTFP species
1	Afforestation.W.C	26.31
2	Improvement W.C.	16.94
3	Kuran W.C.	6.87
4	Plantation W.C	16.38
5	Protection W.C	29.51
	Total	19.03

7.6.1.3 Institutional mechanism for NTFP management in Maharashtra

The salient features of status and management of NTFPs in Maharashtra are given below:

- 1) In Maharashtra, the Non-timber forest species were an integral part of forest management from the beginning. But during the course of implementation, a lot of dotted lines remained unaddressed except major NTFPs like tendu and Apta. The responsibility of the marketing of NTFPs except tendu and Apta was given to Tribal Development Corporation (TDC) in Maharashtra. Presently no formal marketing mechanism exists in Maharashtra after the TDC has become inactive for quite some time.
- 2) The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 confers the rights over NTFPs to the community right holders. Therefore, in areas where the CFRs (involving NTFPs) have been vested with the village community, in such areas, the process of NTFP collection, processing and sale have to be initiated by that community.
- 3) The Government of India passed the Provisions of the Panchayats (Extension to the Scheduled Areas) Act in 1996. The government of Maharashtra has published Maharashtra PESA Rules in 2014. As per the above legislations, Non Timber Forest Produce found on Government land in Scheduled Areas, ownership lies with Gram Sabha. The Gram Sabha is empowered to do collection, processing, sale and development of NTFPs in PESA areas.
- 4) Excluding the above-mentioned areas, the Deputy Conservator of Forests can combine NTFP units and put for auction. In CFR and PESA area also

the Deputy Conservator of Forests can coordinate the NTFP sale upon getting written request from the Gram Sabha.

- 5) Revenue and Forest Department, Government of Maharashtra, through Government Resolution dated 5th October 2011, confers the rights of NTFP collection, processing, and sale to the Joint Forest Management Committees (JFMC).
- 6) There are multiple players involved in collection and sale of NTFP, a mechanism has to be developed to regulate excess harvesting and for sustainable development of NTFPs.

7.6.1.4 The community's existing NTFP management system

The market of NTFP is extremely imperfect and unstructured. At present forest dwellers collect NTFPs and dispose of it to local traders who in turn sell it to the urban centres and finally reach consumers. Due to the lack of direct access to markets, they depend on intermediaries to dispose of their products, reducing their share of the income. Diverse types of information like price, value-addition options, and sustainable harvesting techniques are required by communities to increase their bargaining power and receive higher prices for their products.

7.6.1.5 Evaluation of existing system of NTFP management

The present status of intervention on NTFP management stops at taking new plantations of important NTFP species like Awla, Hirda, Behada, Sitaphal, Jamun, etc., under various afforestation programmes. There is no further concerted efforts in assessment, development of sustainable harvesting modules, skill development of communities, market linkages, etc., in this forest division.

7.6.2 SILVICULTURAL SYSTEM

NTFP collection is restricted to only few species in the West Nashik division. Therefore, holistic efforts are required for augmentation of NTFPs in forest area. The collection of NTFPs on sustainable basis without ruining the crop remains the fundamental principle of management. The JFMCs need to be activated for protection and sustainable harvesting of NTFPs. Demonstrative effect has to be shown in at least few villages, so that, the beneficial results will spread to other villages. Proper grading, value addition and exploring new markets for the traditional NTFPs (like gum), shall be included under the JFM

programme of the Division. The possibility of involvement of good NGOs in such an endeavour should be explored.

7.6.3 ROTATION PERIOD: Not applicable.

7.6.4 HARVESTABLE DIAMETRES: No harvestable diameter is prescribed.

7.6.5 REDUCING FACTORS AND REDUCED AREAS: Not applicable

7.6.6 FELLING CYCLE: The sustainable collection of NTFPs will be done annually as per the Monitoring Plan prepared for all JFMCs at the division level. The procedure for preparation of monitoring plan is given in para 7.6.10 of this chapter.

7.6.7 DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCKS: Not applicable

7.6.8 CALCULATION OF THE YIELD: Because of lack of availability of data of the past yield, the future yield forecast is undone.

7.6.9 TABLE OF FELLING: The compartment remains the unit of collection of all NTFPs and it will be done annually.

7.6.10 METHOD OF EXECUTING THE FELLING

The following steps shall be followed to develop Management and monitoring system for sustainable development of NTFPs in each JFMC:

- a) Demarcation of the NTFP resource base shall be carried-out based on ecosystem type and as far as possible through natural boundaries or village boundaries. These boundaries shall be communicated to the Working Plan division to prepare digitised maps of this resource base.
- b) Conduct the sample field inventory to assess the growing stock and condition of target products and the ecosystem. Then assess the supply volume based on the current harvesting and trade/use.
- c) Identify the current or potential threats to the resource base. Conduct group meetings and inquire where and how the products have been collected in the last three years.
- d) Arrange a workshop at each Range with all stakeholders to prepare a microplan for each Range regarding collection, processing and marketing

of NTFPs. Also, conduct sample interviews with collectors to learn their perceptions of the product availability and quality changes.

- e) Keep community members involved in all data collection and study steps. Use the results of the above steps to design and implement biological monitoring.
- f) The monitoring plan should indicate the area being monitored, target species, ecosystem changes and human activity impacting the species and ecosystem. Sampling areas, growth and yield studies become integral parts of the monitoring plan.
- g) Determine a preliminary estimate of a sustainable harvest regime. Monitor this harvest rate and make adjustments (as necessary) in the biological monitoring plan.
- h) Once the preceding work is over, the Sustainable harvesting of all NTFPs shall be monitored as per the monitoring plan by the concerned Joint Forest Management committees (JFMC).

7.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

1) Fire Protection Measures:

- a. Collection of NTFPs is frequently associated with forest fires, because the villagers set fire around the NTFP yielding trees for clearance of leaf litter and undergrowth. If it is left unattended, such fires spread into forests resulting in damage to huge tract of forests.
- b. The Village Panchayats and JFMCs shall be involved in awareness creation programme to help control forest fires.
- c. In case of forest fire, legal action should be taken against the defaulters. Strict vigilance is necessary during the months of February to May to limit the spread of fires especially during Mahua flowering season.

2) Training Programme for NTFP Collection: To reduce the destructive harvesting techniques, training programmes and workshops for proper NTFPs collection, value addition and marketing shall be organised every year in each Range to ensure their sustainable harvest and use.

3) Documentation of NTFP Collection: As the collection of NTFPs is unorganised in this area, the local Forest Guard with the help of JFMCs needs to take interest in collection of data about the NTFPs at local level. To capture such information with uniformity, suitable printed registers be supplied to all JFMCs from the division office.

- 4) **Survey of weekly markets:** For developing the database on NTFPs, it is prescribed that weekly markets will be surveyed extensively to find out the types of NTFPs coming from forest areas, their extent, purpose of utilisation, the rate, and the chain of marketing and final destination. JFMCs being primary stakeholders should be involved in this valuable exercise. A suitable printed register be supplied to all the JFMCs by the division so as to collect this information. It is prescribed that the previous information should be utilized to formulate correct prescriptions at the time of next revision.

7.6.12 REGENERATION

The treatments prescribed for some important NTFPs are given below. In order to implement the prescriptions, necessary site specific estimates need to be prepared by taking up work study. It will be implemented after getting approval of the Chief Conservator of Forests (T), Nashik.

7.6.12.1 Kadhi patta (*Murraya koengii*): It is a small size plant and forms bush. Its leaves are consumed for culinary purpose. It is in good demand in the local as well as in Mumbai markets. It is chiefly confined in Igatpuri Range. However, in a lesser scale (non-commercial scale), it is seen in other Ranges as well. It propagates well through root suckers and, therefore, it is easy to improve this crop. To augment the population of this species, regeneration through root sucker method should be used. In this method root around the particular plant is damaged by light ploughing or by making the shallow ring around the plant. From the damaged root, new flushes of the coppice come out. Most promising of them shall be retained and others removed. Following prescriptions are given for augmenting the production of this species:

- 1) In flat area where the chances of soil erosion are practically nil, light ploughing and seed sowing of this species will yield good results. After germination the spacing of 1.5 to 2.0 metres shall be maintained between the seedlings and all other seedlings will be removed. One weeding and one soil working for the selected seedlings are required to be carried out.
- 2) In the natural crop, other inferior species occurring in between will be removed and the gap will be filled by root sucker method.
- 3) To allow more branches and more leaves, pruning shall be done judiciously.

- 4) Plucking tender leaves and twigs are to be discouraged. This will increase the production and productivity.
- 5) The areas of its occurrence need to be demarcated and shown on GIS maps of Division and Range. These areas need to be assigned to JFMCs for its management.

7.6.12.2 Chilhar: Seed sowing on suitable areas in various working circles and also on bunds of TCM and CCTs need to be carried out during coupe working.

7.6.12.3 Bael patra: Bael (*Aegle marmelos*) is a medium sized tree. Nashik remain a place of pilgrimage and Bael patra is one of the most important ingredients for worshipping particularly of Lord Shiva. Its concentration in Sinnar Range is good. Following prescriptions are suggested for increasing the production of this species:

- 1) It possesses both religious and medicinal value. This should be taken as one of the species in all plantations under different afforestation schemes particularly in Sinnar, Nashik, Trimbak and Igatpuri Ranges.
- 2) The polypot raised seedling from known seed source shall be used for its artificial plantations. To increase the foliage and fruit bearing capacity, it is essential that its crown should get ample sunlight. Therefore, wherever possible selective pruning of branches interfering in allowing sunlight can be carried out.

7.6.12.4 Kadu Jira: Kadu Jira (*Vernonia anthelmintica*) is confined merely in Peint and Harsul Ranges and this is annual crop. Following is the prescriptions for its management:

- 1) Suitable areas need to be identified and fenced.
- 2) The seed broadcasting in small scattered patches need to be done after identification of suitable sites.
- 3) The natural pockets of this species in the annual coupe should be made free from weeds as far as possible. This will increase the production and productivity.

7.6.12.5 Mahua (*Madhuca longifolia*)

- 1) Mahua Collection: There is good number of Mahua trees in the forest crop. For better protection of Mahua trees and to increase its stock, Mahua trees are numbered and these trees be allotted to members of

JFM committee. The members of committees who have been assigned with the job of protection and nurture of Mahua trees, they should preserve them from fire. This exercise would inculcate sense of ownership and responsibility in preserving the resource. This also indirectly aids in controlling forest fires. Range Forest Officer shall take lead in promoting such practices and also monitor its implementation. Documentation of such steps is necessary to promote the achievements of JFMCs.

- 2) Mahua Regeneration: It is prescribed to provide soil working along with other planted seedlings during coupe operations of area-specific working circles. Mahua shall be one of the species in all new mixed plantations. The Mahua seedlings of 12-15 months old should only be planted in the mixed plantation schemes.

7.6.12.6 Management of Gums: Gum is an important NTFP and is exuded by plants, as normal phenomena and also as a result of disease or injury to the bark. Wood Gum is a substance of more or less sticky nature. The dominant gum producing tree species found in this area are Kahandol (*Sterculia urens*), Dhawada (*Anogeissus latifolia*) and Salai (*Boswellia serrata*). These gums are used in medicines, chemicals, cosmetics, food industries and incense.

- 1) The Gum Producing trees are to be enumerated compartment-wise and the compartments should be mapped based on the density of each species.
- 2) These areas need to be assigned to JFMCs.
- 3) Based on the population numbers of each species and its production potential, the compartments to be divided into three groups. Each group shall be taken for gum tapping annually after a rest for two years.
- 4) The gum tapping training need to be given to JFMC members.
- 5) The harvestable quantity of each species needs to be fixed on per tree basis, and it should be strictly monitored.
- 6) These Gum producing species need to be incorporated in plantation schemes as per site requirement.
- 7) The gum tapping technique developed by the Forest Research Institute (FRI), Dehradun is provided in Appendix II.38.

7.6.12.7 Management of Hirda, Behada and Awla: The Behada (*Terminalia bellirica*) is frequently found in Peint, Harsul and Barhe Ranges. While the Awla (*Phyllanthus emblica*) are hardly found in natural crop. Hirda

(*Terminalia chebula*) is confined merely in Igatpuri range. Fruits of Hirda, Behada and Awla comprise marketable items. Current level of collection is quite erratic and, therefore, poor indicator of their potential in the tract. Following prescriptions are provided for improvement of these species:

- 1) Awla and Behada should be chosen as one of the species in all plantation schemes in the division.
- 2) Hirda shall be one of the species selected in all plantation schemes in Igatpuri range.
- 3) Required tending is prescribed where natural saplings of Behada, Awla and Hirda are found in coupes to alleviate congestion. Soil working and mulching are prescribed along with planted seedlings and to be done during coupe operations of various areas in the working circles.

7.6.12.8 Kartoli (*Momordica dioica*): *Momordica dioica*, commonly known as spiny gourd and also known as karnoli in Marathi. It is a species of flowering plant and the fruit is used as a vegetable in all regions of India. It has commercial importance and is exported and used locally. The seed sowing of this species shall be undertaken along the TCM, CCTs, and also in selected patches inside the forests.

7.6.13 ASSOCIATED REGULATIONS AND MEASURES

- a) Awareness creation: Every year at least one workshop shall be organized on NTFPs related issues to create awareness about the importance of NTFPs and its sustainable harvesting in each Range for both staff as well as JFMC members.
- b) Training: Depending on the availability of NTFPs in the area, the Deputy Conservator of Forests, West Nashik division shall prioritise the Range-wise training programme for both staff and JFMC members regarding collection, processing and marketing of NTFPs.
- c) Van-Dhan outlets: At least one Van-Dhan shop at Nashik shall be started which will market the locally produced NTFP products. This will provide the forward linkages to the NTFP processing.

CHAPTER-8

JOINT FOREST MANAGEMENT

8.1 NAME OF WORKING CIRCLE

Joint Forest Management (JFM) represents a concept under which Forest Department and village committee jointly preserve and manage the forests. The JFM has become the keyword in the present management of forestry sector. People's participation in overall protection of the forest has become sine qua non. JFM has been recognized as an essential tool and strategy for ensuring sustainable development of forest ecosystem. This Chapter provides prescriptions for the whole of West Nashik Forest division regarding JFM activities. Villages that are adjoining to the forest areas remain the focal areas for practicing Joint Forest Management.

8.2 GENERAL CONSTITUTION OF WORKING CIRCLE

The National Forest Policy of 1988 made it possible for India's forests to be managed by the Government and the people together. In pursuance to the National Forest Policy, the Ministry of Environment and Forests (MoEF), GOI advised the State Governments to adopt the Joint Forest Management (JFM) approach for the protection and rehabilitation of degraded forests. The Government of Maharashtra vide Government Resolution dated 16/03/1992 adopted the JFM approach for degraded forest areas. Thereafter, the scope of JFM was extended to good quality forests also through the Government Resolution dated 25/04/2003. Later, on 5/10/2011, the JFMCs were provided legal backing by transferring them under the umbrella of the Mumbai Gram Panchayat Act 1959. In the same way, to more significantly encourage the institution of JFM, particular schemes have been introduced to reduce the biotic pressure on forest and improve the success of plantations like Distribution of LPG/Biogas, Distribution of improved cattle in lieu of scrub cattle, Protection of plantations, etc., (Revenue and Forest department, GR dated 10/12/2012). To promote the holistic development of JFM villages, the Government of Maharashtra had placed more emphasis on the convergence of JFM with other Government schemes under various departments through the Government Resolution dated 22/12/2011.

8.3 GENERAL CHARACTERISTICS OF VEGETATION

West Nashik Division has embraced the Joint Forest Management as one of the tools of forest management from 1992. Ever since, the peoples/community's participation becomes an integral part of conservation and management of forest and wildlife resources. The numbers of JFMCs formed are 394 and these Committees cover an area of 116,935.31 hectare having 59,530 members.

Table 8.1: The details of Joint Forest Management Committees

Year	Name of Range								Total
	Nasik	Sinnar	Igatpuri	Harsul	Peint	Barhe	Nanashi	Trimbak	
2000	-	02	-	-	-	-	-	-	02
2001	-	15	01	-	-	-	02	-	18
2002	-	15	-	-	-	-	01	04	20
2003	-	04	-	-	01	-	-	03	08
2004	01	02	-	-	02	-	-	-	05
2005	01	-	01	-	02	-	-	-	04
2006	23	01	35	22	46	19	18	07	171
2007	01	01	-	02	02	08	-	10	24
2008	03	01	20	04	08	19	02	02	59
2009	-	-	-	01	-	-	-	-	01
2010	-	-	-	-	-	-	-	-	-
2011	02	-	-	01	-	-	-	01	04
2012	05	05	05	05	11	03	05	05	44
2013	01	03	02	06	01	02	01	01	17
2014	-	03	02	03	03	01	03	02	17
Total	37	52	66	44	76	52	32	35	394

The present on-going approach to the Joint Forest Management concept needs to be modified to make it an essential strategy for sustainable rural development. The entire system needs to be revamped and institutionalized in such a way that local villagers develop a sense of “belongingness” to the existing forest and other natural resources. Comprehensive management of natural resources should be directed towards improving the living standards of the general masses in forest fringe villages, which would ultimately lead to sustainable forest development through community development.

8.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS

The areas that will be assigned to JFMC shall be the part of existing Working circles as given in earlier chapters of this Working plan. The activities under JFM programme shall be implemented as per approved Microplan. But the broader guidelines provided in the respective working circles shall be included while preparation of the Microplan.

8.5 BLOCKS, COMPARTMENTS AND JFM AREAS

The areas that will be assigned to JFMC shall be the part of existing Working circles as given in earlier chapters of this Working plan. The activities under JFM programme shall be implemented as per approved Microplan, where the broader guidelines provided in the respective working circles shall be included.

8.6 SPECIAL OBJECTIVES OF MANAGEMENT

- 1) To develop the degraded forest resources by promoting natural and artificial regeneration along with site specific soil and moisture conservation works with the active participation of the villagers.
- 2) To strengthen and empower local institutions for protection and conservation of forest and wildlife resources.
- 3) To explore and evolve strategies to generate sustainable employment to local people.

8.6.1 ANALYSIS OF THE CROP

JFM represents a concept under which the Forest Department and the village committee jointly preserve and manage the forests. The starting point of JFM has to be the realization of the need for JFM both by the Forest Department and the local people. Generally, the scarcity of forest products like fuelwood, fodder, etc., as a result of degradation of forest on which the local communities depended, forces the people to consider steps for the protection and improvement of degraded forests. On the part of the Forest Department, the challenge of effectively preserve forests with limited resources is enormous. The JFM program succeeds where the initiative comes from the people's side and it usually fails where it is forced from the Forest Department side as it would merely represent a Government driven target-oriented program.

The experience of implementation of JFM in Maharashtra state reveals the whole concept still remains to be percolated to the ground except in isolated villages. The essence of the program is the empowerment at the grass-

root level. Entry point activities have been unable to stimulate the local villagers to participate fully in the developmental activities. In many areas, people have been encountered to demonstrate withdrawal systems once entry point activities have been completed and the periodic input intervention by the Department is either withdrawn or made irregular. They need to be given input at the periodic intervals in the form of employment generation schemes, plans, etc., by the Forest Department. Such psychological and financial bathers have inhibited the sustainability of the entire JFM program. Because of the absence of the productive functional relationship between the JFM bodies and Panchayats in the wake of increased decentralization of power to the Panchayat Raj institutions through the 73rd Constitutional amendments, many problems are coming to the fore. Poor marketing linkage of the Joint Forest Management Committee with regard to NTFPs sale has adversely affected the sustainability of the entire program. The concept of voluntary labour (Shramdan) is believed to be missing in many villages. The problem of landless labourers/villagers is being unfocussed considering their overall involvement in the entire development process. Monitoring and evaluation mechanism has been ineffective in many ways to obtain constant feedback necessary for remedial measures.

8.6.2 SILVICULTURAL SYSTEM

In this section, the broader guidelines for JFM implementation are provided. Based on the previous experiences in Maharashtra, the following model is being suggested for the implementation of the JFM program in the West Nashik forest division. Such a holistic approach would pave the way for sustainable forest management through people's participation.

- 1) Utmost care needs to be taken for the identification of suitable villages. As a matter of fact, all such villages where people's response to developmental schemes/plans with reference to forest and environment is quite forthcoming and positive, where expectation level of the villagers is not high and people are prepared to take up voluntary labour (Shramdan) whenever required, should be identified.
- 2) A "Village Bank" consisting of all such willing villages should be created and updated regularly. This Bank will act as a "feeder channel" for the selection of villages where JFM supposed to be implemented. Constant meetings/discussions with the villagers would help to identify and prioritize such villages for JFM. In this way, the entire program would be need-based with clear-cut departure from the target-oriented approach.

- 3) A time-bound and focussed program for sensitization/orientation of the field officials should be taken up. This should be continuing activity at least during the initial phase.
- 4) One of the key points which are a definite departure from the present pattern is that no commitment of any sort should be given to the villagers for usufruct sharing.
- 5) A system of reward or an incentive should be introduced in all JFM villages based on the performance of the JFM committee during the first two to three years. Quantum of reward/incentive should commensurate with the response level of the villagers.
- 6) Preparation of the “micro-plan” on the basis of PRA exercise should be undertaken by the villagers and not by the forest officials. Forest Department should rather act as a facilitator in preparation of the plan and its implementation. The management options for such forests should possess a vision for accomplishing the global, national and regional goals.
- 7) The focus of JFM would be on sustainable management of Non-Timber Forest Products (NTFP) including bamboo and this will, in addition, constitute the primary source of earning for the beneficiaries. One of the significant responsibilities of the forest department should be to develop harvesting and marketing linkages with the consumer industries. This will also ensure local storage and improvement in processing.
- 8) One crucially critical dimension of JFM program is that a suitable mechanism needs to be developed for monitoring and evaluation of the JFM program at frequent intervals. This periodic monitoring and feedback mechanism would pave way for corrective/remedial measures in between which are very much required for sustainable forest management. The parameters selected should be quite simple so that even local villagers can go on implementing and assessing their impact from time to time.

8.6.3 ROTATION PERIOD: The activities under JFM programme shall be implemented as per approved Microplan.

8.6.4 HARVESTABLE DIAMETRES: Not applicable

8.6.5 REDUCING FACTORS AND REDUCED AREAS: Not applicable

8.6.6 FELLING CYCLE: The activities under JFM programme shall be implemented as per approved Microplan.

8.6.7 DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCKS: Not applicable

8.6.8 CALCULATION OF THE YIELD: Not applicable

8.6.9 TABLE OF FELLING: Not applicable.

8.6.10 METHOD OF EXECUTING THE FELLING

Under this section, the implementation guidelines about JFM are provided:

- 1) **Village Bank:** A “Village Bank” consisting of willing villages should be created and updated regularly for the West Nashik forest division. This Bank will act as a “feeder channel” for the selection of villages where JFM supposed to be implemented. Each year, one village from each Range shall be selected for the implementation of the JFM program. Once the selected village completely saturated as per microplan, after that only new village shall be selected in that Range.
- 2) **Microplan:** Preparation of the “micro-plan” on the basis of PRA exercise should be undertaken by the villagers and not by the forest officials. The Forest Department should give all necessary inputs for the preparation of scientific management plans to ensure sustainable management of the entire forest area belonging to the village. The management options for such forest should include the following points:
 - a. **Entry point activity:** The entry point activity shall wholly contain the distribution of plants to be grown in kitchen garden like *Moringa olifera* (Drumstick), *Mangifera indica* (Mango), *Emblica officinalis* (Awla), *Citrus limon* (Lemon), *Psidium guajava* (Guava), *Murraya koenigii* (Kadi patta), etc. The main objective of this intervention is to provide nutritional supplements to family members through these plants.
 - b. **Soil and moisture conservation works:** Soil and moisture conservation works shall be taken up as per the ‘Ridge to valley’ concept. The essential principle will be to conserve the entire rainwater within the village itself to enhance the groundwater table.
 - c. **Afforestation on forest lands:** The Afforestation activities on forest lands will include:

- i. Natural Regeneration: Natural Regeneration is prescribed to be given preference over plantations. The areas having promising NR patches shall be identified and marked for further development. The prescription for these areas is that Natural Regeneration should be supported with Aided Natural Regeneration.
 - ii. Artificial Regeneration: Plantations shall be taken in the open areas which have good soil depth and are well-drained. The choice of species is carefully selected as per site suitability. Good quality seedlings of 12 to 15 months old shall be used for plantations. Improved nursery practices shall be adopted to raise quality seedlings.
 - iii. Bamboo plantation: Bamboo comprises a versatile plant and yields returns within 3 to 4 years. Depending on site suitability, bamboo plantations need to be undertaken under JFM. The use of tissue culture bamboo seedlings shall be used while taking up new plantations. This will provide revenue for the sustenance of the JFM program in the village.
 - iv. Grass and fodder plantation: There is large scale grass and fodder requirement in this area due to flourishing Dairy development. Therefore, priority should be placed for raising grass and fodder trees in forest areas depending on site suitability.
- d. **Plantation on outside forest area**: This activity will be implemented through the Social Forestry division.
- i. Block plantation on village common land: The preference shall be indicated for raising combination of short and long rotation forestry species of NTFP values like Imli (*Tamarindus indica*), Jamun (*Syzygium cumini*), Kadi patta (*Murraya koenigii*), Mahua (*Madhuca logifolia*), Sitaphal (*Annona squamosa*) etc. So that these plantations will provide sustained revenue to the village panchayat.
 - ii. Roadside plantations: All roads within the village and other connecting roads shall be planted under the Roadside plantation program. The long rotation tree species like wild mango (*Mangifera indica*), Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Umber (*Ficus racemosa*), Neem (*Azadirachta indica*), etc., shall be planted along the roads.

- iii. Bamboo plantation on agriculture land: There are two schemes that are implemented by the Maharashtra Bamboo Development Board. They are Atal Bamboo Samruddhi Yojana (a state scheme) and Plantations under National Bamboo Mission (a CSS scheme). More beneficiaries from the JFM villages shall be included under these two schemes.
 - e. **Distribution of LPG**: LPG distribution will deliver direct benefits in reducing fuelwood pressure on forests. Hence, detailed planning need to be made to include all beneficiaries in the JFM village through the convergence of the Government of Maharashtra scheme with Ujwala yojana of GOI.
- 3) **Monitoring and evaluation**: Monitoring refers to the concurrent assessment of any JFM program which can be undertaken concurrently with the implementation of the program, to ensure that the program is on track as prepared. In contrast to monitoring, at the end of the program, its evaluation is done against its baseline situations at the conceptualization stage of the program. The JFM program will be monitored through certain indicators/benchmarks. The indicators of JFM monitoring are provided in Appendix II.32. The online monitoring of the JFM program using advanced technology needs to be developed. The use of this application helps in avoiding duplication of work as maximum information is required to be filled merely once and any updates can be made on an annual basis. This will not only help in reducing effort, time and stationary but also improve work efficiency and transparency.
- 4) **Conflict resolution**: In the process of sustainable management of forests and natural resources, one can't deny the role of local and dependent communities upon them for their livelihood. These communities have been managing these resources in their own traditional and indigenous ways. This day, the collaborative management of natural resources has increased the number of stakeholders in this sector, which is not limited to the foresters and the villagers, there are many others. This has increased the possibilities of conflicts. These conflicts can be divided into two major types; Human-Human Conflict and Human-Wildlife conflict. The JFMC level conflict can be resolved by the JFMC executive body. If the conflict happened between two forest committees or between two different panchayats and JFMCs then the concerned Range Forest Officer would be responsible for the resolution of the conflict. If the conflict is between the JFMCs of two varied ranges then the concerned Assistant Conservator of Forests should resolve the conflicts. The appeal, for all decisions mentioned, should be made to Deputy Conservator of Forests,

West Nashik forest division. In regulating the Human-Wildlife conflict, the empowerment of the community about the importance of wildlife and its conservation is necessary. The community needs to be exposed to precautions to be taken against wildlife attacks and necessary steps to be followed during the encountering of wildlife.

- 5) **Maintenance and corpus fund:** A majority of forest development activities in the State are undertaken with the support of externally or internally supported projects. After the completion of the Project, necessary arrangements for maintenance of assets created under the Project are unavailable. It is, therefore, necessary to establish a fund that can be used in the post-project period for the maintenance of project assets, and also help in the implementation of the statutory working plans including microplans.
- 6) **Self Help Groups (SHGs):** JFMC can decide for several income generation activities for alternative livelihood to particularly low-income groups of the community. They can form SHGs and the front line staff of the forest department can assist them to establish the groups.
- 7) **Training on livelihoods:** Once the JMFC is formed, they should be exposed to diverse training programs to enhance the skill and capacity of the members for the holistic development of the area. The different capacity building training programs which the JFMC members should undertake, would be; Enhancing agriculture productivity through rainwater harvesting, Introduction of alternative energy sources, Hands-on training on cultivation of NTFPs including bamboo and medicinal plants; Pasture development for fodder; Plantation of fruit trees/orchards; Training on Animal husbandry and poultry farming, etc.
- 8) **Convergence:** To make the JFM program successful, a well-planned convergence of various schemes under CSS, State plan, District plan, etc., shall be carried out. These convergence plans need to be implemented in a time-bound manner.

8.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

- a) Exposure visit: Exposure visits enable the JFMC members to interact with and learn from other successful examples of JFMC. It allows them to view practical examples of successful integration of sustainable practices in JFM like their own. They are integral to sensitizing the JFMC members to practices of sustainable forest management.

- b) Raising fodder on Agriculture fields: The grass seedlings of good nutritive values shall be made available to people at concessional price during 'Van-Mahotsav' period from forest nursery to raise fodder on their agriculture fields. This will help in reducing the grazing pressure on forests to a large extent.
- c) Skill development: Skill development in this case refers to the identification of skill gaps and developing the existing skills to enable JFM villagers, mainly youth to get employment outside the village or self-employment, so as to earn sustainable livelihood other than forests. This kind of intervention helps in reducing the dependency of villagers on forests for livelihood and; also create good-will about the Forest Department among the communities.

8.6.12 REGENERATION

- 1) **Potential areas for Joint Forest Management programme**: The areas that will be assigned to JFMC shall constitute a part of existing Working circles as given in earlier chapters of this Working plan. The broader guidelines provided in the respective working circles shall be included while preparation of the Microplans related to regeneration. The following areas will be suitable for JFM program:
 - a. Areas prescribed under the Improvement working circle, Afforestation Working Circle and Grass and fodder management Working Circle remains the potential areas to be covered under JFM programme to improve the vegetation and the socio-economic conditions of the local people.
 - b. Regeneration and protection of NTFPs including bamboo and, collection, grading, value addition and marketing of various NTFPs in the division are proposed to be given focus for working under JFM program.
 - c. Villages which are adjoining to potential Ecotourism sites are proposed to be included in JFM programme.
 - d. All potential wildlife areas like Conservation Reserves under the jurisdiction of West Nashik division are to be included in JFM/EDC programme as per provisions contained in the Government Resolutions.
- 2) **Village Forests**: "Village forests" or "*Gram Van*" means such part of reserved forests or protected forests in the village as assigned to the Village Panchayat under the Indian Forest Act, 1927 and the Village Forest Rules 2014 for management through the Joint Forest

Management Committee (JFMC). The JFMC shall manage its village forests on behalf of the Village Panchayat with due reference to the relevant provisions of the Indian Forest Act, 1927, the Wildlife (Protection) Act, 1972, the Biological Diversity Act, 2002, the Panchayats (Extension to the Scheduled Area) Act, 1996, the Maharashtra Minor Forest Produce (Regulation of Trade) (Amendment) Act, 2006, and rules made thereunder and any other law related to natural resource management in force as applicable to the State of Maharashtra.

- 3) **Maharashtra Village Forest Rules, 2014:** In exercise of the powers conferred by sections 26, 28, 30, 32, 34 and 76 of the Indian Forests Act, 1927 (Act No. XVI of 1927), and all other powers enabling it in that behalf, the Government of Maharashtra has notified the Village Forest Rules on 13th May, 2014. The salient aspects of these rules are mentioned below:

- a. JFMCs fulfills the criteria of Zero encroachment, positive rate of Natural regeneration, effective control of forest fire (area burnt not more than 5 % in last three years), over 60% survival in plantations raised in the said area at the end of fifth year, effective implementation of “charai-bandi” and “kurhad-bandi” are eligible for assignment of Village Forests if at least three criteria are fulfilled.
- b. The village forests assigned to the village community or the Village Panchayat shall be managed by a committee called as the “Van Vyavasthapan Samiti” or the Village Forest Management Committee.
- c. “Van Vyavasthan Samiti” has to prepare “Ten Year Microplan” by dovetailing with prescriptions of the Working Plan of the landscape. An “Annual Implementation Plan” for annual working of the village forests needs to be clearly provided in the Microplan. The Microplan shall be placed before the Gram Sabha for ratification before its approval by the Deputy Conservator of Forests, West Nashik division. It can be revised periodically depending on the site requirements.

8.6.13 ASSOCIATED REGULATIONS AND MEASURES

- 1) Silvicultural management, maintenance of forest boundary, removal of forest encroachment and control over illicit cutting, illicit grazing and forest fire control should receive absolute priority. Forest protection

cannot be viewed in isolation. The works depicted in the Microplan should be reflected in the planning process of the Gram Panchayat.

- 2) Documentation of successful initiatives under the JFM approach must receive importance at the Range and Division level. A compilation of works undertaken in JFM villages in a financial year should be done at the division level and need to be published. This work should be given wide publicity in print and electronic media.
- 3) JFM program should be implemented with complete transparency. The accounts of JFMCs shall be annually audited as per the Government instructions and a copy of such audited statement shall be shared with the Gram sabha and Gram Panchayat. All payments under JFM shall be made either through Account payee cheques or RTGS transfer or depositing directly into respective bank accounts. Payments through cash shall be strictly discouraged.
- 4) As far as possible, all works are to be executed by JFM members only. Monitoring of JFM activities by supervisory cadres (ACF to CCF) remains the key to effective implementation of the JFM program. Periodic reviews at various levels will aid in effective implementation.
- 5) Often, there is thinking in the grassroot level functionaries that, JFM be obliged to be implemented only if funds are allotted to a village. This notion is detrimental to the core values of JFM. Therefore, the supervisory officers should strive to generate suitable awareness among the grassroot functionaries (Forest Guard to RFO) to change attitude and mind-set.
- 6) The field staff of West Nashik division should engage in all efforts to ensure that all JFM Committees have People Biodiversity Registers as part of the various records to be kept. The assistance of the Maharashtra State Biodiversity Board should be consulted for the same.

CHAPTER-9

MANAGEMENT OF THE SPIRITUAL AND CULTURAL ASPECT OF FORESTS AND ECOTOURISM

9.1 NAME OF WORKING CIRCLE

Ecotourism is defined as “Responsible travel to natural areas that conserves the environment and improves the well-being of local people” (Megan Epler Wood, 1990). Ecotourism must make a beneficial impact on both the Ecology and Economy of a given destination. In coherent words, ecotourism denotes a sustainable form of tourism that allows the tourist to perceive the most pristine form of Mother Nature. Ecotourism encourages travellers to devote time in the lap of nature. This chapter outlines the prescriptions related to Ecotourism and these prescriptions are applicable for whole of the West Nashik division.

9.2 GENERAL CONSTITUTION OF WORKING CIRCLE

Ecotourism has received much attention in recent years especially within the developing world. Ecotourism in simple terms means management of tourism and conservation of nature in a way so as to maintain a delicate balance between the requirements of tourism and ecology on the one hand and needs of the local communities for jobs, new skills, income generating employment and a better status for women on the other. Ecotourism developed in India in 1980s, where the land of varied geography offers several tourist destinations that not just de-stress but also rejuvenates people. The traditional treatment of a visitor in India is based on the mythological concept of Atithi Devo Bhavah (Guest is God). This was the mantra of the Indian tourism sector. In India, Ecotourism was identified as a means of achieving twin goals of biodiversity conservation and sustainable development.

The Maharashtra state demonstrates the enormous potential for the development of ecotourism in the form of natural and cultural attractions ranging from unspoiled beaches, forest, wildlife, unique hill stations, ancient cave temples, forts, temples and vibrant tradition of fairs and festivals. The state has conferred ecotourism as a major thrust area for economic growth. As a result of its efforts for ecotourism development, the Maharashtra state has become one of the fascinating ecotourist attractions for the domestic as well as international tourists. Some of the most prominent forms include wildlife

tourism, agro-tourism, religious tourism, and so on. Among these, wildlife tourism is emerging as one of the most desired forms of ecotourism in Maharashtra. Ecotourism activities are gradually increasing around the protected areas and in some cases like Tadoba-Andheri, it is even amassed. Maharashtra's ecotourism policy was declared on 20/08/2008. It speaks about core concepts like participation of the local community, nature education, regulated tourism, and uncompromised conservation. The Maharashtra Ecotourism Development Board was established as per the Ecotourism policy and it has slowly started developing ecotourism sites in the state by involving all stakeholders.

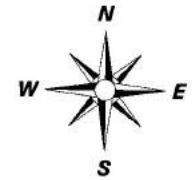
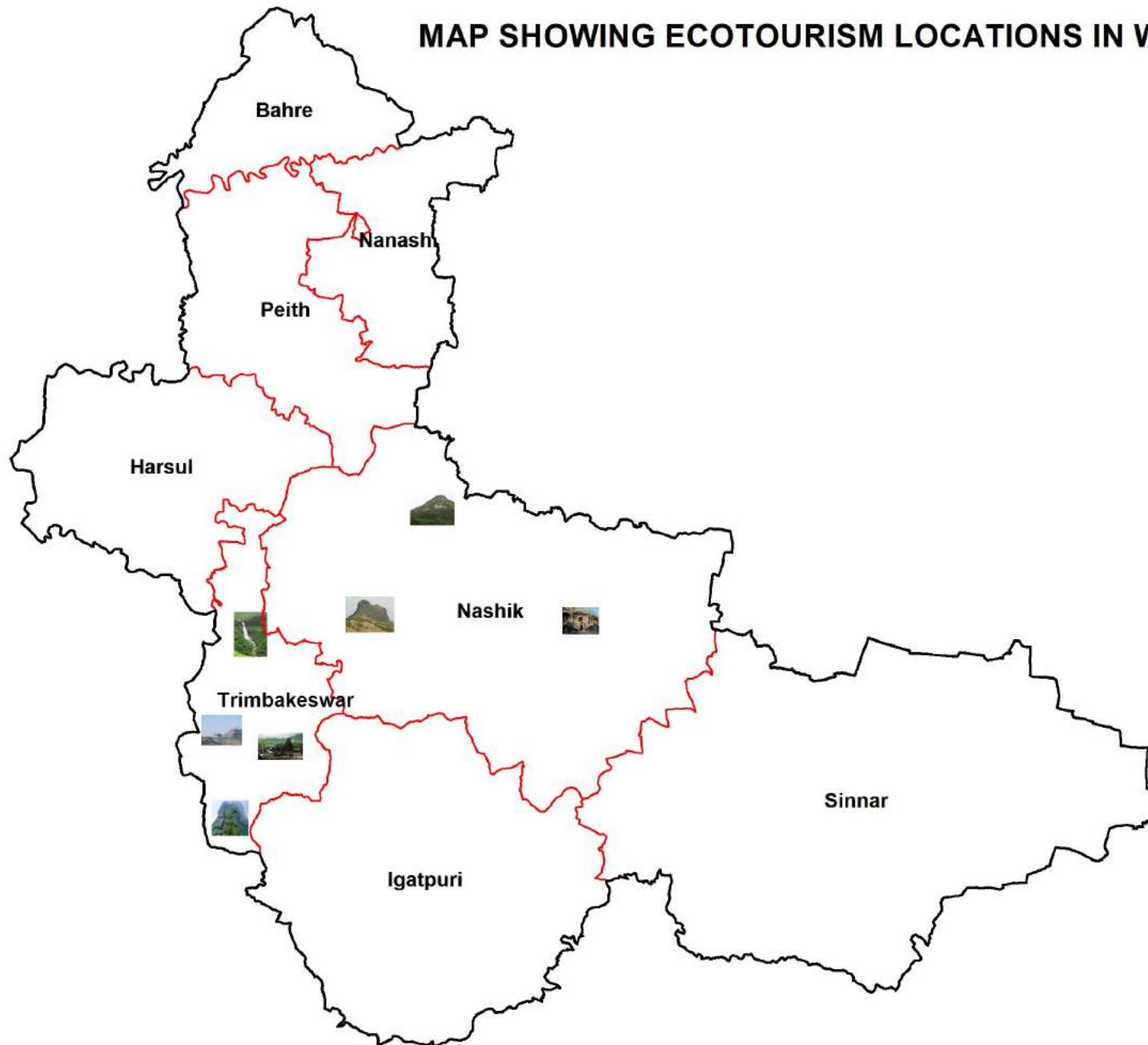
9.3 GENERAL CHARACTERISTICS OF VEGETATION

Nashik district possesses a considerable potential for ecotourism development. It enjoys a lengthy history of religious tourism. Along with the religious places, it has many caves, forts, ghats, waterfalls and festivals. Nashik district is one of the leading districts in case of agriculture and industrial development. This development is not uniform in all the parts. The western hilly tehsils like Trimbak, Surgana, Peint and Igatpuri are lagging behind in agriculture and industrial progress. These tehsils possess factors like natural beauty (ghats, waterfalls, and variety of flora), temples, forts, caves, festivals, and tribal culture, which provide vast opportunity for taking up ecotourism development in the foreseeable future. Efforts should be generated for sensitizing host community as well as administrators and planners.

Important tourist attractions in and around Nashik are:

- A. **Temples:** Trimbakeshwar is one of the most notable places in Nashik district. It is one of the 12 'Jyotirlinga' in India, and it is, in addition, a place of Kumbh Mela (There are only 4 such places in India.). People, mostly Hindus, from all over the world visit here for religious ceremonies. Kawnai temple in Igatpuri Range is a famous temple which was the earlier place of Kumbh Mela in Nashik district.
- B. **Caves:** Pandavleni are the Buddhist rock-cut caves. They are a group of 24 caves in the Trirashmi hill (as known from the inscriptions). Caves carved between the 3rd century BC and the 2nd century AD, representing the Hinayana Buddhist caves. These caves contain inscriptions written in the Brahmi script using Prakrit language. These caves are located 8 km to the southwest of Nashik city. Chamar Leni is the Jain caves located 5 km to the north of the city. It is an immensely popular religious centre of

MAP SHOWING ECOTOURISM LOCATIONS IN WEST NASHIK DIVISION



1:550000
0 6000 12000 18000 24000
Meters

LEGEND

-  Division Boundary
-  Range Boundary
-  Har Har fort
-  Brahm giri
-  Chamarleni
-  Anjneri_Metagharkilla
-  Dugarwadi Water Falls
-  Pandawalen
-  Trimbakeshar

Jain devotees, which mainly came from Maharashtra, Rajasthan and Gujarat. Many religious ceremonies were conducted throughout the year. This part of the hill is covered with plantation of various trees. This peaceful, spiritual place is also the attraction of the local tourist.

C. Waterfalls: One of the major waterfalls lies in west of Trimbakeshwar, called as Dugarwadi waterfall which is 30 km west to Nasik city and 6 km from Trimbakeshwar. This is the highest waterfall in the district. Trekkers from various places and foreign tourists also visit frequently at this place. In addition, Dudhsagar waterfall is famous for its scenic beauty, located 8 km to the west of Nasik city at Someshwar. This waterfall primarily contains water in south west monsoon season and some time when water releases from Gangapur dam.

D. Forts: According to Nashik District Gazetteer, there are 25 forts in the districts and almost all are hill forts. Major forts in the West Nashik division are Metagharkhilla-Trimbak, Har har fort, Anjaneri and Tringalwadi fort. Most of them are damaged but still its historical value lures the tourists.

The most significant feature of the ecotourism industry in this region obtains its capacity to generate large-scale employment opportunities, particularly in remote and underdeveloped area. The Ecotourism potential sites in the West Nashik division are given below:

Table 9.1: Ecotourism sites in West Nashik division

Sl.No.	Range	Beat	Ecotourism site
1	Nashik	Anjaneri	Anjaneri compartment 513 and 514
2	Nashik	Kambala	Ganeshgaon compartment 510
3	Nashik	Anjaneri	Metagharkhilla compartment 515 and 516
4	Trimbak	Trimbak	Metagharkhilla Compartment 440 and 441 in Brahmagiri hills
5	Trimbak	Ambai	Dugarwadi water falls, Compartment 436
6	Trimbak	Awatha	Har har Fort, Takeharsh, Compartment 448 and 449
7	Nashik	Samangaon	Pandavleni, Compartment 537
8	Nashik	Mhasrul	Chamarleni, Compartment 540

9.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS: Not applicable

9.5 BLOCKS, COMPARTMENTS AND JFM AREA

9.6 SPECIAL OBJECTIVES OF MANAGEMENT

- 1) Identification and development of Ecotourism sites in such a way that will ensure long-term (perpetual) sustenance of the environment.
- 2) Conservation of biological diversity and cultural diversity through ecosystem protection.
- 3) Promotion of sustainable development by providing jobs to local populations and the use of local resources.
- 4) Sharing of all socio-economic benefits with local communities and indigenous peoples by having their informed consent and participation in the management of ecotourism enterprises.
- 5) Organize training and other activities to enhance awareness about ecotourism to all the stakeholders.

9.6.1 ANALYSIS OF THE CROP

Ecotourism apparently has undergone many changes over the past few years. Ecotourism was initially viewed as a desire for education and challenging vacations combined with an increased level of awareness and interest in the natural environment. Secondly, the conservation and resource management professional is viewed the natural area visitation as an avenue for enhancing conservation-related benefits, particularly to the residents living near the protected areas. Thirdly, the economic development professionals viewed natural area visitation as an avenue to provide employment in regions that had experienced declined or lack of economic development. Fourthly, to improve the sustainability of all tourism activities, particularly those that occurred in the natural areas. These approaches reveal a change in the goals that various stakeholders attached to the visitation. There are a number of issues relating to ecotourism that contradict the distinct principles of the concept. Some of the critical issues of Ecotourism in Maharashtra are:

- a) Ecotourism competes with other forms of development and human activity for natural resources, especially land and water. The use of natural resources subsequently leads to the transformation of ecological habitats and loss of flora and fauna. Land transformation for ecotourism

development can directly threaten ecological habitats. The use of resources for ecotourism involves an 'opportunity cost' as they are denied to other sectors of economic development.

- b) The fact that ecotourism business is often owned and handled by external interests in just the same way as mass tourism. The economic benefits often are unused for the protection of the areas or to support the local community. Furthermore, the carrying capacity of host areas is uncalculated. As a result, there is a breakdown of civic amenities during the peak season when the influx of tourists is tremendous.
- c) Ecotourism deceives the locals in two ways. To begin with, their traditional economic and social structure undergoes a transformation towards tourism monoculture. Secondly, the promise made to them to provide a perennial source of income and rational distribution of profit made is highly insincere. Those locals gain jobs but only of reasonable quality, low valued and seasonal in nature. Therefore, it can be stated that the cost of ecotourism is borne by locals and vital players like organizers derive profit.
- d) Hence, a systematic, site-specific and careful planning which will provide more benefits for the conservation of flora and fauna along with sustained livelihood to local people, and reduces the ill effects of tourism on nature as well as the local community is need of the hour.

9.6.2 SILVICULTURAL SYSTEM

Ecotourism Charter:

- 1) **Principles of Ecotourism by the Ministry of Tourism, GOI:** The general principles of ecotourism initiatives of the Ministry of Tourism are as under:
 - a. The local community should be involved leading to the overall economic development of the area.
 - b. The likely conflicts between resource use for ecotourism and the livelihood of local inhabitants should be identified and attempts made to minimize the same.
 - c. The type and scale of ecotourism development should be compatible with the environment and socio-cultural characteristics of the local community, and
 - d. It should be planned as a part of the overall area development strategy, guided by an integrated land-use plan avoiding inter-

sectorial conflicts and ensuring sectorial integration, associated with commensurate expansion of public services.

- 2) **Maharashtra Ecotourism policy 2008:** Revenue and forest Department, Government of Maharashtra vide Resolution No. WLP 1002/C.R.53/F-1, Mumbai dated 20.08.2008 has declared “Ecotourism Policy 2008.” This policy illustrates the role of stake holders and their capacity building; Information, Education and communication regarding Ecotourism; Selection and operationalization of Ecotourism centres; and Formation of “Maharashtra Ecotourism Development Board” to promote ecotourism. This policy laid down principles of Ecotourism as below:
- a. The Ecotourism activity should be concise and minimal for operationalization.
 - b. It should be proper in view of environmental, social and cultural aspects.
 - c. It should be proven and worthy of adoption.
 - d. Participation of local community.
 - e. It should neither be degrading nor destructive.
 - f. As per tourist demand but definitely with some restrictions.
 - g. This policy entrusts the Forest Department to prepare management plan of ecotourism centres’ in pursuance of the Forest (Conservation) Act 1980, the Wildlife (Protection) Act 1972, and guidelines by the National Tiger Conservation Authority (NTCA). The Maharashtra Ecotourism Development Board occupies key role in coordination of line departments, granting of permission for infrastructure development, signing of MoU with the Forest Department regarding development of infrastructure and revenue sharing.
- 3) **Management of Ecotourism activities in forest areas through Joint Forest Management Committees (JFMC):** The Government of Maharashtra vides Government Resolution dated 05.10.2011 has issued guidelines for implementing ecotourism activities in forest areas through Joint Forest Management committees. The provisions provided in the said GR includes development of Forts present inside forest areas, fixing and collection of entry fee from tourists, development and maintenance of ecotourism sites, etc.

9.6.3 ROTATION PERIOD: Not applicable

9.6.4 HARVESTABLE DIAMETRES: Not applicable

9.6.5 REDUCING FACTORS AND REDUCED AREAS: Not applicable

9.6.6 FELLING CYCLE: Not applicable

9.6.7 DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCKS: Not applicable

9.6.8 CALCULATION OF THE YIELD: Not applicable

9.6.9 TABLE OF FELLING: Not applicable

9.6.10 METHOD OF EXECUTING THE FELLING

While planning and implementation of Ecotourism activities, the following points are adhered to for better management:

- 1) The Deputy Conservator of Forests, West Nashik division shall prepare an Ecotourism Development Plan for the Division incorporating the potential sites and obtain the approval from the Maharashtra Ecotourism Development Board.
- 2) While developing the ecotourism sites, it should be verified that the proposed activities must not attract nor violate provisions under the Forest (Conservation) Act 1980.
- 3) Local people especially the JFM Committees wherever in existence should be fully involved right from the formative stage.
- 4) Adequate training and capacity building of the staff and local people should constitute part of the development plan.
- 5) The peculiarity and uniqueness of each site should be properly documented and brought up in attractive brochures. The information relevant to tourists like the Dos and Don'ts and others shall also be included in such brochures.
- 6) Any local traditional product, crafts, food items/local cuisine, cultural display, etc., should be encouraged as part of the ecotourism package.
- 7) The development of the ecotourism sites should go hand in hand with the conservation of the biodiversity, the nurture of the environment and the appreciation of nature by the tourists.
- 8) The interests of the forests and wildlife should be of prime importance during designing of the Ecotourism plan.

9.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

- 1) **Regulation of tourist influx:** To control the damage to forest and wildlife due to tourists' influx, the following measures need to be taken at all Ecotourism places in addition to other measures:
 - a. Effective coordination with the District Administration during the peak seasons for the regulation of crowds.
 - b. Regulation of entry of tourists by erecting the Entry gates and barricades to stop stampedes.
 - c. Arrangement for sufficient parking place for vehicles.
 - d. Banning of non-biodegradable items inside the forests and effective waste disposal arrangements.
 - e. Arrangements for a sufficient number of mobile toilets.
- 2) **Environmental education:** The students from the Government schools need to be taken to forest areas on a periodic basis to expose them to various issues related to the forests and wildlife, and its conservation. A similar experiment is recognized as "Nisarganubhav" has been implemented by the Maharashtra Ecotourism Development Board at selected forest divisions. This program needs to be continued for inculcating the sense of forest and wildlife conservation among the school children.

9.6.12 REGENERATION

The potential Ecotourism sites mentioned above in the West Nashik division are surrounded by the forest areas. Appropriate regeneration techniques need to be focussed based on the site requirement. These areas are already referred to in one of the area based Working circles (Chapter 2 to 5); the prescriptions provided in those Working circles regarding regeneration shall be followed religiously.

9.6.13 ASSOCIATED REGULATIONS AND MEASURES

- a) Awareness creation about the ill effects of littering among the visitors.
- b) The visitors shall be cautioned about the precautions to be taken while traveling inside the forests to get protected from the wildlife and restrain the visitors from feeding the wildlife.
- c) Adequate precautionary measures shall be taken to protect the forests from accidental fire from the visitors.

CHAPTER-10

FOREST WATERSHED DEVELOPMENT

10.1 NAME OF WORKING CIRCLE

A watershed comprises an area of land that conveys all the water running under it and draining off it into a body of water. It combines with other watersheds to form a network of rivers and streams that progressively drain into larger water areas. Trees and forests perform an incredible role in reducing storm water in several ways and removing or filtering pollutants that would otherwise wind up in our waterways. Forests filter and regulate the flow of water, in large part due to their leafy canopy that intercepts rainfall, slowing its fall to the ground and the forest floor, which acts like an enormous sponge, before gradually releasing it to natural channels and recharging ground water. This chapter covers the Watershed management in West Nashik division. The prescriptions in this Chapter are applicable for the whole of West Nashik division.

10.2 GENERAL CONSTITUTION OF WORKING CIRCLE

Watershed management is the rational utilization of land and water resources for gaining optimum production and with minimum hazards to natural resources. It essentially relates to the practice of soil and water conservation in the watershed, which means proper land use, protecting land against all forms of deterioration, building and maintaining soil fertility, conserving water for farm use, proper management of local water for drainage, flood protection and sediment reduction and increasing productivity from all prevailing land uses.

The topography of any region may be subdivided into several ecological units, each of which drains to a common point. Each such ecological unit is referred to as watershed. Strictly speaking, the higher land that separates each such unit is called a watershed and the unit itself being termed as the catchment area. The size of a watershed may vary from a few hectares to thousands of square kilometres. Forests are customarily at the top of a watershed. Good forest management secures water at its source, while careless planning or improper use of forested lands can cause problems that take many decades to fix. Good management requires careful planning for all the resources found in the forest, not just the trees. It includes protecting soil and

water sources, thinning overgrown areas, maintaining diverse species and ages of local plant and trees, controlling obnoxious weeds, monitoring insect and disease outbreaks, and designing roads and trails to avoid erosion. These forest management strategies produce clean and abundant water for our watersheds, as well as healthy forests.

Watershed degradation results from the interaction of physiographic features, climate and poor land use. Some of the activities accelerates the process of watershed degradation and these activities could be involving:

- 1) Clear felling on steep slopes, drastic thinning of plants along slopes, faulty logging, roads and disturbance of forest floors during removal of the felled trees.
- 2) Cultivation on sloping land without adequate precautions, cultivation along Nala, cultivation of erosion permitting crops and over cropping areas without replenishing soil fertility.
- 3) Excessive grazing resulting in disappearance of protective cover, development of cattle tracts into channels and compaction of soil resulting in lower infiltration rates.
- 4) Intentional or accidental fire resulting in loss of vegetation, organic matter and microorganisms.
- 5) Destroying protective and productive vegetation in preference for crop production and eventually resulting in soil loss.
- 6) Unscientific mining and quarrying which results in exposure and digging up of slopes, which causes considerable damage to the landscape by destroying vegetation.
- 7) Unscientific road alignment and construction activities largely contribute coarse sediment to the drainage channels causing blockage of flow.
- 8) Misuse of natural resources by Communities.

The watershed degradation can have severe effects on the sustainable development and, the consequences of watershed deterioration are as below:

- a) Reduced productivity of land with respect to food, fuel, forage, fiber and fruits.
- b) Erosion and denudation within and adjoining the watershed.
- c) Quick siltation of the reservoir, lakes and other water body.
- d) Deterioration of water quality due to heavy sedimentation.
- e) Increased incidence of floods and droughts.
- f) Wretched health of people and livestock.

10.3 GENERAL CHARACTERISTICS OF VEGETATION

Certain principal factors of watersheds significantly affect the characteristics of runoff and as such are of great interest in hydrological analyses. The effect of these factors on watershed management is described below:

- 1) **Physiography:** It includes the following aspects:
 - a) **Size:** Both runoff volume and runoff rate increases with the watershed size. However, both the rate and the volume per unit of watershed decrease with an increase in its area. The size of the watershed is thus an important parameter in determining the peak rate of runoff.
 - b) **Shape:** Elongated and narrow watersheds are likely to have more extended time of concentration resulting in the lower runoff rates as compared to the square shaped watersheds of the identical size. The time of concentration equally affects the amount of water that will eventually infiltrate into the soil in the watershed.
 - c) **Land slope:** Slope in addition provides a significant implication for the land use. The speed and extent of runoff depend on the slope of the land. The greater the slope, greater will be the velocity of flow of the runoff water. Land slope cannot be directly changed, but it can be modified through terraces and contour bunding.

The land slope in percent can be determined from a topographic map by the following formula:

$S = (MN/A) \times 100$, Where M = Total length of all contours within a watershed (m), N = Contour interval (m), A = Area of the watershed (m^2)

- 2) **Drainage density and pattern:** The drainage density equally affects the runoff pattern and intensity. High drainage density drains runoff water rapidly, decreases the lag time and also increases the peak of hydrograph.
Drainage density = total length of all stream (km)/catchment area (km^2)
- 3) **Soil and Geology:** The soil and the geology of the watershed determine the amount of percolating water and also governed by the corrective measures, which may be taken for improvement.
- 4) **Vegetative cover:** The type and quality of vegetative cover on watershed land have a substantial influence on runoff, infiltration rate, erosion and sediment production and also on the rate of evaporation. A dense cover of vegetation is a most powerful tool for reducing erosion.

- 5) **Peak runoff:** The maximum flow attained at the outlet is called the peak flow of runoff. It is the main design parameter for designing the soil and water conservation measures.
- 6) **Precipitation:** The amount and nature of precipitation are the most important factor, which determines what will happen in a watershed. Rainfall evenly distributed throughout the year has a different impact as compared to sudden, sharp showers or seasonal rainfall.

10.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREA

The micro-watershed boundaries as defined by the Geological survey department are taken as the basis. Within the micro-watershed area, the village boundary shall be the unit of Watershed treatment. The detail of villages within a micro-watershed to be covered under watershed treatments during the Plan period is given in Appendix II.50.

10.5 BLOCKS, COMPARTMENTS AND JFM AREAS

The village boundary shall be the unit of Watershed treatment and the detail of villages within a micro-watershed to be covered under watershed treatments during the Plan period is given in Appendix II.50.

10.6 SPECIAL OBJECTIVES OF MANAGEMENT

1. To protect, conserve and improve the forest land forming part of watershed for more efficient water retention and infiltration.
2. To protect and enhance the water resource originating from forest lands.
3. To check soil erosion and to reduce the effect of sediment yield on the watershed.
4. Improvement and restoration of soil quality and thus, raising productivity rates.
5. To enhance the ground water recharge and supply of clean and sufficient drinking water for the population.
6. To minimize the risks of floods, droughts and landslides.

10.6.1 ANALYSIS OF THE CROP

The uncertainty of climate is a major problem of the West Nashik division. The monsoon rains in this area generally show considerable variation in their time of arrival, amount and duration. This will lead to increased runoff at times which enhances the soil erosion. The areas under the West Nashik division

display wide variations with respect to amount of rainfall received. The tehsils like Igatpuri and Trimbak receives more rainfall (more than 2500 mm), while Sinnar tehsil receives less rainfall (less than 450 mm). Soil depletion is a major physical problem particularly in the West Nashik division. It has been settled and farmed for so long period, that the soil cover has been subjected to modification. Grassland and deficiencies of vegetal cover have larger implications on soil and moisture regime of the area. The decreasing forest cover due to human centric problems reduces the infiltration of moisture leading to increasing run-off and thus giving rise to soil erosion. The soil is very poor and shallow in hilly and steeply sloping areas receiving very high rainfall (above 2500 mm). So the physical erosion has resulted in heavy loss of fertile soil cover. Particularly in the western tehsils (Peint, Surgana, Trimbak and Igatpuri), the productive soil is very little and people do cultivation even on gentle slopes. This further encourages the gully erosion. Therefore, it is necessary to conserve the soil by using all measures of soil conservation.

10.6.2 SILVICULTURAL SYSTEM

Watershed development in forest areas tries to reduce the volume and the velocity of runoff through a series of interventions. The aim is to lower the water velocity, to make the water flow vertically downwards rather than horizontally across the land surface. Interventions are considered at diverse points in the village in a location-specific manner utilizing locally available materials and the vast knowledge of the local people regarding water flows and resource availability. Interventions are generally planned according to the **“ridge-to-valley principle.”** A general mistake is to begin by constructing a water harvesting structure in the lowest part of the watershed without treating the upper part of the catchment. These results in rapid silting up of the storage capacity created because of the soil erosion taking place in the upper part of the catchment. Therefore, ideally we must begin with the treatment of the ridge area followed by the smallest drain, moving on to larger and larger drains in the watershed, arresting the runoff at each point. Broadly the interventions are categorized into two groups. They are: (1) Ridge area interventions and (2) Drainage line interventions.

(1). Ridge Area interventions: Ridge area interventions include forest area located usually on the ridges and upper reaches. Soil and water conservation measures undertaken in the ridge area will help recharge deeper aquifers in the discharge zone as well as regenerate the degraded forest cover. While doing ridge area treatment, one must remember we are trying to reduce

soil erosion and not to increase it, or in another word the aim of watershed development is to reduce the slope of land and not to increase it. The following points need to remember while selecting the Ridge area interventions:

- a) The utmost care should be exercised not to disturb the existing vegetation.
- b) If boulders are to be used in any structure, they should never be dug out from the soil.
- c) On slopes greater than 25%:
 - i. Intensive plantation of grasses, live-hedges, and shrubs.
 - ii. Where boulders are available, contour bunding with boulders.
- d) On slopes greater than 10% and less than 25%: Contour trenching
- e) On slopes less than 10%:
 - i. Earthen contour bunding
 - ii. Plantation of trees on barren patches and where the crown cover is less than 40%.
 - iii. Encouraging natural regeneration by grazing control, stump dressing of freely coppicing varieties, micro-water harvesting structures and weeding around saplings, treating bamboo clumps by shoring them up with soil.

(2). Drainage Line interventions: These interventions are implemented along the existing drainage lines with an objective to enhance the recharge of groundwater and increasing the duration of flow in the drainage line. Some general considerations should be borne in mind while selecting the site for locating structures on the drainage line:

- a) The width of the drainage line at that point should be narrow.
- b) The width of the drainage line upstream of the point should be more considerable.
- c) The embankments at that point should be clearly defined, stable and high.
- d) The upstream bed slope of the drainage line should be low.
- e) The upstream bed of the drainage line should be made up of impervious material if the principal aim is to harvest water. On the other hand, if the main aim is to increase the rate of groundwater recharge, this material will be relatively pervious.
- f) Ideally in structures where waste weirs have to be constructed, the substrata of the Nala banks should be hard enough, so that the banks of the weir do not easily get eroded.

- g) In all those structures where overtopping is allowed, it is to be ensured that the height of the structure plus the depth of peak flow in the stream is habitually less than the height of the embankments.
- h) Always locate a structure at such a point, where the construction materials are of requisite size and quantities are adequately available.

The Drainage line interventions are as below:

1. Where the local bed slopes are above 20% and where thinning operation yields adequate raw material: brushwood checks
2. Where local bed slopes are between 5-20%:
 - a) If boulders are freely available dry boulder checks
 - b) If boulders are not freely available boulder cum earthen checks
3. Where local bed slopes are less than 5%:
 - a) Nala bunds, which serve as percolation reservoirs in the upper catchment. These are to be located on pervious strata to improve vertical percolation.
 - b) Sand-filled bag structures (Vanrai bandhara) to check the velocity of stream flow and where sand is locally available.
 - c) Gabion structures where velocity and volume of peak run-off are excessively high for loose boulder structures.
4. Where the stream embankments have been severely eroded:
 - a) Nala training, including deepening of channels and raising embankments along sections of streams; especially where during peak floods, the stream flows over its embankments and damages the fields alongside.
 - b) Embankment stabilisation through Gabion structures in stretches where the banks are exceptionally vulnerable and require reinforcement.
5. Where groundwater harvesting wells are located alongside:
 - a) Underground dykes in the discharge zone where the impermeable strata are overlain by thin layer of permeable deposits.

10.6.3 ROTATION PERIOD

The life of Soil and moisture conservation structures are fixed by the Department of Water Conservation, Government of Maharashtra vide Government Resolution dated 03.07.2013. A copy of the same is given as Appendix II.52.

10.6.4 HARVESTABLE DIAMETRES: Not applicable

10.6.5 REDUCING FACTORS AND REDUCED AREAS: Not applicable

10.6.6 FELLING CYCLE: Not applicable

10.6.7 DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCKS: Not applicable

10.6.8 CALCULATION OF THE YIELD: Not applicable

10.6.9 TABLE OF FELLING: Not applicable

10.6.10 METHOD OF EXECUTING THE FELLING

10.6.10.1 RIDGE AREA TREATMENTS

10.6.10.1.1 Ridge area treatment by forest plantation

On slopes steeper than 25% in the ridge area, it is advisable to undertake vegetative interventions only. Where the ridge maintains an existing forest with some vitality, the general thrust should be towards protection and regeneration. In other situations, the plantation may need to be undertaken. The suitable local trees, shrubs, grass, and live-hedge species which are good soil binders shall be integrated into such an afforestation programme. The planting of live-hedge species like *Agave americana* (Agave), *Opuntia ficus-indica* (Cactus) and *Euphorbia ligularia* (Saber), etc., along the contour shall be undertaken in this area. Once, they established in the area, then bush sowing of seeds of local trees and shrubs can be resorted. The model estimate of live-hedge planting is provided in Appendix II.17.

10.6.10.1.2 Ridge area treatment by contour trenching

The contour trenching is a simple and a low-cost method of checking the velocity of runoff in the ridge area of any watershed. A contour trench is a trench dug along a contour line. A contour line is a line, which joins points together of the same elevation. Digging a trench along such a line increases the chances of containing runoff for a more extended period of time within the trench. It is equally accurate that if trenches were not to follow a contour, such digging could actually increase the possibility of soil erosion because there would be a rise in the velocity of runoff following an increase in the slope of the

land. Contour trenches serve to collect the rainwater that falls in the ridge area. This way the soil moisture profile in the area adjacent to the trench gets improved. Along with the water, the eroded fertile topsoil on top gets deposited in the trench. It is, therefore, necessary to combine trench construction with the plantation. The contour trenches helps in slowing down the velocity of runoff, checking soil erosion, and improving local soil moisture profile. The design and planning of Contour trenches in the field is provided in Appendix II.22.

The principle followed for location of proper site for contour trenching includes:

- a) If the slope of the ridge area is 25% or more, the best form of treatment is the planting of grasses, shrubs, live-hedges and trees. This is because for contour trenches to be effective on such high slopes, they will have to be constructed at very close intervals, which could end up causing more soil erosion due to excessive digging.
- b) On the other hand, if the slopes are less than 10%, even then contour trenches are not considered to be the best measure. This is because in such a situation, in comparison to contour trenches, contour bunds are a more effective means of checking runoff and soil erosion. In a contour bund, water not only stops in the excavated portion but also against the bund. Therefore, wherever possible, contour bunds must be constructed in place of contour trenches. However, on very high slopes, it is not possible to make contour bunds since there is a great danger of the bunds breaking.
- c) Thus, given the above considerations, contour trenches are the most appropriate where the slope of the ridge area lies between 10 to 25%.
 - a. It is an ideal treatment for the non-agricultural land.
 - b. If the depth of soil is less than 20 cm, avoid the CCT. CCT should also be avoided in black cotton soil areas.
- d) The distance between the two successive trenches depends on the volume and the velocity of runoff they are expected to handle. This in turn depends on:
 - a. The quantum of rainfall: The greater the rainfall, the lesser the distance.
 - b. The permeability of the soil: The more permeable the soil, the greater shall be the distance.
 - c. The slope of the land: The greater the slope, the lesser the distance.

As the volume and velocity of runoff increase due to any reasons given above, the trenches should become more closely spaced. In several watershed programmes, however, a specific procedure has been adopted for fixing the intervals between trenches: "*The vertical interval between contour trenches is fixed at 1metre*". Thus, with a constant vertical interval of 1metre, the contour trenches would be spaced at a horizontal interval of 20 metres on a 5% slope and 10 metres on a 10% slope. However, one must not follow this rule blindly without taking into account the catchment area that each contour trench has to handle. For example, on high slopes one may end up making too many trenches even though there is very little water, which each trench needs to handle. And on low slopes, very few trenches are made which however are unable to intercept most of the runoff, since each trench is expected to do much more than its fair share of work. In practice, thus, one must fix the maximum and minimum horizontal interval between the two successive contour trenches in a way, which is depicted as follows:

- i. On high slopes, the trenches should be close to each other but never closer than 10 metres.
- ii. On low slopes, the trenches should be far from each other but never farther than 30 metres.

Thumb rule: for the vertical interval between two rows;

V.I. = Slope (%) / C, where value of C = 12 for the medium rainfall.

It is commonly expressed in term of vertical interval (V.I.), which is defined as the difference in elevation between the two similar points on two consecutive bunds. The basic principle involved in fixing the spacing between the two bunds is to keep the velocity of runoff below the critical value, which creates scour.

Vertical interval is usually expressed as:

$$V.I. = 0.305 \times [(S/a) + b]$$

Where V.I. is Vertical Interval in metre, S is Slope in percent, 'a' and 'b' are constants specific to particular region. For soil with good infiltration rates values of 'a' and 'b' are respectively taken as 3 and 2; whereas for soils of low infiltration rates the corresponding value are 4 and 2, respectively.

Staggered Trenching: Over time, experience of watershed programmes has shown that it is better to stagger the digging of contour trenches. This is because it has been found that invariably errors have been made in contouring over long distances. Therefore, instead of making trenches continuously, they should be made in a staggered and discontinuous manner. Dig a trench 2 or 4 metres long on a contour line. Give a gap of 2 or 4 metres and dig another 2 or 4 metres trench along the contour. The trenches are further dig in the similar fashion along this particular contour. Then, come to the next contour line. Begin digging in a stretch, which covers the gap left in the higher contour line. The gaps in this contour line should fall below the trenches in the higher contour line. In this way, we maximize the amount of harvested runoff by the trenches. In other words, chains of staggered trenches should be made along successive contour lines so that water left by one line of trenches is captured by the immediately lower line and so on. In areas where there is an abundance of trees and vegetation, gaps in excavation are in any case essential to allow space for the roots of the trees to spread. Also, where there are hard rocks underneath the soil, trenches must be staggered.

10.6.10.1.3 Ridge area treatment by earthen contour bunding

Contour bunding is again a simple and low-cost method like Contour trenches for checking the velocity of runoff in the ridge area of any watershed. A contour bund is a bund constructed along a contour line. Contour bunding helps in slowing down the velocity of runoff, checking soil erosion and improving local soil moisture profile.

Contour bunds are constructed on the ridge area of a watershed. Rainwater, which falls in this area, flows unchecked carrying with it eroded soil into the flatter portion of the watershed, "the valley". This silt gets deposited into the reservoirs and ponds, thereby reducing their life. Thus, any water harvesting work undertaken in the valley, will become meaningless unless appropriate measures such as contour trenching and bunding are undertaken to control runoff and soil erosion on "the ridge". Like contour trenches, bunds also collect the rainwater that falls in the ridge area. This way the soil moisture profile in the area adjacent to the bund is improved. Along with the water, eroded fertile topsoil also gets deposited in the bund. It is, therefore, important to combine contour bunding with appropriate vegetative measures. The design and planning of Contour bunding in the field is provided in Appendix II.22.

The principle followed for location of proper site for contour bunding is same as that of Contour trenching. In addition, the following thumb rule need to be followed:

- a) On high slopes, the bunds should be close to each other but never less than 30 metres.
- b) On low slopes, the bunds should be far from each other but never more than 60 metres.
- c) Bunding on black cotton soil should be planned carefully and plan the excess water to drain safely into the nearby natural drain. The position and the number of outlets are very important.

10.6.10.2 DRAINAGE LINE TREATMENTS

The main objectives of drainage line treatments are as given below:

- 1) Reduction in soil erosion.
- 2) Trapping silt, which reduces the rate of siltation in water harvesting structures in the lower reaches of the watershed.
- 3) Creating a hydraulic head locally which enhances infiltration of surface runoff into the groundwater system, and
- 4) Increasing the duration of flow in the drainage line.

10.6.10.2.1 Drainage line treatment with boulder checks

Boulder checks are loose rock dams also known as **Loose Boulder structures (LBS)** made on small drainage lines, which have a catchment area of around 10 to 20 ha. As per rainfall parameters the permissible catchment area of the drain for the construction of loose boulder gully plug varies. The main aim of constructing boulder checks is to reduce the velocity of water flowing through the drainage line. Therefore, the capacity of the water harvesting structures created downstream on the drainage line is utilized more fully as they get many more refills. The design and planning of Boulder checks or Loose Boulder structures (LBS) in the field is provided in Appendix II.22.

The location of proper site for boulder checks includes:

- a) Boulder checks should be made as a series on a drainage line, with each structure dividing the overall catchments of the drainage line into smaller sections.

- b) The independent catchment of each boulder check should not be more than 1 to 2 ha.
- c) Boulder checks should not be made where the bed slope of the drainage line at that point is above 20% because the check will not be able to withstand the high velocity of water flow. However, on a drainage line with an overall high bed slope, boulder checks can be constructed in sections where the local bed slope is less than 20%.
- d) Boulder checks should be made where boulders are available in large quantities of the requisite size.
- e) A boulder check should be made where the embankments are well defined and stable, and high enough to accommodate peak flows even after the check has been made, thereby preventing water from rising over and cutting the banks. The height of the embankment at the location of the structure must at least equal the maximum depth of flow in the stream including the design height of the structure in the central portion of the drainage line. This rule is applicable to all structures in which overtopping is permissible.
- f) Even though storage is not a primary consideration in the case of boulder checks, enhanced water retention and groundwater recharge is a desirable objective. Hence, locating the structure in those sections in the drainage line, where the upstream slope is flatter may be advantageous. The flatter the upstream slope, the greater would be the storage per unit height of the structure.
- g) On each drainage line there will be a series of boulder checks. The minimum vertical interval between two successive checks on a drainage line should be equal to the height of the structure, so that the water temporarily stored in one check will reach the toe of the another check upstream. Any interval below this limit would mean under-utilization of the capacity of the downstream boulder check. What interval we keep above this limit would require a balance to be struck between cost considerations and volume of water to be stopped. Once this vertical interval is fixed, the horizontal interval between two successive checks would depend on the bed slope of the drainage line; for instance, with a constant vertical interval of 1m, the boulder checks would be spaced at a horizontal interval of 20 metres on a 5% slope and 10 metres on a 10% slope. In general the relationship can be expressed as follows:

H.I. = V.I. / S, Where, H.I. = horizontal interval; V.I. = vertical interval and, S = slope (%)

However, one must not follow this rule blindly without taking into account the catchment area that each boulder check has to handle. For example, on high slopes one may end up making too many checks even though there is very little water which each checks needs to handle. In practice, one must fix the maximum and minimum horizontal interval between two successive boulder checks as given below.

- a) On high slopes, boulder checks should be spaced close but not closer than 10 metres.
- b) As the slope decreases, boulder checks must be spaced farther, but not farther than 50 metres.

10.6.10.2.2 Drainage line treatment with Gabion structure

Gabion structures are rock and wire dams constructed across the drainage lines with a catchment area of 30-150 ha. They are also constructed to reinforce highly erodible stream embankments.

10.6.10.2.2(A) Gabion structure across drainage line

The main aim of constructing a gabion structures is to reduce the velocity of water flowing through the drainage line. Therefore, the capacity of the water harvesting structures created downstream on the drainage line is utilized more fully as they get many more refills.

The minimum independent catchment area for a gabion structure is 5 ha. For a catchment area smaller than this, even a loose boulder check may suffice. The precise location of a gabion structure depends on the following factors:

- a) Stability of the embankments is the primary consideration. The less stable and more erodible the material on the embankments is, the weaker the structure is likely to be. In such a situation, making the structure stronger would render it too expensive.
- b) The elevation of side embankments from the bed of the stream at least must equal the sum of the depth of peak flow in the stream and the designed height of the structure. For example, if the height of the embankments is 6 metres and the depth of peak flow is 4 metres, then the height of the gabion must not exceed 2 metres to prevent the water from jumping over the sides. Hence, observation of the peak flows is imperative before a gabion structure is planned.

- c) For maximizing storage in the structure, the bed slope of the upstream portion should be low. The flatter the upstream slope, the greater will be the temporary storage per unit height of the structure.
- d) The material composing the bed of the drainage line upstream of the structure should not be completely impermeable, because what we are looking for is temporary storage followed by groundwater recharge.
- e) The design and planning of Gabion structures in the field is provided in Appendix II.22.

10.6.10.2.2(B) Gabion structure along Embankments

These structures are built to cushion the impact of water, preventing it from eroding the banks. On very high slopes as in the Himalayas, such structures are built along the contour lines to prevent landslides. These should be located in those stretches where embankments are prone to severe erosion by the stream. Normally this happens where the stream turns sharply and its flows are directed towards the embankments. The length of the embankment to be strengthened has to be determined. The rectangular boxes have to be placed as a straight wall with a vertical face along this length. The wall width could be a standard 1 metre, while the length and height both are dependent on the local conditions. The height of this wall should be at least 1 metre above the peak flood levels of the stream. The upstream end of the gabion wall should be well embedded into the embankment, so that the stream is not able to cut a path behind the structure. Care must be taken that the gap between the structure and the embankment is filled with rammed earth while raising the rectangular structure.

10.6.10.2.3 Drainage line treatment with Earthen water harvesting

For Forest areas the commonly built earthen water harvesting structures are Percolation tanks. The percolation structure is an earthen dam constructed to impound water flowing in a small drain or a medium drain for the primary purpose of increasing the rate of groundwater recharge. A percolation structure augments flows in the groundwater system by controlling the volume and velocity of surface water flow, thereby allowing water a greater time for percolation into the aquifer. This replenishment of groundwater benefits the irrigation wells situated downstream in the catchment. Enhanced groundwater recharge helps lengthen the life of the seasonal streams through regenerative base flows after the end of the rainy season. Depending on the capacity of the structure and duration of water storage, the pond can have secondary benefits

(such as pisciculture) that are vital for the livelihood security of local communities.

The location of earthen structures is determined on the basis of the following considerations:

- a) **Effective Storage:** The site for an earthen structure should be selected at a point where the total runoff is adequate to fill the structure to its full capacity, *i.e.*, the total runoff should be at least greater than or equal to the 'effective' storage of the structure. Effective storage = Storage capacity + Volume of water percolating from it during one season + Evaporation + Water used for protective irrigation.
- b) **Embankments:** At the point of location, the drainage line must have well defined embankments to which the structures can be anchored. Since the structure is embedded into them, these embankments should be strong and not made of loose material like sand. They in turn depends on:
 - a) Slope of the Upstream Nala Bed: The bed slope should be relatively low (not more than 5%) upstream of the site selected for the earthen structure, in order to maximize storage capacity.
 - b) Width of the Nala: At the site the embankment should be narrow and vertical. But as we move upstream, the nala should ideally widen so as to contain maximum storage within its banks.
- c) **Geology:** Since the primary objective of structure is water storage, the geology of the structure must be favourable for water storage, *i.e.*, percolation losses must be minimal up to reasonable depths. In cases where percolation losses are high and the storage structure makes sense only as a groundwater recharge structure, it is advisable to dig intake wells on the downstream to collect the percolating water. If the percolation losses are high but the strata, which can be tapped by dug wells, yield very little water, the site should be abandoned since a structure here will neither store surface runoff nor recharge wells. In the case of the percolation structure, however, the primary consideration is groundwater recharge. Therefore, we would ideally like the bed of the structure to be made up of relatively pervious material. In both cases, the geology of the waste weir site should preferably be a hard rock so that it does not erode very easily.
- d) **Availability of Materials:** Even if all other factors are favourable and if the requisite materials are not easily available, one may be compelled to abandon the site.

Depending on the construction materials used, two types of structures can be constructed:

- 1) **Structure made of Homogenous Material:** In places with an impervious foundation where availability of clay is virtually nil, structures can be made from a relatively more pervious material either by increasing the area of cross section, ramming the material to a greater extent or by providing a narrow clay blanket on the upstream side in order to control seepage.
- 2) **Core Wall Type:** Where both the pervious and the impervious materials are available, the structure wall can be partitioned between these according to their relative abundance. Where the availability of impervious clayey soil is limited, one can choose to economize on clay by puddling. In the core wall type structure, there is a narrow, impermeable wall, extending from embankment to embankment and made of puddled clay that forms the core of the structure. To support and protect this, the outer flanks of the structure are made of dry or wet rammed coarser soils, which are arranged by grade. The finest particles being placed inside and the coarsest material is placed in graduating way towards outside. The final shelter is provided by pitching, which involves giving a layer of boulders on the upstream face of the structure.

10.6.10.2.4 Forest Pond

Forest pond is a water harvesting structure suitable for the plain area. Main purpose of the structure is to ensure water availability to wildlife. The following are the criteria for the site selection of a dug-out pond:

- a) Catchment area of the pond should be within 2 to 20 hectares.
- b) Soil strata up to 3 metres depths should not be in the form of disintegrated rock or hard rock.
- c) If any well is there, then the farm pond should be on the upstream side of the well.
- d) Soil of the dug-out should be impermeable so that water can be stored for a longer period.
- e) At least three to four hectares catchment area is required for storing 1000 cubic meters (20 m x 20 m x 2.5 m) storage capacity of forest pond.

There are two types of Forest ponds. They are:

- 1) **Dugout type:** Where the slope of the field is relatively low and there are no well-defined drainage channels, the pond will have to be created by excavation. The storage capacity will be confined to this excavated portion. Because of the low slope, there will be little storage above the ground level. Such ponds are best located in the lowermost portion. The runoff has to be directed into the pond through bunds or channels.
 - a) Trapezium type dugout pond: Size of the tank depends on the requirement of water to be stored. Depth of dug out pond depends on the soil strata. Side slope of the dug-out pond depends on the angle of repose, generally 1:1 side slope is provided in cutting section.
 - b) Stepped dugout pond: It is preferred in that location where community may use the pond for their daily work.
- 2) **Dugout cum Embankment type:** Where there is no well-defined channel and the slope of the land is medium, forest pond should be of dugout cum embankment type. Here, the mud excavated should be used to form an embankment all around the pond except at the inlet. At the full reservoir level, the water level will be higher than the ground level and the embankment will serve as a retaining wall. Therefore, even while the dugout portion will be a significant part of the total storage volume, there will be some storage above the dugout portion retained by the embankments.

The following precautions need to be taken care before construction of Forest pond:

- a) Catchment area should be treated for the soil conservation interventions otherwise pond will silt up.
- b) It should be constructed on small drain or the first order drain.
- c) If the dugout pond is used for meeting daily water requirements then stepped type dugout should be preferred.
- d) Select the deep pond instead of a shallow pond. Exit of a dug out pond should be at the ground level and side of the embankment should be protected with stone pitching.
- e) Dugout soil should be stacked in the form of embankment with a one-metre berm.
- f) Pitching should be done where required.
- g) Where percolation losses are high, it may be advisable to allow a layer of transported soil to get deposited on the pond bed during the initial year.

By acting as a clay blanket, this layer would reduce percolation losses. In subsequent years, a silt trap can be made in the inlet channel.

- h) The inlet channel should be lined with boulders to make it safe against erosion. Before the channel reaches the pond, a silt trap should be placed either by digging a trench or through constructing a boulder check.

10.6.10.2.5 Cement Nala Bund

Cement Nala bund or Cement check dams is a permanent structure having long life sustainability. The work of Cement Nala bunding is being done for raising ground water level and prevention of soil erosion. Check dams are constructed across small streams having gentle slope and are feasible both in hard rock as well as alluvial formations. The site selected for check dam should have sufficient thickness of permeable bed or weathered formation to facilitate recharge of stored water within short span of time. The water stored in these structures is mostly confined to stream course and the height is normally less than 2 metres. These are designed based on stream width and excess water is allowed to flow over the wall. In order to avoid scouring from excess run off, water cushions are provided at downstream side. To harness the maximum run off in the stream, series of such check dams can be constructed to have recharge on regional scale.

To select a site for Check Dams/ Nala Bunds, the following conditions may be observed:

- a) The total catchment of the Nala should normally be between 40 to 100 Hectares though the local situations can be guiding factor in this.
- b) The width of Nala bed should be at least 5 meters and not exceeding 15 metres and the depth should not be less than 1 metre.
- c) The Nala bunds should be preferably located in area where contour or graded bunding of lands have been carried out.
- d) The rock strata exposed in the ponded area should be adequately permeable to cause ground water recharge through ponded water.
- e) Dams should be built at sites that can produce a relatively high depth to surface area so as to minimise evaporation losses.
- f) Rocky surfaces should not be fractured or cracked, which may cause the water to leak away to deeper zones or beneath the dam.
- g) Dam foundation must be of solid impermeable rock with no soil pockets or fracture lines.

- h) Dam site should be along the edges of depressions or directly across the lower ends of deep gullies into the rock.

10.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

- a) **Grass planting:** Grass planting using polypot raised grass seedlings on structures like contour bunds, bunds of forest tanks and on other slopes for its stabilization shall be under taken as part of the Engineering structures. This will provide stability to the structure and also enhance the life of the structures. In addition, grass will provide fodder to wildlife.
- b) **Live-hedge planting:** The live-hedge planting shall be undertaken along the contour in sloppy areas. About 2500 plants of *Agave americana* (Agave), *Opuntia ficus-indica* (Cactus) and *Euphorbia ligularia* (Saber), etc., would be planted per hectare. This will helps in the conservation of soil and moisture in the area. After five years when the live-hedge is completely established in the area, bush sowing of seeds of Ficus family-like Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Pimpri (*Ficus amplissima*), Payar (*Ficus arnottiana*), Umber (*Ficus racemosa*), etc., shall be undertaken. In addition, the live-hedge planting shall be undertaken along the TCM (Trench-cum-mound) around the plantations. The live-hedge plantation estimate is provided in Appendix II.17.

10.6.12 REGENERATION: Appropriate regeneration techniques needs to be focussed in these areas for effective soil and moisture conservation along with engineering structures. These areas are already referred to in one of the area based Working circles (Chapter 2 to 5); the prescriptions provided in those Working circles regarding regeneration shall be followed religiously.

10.6.13 ASSOCIATED REGULATIONS AND MEASURES

- 1) **Grazing:** Control of overgrazing in watershed is very important as this will reduce the soil permeability and increases runoff that further enhances the soil erosion.
- 2) **Forest fire:** Forest fire control is must in any watershed for maintaining its good health. Forest fires destroy the soil organic matter which is the binding material for soil particles. Once the binding material is lost, then the soil particles become susceptible for soil erosion and reduce the life of the soil and water conservation structures.

CHAPTER-11

WILDLIFE MANAGEMENT

11.1 NAME OF WORKING CIRCLE

Wildlife performs a key role in regulation and stability of essential processes of nature. Sustainable wildlife management is the sound management of wildlife species to sustain their populations and habitat over time, taking into account the socio-economic needs of human populations. This requires that all land-users within the natural habitat are aware, and consider the effects of their activities on the natural resources and habitat, and on other user groups. In view of its ecological, social, and economic value, wild life remains a significant renewable natural resource, with significance for areas like rural development, land-use planning, tourism, scientific research and cultural heritage. If sustainably managed, wildlife can contribute considerably to the alleviation of poverty as well as to safeguarding human and environmental health. This Chapter deals with Wildlife management in the West Nashik division and the prescriptions in this Chapter are applicable for whole of the West Nashik division.

11.2 GENERAL CONSTITUTION OF WORKING CIRCLE

Wildlife management aims to halt the loss of species. It performs this by following ecological principles to support the needs of wildlife with the needs of people. Sustainable wildlife management requires an understanding of the vital processes and interactions that underlie variations in animal populations. The natural ecosystem comprises “food chain”, which is organized in “trophic levels”. Within a given trophic level, the abundance and distribution of a species result from the interplay of multiple biological processes, including competition between species. Processes operating between trophic levels regulate wildlife populations in natural ecosystems. Understanding such processes provides the basis for balancing the needs of the species through management.

Human-wildlife conflicts occur when humans and wildlife coexist and occupy overlapping habitats (human-wildlife interfaces); they involve situations in which human activities put pressure on wildlife populations and, conversely, wildlife has a negative impact on humans. Human-wildlife conflicts have increased in recent decades, especially in regions where human populations are growing at a rapid pace. Numerous management tools have been developed

worldwide to address Human-Wildlife conflicts, but most are strongly site and species specific.

The aim of sustainable wildlife management is to maintain the wildlife numbers at economically, socially and environmentally desirable levels. Central to this aim remains the concept of carrying capacity. The ecological carrying capacity is the maximum population size that can be sustained by a habitat indefinitely, given the resources available in the environment. The social carrying capacity represents the density of wildlife regarded as acceptable in a given human community. While ecological carrying capacity reflects biophysical limits, social carrying capacity is chiefly determined by user perceptions. The social carrying capacity is, therefore, a subjective measure, but it is crucial in developing strategies to mitigate human-wildlife conflicts. Wildlife management strategies must be adaptive, and they must account for the ecological and social carrying capacities of a given area. Wildlife management is most successful when wildlife is used for sustainable development of ecosystem. To ensure sustainability, biological processes need to be understood and monitored, and the socio-cultural interests of local communities are taken into account in management decisions.

11.3 GENERAL CHARACTERISTICS OF VEGETATION

The general condition and density of wildlife in the Division is relatively good, however, its distribution is quite uneven. Wildlife population density varies with the habitat depending upon availability of food, water and shelter. Wildlife commonly found in the division is given below:

- A. **Carnivores:** Panther (*Panthera pardus*), Striped Hyaena (*Hyaena hyaena*), Jackal (*Canis aureus*), Khokad (*Vulpes bengalensis*), Jungle cat (*Felis chaus*), Wolf (*Canis lupus*), etc.
- B. **Herbivores:** Chowsingha (*Tetracerus quadricornis*), Barking deer (*Muntiacus muntjak*), Sasa (*Lepus nigricollis*), Salu (*Hystrix indica*), Khar (*Funambulus palmarum*), Sambar (*Cervus unicolor*), Llandga (*Canis lupus*), Mongoose (*Harpester edwardsi*), Monkey (*Macaca mulatta*), Common Langur (*Semnopithecus entellus*), etc.
- C. **Reptiles:** Indian cobra (*Naja naja naja*), Dhaman (*Varanus inelicus*), Common Krait (*Bungurus caeruleus*), Russel viper (*Vipera russelli*), Chamaeleon (*Chaemeleon vulgatis*), Ghorpad (*Varanus bengalensis*), etc.
- D. **Birds:** Painted partridge (*Francolinus pictus*), Grey francolin (*Francolinus pondicerianus*), Jungle bush quail (*Perdicula asiatica*), Grey jungle fowl

(*Gallus sonneratii*), Crow pheasant (*Centropus sinensis*), White backed Vulture (*Gyps bengalensis*), Slender billed vulture (*Gyps tenuirostris*), Rufous-backed shrike (*Lanius schach*), Sparrow hawk (*Accipiter nisus*), Brown wood owl (*Strix leptogrammica*), Rose ringed parakeet (*Psittacula manillensis*), Common kingfisher (*Alcedo atthis*), Green bee-eater (*Merops orientalis*), Pariah Kite (*Milvus migrans*), Indian peafowl (*Pavo cristatus*), Blackrumped Woodpecker (*Dinopium benghalense*), Brahminy kite (*Haliastur indus*), Baya weaver bird (*Ploceus philippinus*), Waterhen (*Amaurornis phoenicurus*), Spotted dove (*Spilopelia chinensis*), Red whiskered bulbul (*Pycnonotus jocosus*), Red vented bulbul (*Pycnonotus cafer*), Common myna (*Acridotheres tristis*), Asian Koel (*Eudynamys scolopaceus*), Jungle Babbler (*Turdoides striata*), Black Drongo (*Dicrurus macrocercus*), etc.

- E. **Butterflies:** Common Pierrot (*Castalius rosimon*), Common Wanderer (*Pareronia hippie*), Sailor (*Neptis hylas*), Common small Flat (*Sarangasa dasahara*), Grey Pancy (*Junonia aflites*), Red Pierrot (*Taica da nyseus*), Barron (*Euthalia aconthea*), Lemon Pancy (*Junonia lemonias*), etc.

There are no National parks and Wildlife sanctuaries in West Nashik division. But one Conservation Reserve i.e., Anjaneri Conservation Reserve was notified on 31/01/2017. This Conservation Reserve is having endemic flora and also Vulture nesting sites. The management plan for this Conservation Reserve needs to be prepared at the earliest for effective management.

11.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS: Not applicable.

11.5 BLOCKS, COMPARTMENTS AND JFM AREA: Not applicable

11.6 SPECIAL OBJECTIVES OF MANAGEMENT

- 1) To ensure scientific management of wildlife by undertaking measures like habitat management and monitoring wildlife population.
- 2) To generate awareness among local communities towards need for the wildlife conservation.
- 3) To preserve the wildlife from various diseases.
- 4) To minimize the economic costs and safety risk to rural families living in close proximity to forests.
- 5) To explore the possibility of engineering habitat to reduce man-animal conflict.

- 6) To partner with local communities and national agencies to prevent poaching of the wildlife.

11.6.1 ANALYSIS OF THE CROP

Forests play an important role in providing different types of habitats for the growth of biodiversity. The different components of vegetation like trees, shrubs, and herbs provide significant parameters for wildlife diversity. The tropical forests of the West Nashik division provides suitable habitat for number of mammals, reptiles and birds. The floristic habitat provides nesting bed for birds in the form of tall trees, thick grasslands, and swampy areas. Because of this, the Division was reported to have abundant wildlife and birds a score of years ago. The diminishing trends in wildlife in recent past could be attributed to the encroachment and honeycombing of forest area for cultivation, poaching by the local people, grazing, and forest fires.

As on date, the forest areas of this forest division are highly fragmented and surrounded with agriculture lands. This has resulted in dispersal of wildlife outside the forest area into agriculture lands and habitations. The cropping pattern has undergone a major change over the period with the advent of irrigation systems. Because of this the leopards started live in and around many human dominated agriculture landscapes, in particular sugarcane fields, and also the incidences of crop damage by the herbivores has increased. This has resulted in increased frequency of leopard and herbivores straying into human settlements. Although leopards have demonstrated a remarkable ability to live relatively peacefully close to people, conflicts can and do occur, with leopards killing livestock and in extreme cases people. The frequent incidence of Leopard conflicts near habitations and in agriculture areas necessitates the need for a dynamic wildlife conservation measures outside the forest areas. Specific efforts are required to address these unique situations prevalent in this tract.

The removal of trees and other types of vegetation reduces convenient food, shelter and breeding habitat. When wildlife habitats become fragmented, the native species must live on remaining habitat islands that are surrounded by disturbed land that is being used for agriculture and other uses. Animals may also encounter perilous situations such as increased human-wildlife conflicts and being hit by vehicles when they attempt migrating between habitat fragments.

11.6.2 SILVICULTURAL SYSTEM

Wildlife management is an inter-disciplinary that deals with protecting wildlife and their habitats. There are two general types of wildlife management:

- 1) Manipulative management: Involve regulating numbers of animals directly by harvesting or by influencing numbers by altering food supply, habitat, the density of predators, etc.
- 2) Custodial management: The preventive or protective and minimizes external influences on the population and its habitat. In India, wildlife management is more of Custodial Management where ecological conditions are protected, and threatened species are conserved by law. The management of wildlife depends on certain elements like space, food, water, and shelter. The sustainable management of wildlife depends on the effective manipulations of these elements.

The first genuine need to conserve wildlife in India was realized after the Independence. In 1952, the Indian Wildlife Board was constituted to centralize all the rules and regulations pertinent to wildlife conservation in India, which until then deferred from state to state. In 1956, this Board passed a landmark decree that accorded all existing Game Parks the status of a Sanctuary or a National Park. Later, two landmark events were brought into effect to influence wildlife conservation in India for decades to come. The first was the enactment of the Wildlife (Protection) Act in 1972, and the second is the Project Tiger; the largest wildlife conservation project of its time, was initiated in 1973. The last three decades since the 1990s have witnessed the application of technology and science to conservation on a large scale. Wildlife forensics, telemetry, remote sensing techniques and geographic information systems were all integrated into the practice of wildlife conservation in India.

11.6.3 ROTATION PERIOD: Not applicable

11.6.4 HARVESTABLE DIAMETRES: Not applicable

11.6.5 REDUCING FACTORS AND REDUCED AREAS: Not applicable

11.6.6 FELLING CYCLE: Not applicable

11.6.7 DIVISION INTO PERIODS AND ALLOTMENT INTO PERIODIC BLOCKS: Not applicable

11.6.8 CALCULATION OF THE YIELD

Knowing the wildlife populations is crucial to its conservation as well as assessing the impact of conservation strategies and plans. The wildlife census is defined as the counting of all individuals belonging to the group of interest within a defined area and a survey when only a proportion are counted. The methods of wildlife census are as given below:

- 1) Quadrat method: Sampling area is divided into small squares called quadrates. This method is suitable for plants, slow moving animals and some aquatic organisms.
- 2) Mark recaptures method: Sample animals are caught up, marked and releases them to mix thoroughly with the rest of the population and recaptured to estimate the size of the population mathematically.
- 3) Distance sampling: It is widely used group of closely related methods for estimating the density and/or abundance of biological populations. The main methods are:
 - a) Line transect: A series of straight lines (track lines) is traversed by an observer. This may be achieved in various ways, depending on the study species.
 - b) Point transect: In this method, points are selected randomly and counting of number of organisms present at each point. From this number, the size of the population is estimated.
- 4) Camera trapping method: The use of automatic cameras triggered by the passing animals/birds, record medium to large animals and terrestrial birds in the field. Photographs provide objective records or evidence of an animal's presence and identity. There are two types of cameras; active camera that records only motion and the passive camera that records both motion and stripes.

The wildlife census was conducted in the West Nashik division in 2014 and the details are as below:

Table 11.1: Details of wildlife census 2014

Sl. No.	Wildlife	Numbers		Sl. No.	Wildlife	Numbers
1	Barking deer	06		6	Peafowl	130
2	Fox	13		7	Rabbit	302
3	Hyeana	48		8	Jungle cat	01
4	Leopard	64		9	Wild Pig	204
5	Monkey	444		10	Wolf	01
		Contd....			Total	1213

11.6.9 TABLE OF FELLING: Not applicable.

11.6.10 METHOD OF EXECUTING THE FELLING

The prescriptions for Wildlife management in the West Nashik division are as given below:

- 1) **Creation of data base:** The annual population estimation of the wildlife, including the migratory and other rare birds, in addition to the All India Tiger and Panther population estimation shall be undertaken. Special note should be taken if any nesting site of endangered birds like Vultures is noticed. Concurrent monitoring of top carnivores through camera trapping shall be made.
- 2) **Delineation and mapping of special habitat areas:** Delineation of the special wildlife habitat sites including natural water seepage sites (mesic sites), water holes, natural wallows and saltlicks used by the wildlife, breeding sites, dens or nesting sites of animals and birds appearing in the Schedules of the Wildlife (Protection) Act, 1972 shall be carried out and marked on the Division/Range maps. While preparation of treatment map of the coupe for working in the area-specific working circles, the special wildlife habitat sites mentioned above shall be identified and marked on the map along with its buffer of 50 metres width strip around.
- 3) **Habitat development works:** Due to continuous biotic pressure, the wildlife habitat has also deteriorated and today it has reached a critical condition. The most important factors in the habitat are water, food, safe places for resting, breeding, and nesting. Wallows and salt licks are other factors. Before the start of habitat improvement, some demonstration works and visits to wildlife areas should be carried out to expose the field staff to the technical aspects of Wildlife Management. To meet the minimum requirement of the wildlife the following activities are recommended:
 - a. **Water-hole Development:** Water availability is one of the major factors that decide the health of the habitat. Its non-availability at sufficient places in the forests also increases probability of animals being found on the limited water holes or near villages and thereby increases their susceptibility to poaching. Water is a major limiting factor during the summers in these forests. The water-hole density shall be commensurate with the density of wildlife found in the area and as per the wildlife management regulations. The following steps need to be undertaken to meet the requirements of the wildlife:

- i. All the perennial and ephemeral water holes will be identified, recorded and marked on Division/Range maps.
 - ii. De-silting, if required, shall be carried out during summer to provide adequate drinking water.
 - iii. Creation of additional water holes (permanent and temporary) is prescribed so that more number of water-holes is available.
 - iv. Small Nala-bunds, underground bunds and other technically sound small water harvesting structures may be constructed across the streams to create water-holes and habitat development.
 - v. Small water harvesting structures with submergence area less than 1 hectare shall be undertaken. However, creation of water holes or water harvesting structure should not damage the riparian ecosystem.
 - vi. Small cement concrete saucer shaped water holes shall be constructed at suitable and safe places and be linked to borewells fitted with solar powered pumps or handpumps.
- b. **Development of fodder:** The carrying capacity for grazing is determined after excluding the forest area required to meet fodder requirements of the wildlife and ecologically sensitive sites and special habitat sites for wildlife in the area. Habitat improvement is proposed at places having high density of wildlife and the areas frequented by both domestic animals and wildlife. Special efforts are to be initiated to develop meadows.
- i. Grass and fodder development are proposed at places having high density of wildlife and the areas frequented by wildlife.
 - ii. Plantations prescribed in various working circles shall include at least 10 percent of fodder and fruit species of wildlife importance. *Ficus species* like Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Pimpri (*Ficus amplissima*), Payar (*Ficus arnottiana*), Umber (*Ficus racemosa*), etc., are recommended for this purpose.
 - iii. In the areas falling between the High Flood Level (HFL) and the Full Tank Level (FTL) of major and medium irrigation projects adjoining forest areas, planting of good fodder grass shall be undertaken to increase the grazing facilities for the wildlife.
- 4) **Food/Prey base:** Whether the prey base is adequate or not shall be ascertained from regular herbivore count. Supplements of cattle kill

should be taken into account while computing existing herbivore population. Any downward trend should be looked into seriously and possible reasons for its downslide must be found out and rectifying steps shall be undertaken. To improve the prey base, care of herbivores should be taken by improving the assured fodder availability in the forest, especially during the summer season. The open areas in wildlife rich zones should be developed into meadows for the herbivores.

- 5) **Development of Nesting sites:** The naturally occurring Nesting trees and trees with honeycombs need to be identified and marked on GIS map of the Division/Ranges. Good protection and efforts for increasing its number in forest areas need to be undertaken.

11.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

- a) Monitoring of waterholes: A separate register shall be kept with the Forest Guard where the information related to waterhole should be recorded with GPS readings. During summer, special vigilance at all the water holes in the West Nashik Division shall be undertaken on regular basis. The regular visits of staff to these vulnerable areas should be recorded in the register.
- b) Keeping a watch on the electric lines passing through forests: The information about all 11 KV lines passing through the forest areas shall be collected from the Maharashtra State Electricity Board (MSEB) and they shall be marked on the GIS maps. These maps should be distributed to all the field staff. Based on this information, regular joint patrolling along these Electric lines shall be undertaken by both the Forest department and the Electricity department staff. The line-trip data need to be shared to the Forest Department by the Electricity Department on fortnightly basis. Based on the data the priority must be fixed for patrolling.
- c) Monitoring of Weapon licenses in the area: The information regarding the Weapon licences issued in the West Nashik division shall be procured from the Collector office, Nashik. A workshop should be organised every year for all the Weapon licence holders to sensitise about the wildlife issues and provisions of Law in case of any violations. Also, the monitoring of these Weapon holders for any suspicious activity of wildlife poaching need to be done regularly by the respective Range Forest officer. The concerned Assistant Conservator of Forest should take review on regular basis.

- d) Cognizance of all injury or death cases of human and cattle due to wild animals shall be taken on priority. In addition, the speedy and transparent disposals of all compensation cases need to be done as per Government Resolutions. This will help in reducing the anger of the public towards the forest department.
- e) Local staff shall maintain a record of sensitive wildlife areas like areas with heavy wildlife concentration and keeping a track of vulnerable animals to poaching.
- f) Proper disposal of the carcass of wild animals found dead or killed after all legal formalities as per SOPs.
- g) Establishing a network of informers with the aid of Secret Service Fund provided to the division. This will help in prevention of wildlife poaching effectively in the area.
- h) Every year one regular short-term training/workshops to staff regarding the anti-poaching activities, and legal requirements in dealing with wildlife offence cases shall be conducted in each Range. The Deputy Conservator of Forests, West Nashik division shall prepare the detailed programme and send proposals for funding for these activities from the Principal Chief Conservator of Forests (Wildlife), Maharashtra state.
- i) Cases of Man-wildlife conflict should be handled swiftly and efficiently. Keeping in view the vast area of the division, at least two Rapid Response teams shall be operationalized 24 x 7. Such teams should be provided need based training. Every Range HQ should be adequately equipped with necessary equipment for handling wildlife conflict situations.
- j) Nature education programme in the villages adjoining forests and in schools and colleges shall be arranged under Nisarganubhav programme of the Maharashtra State Ecotourism Board. The involvement of Honorary Wildlife Warden and good NGO's is encouraged for nature education programme.
- k) It will be ensured that cattle grazing in forests near the important wildlife habitats are inoculated against infectious diseases. The Deputy Conservator of Forests, West Nashik division should plan the Veterinary camps in forest fringe areas with the help of the Animal Husbandry Department.

11.6.12 REGENERATION

The prescriptions for regeneration of vegetation as part of habitat development shall be in tune with the prescriptions given in the respective working circles. In case any specific intervention is required, that can be

undertaken after such plans are approved by the Deputy Conservator of Forests, West Nashik division.

11.6.13 ASSOCIATED REGULATIONS AND MEASURES

11.6.13.1 Human-Wildlife Conflict

Conflicts between humans and wildlife have occurred since the dawn of humanity. However, in many regions these conflicts have intensified over recent decades as a result of growth of human population and the related expansion of agricultural and industrial activities. Impacts of Human-Wildlife conflict can range from injury and death, loss of crops and livestock, damaged infrastructure, disease transmission, etc. As a result of these negative impacts, wildlife species may be killed in retaliation.

The Human-Wildlife conflict in West Nashik division revolves around the Leopard problem in Agriculture fields and human habitations. This is a unique problem to this tract. While dealing with the Leopard problem, the steps need to be followed are given below:

- 1) Ministry of Environment, Forests and Climate Change (MoEFCC), Government of India, issued guidelines for Human-Leopard conflict management in 2011, after careful consideration of the inputs received from a variety of stakeholders. These guidelines are needed to be religiously followed in dealing with Human-Leopard conflict situations in areas where leopards coexist among high densities of humans. These guidelines are provided in Appendix II.53.
- 2) Deputy Conservator of Forests, West Nashik division shall prepare a project for wildlife conflict management mainly of Leopard and get approval from the Chief Wildlife Warden, Maharashtra state for its implementation. This Project shall include following points:
 - a. Education and awareness creation among public and staff: Communities are likely to be less resentful and more tolerant towards wildlife populations and their damage, if they are educated properly about the wildlife management issues and the precaution measures against wildlife damages. Therefore, a special project mode approach for creating the awareness about the wildlife behaviour, precautions to be taken during conflicts and the necessity of wildlife conservation, etc., need to be undertaken.

- b. Empowerment and involvement of Communities in wildlife management: Empowering rural communities with knowledge of animal behaviour and information about past conflicts, seasonal patterns, breeding seasons and habitat preferences, as well as practical skills and tools, may help them to deal with wild animal species and acquire new approaches for protecting their crops and livestock.
- c. The payment of compensation and crop insurance: Payment of compensation will increase the tolerance levels against wildlife damage among the affected communities and prevent them from taking retaliatory action themselves. The Insurance schemes need to be encouraged among farming community which will be of great help to the farmer at the time of wildlife damages. The Government of Maharashtra is very generous in providing compensation to wildlife damages which is highest in the country. Effective and timely payment of compensation is crucial for reducing the negative effects on wildlife by humans.
- d. Good land-use planning: This will be critical in the long term management of Human-Animal conflicts. Good land-use interventions both inside forests and on farms will reduce the conflict levels. In consultation with Agriculture department, a suitable cropping pattern needs to be developed in wildlife prone areas which will be beneficial to both farmers and the wildlife. Though this is a difficult task to convince a farmer to shift his farming pattern, this can be tried first in acute wildlife problem areas and by seeing the results, it can be expanded. The suitable change in planting technique in forest areas near to habitations will be helpful in reducing the conflicts. Creation of vegetative barrier in the form of high density plantations consisting of mixture of fruit species, bamboo, grass land, shrubby vegetation for shelter, etc., will help in controlling the movement of wildlife towards habitations. Suitable sites in acute conflict areas should be identified by the field staff for raising these kind of plantations.
- e. Barriers: Including fences like solar fencing, barbed wire fencing and chain link fencing will help in reducing the conflicts. In Protected areas, the solar fencing and chain-link fencing schemes are being implemented under Shyamaprasad Mukherjee Jan van yojana. This scheme needs to be extended to territorial forest areas.

11.6.13.2 Protection measures for Wildlife

- 1) **Vaccination of livestock:** There are many villages within and in forest fringe area. They are dependent on agriculture and forestry works. These villages, with large number of livestock are threat to the wild animals as they share the same water bodies and grazing grounds. Due to common grazing and drinking water at same places, many contagious diseases may spread to wild animals. To protect the wild animals from such contagious diseases, forest department with the help of the Animal Husbandry Department, should take the following preventive measures in such villages:
 - a. Forest staff, with the help of veterinary doctor of the area, should organize annual livestock health check-up camps in villages.
 - b. All livestock present in villages within forest area and comes within 5 KM from the boundary of forest areas should be vaccinated every year for important diseases through the Animal Husbandry Department.
 - c. This activity shall be monitored by the Deputy Conservator of Forest, West Nashik division.
- 2) **Proper sensitization of Staff:** The field staffs of the West Nashik division should be trained in day to day wildlife management and protection works. They should work in close cooperation with the Wildlife wing.
- 3) **Protection from Poaching and Trade:** The forest staff shall develop intelligence system with the help of local people, especially with Joint Forest Management Committee, to gather information about any activities related to poachers and traders of wild life.
 - a. Regular patrolling by the staff shall be carried out in the areas where the population of wildlife is more, especially during summer when these animals become more vulnerable due to water shortage in the forest areas.
 - b. The forest staff shall also be vigilant in the towns' market where at times birds like Parakeets, Partridges, Quails, Water-birds, Monitor lizards, Tortoise, Turtles etc., are brought for sale. If such incidents found, then action should be initiated against the culprits.
- 4) **Protection of Forest from Over-grazing and Fire:** After poaching, uncontrolled grazing and fire are the most important factors, adversely affecting the wildlife. To restrict illegal grazing by cattle, the cattle passes need to be issued after careful verification and their regular monitoring should be done by the field staff. In monthly division meeting, Deputy

Conservator of Forests, West Nashik division should take review of the cattle passes. An effective fire management should be undertaken every year as per the fire protection plan prepared at the division level.

- 5) **Capacity building:** Books related to wildlife management, wild animals' diseases, tranquilization, etc., should be supplied to the field staff to improve their management skills. Short duration training for tranquilization of wild animals to the forest staff and Veterinary Doctors, shall be imparted.
- 6) **Marking Reservations and other restrictions:** The following prescriptions have been made for implementation along with coupe operations and other treatment prescriptions, in the wildlife area-specific coupes.
 - a. No felling of trees or harvesting of any sort shall be allowed in riparian zone.
 - b. While marking of dead, wind fallen and malformed trees in annual coupes, 2 trees per hectare shall be kept reserved, as snags and dens to provide for nesting and resting place for wildlife. No fruit tree of wildlife importance shall be marked for felling in the annual coupes.
 - c. While harvesting at least 2 fallen hollow logs of low commercial value, per hectare shall be reserved for wildlife shelter.
 - d. Labour camps shall not be allowed near water holes frequented by the large mammals or other important wildlife species. The labour camps shall be established away from forest areas.
- 7) **Motivation of staff:** The Deputy Conservator of Forests, West Nashik division will take special care to motivate and orient the field staff in favour of Wildlife through regular meetings, guidance and workshops. Some of the Range Forest Officers and Foresters shall be sent to short term training at the Wildlife Institute of India (WII), Dehradun. Besides this, help from trained officers and staff of wildlife Divisions may also be taken.
- 8) **Vulture Restaurant:** Already one Vulture Restaurant is present in Harsul Range. This needs further strengthening for effective Vulture conservation. DCF West Nashik division shall prepare a Project by including the steps to strengthen the existing Vulture Restaurant like fencing, water hole development inside the fenced area, honorarium to the villagers bringing the carrion to the Vulture Restaurant, watch and ward, awareness about Vulture conservation in surrounding villages, etc., and submit it to the office of the Chief Wildlife Warden, Maharashtra state for approval and providing funds for its implementation.

CHAPTER-12

MANAGEMENT FOR CONSERVATION AND ENHANCEMENT OF BIODIVERSITY

12.1 NAME OF WORKING CIRCLE

The conservation of land, natural resources and biodiversity have become a prime focus across the globe. In the past, most conservation efforts focused disproportionately on separate endangered species, notably large mammals and keystone species. Today, there are a variety of approaches to help conserve species, their habitats, and other valuable resources. Traditional approaches, which continue to remain a crucial factor, include setting aside areas like Protected Areas and Biosphere Reserves, and passing laws that preserve endangered species. More recent efforts focus on the use of market instruments like Agroforestry, Ecotourism, and Bio-prospecting to encourage countries and individuals to engage in more sustainable practices, and on scientific methods, like the reintroduction of species and the creation of gene banks of known species to help ensure biodiversity into the future. This chapter covers the issues regarding biodiversity, its importance, threats, and mitigation in West Nashik division. The prescriptions provided in this chapter are applicable to whole of the West Nashik division.

12.2 GENERAL CONSTITUTION OF WORKING CIRCLE

The concept of biological diversity has been known to man ever since he began to minutely observe the living being around him. However, biodiversity did not become a familiar term to the public until the United Nations Conference on Environmental Development (UNCED) held at Rio de Janeiro (Brazil) in 1992. The Conference laid immense stress on the biological diversity of our earth planet and the need to preserve it for posterity. Biodiversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. India is a party to the Convention on Biological Diversity (CBD), which represents a legally binding multilateral environmental agreement. Pursuant to the CBD, India enacted the Biological Diversity Act in 2002, and notified Biological Diversity Rules in 2004, to impart effect to the provisions of the Convention. It includes three objectives:

- 1) Conservation of biological diversity
- 2) Sustainable use of the diversity and
- 3) Ensuring fair and equitable sharing of benefits of such use.

The Act and the Rules are implemented in India through a decentralized system. A three-tier structure has been established under the Act at the national, state and local levels:

- 1) At the local level, the Biodiversity Management Committees (BMCs) are to be established by institutions of local self-government for implementation of specific provisions of the Act and Rules.
- 2) At the state level, the State Biodiversity Boards (SBBs) are established to handle all matters relating to the implementation of the Act and the Rules.
- 3) At the national level, the National Biodiversity Authority (NBA) is established to address all matters relating to the implementation of the Act and the Rules.
- 4) Each of these structures is required to be connected for decision-making processes on various issues, including issues of access and benefit-sharing (ABS).
- 5) As per the Government of India, Gazette Notification dated 7th January 2009, all forest officers not below the rank of the Range Forest officer are authorized to lodge complaints under section 61 (a) of the Biological Diversity Act 2002. The Maharashtra Government vide Government Resolution dated 14th September 2018, made the Deputy Conservator of Forest as the Member-Secretary of the District level monitoring committee to monitor the implementation of the Biological Diversity Act 2002 at the district level. He has to fulfil a proactive role in dovetailing the district administration's support for the effective implementation of the Act.

12.3 GENERAL CHARACTERISTICS OF VEGETATION

The West Nashik forest division is having a broad variety of landforms varying from mountains that are part of Sahyadri to plains. Cultural and farming diversity is also clearly evident in this region. Much of this terrain is under human management. Hence, conservation strategies that aimed to balance the protection of biological diversity with the human need for land and natural resources remain the key. The potential avenues of market instruments like Agroforestry, Ecotourism and Bio-prospecting have more potential in this

area. In addition to traditional approaches to conservation, the addition of above-market instruments will advance a long way in the sustainable development of the area.

The Anjaneri Reserve Forests in West Nashik division has been constituted as the “Conservation Reserve” as per Revenue and Forest Department notification dated 31st January 2017, for its ecological, faunal and floral significance, and for the purpose of protecting white backed and long billed vultures. The area of “Anjaneri Conservation Reserve” is 569.36 Ha or 5.69 Sq Km. The place has become well known as the type locality of *Ceropegia anjanerica*. It is not reported from any other hill in the surrounding area. There is a great need for conservation of this locality as the only site of existence of this species. *Ceropegia anjanerica* is found in large numbers in association with clumps of *Senecio dalzellii*, *Celosia argentea*, *Lepidagathis* spp., and *Justicia betonica*. Other Western Ghat unique species found on the plateau are *Tricholepis amplexicaulis*, *Desmodium alysicarpoides*, *Heracleum* spp, *Pinda cocanensis*, *Paracaryum malabaricum*, etc. Along with this, the 10 to 12 metres high vertical cliffs are commonly seen here that are providing safe nesting sites for White backed and Long billed vultures. These critically endangered scavenging species is seen in healthy numbers in this area.

12.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS: Not applicable

12.5 BLOCKS, COMPARTMENTS AND JFM AREA: Not applicable

12.6 SPECIAL OBJECTIVES OF MANAGEMENT

- 1) To document, protect and replenish indigenous vegetation and local ecosystems of the area.
- 2) To protect and restore freshwater ecosystems.
- 3) To document and control of invasive species.
- 4) To minimize impacts of human interference and other disturbance like fire, grazing, etc., on biodiversity.
- 5) To maintain and record indigenous peoples’ ethno-botanical knowledge.
- 6) To sensitize the staff and local communities on the issues of Biodiversity for better appreciation and interpretation of the area.

12.6.1 ANALYSIS OF THE CROP

Biological diversity remains a national asset of a country and hence, the conservation of biodiversity assumes more considerable significance. The primary step for conservation of biodiversity is to have a sound system of survey, inventory, taxonomic validation and threat assessment of floral and faunal resources at the local level. Based on such data, management prescriptions need to be developed. Such managed forests will play a key role in the conservation of genetic resources and intra-specific variation in socio-economically significant species. In doing so, attention should be given both to the management of generally species-rich secondary forests in various stages of development, and to the conservation of genetic resources of species characteristic of the mature phase or climax forest.

The two dominant interventions that are carried out by the forest department are harvesting and regeneration. In harvesting, the domination of short-term economic and market forces led to failures in attaining sustainability in natural forest management and conservation. Hence, it is vital that harvesting is complemented by appropriate silvicultural interventions in which due consideration is given to genetic principles. In addition, while taking up regeneration in the form of forest plantations, thorough consideration of a proper mosaic of native plant species need to be planned that can help to conserve genetic resources of priority forest tree species.

The Biological Diversity Act was enacted in 2002 to conserve biodiversity, manage its sustainable use and enable fair and equitable sharing of benefits arising out of the use of biological resources with the local communities. Though 18 years have passed since the enactment of the Act, most of the local bodies present in the West Nashik division have not prepared the People's Biodiversity Registers (PBRs), which are considered to remain the fundamental records of a region's biological resources like plants, animals and the traditional knowledge of the local people. In the absence of the PBRs, the effective implementation of the Act is not visible at the field level.

The Anjaneri Conservation Reserve area is having endemic species and other endangered flora. Hence, necessary protection measures need to be provided. A special Forest protection plan and Fire protection plan shall be prepared for this area. The proposal of Eco-sensitive zone around this Protected Area shall be prepared and submitted to MoEFCC through proper channel at the earliest. Till the final notification of ESZ, the ESZ of 10 km distance from

the boundary criteria as directed by the Hon'ble Supreme Court of India shall be strictly adhered to and necessary protection measures shall be provided to this whole area.

12.6.2 SILVICULTURAL SYSTEM

There are two approaches of biodiversity conservation namely, in situ (on site) conservation and ex situ (off site) conservation.

- a) **In situ Conservation:** In situ conservation means the conservation of ecosystem and natural habitat and maintenance and recovery of viable population of species in the natural surrounding where they have developed their distinctive characteristics. Examples of in-situ conservation are National parks, Wildlife Sanctuaries, Conservation Reserves, Community Reserves, Biosphere reserve, Wetlands, Mangroves and Coral Reefs, Preservation plots, etc.
- b) **Ex situ Conservation:** Ex situ conservation means the conservation of biological diversity components outside their natural habitat. Examples of Ex-situ conservation are botanical and zoological gardens, arboretums, seed bank (gene banks) or some other suitable forms by means of tissue culture techniques.

12.6.3 ROTATION PERIOD: Not applicable

12.6.4 HARVESTABLE DIAMETERS: Not applicable

12.6.5 REDUCING FACTORS AND REDUCED AREAS: Not applicable

12.6.6 FELLING CYCLE: Not applicable

12.6.7 DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCKS: Not applicable

12.6.8 CALCULATION OF THE YIELD

The International Union for Conservation of Nature and Natural Resources (IUCN) has established the following five main conservation categories. These categories were named as Red list categories. This list aims to impart information about the urgency and scale of conservation problems to the public, environmentalists and policy makers.

- 1) Extinct species that are no longer known to exist in the wild. Searches of localities where they were once found and of other possible sites have failed to detect the species.
- 2) Endangered species that have a high likelihood of going extinct in the near future.
- 3) Vulnerable species that may become endangered in the near future because populations of the species are decreasing in size throughout its range.
- 4) Rare species that have small total number of individuals often due to limited geographical ranges or low population densities.
- 5) Insufficiently known species that probably belong to one of the conservation categories but are not sufficiently well known to be assigned to a specific category.

12.6.9 TABLE OF FELLING: Not applicable

12.6.10 METHOD OF EXECUTING THE FELLING

The prescriptions regarding the biodiversity conservation in West Nashik division are as given below:

- 1) The West Nashik forest division in consultation with the local Colleges, Anthropological/Social science institutions and the Maharashtra State Biodiversity Board should carry out Biodiversity studies of all life forms of the flora and fauna. These shall include following in addition to trees and animals:
 - a. Documentation and studies of herbaceous plants
 - b. Documentation and studies on the fungi, ferns, algae and lichen and moss (if any).
 - c. Carry out entomological studies.
 - d. Carry out herpetological studies.
 - e. Documentation of medicinal plants and local traditional medicinal practices along with other indigenous technical knowledge.
 - f. In all above studies, proper documentation with the distribution of species, the abundance and threats to the species may be included.
- 2) The field functionaries of the West Nashik forest division shall identify areas of significant biodiversity value and take lead in In-situ and Ex-situ conservation based on above studies.

- 3) As per the Government of India, Gazette Notification dated 7th January 2009, all forest officers not below the rank of Range forest officers are authorized to file complaints under section 61(a) of the Biological Diversity Act 2002. Hence, the Range Forest officers shall start register offences under the various provisions of the Biological Diversity Act 2002.
- 4) As per the Biodiversity Act 2002, Biodiversity Management Committee (BMC) in each Gram panchayat needs to be established. The local forest Guard/Forester should provide all help and co-operation to the Gram Sabha for the establishment and functioning of the BMCs as and when required.
- 5) All JFM Committees should have People Biodiversity Registers (PBR) as part of the various records to be kept. The Maharashtra State Biodiversity Board, Nagpur should be consulted for the same. Necessary Workshops, training, etc., required for this should be carried out.
- 6) Documentation of Local Medicinal Practitioners (LMP) and the species used by them shall be done through local Colleges/Institutions. After that the Deputy Conservator of Forests, West Nashik division should chalk out the ways and means of sustainable harvest of such medicinal plants.
- 7) Sensitization of the staff of the West Nashik forest division to the issues of biodiversity and its conservation is of utmost importance. The Deputy Conservator of Forests, West Nashik division shall involve such experts and institutions in consultation with the Maharashtra State Biodiversity Board, Nagpur for such training and workshops.
- 8) All efforts should be made to control fire and grazing in the forests as these are among the most principal enemies of biodiversity.

12.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

The following measures need to be undertaken for conservation of Biodiversity:

- 1) Restoration of degraded forest areas through well-planned afforestation programs.
- 2) A separate Management Plan shall be prepared for the management of Anjaneri Conservation Reserve at the earliest and it should include following points:
 - a. Biodiversity profile of the area.

- b. Current and potential threats to the biodiversity, and Conservation and enhancement of natural vegetation.
- c. Protection measures like control of forest fires, grazing, lopping, etc. Special protection of bird habitats, especially of the vultures.
- d. Awareness creation among all the surrounding villages to sensitize about the importance of biodiversity and to reduce overexploitation of plant resources
- e. Protection of natural drainage and micro-planning for water and ecological conservation
- f. Capacity building of JFM committees to design a sustainable development of the area.
- g. Eco-friendly enterprises can be promoted to give locals added income sources.
- h. Management of existing tourism to avoid problems of garbage, nuisance to wilderness etc.
- i. Implementation of Shyamaprasad Mukherjee Jan Van yojana in the area.

12.6.12 REGENERATION

The prescriptions for regeneration has been provided in the area based working circles (Chapter 2 to 5). Those prescriptions shall be followed for the conservation and augmentation of local flora through Natural and Artificial regeneration techniques. There shall be no introduction of exotic species into the forest area in West Nashik division.

12.6.13 ASSOCIATED REGULATIONS AND MEASURES

- a) Effective implementation of the Indian Forest Act 1927, the Wildlife (Protection) Act 1972, the Forest (Conservation) Act 1980, the Biological Diversity Act 2002, etc., for protection and conservation of the Biodiversity present in the area.
- b) Encourage the use of alternative energy like LPG, improved chullah, improved breeds of cow/buffalo, etc. This will help in both general development of the society and the forest ecosystem.
- c) Encourage the use of eco-friendly products and their recycling to reduce pollution in the area.
- d) Enhancing awareness among children and the public through well-documented awareness programs need to be implemented at frequent intervals.

CHAPTER-13

MANAGEMENT OF FOREST HEALTH AND VITALITY

13.1 NAME OF WORKING CIRCLE

Maintaining forest health and vitality is dependent upon the ability of the ecosystem's functions and processes to recover from or adapt to disturbances. While many disturbance and stress events from natural components of forest ecosystems, some may overwhelm ecosystem functions, fundamentally altering their patterns and processes and reducing ecological function. The decline in forest ecosystem health and vitality may have significant economic and ecological consequences for society including a loss of benefits from forest and ruin environmental quality. The maintenance of forest ecosystem health and vitality represents the foundation of sustainable forest management. This Chapter deals with prescriptions related to keep up and improve the health and vigour of the forests. The prescriptions provided in this Chapter are applicable to the whole of the West Nashik Division.

13.2 GENERAL CONSTITUTION OF WORKING CIRCLE

Healthy forests are essential for sustainable forest management. But forests like other ecosystems are subject to a number of threats that can cause tree crop mortality or cut their ability to offer an extensive range of goods and services. Any change in the structure and functioning of natural ecosystems and planted forests will have adverse impacts on the productive function of forest ecosystems, which in turn affect local economies. The causes of the negative impacts on forest health and vitality vary from place to place, and the size and duration of the impacts are difficult to assess. Causes include, but are not limited to fire, insects and diseases, uncontrolled grazing, invasive species, air pollution and extreme climatic events (e.g. drought, frost, storms, and floods). The complexity and interrelationship of these factors and their impact on the health and vitality of forests are difficult to unravel. The global climate change, primarily the result of human activities, is reportedly making forest ecosystems more prone to damage by altering the frequency, intensity, and timing of fire events, droughts, and insect and disease outbreaks, etc. In addition, human activities like encroachment, overgrazing, intentional forest fire, etc., are enhancing degradation of the forest ecosystem. Hence, information gained on the impacts of biotic and abiotic processes, and various

agents, may tell management strategies to reduce and mitigate the risks to the forest ecosystem.

13.3 GENERAL CHARACTERISTICS OF VEGETATION

The forests of the West Nashik division are spread over different physiographical landscapes. The western side is predominantly included with hills with steep slopes while the eastern side is maintaining a relatively flat landscape. Due to this varied topography, the forests are susceptible to various threats in the form of forest fires, grazing, soil erosion, encroachment, etc. The incidences of forest fires are high in this tract and due to difficult topography, the control of forest fires is very challenging to forest staff. The presence of a high number of unproductive livestock in this area puts many pressures on the forests for pasture. The recent spurt in the encroachment of forest lands after the enactment of the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 presents an extremely grave problem for forest management. As the land value is exceptionally high in this area, the protection of the forest area shall obtain the prime objective of the forest department and other works shall be secondary to it. The consolidation of forest boundary of the whole forest division needs to be done promptly in a time bound manner.

13.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS: Not applicable.

13.5 BLOCKS, COMPARTMENTS AND JFM AREA

The details of inter-state, inter-district and inter-division boundary are as given below:

Table 13.1: Details of inter-state, inter-district and inter-division boundaries of the West Nashik division

Sl. No.	Type of boundary	Details	Length (km)
1	State boundary	Gujarat State boundary	92.104
2	District boundary	Ahmednagar	172.275
		Thane	49.320
		Palghar	62.209
		Total	283.804
3	Division boundary	East Nashik	203.619

13.6 SPECIAL OBJECTIVES OF MANAGEMENT

To improve the general health of the forest ecosystem by striving for better composition, normal age distribution, and sturdy structure with high vigour of the forest through the following actions:

- 1) Complete demarcation of forest areas to maintain the territorial integrity in a time-bound manner.
- 2) Minimizing the occurrence and impact of forest fires.
- 3) Detecting and containing pests and diseases from all forms of parasites, fungal, and bacterial attacks.
- 4) Ensuring the grazing in the forest is kept to a minimum of the carrying capacity of the area.
- 5) Reducing human interference on the forest from illegal felling, grazing, hunting, etc., by enforcing the law and influencing the moral perception of the people.

13.6.1 ANALYSIS OF THE CROP

As per Status of Forest Report (SFR)-2017 of the Forest Survey of India (FSI), Dehradun, the forest cover in Nashik district shows progressive degradation that is mainly due to human-centric activities.

Table 13.2: Forest cover status in Nashik district as per SFR reports.

SFR Report	Geographical area (Sq km)	Very dense	Moderately dense	Open forest	Total	% of Geographical area	Change	Scrub
2017	15530	0	350	718	1068	6.88	-16	330
2015	15530	0	351	738	1089	7.01	0	319
2013	15530	0	351	738	1089	7.01	0	319
2011	15530	0	351	738	1089	7.01	0	319
2009	15530	0	351	738	1089	7.01	0	319

The dense forest is totally absent in the district, and the forest area is gradually converting into open and scrub forests due to heavy biotic pressure. Regeneration is inadequate in most of the forest areas due to biotic interference. The biotic factors responsible for degradation of the forests are encroachment, excessive grazing, frequent fires, illicit felling, fuelwood dependency, and weed infestation. The illegal fellings are often concentrated on the species most valued for various purposes. Seedling stages are particularly

exposed to extermination due to excessive grazing and fires. The species surviving during degradation stages are resistant ones, which can withstand the grazing and fires. These species are often of low utility. Therefore, it is perceived that there is an urgent need for the restoration of the forests of West Nashik division through the improvement of forest health and vitality.

13.6.2 SILVICULTURAL SYSTEM

Maintaining forest health and vitality represents the foundation of sustainable forest management. The decline in forest ecosystem health may suffer significant economic and ecological consequences for the society. The threats to forest health and vitality comprise both abiotic and biotic factors. In dealing with those threats, a comprehensive planning process is necessary. The following steps need to be followed for prevention and control of threats to forest health and vitality:

- 1) Monitoring of forests by regular vigilance about the threats to the forest ecosystem and finding out the agents of threats.
- 2) Collection of data about the kind of threats, factors, and processes and their extent.
- 3) Analyze the data and develop various mechanisms and procedures to deal with each of those threats.
- 4) Formulate the alternatives in the form of steps to be followed in the field for its successful implementation for prevention and control of threats.
- 5) Evaluate the alternatives to determine their effectiveness in addressing the problems, opportunities, and objectives.
- 6) Fulfillment of all legal formalities for the successful implementation of the previous steps.
- 7) Necessary resource arrangements like manpower, finance, materials, training, etc., need to be arranged.
- 8) Implementation of preventive and control measures.
- 9) Evaluation of the implementation plans to know its effectiveness and necessity for any modifications.

13.6.3 ROTATION PERIOD: Not applicable

13.6.4 HARVESTABLE DIAMETERS: Not applicable

13.6.5 REDUCING FACTORS AND REDUCED AREAS: Not applicable

13.6.6 FELLING CYCLE: Not applicable

13.6.7 DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCKS: Not applicable

13.6.8 CALCULATION OF THE YIELD: Not applicable

13.6.9 TABLE OF FELLING: Not applicable

13.6.10 METHOD OF EXECUTING THE FELLING

The prescriptions regarding execution of various forest protection measures are discussed below:

13.6.10.1 Fire management: Fire adversely affects natural regeneration, forest growth, ground flora, soil organisms, and site productivity. Effective fire control is essential for sustainable forest development. To formulate an effective procedure for control of forest fires, the entire forest area of West Nashik division shall be divided into following classes:

- a) **Class-I (Complete Fire Protection):** The Class-I fire control areas include all forest areas with good Natural regeneration, plantations, the A-type areas of all coupes, forest depots, forest nurseries, special wildlife habitat areas and any other areas of special importance decided as such by the Deputy Conservator of Forests, West Nashik division.
- b) **Class-II (General Fire Protection):** The Class-II fire control areas include the remaining areas of the Improvement Working Circle (IWC), Protection working circle (PWC) and Grass and Fodder Management working circle (G&FWC) as well as any other areas, which deserve this protection in the opinion of the Deputy Conservator of Forests, West Nashik division.
- c) **Class-III (General vigilance):** The remaining forest areas (areas not included in the previous two classes) are identified as the Class-III fire control areas. Any special measure for fire protection is not undertaken, but the deliberate setting of fire and burning the forest is prohibited.

13.6.10.1.1 Forest fire prevention measures

- 1) A fire protection scheme for the entire division shall be prepared before November each year, identifying the strategic locations (including watchtowers), the strength of fire watchers at each location, deployment of vehicles, use of wireless sets, supervising of the forest staff and the coordination protocol.

- 2) The field staff of West Nashik division and local people should be sensitized about the need for effective fire control. To achieve this, a field-level workshop for all forest staff and JFMC members shall be conducted at all Ranges in the month of December/January.
- 3) All the Class-I and Class-II areas will have external fire lines and internal fire lines dividing the forest area into convenient blocks.
- 4) The cutting of fire lines should be completed in December. Fire tracing (burning) should be completed in February and thereafter should require the permission of the Deputy Conservator of Forests, West Nashik division and the physical presence of a gazetted officer.
- 5) In all Range offices "Register of fire lines," shall be maintain and enter the period of cutting and burning of fire lines. The register will be kept up to date and checked every year in March by the concerned Assistant Conservator of Forests and the Deputy Conservator of Forests, West Nashik division.
- 6) The standard widths of firelines are provided in Table 13.3. The supervising officer will decide the width unit for carrying out the fire line work on the shared boundary.
- 7) Establishment of 24x7 Control Room at all Ranges and Division Office by pooling of resources is necessary to swiftly deploy the teams for dousing fires.
- 8) Fire alerts are being sent to the concerned forest staff by the Forest Survey of India (FSI), Dehradun on registration. It shall be mandatory on the part of the Deputy Conservator of Forests, West Nashik division to register him and make all his staff from Assistant Conservator of Forests till Beat guards get register with the site for receiving these fire alerts from the Forest Survey of India (FSI). Nevertheless, there may be issues of positional accuracy, the inability of detection of small fires, and the probability of false alarms, the system will, however keep the firefighting machinery in alertness.
- 9) A systematic plan for taking up live-hedge planting like *Agave americana* (Agave), *Opuntia ficus-indica* (Cactus), and *Euphorbia ligularia* (Saber), etc., on the boundary of forests along roads, shall be prepared and implemented in a phased manner. This will help in the creation of a vegetative barrier against the spreading of fire from the public travelling on roads. Also, this activity will reduce repeated expenditure of fireline creation along the roads. Bush seed sowing of valuable fire hardy species can be undertaken once the live-hedge is completely established in the area.

Table 13.3: Standard width of various types of fire lines

Sl. No.	Characteristics of the area	Width of fire line
1	External Reserved and Protected Forests boundary including division boundary	12 metres
2	Naturally or artificially regenerated areas (For 5 years)	6 metres
3	Remaining coupe boundary	3 metres
4	Both sides of roads and cart tracks passing through the forests	6 metres
5	Inter-state boundary, Timber, bamboo and firewood depots	30 metres

13.6.10.1.2 Forest fire control measures

- 1) The Deputy Conservator of Forests, West Nashik division to plan the erection of fire watchtowers and establish fire-fighting squads to tackle fire menace in the Division and their duty shall be assigned in line with the squads deployed in the wildlife areas. These squads shall be concentrated in areas where Natural regeneration is being nurtured in the felled coupes and in other fire sensitive areas of the Division. This measure is independent of the watchers engaged in plantation areas. The squads shall ensure no fire incident occurs anywhere in the Division.
- 2) Each location is proposed to have 5 to 10 persons (24x7) including regular staff. Fire prevention should be treated as a top priority item and implemented sincerely during the fire season.
- 3) Areas deliberately burnt for silvicultural reasons under the sanction of the Chief Conservator of Forests, West Nashik division will be excluded from the fire protection scheme. Fire in such areas need not be reported unless spreads beyond such areas.
- 4) Fire Watchers and local forest staff will constantly patrol the Class-I and Class-II fire control areas. The directives require that fires in the Class-I areas be reported to the Deputy Conservator of Forests, West Nashik division immediately, along with details of the area burnt and the damage inflicted on the forest crop.

- 5) The fire lines will be kept clear of all growth and combustible material during the fire season. Leaf litter and other dry material on the fire lines will be collected periodically along the edge and burnt before the fire season starts.
- 6) Fire blowers are extremely effective for clearing the litter from the ground and breaking the spread of fire. The use of these blowers has proven very effective in reducing the labour intensity for firefighting and containing the damage from fire. The blowers should, in addition, be used for maintaining the fire lines, as over time the litter and other dry material falling on the fire line makes them ineffective.
- 7) The group of fire watchers shall immediately rush to the site and extinguish the fire as soon the fire spot is located by upcoming smoke in their area of operation. Modern fire-fighting tools should be utilized for extinguishing the fire. The supervising officials should mobilize reinforcement in case of a massive fire. Utmost care will be exercised to quench the smouldering material. Providing a thick layer of soil over such material is generally effective.
- 8) All fire incidences must be meticulously recorded and investigated to assess the damage. The extremely vague practice reflects the lackadaisical approach to and indifference or the lack of knowledge on the harmful effects of fire on the forests on part of frontline staff. The change of attitude of the field staff is necessary, so as to take the estimation of fire damage seriously.
- 9) Negligence in the fire protection by the staff should be considered as a dereliction of duties.

13.6.10.2 Grazing management

Livestock grazing changes the habitat indirectly by changing soil properties and directly by removal of vegetation. High grazing pressure may change plant diversity mainly by decreasing the abundance of palatable herbaceous species. It can also cause degradation of the forest understorey and reduce tree regeneration. The management of grazing in forests is necessary for enhancing regeneration and reducing the soil compaction. Good grazing and range management are vital for the sustainable management of both livestock and the grazing land. Range management ensures pasture is available for livestock year-round and the soil remains healthy. Good range management organizes livestock to cause the best use of the pasture and helps conserve biodiversity. Sustainable grazing and range management are affected by:

- a) Land condition
- b) Pasture quality and quantity
- c) Grazing frequency and intensity.

All these factors need to be considered while deciding on a range management plan for the area. Good management practices will impact positively on the health of the land and livestock. However, the most key decision for successful range management is determining the carrying capacity and setting a proper stocking rate. Combining the number of grazing animals with the forage resource is an important management decision regardless of the grazing system.

The functional classification of the forest as enunciated in the Grazing policy formulated by the Government of Maharashtra vide its Resolution No. MFP-1365/13221-Y dated 06/12/1968 are as given below:

- 1) **Protection forests:** This includes forests which occur on very steep slopes (25° and above) or along the river banks and forest that have become depleted due to maltreatment. Further harvesting of it will accelerate soil erosion and adversely affect the productivity of agricultural lands in the lower regions. The aim of management shall be to conserve these forests, so that they may extend their beneficial influence on the soil and water regime in order to improve the physical and climatic factors of the locality.
- 2) **Tree forest:** This includes forests situated in the remote areas and is suitable for growing large-sized timber and other produce of commercial value.
- 3) **Minor forest:** This includes forests capable of producing small-sized timber, fuelwood, and has grazing potential.
- 4) **Pasture lands:** This includes open areas and scrubby lands that can be developed as pasture lands. This includes small blocks of forest situated amidst intensively cultivated tracts carrying scrubby growth and capable of producing good fodder grasses.

The grazing rules are framed by the Government of Maharashtra vide its resolution No. MFP/1371/237035-Z dated 03/11/1973. The grazing will be regulated as per the prescribed grazing incidences for each class of forests. Keeping in view the above provisions, the grazing in the various Working circles of the Plan will be regulated as under:

- a) Protection working circle: As per the functional classification, the majority of the forests falling in this working circle are classified as 'protection forest.' The areas under this working circle are completely protected from grazing.
- b) Improvement working circle: This working circle comprises tree forests and the maximum grazing incidence prescribed for it is one cattle unit per 5 hectares owing to the degraded nature of the forests. All main felling coupes will remain closed to grazing for a period of 5 years from the year of felling.
- c) Afforestation working circle: The forests of this working circle are mainly classified as 'minor forest.' The grazing incidence for these forests should not be more than one cattle unit per 5 hectares owing to the degraded nature of the forests. The main coupes will remain closed for a period of 5 years from the year of planting.
- d) Grass and fodder working circle: The forest of this working circle can mainly be classified as 'pasture forests.' But these areas are vastly degraded due to uncontrolled grazing. So, the provision of the 'cut and carry' principle is adopted for these areas. In addition, rotational grazing is also allowed in these areas after successful development of grasslands.

The fee to be levied for issuing grazing permit is as per the rates fixed by the Government of Maharashtra from time to time. However, the present rates as per the above-cited GR are as below:

Table 13.4: The Cattle units as per Government of Maharashtra GR dated 03.11.1973

Sl. No.	Class of Animal	Cattle Unit Equivalent	Grazing fee (Rs)
1	Adult Cow, bull or bullock	1.00	1.00
2	Adult Buffalo	2.00	2.00
3	Buffalo calf under 3 years	1.00	1.00
4	Cow calf	0.50	0.50
5	Sheep	1.00	1.00

The Government of Maharashtra vide its Resolution dated 29/10/2007 and 06/05/2008 has imposed a complete restriction on Sheep grazing in the forests of the West Nashik forest division.

In addition, the following measures need to be implemented for effective Grazing control in forest areas:

- a) Stall feeding: Stall feeding refers to keep and feed an animal in a stall. Stall feeding shall be encouraged among the local people as this will reduce the grazing pressure on forests and also improves the yield from the cattle. In rotational grazing areas, the local people may be allowed to gather the grass on the 'cut and carry' basis to take the grass to the stalls.
- b) Replacement of unproductive cattle with superior milch cattle: The provisions provided in the Revenue and Forest department, Government Resolution dated 10/12/2012 shall be implemented effectively by taking the owner of the cattle into confidence. This cannot be achieved without the active participation of the people. The role of JFMCs and the rapport of the field officers/staff are crucially important for the success of this scheme.
- c) Closing of the area of Natural Regeneration from grazing: This is a neglected part but with the compulsory Aided Natural Regeneration prescribed for post-harvest areas, Deputy Conservator of Forests, West Nashik division should take extra steps to ensure total closure of grazing in these areas.
- d) Supply of nutritive grass seedlings on a concessional rate to the public: It shall be started at the earliest and wide publicity need to be given about this scheme. This will help to make the people self-sustained in getting good quality fodder grass for their livestock in the backyard, and reduces pressure on forest areas.

13.6.10.3 Boundary demarcation

To ensure the integrity of forest areas intact, strict vigilance over the forest boundary and periodic verification of the demarcation on the ground for the whole forest area has been prescribed. Areas that are un-demarcated should be attended on priority.

13.6.10.3.1 Approach to the Forest Demarcation

- 1) Well-defined forest boundary is a pre-requisite for effective forest protection and its sustainable management. Forest areas vulnerable to boundary obliteration need to be identified for the survey and demarcation, so that forest encroachment on the forest fringes could be

detected promptly. The presence of boundary marks additionally serves as a psychological barrier against forest encroachment. Forest boundaries adjoining private land shall receive the absolute priority to ensure the protection from encroachments.

- 2) The forests of the West Nashik division have suffered frequently during the last 10 years due to the implementation of the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006. Many honeycombing has happened in good forest areas. The boundary of forest areas distributed for Agriculture purposes in the past under different schemes like High Power Committee (HPC), Eksali plots, and regularisation of encroachments in the 1970s also need to be properly demarcated on the ground. A time-bound program for demarcation of all forest areas including Reserved forests, Protected forests and others by using Total station survey and DGPS as given in this Plan shall be implemented.
- 3) Proper checks and balances are essential in boundary demarcation. A slight error may lead to losing by vast areas of precious forest land. Forest department has recruited many new Forest Guards, Range Forest Officers, and Assistant Conservator of Forests in last 10 years. So, a proper field-based training about the map reading, identification of reference points on the ground, maintenance of boundary marks, etc., shall be provided to all field staff every year.
- 4) The Total Station survey and DGPS shall be compulsorily used for fixing boundary pillars on the ground. All Forest surveyors shall use the Total station method along with DGPS during the boundary fixing exercise.

13.6.10.3.2 Procedure of Boundary demarcation

A team of senior forest officers Chaired by the Principal Chief Conservator of Forests (Head of Forest Force), M.S. Nagpur has finalized the new design of Class-I and Class-II boundary marks to be used for forest boundary demarcation from 2019-20 onwards. The brief details of those are given Table 13.5. The circular issued by the Office of the Principal Chief Conservator of Forest and HoFF, M.S., Nagpur dated 27-01-2020 along with designs, plans, and model estimates of this proposed Class-I and Class-II boundary pillars are enclosed as Appendix II.21.

Table 13.5: Details of new Boundary pillars

Sl.No.	Description	Class-I boundary pillar	Class-II boundary pillar
1	Flag stone (to be casted at the time of casting Pillar)	0.23x0.23x0.23cm	0.23x0.23x0.23cm
2	Foundation size below G.L.	0.90x0.90x0.30cm	0.60x0.60x0.30cm
3	Base size	0.90x0.90cm	0.60x0.60cm
4	Height above G.L.	1.00 metre	0.75 metre
5	Top size/dimension	0.60x0.60cm	0.45x0.45cm
6	Weight	1687 kg	674 kg
Construction cost as per 2018-19 SSR (Note: The estimate cost may vary as per the site conditions and it is exclusive of taxes)		Rs. 6700-00	Rs. 3400-00

The works of the erection of boundary pillars shall be carried out as per the guidelines provided in that circular and same are mentioned below:

- 1) The survey and demarcation works are to be carried out as per the survey demarcation scheme within the sanctioned budget. Those pillars broken or stolen away or dismantled shall be replaced by the newly approved pillars. While erecting a pillar, the accurate position of the pillars shall be ascertained by the officer, not below the rank of the Assistant Conservator of Forests. The necessary certificate for ascertaining the location duly signed by the Assistant Conservator of Forests shall be preserved as a permanent record of the land records of the division. The necessary information as enclosed herewith shall be painted on the newly erected pillars. The permanent pillars shall be erected on the boundaries of forests in the entire state within the next five years i.e. up to 2025-26. The Deputy Conservator of Forests, West Nashik forest division shall assess the entire length of boundary and prepare detailed estimates for erecting new pillars replacing old ones along with DGPS survey of boundary and submit a requisition for grants to the PCCF office through Chief Conservator of Forests (Territorial), Nashik.
- 2) For the erection of permanent pillars, the following areas shall be given top priority:
 - a. Forest areas vulnerable to illegal mining.
 - b. Forest areas inside or surrounding cities.

- c. Forest areas adjoining revenue lands and private lands.
 - d. Newly notified areas u/s 4 to 20 and 29 of the Indian Forest Act 1927.
 - e. Newly notified areas u/s 18, 26 to 35, and 38 of the Wildlife (Protection) Act 1972.
- 3) Annual work of survey and demarcation includes the DGPS survey, clearance of boundary line, and erection of permanent boundary pillars. The technical sanction as per the new design and plan for the construction of boundary pillars shall be given by the respective Deputy Engineer in the circle. Site-specific estimates shall be prepared by the Engineers/Deputy engineer as per the SSR rates applicable for that year and these estimates shall be technically approved by the engineers as per the delegated powers. For technical sanction and administrative approval, competent authority shall be as per GR No. MSC-2011/CR.178/F-5 dated 30/09/2011.
- 4) After getting technical sanction and administrative approval, work shall be completed within the sanctioned budget as per the existing norms. Class-I pillars shall be erected at the corners or the point of change of survey number and at the end points of straight lines. Class-II pillars are erected between Class-I pillars and each Class-II pillar is clearly visible from the previous one. **As a general norm, approximately two Class-I pillars and three intermediate Class-II pillars shall be fixed for every 1 km length of the boundary.**
- 5) The pillars and the indicator stone shall be painted, and the required information shall be written on it, as per the instructions provided in Appendix II.21. The serial number on the pillar shall be as per the pillar register and as mentioned in the working plan. In the absence of these documents, the pillar number in the divisions shall be decided by the committee Chaired by the Chief Conservator of Forests of the territorial circle. The working plan officer and the concerned Deputy Conservator of Forests/Divisional Forest officer/Assistant Conservator of Forests shall be the members of this committee.
- 6) The location of the pillars before construction shall be verified from the following documents by the officer, not below the rank of Assistant Conservator of Forests.
- a. Survey of India (SOI) Topo sheet
 - b. Pillar register in the electronic format.
 - c. Compartment history.
 - d. Notification regarding RF/PF/Sanctuary and National Park.
 - e. Village map

- f. Report of the Forest Settlement Officer (FSO)
 - g. Working plan/Management Plan
 - h. Maps prepared by the Forest Survey and demarcation units.
 - i. GPS verification
 - j. Cross verification with local Benchmarks erected and preserved by the Land Records department.
 - k. The certificate of verification to that effect shall be a permanent part of land records.
- 7) After the construction of pillars, the work of construction shall be checked for quality by the officer, not below the rank of Assistant Conservator of Forests.
 - 8) During the construction of pillars, the samples of cement concrete mortar mix shall be taken and checked for the quality control by the engineering wing as per the prescribed norms and the certificate shall be maintained as a permanent part of land records.
 - 9) Photograph of the pillars so constructed shall be uploaded on the Asset Monitoring System of IT cell and shall also be preserved at the Division and Range level.

13.6.10.3.3 Routine boundary demarcation

- a) The Beat Guard after his personal inspection of the entire compartment must submit the 'Compartment Inspection Certificates' every month. The certificate must record forest encroachments, illicit cutting, and condition of forest boundaries including pillar numbers and inter-pillar visibility conditions. A separate certificate should be submitted for each compartment.
- b) The Round Officer should submit similar certificates for his inspections. Half of his certification should involve checking of the work performed during the previous month by the Beat Guards in his jurisdictions, and the other half should involve checking of the compartments not reported by the Beat Guards during the months. He should also submit monthly reports regarding the action taken on the forest offences recorded and the progress of forest inquiries entrusted to him.
- c) The Range Forest Officer can allow the delay not exceeding 15 days for reasons recorded in writing. Default on this account for consecutive 2 months should be viewed as a dereliction of duty and should attract disciplinary action.
- d) The Range Forest Officer should check the accuracy of the 'Compartment Inspection Certificates' according to the prescribed norms covering each

round. He should personally check at least two vulnerable compartments covered by the Beat Guards and the Foresters during the previous month.

- e) The Range Forest Officer, Mobile Squad will co-ordinate cross-checking of 'Compartment Inspection Certificates.'
- f) These guidelines shall be applied along with other directives issued for the forest protection from time to time. Other field officers will carry out their field inspections according to these guidelines as modified from time to time. As per the Maharashtra Forest Manual 2012, duties of Forest Guard, Round officers, Range Forest Officer as well as Assistant Conservator of Forests shall be applied along with directives issued for the forest protection.

13.6.10.3.4 Clearance of the Boundary line

Boundary line clearance on the artificial boundaries will follow the standard width as described in this para on the subject. Trees should not be felled for the boundary line, but shrubby undergrowth should be cleared. The norm for the external boundary line is 12 metres and the internal compartment boundary lines should be 3 metres wide.

13.6.10.3.5 Review and monitoring of Boundary demarcation works

Continuous review and monitoring of boundary demarcation works are necessary to ensure time-bound implementation. The Deputy Conservator of Forests, West Nashik division shall get the annual work plan for boundary demarcation prepared from Range Forest Officers well in advance and make suitable budgetary provisions. He shall review the implementation of works every month and report the progress to Deputy Conservator of Forests (Working Plan), Nashik on a quarterly basis. The Chief Conservator of Forests (T), Nashik shall review the progress every quarter and instruct for course corrections.

13.6.10.3.6 Prescriptions for management of forest areas on which the Forest rights are recognised

The implementation of the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Rights) Act 2005 is going on in this Division from last more than one decade. The finalization of all legitimate cases need to be done

in a time bound manner. The prescriptions for management of these areas are given below:

- 1) Boundary Demarcation: The forest areas on which the individual forest rights (IFR) are recognized by the District Level Committee are to be properly demarcated on the ground with suitable boundary pillars to prevent any further encroachment. In the case of Community Forest Rights (CFR), the area shall be properly demarcated so that the Village level institutions and the Forest Department officials can maintain absolute clarity about the boundaries of CFR. As of now, the boundary demarcation work of FRA beneficiaries has been uninitiated in the district. Therefore, this exercise requires prompt attention of Deputy Conservator of Forest, West Nashik to obtain the help of District Administration to get it done through Land Survey Department, and shall be completed within 2 years from the date of commencement of this Working Plan. The progress of boundary demarcation works shall be monitored on a quarterly basis by the Deputy Conservator of Forests, West Nashik and on annually by the Chief Conservator of Forest (Territorial), Nashik. The GPS coordinates of such boundary pillars shall be maintained in the Boundary Pillar Register which shall be specific to FRA implementation. The Deputy Conservator of Forests, West Nashik shall ensure the checking of pillars from his/her field staff.
- 2) Updation of Area Registers: The Divisional Area Register (Form No. 1) shall contain the area vested with rights under FRA in the 'Remarks' column against each Compartment/Survey No/Gut No.
- 3) If the claims under the Act are finally rejected by the competent authority, such encroachments shall be removed promptly by following the due process of law.
- 4) As per Rule 4(e), the Gram Sabha is duty-bound to constitute Committees for the protection of wildlife, forest, and biodiversity, from amongst its members, to carry out the provisions of section 5 of the Act. Similarly, as per Rule 4 (f), such Committee shall prepare a conservation and management plan for sustainable management of community forest resources and integrate such plan with the working plans or management plans of the forest department. Therefore, the territorial officers shall examine such Conservation and Management Plans for CFR areas and ensure that the prescriptions dovetail with the broad prescriptions of the approved working plan.

13.6.10.3.7 Management of Private Acquired forests

Boundaries of Acquired forests are to be demarcated on priority within two years from the sanctioning of this Plan. Management prescriptions have been given to this area as per its present status.

13.6.10.3.8 Management of Area of Non-forest land taken for Compensatory Afforestation

The Non-Forest Land will be taken over by the Forest Department for Compensatory Afforestation from user agencies. Boundaries of this area are to be demarcated and secured on priority within 2 years from the date of taking possession.

13.6.10.3.9 Compartment Plates

Metal plates on the boundary trees at a height of 2.5 to 3.0 metres will be fixed on the corners and roughly at half-kilometre interval on the side away from the compartment. The colour of the plate and lettering should agree with the state-level general guidelines. Till such guidelines are available, red letters on white plates will be used. The size of the plate and letters should not be less than 15 cm and 10 cm, respectively. Strokes should be at least 2 cm wide.

13.6.10.4 Disposal of Forest offence cases

The directions issued vide Government Resolution dated 13th August 2014 shall be followed in true spirit as far as forest protection issues are concerned (copy of the said GR is provided in Appendix II.35). The Deputy Conservator of Forests, West Nashik division will take a periodic review of Assistant Conservator of Forests and Range Forest Officers on a monthly basis as per the directions given in the Government Resolution.

- 1) Regular review of Offense cases: The Deputy Conservator of Forests, Assistant Conservator of Forests, and Range Forest Officers in the West Nashik division will conduct a review of forest offence cases at least once every month. Shifting of boundary marks along the forest boundary shall be viewed seriously, and the adjoining landholders or encroachers would be charged in the court for omission or commission causing obliteration of the forest boundary. Charges regarding all cases of forest encroachments must be submitted before the Judicial Magistrates within 3 months. Similar time-bound action is recommended in all cases of

timber theft. All cases of violation of the Forest (Conservation) Act, 1980 shall be dealt with timely and firmly.

- 2) Monitoring of Offence registers: The Deputy Conservator of Forests, West Nashik division shall personally carry out routine checking of the Range offence Register and the Round Enquiry Reports in at least 4 Ranges every year. Similarly, the Chief Conservator of Forests shall examine these records in at least one Range every year, and circulate the inspection report to all the Ranges.
- 3) Constant training: The Deputy Conservator of Forests and the Assistant Conservator of Forests will periodically convene staff meetings to review and impart training for the boundary management and effective disposal of offence cases.
- 4) Awards and Rewards: Staff who has performed exemplarily in forest protection should be nominated for State and National awards.
- 5) JFM activities: JFM activities open up communication channel, discourage forest offences and provide village bodies an opportunity for direct involvement in forest protection. Therefore, JFM activities should be encouraged and taken advantage of as a workable strategy for effective forest protection.
- 6) Disposal of confiscated vehicles: Once the confiscation procedure is completed by the Authorised officer, then the disposal of confiscated vehicles shall be done within 3 months after completion of all required formalities.

13.6.10.5 Sawmill inspection

A sawmill is a facility where logs are cut into lumber. In Maharashtra, the sawmill licenses are issued annually with certain conditions to be followed by the licensee. The regular sawmill inspection should be carried-out by the field staff to ascertain the compliance of all conditions provided in the sawmill licenses. The norms of Sawmill inspection are as given in Table 13.6. For further details refer the Government Resolution dated 13th August 2014. The copy of the said GR is provided in Appendix II.35.

Table 13.6: Norms of Sawmill inspection

Sl. No.	Designation	Sawmill inspection targets
1	Range Forest officer	At least 8 sawmill per month. If the number of sawmills in the Range are less than 8, then he has to inspect all the sawmills
2	Assistant Conservator of Forests	At least 4 sawmills per month
3	Deputy Conservator of Forests	At least 2 sawmills per month

13.6.10.6 Forest check posts

Strengthening of Forest check posts needs to be undertaken by providing safe infrastructure, necessary furniture, and other equipment. All Forest check posts shall be fitted with CCTV cameras and those cameras shall be connected through mobile-based applications for real-time monitoring of activities by the supervisory officers.

13.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

The insect pests and fungal diseases constitute major biological determinants of forest productivity, particularly in nurseries and plantations. They cause heavy damage to seedlings and hence reduce both quantity and quality of planting stock. A detail about the general management of nursery pests and diseases in brief is given below:

13.6.11.1 Forest nursery pest management

Insect pests that attack the given tree species are usually the pests in the nursery stage as well. The most common types of damage in forest nurseries are leaf feeding, shoot-boring, sap sucking and gall forming. An account of the symptoms caused by these insects and the possible management options are discussed below:

- 1) **Leaf feeders:** Caterpillars, beetles and grasshoppers are the important leaf feeding insects. The caterpillars may feed either on the leaf surface or roll the leaves and feed from within. Beetles generally feed along the edges of leaves or scrape the tissues causing defoliation. Beetles and

weevils are the common defoliators. Of these, the latter feed irregularly along the leaf margin, occasionally causing extensive damage. The natural enemies of these insects which include various birds, spiders, ants, praying mantis and parasitic wasps play a major role in keeping the pest population under control. In epidemics, application of pesticides such as (0.2%) Fenitrothion (Sumithion), (0.1%) Carbaryl (Sevin), (0.05%) Quinalphos (Ekalux), (0.05%) Deltamethrin or Beauveria suspension has been suggested.

- 2) **Sap-sucking Insects:** Mealy bugs, white flies, cow bugs, aphids and psyllids are the major sap sucking insects. Incidence of these insects may cause shoot die-back and seedling mortality. They may also act as vectors of various plant diseases. Use of either tobacco/soap emulsion has been reported to be effective in managing sap sucking insects. Application of dimethoate (Rogor) or monocrotophos (Nuvacron, Monophos) (0.01-0.05%); phosphamidon (Dimecron) (0.04%) or fenitrothion (Sumithion) (0.02%) or Tiamethoxam (Actra 0.25gm/1 lit) or Fusarium suspension has also been suggested.
- 3) **Shoot boring insects:** Scolytids and weevils are among the important shoot borers of seedlings. Both larvae and adults bore holes into the shoots causing seedling mortality. Removal of affected shoots and, maintaining low seedling density has been suggested.
- 4) **Gall-forming Insects:** Leaf and stem galls are produced by psyllids and wasps. Removal of affected shoots and application of a systemic insecticide such as dimethoate (Rogor) or monocrotophos (Nuvacron, Monophos) (0.01-0.02%); phosphamidon (Dimecron) (0.04%) or fenitrothion (Sumithion) (0.02%) or Tiamethoxam (Actra 0.25gm/1 lit) may be used to control the gall insects.
- 5) **Root borers:** Termites and several root feeding beetles of the families Elateridae and Scarabaeidae attack the roots. White grubs (Holotrichia sp.) of the family Scarabaeidae also frequently attack roots. Soil drenching using a soil insecticide such as Phorate 2G may be effective in managing the white grubs.

13.6.11.2 Forest nursery disease management

Plant pathogen causes significant losses in forests. Fungal pathogens are one of the most common resistant types of pathogens. General suggestions for prevention and control of the pathogenic outbreak in forest nursery are as given below:

- a) **Fungicide based approach:** Rust or fungal is very hard to treat. Fungicides such as Mancozeb or Triforine may help but never eradicate the disease. Some organic preventive solutions are available and Sulphur powder is known to stop the growth of rust and any other fungal species. In addition the Neem oil based bio-pesticide helps in control of rust and other fungal infections also.
- b) **Non fungicide based approach:** High standards of hygiene and good soil drainage, and careful watering may minimize problems. Any appearance of rust or fungal must be immediately dealt with by removing, collection and burning all affected leaves away from the seedlings.

13.6.12 REGENERATION: Not applicable

13.6.13 ASSOCIATED REGULATIONS AND MEASURES

- 1) **Consolidation of forest records:** The Gazette notifications related to all RF, PF, and Section 4 areas shall be compiled in the form of a book and circulated to all Ranges. In the same way, the Deputy Conservator of Forests, West Nashik division shall coordinate with the Working Plan officer (WPO), Nashik for the digitisation of maps for distribution to field staff.
- 2) **Proper documentation of FRA details:** The Deputy Conservator of Forests, West Nashik division shall coordinate with the Collector, Nashik to consolidate all the information about the Individual Forest Rights (IFR) and Community Forest Rights (CFR) under the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 in the form of a book, and necessary updating in the divisional level Land Register should be done on priority. These details should be shared with the Working Plan office for updating on division's digitized map.

CHAPTER-14 GENERAL FINANCIAL FORECAST

Estimated Annual Expenditure (details) for the Working Plan Implementation in West Nashik Division.

Improvement Working Circle

Expected expenditure during the plan period (Rs in Lakh)

Sl. No.	Particulars of work	Avg. Quantum of work	unit	Man days/ unit	Rate /unit (Rupees)	Annual (Rs. In lakh)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Average (Rs.in Lakh)
1	Demarcation and marking	2468	Ha.	2.05	697.00	17.20	17.20	17.20	17.20	17.20	17.20	17.20	17.20	17.20	17.20	17.20	17.20
2	Coupe working	0	Ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2a	Timber harvesting	0	cum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2b	Firewood extraction	2568	stacks	3.50	1190.00	30.55	30.55	30.55	30.55	30.55	30.55	30.55	30.55	30.55	30.55	30.55	30.55
3	ANR+Nursing of naturally occurring seedlings and coppice management etc. in "D" area + B1 area	822	Ha.	10	2662	21.88	21.88	21.88	21.88	21.88	21.88	21.88	21.88	21.88	21.88	21.88	21.88
3a	PPO/PYO (Pre - planting	200	Ha.	108.7	36964.80	73.93	73.93	73.93	73.93	73.93	73.93	73.93	73.93	73.93	73.93	73.93	73.93

	works)																
3b	FYO First year operations	200	Ha.	120.3	40908.80	81.82	0.00	81.82	81.82	81.82	81.82	81.82	81.82	81.82	81.82	81.82	81.82
3c	SYO Second year operations	200	Ha.	107.0	36386.80	72.77	0.00	0.00	72.77	72.77	72.77	72.77	72.77	72.77	72.77	72.77	72.77
3d	TYO Third year operations	200	Ha.	79.62	27070.80	54.14	0.00	0.00	0.00	54.14	54.14	54.14	54.14	54.14	54.14	54.14	54.14
3e	Fourth year operations	200	Ha.	40.50	13770.00	27.54	0.00	0.00	0.00	0.00	27.54	27.54	27.54	27.54	27.54	27.54	27.54
3f	Fifth year operations	200	Ha.	40.50	13770.00	27.54	0.00	0.00	0.00	0.00	0.00	27.54	27.54	27.54	27.54	27.54	27.54
4	SMC works	200	Ha.	-	15000.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
5	Plantation Teak/Mix																
5a	PPO/PYO (Pre-planting works)	100	Ha.	153.8	52292.00	52.29	52.29	52.29	52.29	52.29	52.29	52.29	52.29	52.29	52.29	52.29	52.29
5b	FYO (First year operations)	100	Ha.	182.0	61910.60	61.91	0.00	61.91	61.91	61.91	61.91	61.91	61.91	61.91	61.91	61.91	61.91
5c	SYO Second year operations	100	Ha.	159.4	54226.60	54.22	0.00	0.00	54.22	54.22	54.22	54.22	54.22	54.22	54.22	54.22	54.22
5d	TYO Third year operations	100	Ha.	104.0	35360.00	35.36	0.00	0.00	0.00	35.36	35.36	35.36	35.36	35.36	35.36	35.36	35.36

5e	Fourth year operations	100	Ha.	40.50	13770.00	13.77	0.00	0.00	0.00	0.00	13.77	13.77	13.77	13.77	13.77	13.77	13.77
5f	Fifth year operations	100	Ha.	40.50	13770.00	13.77	0.00	0.00	0.00	0.00	0.00	13.77	13.77	13.77	13.77	13.77	13.77
	Total			1182.6		646.81	203.97	347.7	474.69	564.19	605.50	646.81	646.81	646.81	646.8	646.81	646.81

Note:

1. The man-days approved for Demarcation and Marking is for 'D' type areas. However, man-days for 'B' type and 'C' type areas be decided by Deputy Conservator of Forests, West Nashik division as per crop condition.
2. Man-days for Fire Protection will be sanctioned after preparing "Fire Protection Plan" for the entire division.
3. The fund requirement will vary as per the prevailing wage rate.
4. The above items are only indicative and not exhaustive. The Deputy Conservator of Forests, West Nashik division can change the quantity shown as per site requirements.
5. ANR shall be carried out as per requirement of site conditions and staff Capacity.

**Estimated Annual Expenditure (details) for the Working Plan Implementation in West Nashik Division
Afforestation Working Circle**

Sl. No.	Particulars of work	Avg. Quantum of work	unit	Man days/unit	Rate /unit (Rupees)	Annual (lakh Rs.)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Average (RS. In Lakh)
1	Demarcation and marking	876.0	Ha.	2.05	697	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10
2	Coupe Working Hygenic Felling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2a	Timber harvesting	0	Cum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2b	Firewood extraction	2150	stack	3.50	1190	25.58	25.58	25.58	25.58	25.58	25.58	25.58	25.58	25.58	25.58	25.58	25.58
3	ANR+Nursing of naturally occurring seedlings and coppice management etc. in understocked patches																
3a	PPO/FYO	250	Ha.	108	36964	92.41	92.41	92.41	92.41	92.41	92.41	92.41	92.41	92.41	92.41	92.41	92.41
3b	FYO (First year operations)	250	Ha.	120	40908	102.2	0.00	102.2	102.2	102.2	102.2	102.2	102.2	102.2	102.2	102.2	102.2
3c	SYO (Second year operations)	250	Ha.	107	36386	90.96	0.00	0.00	90.96	90.96	90.96	90.96	90.96	90.96	90.96	90.96	90.96
3d	TYO (Third year operations)	250	Ha.	79.6	27070	67.68	0.00	0.00	0.00	67.68	67.68	67.68	67.68	67.68	67.68	67.68	67.68

3e	Fourth year operations	250	Ha.	40.5	13770	34.42	0.00	0.00	0.00	0.00	34.42	34.42	34.42	34.42	34.42	34.42	34.42
3f	Fifth year operations	250	Ha.	40.5	13770	34.42	0.00	0.00	0.00	0.00	0.00	34.42	34.42	34.42	34.42	34.42	34.42
4	SMC works	250	Ha.	-	15000	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50
5	Teak/Mix Plantation																
5a	PPO/FYO	300	Ha.	153	52292	156.8	156.8	156.8	156.8	156.8	156.8	156.8	156.8	156.8	156.8	156.8	156.8
5b	FYO (First year operations)	300	Ha.	182	61910	185.7	0.00	185.7	185.7	185.7	185.7	185.7	185.7	185.7	185.7	185.7	185.7
5c	SYO (Second year operations)	300	Ha.	160	54226	162.6	0.00	0.00	162.6	162.6	162.6	162.6	162.6	162.6	162.6	162.6	162.6
5d	TYO (Third year operations)	300	Ha.	104	35360	106.0	0.00	0.00	0.00	106.0	106.0	106.0	106.0	106.0	106.0	106.0	106.0
5e	4th YO (Fourth year operations)	300	Ha.	40.5	13770	41.31	0.00	0.00	0.00	0.00	41.31	41.31	41.31	41.31	41.31	41.31	41.31
5f	5th YO (Fifth year operations)	300	Ha.	40.5	13770	41.31	0.00	0.00	0.00	0.00	0.00	41.31	41.31	41.31	41.31	41.31	41.31
	Total			1182		1185	318.4	606.4	860.0	1033	1109	1185	1185	1185	1185	1185	1185

Note:

1. The man-days approved for Demarcation and Marking is for 'D' type areas. However, man-days for 'B' type and 'C' type areas be decided by Deputy Conservator of Forests, West Nashik division as per crop condition.
2. Man-days for Fire Protection will be sanctioned after preparing "Fire Protection Plan" for the entire division.
3. The fund requirement will vary as per the prevailing wage rate.
4. The above items are only indicative and not exhaustive. The Deputy Conservator of Forests, West Nashik division can change the quantity shown as per site requirements.

**Estimated Annual Expenditure (details) for the Working Plan Implementation in West Nashik Division
Grass and Fodder Working Circle**

Sl No.	Particulars of work	Avg. Quantum of work	unit	Man days/ unit	Rate /unit (Rupees)	Annual (lakh Rs.)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Average (RS. In Lakh)
1	Demarcation of coupe	307	Ha.	1.0	340.0	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
2	Artificial grass plantation of 3 year model	40	Ha.	498	1.69	67.78	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8	67.8
3	Enclosure	40	Ha.	0	30000	12.00	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.00
4	Removal of shrub growth & weeds	150	Ha.	5	1700	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55
	Total			504	32041	83.37	83.37	83.37	83.37	83.37	83.37	83.37	83.37	83.37	83.37	83.37	83.37

Note:

1. The man-days approved for Demarcation and Marking is for 'D' type areas. However, man-days for 'B' type and 'C' type areas be decided by Deputy Conservator of Forests, West Nashik division as per crop condition.
2. Man-days for Fire Protection will be sanctioned after preparing "Fire Protection Plan" for the entire division.
3. The fund requirement will vary as per the prevailing wage rate.
4. The above items are only indicative and not exhaustive. The Deputy Conservator of Forests, West Nashik division can change the quantity shown as per site requirements.

**Estimated Annual Expenditure (details) for the Working Plan Implementation in West Nashik
Division**

Protection Working Circle

Sl. No.	Particulars of work	Avg. Quantum of work	unit	Man days/unit	Rate /unit (Rupees)	Annual (lakh Rs.)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Average (RS. In Lakh)
1	Demarcation	570	Ha.	1	340	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94
2	SMC works	570	Ha.	-	10000	57	57	57	57	57	57	57	57	57	57	57	57
	Total					58.94	58.94	58.94	58.94	58.94	58.94	58.94	58.94	58.94	58.94	58.94	58.94

**Estimated Annual Expenditure (details) for the Working Plan Implementation in West Nashik Divisoin
Boundary Demarcation**

S/ No.	Particulars of work	Avg. Quantum of work	unit	Man days/ unit	Rate / unit (Rupees)	Annual (lakh Rs.)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Average (RS in Lakh)
1a	Fixing boundary pillars Class-I	696	pillar		6700	47	47	47	47	47	47	47	47	47	47	47	470
1b	Fixing boundary pillars Class-II	4462	pillar		3400	152	152	152	152	152	152	152	152	152	152	152	1520
	Total	5158				199	199	199	199	199	199	199	199	199	199	199	1990

Abstract of Year wise Requirement of Funds for Implementation of Working Plan (Rs. In Lakh)

Sr. NO	Working Circle /Activity	Year -1	Year-2	Year-3	Year -4	Year -5	Year -6	Year -7	Year -8	Year -9	Year -10
1	IWC	204	348	475	564	606	647	647	647	647	647
2	Afforestation	318	606	860	1034	1110	1185	1185	1185	1185	1185
3	Grass and Fodder WC	83	83	83	83	83	83	83	83	83	83
4	Protection	59	59	59	59	59	59	59	59	59	59
5	Boundary Demarcation	199	199	199	199	199	199	199	199	199	199
	Grand Total	863	1295	1676	1939	2057	2173	2173	2173	2173	2173

Note: The requirement for funds will vary according to prevailing wage rate.

CHAPTER-15

MISCELLANEOUS REGULATIONS

15.1 PETTY FELLING AND EXTRACTION

The PESA areas present in the West Nashik division are having all rights over the Non-timber forest produce for its harvesting, processing, and sale. Earlier some special privileges are assigned for areas falling under Nashik, Igatpuri, Dindori, Surgana and Peint tehsil of the West Nashik division and are as given below:

- 1) Removal of Mahua (Moha) flower and fruit for the gatherers' own use or for sale.
- 2) Cutting and removal of reeds in addition to grass and dead leaves allowed under general privilege, for use for fuel in protected forests. No logging of trees is allowed for this purpose.
- 3) Collection and removal for the gatherers' own use and for sale, all minor forest produce.
- 4) Removal of Karvi by head loads or cart-loads for agricultural purposes.

15.2 RIGHTS AND CONCESSIONS

Rights are legal, social, or ethical principles of freedom or entitlement; that is, rights are the fundamental normative rules about what is allowed of people or owed to people according to some legal system, social convention, or ethical theory. While a Concession is a special right or privilege that is given to people.

No right, except the “right of way and access to water source” exists in these forests for bonafide use only.” The usual concessions enjoyed by the villagers remain like a collection of small dead wood, thorns, grass, karvi stalks, leaves, fruits, moha flowers, and other NTFPs.

15.3 DEMARCATION, TREATMENT MAP PREPARATION AND MARKING OF COUPE

15.3.1 Demarcation of Coupe

- a) The annual coupes for harvesting will be demarcated one year in advance, and each coupe, if so required, may be subdivided into four

sections for effective management and control. The Range Forest Officer will thoroughly inspect the coupe after demarcation and issue 'Coupe Demarcation Certificate' in the prescribed format, given in the following paragraph, which is to be verified by the concerned Assistant Conservator of Forests.

- b) The prescribed format for the Coupe Demarcation Certificate is as given in Form No. 15.1

Form No. 15.1

"I ----- R.F.O. ----- Range, certify that I have personally inspected the demarcation of the coupe No. ----- in Compartment ----- of Felling Series ----- of Working circle ----- on dated ----- and found that the coupe has been demarcated as prescribed in the working plan. The area of the coupe is ----- hectares.

Date:

Signature of the RFO

- c) Annual coupes have been prescribed to be demarcated by cutting and clearing bushy undergrowth on 3 metres broad line and by erecting pillars or posts up to 2 metres height in the middle of the cut line at suitable intervals, so that one pillar shall be visible from the other, except where the coupe boundary runs along streams, fire line or road. The pillars shall bear the coupe number, name of the felling series and the working circle on the side away from the coupe.
- d) Selected trees, above 45 cm GBH, at suitable intervals standing on the periphery of the coupe will be given two coal tar bands and a geru band in between after scrapping the loose dead bark. The lower coal tar band will be at breast height (B.H.) and the other coal tar band will be 15 cm above it. Just below the lower coal tar band, Tree serial number in Arabic will be given on the side away from the area of the coupe. The bands and serial numbers of such trees will be maintained in the marking register as per the format given in Form No. 15.2.

Form No. 15.2: List of trees on the coupe boundary

Sl. No.	Name of species	GBH (OB)	Remarks
1			
2			
3			

- e) No tree bearing the coupe demarcation bands, is proposed to be marked for felling.
- f) **Demarcation of Sections:** For effective monitoring and control of the harvesting operations, each coupe marked for felling in respective Working Circle will conventionally be divided into four broadly similar sections. Sections will be demarcated by 1.5 metres wide cut lines by clearing brushwood unless the section line runs along with a permanent feature. Trees above 45 cm girth, selected at suitable intervals on the inner edge of the 1.5 metre wide cleared section line will be given two coal tar bands 15 cm apart, the lower coal tar band being at breast height. Just below the lower coal tar band section number will be given on the side away from the area they would denote.
- g) **Demarcation of other areas given in the Treatment Map:** The other category of areas shown in the treatment map will be marked by giving one geru band at breast height (B.H) and one coal tar band 5 cm above it.
- h) **Assessment of Natural Regeneration:** At the time of the survey and demarcation, the staff should also assess the number of Natural Regeneration in the coupe. The exact number obtained by total count or sampling will decide the number of AR seedlings that would be required at the time of ANR operation.

15.3.2 Treatment map

- 1) Instantly, after completion of the demarcation of the coupe, Range Forest officer will prepare the Treatment map by clearly showing the various Treatment-type areas as prescribed. The concerned Assistant Conservator of Forest will verify the treatment map and necessary corrections if any will be made, before submission to the Deputy Conservator of Forests, West Nashik for approval.
- 2) The treatment map will bear the date of preparation by the Range Forest Officer and verification by the Assistant Conservator of Forests.
- 3) Preparation of treatment map shall be undertaken one year in advance of the coupe working. Timely preparation would facilitate necessary checking and corrections if any in time.
- 4) Immediately after seeking approval of the treatment map, site-specific Work Plan for the entire coupe shall be prepared by Range Forest Officer, incorporating all the prescribed activities under various treatment-type areas marked on the map, entailing quantum of work involved, the estimated amount required and period of operation for each activity. The

Work Plan is proposed to be verified by the Assistant Conservator of Forests concerned and submitted for approval to the competent authority.

15.3.3 Marking of trees for Harvesting

- a) After approval of the treatment map, marking of trees for harvesting shall be carried out as per prescriptions given in respective working circles. Marking of trees for harvesting shall be done one year in advance of the coupe working after coupe demarcation and treatment plan preparation. Marking shall be done departmentally. Timely marking would facilitate necessary checking and corrections, if any, in time.
- b) Marking is prescribed to be done by the forester concerned under the constant supervision of Range Forest Officer and guidance of concerned Assistant Conservator of Forests. The Range Forest Officer and Assistant Conservator of Forest shall inspect the whole coupe after marking and incorporate necessary corrections if any. The Deputy Conservator of Forests, West Nashik shall himself inspect the majority of coupes to ascertain proper marking as per prescriptions of the working plan as well as to guard against the excessive marking. To ensure this close supervision, a marking certificate in the following format is prescribed:

Form 15.3

I RFO Range personally inspected the marking of the coupe No. in compartment of felling series in Working circle on date and found that marking of trees for felling has been done as prescribed in the working plan.

Date:

Signature of the RFO

These certificates shall be regularly and frequently checked and verified by the concerned Assistant Conservator of Forest as well as Deputy Conservator of Forests, West Nashik division.

- c) Trees marked for felling will be given geru bands at breast height and will bear marking hammer impression at the B.H. (breast height) as well as at the base on the blazes of sizes 10cm x 10cm. The blaze size should be strictly adhered to so as to aid in the identification of marked trees at the time of felling.

- d) Following trees, in addition, will bear digit serial numbers both at B.H. (Breast Height) and at the base.
- i. All trees of Teak, Khair, Bija, Shisham, Ain, Tiwas, Haldu, Kalam, Dhaoda, and other timber yielding trees of 45 cm and above girth at B.H (o.b).
 - ii. Trees of all other species of and above 60 cm girth (o.b) at breast height.
- e) The remaining trees marked will bear serial numbers, which will be given by coal tar. The digit and coal tar serial numbers will form separate series.
- f) The number of the tree marked shall be written vertically on the blaze, shown as under:

For Tree no. 195

XX (Hammer mark)
1
9
5

- g) All trees bearing serial numbers will be individually recorded in marking (recording) book as per the following Form No. 15.4. The serial number indicated in coal tar must be recorded in the marking book. Remarks column shall invariably mention the deformities if any, like dead, top broken, hollow, severe insect damage, etc.

Form No. 15.4: Format for Marking of Trees for Harvesting

Tree	Serial No.	Name of species	GBH (OB)	Remarks
Digit No.	Coal tar			

- h) Abstract of trees marked for felling will be recorded in 15 cm girth classes; Timber, poles, and firewood trees will be shown, separately.

- i) Malformed trees alone will be recorded as a fuel trees, except that of teak. A tree will be classified as fuel tree only when it is incapable of yielding any useful sawn timber or pole.

15.4 HARVESTING AND DISPOSAL

15.4.1 Agency for harvesting: The Deputy Conservator of Forests, West Nashik division shall decide the agency for harvesting in accordance with the applicable policies and regulations. The present policy prohibits the sale of standing trees. Estimation of the bamboo yield should be based on actual enumeration carried out on the same year before onset of monsoon prior to the beginning of bamboo harvesting.

15.4.2 Disposal at timber depots: Harvested timber and firewood are proposed to be transported to the established forest depots for sale by auction according to the prevailing policies and guidelines. Bamboos are also sold at these depots.

15.5 IRREGULAR HARVESTING

Irregular harvesting of timber, firewood, and other NTFPs is prohibited, except in the following cases:

- 1) Harvesting for the fire lines and the transmission line: The Deputy Conservator of Forests, West Nashik division may permit the felling of trees within the prescribed width of the established fire lines and the approved power transmission line. The prescribed width in the guidelines for the Forest (Conservation) Act, 1980, and rules, thereunder, will be applicable to the transmission lines. The creation of new fire lines shall require prior permission of the Deputy Conservator of Forests, West Nashik division.
- 2) Felling for the haulage roads: The Deputy Conservator of Forests, West Nashik division may permit the felling of trees for the purpose of temporary haulage roads in nature and should be aligned properly to ensure minimum possible felling of trees.
- 3) Harvesting in forest areas diverted for non-forestry purposes: Felling of trees on forest land required by the User agency like Irrigation, PWD, etc., will only be undertaken after the proposals for the use of forest land for non-forest purposes are approved by the Government of India under the provisions of the Forest (Conservation) Act, 1980 and as per latest

guidelines issued by Government of India and Government of Maharashtra from time to time for specific projects. The Deputy Conservator of Forests, West Nashik division may permit the felling of trees on forest area diverted for the non-forestry purposes as approved under the provisions of the Forest (Conservation) Act, 1980 after getting tree felling permission from the competent authority. The material obtained from such harvesting will be brought to the depots and will be disposed of as per departmental procedures.

- 4) Harvesting of dead, fallen and uprooted trees in the storm: Removal of the dead, fallen, and uprooted trees by wind or storm from all parts of the forests, except the coupes due for work, will be done in the following manner.
 - a. Every year in the month of October, each beat guard will report the availability of dead, fallen, and uprooted trees by wind or storm to the concerned Range Forest officer.
 - b. The Range Forest Officer will estimate availability for such material in each compartment and the concerned Assistant Conservator of Forest will verify the same.
 - c. If more than 2 (two) such trees per hectare are estimated, proper marking will be carried out. Two dead and fallen trees are to be retained for wildlife conservation.
 - d. Wood removal will be carried out from the compartment after approval of the Deputy Conservator of Forests, West Nashik division. The timber harvesting details will be entered in the compartment history.
 - e. Removal of dead and diseased trees will be undertaken under the supervision of an officer, not below the rank of the Assistant Conservator of Forests.
- 5) No irregular harvesting for the purpose of undertaking plantations/afforestation works under schemes outside the scope of this working plan will be taken up in any of the areas under the working plan.

15.6 MAN-DAYS PRESCRIBED FOR VARIOUS WORKING PLAN ACTIVITIES

The man-days prescribed for various Working Plan activities like Demarcation and marking, Fire-line creation and 1/5th boundary demarcation are given below:

Table 15.1: Man-days prescribed for various Working Plan activities

Sl. No.	Type of work	Unit	Man-days
Demarcation and marking			
1	Preparation of Grid map	Hectare	1.00
2	Demarcation	Hectare	1.00
3	Enumeration	As per wage board rates	
4	Marking		
5	Timber harvesting		
6	Firewood extraction		
7	Natural Regeneration	600 trees/Ha	10.00
8	Cleaning	Hectare	8.00
9	Cut Back Operations	Hectare	6.00
10	Old Teak plantations thinning	Hectare	17.50
11	Bamboo harvesting, long bamboo	As per wage board rates	
12	Bamboo harvesting, bamboo bundles		
Fire-lines			
1	3 m width: Cutting 4 man-days and Burning 2.5 man-days	Kilometer	6.50
2	6 m width: Cutting 8 man-days and Burning 4 man-days	Kilometer	12.00
3	12 m width: Cutting 12 man-days and Burning 8 man-days	Kilometer	20.00
4	30 m width: Cutting 20 man-days and Burning 10 man-days	Kilometer	30.00

15.7 MAINTENANCE OF THE FOREST LAND RECORDS

15.7.1 Maintenance of the land records and forest maps: The forest land records and the forest maps will be brought up to date and maintained as such. A certificate to this effect will be recorded annually in the Form No-1 Register during the month of June from the Ranger surveyor/Surveyor.

15.7.2 Reconciliation of the revenue records: The revenue records will be reconciled on the basis of the forest notifications. The Collector, Nashik and the Deputy Conservator of Forests, West Nashik division will jointly ensure the Revenue Records are brought up to date according to the forest notifications. Since the State Government/Divisional Commissioner issues the forest

notifications, there is no apparent need to issue separate orders for the mutation entries. The Revenue Department need to provide a certified copy of the Records of Rights to the West Nashik Forest Division to mark the completion of the process. But to save time, the Deputy Conservator of Forest, West Nashik division should designate one Assistant Conservator of Forest for coordination with the Revenue Department for land records reconciliation. Along with the reconciliation, the details of land grants (Patta) issued on the forest land shall also be made available by the Collector, Nashik to the Deputy Conservator of Forests, West Nashik division.

15.7.3 Section-4 notification of Protected Forests and other forest areas under the control of Forest department

The Protected forest and other forest areas under the control of Forest department shall be notified under Section-4 of the Indian Forest Act 1927 within a year from the date of sanction of this Plan. In addition, the private lands taken over from user agency for Compensatory Afforestation also need to be notified under the Section-4 of the Indian Forest Act 1927 within six months after taking possession over such lands by the Forest Department.

15.8 INFRASTRUCTURE DEVELOPMENT AND MAINTENANCE

The construction and maintenance of staff quarters, offices, Forest Rest Houses, forest roads, forest depots, etc., represent absolutely crucial activity in the Forest Department. The remoteness of forest headquarters adds further importance to the necessity of developing a good infrastructure for forest staff. The analysis of infrastructure is done in the following points:

- a) **Division level:** The Division office is very old and becomes dangerous to the life of the staff. The new office building needs to be constructed at the earliest or else it should be shifted to some other place. The residence of the Deputy Conservator of Forests, West Nashik is in good condition but needs special repairs. The Forest Rest House (FRH), Nashik is a new one and adequately maintained. The availability of quarters for other staff is extremely poor. Around twenty quarters of various types are available in Nashik but they are in very bad condition due to poor maintenance. They need to be repaired on priority within two years. In addition to this, new quarters shall be constructed for both office staff and field staff. The Deputy Conservator of Forests, West Nashik division shall take a

personal interest in providing good liveable conditions to staff by way of good quarters and proper maintenance of forest colony.

- b) **Range level:** The condition of staff quarters is not good at Range headquarters. Except for the Range offices, other available quarters at Range headquarter, Round headquarter, and Beat headquarter are not maintained properly. The repairing of all existing staff quarters and other new quarters shall be taken up in a phased manner over a period of five years from the date of sanctioning of this Plan. The infrastructure should be developed in the Colony concept at Range headquarter for concerned Range Forest Officer and his office staff, and at Round headquarter for Forester and Forest Guards. The colony can be maintained in a more effective way rather than quarters scattered all over the Range.
- c) **Forest Rest house:** The FRHs are maintained in fairly good condition in the West Nashik division. But except for the FRH at Nashik, other FRHs need maintenance. Necessary attention needs to be given in maintaining all FRHs in good condition as these are important for field inspections.
- d) **Forest depots:** The essential infrastructures in Mhasarul timber depot are unprovided and lacking in basic facilities. The forest depots need to be maintained on a regular basis by developing the infrastructure like good fencing, staff quarter, barriers at the entrance, drinking water facility, Auction hall, etc.
- e) **Forest nursery:** The minimum infrastructure is available at all forest Nursery in this division. But they have developed on an Ad hoc basis. A systematic nursery infrastructure plan needs to be developed at each Range and in a phased manner, they have to be implemented. The necessary infrastructure like good fencing, borewell/well, electricity connection, water pipeline, shade-net structure, storeroom, composting facility, vermicompost, and vermi-wash facility, seed treatment platform, etc., need to be developed at all forest nursery.
- f) **Forest Roads:** The forest areas of the division have a good network of roads and cart tracks. The Public Works Department of the state government or the Zilla Parishad, Nashik maintains the large number of roads passing through the forest area. Very few stretches are with Forest Department. The compilation of records for all roads passing through the forest area, and the roads under the control of the Forest department for maintenance shall be made on a priority basis. The extent of forestry operations and gravity of forest protection concerns should determine the priority for maintenance of the forest roads. Unwarranted up-gradation of the forest roads should be discouraged, but required culverts may be

constructed in stretches useful for forest protection. In no case, provisions of the Forest (Conservation) Act, 1980 be violated.

15.9 ESTABLISHMENT AND LABOUR

15.9.1 Establishment: The details of the sanctioned posts and its current position are as underneath:

Table 15.2: Staff strength in West Nashik division

Group	Name of Post	Sanctioned Post	Posts filled	Vacant Post
A	Deputy Conservator of Forest	01	01	00
	Deputy Engineer	01	00	01
	Assistant Conservator of Forest	04	02	02
	Total	06	03	03
B	Range Forest Officer	11	09	02
	Office Superintendent	01	01	00
	Total	12	10	02
C	Forester	46	43	03
	Forest Guard	181	167	14
	Forest Surveyor	02	02	00
	Accountant	13	12	01
	Clerk cum typist	20	18	02
	Head Clerk	01	01	00
	Senior Statistician	01	01	00
	Steno (Lower Grade)	01	00	01
	Driver	05	05	00
	Junior Engineer	01	01	00
	Tracer	01	01	00
	Police Constable	02	00	02
	Total	274	251	23
D	Naik	01	01	00
	Peon	04	02	02
	Watchmen	10	03	07
	Cleaner	01	01	00
	Vehicle Cleaner	01	01	00
	Total	17	08	09
	Grand Total	309	272	37
D	Forest Labour	114	114	00
	Total	114	114	00

The sanctioned posts are sufficient but their skill up-gradation shall be taken up on a continuous basis. The areas of training necessary for staff are given below:

Table 15.3: List of trainings necessary for Staff

Sl. No.	Details of staff	Training modules
1	Office ministerial staff	a) Office procedure b) Purchase through Government e-Market place (GeM) and other related issues c) E-Tender process d) Service Rules and Disciplinary Proceedings e) Right to Information Act 2005 f) New computer programmes developed by the Maharashtra Forest department
2	Field Staff (ACF, RFO, Forester and Forest Guard)	a) Forest and General Law b) Service Rules and Disciplinary Proceedings c) Right to Information Act 2005 d) New computer programmes developed by Maharashtra Forest department e) Purchase through Government e-Market place (GeM) and other related issues f) The Scheduled Tribes and other Forest Dwellers (Recognition of Rights) Act 2005 g) Record keeping
3	Surveyors	a) Total Station survey b) Record keeping c) GIS, DGPS and Remote sensing

15.9.2 Labour

- a) Forestry is a labour intensive work and the labour availability is critically important for the successful implementation of forestry works. In the West Nashik division, the labour availability is good except during peak agriculture period. So, the necessary phasing of forestry work needs to be done precisely in advance.
- b) Fair labour practices shall be followed in labour-related issues as per the directions issued by the Government from time to time.
- c) Labour payments shall be directly deposited in the Bank accounts of the labours.

15.10 CONTROL AND RECORDS

15.10.1 Control and Records

The following records will be maintained in the West Nashik Forest Division Office:

- 1) Control Forms
- 2) Compartment History
- 3) Deviation proposal
- 4) Plantation Registers
- 5) Nursery Registers
- 6) Divisional Note Book
- 7) Boundary Registers

15.10.2 Control Forms: All control forms and Compartment histories shall be maintained as per the formats prescribed in Appendix II-41. The records of all harvesting, subsidiary cultural operations, regeneration works and soil and moisture conservation work carried out as per prescriptions of the Working Plan need to be maintained in the control forms.

Two sets of control forms will be prepared. One set will be kept in the division office and the other set will be submitted to the Deputy Conservator of Forests (Working Plan) Nashik through the Chief Conservator of Forests (Territorial), Nashik. The Forms will be sent annually by the Deputy Conservator of Forests, West Nashik Division to the Deputy Conservator of Forests (Working Plan) Nashik not later than 1st October every year after taking the necessary entries. All entries showing the deviations from the prescriptions

will be underlined in red. The Deputy Conservator of Forests (Working Plan), Nashik will scrutinise it and process it further.

15.10.3 Compartment History:

- a) Compartment history *i.e.*, the records of various forestry activities and observations made in the past year will be maintained in Forms prescribed in Appendix II.42.
- b) Each Compartment must have a separate file for its records. Compartment history must be maintained in the office of the West Nashik Forest Division; since they keep the record of past management practices and their effects on the growing stocks.
- c) Every year in the month of July, the Range Forest Officer should fill in the necessary information and will send it to Deputy Conservator of Forest, West Nashik Division for scrutiny through concerned Assistant Conservator of Forest in charge. After compilation, one copy of the forms will be sent to Deputy Conservator of Forests (Working Plan), Nashik.

15.10.4 Deviations and deviation proposals

15.10.4.1 The activities not considered as deviations: The following works shall not be considered as deviations of the Working Plan.

- 1) Removal of dead and fallen trees
- 2) Petty fellings carried out with the permission of competent authority like privileges, rights, trees dangerous to human existence/living, etc.

15.10.4.2 Deviations from Working Plan: There are two types of deviations as per the National Working Plan code 2014. They are:

- A. Deviations that do not change the basis of management permanently
 - a) The non-working of a coupe in the prescribed year or working of a coupe in the year not prescribed by the Plan.
 - b) Changes in the areas of the coupe due to disforestation or execution of any special scheme.
 - c) Deviations of positive nature *i.e.*, out of turn plantations and soil and water conservation works carried-out outside the due coupe area under any Project, Schemes and Compensatory afforestation.
- B. Deviations changing the basis of management permanently
 - a. Changes in the silvicultural systems.

- b. Formation of new felling series.
- c. Clear felling of natural forest.
- d. Large scale felling due to natural calamities.

The sanctions to all the deviations will be obtained well in advance. The proposals for sanction of deviations will be submitted timely so that the permission is received before deviations occur. The format for submission of Deviation proposals is given in Appendix II.39.

15.10.4.3 Procedure for obtaining sanction for deviations

- 1) For deviations of type “A” in para 15.10.4.2, the Deputy Conservator of Forests, West Nashik division should submit the proposal of deviation to the Deputy Conservator of Forests (Working Plan), Nashik through the Chief Conservator of Forests (Territorial), Nashik. The Chief Conservator of Forests (T), Nashik has to give his opinion for the deviation proposal submitted by the concerned Deputy Conservator of Forests. The Deputy Conservator of Forest (Working Plan), Nashik after scrutiny of the records submit the proposals with his comments to the Additional Principal Chief Conservator of Forests (Working Plan West), Pune. Further, the APCCF (Working Plan West), Pune will forward the proposal with his comments to the Principal Chief Conservator of Forest (P&M), Nagpur. The PCCF (P&M) will give the necessary sanction for deviations.
- 2) For deviations of type “B” in para 15.10.4.2, the Deputy Conservator of Forests, West Nashik division should submit the proposal of deviation to the Deputy Conservator of Forests (Working Plan), Nashik through the Chief Conservator of Forests (Territorial), Nashik. The Chief Conservator of Forests (T), Nashik has to give his opinion for the deviation proposal submitted by the concerned Deputy Conservator of Forests. The Deputy Conservator of Forest (Working Plan), Nashik after scrutiny of the records submit the proposals with his comments to the Additional Principal Chief Conservator of Forests (Working Plan West), Pune. Further, the APCCF (Working Plan West), Pune will forward the proposal with his comments to the Principal Chief Conservator of Forest (P&M), Nagpur. The Principal Chief Conservator of Forests and Head of Forest Force (PCCF & HoFF), M.S., Nagpur will give the necessary sanction for deviations.

15.10.5 Plantation and Nursery Registers: Plantation registers will be maintained for all the areas of both artificial regeneration and natural regeneration as per established departmental procedures. It shall be

maintained as per the formats provided in Appendix II.43. Similarly the nursery registers also need to be maintained at all nurseries to record all happenings in the forest nursery and the format of nursery register is provided as Appendix II.44.

15.10.6 Divisional Note Book: At divisional level all-important matters will be recorded by the Deputy Conservator of Forests, West Nashik division every year with his explicit opinions about the working plan operations. A brief note about the plantation will also be recorded by the Deputy Conservator of Forests, West Nashik division under appropriate heads. The format of the Divisional Journal/Note book is given in Appendix II.45.

15.10.7 Fire Records: They should be maintained as per the latest orders from State Government from time to time.

15.10.8 Other Records: List of amendments to the working plan and list of area changes will be maintained in prescribed forms.

15.11 Prescriptions for forest areas under Eksali plots, HPC, IFR, etc

In the past, the forest areas have been distributed for agriculture under various names by the State Government in West Nashik division. After that the necessary reconciliation of those forest areas has not been done by the Forest Department. There is a need for reconciliation of records related to earlier distributions, its ground survey and removal of encroachment if any. In this direction the following prescriptions are provided:

- 1) Reconciliation of records related to Eksali plots, HPC, Individual Forest Rights (IFR), etc.
- 2) Preparation of village-wise list of beneficiary with all details like survey number/Gut number, area allotted, Government orders, name of original beneficiary, present occupant, etc.
- 3) Survey and demarcation of whole forest survey number/Gut number to identify the land allotted to the beneficiary and the remaining area with the Forest Department.
- 4) Enquiry about the issues like compliances of conditions, illegality in land transfer if any, etc., shall be done.
- 5) If any illegality found, then necessary legal recourse shall be taken.
- 6) After fulfilling the legal compliances, the forest land illegally occupied shall be taken into possession of the Forest Department.

15.12 Observations on Evaluation reports of plantations

The evaluations of the plantations are carried out by the Divisional Forest Officer (Evaluation), Nashik, and his sub-ordinate officers and staff. While going through the evaluation reports of few plantations carried-out during the last decade, certain observations are found to be important and worth mentioning here, so that necessary steps be taken up by the territorial staff of the West Nashik division while implementing the working plan prescriptions. The observations are as given below:

- a) It is necessary to prepare a site-specific estimate of the plantations before taking up the activity.
- b) It is necessary to seek the cooperation of the villagers so as to contain the menace of cattle grazing.
- c) The treatment map should be prepared by the concerned Range Forest officer.
- d) Special efforts and steps needed to be taken to protect the plantations.
- e) Careful selection of species for plantations and its nursery care as mentioned in respective working circles need to be religiously followed for the success of plantations.

15.13 Survey and maps

Eight sets of fresh maps on 2" = 1 mile scale have been prepared as follows:

- a) Management maps: 6 sets
- b) Stock maps: 2 sets

The distribution of maps will be as follows:

- 1) Deputy conservator of forest (Working Plan), Nashik: One draft set showing the existing compartment boundaries and stocking details will be prepared based on which the master sets of stock maps and management maps showing the compartments, coupes, felling series, working circles, and other management details will be prepared.
 - a) Management maps: One master set
 - b) Stock maps: One master set
- 2) Deputy conservator of Forest, West Nashik division:
 - a) Management maps: 3 sets

- b) Stock maps: 1 set
- 3) Chief Conservator of Forest (T), Nashik:
 - a) Management maps: 1 set
- 4) Additional Principal Chief Conservator of Forest (Working plan West),
Pune:
 - a) Management maps: 1 set

CHAPTER-16

SCIENCE AND RESEARCH

16.1 RESEARCH GAPS

A research need is defined as a gap that limits the ability of decision-makers from making decisions. Because of the lack of any research works/paper related to the natural resources of the West Nashik Division, many chapters that involve specific information on the West Nashik Forest Division could not be written with accurate data. The research gap is within almost every aspect of the Working Plan as the scope of earlier Plans was restricted in many issues like Biodiversity and all its components, Climate change and Carbon sequestration, NTFP research, Trees outside forests, Social and cultural aspects of forests, Ecosystem Services, etc. However, an area in which the research gap is felt is explained below:

- a) Biodiversity: Apart from a few mammals, trees, and a few major herbs and shrubs, the Forest Department does not have a record of the whole gamut of biodiversity present in the Forest Divisions. The details of Flora, Birds, Butterflies and Reptiles are collected from the Botany and Zoology departments of Trimbakeshwar College. In addition, the information of biodiversity is collected from the various websites. It is explicit that a Biodiversity Assessment study is very much required for the documentation of the richness of these forests.
- b) Carbon sequestration: Carbon sequestration remains an essential aspect of the contribution of forests towards Climate Change. However, since we do not have base data, it would be challenging to monitor the increase/decrease in sequestration levels. Infusion of technical persons specialized in Ecology/Forestry on contractual basis into SoFR units will help in the effective assessment of the diverse pools of Carbon. Otherwise, periodical study through Institutes can be carried out for each forest division.
- c) NTFP Research: NTFP is extremely critical to the health and productivity of the forests. Though we possess data on the major NTFP tree species and few prominent medicinal plants, it is known that the people around forests use much more variety of species than we ever know. There is a need for research to be done for the documentation of all the species that are being used by the people and also to devise the most effective methods for the harvest of the species through experimentation.

16.2 PRESERVATION PLOTS

Preservation plots, the miniature nature reserves, are demarcated forest areas set aside for the preservation of the forest in perpetuity permitting only such human interference as is necessary for their protection and maintenance. Following the recommendations of the IIIrd All India Silvicultural Conference (Anon, 1929), preservation plots in the representative areas of Chief Forest Types were marked. By 1939, about 112 preservation plots were established throughout the country, when the concept of preservation of both climatic and seral types was generated (Anon., 1939). In 1961, during the Xth All India Silvicultural Conference, emphasis was placed on the preservation of magnificent specimens of forests i.e. groups of out-standing trees, rare types of forests of botanical curiosity, and patches of relict vegetation, specimens of managed forests (stable sub-climax stages) and climax forests. (the excerpts from the paper 'An account of Preservation Plots in Central India' by B.N. Gupta and N.G. Totey, Indian Forester, 1994).

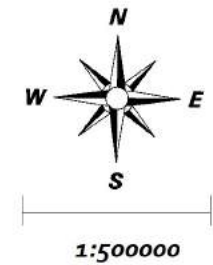
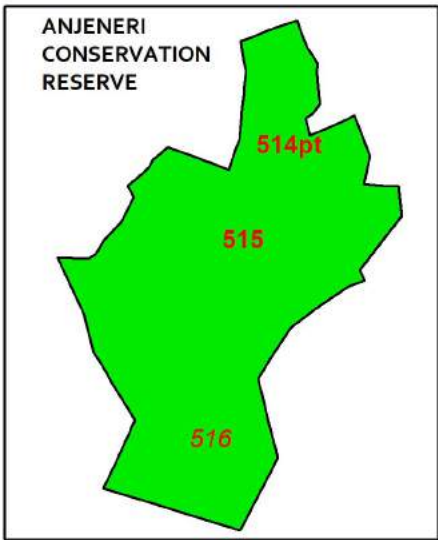
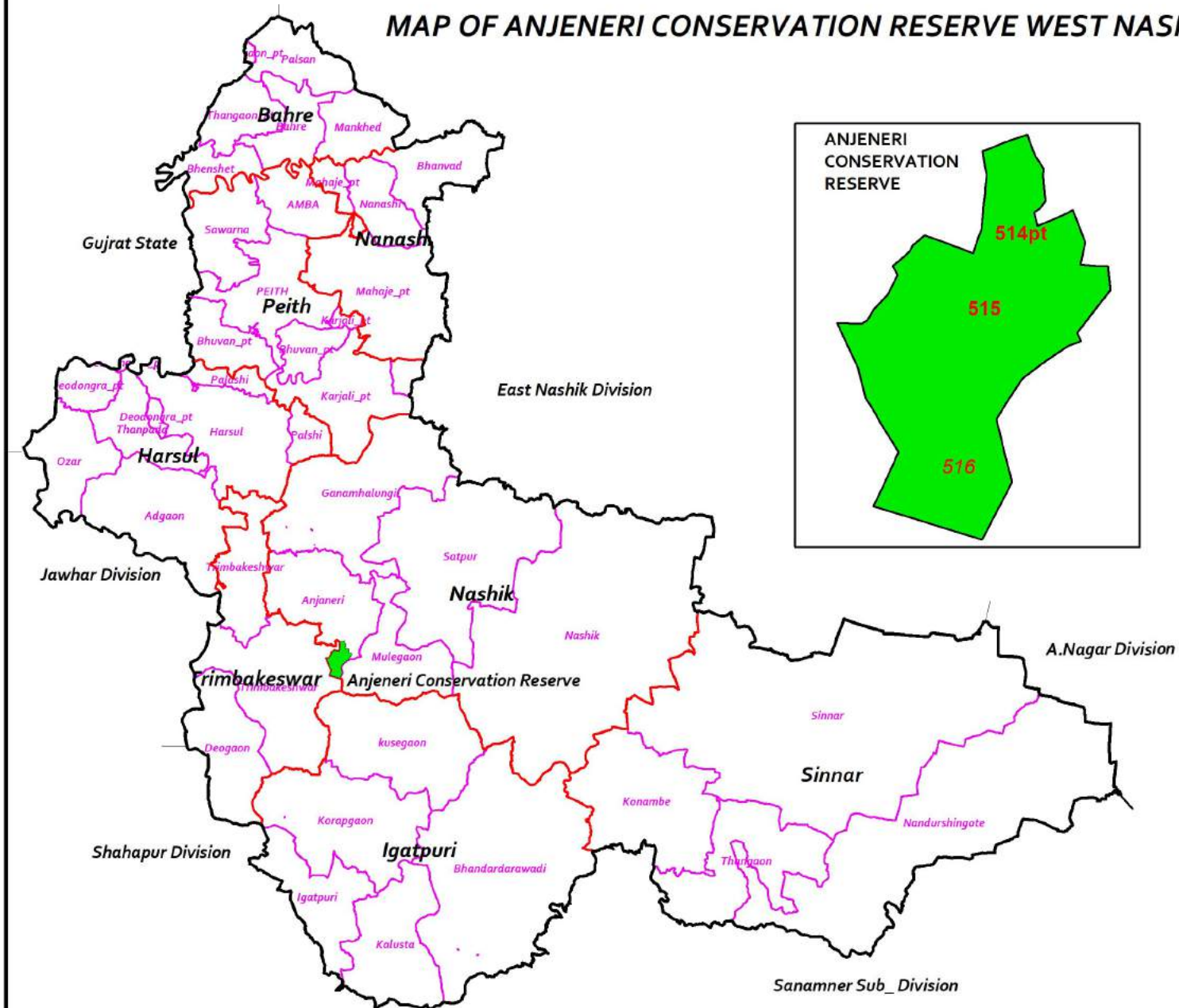
16.2.1 Preservation Plots in Maharashtra

Preservation plots in Maharashtra have been established as early as 1955 and 1993. There are 23 preservation plots in Maharashtra covering an area of 517.32 ha. Out of these, about 50% plots fall in dry deciduous forests, 30% in moist deciduous forests, and 20-22% in subtropical hill forests. There are 36 forest types as per the Champion and Seth (1968) in Maharashtra spread over 44044 sq. km (Anon. 1991), but preservation plots have been identified only in 5 to 8 types like 3B/C1, 3B/C2, 5A/C1, 5A/C3, 8A/C2, etc. The remaining forest types though important from the point of view of biodiversity are not covered. In the West Nashik forest Division, no Preservation Plot was established by the Research wing of the Forest department.

16.2.2 Identification of Preservation plots in West Nashik division

Anjaneri has already been declared by the Government of Maharashtra as the Conservation Reserve. The entire area of Anjaneri will be maintained as Preservation Plot. The details of this Preservation plot are as given below:

MAP OF ANJENERI CONSERVATION RESERVE WEST NASHIK DIVISION



LEGEND

- DIVISION BONDARY
- RANGE BOUNDARY
- ROUND BOUNDARY
- ANJENERI CONSERVATION RESERVE

Table 16.1: Details of Preservation Plot

Sl. No.	Range	Name of preservation plot	Compartment	Year	Area (Ha)	GPS location
1	Nashik	Anjaneri	514 to 516	2020	569.00	E73°35'41.118 ^{II} N19°55'18.544 ^{II}

Following activities will be carried out for monitoring of succession process:

- a) These plots should be well-demarcated on the ground, geo-referenced, and plotted on a GIS-based map. The preservation plot will be completely fenced with chain link fencing.
- b) These plots shall be spared from all human interference including harvesting operations if prescribed in the Plan. Activities shall be limited to those that would ensure protection, rejuvenation and maintenance.
- c) The entire area of Anjaneri will be maintained as a Preservation plot and 12 metres clear strip around these plots need to be maintained. This will act as a fire line and also gives clear demarcation on the ground. These strips shall be maintained every year.
- d) A total enumeration of biodiversity including both flora and fauna of this area shall be taken up taking into account all the species (trees, shrubs, herbs and other lowerforms of flora) of the forests. The data need to be collected in measurable traits like Age-class distribution, height, girth, regeneration status, etc.
- e) The forest shall equally be described in a proper manner with respect to its species composition, forest storey, condition of the crop, health and vitality, presence of pests, etc.
- f) The recordings for the Preservation Plots should be compiled and a copy of the same be submitted to the Working Plan office annually.

16.3 SAMPLE PLOT, REGENERATION PLOTS AND NTFP PLOTS

The sample plots identified in different Working circles are given in the table below and these plots will also be used as Regeneration plots and NTFP plots. The regeneration plots will be laid around these sample plots as per procedure given by the Forest Survey of India (FSI), Dehradun.

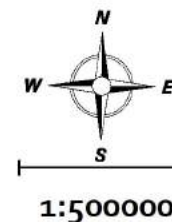
The prescriptions for Sample plots, Regeneration plots and NTFP plots are as underneath:

- The Deputy Conservator of Forests, West Nashik Division shall carry out an arrangement for yearly collection of data regarding crop growing stock and its increment, incidences of threats, regeneration status, NTFP species, carbon pool data of both above ground and below ground, etc.
- The data compiled so shall be used for comparison after every five years for change indicators.
- All these plots shall be properly demarcated with cement pillars for their identity on the ground.
- The data collected annually shall provide the inputs for the revision of Working Plan prescriptions.
- The Deputy Conservator of Forests, West Nashik shall take a personal interest in the collection of valuable data from these plots and its proper documentation. Any difficulty in locating and documenting the data from these Sample plots, the Deputy Conservator of Forests can take assistance from the Working Plan officer (WPO), Nashik.

Table 16.2: Details of Sample plots to be maintained permanently

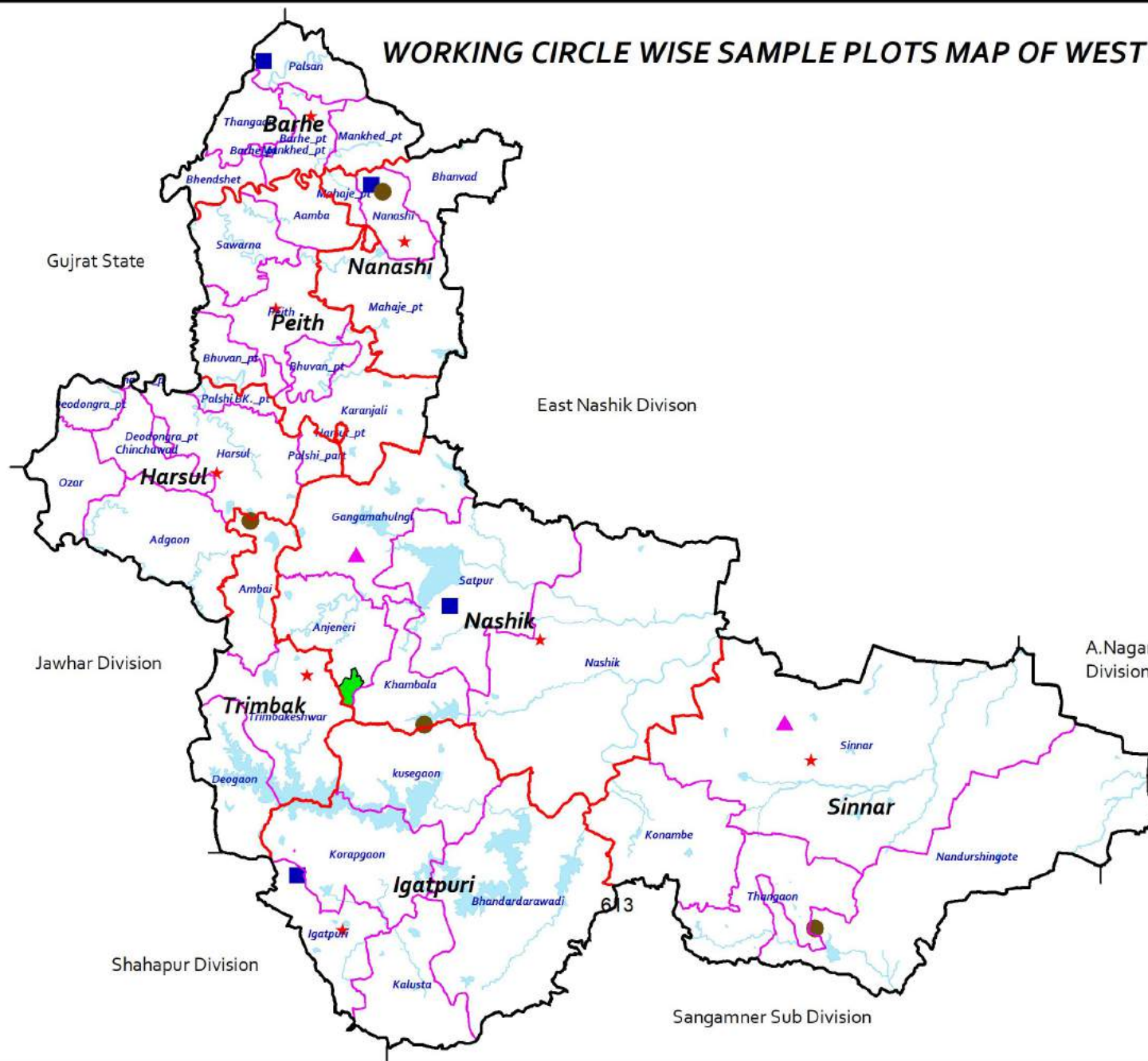
Sl. No.	Range	Beat	Village	Working circle	Comptt	Longitude and Latitude
1	Barhe	Bhavada	Madhuri	IWC	06	E73°28'44.316 ^{II} N20°30'16.698 ^{II}
2	Nanashi	Gandola	Gandola	IWC	271	E73°35'15.374 ^{II} N20°23'36.009 ^{II}
3	Nashik	Satpur	Wasali	IWC	508	E73°40'17.726 ^{II} N19°59'56.787 ^{II}
4	Igatpuri	Igatpuri	Khaira	IWC	665	E73°31'32.221 ^{II} N19°44'44.786 ^{II}
5	Nanashi	Dehre	Dehre	AWC	273	E73°35'157.812 ^{II} N20°23'03.899 ^{II}
6	Trimbak	Warasvahir	Waghera	AWC	427	E73°28'26.583 ^{II} N20°04'30.782 ^{II}
7	Nashik	Dahegaon	Dahegaon	AWC	530	E73°38'55.349 ^{II} N19°53'16.863 ^{II}
8	Sinnar	Nandur Singote	Chapadgaon	AWC	584	E74°02'10.680 ^{II} N19°42'11.399 ^{II}
9	Nashik	Anjaneri	Metghar Fort	PWC	516	E73°35'41.118 ^{II} N19°55'18.544 ^{II}
10	Igatpuri	Adsare Bk	Sonoshi	PWC	618	E73°46'31.381 ^{II} N19°38'32.005 ^{II}
11	Sinnar	Deshwandi	Deshwandi	GFWC	562	E74°00'13.017 ^{II} N19°53'33.562 ^{II}
12	Nashik	Ganga-Mhalungi	Ganga-Mhalungi	GFWC	492	E73°34'43.069 ^{II} N20°02'35.831 ^{II}

WORKING CIRCLE WISE SAMPLE PLOTS MAP OF WEST NASHIK DIVISION



LEGEND

- Division_Boundary
- Range_Boundary
- Round_Boundary
- Sampal_Plot_AWC
- Sampal_Plot_IWC
- Sampal_Plot_PWC
- Sampal_Plot_Fodder
- Conservation Reserve
- DRAINS



16.4 REFERENCES

During the process of writing of this Working Plan the following papers, articles, reports, and documents were referred and used for the writing of the Working Plan.

Table 16.3: List of papers, articles, reports and documents referred

Sl. No.	Department	Subject
1	FSI (Forest Survey of India)	
1(a)	SFR 2009 to 2017	The condition of the forests and forest cover over the last decade during the implementation of the plan based on the forest cover maps published by FSI.
1(b)	Carbon Statistics of India	Methodology for the assessment of Forest Carbon and accounting of Forest Carbon Stock.
2	Indian Institute of Forest Management, Bhopal (IIFM)	Net Present Value
3	Ground water survey and Development Agency (GSDA)	1) Assessment of Dynamic Ground Water Resources of the Maharashtra and Aquifer Parameters. 2) Taluka wise Ground Water Resources in Nashik District.
4	iucnredlist.org	IUCN Status of animals
5	Social Forestry Nashik and Nashik Municipal Corporation	Information regarding Tree outside forest area
7	Survey of Forest Resources (SoFR), Nashik	Tree Enumeration of the West Nashik Division.
8	Maharashtra Remote Sensing Application Centre (MRSAC)	Village Boundary and Survey Number data of Nashik District.
9	National Agroforestry Policy 2014	Potential of Agroforestry for

		TOF
10	Implementation of Biological Diversity Act in India; An overview by Pravat Chandro Sutar, Nigamananda Swain and Bikash Rath	Implementation of Biodiversity Act 2002
11	Characterisation and Classification of Soils of Nashik District, Maharashtra by JAGDISH PRASAD <i>et.al.</i>	Soil characterisation and soil properties of Nashik
12	A source Book for Soil and Water conservation measures by Foundation for Ecological Security	Soil and water conservation measures
13	United Nations Forum on Forests Report of the sixth session (27/05/2005 and 13/02/2006)	International Goals of Forest Management
14	Sustainable forest management in India by Tajbar S. Rawat <i>et.al</i>	Sustainable Forest management principles and practices
15	Fungal Diseases of Trees in Forest Nurseries of Indore, India, Hemant Pathak <i>et.al.</i>	Forest nursery diseases management
16	Global Forest Resources Assessment- Forest health and vitality	Forest health and Vitality
17	www.fao.org	Issues related to JFM, NTFP, Forest management, Forest Protection, etc.
18	www.shodhganga.inflibnet.ac.in	Various issues related to Nashik district and Forest Management in India.
19	ENVIS and Wildlife Institute of India, Dehradun	Ecology and Management of Grassland Habitats in India
20	ENVIS MoEFCC	a) Handbook on JFM b) Human-Leopard conflict management
21	The International Ecotourism Society (www.ecotourism.org)	Ecotourism, Principles and Methodology
22	Nursery Pests of Forest tree species and their management, George Mathew	Forest nursery Pests management

Chapter-17

SUMMARY OF PRESCRIPTIONS

17.1 INTRODUCTION

Nashik possesses a unique personality of its own, due to its mythological, historical, social and cultural importance. The city is situated on the banks of the Godavari River, naturally making it one of the holiest places in the world. There are two forest divisions and one sub-division in Nashik district. They are West Nashik division, East Nashik division and Malegaon sub-division. This Plan contains the area of the West Nashik division. The tract dealt lies between latitude $19^{\circ} 35'$ and $20^{\circ} 50'$ North and Longitude $73^{\circ} 16'$ and $74^{\circ} 56'$ East.

The topography of West Nashik division comprises of varied features from hilly to plain as progress from west to east. The western portion is hilly and intersected by ravines, and here only the most classic kind of cultivation is possible. Broadly the hills can be categorized into three noteworthy ranges:

- 1) Selbari Range, which may be inclusive of the Dholbari range alternately called Selbari-Dholbari range.
- 2) Satmala Range also designated the Satmala-Ajanta range.
- 3) Trimbakeshwar Range constitutes the Trimbak-Anjaneri hills.

The soils of the district represent the weathering products of Basalt and include various shades from grey to black, red, and pink colour.

The boundaries of the West Nashik forest division are given below:

Table 17.1: Boundaries of the West Nashik division

Sl. No.	Directions	Name of division/district
1	North	East Nashik division and Gujrat state
2	East	East Nashik division and Ahmednagar division
3	West	Jawhar Division and Gujarat state
4	South	Shahapur division and Sangamner sub-division

The total forest area of the West Nashik division as per Form No. 1 is 126304.399 ha, out of this, 31451.140 ha has been handed over to FDCM. In the year 2016-17, an area of 290.153 ha has been transferred to East Nashik

forest division. Hence, the net area in charge of the West Nashik forest division is 94853.259 ha.

Table 17.2: Range-wise forest area Statement

Sl. No.	Range	Area (in Ha)						
		Reserved Forest	Protected Forest	CA area	Acquired Forest	Total	Area handed over to FDCM	Net Area
1	Barhe	10903.622	4167.578	0.000	0.000	15071.200	0.000	15071.200
2	Nanashi	7743.506	615.534	6.970	100.490	8466.500	594.746	7871.754
3	Peint	16081.336	5477.216	2.970	132.310	21693.832	11578.757	10115.075
4	Harsul	14889.359	10017.465	0.000	3209.073	28115.897	13342.743	14773.154
5	Trimbak	9630.986	0.000	0.000	831.090	10462.076	0.000	10462.076
6	Nashik	10918.684	150.000	46.450	0.000	11115.134	2132.228	8982.906
7	Igatpuri	17166.130	0.000	0.000	159.890	17326.020	3802.666	13523.354
8	Sinnar	13879.969	0.000	4.000	169.771	14053.740	0.000	14053.740
	Total	101213.592	20427.793	60.390	4602.624	126304.399	31451.140	94853.259

West Nashik division earlier had four subdivisions and six Ranges. In the year 2007, two new Ranges i.e., Trimbak and Nanashi were formed. Hence, as on prevalent today, there are four subdivisions and eight Ranges in the West Nashik division.

Table 17.3: The administrative units of the West Nashik forest division

Sl. No.	Sub-division	Ranges	Rounds	Beats
1	Nashik	Nashik	5	16
		Trimbak	3	11
2	EGS	Igatpuri	5	18
		Sinnar	4	14
3	Campa	Harsul	6	19
		Peint	5	20
4	FLCS	Nanashi	3	11
		Barhe	5	17
Total	4 subdivisions	8 Ranges	36 Rounds	126 beats

The allocation of forest areas under various working circles in this working plan is as given under.

Table 17.4: Area Allocation to Different Working Circles

Sl. No.	Name of Working circle	Area allotted (Ha)
1	Improvement working circle	49347.193
2	Afforestation working circle	17519.221
3	Protection working circle	11388.756
4	Grass and Fodder working circle	6136.657
5	Bamboo (Overlapping) working circle	9031.00
	Total	84391.827

17.2 THE SUMMARY OF PRESCRIPTIONS OF VARIOUS CHAPTERS

17.2.1 IMPROVEMENT WORKING CIRCLE

- 1) Coupe Demarcation and Treatment Map
 - a. Demarcation and Marking: One year in advance
 - b. Treatment Map shall indicate A, B, C and D type areas.
 - c. A type area: Protection area (A1: Steep slopes, A2: 20 metres wide strips along streams, A3: excessively erosion prone areas)
 - d. B-type area: Understocked areas (density <0.4)
 - e. C-type area: Congested Pole crop
 - f. D-type area: Well stocked areas (density >0.4)
- 2) Marking
 - a. A type area: No marking
 - b. B type area: All dead trees, live high stumps
 - c. C type area: The congested pole crop shall be marked for thinning.
 - d. D type area:
 - i. All fruit bearing species shall be reserved.
 - ii. All dead and malformed trees retaining 2 trees per ha and all live high stumps shall be marked for felling. Matured trees that have developed hollowness and show visual sign of decay will be marked for felling.
- 3) Silvicultural System
 - a. Improvement felling for qualitative and quantitative improvement of the forest crop.
 - b. Adequate growing space is provided to trees of valuable species.
 - c. The improvement felling supplemented by tending of naturally regenerated crop will aid in transition of middle aged stem to

maturity. Natural regeneration deficient areas to be supplemented by the Artificial regeneration.

- d. The species whose population in the 'stand' dynamics is less than 1% shall be retained till they reach the rotation age.

4) Regeneration

- a. Natural Regeneration: Natural regeneration of seed origin of valuable species to be preferred and managed through tending operations. If NR of seed origin is not available in required numbers, then the coppice of valuable species will be nurtured.
 - b. Artificial Regeneration: Depending on site suitability, plantations of local species shall be taken up on Natural regeneration deficient areas.
 - c. In the areas suitable for teak, pure teak plantations shall be taken up. Also, in all plantations about 10 per cent seedlings shall be of Ficus family like Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Umber (*Ficus racemosa*), etc.
 - d. Strict protection from fire and grazing
 - e. The good *Gliricidia* plantations need to be converted into more valuable species by clearing alternatively a strip of 35 metre along the contour. About 5.5 metres spacing shall be provided on sides adjacent to retained *Gliricidia* crop to reduce competition. In clear felled strips, artificial plantation of suitable local species will be undertaken.
 - f. The Grass plantation using the poly-pot raised palatable grass seedlings shall be taken up.
 - g. The small isolated patches are vulnerable for encroachment. They need to be clearly demarcated on ground followed by protection through chain-link fencing around. These lands shall be used for raising plantation of *Ficus spp* (Vad, Pipal and Umber, etc.), so that they act as micro-habitat for avifauna.
- 5) SMC Works: Soil and moisture conservation measures on the "Ridge to Valley" principle shall be taken up in this working circle for effective conservation of soil and water. These activities help in fostering good micro-climate for better development of vegetation.

17.2.2 AFFORESTATION WORKING CIRCLE

1. Coupe Demarcation and Treatment Map

- a) Demarcation and treatment map will be prepared one year in advance.

- b) Treatment map shall show A, B, C and D areas.
 - c) A type area: Protection area (A1: Steep slopes, A2: 30 metres wide strips on both sides of streams, A3: excessively erosion prone areas).
 - d) B-type area: Understocked areas (density <0.4)
 - e) C-type area: Congested Pole crop
 - f) D-type area: Well stocked areas (density >0.4)
2. Silvicultural System
- a) Only hygienic fellings prescribed (Dead, diseased, live high stumps, etc.)
 - b) Afforestation of local species by planting quality seedlings of 12 to 15 months old.
 - c) JFMCs to be actively involved.
3. Regeneration
- a) Tending of Natural regeneration is prescribed to be given preference over plantation.
 - b) Cultural operations for natural regeneration in 'D' type areas and artificial regeneration in 'B' type areas are prescribed.
 - c) In the areas suitable for teak, pure teak plantations shall be taken up. Also, in all plantations about 10 per cent seedlings shall be of *Ficus* family like Vad (*Ficus benghalensis*), Pipal (*Ficus religiosa*), Umber (*Ficus racemosa*), etc.
 - d) Requirement of site would be the prime consideration for deciding the extent of plantation.
 - e) The small isolated patches are vulnerable for encroachment. They need to be clearly demarcated on ground followed by protection through chain-link fencing around. These lands shall be used for raising plantation of *Ficus spp* (Vad, Pipal, Umber, etc.), so that they act as micro-habitat for avifauna.
 - f) The good *Gliricidia* plantations need to be converted to more valuable species by clearing alternatively a strip of 35 metres along the contour. About 5.5 metres spacing shall be provided on sides adjacent to retained *Gliricidia* crop to reduce competition. In clear felled strips, artificial plantation of suitable local species will be done.
4. SMC Works: Soil and moisture conservation measures on the "Ridge to valley" principle shall be taken up in this working circle for effective conservation of soil and water. These activities help in fostering good micro-climate for better development of vegetation.

17.2.3 PROTECTION WORKING CIRCLE

1. Coupe Demarcation and Treatment Map
 - a) Demarcation: One year in advance
 - b) Treatment Map shall show A, B, C and D type areas
 - c) A type area: Protection area (A1: Steep slopes, A2: 20 metres wide strips along streams, A3: excessively erosion prone areas)
 - d) B-type area: Understocked and blank areas (density less than 0.3)
 - e) C-type area: Group of naturally grown poles.
 - f) D-type area: Well stocked forest patches.
2. Silvicultural System
 - a) Silviculture system is proposed on “Ridge to valley” principle of watershed management.
 - b) Harvesting of green trees is prohibited.
3. Regeneration
 - a) Natural Regeneration: All seedlings and saplings of valuable species more than 1 meter height will be nursed as future crop. The artificial regeneration shall be used to supplement the Natural regeneration deficient areas.
 - b) Strict protection from fire and grazing.
 - c) Grass plantation using poly-pot raised seedlings shall be undertaken.
 - d) Creation of live-hedge along the contour on areas having slope more than 25° for conservation of soil and moisture; bush sowing of suitable tree species once the live-hedge establishes in the area.
5. SMC Works: Soil and water conservation measures shall be taken up in this working circle depending on site requirement. The principle of ‘Ridge to Valley’ to be religiously followed in planning and execution of soil and water conservation works. The requirement of the site would be the prime consideration while planning for Soil and moisture conservation works.

17.2.4 GRASS AND FODDER MANAGEMENT WORKING CIRCLE

- 1) Coupe Demarcation: The coupe due for closure to grazing will be demarcated one year in advance. The period of the closure will be prominently displayed at the convenient places.
- 2) Silvicultural system: The silvicultural systems to be followed are as under:
 - a. Natural augmentation of grasslands

- b. Artificial regeneration of palatable grass species
 - c. Rotational grazing
 - d. Encourage grass plantation in private areas.
- 3) Treatment
- a. The method of treatment to improve grasses shall comprises of (a) augmenting natural grasses in grasslands through closure, (b) artificial augmentation of palatable grass species and (c) rotational grazing in pasture areas.
 - b. The polypot grass seedlings of good nutritional value shall be distributed to the public on the concessional rate in line with distribution of seedlings at concessional rates during Van-mahotsav season.
 - c. Removal of invasive weeds.
 - d. JFMCs to be actively involved.
- 4) Associated regulations
- a. Seeding of grasses: To allow seeding of fodder grasses, the coupe shall be closed to the cutting of grass from 1st June to 30th November, after which the grass will be allowed to be removed by cutting. Data on such removals should be kept with JFMCs.
 - b. Fire Protection: The areas shall be protected from fire with the involvement of local people or JFM Committees.
 - c. Inspections: The area closed to grazing shall be inspected frequently by the Officers in charge to see that the closure is adequately enforced.
- 5) Soil and water conservation measures shall be taken up in this working circle depending on site requirement. The principle of 'Ridge to Valley' to be religiously followed in planning and execution of soil and water conservation works. The requirement of the site would be the prime consideration while planning for Soil and moisture conservation works.

17.2.5 BAMBOO (OVERLAPPING) WORKING CIRCLE

The crop will be managed on a clump basis i.e., each clump will be treated independently as per the requirement. The clumps shall be worked as per the standard silvicultural rules for the harvesting of Bamboo. The felling rules are explained below:

- 1) The harvesting of bamboo will be done in a cutting cycle of 3 years. Each cutting series will be divided into three annual coupes viz., A, B and C.

One of the coupes from each of the cutting series will be worked annually.

- 2) No harvesting works shall be permitted between 15th June and 30th September. During this period, the sprouting of new bamboo culms takes place and they need to be protected from harvesting.
- 3) No clump shall be considered fit for harvesting unless it contains more than 12 mature culms (One year as well as more than one-year-old culms among them). There must have at least a few culms of two years old.
- 4) No culms below the age of two years shall be cut/harvested.
- 5) Following culms shall be removed from all clumps:
 - a) All dead, decayed and dry bamboo
 - b) Culms whose half or more of the top part is broken or damaged
 - c) Twisted or malformed culms
- 6) In a mature clump, the following types of culms (Green and live) shall be retained:
 - a) All culms below the age of two years
 - b) From the culms of more than one year old, culms equal in number to the current season's (i.e. less than one-year-old) culms or 12 whichever is more. The remaining culms of age more than two years will be considered available for harvesting
- 7) The cutting height of culms will be between 15 to 45 cm above ground level i.e., above the first internode above the ground. The cutting shall be slant with a pointed instrument.
- 8) In case of any flowering, no culm from the flowered clump shall be cut/felled in the year of flowering.
- 9) Harvesting of bamboo shall be done in a manner so as to ensure the retained culms are evenly spaced and that some mature culms i.e., more than two years old are retained at the periphery for the purpose of support to the new culms.
- 10) Following acts will be strictly prohibited:
 - a) Digging of rhizomes
 - b) Lopping of bamboo culms for fodder
 - c) Use of tender bamboo culms for bundling
- 11) Climbers interfering with the growth of bamboo clumps shall be removed.
- 12) After cutting, the debris will be stacked at a distance not less than 2 metres away from the outer periphery of each clump. Cutting shall be supervised by a forest officer, not below the rank of the Range Forest

officer under the guidance of concerned Assistant Conservator of Forest fully conversant with the rules of bamboo cutting.

17.2.6 NON TIMBER FOREST PRODUCE

The prescriptions provided for management of Non timber forest produce through sustainable harvesting plan as given below:

- a) Demarcation of the NTFP resource base shall be carried-out based on ecosystem type and as far as possible through natural boundary or village boundary. These boundaries shall be communicated to the Working Plan division to prepare digitised maps of this resource base.
- b) Conduct the sample field inventory to assess the growing stock and condition of target products and the ecosystem. Then assess the supply volume based on the current harvesting and trade/use.
- c) Identify the current and potential threats to the resource base. Conduct group meetings and inquire where and how the products have been collected in the last three years.
- d) Arrange a workshop at each Range with all stakeholders to prepare a microplan for each Range regarding collection, processing and marketing of NTFPs. Also, conduct sample interviews with collectors to learn their perceptions of the product availability and quality changes.
- e) Keep community members involved in all data collection and study steps. Use the results of the above steps to design and implement biological monitoring.
- f) The monitoring plan should indicate the area being monitored, target species, ecosystem changes and human activity impacting the species and ecosystem. Sampling areas and growth and yield studies become integral parts of the monitoring plan.
- g) Determine a preliminary estimate of a sustainable harvest regime. Monitor this harvest rate and make adjustments (as necessary) in the biological monitoring plan.
- h) Once the preceding work is over, the Sustainable harvesting of all NTFPs shall be monitored as per the monitoring plan by the concerned Joint Forest Management committees (JFMC).

17.2.7 JOINT FOREST MANAGEMENT

The prescriptions for Joint Forest Management activities are as given below:

- 1) Village Bank: A “Village Bank” consisting of willing villages should be created and updated regularly for the West Nashik forest division. This Bank will act as a “feeder channel” for the selection of villages where JFM supposed to be implemented. Each year, one village from each Range shall be selected for the implementation of the JFM program.
- 2) Microplan: Preparation of the “micro-plan” on the basis of PRA exercise should be undertaken by the villagers and not by the forest officials. The Forest Department should give all necessary inputs for the preparation of scientific management plans to ensure sustainable management of the entire forest area belonging to the village. The management options for such forest should include the following points:
 - a. Entry point activity: The entry point activity shall wholly contain the distribution of plants to be grown in kitchen garden like *Moringa olifera* (Drumstick), *Mangifera indica* (Mango), *Embllica officinalis* (Awla), *Citrus limon* (Lemon), *Psidium guajava* (Guava), *Murraya koenigii* (Kadi patta), etc. The main objective of this intervention is to provide nutritional supplements to family members through these plants.
 - b. Soil and moisture conservation works: Soil and moisture conservation works shall be taken up as per the Ridge to valley concept. The essential principle will be to conserve the entire rainwater within the village itself to enhance the groundwater table.
 - c. Afforestation on forest lands: The Afforestation activities on forest lands will include:
 - i. Natural Regeneration: Natural Regeneration are prescribed to be given preference over plantations. The areas having promising NR patches shall be identified and marked for further development. The prescriptions for these areas are that Natural Regeneration should be supported with Aided Natural Regeneration.
 - ii. Artificial Regeneration: Plantations shall be taken in the open areas which have good soil depth and are well-drained. The choice of species is carefully selected as per site suitability. Good quality seedlings of 12 to 15 months old shall be used for plantations. Improved nursery practices shall be adopted to raise quality seedlings.
 - iii. Bamboo plantation: Bamboo comprises a versatile plant and yields returns within 3 to 4 years. Depending on site suitability, bamboo plantations need to be undertaken under

JFM. The use of tissue culture bamboo seedlings shall be used while taking up new plantations. This will provide revenue for the sustenance of the JFM program in the village.

- iv. Grass and fodder plantation: There is large scale grass and fodder requirement in this area due to flourishing Dairy development. Therefore, priority should be placed for raising grass and fodder trees in forest areas depending on site suitability.
- d. Plantation on outside forest area: This activity will be implemented through the Social Forestry division of the Forest department.
 - i. Block plantation on village common land: The preference shall be indicated for raising combination of short and long rotation forestry species of NTFP values like Tamarind (*Tamarindus indica*), Jamun (*Syzygium cumini*), Kadi patha (*Murraya koenigii*), Triphala (Hirda, Behada, Amla), etc. These plantations will provide sustained revenue to the village panchayat.
 - ii. Roadside plantations: All roads within the village and other connecting roads shall be planted under the Roadside plantation program.
 - iii. Bamboo plantation on agriculture land: There are two schemes that are implemented by the Maharashtra Bamboo Development Board. They are Atal Bamboo Samruddhi Yojana (a state scheme) and Plantations under National Bamboo Mission (a CSS scheme). More beneficiaries from the selected JFM villages shall be included under these two schemes.
- e. Distribution of LPG: LPG distribution will deliver direct benefits in reducing fuelwood pressure on forests. Hence, proper planning should be made to include all beneficiaries in the JFM village through the convergence of the Government of Maharashtra scheme with the Ujwala yojana of Government of India.
- f. Monitoring and evaluation: Monitoring refers to the concurrent assessment of any JFM program which can be undertaken concurrently with the implementation of the program, to ensure that the program is on track as prepared. In contrast to monitoring, at the end of the program, its evaluation is done against its baseline situations at the conceptualization stage of the

program. The online monitoring of the JFM program using advanced technology needs to be developed.

- 3) Conflict resolution: The collaborative management practices for sustainable management of natural resources have included more stakeholders, which is not limited to the foresters and the villagers. This has increased the possibilities of conflicts. These conflicts can be divided into two major types; Human-Human Conflict and Man-wildlife conflict. The JFMC level conflict can be resolved by the JFMC executive body. If the conflict happened between two forest committees or between two different panchayats and JFMCs then the concerned Range Forest Office would be responsible for the resolution of the conflict. If the conflict is between the JFMCs of two varied ranges then the concerned Assistant Conservator of Forests should resolve the conflicts. The appeal, for all decisions mentioned, should be made to Deputy Conservator of Forests, West Nashik forest division. In regulating the Human-Wildlife conflict, the empowerment of the communities about the importance of wildlife and its conservation is necessary. The communities need to be exposed to precautions and safety measures to protect themselves and also the wildlife.
- 4) Maintenance and corpus fund: After the completion of the Project, necessary arrangements for maintenance of assets created under the Project are need to be done. It is, therefore, necessary to establish a fund that can be used in the post-project period for the maintenance of project assets, and also help in the implementation of the statutory working plans including microplans.
- 5) Self Help Groups (SHGs): JFMC can decide for several income generation activities for alternative livelihood for particularly low-income groups of the community. They can form SHGs and the front line staff of the forest department can assist them to establish the groups.
- 6) Training on livelihoods: Once the JMFC is formed, they should be exposed to diverse training programs to enhance the skill and capacity of the members for the holistic development of the area.
- 7) Convergence: To make the JFM program successful, a well-planned convergence of various schemes under CSS, State plan, District plan, etc., need to be carried out. These convergence plans shall be implemented in a time-bound manner.

17.2.8 MANAGEMENT OF THE SPIRITUAL AND CULTURAL ASPECTS OF FORESTS AND ECOTOURISM

The details of prescriptions provided for Ecotourism are as given below:

- 1) The Deputy Conservator of Forests, West Nashik division shall prepare an Ecotourism Development Plan for the Division incorporating the potential sites and obtain the approval from the Maharashtra Ecotourism Development Board.
- 2) While developing the ecotourism sites, it should be verified that the proposed activities must not attract nor violate provisions under the Forest (Conservation) Act 1980.
- 3) Local people especially the JFM Committees wherever in existence should be fully involved right from the formative stage.
- 4) Adequate training and capacity building of the staff and local people should constitute part of the development plan.
- 5) The peculiarity and uniqueness of each site should be properly documented and brought up in attractive brochures. The information relevant to tourists like the Dos and Don'ts and others shall also be included in such brochures.
- 6) Any local traditional product, crafts, food items/local cuisine, cultural display, etc., should be encouraged as part of the ecotourism package.
- 7) The development of the ecotourism sites should go hand in hand with the conservation of the biodiversity, the nurture of the environment and the appreciation of nature by the tourists.
- 8) The interests of the forests and wildlife should be of prime importance in all Ecotourism plans.

17.2.9 FOREST WATERSHED DEVELOPMENT

Watershed development in forest areas tries to reduce the volume and the velocity of runoff through a series of interventions. The aim is to lower the water velocity, to make the water flow vertically downwards rather than horizontally across the land surface. Interventions are considered at diverse points in the village in a location-specific manner utilizing locally available materials and the vast knowledge of the local people regarding water flows and resource availability. Interventions are generally planned according to the "ridge-to-valley principle." Ideally the treatments should begin with the treatment of the ridge area followed by the smallest drain, moving on to larger and larger drains in the watershed, arresting the runoff at each point. Broadly

the interventions are categorized into two groups; they are (1) Ridge area interventions and (2) Drainage line interventions.

- 1) Ridge Area interventions: Ridge area interventions include forest area located usually on the ridges and upper reaches. Soil and water conservation measures undertaken in the ridge area will help recharge deeper aquifers in the discharge zone as well as regenerate the degraded forest cover. While doing ridge area treatment, the aim of watershed development is to reduce the slope of land and not to increase it.
- 2) Drainage Line interventions: These interventions are implemented along the existing drainage lines with an objective to enhance the recharge of groundwater and increasing the duration of flow in the drainage line.

17.2.10 WILDLIFE MANAGEMENT

The prescriptions for Wildlife management are as given below:

- 1) Creation of Data Base: The annual population estimation of the wildlife, including the migratory and other rare birds, in addition to the All India Tiger and Panther population estimation shall be undertaken. Special note should be taken if any nesting site of endangered birds like Vultures is noticed. Concurrent monitoring of top carnivores through camera trapping shall be made.
- 2) Delineation and Mapping of Special Habitat Areas: Delineation of the special wildlife habitat sites including natural water seepage sites (mesic sites), water holes, natural wallows and saltlicks used by the wildlife, breeding sites, dens or nesting sites of animals and birds appearing in the Schedules of the Wildlife (Protection) Act, 1972 shall be carried out and marked on the Division/Range maps. While preparation of treatment map of the coupe for working in the area-specific working circles, the special wildlife habitat sites mentioned above shall be identified and marked on the map along with its buffer of 50 metres width strip around.
- 3) Habitat Development Works: Due to continuous biotic pressure, the wildlife habitat has also deteriorated and today it has reached a critical condition. The most important factors in the habitat are water, food, safe places for resting, breeding, and nesting. Wallows and salt licks are other factors. Before the start of habitat improvement, some demonstration works and visits to wildlife areas should be carried out to expose the field staff to the technical aspects of Wildlife Management. To meet the

minimum requirement of the wildlife the following activities are recommended:

- a. Water-hole Development: Water availability is one of the major factors that decide the health of the habitat. Its non-availability at sufficient places in the forests also increases probability of animals being found on the limited water holes or near villages and thereby increases their susceptibility to poaching. Water is a major limiting factor during the summers in these forests. The water-hole density shall be commensurate with the density of wildlife found in the area and as per the wildlife management regulations.
 - b. Development of Fodder: The carrying capacity for grazing is determined after excluding the forest area required to meet fodder requirements of the wildlife and ecologically sensitive sites and special habitat sites for wildlife in the area. Habitat improvement is proposed at places having high density of wildlife and the areas frequented by both domestic animals and wildlife. Special efforts are to be initiated to develop meadows.
- 4) Food/Prey Base: Whether the prey base is adequate or not shall be ascertained from regular herbivore count. Supplements of cattle kill should be taken into account while computing existing herbivore population. Any downward trend should be looked into seriously and possible reasons for its downslide must be found out and rectifying steps shall be undertaken. To improve the prey base, care of herbivores should be taken by improving the assured fodder availability in the forest, especially during the summer season. The open areas in wildlife rich zones should be developed into meadows for the herbivores.
 - 5) Development of Nesting Sites: The naturally occurring Nesting trees and trees with honeycombs need to be identified and marked on GIS map of the Division/Ranges. Good protection and efforts for increasing its number in forest areas need to be undertaken.

17.2.11 MANAGEMENT FOR CONSERVATION AND ENHANCEMENT OF BIODIVERSITY

There are two approaches of biodiversity conservation namely, in situ (on site) conservation which tries to protect the species where they are, i.e., in their natural habitat and ex situ (off site) conservation which attempts to protect and preserve a species in place away from its natural habitat.

The prescriptions for Conservation and enhancement of Biodiversity are as given below:

- 1) In consultation with the local Colleges, Anthropological/Social science institutions and the Maharashtra State Biodiversity Board, Nagpur, the Biodiversity studies of all life forms of the flora and fauna should be carried-out. These shall include following in addition to trees and animals:
 - a. Documentation and studies of herbaceous plants
 - b. Documentation and studies on the fungi, ferns, algae and lichen and moss (if any).
 - c. Carry out entomological studies.
 - d. Carry out herpetological studies.
 - e. Documentation of medicinal plants and local traditional medicinal practices along with other indigenous technical knowledge.
 - f. In all above studies, proper documentation with the distribution of species, the abundance and threats to the species may be included.
- 2) The field functionaries of the West Nashik forest division shall identify areas of significant biodiversity value and take lead in In-situ and Ex-situ conservation based on above studies.
- 3) As per the Government of India, Gazette Notification dated 7th January 2009, all forest officers not below the rank of Range forest officers are authorized to file complaints under section 61(a) of the Biological Diversity Act 2002. Hence, the Range Forest officers shall start register offences under the various provisions of the Biological Diversity Act 2002.
- 4) As per the biodiversity Act 2002, Biodiversity Management Committee in each Gram panchayat needs to be established. The local forest guard/forester should provide all help and co-operation to the Gram Sabha for the establishment and functioning of the BMCs as and when required.
- 5) All JFM Committees should have People Biodiversity Registers (PBR) as part of the various records to be kept. The Maharashtra State Biodiversity Board, Nagpur should be consulted for the same. Necessary Workshops, training, etc., required for this should be carried out.
- 6) Documentation of Local Medicinal Practitioners (LMP) and the species used by them shall be done through local Colleges/Institutions. After that the Deputy Conservator of Forests, West Nashik division need to

chalk out the ways and means of sustainable harvest of such medicinal plants.

- 7) Sensitization of the staff of the West Nashik forest division to the issues of biodiversity and its conservation is of utmost importance. The Deputy Conservator of Forest, West Nashik division shall involve such experts and institutions in consultation with the Maharashtra State Biodiversity Board, Nagpur for such training and workshops.
- 8) All efforts should be made to control fire and grazing in the forests as these are among the most principal enemies of biodiversity.

17.2.12 MANAGEMENT OF FOREST HEALTH AND VITALITY

The prescriptions regarding execution of various forest protection measures are as given below:

- 1) Fire management: Fire adversely affects natural regeneration, forest growth, ground flora, soil organisms, and site productivity. Effective fire control is essential for sustainable forest development. To formulate an effective procedure for control of forest fires, the entire forest area of the West Nashik division shall be divided into following classes:
 - a. Class-I (Complete Fire Protection): The Class-I fire control areas include all forest areas with good Natural regeneration, plantations, the A-type areas of all coupes, forest depots, forest nurseries, Special Wildlife habitat areas and any other areas of special importance decided as such by the Deputy Conservator of Forests, West Nashik division.
 - b. Class-II (General Fire Protection): The Class-II fire control areas include the remaining areas of the Improvement Working Circle (IWC), Protection working circle (PWC) and Grass and Fodder Management working circle (G&FWC) as well as any other areas, which deserve this protection in the opinion of the Deputy Conservator of Forests, West Nashik division.
 - c. Class-III (General vigilance): The remaining forest areas (areas not included in the previous two classes) are identified as the Class-III fire control areas. Any special measure for fire protection is not undertaken, but the deliberate setting of fire and burning the forest is prohibited.
- 2) Grazing management: The grazing rules are framed by the Government of Maharashtra vide its resolution No. MFP/1371/237035-Z dated 03/11/1973. The grazing will be regulated as per the prescribed grazing

incidences for each class of forests. Keeping in view, the above provisions, the grazing in the various Working circles of the Plan will be regulated as under:

- a. Protection working circle: As per the functional classification, the majority of the forests falling in this working circle are classified as 'protection forest.' The areas under this working circle are completely protected from grazing.
 - b. Improvement working circle: This working circle comprises tree forests and the maximum grazing incidence prescribed for it is one cattle unit per 5 hectares owing to the degraded nature of the forests. All main felling coupes will remain closed to grazing for a period of 5 years from the year of felling.
 - c. Afforestation working circle: The forests of this working circle are mainly classified as 'minor forest.' The grazing incidence for these forests should not be more than one cattle unit per 5 hectares owing to the degraded nature of the forests. The main coupes will remain closed for a period of 5 years from the year of planting.
 - d. Grass and fodder working circle: The forest of this working circle can mainly be classified as 'pasture forests.' But these areas are vastly degraded due to uncontrolled grazing. So, the provision of the 'cut and carry' principle is adopted for these areas. In addition, rotational grazing is also allowed in these areas after the complete development of grasslands..
 - e. The government of Maharashtra vides its Resolution dated 29/10/2007 and 06/05/2008 has imposed a complete restriction on Sheep grazing in the forests of the West Nashik forest division.
- 3) Boundary demarcation: To ensure the integrity of forest areas intact, strict vigilance over the forest boundary and periodic verification of the demarcation on the ground for the whole forest area has been prescribed. Areas that are un-demarcated should be attended on priority. The approach to the Forest Demarcation is as given below:
- a. Well-defined forest boundary is a pre-requisite for effective forest protection and its sustainable management. Forest areas vulnerable to boundary obliteration need to be identified for the survey and demarcation so that forest encroachment on the forest fringes could be detected, promptly. The presence of boundary marks additionally serves as a psychological barrier against forest encroachment. Forest boundaries adjoining private land shall receive the absolute priority to ensure the protection of these areas.

- b. The forests of the West Nashik division have suffered frequently during the last 10 years due to the implementation of the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006. Many honeycombing has happened in good forest areas. The boundary of forest areas distributed for Agriculture purposes in the past under different schemes like High Power Committee (HPC), Eksali plots, and regularisation of encroachments in the 1970s also need to be properly demarcated on the ground. A time-bound program for demarcation of all forest areas including Reserved forests, Protected forests and others by using Total station survey and DGPS is necessary as given in this Plan shall be implemented.
 - c. Proper checks and balances are essential in boundary demarcation. A slight error may lead to losing by vast areas of precious forest land. Forest department has recruited many new Forest Guards, Range Forest Officers, and Assistant Conservator of Forests in last 10 years. So, a proper field-based training about the map reading, identification of reference points on the ground, maintenance of boundary marks, etc., shall be provided to all field staff every year.
 - d. The use of the Total Station survey and DGPS shall be compulsorily used for fixing boundary pillars on the ground. All Forest surveyors shall use the Total station method during the boundary fixing exercise.
 - e. The circular issued by the Office of the Principal Chief Conservator of Forest and HoFF, M.S., Nagpur dated 27-01-2020 about the new designs, plans, and model estimates of Class-I and Class-II boundary pillars shall be followed for fixing of new boundary pillars.
- 4) Forest offence cases: The directions issued vide Government Resolution dated 13th August 2014 shall be followed in true spirit as far as forest protection issues are concerned. The Deputy Conservator of Forests, West Nashik division will take a periodic review of Assistant Conservator of Forests and Range Forest Officer on a monthly basis as per the directions given in the GR.
- a. Regular review of Offense cases: The Range Forest Officer, the Assistant Conservator of Forests and the Deputy Conservator of Forests of the West Nashik division will conduct a review of forest offense cases at least once every month. Shifting of boundary marks along the forest boundary shall be viewed seriously, and the

adjoining landholders or encroachers would be charged in the court for omission or commission causing obliteration of the forest boundary. Charges regarding all cases of forest encroachments must be submitted before the Judicial Magistrates within 3 months. Similar time-bound action is recommended in all cases of timber theft. All cases of violation of the Forest (Conservation) Act, 1980 shall be dealt with timely and firmly.

- b. Monitoring of Offense registers: The Deputy Conservator of Forests, West Nashik division shall personally carry out routine checking of the Range Offence Register and the Round Enquiry Reports in at least 4 Ranges every year. Similarly, the Chief Conservator of Forests shall examine these records in at least one Range every year, and circulate the inspection report to all the Ranges.
- c. Constant training: The Deputy Conservator of Forests, West Nashik division and the Assistant Conservator of Forests will periodically convene staff meetings to review and impart training for the boundary management and effective disposal of offense cases.
- d. Awards and Rewards: Staff who has performed exemplarily in forest protection should be nominated for the State and National awards.
- e. JFM activities: JFM activities open up communication channel, discourage forest offences and provide village bodies an opportunity for direct involvement in forest protection. Therefore, JFM activities should be encouraged and taken advantage of as a workable strategy for effective forest protection.
- f. Disposal of confiscated vehicles: Once the confiscation procedure is completed by the Authorised officer, then the disposal of confiscated vehicles shall be done within 3 months after completion of all required formalities.

CHAPTER-18

TREES OUTSIDE FOREST (TOF), IT'S POTENTIAL AND FUTURE MANAGEMENT

18.1 NAME OF WORKING CIRCLE

The “Trees outside Forests” is defined as the trees growing outside the forest and not belonging to Forest or other wooded land (Bellefontaine et al., 2002). Trees outside Forest (TOF) can play significant roles in national economies, ecosystems, and international efforts for sustainability. Trees outside forests have remained an integral part of India's cultural ethos and rural land use in India, and they ensure a multitude of ecological, economic, social, and cultural functions that in many cases are vital for human livelihood. India's growing population will inevitably exert mounting pressure on its natural resources. So, the promotion of social forestry and trees outside forests is crucial. This chapter covers all issues related to increasing the Trees outside forest for the betterment of society in West Nashik division. The prescriptions provided in this chapter are applicable to the whole of the division.

18.2 GENERAL CONSTITUTION OF WORKING CIRCLE

The increasing human population and rapid economic growth have put immense pressure on forests and other natural resources. In India, forest situation represents the net result of various happenings i.e., degradation, deforestation, afforestation, conservation, etc., at various scales during distinct temporal phases. In tune with the objectives of our national forest policy 1988, we have to achieve a national target of bringing 33% of the landmass of our country under forest and tree cover for ensuring ecological security and environmental balance. However, forest cover and tree cover in Maharashtra has over the years stabilized at around 20% of the geographical area. The area under forest and forest land is difficult to increase in Maharashtra state in general and Nashik district in particular. The sole way left for the increase of tree cover has to be through afforestation activities in non-forest areas. The areas outside forests comprise primarily of private farm forestry/agroforestry, canal bank areas, Roadside strips, Railway-line side strips, blank and degraded land, wasteland, etc. Apart from increasing the tree cover, extension of forestry in non-forest areas especially as agro-forestry and farm forestry offers

tremendous potential to increase the production of timber and other wood products and, reduce the pressure on natural forests.

18.3 GENERAL CHARACTERISTICS OF VEGETATION

Trees outside forest (TOF) comprise a heterogeneous natural resource. Traditional systems of cultivating trees in and around agriculture fields, raising arable crops or grasses and animals have provided life support and sustainability to the agro-ecosystems. Traditionally, the integration of multipurpose woody perennials in farming systems has represented an established mechanism as insurance against vagaries of climate in many places. Trees outside forest (TOF) provide farmers with marketable products (like lumber, building poles, firewood, animal fodder, fruits, and medicines), all of which derive supplemental income. Apart from all these, such trees also help in providing other environmental benefits.

The Forest Survey of India (FSI), Dehradun started estimating tree cover in the country from the year 2001 to have a comprehensive picture of forest and tree cover to compare with the national goal of 33% forest and tree cover. The productivity of trees outside forest is very high in comparison to natural forests, and in-addition trees grown have market demand. Approximately, TOF supplies 49% of the fuelwood and 48% of the timber annually (Rai and Chakraborty, 2001). Agroforestry is being gainfully practiced in this area on a moderate scale but its potential is until now to be completely realized by the farmers owing to number of bottlenecks. The need is to set friendly policies with regards to TOF for its free movement and trade at the local level, and foreign trade, multi-stake partnership, certification, etc., at the National level. Wood-based industries' status would be sustained only through promoting plantations outside the forests. The Agroforestry Policy 2014 initiatives for trees on agriculture lands would achieve the current requirements and in addition, transform the landscape as well.

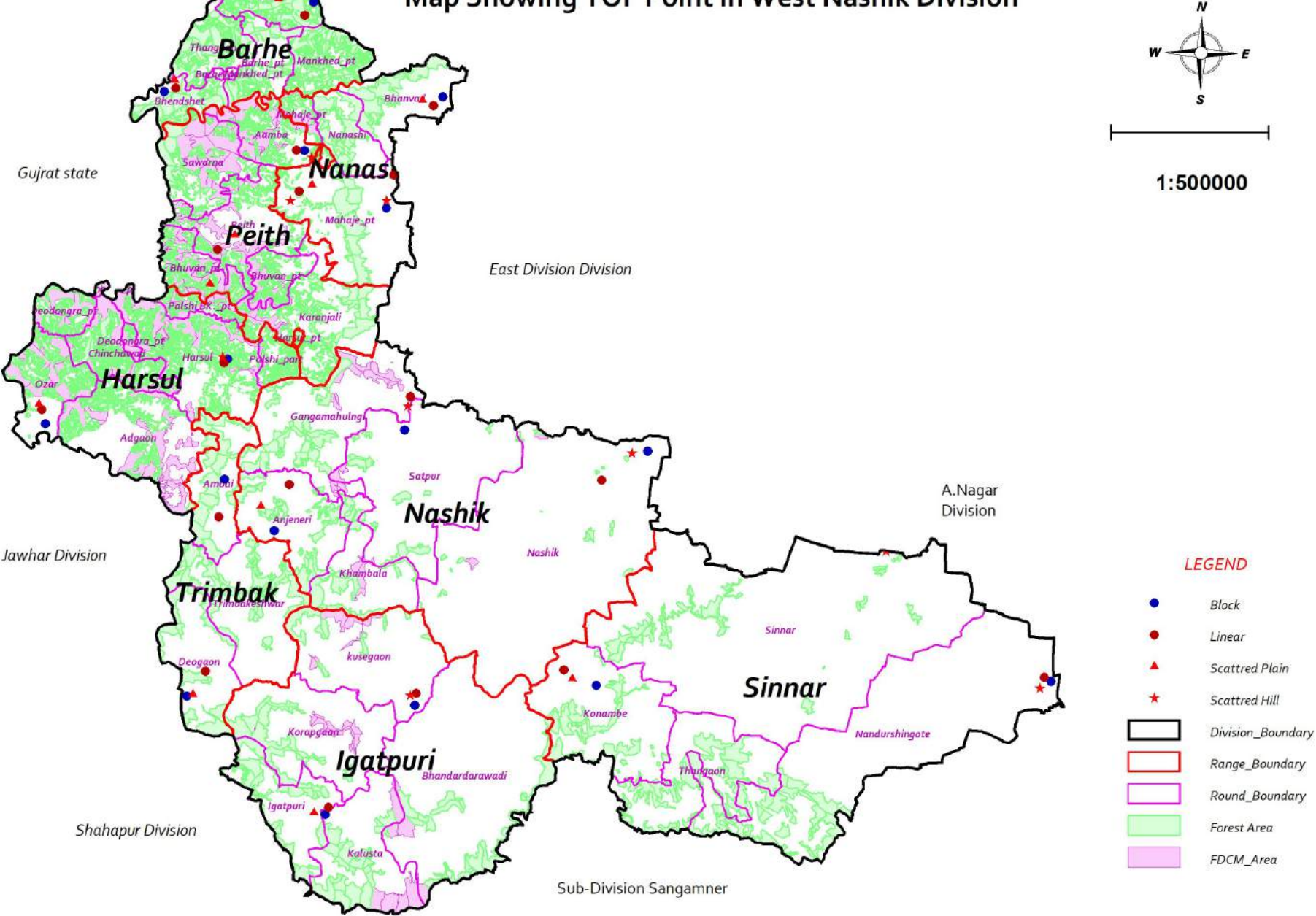
18.4 FELLING SERIES, CUTTING SECTIONS AND JFM AREAS: Not applicable.

18.5 BLOCKS, COMPARTMENTS AND JFM AREA: Not applicable.

18.6 SPECIAL OBJECTIVES OF MANAGEMENT

- 1) Increase the Green cover on potential non-forest lands that belonged to the Government.

Map Showing TOF Point In West Nashik Division



- 1) Involvement of people and the community in taking up tree plantations on private lands through Agroforestry and Farm forestry.
- 2) Awareness creation in public about the tree plantations and its role in combating climate change.

18.6.1 ANALYSIS OF THE CROP

Trees outside forests are observed in a vast variety of land-use systems from trees on farms, along roads and canals, in and around settlements, and in urban forestry settings. Trees in addition to other benefits, improve soil fertility by fixing nitrogen and recycling nutrients from the soil, thereby helping to increase crop yields and providing stability of forthcoming production. Global warming and associated problems of climate change have urged the need for change in land-use that are more dependable in production and more sustainable in terms of resource conservation to ensure food security and adapt to the changes. Trees increase ecosystem biodiversity above and below ground and they can help ameliorate global climate change by sequestering carbon in their live biomass as well as in the soil, that otherwise would be added to the earth's atmosphere. The agroforestry practice, which works on the principle of sustainability in terms of all the three dimensions *viz.*, Economic (profitability and productivity), ecological (environmentally sound) and social (food security, health, and safety) make it a sound land-use system to meet the material requirement and ecological security. The value of trees in the urban environment is now generally recognized not only aesthetically but also functionally in helping to make towns and cities agreeable places to work and live.

In the present condition, forests in India cannot meet the demand for timber, industrial wood, and fuelwood on a sustainable basis because of low growing stock, poor growth rates, inadequate financial and technical inputs, and serious biotic pressures. The growing shortage of industrial wood has hampered the growth and modernization of wood-based industries and employment opportunities in the forestry sector. The policies present in our country to promote tree planting in areas outside forests are the National Forest Policy 1988 and the Agroforestry Policy 2014. Both these policies do specify that the wood industries must procure their own raw materials for forest-based industries from persons practicing agroforestry in the private sector, without adversely affecting the food production. Hence, a way forward lies in improving the productivity of degraded forests and encouraging farm and agroforestry by using genetically superior forest resources. It is high time

that the Forest Department, rural communities, wood-based industries, and financial institutions join hands to transform forest productivity, especially in the above areas through genetically improved plant material. Apart from savings in foreign exchange, such plantations would help in the greening of India, conserve our natural forests, provide vast employment opportunities, promote local processing and value addition, generate sustainable incomes for local communities, and help mitigate the greenhouse gases and waste management.

The Trees outside forest (TOF) present in the West Nashik division have belonged to the following categories:

- a) Trees bordering agriculture fields and fruit orchards.
- b) Trees growing naturally or planted on community lands.
- c) Block plantations.
- d) Trees planted in and around ponds.
- e) Trees along the roads.
- f) Other categories not included in the above, including homesteads, townships, gardens, etc.

The farmers in this tract are interested in taking up tree plantations of valuable species like Sandal (*Santalum album*), *Bamboo*, etc., on their private lands. But the rules and regulations regarding felling and transport of trees away from private lands have had a negative impact on tree planting outside forest areas. Therefore, simplification of the rules and regulations is necessary for expanding the area under TOF.

The status of TOF in the West Nashik division is provided in Appendix II.54.

18.6.2 SILVICULTURAL SYSTEM

The system followed for raising trees outside the forest is the artificial plantations by using good quality planting materials of the known source. The systems of planting on various types of lands are as given below:

- 1) Roadside/Canal-side/Railway line side Plantations
- 2) Agroforestry models:
 - a) Boundary/Bund Plantation: Trees on the boundary + Crops
 - b) Block plantation: Trees + Crops
 - c) Energy plantation: Trees + Crops during the initial year

- d) Alley cropping: Shrubs + Crops
- e) Agri-Horticulture: Fruit trees + Crops
- f) Agri-Horti-Silviculture: Trees + Fruit trees + Crops
- g) Horti-Pasture: Fruit trees + Pasture/Animals
- h) Shelterbelts: Trees +/- Crops
- i) Windbreaks: Trees +/- Crops
- j) Homesteads: Multiple combinations of trees, fruit trees, etc.

18.6.3 ROTATION PERIOD

The rotation of trees under TOF depends on the objectives of plantation. Hence, no uniform rotation is prescribed.

18.6.4 HARVESTABLE DIAMETERS

The rotation of trees under TOF depends on the objectives of plantation. Hence, no uniform harvestable diameter is prescribed.

18.6.5 REDUCING FACTORS AND REDUCED AREAS: Not applicable

18.6.6 FELLING CYCLE: Not applicable.

18.6.7 DIVISION INTO PERIODS AND ALLOTMENT TO PERIODIC BLOCK (PB): Not applicable

18.6.8 CALCULATION OF THE YIELD: Not applicable.

18.6.9 TABLE OF FELLING: Not applicable

18.6.10 METHOD OF EXECUTING THE FELLING

The prescriptions for enhancing the Trees outside forest (TOF) in West Nashik division are explained below:

- 1) “Agroforestry Conference” of all stakeholders like Farmers, Researchers, Wood-based Industrialists, Sawmill Associations, etc., need to be organized at Division level by the Forest department every year for the exchange of ideas and expansion of good successful practices.
- 2) A serious relook at Maharashtra Tree Felling Act 1964 need to be done by the Forest Department, and the necessary ease of doing business to

be promoted to assist the farmers to obtain timely permission for tree felling.

- 3) Strengthening Farm and Agroforestry Research and extension services to develop profitable and replicable agroforestry models. All research organizations of the Central Government and the States may be involved in this important endeavour. A digital support system regarding good cultivation practices may be provided to the growers.
- 4) Every year during the month of July, 'Van-mahotsav' programme need to be organised by involving of all stakeholders. A big publicity programme needs to be taken up during this period to generate the impact/momentum that 50 crore plantation programme has created among public to be sustainably maintained.
- 5) Promotion of investments for commercial plantations by making institutional funds available to the growers on concessional terms on long term basis including insurance cover.
- 6) Continuation of selling of seedlings at concessional price to people during Van-Mahotsava season.
- 7) Certification of forest resource materials (FRM) and registration of nurseries to facilitate the availability of quality planting material.
- 8) Encourage the plantations under the tripartite agreements involving forest departments, the investors, and good NGOs for undertaking plantations on degraded forests.
- 9) Development of good networking between farmers and the traders, for sale of wood from Agroforestry.

18.6.11 SUBSIDIARY SILVICULTURAL OPERATIONS, CLEANING AND THINNING

In Maharashtra state the following departments are given the responsibilities of management of TOF in various sectors:

- 1) Forest department: Forest department is looking after both greening and regulation of tree felling outside Municipal Corporation and Nagar Parishad areas. The Social forestry wing is the Nodal Department for taking up plantations on lands outside the recorded forest areas.
- 2) Revenue Department: The District Collector is the Chairman of the District Wasteland Development Board. Essentially, there are two types of wastelands, namely Culturable wastelands and Non-culturable wastelands. Being the Chairman of the Wasteland Development Board,

the Collector and the Revenue Department to take interest in greening of all Culturable wastelands.

- 3) Agriculture department: This department deals mainly with the raising of fruit plantations on Agriculture lands under various schemes.
- 4) Municipal Corporation: This department is looking after both regulation of tree felling and greening of urban areas within Municipal Corporation.
- 5) Nagar Parishad/ Nagar Panchayath: This department is looking after both regulation of tree felling and greening of urban areas within Nagar Parishad areas.
- 6) Gram Panchayat: The responsibility of Greening of areas under the control of Gram Panchayat including the community land present in the village.
- 7) Industry Department: They undertake the plantations in areas under the control of Maharashtra Industrial Development Corporation (MIDC) and other Industrial areas.
- 8) Public works department: Greening along the roadsides.
- 9) Irrigation Department: Greening along the canals and Dam sites.
- 10) Education Department: Both Higher and Lower Education Departments will look after the Greening in school premises, University lands, etc.

18.6.12 REGENERATION

The Greening of Maharashtra schemes under various Departments are as follows:

A. Social Forestry:

- a. Linear plantations: Linear plantations along roads, canals, railway line, etc., through Bihar pattern, under MGNREGS which is one of the very successful models in Maharashtra state.
- b. Kanya Vansamruddhi Yojana: When a girl child born in the family, 10 seedlings (5 teak and 5 other fruit species) will be given to the family for planting on their land from the Social Forestry wing of the Forest department.
- c. Plantation on Agriculture bunds under MGNREGS.

B. Maharashtra Bamboo Development Board:

- a. Atal Bamboo Samruddhi Yojana: A state scheme for taking up tissue culture bamboo plantations on private lands with subsidy of 50% to 80% on plants cost.

- b. Plantations under National Bamboo Mission: A CSS scheme for taking up bamboo plantations up to 2 ha per person on subsidy of 50%.

C. Agriculture department:

- a. Bhausaheb Fundakar Fruit plantation scheme under MGNREGS.

18.6.13 ASSOCIATED REGULATIONS AND MEASURES

- 1) The nursery stock raised at departmental nurseries of both Territorial and SFD wing shall be from the known source. It is necessary to provide right planting stock from known source to people. If we fail in providing good quality planting stock of known source, we will fail miserably in future because for a farmer, land remain a valuable resource and constantly want to utilize it for economical returns.
- 2) The linear plantations under 'Bihar pattern' need to be expanded to cover all potential areas available.
- 3) Both Territorial and Social Forestry wings shall organize a programme during World Forestry day, World Environment Day, etc., by involving all stakeholders like NGOs, School children, Industries, Other Government departments, etc, for creating awareness.
- 4) At each district, "Farmers' Mela" need to be organised during May or June month every year to inculcate the importance of Agroforestry among all the farmers. In this programme people from wood based industries, Representatives of Agriculture University working on Agroforestry, Representatives from Research Institutes like Forest Research Institute (FRI), Dehradun, Tropical Forest Research Institute (TFRI), Jabalpur, Institute of Wood Science and Technology (IWST), Bengaluru, Indian Plywood Research and Training Institute (IPIRTI), Bengaluru, etc., shall be invited for interaction with Farmers.