GOVERNMENT OF MAHARASHTRA

WORKING PLAN

FOR THE FORESTS OF

SATARA FOREST DIVISION

VOLUME : I : TEXT (PART I & II)

Period 2010 - 11 to 2019–20

By
Vikas Gupta
N.Mohan karnat

PREFACE

'SATARA' city was the capital of erstwhile Maratha Kingdom. The district is situated in south-western part of Maharashtra on the basins of Bhima and Krishna rivers and shows variation in relief ranging from the pinnacles and high plateaus of Sahyadri range with height over 4500 feet above mean sea level to the subdued basin of the Nira river in Phaltan tahsils with the average height of about 1700 feet above mean sea level. The climate ranges from the highest average annual rainfall of over 6000 mm in Mahabaleshwar region to the driest in Man tahsil where the average annual rainfall is about 500 mm. Mahabaleshwar, "The Queen of Hill Stations", served as the summer capital of Bombay province during the British Raj, and is a very popular hill resort today attracting huge number of tourists.

The total forest cover of Satara district is 851 km^2 out of which, 'Very dense forest cover' is nearly 14% while 'Moderately dense' is 50% of the total forest cover. The geographical area of Satara district is 10,484 km^2 and is spread over 11 talukas. The Satara forest division has twelve forest ranges viz. Dahiwadi, Dhebewadi, Karad, Khandala, Koregaon, Mahabaleshwar, Medha, Patan, Phaltan, Satara, Waduj and Wai.

This Working Plan covers 1,309.18 km^2 of forest area falling within the jurisdiction of Satara forest division. It replaces the WP by Kulkarni and Pethkar (1996-97 to 2005-06) which had total 6 Working Circles- 4 main WCs viz. Protection and Reservoir catchment WC, Mahabaleshwar Plateau WC, Enrichment WC, Afforestation WC along with 2 overlapping WCs viz. NTFP (OL) WC and Wildlife (OL) WC. The revised WP has total 8 WCs - 4 main WCs viz. Protection cum Reservoir Catchment WC, Mahabaleshwar-Pachgani Eco-sensitive Zone Management WC, Improvement WC and Afforestation WC along with 4 overlapping WCs viz. Wildlife Management (OL) WC, Old Plantations Management (OL) WC, Bamboo Management (OL) WC and NTFP (OL) WC. 'Mahabaleshwar Plateau WC' of the previous Plan was replaced by 'Mahabaleshwar-Pachgani Eco-sensitive zone Management WC' in the revised Plan as per the Ministry of Environment and Forests Notification dated 17th January, 2001. 'Enrichment WC' of the previous Plan was revised as 'Improvement WC' in the revised Plan. Old successful plantations of Acacia auriculiformis, Eucalyptus, Glyricidia, Teak and mixed spp. are being dealt in the 'Old Plantations Management (OL) WC' in the revised plan. Bamboo Management (OL) WC has been added in the revised plan to manage the Bamboo bearing forest areas. Forest compartments allotted to the WC of the previous Plan have been

reallotted on the basis of their present stocking and enumeration data. The annual coupes have been laid in the watershed following the ridge to valley concept. Each village in a watershed shall be taken as a unit of holistic development. It is prescribed to converge and integrate forestry management interventions with development schemes of other departments under

JFM, FDA, IWDP, DRDA, District Plan etc. for socio-economic upliftment of the village communities.

The Working Plan was prepared based on the data of forest area, boundaries and other details made available by the DCF, Satara Forest division. Timely availability of the matching budgetary grants for the development and protection works as per the prescriptions of this Working Plan are crucial for the successful implementation of any management intervention and needs to be given proper attention for achieving desired results.

I am extremely thankful to Dr. SK Khetrapal, Additional Principal Chief Conservator of Forests (Production & Management) MS, Nagpur and Shri AK Joshi, former APCCF (P&M) MS for providing able and valuable guidance in preparing this Plan. I am also thankful for the guidance and suggestions provided by Shri Shirish Asthana, CCF WP, Pune and Dr. A.D. Shejale, former CCF WP, Pune. Sincere thanks to Shri RK Pole, Conservator of Forests, Kolhapur Circle, Shri AV Ashtekar, former CF, Kolhapur Circle and Shri Sarfraz Khan, Dy. Conservator of Forests, Satara Division for their cooperation in preparing this Plan. Also, I thank to Prof. SR Yadav, Head of Botany Department, Shivaji University, Kolhapur and Shri Sunil Karkare, Honorary Wildlife Warden, Kolhapur for updating me in preparing the list of flora and fauna found in Satara district, respectively.

I also acknowledge and appreciate the hard work put in by Shri. BS Jadhav, Shri MR Patil and Shri SB Ekal all Range Forest Officers, Shri SV Mirashi, Shri SR Thorat and Shri SN Bamne all Ranger Surveyors, Shri AV Kamble, Forest Surveyor and Shri Sunil Varkat, Steno-typist of this office in preparing this Plan.

Date : 07 .01 .2010
Place : Kolhapur

(N. Mohan Karnat)
Conservator of Forests
Working Plans, Kolhapur

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LIST OF TREES, SHRUBS, CLIMBERS, BAMBOOS AND GRASSES FOUND IN SATARA FOREST DIVISION

Local name			Botanical name
			TREES
Ain / Sadada	..	..	*Terminalia tomentosa*
Alu	..	..	*Vangueria spinosa*
Amba	..	..	*Mangifera indica*
Ambada	..	..	*Spondias mangifera*
Amberi	..	..	*Nothopegia colebrookiana*
Ambat	..	..	*Embelia basaal*
Anjani	..	..	*Memecylon edule*
Apta	..	..	*Bauhinia racemosa*
Asana, Katak	..	..	*Bridelia retusa*
Awala/ Aonla	..	..	*Emblica officinalis*
Arjun	..	..	*Terminalia arjuna*
Akash neem	..	..	*Millingtonia hortensis*
Bartondi	..	..	*Morinda tinctoria*
Bakul	..	..	*Mimusops elengi*
Bel	..	..	*Aegle marmelos*
Bhendi	..	..	*Thespesia populnea*
Bherli mad	..	..	*Caryota urens*
Bhokar	..	..	*Cordia myxa*
Bhoma	..	..	*Glochidion lanceolarium*
Bibla / Bija	..	..	*Petrocarpus marsupium*
Biba / Bilva	..	..	*Semecarpus anacardium*
Bibi / Ran biba	..	..	*Holigarna grahamii*
Bor	..	..	*Zizyphus jujuba*
Bulgi	..	..	*Vitex altissima*
Babhul	..	..	*Acacia arabica*
Bahawa	..	..	*Cassia fistula*
Behada	..	..	*Terminalia belleric*
Bondara / Lendi	..	..	*Lagerstroemia parviflora*

Local name			Botanical name
Champhar	..	..	*Flacourtia montana*
Chandan	..	..	*Santalum alb*
Chandada / Chandiva	..	..	*Macaranga roxburgii*
Charoli / Char	..	..	*Buchanania lanzan*
Cher/Chira	..	..	*Erinocarpus nimmonii*
Chinch	..	..	*Tamarindus indica*
Chafa /Sonchafa	..	..	*Michelia champaca*
Dalchini	..	..	*Cinnamomum zeylanicum*
Datir	..	..	*Ficus gibbosa*
Datrang / Ajan Vriksha	..	..	*Ehretia laevis*
Dahivan	..	..	*Cordia macleodii*
Dhaman / Tadsal	..	..	*Grewia tiliifolia*
Dandas / Harrani	.	..	*Dalbergia lanceolaria*
Daka	..	..	*Pygium gardneri*
Dhawada	..	..	*Anogeissus latifolia*
Gela / Gel phal	..	..	*Randia dumetorum*
Kari	..	..	*Diospyros montana*
Gulmohar	..	..	*Delonix regia*
Hed /Haldu	..	..	*Adina cordifolia*
Hela	..	..	*Terminalia belerica*
Hirda	..	..	*Terminalia chebula*
Humb / Hoom	..	..	*Miliusa tomentosa*
Hura	..	..	*Sapium insigne*
Haldi / Out /Tawir		..	*Garcinia spicata*
Irai / Bobi	..	..	*Calophyllum wightianum*
Jambha	..	..	*Xylia xylocarpa*
Jambhul	..	..	*Syzygium cumini*
Kadamb	..	..	*Anthocephalus cadamba*
Kajara / Kuchala	..	..	*Strychnos nux-vomica*
Kalhoni / Kavashi	..	..	*Hopea wightiana*

Local name	Botanical name
Kakad / Kudak	*Garuga pinnata*
Kalamb	*Mitragyna parvifolia*
Kaphis, Khargol	*Trema orientalis*
Kokam /Ratamba	*Garcinia indica*
Karambel	*Dillenia pentogyna*
Karanj	*Pongamia pinnata*
Kadu kavath / Kavith	*Hydnocarpus launifolia*
Khair	*Acacia catechu*
Kharshing	*Radarmachera xylocarpa*
Karvath	*Ficus asperrima*
Safed Shirish	*Albizia procera*
Kinjal	*Terminalia paniculata*
Koker, Kolilnder	*Sterculia guttata*
Kokum	*Garcinia indica*
Koshimb / Kusum	*Schleichera oleosa*
Kuda (Kala Kuda)	*Wrightia tinctoria*
Pandra Kuda	*Holarrhena antidysenterica*
Kuda, Nag (Nag Kuda)	*Tabernaemontana heyneana*
Kumbha	*Careya arborea*
Kardal / Karai / Pandruk ..	*Sterculia urens*
Karpa /Lokhandi	*Hemigyrosa canescens*
Kavath	*Limonia ocidissima*
Kaju	*Anacardium occidentale*
Kanchan/Kachnar ..	*Bauhinia varigata*
Kathbor / Ghati / Ghuti	*Ziziphus xylopyra*
Kashid / Kasid	*Cassia siamia*
Kirmira	*Glycosmis mauritiana*
Kunkuphal /Shendri ..	*Mallotus philippensis*
Kate Kumbal	*Siderozylon tomentosum*
Kunti / Dhulajoti/Kamini / Pandhare ..	*Murraya paniculata*
Limbara / Bakan Nimb/ Bakayana ..	*Melia azedarach*

Local name	Botanical name
Lokhandi / Raikuda	*Ixora arborea*
Medshingi	*Dolichandrone falcata*
Moha	*Madhuca indica*
Moi, Shimati / Moya	*Lannea coromandelica*
Nag Chapha / Nag - Kesar	*Mesua ferrea*
Nana	*Lagerstroemia lanceolata*
Tiwar	*Barringtonia acutangula*
Naral	*Cocus nucifera*
Nandruk	*Ficus retusa*
Neem / Kadu nimb	*Aazadirachta indica*
Padali, paral	*Stereospermum chlonoides*
Pair	*Ficus arnottiana*
Palas	*Butea monosperma*
Pangara	*Erythrina indica*
Parjambhul	*Olea dioica*
Phanas	*Artocarpus integrifolia*
Phanashi / Ran phanashi	*Carallia brachiata*
Phudgus	*Alseodaphne semecarpifolia*
Pimpal	*Ficus religiosa*
Papara / Vavli	*Holoptelia integrifolia*
Panchota /Palla	*Palaquium ellipticum*
Pisa	*Actinodaphne hookeri*
Pitkuli, Bhedas	*Eugenia zeylanica*
Surangi, Undi	*Colophyllum inophyllum*
Ritha	*Sapindus emarginatus*
Sag	*Tectona grandis*
Sali/ Salai	*Aporosa lindleyana*
Satwin	*Alstonia scholaris*
Kate Sawar	*Salmalia malabarica*
Shindi	*Phoenix sylvestris*
Shendri, Kumkum	*Mallotus philippinensis*

Local name			Botanical name
Shevga	..	..	*Moringa oleifera*
Shiras	..	..	*Albizzia lebbek*
Shiras, Kala	..	..	*Albizia odoratissima*
Shissam	..	..	*Dalbergia latifolia*
Shivan	..	..	*Gmelina arborea*
Songarbi	..	..	*Vitex leucoxylon*
Suru	..	..	*Casuarina equisetifolia*
Tamal patra	..	..	*Cinnamomum tamala*
Tetu	..	..	*Oroxylum indicum*
Tupa	..	..	*Canthium dicoccum*
Tembhurni	..	..	*Diospyros peregrine*
Tiwas	..	..	*Ougenia dalbergioidis*
Tirphal	..	..	*Zanthoxylum rhetsa*
Wad	..	..	*Ficus bengalensis*
Waras	..	..	*Heterophragma quadriloculare*
Warang / Bhoti	..	..	*Kydia calycina*
		SHRUBS	
Adulsa	..	..	*Adhatoda vasica*
Akra	..	..	*Strobilanthes heyneanus*
Ankul/Ankol	..	..	*Alangium salvifolium*
Bedki/Gudmari	..	..	*Gymnema sylvestre*
Bhamani	..	..	*Colebrookea oppositifolia*
Bhandira	..	..	*Clerodendrum infortunatum*
Bharati/Hekal	..	..	*Gymnosporia montana*
Bohkada/Charbati/Kirmira	..	..	*Casearia graveolens*
Bugdi	..	..	*Ardisia humilis*
Bukra	..	..	*Strobilanthes sessilis*
Dinda/ Motha Dinda	..	..	*Leea sambucina* /
		..	*Leea macrophylla*

Local name			Botanical name
Dhaiti/ Dhayati	..	..	*Woodfordia fruticosa*
Hesur	..	..	*Callicarpa lanata*
Ghat bor	..	..	*Zizyphus xylopyra*
Ghaneri	..	..	*Lantana camara*
Hasoli/ Asoli	..	..	*Grewia microcos*
Hadkya	..	..	*Rauvolfia densiflora*
Karand, Karwand	..	..	*Carissa carandus*
Kadi patta/ Kadi nimb	.	..	*Murraya koenigii*
Katar, Karavti	..	..	*Streblus asper*
Kevda	..	..	*Pandanus furcatus*
Kesari/ Murud Sheng	..	..	*Helicteres isora*
Karvi	..	..	*Strobilanthes callosus*
Kulkutta/ Kirmira/ Modi	..	..	*Casearia esculenta*
Kokani/ Kutkutar/ Nagotri	..	..	*Connarus wightii*
Kutri	..	..	*Solanum giganteum*
Lajalu	..	..	*Mimosa pudica*
Lotal	..	..	*Osyris arborea*
Hadsandhi	..	..	*Litsaea glutinosa*
Makad limbu/ Ran limbu	..	..	*Atlantia monophylla*
Manikyan	..	..	*Glycosmis pentaphylla*
Modgi	..	..	*Casearia tomentosa*
Nakeri	..	..	*Melastoma malabathricum*
Narkya/ Amruta/ Ghanera	..	..	*Mappia foetida* /
		..	*Nothapodytes nimmoniana*
Nildoo, Nerali, Ambgool	..	..	*Elaeagnus latifolia*
Nirgudi	..	..	*Vitex negundo*
Nivdung	..	..	*Euphorbia neriifolia*
Pandhari/ Kunti/ Kamani	..	..	*Murraya paniculata*
Pandhar phalli	..	..	*Fluggea microcarpa*
Papadi	..	..	*Pavetta indica*
Patang	..	..	*Caesalpinia sappan*

Local name			Botanical name
Parwi, Showla	..	..	*Wendlandia notoniana*
Pit karvi, Gurgi	..	..	*Strobilanthes ixiocephalus*
Pitkuli	..	..	*Ixora coccinea*
Rametha/ Datpadi	..	..	*Lasiosiphon eriocephalus*
Ranjai/ Kusari	..	..	*Jasminum malabaricum*
Rakta rohida/ Rakta rora	..	..	*Maba nigrescens*
Rui/ Akk	..	..	*Calotropis gigantea*
Sabja/ Ran tulasi	..	..	*Ocimum* americanum
Sapshi/ Sapsan	..	..	*Aristolochia indica*
Shatavari	..	..	*Asparagus racemosus*
Sherwod/ Bhutkes	..	..	*Mussaenda frondosa*
Sundara/ Mudra/ Petari	..	..	*Abutilon indicum*
Tinpani/ Tipani	..	..	*Allophylus cobbe*
Toran	..	..	*Zizyphus rugosa*
Tupa, Arsul	..	..	*Canthium umbellatum*
Ukshi/ Baguli	..	..	*Calycopteris floribunda*
Vanda/ Bandgul	..	..	*Loranthus cuneatus*
Waiwarung/ Wavding	..	..	*Embelia ribes*
	CLIMBERS		
Alei	..	..	*Dalbergia volubilis*
Amgul	..	..	*Elaeagnus latifolia*
Bhui Kohola/ Vidari kand	..	..	*Ipomaea digitata*
Cane	..	..	*Calamus pseudotenuis*
Chambuli	..	..	*Bauhinia vahlii*
Chickni	..	..	*Bridelia stipularis*
Chillari	..	..	*Caesalpinia mimosoides*
Garambi/ Gardal	..	..	*Entada scandens*
Ghotvel/ Chopchini	..	..	*Smilax zeylanica*
Gunj	..	..	*Abrus precatorius*
Jungali miree	..	..	Piper hookeri

Local name			Botanical name
Kajarvel	..	..	*Strychnos colubrina*
Kanheri/ Borati/ Burgi	..	..	*Zizyphus oenoplia*
Vilayati vakundi	..	..	*Cryptostegia grandiflora*
Kali vel / Jungali kajorne	..	..	*Vitis auriculata*
Kavali	..	..	*Cryptolepis buchananii*
Khaj Kuhili	..	..	*Mucuna pruriens*
Kodan / Kaundal	..	..	*Trichasanthes palmata*
Shendri	..	..	Combretum ovalifolium
Lal chameli/ Rangoon creeper	..	..	*Quisqualis indica*
Ran tur	..	..	*Cajanus scarabaeoides*
Morvel / Shendvel	..	..	*Clematis gouriana*
Navali cha vel	..	..	*Ipomoea vitifolia*
Nagodari / Kokani / Kutkutar	..	..	*Connarus wightii*
Palas vel	..	..	*Butea superba*
Wasan vel / Jaljamni	..	..	*Coculus villosus*
Pendguli vel or Edvel	..	..	*Dalbergia horrida*
Phulsun	..	..	*Spatholobus purpureus*
Piloka	..	..	*Combretum extensum*
Poir/ Pasan / Datwan / Kanguni	..	..	*Phyllanthus reticulatus*
Kali vel / Jungli kajorni	..	..	*Vitis auriculata*
Ravan vel / Waghchawad	..	..	*Schefflera elliptica*
Shembi / Chilar	..	..	*Acacia pennata*
Samudrashoka	..	..	*Argyreia speciosa*
Shikekai	..	..	*Acacia concinna*
Tugelami	..	..	*Ipomoea campanulata*
Wakeri / Waghati	..	..	*Wagatea spicata*
Wild pepper	..	..	*Piper trichostachyon*
Watoli / Waten vel / Ramrik	..	..	*Cocculus macrocarpus*

Local name			Botanical name
		BAMBOOS	
Chiwa /Huda /Chiwan	..	..	*Oxytenanthera monostigma/ Pseudoxytenanthera ritcheyi*
Kalak / Padai / Mandgay / Velu / Kanak		..	*Bambusa bambos*
Konda / Managa / Chiwari / Mes		..	*Oxytenanthera stocksii / Pseudoxytenanthera stocksii*
Shib /Udha / Medar		..	*Dendrocalamus strictus*
		GRASSES	
Anjan	..	..	*Cenchrus ciliaris*
Bhalekusal	..	..	*Andropogon tricticeus*
Bhongrut	..	..	*Themeda quadrivalvis*
Boru	..	..	*Sorghum halepense*
Burghushi	..	..	*Eragrostis tenella*
Chikra	..	..	*Eragrostis tremula*
Chigan chara	..	..	*Panicum prostatum*
Dongari gawat	..	..	*Crysopogon montana*
Gondal	..	..	*Andropogon pumilis*
Haryali / doob	..	..	*Cynodon dactylon*
Kunda	..	..	*Ischoemum pilosum*
Kusali	..	..	*Heteropogon contortus*
Marvel	..	..	*Dichanthium annulatum*
Natgras	..	..	*Cyprus rotundus*
Nilgawat	..	..	*Panicum antidotale*
Phuli / Kodmor	..	..	*Apluda varia*
Phulera	..	..	*Themeda ciliata*
Pandhari Kusal	..	..	*Aristida paniculata*
Sheda	..	..	*Sehima nervosum*
Pavana	..	..	*Sehima sulcatum*
Rosha / Tokhadi	..	..	*Cymbopogon martini*
Shimpi	..	..	*Panicum isachne*
Vala	..	..	*Andropogon muricatus*
Wavashi	..	..	*Saccharum procerum*

MEDICINAL PLANTS

Over 400 plant species of some medicinal value occur in the area. The region is a perennial source of medicinal plants for botanists, doctors and pharmaceutical campanies. Many species have local medicinal uses. Some of the plant species with established medicinal value are as follows:

Abrus precatorius, Abutilon indicum, Acacia leucophloea, A. nilotica ssp. indica, A. sinuata, Achyranthes aspera, Actinodaphne angustifolia, Adhatoda zeylanica, Aegle marmelos, Aerva lanata, Agave americana, Ageratum conyzoides, Ailanthus excelsa, Albizia lebbeck, A. odoratissima, A. procera, Allium cepa, A. sativum, Anacardium occidentale, Anogeissus latifolia, Argemone mexicana, Asparagus racemosus, Atlantia monophylla, A. racemosa, Azadirachta indica, Bacopa monnieri, Barleria prionitis, Bauhinia purpurea, B. racemosa, Biophytum sensitivum, Bixa orellana, Blumea eriantha, Boerhavia diffusa, Bombax ceiba, B. insigne, Bowellia serrata, Brassica campestris, Buchanania lanzen, Butea monosperma, Caesalpinia bonduc, Cadaba fruiticosa,

Calendula officinalis, Calotropis gigantea, Calycopteris floribunda, Canarium strictum, Capparis spinosa, C. zeylanica, Cardiospermum halicacabum, Carica papaya, Carissa congesta, Casearia tomentosa, Cassia auriculata, C. fistula, C. occidentalis, C. sophaera, C. tora, Careya arborea, Celastrus paniculatus, Celosia argentea, Centella asiatica, Ceropegia bulbosa, Chenopodium album, Cissampelos pareira, Clematis gouriana, C. triloba, Clerodendrum multiflorum, C. serratum. Clitoria ternatea Cocculus hirsutus, Cochlospermum gossypium , Cox lacryma-jobi, Commelina benghalensis, Crotalaria retusa, Cleome viscosa Curculigo orchioides, Curcuma aromatica, Cyclea peltata, Cynodon dactylon, Datura metel Dalbergia volubilis, Desmodium gangeticum, D. laxiflorum, Discorea oppositifolia, Diospyros melanoxylon, Dodonaea viscosa, Echinops echinatus, Eciipta prostrato, Embilica officinalis, Evoluvulus alsinoidcs , Ficus benghalensis, Garcinia indica, Gnidia glauca, Gloriosa superba, Grewia tillifolia, Helicteres isora, Hemidesmus indicus, Hibiscus rosa-sinensis, Hiptage beghalensis, Holarrhena pubescens, Homonoia riparia, Jatropha curcas, Lawsonia alba, Leonotis nepetaefolia, Leucas aspara, Malvastrum coromandelianum, ,Mangifera indica, Melia dubia, Memecylon umbellatum, Mirabilis jalapa, Mimosa pudica, Moringa oleifera, Mitragyna parviflora, Mucuna ruriens, Ocimum spp., Paracalyx scariosa, Paramignya monophylla, Pergularia 'aemia, Pittosporum napaulense, Plumbage zeylanica, Psoralea corylifolia, lerocarpus marsupium , Pueraria tuberosa, Rauvolfia serentina, Ricinus ornmunis, Rosa multiflora, Rubia cordifolia, Santalum album, Scilla hyacinthina, Semecarpus anacardium, Sida rhombifolia, Solatium nigrum, Solanum surattense, Sphaeranthus indicus, Spondias pinnata, Swertia densiflora, Terminalia arjuna, Terminalia bellirica, T. chebula, Tinospora cordifolia, Tribulus terrestris, Tylophora indica, Vitex negundo and Wattakaka volubilis.

ENDEMIC PLANTS

According to an estimate of Threatened plant committee of IUCN, about 10% of World's Flora is under varying degree of threat (Jain and Sastry, 1980). The floristic analysis of the study area revealed that about 175 species endemic to Peninsular India occur in the region. Bachulkar (1993) recorded 26 endemic, endanagered plant species for Satara district. Most of the endemic species have narrow range of distribution and restricted to their specific habitats. They are isolated through geographical and ecological barriers. High concentraton of endemic species in the region is indication of the richness of the flora. Mahabaleshwar Khandala range (which includes study area) is recognised as one of the several **'Hot spots'** in Western Ghats.

There are 60 monotypic genera endemic to peninsular India (Nayer 1996). Some of them viz. Carvia, Dlcoelospermum, Erinocarpus, Indopoa, Moullava, Polyzygus, Pseudodichanthium, Supushpa, and Seshagirica are found •n the Region. Other monotypic endemic genera e.g. Ferea, Triplopogon' and Trilobachne occur in neighbouring area. Some of the rarest endemic species recorded from the area include Abutilon ranadei, Aponogeton satarensis, Begonia trichocarpa, Ceorpegia jainii, Ceorpegia media, Polyzgaus tuberosus, Rotala ritchiei, and Seshagirica sahyadrica. A comprehensive list of endemic plants of the region is given below.

'Abutilon ranadei, Adelocaryum coelestinum, A. malabaricum, Adnoon indicum, Aerides maculosum, Aeschynanthus perrottetti, Alysicarpus pubescence var. vasavadae, A.belgaumensis var. racemosa, Ancistrocladus heyneanus, Anisomeles heyneana, Aporosa lindleyana, "Aponogeton satarensis, Argyreia bosaena, A. cune,ata, A. pilosa, Arisaema caudatum, A. murrayi,$_t$ Assystasia dalzelliana, A. mysurensis, Barleria gibsoni, Begonia trichocarpa, Blepharis asperima, Bulbophyllum fimbriatum, B. neilgherrense, Calacanthus grandiflorus, Canarium strictum, Canscora paucifiora, C. perfoliata, Carissa inermis, Carvia callosa, Casearia rubens, Cajanus lineata , C. sericea,' Ceropegia jainii, C. media, C. noorjahaniae, C. occulata, C. sahyadrica, C. vincaefolia, Chlorophytum glaucoides, C. glaucum, Cissus woodrowii, Cinnamomum macrocarpum, Crinum brachynema, Crotalaria filipes var. trichophora, Cucumis setosus, Curcuma neilgherrensis, C. pseudomontana, Cyanotis arcotensis, C. concanensis, C. faciculata var. glabrescens, Dalzellia zeylanica var. konkanica, Decaschistia trilobata, Delphinium malbaricum var. malabaricum, Dendrobium aqueum, D. barbatulum, D. herbaceum, D. microbulbon, D. nanum, D. ovatum, Derris heyneana, Desmodium ritchie, Dicaelospermum ritchiei, Dimorphocalyx lawianus, Dioscorea bellophylla,Dyschorlste dalzellii, Entada pursaetha, Eranthemum roseum, Eria dalzellii, E. excilis, E. microchilos, Erinocarpus nimmonii, Eriocaulon cuspidatum, E. dalzellii, E. lanceolatum, E. odoratum, E. robusto-brownianum, E. stellulatum, E. tuberiferum, Eulophia ramentacea,Euonymus indicus, Exacum lawii, Flacourtia montana, Flickingeria nodosa,Gantelbua urens, Garcinia indica, G. talbotii, Glochidion ellipticum, Glyphochloa forficulata, G. mysorensis, Griffithiella hookeriana, Habenaria crassifolia, H. gibsonii, var. gibsonii, H.gibsonii var. foliosa, H.grandifloriformis, H.heyneana, H.longicorniculata, H. multicaudata, H. panchganiensis, H rariflora, Haplanthodes neilgherrensis, H. tentaculatus,

H. verticillatus, Hemigraphis latebrosa var. heyneana, Heterostemma urceolatum, Hitchenia caulina, Hopea ponga,Hygrophila pinnatifida, Hymenodictyon obovatum, Impatiens dalzellii, I. lawii, Ipulcherrima, I. tomentosa, Indigofera dalzellii, Indigofera uniflora, Iphigenia magnifica, I. pallida, Iphigenia stellata, Ischaemum diplopogon, I. impressum,Ixora brachiata, Jasminum malbaricum, Justicia santapaui, J. trinervia, J.wynaadensis, Kalanchoe bhidei, K. olivacea, Lamphrachenium microcephalum, Lavandula gibsoni, Mallotus stenanthus, Manisuris clarkei, Maytenus rothiana, Meiogyne pannosa, Memecylon talbotianum, Murdannia crocea ssp. ochracea, Mussaenda laxa, Neanotis concanensis, N. montholonii, N. rheedii, Neolitsea cassia, Neuracanthus sphaerostachyus, Nilgiranthus heyneanus, N. upulinus, Nothapodytes nimmoniana, Oberonia brunoiana, Pavetta siphonantha, Phyllocephalum tenue, Pinda cocanense, Piper hookeri, P. richostachyon, Plectranthus stocksii, Pogostemon purpurescens, polyzygous tuberosus, Porpax jerdoniana, P. reticulata, Pseudanthistira hispida, pseudodichanthium serrafalcoides, Ramphicarpa longiflora, Senecio bombbayensis, S. dalzellii, Seshagirica sahyadrica, Smithia agharkarii, S bigemina,.
S. setulosa, Supushpa scorbiculata, Swertia minor, Tetrastigma canarense, Thelepaepale ixiocephala, Tolypanthes lagenifer, Torenia indica, Tricholepis amplexicaulis, T.radicans, Ventilago bombaiensis, Vigna khandalensis, Wendelandia thyrsoides, Zinziber cernum and Zinziber neesasum

ENDANGERED PLANT SPECIES RECORDED IN RED. DATA BOOK

Abutilon ranadei, Aponogeton satarensis, Begonia trichocarpa, Ceropegia jainii, C noorhjahaniae, C. occulata, C. sahyadrica, C. vincaefolia, Decaschistia trilobata, Erinocarpus nimmonii, Euphorbia panchganensis, Habenaria panchganensis, Iphigenia stellata, I. magnifica, Kalanchoe olivacea, Polyzygus tuberosus, Rotala ritchiei, Seshagiria sahyadrica, Smithia agharkarii and Vigna khandalensis.

Flora of 'Kas Plateau' and its surroundings

RED data plant species recorded from the Kas plateau

1. Abutilon ranadei	*18. Dicanthium panchganiensis*
2. Aponogeton satarensis	*19. Dipcadi maharashtrensis*
3. Barleria gibsonicides	*20. Dipcadi ursulae*
4. Begonia phrixophylla	*21. Erinocarpus nimmonii*
5. Campanula alphonsii	*22. Euphorbia panchganienisis*
6. Ceropegia huberi	*23. Frerca indica*
7. Ceropegia jainii	*24. Habenaria panchganensis*
8. Ceropegia lawii	*25. Iphigenia magnifica*
9. Ceropegia noorjhaniae	*26. Iphigenia stellata*
10. Ceropegia oculata	*27. Kalanchoe olivacea*
11. Ceropegia sahyadrica	*28. Murdannia lanuginosa*
12. Ceropegia vincoefolia	*29. Pimpinella katrajensis*
13. Crinum brachynema	*30. Sheshagiria sahyadrica*
14. Crinum eleonorae	*31. Smithia aghargarii*
15. Crotolaria filipes var trichocarpa	*32. Vigna khandalensis*
16. Decaschistia trilobata	*33. Nogra dalzellii*
17. Dicanthium maccamii	*34. Brahehystelma nawrojii*

Herbaceous plant species recorded from the Kas plateau

1. Cardamine trichocarpa	*23. Senecio belgaumensis*
2. Polygala presicariaefolia	*24. S. bombayensis*
3. Linum mysorense	*25. Spilanthes calva*
4. Alysicarpus belgaumensis	*26. Tricholepis amplexicaulis*
5. Crotalaria filipes	*27. Lobelia aisonoldes*
6. Desmodium triflorum	*28. L. Heyneana*
7. Flemingia nilghiriensis	*29. Ceropegia jainii*
8. Goniogyna hirta	*30. C. vincoefolia*
9. Indigofera dalzellii	*31. Seshagiria sahyadrica*
10. Cassia mimosoides	*32. Canscora concanensis*
11. Drosera burmannii	*33. Exacum bicolor*
12. Anmannia baccifera	*34. Swertia densifolia*
13. Rotala densiflora	*35. Paracaryopsis coelestinum*
14. Dicoelosperemum ritchiei	*36. Trichodesma sedgwickianum*
15. Begonia crenata	*37 Evolvulus alsinoides*
16. Mollugo pentaphylla	*38. Buchnera hispida*
17. Pimpinella adscendens	*39. Centranthera indica*
18. Pinda concanensis	*40. Lindenbergia muraria*
19. Dentella repens	*41. Lindernia antipoda*
20. Hedyotis stocksii	*42. Pedicularis zeylanica*
21. Neanotis calycina	*43. Rhamphicarpa longiflora*
22. Spermacoce pusilla	*44. Sopubia delphinifolia*

45. Impatiens balsamina (var. agrestis)	*90. Striga densiflora*
46. Impatiens balsamina (var. rosea)	*91. Utricularia albo-coerulea*
47. Impatiens dalzellii	*92. Blumea lacera*
48. I. lawii	*93. B. oxyodonta*
49. I. minor	*94. Gnaphalium polycaulon*
50. I. oppositifolia	*95. Tricholepis radicans*
51. I. pusilla	*96. Swertia densifolia*
52. I. linifolia	*97. Exacum lawii*
53. Smithia agharkarii	*98. E. pumilum*
54. S. bigemina	*99. Swertia minor*
55. S. hirsuta	*100. Paracaryopsis malabaricum*
56. S. pycnantha	*101. Lindernis hyssopioides*
57. S. setulosa	*102. L. nummularifolia*
58. Cassia pumila	*103. Sopubia trifida*
59. Drosera indica	*104. Striga gesneroides*
60. Rotala floribunda	*105. Utricularia arcuata*
61. R. sepyllifolia	*106. U. coerulea*
62. Neanotis concanensis	*107. U. graminifolia*
63. N. hohenackerii	*108. Crinum woodrowii*
64. N. rheedii	*109. Cynotis concanensis*
65. Utricularia praeterita	*110. Cynotis fasciculata var. fasciculata*
66. U. reticulate	*111. Cynotis fasciculata var. glabrescens*
67.U. uliginosa	*112. Cynotis tuberosa*
68. Justicia trinervia	*113. Murdannia crocea ssp ochracea*
69.Lepidagathis prostrata	*114. M. dimorpha*
70 .Pleocaulus richiei	*115. M. lanuginosa*
71. Rostellularia japonica	*116. M. semiteres*
72. Leucas indica	*117. M. simplex*
73. Leucas stelligera	*118. M. versicolor*
74. Pogostemon deccanensis	*119. Cryptocoryne spiralis*
75. Euphorbia laeta	*120. Eriocaulon achiton*
76. E. nerifolia	*121. E. duthiei*
77. E. panchganiensis	*122. E. humile*
78. Burmannia coelestis	*123. Eriocaulon minatum*
79. Habenaria crassifolia	*124. E. quinquangulare*
80. H. grandifloriformis	*125. E. ritchieanum*
81. H. heyneana	*126. E. sedgwickii*
82. H. longicorniculata	*127. E. stelullatum*
83. H. panchganiensis	*128. E. vanheurckii*
84. H. rariflora	*129. Bulbostylis barbata*
85. Peristylus densus	*130. B. densa*
86. P. stocksii	*131. Cyperus halpan*
87. Hitchenia caulina	*132. C. iria*
88. Curuligo orchioides	*133. C. nutans*
89. Hypoxis aurea	*134. C. tenuispica*

135. Pancratium donaldii	*168. Eleocharis geniculata*
136.P. triflorum	*169. Fimbristylis aestivalis*
137. Arisaema sahyadricum	*170. F. dichtoma*
138. A. murrayi	*171. F. tenera*
139. Chlorophytum glaucoides	*172. Kyliinga tenuifolia*
140. C. glaucum	*173. Mariscus squarrosus*
141. C. laxum	*174. Andropogon pumilus*
142. Dipcadi maharashtrensis	*175. Aristida redacta*
143. D. montanum	*176. Arthraxon hispidus*
144. D.ursulae	*177. A. jubatus*
145. Drimia indica	*178. A. lanceolatus Var meeboldii*
146. Drimia polyantha	*179. A. lanceolatus Var raizade*
147. Iphigenia indica	*180. A. lancifolius*
148. I. pallida	*181. Arundinella spicata*
149. I. magnifica	*182. Chrysopogon lancearius*
150. I. stellata	*183. Coelachne minuta*
151. Scilla hyacinthina	*184. Dichanthium armatum*
152. Crinum brachyneama	*185. D. concanensis*
153. C. elenorae	*186. Ischaemum diplopogon*
154. Ceropegia. jainii	*187. I. indicum*
155. Digitaria ciliaris	*188. Iseilema laxum*
156. Dimeria ornithopoda	*189. Jansenella griffithiana*
157. Eragrostis unioloides	*190. Manisuris clarkei*
158. Eulalia trispicata	*191. Pennisetum glaucum*
159. Garnotia tenella	*192. Rhynchelytrum repens*
160. Glyphochloa forficulata	*193. Sehima ischaemoides*
161. Indopoa paupercula	*194. Sporobolus indicus var diander*
162. Isachne bicolor	*195. Tripogon bromoides*
163. I. gracilis	*196. T. lisboae*
164. I. lisboae	*197. T. trifidus*
165. Bluema eriantha	*198. ophioglossum sp.*
166. Conyza stricta	*199. Isotes sp.*
167. Dichrocephala integrifolia	*200. Ceropegia media*

List of Fauna found in the Satara Forest Division

MAMMALS

Common name	Scientific name	Status	Distribution
Bonnet Macaque	*Macaca radiata*	C	WG
Common Langur	*Presbytis entellus*	C	SD
Tiger	*Panthera tigris*	R	Koyna WLS.
Panther	*Panthera pardus*	C	K/P/Koyna WLS
Leopard Cat	*Felis bengalensis*	R	Mb/ Koyna WLS
Jungle Cat	*Felis chaus*	C	SD
Desert Cat	*Felis libyca*	UC	SD
Small Indian Civet	*Viverricula indica*	UC	SD
Common Palm Civet	*Paradoxurus hermaphroditus*	C	SD
Common Mongoose	*Herpestes edwardsi*	C	SD
Striped Hyena	*Hyaena hyaena*	R	M/P
Wolf	*Canis lupus*	R	M/P
Jackal	*Canis aureus*	C	SD
Indian fox	*Vulpes bengalensis*	C	SD
Indian Wild Dog	*Cuon alpinus*	R	Koyna WLS.
Sloth bear	*Melursus ursinus*	UC	Koyna WLS
Common Otter	*Lutra lutra*	C	Krusna river
Moles	*Talpa micrura*	C	SD
Indian Tree Shrew	*Anathana ellioti*	C	WG
Flying Fox	*Pteropus giganteus*	C	SD
Fulvous Fruit – Bat	*Rousettus leschenaulti*	C	SD
Short – Nosed Fruit Bat	*Cynopterus sphinx*	C	SD
Indian Pipistrelle	*Pipistrellus coromandra*	C	SD
Painted Bat	*Kerivoula picta*	UC	SD
Indian Giant Squirrel	*Ratufa indica*	C	WG
Fivestriped Palm Squirrel	*Funambulus pennanti*	C	SD
Threestriped Palm Squirrel	*Funambulus palmarum*	C	WG
Indian Field Mouse	*Mus booduga*	C	SD
Common House Rat	*Rattus rattus*	C	SD
Bandicoot Rat	*Bandicota indica*	C	SD
Indian Porcupine	*Hystrix indica*	C	SD
Indian Hare	*Lepus nigricollis*	C	SD
Gaur	*Bos gaurus*	C	WG
Four – Horned Antelope	*Tetracerus quadricornis*	UC	WG
Sambar	*Cervus unicolor*	C	WG
Barking deer	*Muntiacus muntjak*	C	WG
Mouse deer	*Tragulus meminna*	C	WG
Indian Wild Boar	*Sus scrofa*	C	SD
Indian Pangolin	*Manis pentadactyla*	UC	WG

HERPETOFAUNA

SNAKES

Common name	Scientific name	Status	Distribution
Brahminy Worm Snake	*Ramphotyphlops braminus*	C	SD
Beaked Worm Snake	*Grypotyphlops acutus*	C	SD
Large Scaled Shieldtail	*Uropeltis macrolepis macrolepis*	C	WG
Indian Rock Python	*Python molurus molurus*	UC	WG
Common Sand Boa	*Gongylophis conicus*	UC	SD
Red Sand Boa	*Eryx johnii*	UC	SD
Common Trinket Snake	*Coelognathus helena helena*	C	SD
Montane Trinket Snake	*Coelognathus helena monticollaris*	UC	WG
Indian Rat Snake	*Ptyas mucosa*	C	SD
Banded Racer	*Argyrogena fasciolata*	C	SD
Slender Racer	*Coluber gracilis*	UC	SD
Russell's Kukri Snake	*Oligodon taeniolatus*	UC	SD
Common Kukri Snake	*Oligodon arnensis*	C	SD
Common Bronzeback Tree Snake	*Dendrelaphis tristis*	C	SD
Barred Wolf Snake	*Lycodon striatus*	UC	SD
Common Wolf Snake	*Lycodon aulicus*	C	SD
Dumeril's Black – headed Snake	*Sibynophis subpunctatus*	UC	SD
Checkered Keelback	*Xenochrophis piscator*	C	SD
Striped Keelback	*Amphiesma stolatum*	C	SD
Green Keelback	*Macropisthodon plumbicolor*	C	SD
Common Cat Snake	*Boiga trigonata*	C	WG
Ceylon Cat Snake	*Boiga ceylonensis*	C	WG
Condanarus Sand Snake	*Psammophis condanarus*	UC	SD
Leith's Sand Snake	*Psammophis leithii*	UC	SD
Common Vine Snake	*Ahaetulla nasuta*	C	WG
Common Krait	*Bungarus caeruleus*	C	SD
Slender Coral Snake	*Calliophis melanurus*	UC	WG
Striped Coral Snake	*Calliophis nigrescens*	UC	WG
Spectacled Cobra	*Naja naja*	C	SD
Russell's Viper	*Daboia russelli*	C	SD
Saw-Scaled Viper	*Echis carinatus*	C	SD
Bamboo Pit Viper	*Trimeresurus gramineus*	UC	WG
Malabar Pit Viper	*Trimeresurus malabaricus*	UC	WG

Common name	Scientific name	Status	Distribution
	CROCODILE		
Mugger	*Crocodylus palustris*	UC	Krishna river
	CHAMELEONS		
Indian Chameleon	*Chamaeleon zeylanicus* (Laurenti)	UC	SD
	MONITOR LIZARD		
Common Indian Monitor	*Varanus bengalensis* (Schneider)	C	SD
	TURTLE		
Black Turtle	*Melanochelys trijuga* (Schweigger)	UC	SD
Indian Mud Turtle	*Lissemys punctata* (Lacepede)	C	SD
Indian Flap – Shell Turtle	*Lissemys punctata punctata*	C	SD
Peninsular Flap – Shell Turtle	*Lissemys punctata granosa*	C	SD
Indian Soft Shell Turtle	*Aspideretes gangeticus*	C	SD
	GECKO		
Northen House Gecko	*Hemidactylus flaviviridis* (Ruppell)	C	SD
Brook's Gecko	*Hemidactylus brookii* (Gray)	UC	WG
Termite Hill Gecko	*Hemidactylus triedrus* (Daudin)	UC	P/Ma
Rock Gecko	*Hemidactylus maculatus* (Dum. & Bibr)	UC	P/Ma
	AGAMIDS		
Common Garden Lizard	*Calotes versicolor* (Daudin)	C	SD
Forest Calotes	*Calotes rouxi* (Dum. & Bibr)	C	WG
Southern Green Calotes	*Calotes calotes* (Linn)	C	WG
Fan-throated Lizard	*Sitana ponticeriana* (Cuvier)	R	Thoseghar
	SKINKS		
Brahminy Skink	*Mabuya carinata* (Schneider)	C	SD
Little Skink	*Mabuya macularia* (Blyth)	C	SD
Snake Skink	*Lygosoma punctatus* (Beddome)	C	SD

AMPHIBIONS

TOADS

Common name	Scientific name	Status	Distribution
Common Indian Toad	*Bufo melanostictus* (Schneider)	C	SD
Marbled Toad	*Bufo stomaticus*	C	SD

FROGS

Bush Frog	*Philautus sp.*	UC	SD
Common Tree Frog	*Polypedates maculatus* (Gray)	C	SD
Skittering Frog	*Rana cyanophlyctis* (Schneider)	C	SD
Indian Pond Frog	Rana hexadactylus (Lesson)	C	SD
Indian Bull Frog	*Rana tigerina* (Daudin)	C	SD
Indian Cricket Frog	*Rana limnocharis* (Gravenhorst)	C	SD
Fungoid Frog	*Rana malabarica* (Tschudi)	C	WG
Bicoloured Frog	*Rana curtipes* (Jerdon)	C	SD
Golden Frog	*Rana aurantiaca* (Boulenger)	C	WG
Indian Burrowing Frog	*Rana breviceps* (Schneider)	C	WG

BUTTERFLIES

Common name	Scientific name
Twany Coster	*Acraea violae* (Fabricius)
Blue Tiger	*Tirumala limniace exoticus* (Gmelin)
Common Crow	*Eploea core core* (Cramer)
Dark Blue Tiger (Fruhstorfer)	*Tirumala septentrionis dravidarum*
Glassy Blue Tiger	*Parantica aglea aglea* (Cramer)
Malabar Tree Nymph	*Idea malabarica* (Moore)
Plain Tiger	*Danaus chrisippus chrisippus* (Linnaeus)
Striped Tiger	*Danaus genutia genutia* (Cramer)
Banded Angle	*Odontoptilum angulata angulata* (Felder & Felder)
Brown Awl	*Badamia exclamationis* (Fabricius)
Common Banded Awl	*Hasora chromus chromus* (Cramer)
Common Spotted Flat	*Celaenorrhinus leucocera* (Kollar)
Dark Palm Dart	*Telicota ancila bambusae* (Moore)
Golden Angle	*Caprona ransonnetta potiphera* (Hewitson)

Indian Palm Bob	..	..	*Suastus gremius gremius* (Fabrius)
Indian Skipper	..	..	*Spialia galba galba* (Fabrius)
Malabar Flat	..	..	*Celaenorrhinus ambarreesa* (Moore)
Banded Blue Pierrot	..	..	*Discolampa ethion vavasanus* (Fruhstorfer)
Bright Babul Blue	..	..	*Azanus ubaldus* (Cramer)
Common Pierrot	..	..	*Castalius rosimon rosimon* (Fabricius)
Common Silverline	..	..	*Spindasis vulcanus vulcanus* (Fabricius)
Indian Cupid	..	..	*Everes lacturnus syntala* (Cantlie)
Pale Grass Blue	..	..	*Zizeeria maha ossa* (Swinhoe)
Red Pierrot			*Talicada nyseus nyseus* (Guerin-Meneville)
Zebra Blue	..	..	*Syntarrucus plinius* (Fabricius)
Baron	..	..	*Euthalia aconthea meridionalis* (Fruhstorfer)
Baronet	..	..	*Symphaedra nais* (Forster)
Black Rajah	..	..	*Charaxes solon solon* (Fabricius)
Blue Pansy	..	..	*Pecis orithya* (Linnaeus)
Chocolate Pansy	..	..	*Precis iphita iphita* (Cramer)
Commander	..	..	*Moduza procris undifragus* (Fruhstorfer)
Common Castor	..	..	*Ariadne merione merione* (Cramer)
Common Leopard	..	..	*Phalanta phalantha phalantha* (Drury)
Common Map	..	..	*Cyrestis thyodamas indica* (Evans)
Common Nawab	..	..	*Polyura athamas athamas* (Drury)
Common Sailer	..	..	*Neptis hylas varmona* (Moore)
Common Sergeant	..	..	*Athyma perius perius* (Linnaeus)
Danaid Eggfly	..	..	*Hypolimnas misippus* (Linnaeus)
Great Eggfly	..	..	*Hypolimnas bolina jacintha* (Drury)
Grey Pansy	..	..	*Precis atlites* (L.)
Indian Red Admiral	..	..	*Vanessa indica pholoe* (Frushstorfer)
Joker	..	..	*Byblia ilithyia* (Drury)
Lemon Pansy	..	..	*Precis lemonias lemonias* (Linnaeus)
Peacock Pansy	..	..	*Precis ariann ariann* (Linnaeus)
Tawny Rajah	..	..	*Charxes bernardus imna* (Butler)
Yellow Pansy	..	..	*Precis hierta hierta* (Fabricius)
Plum Judy	..	..	*Abisara echerius prunosa* (Moore)
Blue Mormon	..	..	*Papilio polymnestor* (Cramer)
Common Blue Bottle	..	..	*Graphium sarpendon teredon* (Felder & Felder)
Common Mime	..	..	*Chilasa clytia* (Linnaeus)
Common Mormon	..	..	*Papilio polytes polytes* (Linnaeus)
Common Mormon	..	..	*Papilio polytes ramulus* (Cramer)

Common Rose		*Pachliopta aristolochiae aristolochiae* (Fabricius)
Crimson Rose	.. ..	*Pachliopta hector* (Linnaeus)
Lime Butterfly	.. ..	*Papilio demoleus* (Linnaeus)
Red Helen	.. ..	*Papilio helenus daksha* (Moore)
Southern Birdwing	.. ..	*Troides minos* (Cramer)
Spot Swordtail	.. ..	*Pathysa nomius nomius* (Esper)
Tailed Jay	.. ..	*Graphium arianne menides* (Felder & Felder)
Common Emigrant	.. ..	*Catopsilia crocale* (Cramer)
Common Grass Yellow	.. ..	*Eurema hecabe arianne* (Moore)
Common Gull	.. ..	*Cepora nerissa nerissa* (Fabricius)
Common Jezebel	.. ..	*Delias eucharis* (Drury)
Common Wanderer	.. ..	*Pareronia valeria arian* (Fabricius)
Crimson Tip	.. ..	*Colotis danae danae* (Fabricius)
Great Orange Tip	.. ..	*Hebomoia glaucippe australis* (Butler)
Lemon Emigrant	.. ..	*Catopsilia arian* (Fabricius)
Mottled Emigrant	.. ..	*Catopsilia pyranthe* (Linnaeus)
Pioneer	.. ..	*Anaphaeis aurota* (Fabricius)
Three Spot Grass Yellow	.. ..	*Eurema blanda siletana* (Wallace)
White Orange Tip	.. ..	*Ixias arianne* (Cramer)
Yellow Orange Tip	.. ..	*Ixias pyrene sesia* (Fabricius)
Bamboo Treebrown	.. ..	*Lethe europa ragalva* (Fruhstorfer)
Common Bush Brown	.. ..	*Mycalesis perseus typhlus* (Fruhstorfer)
Common Evening Brown	.. ..	*Melantitis leda leda* (Drury)
Common Four Ring	.. ..	*Ypthima huebneri* (Kirby)
Common Tree Brown	.. ..	*Lehe rohria* (Fabricius)
Nigger Cloudy Brown	.. ..	*Orsotrioena medus medus* (Fabricius)

MOTHS

Moon Moth	..
Owlet Moth	..
Bee Hawk Moth	..
Monkey Moth	..
Atlas Moth	..
Tussar Silk Moth	..

INSECTS

Stick Insect	..	
Hornet Wasp	..	*Vespa orientalis*
Hooded Grass Hopper	..	*Teratodes monticollis*
Painted Grass Hopper		- -

Praying Mantis	- -
Leaf Insects	- -
Tortoise Shelled Beetle	- -
Dragon Fly	- -
Damsel Fly	- -
Leopard Beetle	- -
Bombardial Beetle	- -
Long Horned Beetle	- -
Spittle Bug	- -

ARACHNIDS

Scorpiones	Scorpion
Opiliones	Harvestmen
Acarina	Ticks and Mites
Araneae	Spiders
	Speckled Band Fourleg
	Banded Fourleg
	Giant Wood Spider
	Black Wood Spider
	Ashy Social Spider
	Common Two tail
	Giant Crab Spider
	Tunnel wolf
	Green Lynx
	Brown Lynx
	Box Long Legs
	Round Long Legs
	Dandy Long Legs
	Zebra Jumper
	Common Big Jaw.

ABBREVIATION : STATUS - C : Common, UC : Uncommon, R : Rare

DISTRIBUTION : SD : Through out Satara district.

WG : Western Ghat

P : Phaltan Taluka

M : Man Taluka

Mb : Mahabaleshwar Taluka

AVIFAUNA

S No.	NAME OF THE BIRD		STATUS
1	Painted Francolin	*Francolinus pictus*	R C
2	Grey Francolin	*Francolinus pondicerianus*	R C
3	Rain Quail	*Couturnix coromandelica*	R C
4	Jungle Bush Quail	*Perdicula asiatica*	M C
5	Yellow–legged Buttonquail	*Turnix tanki*	M C
6	Barred Buttonquail	*Turnix suscitator*	R U
7	Red Spurfowl	*Galloperdix spadicea*	R C
8	Painted Spurfowl	*Galloperdix lunulata*	R U
9	Grey Junglefowl	*Gallus gallus*	R C
10	Indian Peafowl	*Pavo cristatus*	R C Br
11	Bar-headed Goose	*Anser indicus*	M U
12	Lesser Whistling Duck	*Dendrocygna javanika*	R C
13	Ruddy Shelduck	*Tadorna ferruginea*	M C
14	Comb Duck	*Sarkidiornis melanotos*	M C
15	Cotton Pigmy Goose	*Nettapus coromandelianus*	R C
16	Gadwall	*Anas strepera*	M U
17	Eurasian Wigeon	*Anas penelope*	M U
18	Spot-billed Duck	*Anas poecilorhyncha*	R C
19	Common Teal	*Anas crecca*	M C
20	Garganey	*Anas querquedula*	M C
21	Northern Pintail	*Anas acuta*	M C
22	Northern Shoveler	*Anas clypeata*	M C
23	Red–crested Pochard	*Rhodonessa rufina*	M O
24	Common Pochard	*Aythya ferina*	M U
25	Ferruginous Pochard	*Aythya nyroca*	M O
26	Tufted Duck	*Aythya fuligula*	M O
27	Browm-capped Pygmy Woodpecker	*Dendrocopos nanus*	R U
28	Yellow-crowned Woodpecker	*Dendrocopos atratus*	R U
29	Lesser Yellownape	*Picus chlorolophus*	R O
30	Black-rumped Flameback	*Dinopium benghalense*	R U
31	Greater Flameback	*Chrysocolaptes lucidus*	R C
32	White-naped Woodpecker	*Chrysocolaptes festivus*	R U
33	Brown-headed Barbet	*Megalaima zeylanica*	R C
34	Coppersmith Barbet	*Megalaima haemacephala*	R C Br
35	Indian Grey Hornbill	*Ocyceros birostris*	R O
36	Malabar Pied Hornbill	*Anthracoceros coronatus*	R U
37	Great Hornbill	*Buserous bicornis*	R U
38	Common Hoopoe	*Upupa epops*	R O
39	Indian Roller	*Coracias benghalensis*	M C
40	Common Kingfisher	*Alcedo meninting*	R C
41	Oriental Dwarf Kingfisher	*Ceyx erithacus*	R U
42	White-throated Kingfisher	*Halcyon smyrnensis*	R C
43	Pied Kingfisher	*Ceryle rudis*	R C
44	Green Bee-eater	*Merops orientalis*	R C
45	Blue-tailed Bee-eater	*Merops philippinus*	M O
46	Pied Cuckoo	*Clamator jacobinus*	M U
47	Common Hawk Cuckoo	*Hierococcyx varius*	M O
48	Indian Cuckoo	*Cuculus micropterus*	R C
49	Banded Bay Cuckoo	*Cacomantis sonneratii*	R U
50	Grey Bellied Cuckoo	*Cacomantis passerinus*	M U

S No.	NAME OF THE BIRD		STATUS
51	Asian Koel	*Eudynamys scolopacea*	R C Br
52	Greater Coucal	*Centropus sinensis*	R C
53	Alexandrine Parakeet	P*sittacula eupatria*	R U
54	Rose-ringed Parakeet	*Psittacula krameri*	R C Br
55	Plum-headed Parakeet	*Psittacula cyanocephala*	R C
56	Malabar Parakeet	*Psittacula columboides*	R U
57	Asian Palm Swift	*Cypsiurus balasienis*	R C
58	House Swift	*Apus affinis*	R C Br
59	Crested Treeswift	*Hemiprocne coronata*	R U
60	Barn Owl	*Tyto alba*	R C Br
61	Collared Scops Owl	*Otus bakkamoena*	R U
62	Eurasian Eagle Owl	*Bubo bubo*	R O
63	Brown Fish Owl	*Ketupa zeylonensis*	R C
64	Mottled Wood Owl	*Srix ocellata*	R U
65	Jungle Owlet	*Glaucidium radiatum*	R C
66	Spotted Owlet	*Athene brama*	R C Br
67	Grey Nightjar	*Caprimulgus indicus*	R C
68	Indian Nightjar	*Caprimulgus asiaticus*	R C
69	Savana Nightjar	*Caprimulgus affinis*	R C
70	Rock Pigeon	*Columba livia*	R C
71	Nilgiri Wood Pigeon	*Columba elphinstonii*	R U
72	Oriental Turtle Dove	*Streptopelia orientalis*	R C Br
73	Spotted Dove	*Streptopelia chinensis*	R C
74	Red Collared Dove	*Streptopelia tranquebarica*	R C Br
75	Eurasian Collared Dove	*Streptopelia decacto*	R C
76	Emerald Dove	*Chalcophaps indica*	R U
77	Yellow-footed Green Pigeon	*Treron phoenicoptera*	R C
78	Demoiselle Crane	*Grus virgo*	M U
79	White-breasted Waterhen	*Amauroni phoenicurus*	R C Br
80	Baillon's Crake	*Porzana pusilla*	M U
81	Purple Swamphen	*Porphyrio porphyrio*	R C Br
82	Common Moorhen	*Callinula chloropus*	R C
83	Common Coot	*Fulica atra*	R C Br
84	Chestnut-bellied Sandgrouse	*Pterocles exustus*	R O
85	Eurasian woodcock	*Scolopax rusticola*	M C
86	Pintail Snipe	*Gallinago stenura*	M C
87	Common Snipe	*Gallinago gallinago*	M C
88	Black-tailed Godwit	*Limosa limosa*	M C
89	Eurasian Crulew	*Numenius arquata*	M O
90	Spotted Redshank	*Tringa erythropus*	M C
91	Common Redshank	*Tringa tetanus*	M C
92	Marsh Sandpiper	*Trigna stagnatilis*	M C
93	Common Greenshank	*Trigna nebularia*	M C
94	Green Sandpiper	*Trigna ochropus*	M C
95	Wood Sandpiper	*Trigna glareola*	M C
96	Common Sandpiper	*Actitis cinereus*	M C
97	Little Stint	*Calidris alba*	M C
98	Temminck's Stint	*Calidris temminckii*	M O
99	Greater Painted Snip	*Rostratula benghalensis*	M C
100	Indian Courser	*Cursorius coromandelicus*	R C
101	Black-winged Stilt	*Himantopus himantopus*	M C
102	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	R C
103	Bronze-winged Jacana	*Metopidius indicus*	R U

S No.	NAME OF THE BIRD		STATUS
104	Great Thick-knee	*Esacus recurvirostris*	R U
105	Small Pratincole	*Glareola lactea*	M C
106	Little Ringed Plover	*Charadrius hiaticula*	M C
107	Kentish Plover	*Charadrius alexandrinus*	M C
108	Yellow-wattled Lapwing	*Vanellus malarbaricus*	R C Br
109	Red-wattled Laowing	*Vanellus indicus*	R C Br
110	Black-headed Gull	*Larus ridibundus*	M U
111	Gull-billed Tern	*Gelochelidon nilotica*	M U
112	River Tern	*Sterna aurantia*	M C
113	Black-bellied Tern	*Sterna acuticauda*	M U
114	Whiskered Tern	*Chlidonias hybridus*	M U
115	Osprey	*Pandion haliaetus*	R U
116	Black-shouldered Kite	*Elanus caeruleus*	R C
117	Black Kite	*Milvus milvus*	R C Br
118	Brahminy Kite	*Haliastur indus*	R C
119	Short-toed Snake Eagle	*Circaetus gallicus*	R C
120	Crested Serpent Eagle	*Spilonis cheela*	R C
121	Eurasian Marsh Harrier	*Cirus aeruginosus*	M C
122	Pallid Harrier	*Ciecus macrourus*	M U
123	Shikra	*Accipiter badius*	R O
124	Oriental Honey Buzzard	*Pernis ptilorhncus*	R O
125	White-eye Buzzard	*Butastur teesa*	R U
126	Tawny Eagle	*Aquila rapax*	R U
127	Bonelli's Eagle	*Nieraaetus fasciatus*	R C Br
128	Booted Eagle	*Hieraaetus pennatus*	M O
129	Changeble Hawk Eagle	*Spizaetus cirrhatus*	R C
130	Common Kestrel	*Falco tinnuculus*	R C
131	Red-necked Falcon	*Falco chicquera*	R U
132	Laggar Falcon	*Falco jugger*	R U
133	Peregrine Falcon	*Falco peregrinus*	R U
134	Little Grebe	*Tachybaptus ruficollis*	R C Br
135	Darter	*Anhinga melanogaster*	M C
136	Little Cormorant	*Phalacrocorax niger*	M C
137	Little Egret	*Egretta garzetta*	R C
138	Great Egret	*Casmerodius albus*	M C
139	Intermediate Egret	*Mesophoyx intermedia*	R C
140	Cattle Egret	*Bubulcus ibis*	R C
141	Indian Pond Heron	*Ardeola grayii*	R C
142	Grey Heron	*Ardea cinerea*	M C
143	Purple Heron	*Ardea purpurea*	M C
144	Glossy Ibis	*Plegadis falcinellus*	M C
145	Black-headed Ibis	*Threskiornis melanocephalus*	M C
146	Black Ibis	*Pseudibis papillosa*	R C Br
147	Eurasian Spoonbill	*Platalea leucorodia*	M C
148	Asian Openbill	*Anastomus oscitans*	M C
149	Woolly-necked Stork	*Ciconia episcopus*	M C
150	Indian Pitta	*Pitta brachyura*	R C
151	Asian Fairy Bluebird	*Lrena puella*	R C
152	Blue-winged Leafbird	*Chloropsis cochinchinensis*	R C
153	Golden-fronted Leafbird	*Chloropsis aurifrons*	R C
154	Bay-backed Shrike	*Lanius vittatus*	R C
155	Long-tailed Shrike	*Lanius schach*	M C
156	Southern Grey Shrike	*Lanius meridionalis*	R C

S No.	NAME OF THE BIRD		STATUS
157	Rufous Treepie	*Dendrocitta vagabunda*	R C
158	House Crow	*Corvus splendens*	R C Br
159	Large-billed Crow	*Corvus macrorhynchos*	R C Br
160	Ashy Woodswallow	*Artamus fuscus*	M O
161	Eurasian Golden Oriole	*Oriolus oriolus*	R O
162	Black-headed Oriole	*Oriolus xanthornus*	R C Br
163	Large Cuckooshrike	*Coracina macei*	R C
164	Black-headed Cuckooshrike	*Coracina melanoptera*	R C
165	Small Minivet	*Pericrocotus erythropygius*	R C
166	Scarlet Minivet	*Pericrocotus flammeus*	R C
167	White-throated Fantail	*Rhipidura hypoxantha*	R C
168	White-browed Fantail	*Rhipidura aureola*	R C
169	Black Drongo	*Dicrurus macrocercus*	R C
170	Ashy Drongo	*Dicrurus leucophaeus*	R C
171	White-bellied Drongo	*Dicrurus caerulescens*	R O
172	Greater Racket-tailed Drongo	*Dicrurus paradiseus*	R C Br
173	Blach-naped Monarch	*Hypothymis azurea*	R O
174	Asian Paradise Flycatcher	*Terpsiphone paradise*	M O
175	Common Iora	*Aegithina tiphia*	R C
176	Common Woodshrike	*Tephrodornis pondicerianus*	R C
177	Blue Rock Thrush	*Monticola solitarius*	R C Br
178	Malabar Whistling Thrush	*Myophonus horsfieldii*	R C Br
179	Eurasian Blackbird	*Turdus merula*	R C Br
180	Tickll's Blue Flycatcher	Cyornis tickelliae	R C
181	Bluethroat	*Luscinia svecica*	M O
182	Indian Robin	*Saxicoloides fulicata*	R C Br
183	Black Redstart	*Phoenicurus orchuros*	M C
184	Common Stonechat	*Saxicola toquata*	M C
185	Pied Bushchat	*Saxicola caprata*	M C
186	Brown Rock-chat	*Cercomela fusca*	M U
187	Chestnut-tailed Starling	*Sturnus malabaricus*	M C
188	Brahminy Starling	*Sturnus pagodarum*	R C Br
189	Rosy Starling	*Sturnus roseus*	M C
190	Common Myna	*Acridotheres tristis*	R C Br
191	Jungle Myna	*Acridotheres fuscus*	R C Br
192	Chestnut-bellied Nuthatch	*Sitta castanea*	M O
193	Velvet-fronted Nuthatch	*Sitta frontalis*	M O
194	Great Tit	*Parus major*	R C
195	Black-lored Tit	*Parus xanthogenys*	R U
196	Dusky Crag Martin	*Hirundo concolor*	R C Br
197	Wire-tailed Swallow	*Hirundo smithii*	M C Br
198	Red-rumped Swallow	*Hirundo daurica*	M C
199	Red-whiskered Bulbul	*Pycnonotus melanicterus*	R C Br
200	Red-vented Bulbul	*Pycnonotus cafer*	R C Br
201	White-browed Bulbul	*Pycnonotus luteolus*	R C
202	Yellow-browed Bulbul	*Lole indica*	R U
203	Jungle Prinia	*Prihia sylvatica*	R C
204	Plain Prinia	*Prihia inornata*	R C
205	Ashy Prinia	*Prinia socialis*	R C
205	Oriental White-eye	*Zosterops palpebrosus*	R C

206	Clamorous Reed Warbler	*Acrocephalus stenetoreus*	M U
207	Common Tailorbird	*Orthotomus sutorius*	R C Br
208	Common Chiffchaff	*Phylloscopus collybita*	M O
209	Indian Scimitar Babbler	*Pomatorhinus horsfieldii*	R U
210	Yellow-eyed Babbler	*Chrysomma sinense*	M C
211	Common Babbler	*Turdoides caudatus*	R C
212	Largr Grey Babbler	*Turdoides malcolmi*	R C
213	Jungle Babbler	*Turdoides malcolmi*	R C
214	Brown-cheeked Fulvetta	*Alcippe poioicephala*	R U
215	Indian Bushlark	*Mirafra erythroptera*	R C
216	Ashy-crowned Sparrow Lark	*Eremopterix grisea*	R C Br
217	Rufous-tailed Lark	*Ammomanes phoenicurus*	R C
218	Sykes's Lark	*Galerida deva*	R C Br
219	Oriental Skylark	*Alauda gulgula*	R C Br
220	Thick-billed Flowerpecker	*Ddicaeum agile*	R C
221	Purple-rumped Sunbird	*Nectarinia zeylonica*	R C Br
222	Purple Sunbird	*Nectarinia asiatica*	R C Br
223	Loten's Sunbird	*Nectarinia lotenia*	R U
224	House Sparrow	*Passer domesticus*	R C Br
225	Chestnut-shouldered Petronia	*Petronia xanthocollis*	R C
226	Yellow Wagtail	*Motacilla flava*	M C
227	Grey Wagtail	*Motacilla cinerea*	M C
228	Paddyfield Pipit	*Anthus rufulus*	R C
229	Tree Pipit	*Anthus trivialis*	M C
230	Baya Weaver	*Ploceus philippinus*	R C Br
231	Red Avadavat	*Amandava amandava*	R C Br
232	Indian Silverbill	*Lonchura malabarica*	R C Br
233	White-rumped Munia	*Lonchura striata*	R C
234	Scaly-breasted Munia	*Lonchura punctulata*	M C
235	Black-headed Munia	*Lonchura malacca*	R U
236	Common Rosefinch	*Carpodacus erythrinus*	M C
237	Crested Bunting	*Melophus lathami*	M C
238	Black-headed Bunting	*Emberiza melanocephala*	M C
239	Red-headed Bunting	*Emberiza bruniceps*	M C

STATUS : R – Resident, M – Migrant, C – Common, O – Occasional, U – Uncommon, Br - Breeding

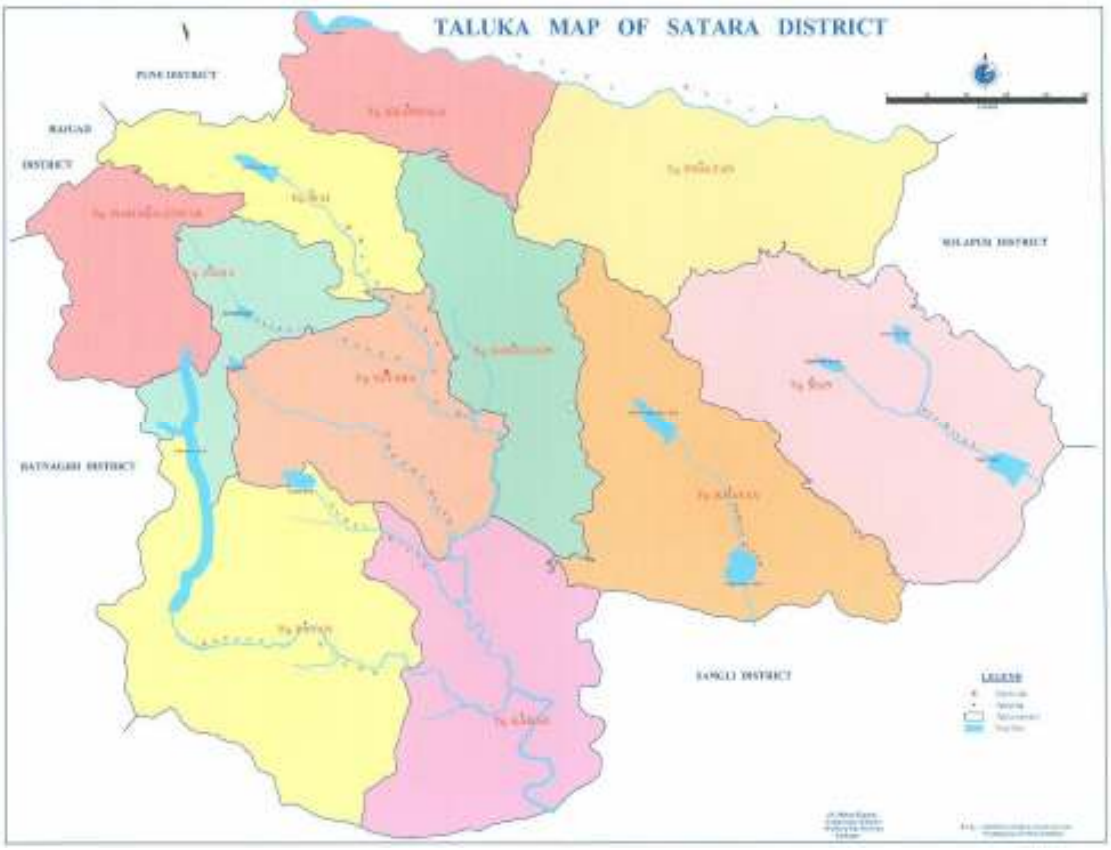
GLOSSARY OF LOCAL TERMS / ABBREVIATIONS

Sr.No.	Local name	Meaning
1.	Geru	Red ochre or red earth
2.	Ghat	A road with a steep gradient
3.	Jhirras	Temporary small well dug in nallas during Summer
4.	Kuran	A grass reserve close to grazing
5.	Malki lands	Lands belonging to private individuals
6.	Murrum	Lateritic soil reddish brown in colour
7.	Nalla	A water course
8.	Nachani	An edible food grain
9.	Rab	A patch of ground which is given a good burn and used for regeneration purpose.
10.	Tahsil/ Taluka	An administrative unit of district
11.	Tahal	Leafy branches of trees

ABBREVIATIONS USED IN THE PLAN

ACF	:	Assistant Conservator of Forests
APCCF	:	Additional Principal Chief Conservator of Forests
AR	:	Artificial Regeneration
CAI	:	Current Annual Incremant
CBO	:	Cutting Back Operations
CCT	:	Continuous Contour Trenches
Cum	:	Cubic metre
CF	:	Conservator of Forests
DILR	:	District Inspector of Land Records
DRDA	:	District Rural Development Agency
DCF	:	Deputy Conservator of Forests
EPT	:	Elephant proof Trench
FCA	:	Forest Conservation Act
FD	:	Forest Department
FDA	:	Forest Development Agency
FLCS	:	Forest Labourers' Cooperative Society
FPC	:	Forest Protection Commitee
FRSSU	:	Forest Resources Survey Scheme Unit
FYO	:	First Year Operations
FYP	:	Five Year Plan
GIS	:	Geographic Information System
GBH	:	Girth at breast height
Ha.	:	Hectare
IUCN	:	International Union for Conservation of Nature
IWC	:	Improvement Working Circle
IWDP	:	Integrated Watershed Development Programme
JFM	:	Joint Forest Management
MAI	:	Mean Annual Increment
MEDA	:	Maharashtra Energy Development Agency
MPCA	:	Medicinal Plants Conservation Area

MSL	:	Mean Sea Level
MSEDC	:	Maha State Electricity Distribution Co.
NTFP	:	Non Timber Forest Produce
NR	:	Natural Regeneration
PA	:	Protection Area
PCCF	:	Principal Chief Conservator of Forests
PF	:	Protected Forest
PPO	:	Pre planting Operations
PWD	:	Public Works Department
RF	:	Reserve Forest
RFO	:	Range Forest Officer
SCI	:	Selection cum Improvement
SHG	:	Self Help Group
SMC	:	Soil and Moisture Conservation
SOFR	:	State of Forest Report
SYO	:	Second Year Operation
TCM	:	Trench cum mound
TM	:	Treatment map
TYO	:	Third Year Operations
WC	:	Working Circle
WP	:	Working Plan
WL	:	Wild life
WS	:	Working Series


TALUKA MAP OF SATARA DISTRICT
PUNE DISTRICT
RAIGAD
DISTRICT
SOLAPUR DISTRICT
RATNAGIRI DISTRICT
SANGLI DISTRICT
LEGEND


SATARA FOREST DIVISION – RANGE MAP

PART - I

SUMMARY OF FACTS ON WHICH THE PROPOSALS ARE BASED

CHAPTER - 1
THE TRACT DEALT WITH

SECTION 1: NAME AND SITUATION

This Working Plan deals with the entire forest area including all reserved forests, protected forests, unclassed forests, and finally acquired forests in charge of the Satara forest division within the geographical boundaries of Satara district. This Plan however excludes the areas notified as Koyana wildlife sanctuary and Chandoli National Park within Satara district as these are covered by separate Management Plans and are under the administrative control of the Kolhapur wildlife division.

The geographical area of Satara district is 10,480 km^2 and is spread over 11 talukas viz. Satara, Koregaon, Jaoli, Mahabaleshwar, Wai, Khandala, Phaltan, Maan, Khatav, Patan and Karad. The recorded forest area of the district including sanctuary areas is 1570.51 sq.km that is 14.98% of the geographical area of the district. The Satara forest division however has a forest area of 1,309.18 km^2 that is spread over 12 forest ranges and all 11 talukas and is 12.49 % of the geographical area.

As per the latest 'India State of Forest Report 2009' published by Forest Survey of India, Dehradun, the 'total forest cover' of Satara district is 1276 km^2 that is 12.18 % of the geographic area out of which, 'Very dense forest cover' is 9.3 % while 'Moderately dense' is 44.60 % of the total forest cover. The 'Open forest cover' constitutes 46.1 % of the total area under forest cover. This means about 53.9 % of the total forest cover within the district is moderately dense to very dense.

The forest area of Satara forest division extends over in scattered blocks throughout the civil territories of Satara district. The Satara division is bounded to the North by Nira River and Pune district, to the East by Sholapur district; to the South by Sangli district, and to the west by Raigad and Ratnagiri districts. The forest area lies between latitudes 17^0 05' N and longitudes 18^0 05' N and longitudes 73^0 30' E and 74^0 05'E.

SECTION 2: CONFIGURATION OF THE GROUND

The Satara district forms rugged country stretching about 100 kms from North to South with a considerable regularity in height and presents a panoramic view all around with truncated hill ranges separated by deep valleys descending to the plains.

The Satara district contains two main systems of hill ranges viz. the Sahyadri and the Mahadev hill ranges running North-South direction and South-East direction respectively. With the exception of Mahabaleshwar and Koyana valley, other hills are low, barren and rugged. The Sahyadri hill range forms the western boundary of the district. The main range of Sahyadris form about 20 kms North of Pratapgad, passes South-West for about 30 kms and then turns towards South-East for about 50 km till it enters Sangli district between

Patan and Shirala. The crest of the Sahyadris is crowned by several peaks of which two are the major forts Viz. Pratapgad (1080 mtrs) and Makrandgad (1236 mtrs). The Mahadev hill range originates from the Sahyadrian complex about 16 km North of Mahabaleshwar and stretches East and South-East across the whole breadth of Satara district. It passes about 50 km to the East beyond Khambatki pass, on the Satara- Pune road and the range breaks into two parts near Tadavale about 20 km South-East of Khambatki and again stretches in an irregular line to the extreme East of the district at Kothle.

The tops of both the Sahyadris and the Mahadev hills, especially in the North-Western Tahsils of Wai, Javli, and Patan look like a succession of fortresses raised on a series of plateaus, piled one over the other, the whole surmounted by a wall of rock. The top of Mahabaleshwar, the highest point in the district is about 1436 mtrs from mean sea level. From the high Deccan table land on the East, the Sahyadris seem some what low and tame. But from the western edge of their crest, great forms stand out from the Konkan with bold wild outlines and cliffs which in places have a sheer drop of over 900 mtrs. For about 45 kms after leaving the Sahyadris, the Mahadev hills keep a height of about 1220 mtrs above mean sea level and about 600 mtrs above the plains. The North face of the Mahadev range falls sharply into the Nira valley, the distance from the crest of the river being not more than 15 to 20 km. To the South the hills fall much more gently to the valley of the Krishna.

Within the limits of the tract there are some notable hills and hill forts, having elevations as under:

Table No. 1 : Elevation of hills.

Hills	Elevation	Hills	Elevation
Eruli	1381 M.	Kamalgad	1375 M.
Kenjalgad	1301 M	Pandavgad	1273 M.
Vandan	1174 M.	Vardhangad	1067 M
Sonjai	1003	Mahimangad	981 M
Sajjangad	914 M	Pratapgad	1080 M

SECTION 3: GEOLOGY, ROCK AND SOIL

Geology:

The entire area of the district is covered by basaltic lava, flows of upper cretaceous of lower Eocene age. The basalt is capped by laterite of younger age which is bound in the plateau above 900 mtrs from mean sea level. Alluvium occurs in patches along banks of rivers Krishna, Venna, Kudali and Koyana with average thickness of 10 mtrs and contains pebbles, boulders of trap and beds of sand.

Rock:

The Deccan trap which belongs to the type called plateau basalt is extremely uniform in composition over wide areas and is generally dark greenish-grey in colour but brownish to purple tints are also met within geological mapping. Detailed petrographic studies of the fabric

pattern of the various lava flows in parts of the area have brought to light, a succession of at least 12 units, forming five different flows, between altitudes 533 mtrs and 915 mtrs above MSL. The various flows appear to be fairly thick, varying from 60 to 120 mtrs, the individual cooling units varying from 10 to 80 meters in thickness. The flows cover wide areas and few of them have been traced over a distance of over 30 km.

Petrologically, the flows could be classified as (i) massive, compact and/or the grain basalt and (ii) vesicular zeolitic basalt and red bole. The term massive basalt has been applied to fine grained basalt with very few vesicles. Vesicular basalt have vesicles 4 to 5 meters in diameter, which are generally lined up with zeolite, calcite etc. The distribution and density of vesicles in the same flow may vary greatly. 'Red bole' beds are composed of ferruginous clayey substance of brick red colour.

Terrain view (Dahiwadi range)

The structure of these basalt flows is simple as there is no folding or pronounced faulting in the area. The various flows may be described as horizontal although a negligible amount of tilt towards East is indicated by the difference of levels of red bole beds and a few comparable flows.

Following salient facts, however, emerge from the comparable studies of different basalt flows in the area under reference viz. (a) broad sequences of lava eruption are manifested in the area and (b) there is an apparent decrease in the proportion of massive lava from West to East. The volcanic rocks weather differently in the high rainfall zone in Satara district where there is a thick lateritic cover than in the low rainfall area.

Laterite rests on the Deccan trap at an elevation of about 900 meters capping the summits of the hills in the Western portion of the area. It has a thickness of about 30/40 mtrs and is a scoriaceous and variegated clayey rock with characteristic red and brown colour. A fairly thick formation of lithomargic clays occur in between the laterite and Deccan trap in the Western parts of Satara district.

Soil:

The soils in the Satara district belong to three main classes Viz. (a) Reddish brown soil in the hills (b) Black and (c) Light coloured soil in the plains, depending on the nature of underlying rocks.

The red clayey soil in the Sahyadri hill ranges is formed from the disintegration of laterite and is thin and poor on upper hill slopes and rich on lower gentle slopes. It is greatly neutralized by a mixture of humus which adds to its fertility in dense forest areas while in open areas it is extremely poor and forms hard strata. The typical laterite soil found in Mahabaleshwar, Pachgani plateau and on the higher ridges of Sahyadri indicate a tropical one, which being soft and porous, forms a well drained sub-soil. The laterite however when

found in exposed conditions gets so hard after oxidation of the iron contained in it that it offers great resistance to further erosion. Rich black soil is found in Wai, Jaoli, Patan and Karad tahsils especially along the banks of leading streams. In the Krishna valley it is found in the broadest belt and is said to be one of the richest in the South. Medium to deep black alluvial soil is found in the central portion of Satara district. The leading light coloured soil is in the 'malran' or 'murummal' a poor and hard rocky soil common at the bases of mere Eastern hills.

Red laterite soil

Bauxite, copper, Manganese ore and building materials are the important minerals and rocks found in Satara district. The most important mineral is Bauxite. The bauxite occurrences are confined to the chains of plateau of the Western Ghats. The bauxite is associated with laterite capping and owes their origin to Deccan trap. The major deposits are located in Koyana valley of Mahabaleshwar and Wai tahsils of the district.

Psilomelane nodules which manganese ore are found with laterite fragments on the plateau of Mahabaleshwar, Eruli, Kas of Satara district. The manganese content is very low i.e.32.7 % and is not economical.

Kankar limestone occurs in the form of nodules which are strewn over the fields, forming typical bedland topography. Kankary soil is also present in nalla beds in Maan and Bhima river sections. The average thickness is one to three meters and Kankar bands are also seen in the form of criss-cross pattern in weathered zeolitic trap. Calcium Tufa occurs in small irregular patches at Wakri in Phaltan tahsil.

Number of quarries for basalt rock occur in Satara, Karad, Koregaon, Patan etc. and have been made use as good construction material and as well for railway ballast and road metal.

SECTION 4: CLIMATE AND RAINFALL

The climate of the district on the whole is moderate. It does not show extremities. However, three distinct seasons are experienced. These are monsoons from June to September while October and November are the post-monsoon months with warmer climate, winters from end November upto middle of February followed by a warm to hot summer from mid February upto first or second week of June.

Rainfall:

The South-west monsoon, the main source of rainfall, begins about the middle of June and lasts till the end of September. Nearly 85 % of the rainfall occurs during these months only. These rains do not cross beyond 40 km. east of Satara. The Eastern part of the district receives rains chiefly due to retreating North-East monsoons between mid-May to mid- June and October and November. Close to Sahyadri, and in the Sahyadri and Central belts, the

rainfall is heaviest, and in the Eastern belt which is farther from the Sahyadri, the rainfall is poorer and erratic. The average annual rainfall in Maan taluka in the eastern part is 473 mm while it is upto 6200 mm in Mahabaleshwar taluka in the western part of the district. The Sahyadris and the western parts of the Mahabaleshwar, Patan and Jawali talukas receive average annual rainfall upto 5000 mm which is reduced by 600 to 1200 mm in the eastern parts of the talukas. In the central and southern parts of the district receive upto 1200-2000 mm rainfall and include Satara, Wai, Koregaon and Karad talukas. In the eastern part having Phaltan, Khatav and Maan talukas as well as in Khandala taluka in the northern part of the district receive less than 600 mm rainfall.

Temperature:

The winters start by about end of November and continue till middle of February, December being the coldest month. In this season the mean daily maximum temperature in the plains is 28.4^0 C, while the mean daily minimum temperature is 13.2^0C. At Mahabaleshwar, the mean daily maximum temperature in December is only 28.1^0 C and the mean daily minimum is 13.6^0 C. During the period between the middle of February to end of May there is continuous increase in the temperature. The rise in temperature is more marked in the plains than on the hills. May being the hottest month of the year, the mean daily maximum temperature and the mean daily minimum temperature in the plains are 35.8^0 C, and 22.3^0 C., while at Mahabaleshwar they are 30.1^0 C, and 18.0^0 C, respectively. The heat is sometimes relieved by afternoon thunder showers. The onset of the South-West monsoons in the first or second week of June brings down the day temperature appreciably.

Humidity:

During the monsoon months, the air is highly humid while during the summers and the winters, the air is dry particularly in the afternoons. In the plain, the dryness is more marked than in the hills.

Wind:

Winds are strong particularly on the hills in the monsoon season. They are light to moderate during rest of the year. Thunderstorms occur in the hot season and in the post monsoon months. The hilly areas are generally covered with clouds and fog during the rainy season. Fog also occurs occasionally in the valleys in the cold season. Occurrence of frost is not recorded.

SECTION 5: WATER SUPPLY

On the whole water supply in the forest track is satisfactory. The drinking water is available from the tanks, streams and wells in most of the villages but in some villages in higher ridges of Western Ghats and Mahadev ranges, drinking water has to be brought over from long distances during summers. The rivers, nallas, irrigation reservoirs, percolation tanks and wells constitute the sources of water for agriculture and improve the moisture regime in their vicinity. The water table is quite high in otherwise water scarce Khatav and Maan talukas and therefore digging of wells is easier and less costly.

There are two river drainage systems within the limits of Satara district Viz. the Bhima system which is in small part of the North and North-Eastern portion and the Krishna system throughout the rest of the district. The Bhima river has two tributaries; the Nira and the Maan. A narrow belt beyond the Mahadev hills drains north into the Nira, which flows east into the Bhima and the north-east corner of the district beyond the Mahimangad-Panhala spur drains south-east along the Maan which afterwards flows east and north-east to join the Bhima.

The drainage system of the Krishna includes, the drainage of five tributaries from the right side, the Kudali, Venna, Urmodi, Tarli and Koyana and two from the left side Vasna and Yerla. The Krishna is one of the most important and sacred rivers of southern India. It rises on the eastern brow of the Mahabaleshwar Plateau 6 km west of the village Jor. About 15 km from Wai it receives the Kudali from the right. After meeting the Kudali, the river continues to run south by Nimb and Vaduth and after 25 km receives the

River Krishna

Venna on the right near Mahuli. After meeting the Venna, the Krishna curves to the south-east and separates Satara from Koregaon for about 15 km till it reaches the border of Karad. In Koregaon, after a course of 60 km, near Mangalapur, it receives the Vasna from the left and after a course of about 8 km in the extreme south of Satara, about 3 km south- west Venegaon, it receives the Urmodi from the right. It receives from the right two tributaries viz. the Tarli near Umbraj and the Koyana near Karad. Out of the 1280 km. of total length about 176 km. lie within Satara district. Today Koyana, the chief feeder of Krishna has become an important river in Maharashtra due to its hydro-electric project. There are 5 major and 9 medium irrigation projects in addition to many minor ones in the district and are as follows;

Major irrigation projects

1. Dhom in Wai taluka 2. Kanher in Satara taluka 3. Aarfal in Koregaon taluka 4.Veer in Khandala taluka 5. Tembhu in Karad taluka

Medium irrigation projects

1. Ner in Khatav taluka 2. Raanand in Maan taluka 3. Taarli in Patan taluka 4. Urmodi in Satara taluka 5. Mhaswad in Maan taluka 6. Krishna in Karad taluka 7. Yeralwadi in Khatav taluka 8. Yevti Mhasoli in Karad taluka 9. Andhali in Maan taluka. The above mentioned dams are constructed for irrigation purpose & drinking water facilities.

SECTION 6: DISTRIBUTION OF AREA

Forest area of Satara division has been verified with respect to the records of Revenue and SLR department in the year 2000. The form No. 1 was updated accordingly. The forest area in charge of forest department in Satara forest division is 1309.18 Sq.km. Out of this 1177.56

sq.km. is reserved forest; 47.82 sq.km is protected forests,15.21 sq.km. is unclassed forests and acquired private forest is 68.58 sq.km. The percentage of forest area to the geographical area of the division is 12.49 %. The forest area is spread over 12 Ranges. These areas are in scattered blocks throughout the civil territory of Satara district.

Table No. 2 : Distribution of Area.

Taluka	Range	Reserved forest			Protected forest	Unclassed forest	Private	Total
		Sec. 20	Sec. 4	Total				
Satara	Satara	8272.21	0	8272.21	0	109.82	391.57	8773.60
Koregaon	Koregaon	9867.82	0	9867.82	0	303.40	0	10171.22
Jawali	Medha	8274.41	347.52	8621.93	0	62.80	237.48	8922.21
M.shwar	M.shwar	14693.14	1199.52	15892.66	268.74	212.05	4013.29	20386.74
Wai	Wai	12897.08	0	12897.08	0	119.54	45.25	13061.87
Khandala	Khandala	5713.49	320.39	6033.88	0	0	13.50	6047.38
Phaltan	Phaltan	3906.88	0	3906.88	4452.46	0	0	8359.34
Man	Dahiwadi	12228.68	0	12228.68	0	41.54	0	12270.22
Khatav	Waduj	6895.97	0	6895.97	0	172.49	4.77	7073.23
Karad	Karad	12475.10	0	12475.10	0	22.42	553.66	13031.18
Patan	Dhebewadi	9486.84	90.92	9577.76	0	133.13	400.91	10111.80
	Patan	11050.82	47.96	11098.78	61.22	344.28	1197.69	12708.97
G.Total		**115749.44**	**2006.31**	**117755.75**	**4782.43**	**1521.47**	**6858.11**	**130917.76**

The forest areas under Desai's plan were surveyed on 4"= 1 mile scale by the Survey of India and for remaining forest areas village maps of 8"=1 mile scale are available.

SECTION 7: STATE OF BOUNDARIES

The total length of the boundary of the forest is 7306.843 km. of which 46.15 km. is natural boundary and the rest is artificial boundary. The artificial boundary is demarcated by the boundary marks (cairns) as specified in the Article 123 of the Bombay Forest Manual volume II. A first class boundary mark occupies main points and corners and where the forest boundary intersects the village boundary and where the former takes an abrupt turn. A second class boundary mark occupies intermediate points and shape of boundary mark is a truncated cone. They are built of loose stones. Most of the cairns are collapsed and they require repair. For last few years, cement concrete pillars are being erected for demarcation of forest boundaries. Forest boundary upto 555.50 km length has been demarcated by using cement concrete pillars (1st Class-5143 Nos., 2nd Class 2158 Nos.). A Statement giving the extent of natural and artificial boundaries is given in **Appendix No. 20. 5**

SECTION 8: LEGAL POSITION

The forests of Satara district were duly constituted into Reserved forests between the years 1879 to 1955. In 1903 and onwards most of the forest areas were transferred to Revenue Department and after reconstitution of forest divisions in 1974, portions of such areas were retransferred to the Forest Department for implementing various developmental schemes. The protected forests were duly constituted between the years 1894 to 1950. The details of the notifications under which the forests have been declared as Reserved and Protected forests is given in the **Appendix No. 1.11**

SECTION 9: RIGHTS AND CONCESSIONS

There are no rights except the right of way and access to and use of temples, wells and watering places in the reserved forests. The general and special privileges granted in the forest areas as per the Articles 132 and 138 of the Bombay Forest Manual volume III will have to be made applicable to these areas subject to the condition that the Gram Panchayats take the responsibility of protection of forest areas.

CHAPTER - 2

THE FLORA AND FAUNA

THE FOREST FLORA

SECTION 1: COMPOSITION AND CONDITION OF THE CROP

The Western Ghats region is known as one of the eight 'hottest' biodiversity hotspots of the 34 identified biodiversity hotspots worldwide. The region hosts a tremendous diversity of plant and animal life. The diverse natural wealth of the region is an important source of livelihood for a number of ethnic communities inhabiting the region. For instance, local communities harvest nearly 150 uncultivated food plants and more than 500 medicinal plants from forests for food and medicine. The forests are also a source of varied NTFPs and industrial raw materials.

Nearly 1,452 species of plants belonging to 680 genera of 156 families have been recorded as per the Ph.D. Thesis on 'Flora of Vasota and its surroundings' of Satara district by Dr. Madhukar Y. Cholekar (Bachulkar) under the guidance of Dr. S.R. Yadav of Shivaji university of Kolhapur. Out of the total taxa '**endemic'** to peninsular India, 694 are found in Maharashtra (Singh and Karthikeyan, 2000) of which 175 species are recorded in the study area. Similarly, a total of 251 species are reported to be '**endangered'** in Maharashtra state (Singh and Karthikeyan, 2000) of which 20 species are found in the study area. They comprise *Abutilon ranadei*, *Aponogeton satarensis*, *Begonia trichocarpa* and 5 species of *Ceropegia* viz. *Ceropegia jainii, C. noorhjahaniae, C. sahyadrica and C. vincaefolia, Decaschistia trilobata, Erinocarpus nimmonii, Euphorbia panchganensis, Habenaria panchganensis, Iphigenia stellata, I. magnifica, Kalanchoe olivacea, Polyzygus tuberosus, Rotala ritchiei, Seshagiria sahyadrica, Smithia agarkarii and Vigna khandalensis.* India harbors over 2000 '**medicinal plants'** of which over 400 plant species of some therapeutic value have been enumerated in the study area. The detailed list of Endemic, Endangered and Medicinal plant species is given on **page no. xxiv** of this volume.

However, forests in the Western Ghats region are under increasing stress due to over exploitation, degradation and habitat destruction. Due to variations in climatic conditions the composition of the forests varies in the Satara district as we move from the Western Ghat areas towards eastwards flat plateau land. Variations are also observed due to varied elevations above msl and also due to variations in soil types. The top of the Western Ghats receive maximum rainfall almost upto 6000 mm. and have cloud cover for most of the rainy season. It supports semi evergreen but stunted forests. Beyond the width of about 5 km the rainfall reduces to around 3000 mm. and here semi evergreen forests or moist deciduous forests of site quality IV a to IV b are seen. As we move further eastwards where the rainfall reduces to about 1500 to 2500 mm. moist deciduous forests are found. Further eastwards in the rainfall zone 650 to 1250 mm. mixed dry deciduous forests are seen. At about 50 km. east of the Western Ghat ranges, the rainfall reduces to 250 to 500 mm. and the rainfall here is irregular and hence the forests seen are stunted, thorny type forests.

In these areas, most of the tree covered areas are found in a North South belt parallel to and at a distance 25 to 30 kms from the Western Ghats. According to the Champion and Seth classification of the forests types of India, the main forest types found in Satara forest division are as follows.

1. $_8A/C_2$ – Western sub-tropical hill forests
2. $_2A/C_2$ – West coast semi-evergreen forests
3. $_3B/C_2$ – Southern moist mixed deciduous forests
4. $_5A/C_3$ – Southern dry mixed deciduous forests
5. $_5A/C_{1b}$ – Dry teak forests
6. $_5D/S_4$ – Dry grass lands

SECTION 2: THE GENERAL DESCRIPTION OF THE GROWING STOCK

The forests of Satara forest division belong to the following main groups as per revised classification of forest types by Champion and Seth:

1. Western sub-tropical hill forests- $_8A/C_2$

This forest type occurs in Sahyadri ranges where altitude is more than 1,000 meters above mean sea level and rainfall exceeds 2500 mm. This category exists in higher ridges of Mahabaleshwar, Patan, Dhebewadi ranges. The crop is mostly middle aged. Density varies from 0.5 to 0.8. The crop is mostly stunted, without distinct canopies with large blanks interspersed where heavy soil erosion and laterization has taken place. Shifting cultivation, uncontrolled grazing, heavy precipitation have led to degradation of these areas. Main species are Syzigium cumini, Actinodaphne angustifolia, Terminalia chebula, Memecylon edule, Catunaregam spinosa, Phyllanthus emblica, Olea dioica, Acacia concinna etc. Bamboo is absent. The height of trees varies from 5 to 12 meters. The trees are generally of spreading habit. Shikekai and Hirda occur predominantly.

Floristics

I/II. Actinodaphne angustifolia (f), Bridellia retusa (lo), Catunaregam spinosa (f), Flacourita latifolia (lo) Glochidion lanceolarium (c) Ligustrum neilgherrense (lo), Memecylon edule (a), Murraya paniculata (lo), Olea dioica (f), Symplocos racemosa (f), Syzigium cumini (a), Terminalia chebula (f), Xantolis tomentosa (c).

IIa Bamboo-absent.

III/IVa - Achyranthes aspera, Allophylus cobbe, Alylosia lineate, Blepharis asperrima, Canthium dicoccum, Capparis Longispina, Carvia Callosa, Gnidia glauca, Impatiens acaulis, Leucus stelligera, Pavetta Indica, Pogostemon Parviflorus.

IVb - Apluda varia, Arundinella spicata, Sporobolus species.

V. - Acacia concinna, Clematis wightiana, Elaeagnus conferta, piper hookeri, Rosa multiflora, Smilax zeylanica.

2. West coast semi-evergreen forests- $_2A/C_2$

This forest type occurs in the Western part of Satara Division viz. Patan, Mahabaleshwar, Dhebewadi. These are found between the Western Sub tropical hill forests and Southern moist

mixed deciduous forests at altitudes between 450 meters to 1,000 meters above mean sea level. In these areas the rainfall is heavy and generally exceeds 2,000 mm. In this type of forests the leaves of all trees are not shed at a time. That is why these forests appear always green. Though, particular species dominates, it is a mixed forest. Crop is middle aged to mature. Density varies from 0.4 to 0.6. Height varies from 12 to 25 meters. Crop has been affected adversely on account of soil erosion, grazing and shifting cultivation in the past.

Floristics

I/II. Actinodaphne angustifolia (f), Artocarpus hirsute (o), Bridellia retusa (c) Careya arborea (o), Cassia fistula (o), Catunaregam spinosa (f), Diospyros montana (lo), Garcinia indica (o),Gmelina arborea (o), Lagerstroemia microcarpa (o), Mangifera indica(o) Memecylon edule (a), Salmalia malabarica (o), Symplocos racemosa (f), Syzigium cumini (a), Terminalia alata (c), Terminalia paniculata (o), Wrightia tinctoria(o), Xantolis tomentosa (f).

IIa. Bamboo

III. Alylosia lineate, Carvai callosa, Colebrookea oppositifolia, Crotalaria retusa, Embelia ribes, Holarrhena paniculata, Pavetta indica.

IVa. Achyranthes aspera, Ixora coccinea, Rungia parviflora, Strobilanthes scrobiculatus.

IV b. Andropogon species, Apluda varia.

V. Abrus precatorius, Acacia concinna, Clematis gouriana, Gnetum ula.

3. Southern moist mixed deciduous forests- $_3B/C_2$

This type of forest is met with along the lower slopes of Sahyadri ranges. The rainfall is between 1,250 mm. To 2,000 mm. Crop is mixed one. Teak is rarely found. This forest is found in the Western part of Satara and Khandala ranges and in lower parts of Dhebewadi and Patan ranges. The density of crop varies from 0.5 to 0.7. Average height of tree is 12 to 15 meters. Regeneration is almost absent.

Floristics

I. Terminalia alata (f), Terminalia paniculata (f), Lagerstroemia microcarpa (f), Dalbergia latifolia (f) pterocarpus marsupium (c), Schleichera oleosa (c), Salmalia malabarica (c), Hotoptelea integrifolia (o), Careya arborea (o), Haldina cordifolia (o), Terminalia belerica (o).

II. Alstonia scholaris, Diospyros peregrine,phyllanthus emblica, Grewia tiliaefolia, Flacourtia indica, bridelia retusa, Catunaregam spinosa, Ixora arborea, Garuga pinnata, Wrightia tinctoria.

IIa. Bamboo

III. Carissa carandus,Zizyphus nigosa, woodfordia fruticosa, Vitex negundo, Callicarpa lanata, Holarrhena Paniculata. Clerodendron viscosum.

IVb Grasses-absent.

V. Anodendron paniculatum. Mezoneurum cucullatum, Jasminum malabaricum, Coceulus microcarpus, Elaeagnus conferta.

4. Southern dry mixed deciduous forests- $_5A/C_3$

This forest type occurs in the central portion of the tract where the rainfall varies from 750 mm to 1,500 mm. It occurs particularly in the Western part of Karad and Satara ranges. In general, the height of the trees varies from 10 to 12 meters. Forest crop is comparatively better than the degraded scrub forest commonly met with in the Eastern portion of the tract. Density of the crop is generally less than 0.5. The areas are subjected to heavy grazing and frequent annual fires and have increased the proportion of thorny species on the poor and eroded sites.

Floristics

I/II Anogeissus latifolia, Terminalia alata, Soyemida febrifuia, Albizzia amara, Cassia fistula, Santalum album, Lannea coromandelica, Diospyros melanoxylon, Phyllanthus emblica, Aegle marmelos, Bauhinia racemosa, Azardirachta indica, Balanites egyptica, Boswellia serrata, Lagerstroemia microcarpa.

IIa. Bamboo- absent

III.Randia uliginosa, carissa carandas, cassia auriculata, Maytenus emarginata. Growth is usually thin and sparse.

IV a Coarse grasses like Heteropogon contortus, Fremopogon foveolatus etc.

V A few climber like Zizyphus ocnoplia, Acacia intsia, Caesalpinia decapetala etc.

Babul (Acacia nilotica)forests:

Babul forests occur in small scattered patches in Eastern portion of the tract along the banks of Nira and Maan river. Soil is mostly alkaline and alluvial. Average annual rainfall is less than 700 mm. The main species is Acacia nilotica. The trees usually have short boles and low branching crowns. The usual height of the trees is 6 to 9 meters. Gum is locally collected from this species. Acacia nilotica is used locally for agricultural implements and as fire-wood. The other species occasionally met with are Azadirachta indica, Tamarindus indica, Pongamia pinnata and Acacia eburnea. Undergrowth and regeneration of babul is mostly absent.

5.Dry teak forests- $_5A/C_{1b}$

This type is generally met with in Ghotil, Kalgaon, Salve areas of Dhebewadi range, Dara and Kaner of Satara range. Site quality is generally less than IV-a. Teak usually forms major portion of the crop. Except in Ghotil area, elsewhere the crop is mostly unsound. The crop is mostly middle-aged. Reproduction of teak and other principle species is scanty. These areas are subjected to heavy grazing and frequent fires.

Floristics

I/II. Tectona grandis, Anogeissus latifolia, Terminalia alata, Dalbergia latifolia, Bridelia retusa, Schleicherea oleosa, Grewia tiliifolia, Albizia lebbek, Bauhinia racemosa, Lagerstroemia

microcarpa, Cassia fistula, phyllanthus emblica, Acacia catechu, Ougenia oojeinensis.

II a Bamboo-absent.

III.Zizyphus xylopyra, Lantana camara, Helicteres isora, Woodfordia fruticosa.

IV b Coarse grasses.

V. Caesalpinia decapetala, Abrus precatorius etc.

6. Dry grass lands- $_5D/S_4$

This type occupies nearly 1/3rd of the tract dealt with. This type occurs in low rainfall areas where annual rainfall received is less than 750 mm. Due to intense biotic interference and frequent drought, the areas are devoid of tree growth. Due to severe grazing and frequent fire, low quality grasses like Kusali have suppressed the growth of good quality grasses like Pawnya, Dongari, Marvel. Progression may take place if these areas are rigidly protected from these biotic factors. Common grass species met with are Heteropogon contortus, Aristida faniculata, Fragrostis species. Good fodder species like Dichanthium annualatum, schima nervosum are rare. In moist localities sometimes Cymbopogon martini also met with. Thorny species such as Euphorbia neriifolia, Maytenus emarginata and Rhus mysorensis are occasionally met with.

A detailed list of floral species is given on pages ix to xxii

Devrais or Sacred Groves are small patches of forests, protected and preserved in their natural form in reverence to local deities by villagers. Many of these are part of notified forest areas. Since these Devrais are worshipped by villagers they are not exploited and in fact even grazing is prohibited. It is a common belief that interference in Devrais results in inviting wrath of the deities resulting in calamities like drought, floods, storms, epidemics. These Sacred Groves are excellent repositories of bio diversity and can be used for creating awareness among people regarding importance of forests. Many of these devrais are owned by the Gram Panchayats, Devasthan samitis. As many as 22 Devrais covering 346.74 hectare have been recorded in Satara district. A list of devrais is given in **Appendix No. 2.1** of Volume II.

SECTION 3: STATUS OF NATURAL REGENERATION

N.R. of teak in Debewadi range

Young recruits of Ain, Kinjal, Anjani, Jamun, Pisa, Katak, Kumbhi, Chandada, Umbar etc. appear profusely after first few showers of the season. The status of NR in general can be treated as satisfactory except for the forest patches adjoining villages that are prone to fires and unregulated grazing.

SECTION 4: INJURIES TO WHICH CROP

The principle causes of injury to which crop is liable in the order of importance are human agency, grazing, drought, fire, climbers and weeds, wind, wild animals, epiphytes and parasites, insects and fungi.

Illicit cutting

The problem of illicit felling though not very serious is mainly for fuel wood in form of head loads and small timber to some extent. The damage is particularly serious in the villages surrounding well wooded forest areas of Satara, Patan, Karad and Mahabaleshwar ranges.

Encroachments

Increasing human population has resulted in demand for more and more land for cultivation, resulting in the tendency to encroach upon the forest land. Though the problem is not of serious proportion in the district, firm and timely steps are necessary to stop such tendencies and to protect the forest areas from further destruction. The statement showing the extent of encroachment range wise is given in **Appendix No. 20.1** and **20.2** of Volume II.

Grazing

The area is having cattle population of 27.97 lakhs. The grazing incidence and intensity is much more than the availability especially in the eastern part of the district. The eastern part of the district is drier and has less forest area, hence suffers from fodder shortage especially during summers. The sheep graziers of 'Dhanagar' community settled in the eastern part of the district keep on migrating from one place to another in search of greener pastures along with their herds. Continuous and heavy incidence of grazing within forest areas does not allow regeneration of tree species to establish. Grazing results in direct damage to young growth by browsing and trampling and thereby affecting regeneration of forests. Hardening and compacting of soil renders extremely unfavourable conditions for regeneration and growth. Statement showing the cattle population of the division as per the census carried during the year 2003 is given in the **Appendix No. 4.1** and statement showing the extent of damage due to fire, grazing, illicit cutting and other offences is given in **Appendix No. 2. 2** of Volume II.

Drought

It is severe in the eastern region of the district. There is a long spell of dry weather from the beginning of November till the arrival of Monsoon. Occasional summer showers received during April and May are localised and so erratic that their beneficial effect is not of much use. Drought adversely affects young regeneration.

Fires

Considerable damage is caused by fires in areas of the deciduous forests. Dry season from February to June is very long during which the forests are susceptible to fires. Fires mostly damages young regeneration coming up on the forest floor.

Recurrent fires badly affect the regeneration status of the forest by killing the young recruits and seedlings.

Fires are either accidental or set by people with an interest to get good flush of grass. There is a good growth of grasses in western ghat forests due to heavy rainfall. The dried grass after winter season in these areas poses major threat of forest fire. Generally less number of fire incidents has been reported in the evergreen forests of Mahabaleshwar, Dhebewadi and Patan ranges.

Fire damage

Climbers and weeds

Climbers do damage to the trees by strangling. The damage is appreciable in evergreen and Semi-evergreen forests of Mahabaleshwar and Patan ranges. The few climbers are *Acacia concinna, Atlantia racemosa, Abrus precatorius, smilax zeylanica, Caesalpinia decapetala*. Karvi (*Strobilanthes callosus*) has become a major weed in the forest areas while *Lantana camara* is also common weed in many areas of this tract.

Wind

Winds are strong particularly in the Western Ghat region during monsoon period. The damage due to wind is not significant in the evergreen and semi evergreen forests of Mahabaleshwar, Patan, Dhebewadi and Satara ranges.

Wild animals

Damage in some plantations by bisons, wild-boars, porcupines, rats and monkeys is noticed. Frequent incidents of damage of the crop in the private fields by bisons in the western part especially in Mahabaleshwar area are reported.

Insects and fungi

There is a sporadic attack soon after the rains by teak skeletoniser (Hapalia machaeralis) and teak defoliator (Hyblea puera) and it does not become epidemic. Damage by fungi is not common.

Epiphytes and parasites

It is commonly seen in the evergreen forests that the Dendrobium species forming large masses on the branches of trees. The damage is however not serious. Some Loranthus species infest tree species like Teak, Kinjal, Anjani etc. and the attack is apparently endemic.

Table No. 3 : No. of offences

Sr.No	Year	No. of offences booked					
		Illicit cutting	Encroachment	Fire	Grazing	Wild Animal	Other
1	1998	355	5	40	80	1	174
2	1999	136	0	11	5	0	70
3	2000	348	3	78	58	5	134
4	2001	543	9	42	89	7	163
5	2002	813	0	12	25	0	33
6	2003	570	113	17	114	9	280
7	2004	786	5	71	61	28	105
8	2005	559	0	98	102	20	242
9	2006	538	0	138	57	9	94
10	2007	421	0	135	47	16	107

SECTION 5 : SOIL EROSION

Eastern part of the division has been affected badly due to soil erosion which is mainly caused due to absence of vegetal cover. Repeated fires and excessive grazing are mainly responsible for the destruction of the vegetal cover in this region. The erratic rains which gave rise to heavy run off accelerated the process of soil erosion resulting removal of top soil, exposing the gravely sub-soil. To avoid further destruction, the area must be protected from uncontrolled grazing, fires and illicit felling and effective soil conservation measures will have to be undertaken.

THE FOREST FAUNA

SECTION 6 : DISTRIBUTION OF WILD LIFE

The wild animals are mainly confined to the hilly regions of the Sahyadri and its foot hills. Due to natural inaccessibility and scanty population in Dhebewadi, Mahabaleshwar and Koyana catchment areas and also availability of water, forest cover and protection, the wild animals are sighted more frequently. The common wild animals and birds found in the tract and their general distribution are as under:

I. Carnivora

1. *Tiger (Panthera tigris)*

Tiger has become very rare in the tract and found only in the forests near Malokolna towards south of Helvak of Patan range and in some portion of Dhebewadi range.

2. Panther (Panthera pardus)

Panthers are particularly seen near Mahabaleshwar and Pachgani in the Koyana catchment and in the Warana valley of Dhebewadi range.

3. The Wild cat or Ran manjar (Felis chaus)

It is one of the smaller cat and is found in large numbers. It generally lives in open grass land and scrub jungle and reedy banks of river and marshes and is a serious menace to poultry.

4. The Civet or Joswadi manjar (Viverricula indica)

They are mostly found in the semi-evergreen forests of Patan, Dhebewadi and Mahabaleshwar ranges. The common palm civet is also found in open grassy scrub forests but is rare.

5. The Hyaena or Taras (Hyaena hyaena)

The striped Hyaena is commonly found in open grass lands and in low hills around Mahabaleshwar and Panchgani plateau and in Phaltan, Koregaon tahsils of Satara district.

6. The Wolf or Landaga (Canis lupus)

It is a member of the canidae family and is a powerful animal having great endurance and is found in the hills around Phaltan and Khatav but has become rare.

7. The Jackal or Kolha (Canis aureus)

It is found all over the tract in grassy open woodlands.

8. The Fox or Khokad (Vulpes bengalensis)

It is commonly found in the open grassy plains of Satara division.

9. The Wild dog or Dhole (Cuon alpinus)

It is one of the remarkable animals and always moves in packs and runs at a tireless trot. They are mostly found in Koyana valley.

10. The sloth bear or Aswal (Melursus ursinus)
The sloth bear has whitish 'V' shaped mark on his breast, a pale whitish grey snout and long white claws and are confined to the well wooded hilly portions of the ghat areas of Bamnoli and Kas but are not numerous.
11. The Indian grey mongoose (Herpestes edwardsi)
It is a common mongoose found all over Satara division and they adopt themselves to their surroundings.
12. The Indian Pangolin (Manis crossicaudata)
It is a peculiar animal which has large scales and is light yellowish brown in colour, found on the river banks.

II) Herbivores

1. The Bison or Gaur (Bos gaurus)

Bison is the biggest ox in the world and are essentially animals of deep forests in the hills and are rarely found in the forests on the Mala pass hills and in the South of Helvak near Mala-Kolna and at Kirsule in the forest of Koyana valley.

2. Indian Gazelle or Chinkara (Gazella gazella)

It is an antelope found in small numbers in the hills of Man in Satara division, but now has become rare.

3. The barking deer or bhekad (Muntiacus muntajak)

A small deer makes series of crackling barks when alarmed or in flight.

4. *Sambar (Cervus unicolor)*

It is the biggest Indian deer found in the hilly forests of Mahabaleshwar, Satara, Patan (Koyana Valley) and Dhebewadi ranges.

5. *The Wild boar or Ran dukkar (Sus scrofa)*

It is usually found in grassy and bushy forest areas as well in hilly forests of Satara Division.

6. *The India hare (Lepus nigricollis)*

It is found in open bushy areas in all over the division and often on the banks of rivers.

III) Rodents

1. Squirrels

Squirrels are rodents like rats, mice, porcupines. They are easily recognized by their slender built, bushy tails and arboreal habits. The Indian giant squirrel (Ratufa indica) are shy, wary animals keeping mostly to the canopy and are commonly found in Mahabaleshwar and Pachgani plateau forests as well the Western Ghat region. The Indian porcupine or sayal (Hystrix indica) is common throughout the forests areas of Satara division. The five-striped palm squirrel (Funambulus Pennanti) is also common throughout the tract.

IV) Birds

Game birds

The Indian sand grouse (ptetrocles exustus), Green Pigeon are commonly found in the eastern part of the district. Pond heron, Cattle egrets, Stone plover (Ddicnemus indicus) Bald coots are commonly found through out the district. The painted partridge (Francolonus pictus) Common quail, Jungle bush quail, Jungle fowl, Pea fowl are found in the forts of Mahabaleshwar, Dhebewadi and Koyana. The Rain Quail breed in September in the meadows and kurans around Satara. The common Grey partridge (Ortygornis pondicerianus) is generally found in the sugar cane fields towards Tasagaon. The Courser (Cursorius coromandelicus) is very common in the Eastern part of the district.

The common (Phalacrocorax carbo), the Darter (Anhinga rufa), Little Green bittern (Ixobrychus minutus), the Spoon Bill (Platalea leucorodia), the White Ibis (Threskiornis aethiopica), the Common teal (Anas crecca), the Whistling teal (Dendrocygna jayanica), Pin-tail Duck (Anas acuta), the Spot bill Duck (Anas poecilorhyncha), the Comb Duck or Nakta (Sarkidiornis melanotos) are found in large rivers of Nira, Krishna and Yerla and also in tanks and lakes near Mhasavad, Mayani, Kas, Pingli etc. The migrant birds viz the Demoiselle crane (Anthropoides virgo) Greater Flamingo (Phoenicopterus roseus) Lesser Flamingo (Phoeniconaias minor), the Siberian Ducks, the white necked stork (Ciconia episcopus) the Black necked stork (Ephippiorhynchus asiaticus) the Bar headed goose (Anser indicus) are some of the birds seen in winter season in large rivers, in tanks and lakes at Mayani, Dahiwari, Mhasavad etc.

Other than the game birds mentioned above the common birds viz. Indian Roller, Paradise Fly catcher, Pied king Fisher, Koel, Golden Oriole, Crow Pheasant, Parakeets, Bulbul, Doves, Wood peckers, Sun birds, Magpie, Hoopoe, Tailor Bird, Rock Pigeon, Hawks, Eagles and Owls, Green bee eater etc. are seen in the district.

SECTION 7 : INJURIES TO WILDLIFE

The major reasons for depletion of wild animal populations are as follows:

i. Poaching of wild animals for meat and other non consumptive uses.
ii. Habitat destruction / shrinkage.
iii. Easy access to forest areas because of extensive road network.
iv. Loss of contiguity of forest areas.
v. Inadequate and ill-equipped field staff for protection.
vi. Lack of awareness amongst people regarding importance of wildlife conservation.
vii. Forest fires.
viii. Availability of guns with farmers for crop protection.

The animals which are normally poached are Barking deer, Hare, Wild boar, Sambar, Jungle fowl, Peafowl, Quails and Partridges. Usually electric wires, guns and locally made hand bombs are used for poaching. Trained dogs are used to chase and hunt the prey at places.

CHAPTER - 3

UTILIZATION OF FOREST PRODUCE

SECTION 1: AGRICULTURAL CUSTOMS AND WANTS OF THE POPULATION

The population of Satara district is 28.09 lakhs as per 2001 census out of which nearly 86% live in the rural areas. The 2003 live stock census estimated 15.79 lakh domestic cattle in the district. Agriculture is the main occupation of the people. Out of total population 37.20 % constitutes the working population and nearly 70 % of this working population is farmers. Only 4% people have land holdings above 5 hectares while majority 57% have holdings less than 1hectare.

All cultivable lands of Satara district can be divided into three main categories viz. Jirayat i.e. dry crop land, Bagayat i.e. irrigated crop lands and Paddy lands. Dry lands largely depend on monsoons for irrigation and depending upon the season they give Kharif crops (July to September) and Rabi crops (mid October to February). Jowar, bajari and ground nut are the important kharif crops while wheat and harbhara are the important rabi crops.

The district has a net work of irrigation projects which includes 5 major, 9 medium and many minor irrigation projects. As per the statistics during the year 2000-2001, total agricultural area in the district is 7,21,000 hectares out of which 2,32,000 hectares area i.e. 32% is covered under irrigation. Wells are important means of irrigating the cultivable lands in the district and covered 63% of the total irrigated area under crops. Patan, Jawali, Phaltan, Karad and Wai talukas have the maximum cultivable area under well irrigation in descending order. Jowar, Sugarcane, Wheat, Bajari and Rice are the main crops using irrigation potential of the district and covered around 25%, 20%, 12%, 9% and 6% of the irrigated area. Nearly 69%, 12% and 6.50% of agricultural area was covered under cereal crops, oil seeds and sugarcane respectively.

The important agricultural crops in the district are Jowar, Bajara, Ground nut, Rice, Sugarcane, Wheat and Soybean covering 29%, 12%, 9%, 7%, 6.50%, 5%, and 2% of total cultivable area respectively. Jowar is mainly grown in Khatav, Maan, Phaltan, Koregaon, Patan and Karad talukas while Bajari is mainly grown in low rainfall eastern parts of Maan, Khatav, Phaltan and Khandala talukas. Ground nut is mainly grown in Satara, Khatav, Karad and Patan talukas.

Rice : Traditional agricultural crop

Rice is chiefly grown in Patan, Karad, Jawali and Khatav talukas. Sugar cane is grown in Karad, Patan and Koregaon talukas mainly. The Jowar, Paddy and Sugarcane are the main crops in terms of total production.

The district grows and gets a good harvest of all vegetables viz. Tomato, Onion, Potato, Cauli flower, Brinjal and leafy vegetables etc. In addition, oil seeds are taken from Soya bin, Groundnut, Sunflower, Til and Kardi etc for the production of the oil. The district is known for good harvest of turmeric and potato crops and is famous for ginger crop.

Amongst the horticultural crops, Khatav and Maan talukas produce good harvest of grapes and pomegranate while Wai, Satara and Koregaon talukas produce good crop of mangoes. Strawberry comes up well in Mahabaleshwar, Wai and Javli talukas.

Major constituent of the population of the district resides in rural area, whose main occupation is agriculture. This section of the population depends upon the forests for their requirement of timber for agricultural implements, house construction, firewood, fodder and non-timber forest produces. The farmers are progressive and large number of them is using improved agricultural practices.

Oil seed Sesame (Til) crop

There are few cottage industries based on forests which are as follows:

(a) Collection, extraction and purification of honey

This is the most important industry in areas around Mahabaleshwar and Panchgani as there is ample vegetation with varieties of flowering species. There are three apiaries at Mahabaleshwar; one run by the Khadi and village Industries Board and the other two viz. Madhukosh and Madhusagar by co-operative societies. Mahabaleshwar honey is known for its quality and is in great demand by the tourists and in the adjoining areas.

(b) Walking sticks

Making of walking sticks is another well known cottage industry at Mahabaleshwar. The industry is seasonal and run by local people. These sticks are made out of wood of Medshing, Rohtal, Pandhari, Kolusra, Atki, Chimat and Gela from the forests of Mahabaleshwar plateau.

(c) Basket making

This is a hereditary industry of Buruds. Baskets of various shapes and sizes are made to stock fruits, eggs etc. They also make sieves, bamboo mats, baskets for caging hens, etc. These industries are located in Mahabaleshwar, Patan and Satara tahsils. The bamboos used for basket making etc. are mostly grown in malaki lands around Mahabaleshwar plateau.

(d) Tanning industry

This is mostly concentrated at Satara and Wai. Hirda fruits (Myrobalans), babul bark are used for this purpose.

(e) Rope making

Ropes are made from fibers of Agave species which are grown abundantly in Maan, Khatav, Phaltan, Koregaon, Khandala, Karad tahsils and to some extent all over the district except in heavy rainfall areas. This is the hereditary industry run by Matang population.

The main requirements of the people from the forests are as under:

(i) Timber

The demand is mostly for small timber and poles. Teak is preferred to all other species but it is available in very small quantity and its cost is also prohibitive. Other species used as an alternative to teak in the construction are neem, amba, dhavada, tiwas, ain, babul etc. The demand for timber is about 14,000 Cum. (4,65,891 families X 0.03 Cum.= 13,976 Cum.)

(ii) Fuel (Firewood)

There is a great demand for firewood through out the district. Firewood is used by the people extensively for cooking. In the high forest areas it is brought from forests. The annual demand of firewood is estimated to be 10,06,400 M.T.(4,65,891 families X 2.16 M.T.)

(iii) Grass and Grazing

Grasses are used for thatching and for feeding the animals. The demand of grazing particularly in the eastern part of the district is very high.

Table No. 4 : Details of availability and shortage of fodder

1.	Live stock number	12,57,088
2.	Total fodder requirement	26,78,130 M.T.
3.	Fodder available from crop residues	11,59,150 M.T.
4.	Fodder from field weeds, bunds etc	1,31,960 M.T.
5.	Fodder from rain fed fodder crops	1,22,514 M.T.
6.	Fodder from irrigated fodder crops	44,860 M.T.
7.	Fodder from forest	1,48,600 M.T.
8.	Fodder from permanent pasture	1,66,200 M.T.
9.	Fodder from grazing lands, Wastelands fallow	1,09,000 M.T.
10.	Total fodder available from all sources.	18,82,284 M.T.
11.	Available %	70 %
12.	Shortage %	30 %

(Data collected by M.P.A.U. Rahuri, district Ahmadnagar)

(iv) Other forest produce

The other forest produce which the villagers take from the forests are edible fruits and flowers, gum, honey, chillar bark, Shikekai, thorns etc. To protect the crops from wild and domestic animals, thorns of henkal, arati, bor and babul etc are used for fencing their fields.

SECTION 2: MARKETS AND MARKETABLE PRODUCE

By and large the forest produce of this division is locally consumed. Some produce is also transported to neighbouring villages and towns. The main local markets for the forest produce in Satara district are Mahabaleshwar, Wai, Satara, Karad, Patan, Dhebewadi, Koregaon. Only the non-timber forest produce as shikekai is sold in these markets on bazaar day. Gum, Honey, Hirda, Kadi-nimb leaves, Apta leaves, Chillar bark, Pisa fruits etc. are partly consumed locally and partly exported outside to the various confectionaries in the State. All the market places are well connected by metalled and asphalt roads.
The marketable products from these forests are as under.

A) **Major Forest Produce**

i) *Timber*

There is great demand for teak timber and poles for building agricultural purposes. Most of the requirement of teak timber is met by importing from Karnataka state as the quantity of teak timber available in the forest is of negligible amount. Due to prohibitive cost of teak timber, other superior injaili species obtained from these forests are also used for building and other purposes. The average sale of timber for the last ten years i.e. from 1983-84 to 1992-93 is 190.1 Cum. as against the tremendous demand of 14,000 Cum.

ii) *Firewood*

The evergreen forests of the tract dealt with produce firewood. Up to last working plan period these forests were able to meet the firewood demand of the local population and nearby villages and towns. But today the demand for firewood is so great that it threatens to out strip the supply. Most of the working in these forests is stopped due to steep and precipitous slopes and being the catchment areas of hydroelectric and irrigation projects. The only source of firewood is the removal of dead, and wind fallen trees in this forest.

iii) *Charcoal*

In remote areas upto last few years charcoal was manufactured where the transport of timber was very difficult and uneconomical. Now a days manufacture of charcoal is totally stopped.

B) Non-Timber Forest Produce

i) *Hirda*

Hirda is consumed locally by tanning industries in the district. The average annual production of hirda fruits is 520 M.T.

ii) *Shikekai*

Shikekai pods are used in manufacture of soap and powder which is used for washing hair. The average annual production of shikekai is 836 quintals and most of the quantity is exported to Mumbai.

iii) *Apta leaves*

Apta leaves are commonly used for making bidis. Most of the Apta leaves are exported to Mumbai. The average annual production of Apta leaves is about 71 quintals.

iv) *Pisa fruits*

The oil extracted from Pisa fruits is used in soap making. It is mostly exported to Mumbai and Gujarat. The estimated yield per annum is 35 quintals.

v) *Grass*

Most of the areas are either devoid of tree growth or are poorly stocked. Grass kurans are generally allotted to the Gram panchayats if they so demand on the upset price. Generally the areas adjoining the villages are overgrazed with the result that quality of the grass is deteriorated. The average annual production of the grass is about 500 Metric Tonnes.

The other non-timber forest products available in Satara District are Arrowroot, Rametha bark, Kadi-limb, Wavding, Chinch fruits, Karanj etc.

SECTION 3: LINES OF EXPORT

(i) Railways

The Mumbai Kolhapur railway line passes from North to South through the centre of the tract and traverses Phaltan, Koregaon, Satara and Karad tahsils of Satara District. It made the transport easy and prompt.

(ii) Roads

Public works Department of the State Government and Zilla parishad maintain roads in the district. Mumbai- Bangalore National highway is maintained by superintending Engineer, Special project Circle, Pune. In general there are adequate roads in the tract dealt with except in some evergreen forests in Mahabaleshwar and Dhebewadi ranges.

SECTION 4: METHODS OF EXPLOITATION AND THEIR COST

Annual coupes are worked either departmentally or through Forest Labour Co-operative Societies. Felling, logging, stacking of firewood and timber is done by the labourers engaged departmentally or through Forest Labourers Co-operative Societies. Felling is exclusively done by saws. The stumps of the felled trees are trimmed properly to obtain good coppice shoots.

The whole operation is labour oriented and the labourers engaged in this work are all from the local villages who get seasonal employment every year.

Harvesting of non-timber forest produce is done through the contractors of Forest Labourer's Co-operative Societies. Non-Timber forest extracted from different ranges is as under.

	Non-timber Forest Produce	**Ranges from where extracted**
1.	Shikekai	Mahabaleshwar, Dhebewadi, Patan.
2.	Arrowroot	Mahabaleshwar
3.	Kadi-nimb	Mahabaleshwar, Satara, Karad, Patan.
4.	Chillar bark	Satara, Mahabaleshwar, Patan.
5.	Hirda	Mahabaleshwar, Patan, Dhebewadi
6.	Pisa fruits	Mahabaleshwar, Patan.
7.	Apta leaves	Patan

After nationalization of Apta and Tendu leaves in 1969, the Apta leaves are collected through authorized agents and disposed off by inviting sealed tenders. For collection of other non-timber forest produce, annual leases are auctioned. Non-timber forest produce from Mahabaleshwar range is generally collected by the Forest Labourer's Co-operative Society.

The grass kurans are allotted to the institutions and public bodies according to the following order of priorities fixed by the Government in Revenue and forest Department vide their resolution Nk.MFP.1665/118931-Y, dated 8th November 1971.

i) Village Panchayats
ii) Public Bodies including Dairy Societies.
iii) Forest Labourer' Cooperative Society

Kurans not allotted to any of the above bodies, are sold by open auction.

In Satara Forest Division there are two Forest Labourers co-operative Societies. But today as there is no working in the division, these societies are not functioning. The name of these societies are 1) Pather village Jungle Kamgar Society, Ltd. Mahabaleshwar. 2) Dari vibhag Jungle Kamgar Society Ltd. Kumroshi.

Before commencement of the working season every year, the piece work rates to be paid for the various forestry operations are fixed by the Circle wage Board presided over by the Conservator of Forests.

SECTION 5: PAST AND CURRENT PRICES

The prices of all forest produce have undergone a revolutionary change during the last decade. The quantity of timber and firewood produced in this tract is quite inadequate to meet the local demands hence the bulk quantity has to be brought from outside. Market rates are therefore comparatively higher than those in other divisions.

CHAPTER – 4

SOCIO ECONOMIC SURVEY

SECTION 1: SOCIO ECONOMIC SURVEY

As per socio-economic survey report of 2006-07, the land use pattern of the district as in 2000-01 estimates 13% of the geographical area under forests, 11% area is not available for cultivation, 12% area is not sown, 11% is kept fallow while only 53% area is under cultivation.

Table No. 5 : Land use pattern

Sr.No.	Land use pattern	Area in '000' ha.	Percentage
1.	Total geographic area	1058	
2.	Area under forest	138	13%
3.	Area not available for cultivation		11%
	a) Area under non agricultural use	28	
	b) Barren and not suitable for agricultural	93	
4.	Area not sown	123	12%
5.	Fallow land	119	11%
6.	Sown	557	53%

Agriculture is the main occupation of the people. Agriculture is the main occupation of the people. Out of total population 37.20 % constitutes the working population and nearly 70 % of this working population is farmers. Only 4% people have land holdings above 5 hectares while majority 57% have holdings less than 1hectare. 22% are farmers and 10% are engaged as farm labourers. Nearly 1% are in manufacturing and service sector while 13% are engaged in miscellaneous jobs. There are 83517 families living below poverty line in the year 2002 in the district.

The population of Satara district is 28.09 lakhs as per 2001 census out of which 86% live in the rural areas and 14% in urban areas. Around 9% population of the district belongs to scheduled castes whereas percentage of scheduled tribes is less than 1%. The population density of the district is 268 per sq. km. which is less than the state average of 315 per sq. km. Karad taluka has the highest population density of 561 per sq. km. while Maan taluka has the

lowest density of 138 per sq. km. The district has sex ratio of 995 which is higher than the state average of 922. The average literacy rate of the district is 79% comprising 88 percent for men and 69 percent for women. The literacy rate in the rural and urban areas is around 77 % and 86 % respectively.

The 2003 live stock census estimated 15.79 lakh domestic cattle in the district, density being 149 per sq. km. Buffaloes consists 23.34% of cattle population followed by cow/ox as 22.85%, while sheep and goat consists 53% of the total population. There is decline in live stock population of the 1997 live stock census by nearly 4%. The number of imported jersey cows has increased by nearly 15% in comparison to their number in 1997 thereby leading to increase in milk production. These cattle graze both in forest areas as well as in gairan land. Majority of sheep and goats are confined to Maan, Khatav, Phaltan and Khandala talukas which are comparatively drier areas. A statement showing Cattle population is given in the **Appendix No. 4.1** of Volume II.

In all there were 6,274 registered cooperative societies in the district by 31/03/07. Being a leading producer of Sugarcane, the district had 12 sugar factories which produced 1.52 lakh metric ton of sugar during the year 2004-05. The district is amongst leading producers of milk. There are 1,316 milk cooperatives in the district which produced 4700 lakh litre milk during the year 2006-07, collecting and marketing nearly 1.29 lakh litres of milk every day.

In all, there are 513 factories registered in the district out of which 394 are working giving employment to nearly 22,000 labourers.

SECTION 2: HARVESTING AND MARKETING OF FOREST PRODUCE BY FDCM

The Forest Development Corporation of Maharashtra (FDCM) was established in 1974 to convert low quality forests into high quality forests. A sub divisional office of the FDCM, under an Assistant manager was established in 1987-88 and was entrusted to take up afforestation works on the denuded and under stocked hill ranges of Satara forest division. The funding source was Employment Guarantee Scheme at district level. The FDCM planted nearly 15 lakh seedlings on 8,399 hectare degraded area in eight years since its inception in 1988 till 1996. The species planted were Eucalyptus, Australian babul, Karanj, Neem, Jambhul, Amba, Kaju, Aonla etc. The unit was however closed in March 1997 as no other land was made available to the FDCM for afforestation by the department. The forest areas along with the plantations raised during this period were handed over back to the Satara forest division. The FDCM therefore does not have any role in harvesting and marketing of forest produce in Satara district.

CHAPTER – 5

FIVE YEAR PLANS

Forest Resources

India is one of the 12 mega diversity countries, commanding 7% of the world's biodiversity and supporting 16% of the major forest types, varying from tropical rainforest in the north-east, to desert and thorn forests in Gujarat and Rajasthan; mangrove forest in West Bengal, Orissa, Maharashtra and other coastal areas; and dry alpine forests in the western Himalaya. The most common forest types are tropical moist deciduous forests, tropical dry deciduous forests, and wet tropical evergreen forests. India has 45,000 identified plant species, including 15,000 flowering plants [5154 - endemic] and 81,000 species of fauna. Though India has only 2.5% of the land and less than 2% of the world's forest area but it support more than 7% of its variety of flora and fauna.

But nearly half of the country's area is degraded, affected by the problems of soil degradation and erosion. According to the Government statistics, nearly 22%, or 65 million ha, of the country's land have been recorded as forests, but only 19.5% have forest or tree cover, which is much less than the goal of 33% set by the National Forest Policy, 1988.

The rising population has forced the rural poor to deplete the natural resources. It was reported that the population reached one billion people in 2000, comprising about 16% of the world's population. The problem is further compounded by the high cattle population, estimated to be 450 million, about 18% of the cattle population in the world. Most of these animals have a very low productivity but graze freely in forest areas, causing the degradation of forests. This has led to severe erosion, loss of soil, and floods in the lower plains, in addition to the destruction caused by shifting cultivation. As a result, the demographic and economic landscape of the country is plagued with poverty and underemployment. Agricultural productivity is only 1 ton per ha against the actual capability of 4 ton per ha. How to achieve the optimum land use, including soil and moisture conservation measures, are the main challenges confronting the policy and decision- makers.

Mobilization of Funds in the Past

Since the commencement of the First Five Year Plan (FYP) in 1951, a total Rs 85 billion have been spent by the end of the Eighth FYP in 1996-97, on forestry development planning activities. During this period, afforestation of about 26.9 million ha has been carried out. Financial allocation to the forestry sector has increased from Rs 76 million in the First FYP to Rs 40 820 million in the Eighth FYP, but has always been less than 1% of the total plan outlay of the country. This is one of the main reasons for the continuous deterioration of forest resources

A provision of Rs 68 billion has been made for the Ninth Plan. During 1997-98, afforestation of 1.48 million ha was completed and thus, up to 1997-98, the total area afforested is 28.38

million ha. The average annual plan outlay for the forestry sector during the Eighth FYP was about Rs 8.16 billion whereas the estimated annual value of harvests (recorded and unrecorded) from the forests was worth Rs 300 billion during the same period, which is about 36 times more than the planned investment. Budgetary allocation for forestry under the Five Years Plans is given in the following table.

Table No. 6 : Budget allocation for forestry under the Five Year Plans, (million RS) (GOI)

Plan/Year	Thrust Areas	Total Plan		Forest and Wildlife Plan		Forest Outlay
		Outlay	Actual	Outlay	Actual	(% of total)
First Plan (1951-1956)	S&D, Rehabilitation of degraded forest	23 780	19 600	76	85	0.32
Second Plan (1956-1961)	As above	45 000	46 720	212	212	0.47
Third Plan (1961-1966)	Increasing Productivity, Fast growing spp. Pl. Modern logging	75 000	8 577	458	459	0.61
Annual Plan (1966-1969)	As above	66 250	66 225	419	421	0.63
Fourth Plan (1969-1974)	As above	159 020	157 790	894	938	0.56
Fifth Plan (1974-1979)	Social Forestry	393 220	394 260	2 088	2 088	0.53
Annual Plan (1979-1980)	Social Forestry	126 010	121 760	683	683	0.54
Sixth Plan (1980-1985)	Social Forestry Forest Cons.	975 000	1 092920	6 924	NA	0.71
Seventh Plan (1985-1990)	Forest Cons. Massive Aff. Wasteland Dev.	1 800 000	2 187 300	18 519	19759	1.09
Annual Plan (1990-1991)	As above	647 170	583 690	6 299	5 764	0.97
Annual Plan (1991-1992)	As above	723 170	647 500	7 831	7 153	1.08

Eighth Plan (1992-1997)	JFM, Ecotourism Biodiversity Conservation Wasteland utilisation	4 341 000	-	40 820	39 930	0.94
Ninth Plan (1997-2002)	As above	8592000	7058180	68 228		0.79
Tenth Plan (2002-2007)	Biodiversity Conservation	15923000				
Total up to 10th FYP		**17966620**		**153523**		**0.85**

Forest Policy and Planning

India has a long tradition of professional forestry and a nation wide concern for forest resources. Contemporary forestry legislation and policy date to at least 1864, at which time forests became almost exclusively State property under the then British rule. The first forest policy of 1894 was revised in 1952. The present guiding legislation dates back to the Indian Forest Act of 1927. The National Commission of Agriculture (NCA) studied the forestry planning in the country in 1976 and made recommendations for future action. This led to the emergence of Social Forestry and the establishment of Forest Development Corporations (FDCs). The new policy accords highest priority to the environmental role of forests and the derivation of direct economic benefit must be subordinated to this priority.

The main aim of establishing FDCs was to enable the Forest Department to retain earnings from the sale of products for investment in plantations. However, this policy had two undesirable effects, namely:

Given the realities of budgetary allocations, external aid for social forestry resulted in the earmarking of 70 to 80% of the funds for social forestry. As a result natural forests received little attention.

The establishment of high value plantations at the expense of natural forests resulted in the loss of biodiversity and non-wood forest products. As a result, there was opposition to the practice from the people, and the Government had to revise the plantation programme strategy.

The forest policy has been updated, most recently through the National Forest Policy (1988). Other supplementary legislation has been enacted to explicitly provide for control and regulations covering non-forest resources, wildlife protection and environmental protection, together with other broad directives in substantive areas of national policy which have an impact on forestry, including land use. A Wildlife Action Plan was formulated in 1983, a National Conservation Strategy in 1992, followed by a National Environmental Action Plan in 1993.

As a result of the National Forest Policy, 1988, the mechanism of Joint Forest Management (JFM) was legalised in 1990. Its principal aim is to ensure environmental stability and maintenance of the ecological balance through the preservation and rehabilitation of forests, while providing for fuel wood, fodder, Non-Timber Forest Products (NTFPs), and small timber needs. The JFM has since been institutionalised by most of the States. The emphasis has been on the formation of Village Forest Committees and empowering them for participatory management of degraded forests on a benefit-sharing basis.

It was reported that the country's achievement in raising forest plantations, in terms of area, has been impressive. Up to 1998, the total area of tree plantations was 28.38 million ha, of which about 17 million ha were planted before 1990's. The current annual rate of plantation is 1.2 million. The quality of these plantations varies considerably. It should be noted that forest plantations are a means to meet the increasing demand for industrial raw material or for direct consumption, i.e. fuel wood, but not to justify deforestation or claim restoration of biodiversity and other environmental services.

The performance of forest plantations, in terms of survival, growth and yield, has been poor caused by several factors, including inadequacies in site selection and site-species matching, poor planting stock, lack of proper maintenance and protection (from fire, grazing, pests and diseases), lack of timely tending/thinnings, delays in fund allocation, and inadequately trained staff.

According to the latest State of Forest Report, 2003, the total forest cover of the country is 678333 km2 or 20.64 % of the geographical area, with very dense forest (VDF) accounting for 1.56%, moderately dense forest (MDF) accounting for 10.32% and open forest constituting 8.76%. *The Report states that the forest cover has increased by 2795 km2 or 0.41% since the last survey in 2001.* Funding to the tune of Rs 66.95 billion per year is required in order to achieve one-third forest cover within the next 20 years whereas, Rs 16 billion per year is available from both the central and state budget together to be allocated for afforestation.

Despite the enactment of all the above legislations, clear symptoms of degradation and a declining capacity in meeting the various needs of the population, particularly the rural poor and tribals are evident. Efforts to enlarge the forest estate as set forth in the National Forest Policy (from the present 19 percent to 33 percent of the total geographical area) would require a substantial increase in fund allocation to the forestry sector.

To reverse the process of degradation and for the sustainable development of forests, the Government has prepared the National Forestry Action Programme (NFAP).

National Forestry Action Programme (NFAP)

In 1993, the Government decided to start a new strategic planning process following the National Forestry Action Programme (NFAP) concept. The preparation of an NFAP was decided with the goal of addressing the issues underlying the major problems of the forestry

sector in line with the National Forest Policy, 1988. The NFAP is to evolve as a development process by integrating forestry development in the country within the framework of the national five-year plans. The exercise was supported by the UNDP.

The objective of the NFAP is to enhance the contribution of forestry and tree resources to ecological stability and people-centred development through qualitative and quantitative improvement in investment on sustainable conservation and development of forest resources.

The basic purpose of the NFAP is to establish a direct linkage between the national forest policy and the national five-year plans. In the past, there has not been a comprehensive and constant programme structure, so it was difficult to get linkages and establish trends.

In the context of sector policies, the NFAP exercise proposed that imperatives need to be identified which represent the absolute requirements to which all supporting objectives should contribute. For the forest policy in India, three imperatives are suggested: *sustainability, efficiency, and people's participation*. Sustainability should be the guiding factor for forest management. Neither conservation nor development can be achieved in isolation. Efficiency in production implies improving productivity, reducing wastes and indirect costs, and thus registering a higher economic rate of return compared to other alternatives. The philosophy of people-based development assumes that participation is not only a fundamental precondition for, and a tool of, any successful development strategy, but also is an end in itself.

Five Year Plans

The basic purpose of the NFAP is to establish direct linkages between the National Forest Policy and the National Five Year Plans (FYPs). In the past, there was no comprehensive and constant programme structure for forestry. Every FYP has had its own programme structure, so it was difficult to get linkages and establish trends. Although plans had specific objectives and programmes, the main activity under most of them was tree planting. The emphasis of different FYPs regarding forestry was as follows:

· First and Second FYPs: Rehabilitation of degraded forest, introduction of economic species, survey, and forest demarcation;

· Third and Fourth FYPs: Increasing productivity of forest through fast growing species plantations, scientific assessments, and modern logging;

· Fifth FYP: Social forestry and fuel wood reserves to save natural forests;

. Sixth FYP: Social forestry, Forest conservation

· Seventh FYP: Forest conservation, massive afforestation, and wasteland development; and

· Eighth and Ninth FYP: Preservation of biological and genetic diversity (both flora and fauna), protection of forest against biotic interference, utilisation of wastelands, and promotion of people's participation through Joint Forest Management (JFM) schemes. The percentage share of Forestry Sector Outlay changed from 0.32 percent of the total outlay in First FYP to 0.94 percent in Eighth FYP. The highest allocation was in the Seventh FYP (1.09%). For the sustainable development of the sector, allocation to the forestry sector should be raised to about 4 to 5 percent of the total outlay of the country.

CHAPTER - 6

STAFF AND LABOUR SUPPLY

SECTION 1: STAFF

The following is the position of the staff working in Satara Forest division.

Table No. 7 : Staff of Satara forest division.

Sr.No.	Designation	Number of Posts.
1	Deputy Conservator of Forests	1
2	Assistant Conservator of Forests	4
3	Range Forest Officers	16
4	Sectional Engineer	1
5	Chief Accountant	1
6	Accountant	18
7	Clerks	20
8	Surveyor	3
9	Forester	51
10	Forest Guard	196
11	Mali	6
12	Driver	5
13	Peons	6
	Total	**328**
	Van majoors	65

A list of officers who held the charge of DCF, Satara Forest Division in the past is given in the **Appendix No. 6.1** of Volume II.

SECTION 2: LABOUR SUPPLY

Labourers required for forestry works are not easily available, more so in the western part of the district. The local labour prefer working on agricultural activities which coincide with the forestry activities like plantations since the returns from the agricultural activities are more compared to the forestry works and the work is available nearer or in the village itself compared to the remote locations of forestry works. The rate structures of forestry works therefore need to be revised keeping this in view. The increased industrial activities and the overall increase in the standard of living of the people considering better irrigation facilities also fail to attract labourers for the hard work and low returns they get in forestry activities. For nearly all the forestry works, labour is brought mainly from the nearby Belgaum and Bijapur districts and villages of Karnataka state. They are mostly from the 'Lambani' tribe and work as camping labour.

CHAPTER - 7

PAST SYSTEMS OF MANAGEMENT

SECTION 1 GENERAL HISTORY OF FORESTS

From the point of view of management, the forests fall in the following three categories:

A. Forests of Ex-Bombay State.
B. Forests of Ex-States of Aundh and Phaltan.
C. Acquired forests.

The general history of the forest is described separately for each category as under:

A. Forests of the Ex-Bombay State

Prior to 1818, Satara territory was ruled by the Marathas. During their rule, the forests were specially preserved in the West of the division to make the approach to hill forts more difficult and in some cases to protect villages from the full force of monsoon. Elsewhere the system was to reserve all teak, sandal and black wood, i.e. the only species which had market value as "Royal trees." These trees could be cut only on payment of fees. In addition there were fairly extensive tracts reserved as Sheri or crown lands. These were principally grass lands to produce hay and to provide grazing for the state cavalry and elephants. There were patches of teak forests which were preserved to exercise the "Royalty right." The right to graze cattle in these forests was either sold yearly or given on contract. In most villages an area was set apart as common land known as "gairan" where free grazing was allowed for tenants who held their lands on hereditary tenure, a privilege which casual tenants did not possess.

The acquisition of territory by the British started in 1818 with the overthrow of Bajirao Peshva II and continued till 1848 when the whole of the Satara State lapsed to the British on the death of Shahaji, Raja of Satara. After acquisition of the territory, some Sheri lands were let out for cultivation and some were retained as forest or grazing lands. Fixed tax known as "Gavat-Katai" or 'grass-cess' was levied from certain villages in lieu of the supply of grass free of charge to the Raja. There was grazing tax on sheep at rates varying for almost every village and ranging from Rs.5.25 to Rs.6.62 per 100 sheep belonging to resident villagers and Rs.7.25 per 100 sheep belonging to wandering khillris. Dr. Gibson, Superintendent of the Botanical Garden, was appointed as the first Conservator of Forests under the Bombay Presidency from 19th December 1846 and Satara was added to his charge in 1848. In his report, he remarked that the previous destruction of the forests especially on the Ghats was so great that it could take many years to build up anything like wood-preserves. In 1859-60 he suggested levying a tax on Hirda from the forests around Mahabaleshwar but it was not until 1879 that the system of purchasing Hirda at Government depots was introduced. Forest reserves were set apart in the evergreen forests along the Ghats at the time of the revenue settlements during 1860-62. As these settlements presupposed

permanent occupation of lands given for cultivation, the rates of assessments were fixed at only Rs.0.31 to 0.46 per hectare, in order to allow for the long fallow periods without which cultivation on the steep hill sides in the high rainfall tract was impossible. This however was not in accordance with ideas of the inhabitants, who expected to be allowed to continue their old time practice of shifting cultivation and to be able to move into the forest reserves as soon as they had exhausted the lands they already had. After a few years, therefore, when they had improvidently exhausted the lands given for cultivation, and they found that all the forest reserves were not to be made available for a similar purpose, there was considerable distress, to mitigate that, some lands from the reserves were given out in 1868 by Mr. Spence and in 1872 by Mr. Wilson. In the latter year, Satara was separated from Pune and formed into a separate forest charge. In 1875, a joint demarcation was carried out by Messrs Shuttleworth and Winter to fix minimum essential forest reserves. In 1879, after the introduction of Indian Forest Act 1878, a total area of 5,94,606 acres was proclaimed to be reserved forest. Even this, however, was by no means final and it was not until 1883 that the final settlement was fixed for Wai, Satara and Javli tahsils. The rights acknowledged were limited to those of way and of access to temples, spring and water courses. Privileges sanctioned were grazing and gathering dead wood, thorns, and certain minor forest produce.

During these years exploitation was gradually extended, boundaries were demarcated, survey and mapping work was completed and the staff was gradually organized. The trade was principally in some teak rafters at an average price of 10-40 rupees per hundred except at Mahabaleshwar where a fuel depot was maintained and miscellaneous (Species other than teak) rafters were sold for house building. The price of fuel at the depot was Rs.1.25 per Khandi of 784 lbs. The sales of teak rafters had risen from 13,119 to 32,619 in 1882-83. It was not until 1892-93 that organized exploitation was introduced. In that year the first Working Plan written by Fagan was introduced.

B. *Forests of ex-states of Aundh and Phaltan*

The former states of Aundh and Phaltan were merged with Bombay State in 1948. Before merger the management of the forests in these States was primarily in the hands of Revenue officers. During the period, no scientific treatment was given to the forests which resulted in continual deterioration of the forests. Heavy illicit cutting and un-controlled grazing and browsing by large herds of cattle, sheep and goats had brought about untold loss of forest capital.

C. *Acquired Forests*

Besides these two categories, areas added in Satara forest division from 1973 onwards under different categories were as under:

a) Area transferred from Bhor sub division
b) Area acquired under Private Forest Acquisition Act 1975
c) Area transferred from Revenue Department
d) Area acquired for compensatory afforestation under Forest Conservation Act 1980

Obviously these areas were not included in B.P. Desai's Working Plan (1975-76 to 1989-90) but were added in the previous WP by Kulkarni and Pethkar.

SECTION 2: PAST SYSTEMS OF MANAGEMENT AND THEIR RESULTS

The past management of the above referred three groups of the forest included in the present Plan is discussed separately in the succeeding paragraphs.

A. Forests of the Ex-Bombay state

Fagan's Provisional Working Plan (1892-93 to 1933-34)

In 1892-93, Fagan wrote and brought into force a provisional WP for 47,579 acres of teak forest, 518 acres of babul (Acacia arabica) forest and 1,484 acres of evergreen forest at Mahabaleshwar. For the *teak forests coppice with standards on 40 years rotation was prescribed, for babul clear felling on a 40 years rotation with artificial regeneration and for the evergreen forest, light improvement fellings on 30 years cycle* was prescribed. The Plan remained in force till 1932-33 for most of the eastern half of the Satara division.

Bourke's Plan (1909-1917)

In 1909 D.R.S. Bourke revised the portion of Fagan's Plan which dealt with Mahabaleshwar and adding additional areas on the plateau. The system prescribed remained the same viz. light improvement fellings on 30 years cycle. Forests brought under Fagan's Plan were included in Block I and the remaining forests on the plateau in Block II and III. Coupes were closed to grazing for 10 years.

Master's Plan (1917-18 to 1922-23)

Bourke's Plan was revised by A.N. Master in 1917-18. More forests on the lower slopes were brought into the Plan. The system prescribed remained the same viz. light improvement fellings on 30 years cycle. Old blocks I to III were retained and new areas were included in blocks IV to IX. Climber cutting was prescribed. Coupes were close to grazing for 10 years.

Hodgson's Plan (1922-23 to 1933-34)

Master's Plan was revised by E.M. Hodgson in 1922-23. Owing to the increased demand for fuel at Mahabaleshwar and Pachgani, it was felt necessary to work larger areas of the forest. Areas under Master's Plan were included in block I to IX and new areas in blocks X to XVI. He prescribed light improvement fellings on 30 years cycle. Coupes of Blocks I to VI and XV were to be worked annually while the other blocks were kept reserved to meet the future increased demand. Exploited coups were closed to grazing for 10 years.

Maitland- Kirwan's Plan (1907-08 to 1933-34)

In the South-Western portion of the Satara division, where the best teak forests (Karad, Patan and Shirala teak forests) were located, Fagan's Plan was revised by J.D. Maitland- Kirwan in 1907-08. Here also the main prescriptions were retained unaltered but some additional areas were brought under regular management and the allocation to felling series and coupes was modified in some cases.

Results

The past system of management was coppice with standards in all organised deciduous forests and light improvement felling in the organized evergreen forests on and around Mahabaleshwar plateau. Coppice with standards was worked on rotation of 40 years for

coppice and (40 + X) years for standard, X is the age of which the standard was reserved. The rotation of 40 years in deciduous forests was fixed arbitrarily without making detailed test as to what rotation age would be productive of the highest volume or revenue returns. As a consequence, better teak in the South-West had been wasted under a short rotation as 40 years. The crop did not seem to have been benefited under coppice with standard system as the coppice was found to be of poor quality due to overhead cover and most of the standards deteriorated having remained much too long on the area. The forests were gradually invaded by shade bearing species since light demanders had little chance to flourish under the existing growth. The Plantations of teak suffered considerably. The babul forests which apparently existed in the past were no longer found. Many lands had been disforested for agriculture. The evergreen forests on Mahabaleshwar plateau and other exploitable areas surrounding it were worked under light improvement felling on a 30 years cycle, and the area of each annual coupe in a felling series was equal or approximately equal to $1/30^{th}$ of the area of that felling series. Prescriptions of marking rules were not clear. The terms like "supposed dying trees" "trees of valuable species," "Large trees", "unsound trees" were not defined. That resulted in felling for revenue.

Singh's Plan (1934-35 to 1972-73)

In 1934-35, J.A. Singh revised all existing Plans for different parts combining them into one Plan. He divided the forest into evergreen zone and deciduous zone.

In evergreen zone, Fuel Working Circle (18,316.1ha.), Experimental Working Circle (552.40 ha.), Hirda and Shikekai Working Circle (5,20,966 ha) and the In-exploitable Working Circle.(93,353 ha.) were constituted. In Fuel Working Circle, all exploitable evergreen forests in and around Mahabaleshwar Plateau and evergreen forests of Thoseghar, Jalkewadi and Navli-Dhavli were included. The silviculture system adopted was selection fellings with 30 years felling cycle and 21 felling series corresponding to 21 blocks. Felling Series VIII to XVIII were situated on difficult ground and so were not worked. Decaying, overmature, unsound and suppressed trees etc were to be removed. The Experimental Working Circle was divided into three felling series viz. (1) The exotic felling series prescribing introduction of exotics at Mahabaleshwar (2) The teak conversion felling series prescribing introduction of teak in wet mixed deciduous forests in Satara and Patan ranges and (3) Anjani felling series prescribing cultural operations and felling of useless growth impeding the development of Anjani trees in Patan range. Hirda and Shikekai Working Circle comprised of all the in-exploitable evergreen forest which were not economical to be worked. Only Hirda and Shikekai were to be collected. The prescribed operations to be carried out were mature and fruit bearing trees to be freed to stimulate fruiting, planting of one year old Hirda seedlings on selected sites to be carried out, Shikekai climbers to be trained on useless species and propagation of Shikekai to be done by sowing seeds or planting cuttings. In the In-exploitable Working Circle the evergreen forests which were inaccessible or were of extremely poor growth were clubbed together.

In deciduous zone, Teak Timber Working Circle (2513.20 ha), the Main Working Circle (23,518.40 ha) and the Pasture Working Circle (27,048.0 ha) were constituted. All the best teak bearing forests were included in the Teak timber Working Circle. The silvicultural system prescribed was *modified clear felling followed by natural and artificial regeneration*. The rotation of 65 years was adopted. Mixed deciduous forests capable of producing small sized timber and fuel with satisfactory regeneration from coppice shoots

and artificial regeneration were included in the Main Working Circle. The system prescribed was '*modified clear felling*' limited to those areas where satisfactory regeneration could be obtained from coppice shoots supplemented by artificial regeneration. Rotation of 40 years was adopted. All degraded areas in the mixed deciduous zone were allotted to the Pasture Working Circle. Thinning of congested stems, removal of over matured trees, and Plantation of sandalwood and fodder yielding species were prescribed. Controlled grazing, periodical closures and soil conservation measures were also advocated.

Results

In Fuel Working Circle, out of 21 FS only 5 FS (I to V) were situated on Mahabaleshwar plateau and remaining along steep slopes. FS II, IV and V were fully worked while others were either partly worked or not worked at all due to inaccessible terrain. The silvicultural system prescribed was infact 'Improvement fellings'. The prescriptions of marking rules were not clear. The terms like overmature and unsound trees, decaying trees, advance growth etc were not defined. This resulted in over felling for revenue to a certain extent. As maturity was not defined, thinnings which were prescribed in the 11th and 21st year amounted to main felling for revenue. The prescription of artificial regeneration in felled coupes was not attended properly. In the Experimental Working Circle, no work seems to have been carried out. In Hirda and Shikekai Working Circle, except extraction of Hirda and Shikekai fruits, no other operations were carried out for encouragement of Hirda trees and Shikekai climbers.

In the Teak timber Working Circle in the deciduous zone, over exploitation of teak trees, failure of teak plantations in clear felled area, heavy illicit cutting and hacking of shoots from raised plantations resulted in conversion of, once known as best teak bearing areas into poor and degraded teak forests and the main object to convert them into high forests could not be achieved. In the Main Working Circle, clear felling of the areas unfit for regeneration, lack of artificial regeneration, failure of plantations due to improper selection of site, heavy illicit cutting and hacking, improper working of subsidiary silvicultural operations, resulted into formation of scrubs and grassy blanks. In the Pasture Working Circle, the scheme was not implemented successfully due to lack of co-operation from local people, lack of trained staff. The areas were heavily grazed due to excess cattle population than carrying capacity. Except selling of the grass, no improvement works were carried out. All these factors resulted in heavy soil erosion leading to exposure of hard parent rock and growing of unpalatable coarse grasses.

B. Forests of the Ex-State of Aundh and Phaltan

V.M. Wagle's Scheme (1949-50 to 1957-58)

In Phaltan region, five year felling scheme drawn up by V.M. Wagle was introduced in 1949-50 for exploitation of babul. Selection cum Improvement system of felling supplemented with artificial regeneration was prescribed.

Results

Fellings amounted to clear felling. Natural regeneration of babul was absent and also artificial regeneration failed due to uncontrolled grazing, illicit-cutting and fires. Planting of areas devoid of tree growth remained to be implemented.

S.M. Wagle's Scheme (1958-59 to 1972-73)

Three separate schemes, previously prepared for the forest areas in Aundh, Akkalkot and Phaltan were combined and consolidated into one scheme by S.M. Wagle as the forest areas of these states were alike in many respects. In this scheme the Pasture Working Circle (4,534.50 ha), the Kuran Working Circle (1,722.80 ha.) and the Fuel Working Circle were constituted. Highly denuded areas containing a sparse scrub type growth of forest with large blanks were included in the Pasture Working Circle. In this Working Circle, rotational grazing and periodic grazing with land improvement and afforestation were prescribed. The areas which were in excess of grazing requirements and were in large blocks were allotted to the Kuran Working Circle. Maintenance of Kurans under permanent closure and introduction of edible and nutritious varieties of fodder grasses and trees of fodder value were prescribed. The areas covered with natural babul and other species of fuel value were included in the Fuel Working Circle. The silviculture system prescribed was clear felling with artificial regeneration of babul and other fuel species. Rotation of 25 years was prescribed.

Results

In the Pasture Working Circle improper implementation of scheme, lack of co-operation from local people and over- grazing resulted in growing unpalatable and coarse grasses, heavy soil erosion and exposure of hard parent rock. In Kuran Working Circle no improvement works were carried out as prescribed. In the Fuel Working Circle the worked areas had been reduced to blanks due to failure of regeneration operations. The areas were subjected to heavy soil erosion. Prosopis juliflora was raised in some areas which eventually encroached upon some of the adjacent babul areas.

B.P. Desai's Plan (1975-76 to 1989-90)

B.P. Desai revised the Singh's Plan (1934-35 to 1972-73) and S.M. Wagle's scheme (1958-59 to 1972-73) and consolidated the whole forest area of Satara forest division except area transferred from other department to this forest division from 1973 onwards. B.P. Desai constituted seven Working Circles for the forests of this division. Allocation of areas, treatment prescribed and the results for each Working Circle is summarised as below.

1. The Protection Working Circle (36,362.911 ha)

This Working Circle included all forests occurring on very steep slopes forming the catchment of the hydro-electric project at Koyana nagar and irrigation project at Dhom. It also included areas of Hirda and Shikekai Working Circle, inaccessible areas of Fuel Working Circle and all areas of In-exploitable Working Circle of Singh's Plan. No working and silviculture systems were prescribed except the collection of Minor Forest Produce on lease to avoid erosion and laterization due to opening of the canopy of the existing vegetal cover. The area was proposed to be fire protected and completely closed to grazing.

Results

The forests under this WC were not worked under any silvicultural system. Only Planting of blanks and afforesting the open lands was done. In regular Plantations, only weedings were done. All these operations resulted in improving the stock and site conditions by soil and water conservation. The improvement was very conspicuous in Koyana catchment forests mainly due to protection from grazing, Fires and illicit-cutting. Area had regenerated naturally.

2. The Selection cum Improvement Working Circle (32,764.205 ha)

This WC included all the evergreen and semi-evergreen forests found in Mahabaleshwar, Satara, Dhebewadi and Patan ranges of the Western region, other than those included in Protection Working Circle. It also included all accessible and workable areas excluding the areas under the Silviculturist plots of the Experimental Working Circle of Singh's Plan. The special objects of management in the constitution of this Working Circle were

i. To maintain adequate soil cover over catchment areas of important rivers like Koyana and Krishna.
ii. To improve existing crop
iii. To improve and preserve aesthetic beauty of the Mahabaleshwar plateau.
iv. To meet firewood and charcoal demand of the consumers of the Mahabaleshwar and Pachgani area.

The area was divided into 18 felling series out of which 6 felling series were provisional (which were remote) and remained unexploited. The felling cycle of 20 years was adopted, since these forests were not worked in the past. In each felling series 20 annual coupes were formed. The forest area of Malcompeth felling series was interspersed amongst the populous places of plateau, so felling was not prescribed in this felling series. To achieve the above special objectives, operation prescribed were (1) Climber cutting except Shikekai (2) Removal of growth interfering with Pisa and Hirda trees as well as saplings and poles of Medshing, Chimat and Gela etc. over the whole area. (3) No felling of living trees in unworkable areas (4) Removal of unsound, diseased, dying and over-matured trees strictly on silvicultural considerations and plantable under-stocked area to be planted with suitable species (5) Subsidiary silvicultural operations like cutting back, cleaning to be carried out (6) Protection of felled coupe from fire and grazing for 7 years. The exploitable girth for Ain and Nana was kept at 105 cm gbh, 90 cm gbh for Jambhul and Kinjal and 75 cm gbh for Anjani and Bhoma etc.

Results

The prescriptions laid down in the Working Plan were good and suited to improvement of the growing stock. As the operations were not carried out as per the prescriptions, no beneficial effect to achieve the objectives could be seen.

3. The Improvement Working Circle (4,435.294 ha)

This Working Circle included all such areas where teak was found and which were capable of producing medium sized timber of teak and valuable miscellaneous species. All such areas

from the Teak timber Working Circle and the Main Working Circle of Singh's Plan were included in this Working Circle. The forests in these areas were poor and degraded due to over-exploitation, heavy grazing and frequent fires. Large gaps and under-stocked areas were found commonly. The special objects of management in constituting this Working Circle were (1) To improve the condition of the growing stock (2) To increase the economic value of forest by restocking the over-exploited and area affected by illicit fellings (3) To preserve and improve site quality by preventing soil erosion. The area was divided into 6 felling series with 20 coupes in each felling series. To cover whole area quickly, 20 years felling cycle was adopted. To achieve the above special objectives the operations prescribed were (1) Climber cutting over the whole area. (2) Removal of over matured (>90 cm gbh) and malformed trees in patches of advance growth and in old Plantations. (3) In plantable areas, all tree growth except teak and other valuable species to be removed and planting with teak and other suitable valuable species was to be done. (4) In remaining areas, removal of over matured, dead, dying trees, trees of inferior species interfering with growth of valuable species (5) Cutting back operations, anti-erosion measures, weeding in plantation areas, cleaning, thinning as subsidiary silviculture operations to be carried out. (6) Worked coupes were to be closed to grazing for 7 years.

Results

Treatments prescribed were not followed strictly and carried out timely resulting in adverse impact on soil and moisture condition. Even the crop is further deteriorated.

4. The Afforestation Working Circle (27,857.485 ha)

All areas which were unfit for working on account of sparse growth and low percentage of economically valuable species and which were incapable of producing small sized timber or firewood were included in this Working Circle. To cover whole area quickly, an Afforestation period of 20 years was adopted. The area was divided into 19 afforestation series with 20 coupes in each afforestation series. Object of management was to restock the blanks and under-stocked areas, to prevent soil erosion and to produce fuel, small timber and fodder grasses. To achieve the objectives, operations prescribed were (1) Removal of only dead trees from unworkable areas. (2) Improvement fellings to benefit the crop in workable areas i.e. areas adequately stocked and areas successfully planted and not in need of afforestation. (3) Removal of bushy and undesirable growth if interfering with afforestation operations and planting the area with suitable species like Neem, Shiras, Babul, Khair, Anjan, Karanj, Eucalyptus, Hirda, Bibla, Tendu, Teak, Sissoo, Shikekai in the afforestation area. Gully plugging and nalla bunding was also advised in afforestation areas.

Results

The results were found not satisfactory especially in the Eastern part of the district because these areas suffered from drought and erratic rains and adverse biotic factors like illicit cutting, illicit grazing and fires. The problems of protection of these artificially regenerated areas in post-planting years is more acute in this region due to ever increasing demand of grazing population of sheep, goats and other cattle.

5. The Pasture Working Circle (55,547.333 ha)

This Working Circle included all the areas of the Pasture Working Circle of Singh's Plan and Wagle's scheme and also the area other than those included in Afforestation Working Circle which were not under any management before. These areas were devoid of any tree growth except thorny bushes seen sparsely. The areas were distributed all over the division. The main object of this Working Circle was to provide grazing to the maximum possible local domestic cattle with improvement of pastures. The system adopted was rotational grazing with "Three pasture Scheme". Area was divided into 40 grazing series and three pastures in each grazing series. Out of three pastures, one was to be closed to grazing for continuous period of 6 years, in rotation. During 1st year of closure, improvement works were to be carried out. From 3rd year onwards, cutting of grasses in closed pasture was to be permitted. Improvement of grasses and protection of forests from fires had been suggested.

Results

In this Working Circle no treatment was given which had affected adversely on soil and moisture. The forest area available for grazing was much less than was necessary to meet the grazing demands. The pressure of grazing on forest areas was heavy due to excessive cattle population and excessive grazing had upset the biological balance. At places rocky out crops had emerged out due to heavy soil erosion. All this resulted in increased proportion of coarse and unpalatable grasses.

6. The Kuran Working Circle (3,042.559)

This Working Circle comprised the areas similar to those which had been allotted to Pasture Working Circle and where there was keen demand for fodder grasses near towns and large villages. In all 30 Kurans had been formed. The special objects of management were (1) to protect area from soil erosion (2) to improve the quality and to increase the yield of fodder by introducing better fodder grass species. Closure of area to grazing and sale of grass annually on cutting terms was prescribed. Cutting of grasses was allowed only after 31st October. 10th portion of each Kuran was prescribed to be taken up for special improvement operations like fencing, gully-plugging and nalla-bunding, introduction of better varieties of fodder grasses and removal of obnoxious weeds, annually.

Results

Treatment as per the prescriptions was not completely given so no beneficial effect was noticed.

7. The Minor Forest Produce (Overlapping) Working Circle

This Working Circle included all the areas covered by the Working Plan. Apart from Hirda and Shikekai and grass, various minor forest products sold annually from area dealt with were Apta, Tendu and Kadi nimb leaves, Chillar and Tarvad bark, Pisa fruit, Arrow root tubers, sticks of Medshing, Rohtal, Pandhari, Atki and Gela and Agave leaves. Objects of management of this Working Circle were to increase the yield to the maximum extent to ensure and proper collection of Minor forest products. Treatment prescribed were (1) Removal of congestion by removing inferior species to avoid suppression of Hirda, Kadi nimb trees and Shikekai climbers (2) Planting of Apta, Tembhurni, Agave in suitable localities.

Results:

Climber cutting, removal of lateral shade of fruit bearing trees etc. does not seem to have been done, affecting adversely on minor forest production.

L.G.Kulkarni and Pethkar's Plan (1996-97 to 2005-06)

Kulkarni and Pethkar revised Desai's WP (75-76 to 89-90) with the basic objectives of governing the National Forest Policy of 1988. The whole forest area of Satara forest division i.e. 1,28,935.75 ha has been divided into 4 main and 2 overlapping Working Circles. Allocation of areas, treatment prescribed and Results for each WC is given below

Table No. 8 : Allocation of area to the W.C.

Sr.No.	Working Circle	Area (Ha.)
1	The Protection and Reservoir Catchment W. C.	43682.75
2	Mahabaleshwar Plateau W. C.	5567.97
3	Enrichment Working Circle	22352.65
4	Afforestation Working Circle	57332.59
5	Non-Timber Forest Produce (Overlapping) W.C.	128935.76
6	Wild life (Over lapping) W.C.	128935.76

Paucity of funds and timely availability of the same were the major constraints in timely implementation of the prescriptions of the Plan. The Plan period was 1996-97 to 2005-06, but the funds were made available only from 2001-02. Hence few Plantations / SMC works were carried out as per availability of funds. In addition to this afforestation and SMC work taken over from the other sources like E.G.S., SGRY, WGDP, RVP, etc are as follows

Protection and Reservoir Catchment Working Circle

This WC included all forest areas which were on very steep to precipitous slopes, areas which came under catchments of hydroelectric project of Koyana nagar, Dhom dam and also the areas that had been depleted through maltreatment, illicit cutting, illicit grazing and fires and exploitation of which accelerate soil erosion. It included very steep to precipitous and inaccessible areas of Mahabaleshwar, Patan, Satara and Dhebewadi Ranges. The area included in this WC was 43682.75 ha. The WC comprised of areas bearing evergreen and semi-evergreen types of vegetation. The crop was middle aged to mature. The upper hill slopes had poor density or blank areas while the density on the lower slopes and in valleys varied from 0.5 to 0.8. The objects of management were to maintain existing vegetal cover, to prevent soil erosion for avoiding silting of Koyana nagar and Dhom dams, to improve the forest cover by gap Planting and under Planting wherever possible and to improve subsoil water regime.

It was prescribed not to fell trees of any kind. Soil conservation works like check dams, nalla bunding and gully plugging were to be taken up in the accessible areas. Reboisement of the under stocked and blank areas in accessible areas was to be undertaken by Planting local species raised in nursery as well as seed sowing. Dibbling of seeds of suitable species along with bush sowing as well as under Planting of bamboo and cane were also to be carried out. Removal of dead and wind fallen trees in accessible areas were allowed to meet local demand of firewood, retaining 4 dead trees per ha for the benefit of wild life. The minor forest produce like Hirda, Shikekai etc were allowed to be extracted. No quarrying or mining permits were to be issued.

Results

The Plan period was 1996-97 to 2005-06, but non-Plan funds were made available only during the year 2004-05 & 2005-06. These funds were not sufficient. Only 50 ha of afforestation works and 1724.88 cum SMC works were done under these funds. Under various Plan schemes, 2466.18 ha afforestation works & 157558.50 cum SMC works were carried out during the Plan period. The sequence of coupes as given in the WP was not followed. Mixed species Plantations were raised in the protection areas on the moderate slopes during the WP period and majority of them are found to be partially successful. Plant species like Awala, Silver Oak, Acacia auriculiformis, Jambhul, Acrocarpus, and Eucalyptus have shown good results. Acacia and Eucalyptus have at most places suppressed other miscellaneous species. Bamboo Plantations have shown moderate results due to damage made by wild life especially wild boars. Vegetation cover is improved by gap planting. Erosion and silting is controlled to some extent. The majority of the area being on the steep slopes is naturally well protected. There are very few incidents of illicit felling though the area is prone to fires.

4. Mahabaleshwar Plateau Working Circle

This WC included all the forest areas of Mahabaleshwar and Panchgani plateau. The area of the forests included in this Working Circle was 5567.97 ha. The forests belonged to Western sub tropical hill forests. Trees of evergreen species predominate largely and under their canopy climbers, ferns, orchids, moss and other herbaceous undergrowth were found in abundance. The rocky sides of cliffs were either bare or covered with sparse stunted vegetation. The crop is generally young to middle aged. The objects of management were to maintain and improve the forests around Mahabaleshwar and Pachgani to preserve the aesthetic & climatic amenities of the famous hill station as well as to maintain and improve soil cover over the catchment of Krishna and Koyana rivers by undertaking Plantation & soil conservation works. Works like afforestation in blanks, and areas having stunted growth of vegetation's, Planting of Agave in blank areas with shallow soil depth, Soil & Moisture Conservation works as per the site requirement, Introducing the various species of grasses, Removal of dead & wind fallen trees were prescribed.

Results

Afforestation & SMC works were taken up in this WC under different schemes. Sequence of coupes and schedule of working was not followed. Only afforestation on 25 ha area was done in the year 2005-06 in this WC under Non-Plan funds and 150.06 ha afforestation along with 2258.32 cum SMC works were carried out under various Plan schemes during the Plan period. High rainfall, temperate & foggy climate of the area resulted in stunted growth and low

survival rate (30%) in the Plantations. The tree species like Jambhul & Silver Oak are doing well under these climatic conditions. Other local species need to be promoted.

3. Enrichment Working Circle

This WC included all forest areas allotted to Improvement Working Circle and part forest area of Afforestation Working Circle of Desai's Plan. These areas were capable of producing medium size timber of teak and valuable miscellaneous species. The area included in this WC is 22,352.65 ha. The forest largely belonged to 'Dry teak bearing forest' type. The forests were rather of poor quality. At many places teak was the predominant species but in stunted coppice form. The area was mostly under stocked or blank and density varied from 0.1 to 0.4. Few scattered patches were with high-density upto 0.5 to 0.8. Regeneration of teak was poor. The crop in general was young to middle aged. The mature and overmature trees were scattered in the area. The objects of management were to improve the condition of the existing growing stock, to restock the over exploited areas and areas adversely affected by illicit cutting and grazing with suitable species as well as to prevent soil erosion and improve water regime and site quality.

Only dead, dying and wind fallen trees were prescribed to be removed. In patches of teak coppices, it was prescribed to free teak crop of thorny bushes, illicitly cut stools were to be cut flush to the ground and two best shoots from one stool were to be retained as future crop. Advance growth of other species like Ain, Shisham, Kalamb, Shiras, Khair were also to be retained. All plantable blanks and under stocked areas were to be enriched with valuable species like Teak, Sissoo, Shivan, Kalamb, Shiras, Khair, Bibla, Tendu, Apta, Hirda to restock the areas along with soil and moisture conservation measures. In plantable blanks of minimum 2 ha area where tree species could not be raised, Agave species was to be planted. Felling cycle of 20 years was fixed.

Results

Afforestation and SMC works were taken up in this WC under various sources of fund. The sequence of coupes as given in the WP was not followed. An extent of 342 ha area was planted; Teak (10ha.), Hirda (20ha), and mixed species Plantation (312ha) during the year 2003-04 under Non-Plan schemes. SMC works of 5546.81cum were also under taken from the year 2001-02 to 2005-06 under Non-Plan. Similarly afforestation of mixed species on an area of 6591.24 ha and SMC works of 16040.65 cum were also done under various Plan schemes during the Plan period. Crow bar method of Teak stump planting on an area has resulted in poor survival of teak stumps and stunted growth of survived stumps. Mixed species afforestation works by and large are successful. Seed sowing of Neem, Babul, Karanj, Khair, Glyricidia etc has also given good results. There are some overgrown old Plantations which need to be managed for further silvicultural operations like cleaning, thinning and felling. Bamboo Plantations have shown moderate results due to damage by wild boar. Other prescriptions like improvement fellings, CBO etc were not followed.

4. Afforestation Working Circle

This WC included the forest areas having sparse tree growth and open blank areas in degraded state. The total area of this WC is 57332.39. The objects of management were to conserve soil

and moisture, to increase the productivity of forest and to improve the stocking and growth of old Plantations and miscellaneous species.

Pit in trench model was prescribed for afforestation. It was prescribed to dig the pits of size 60 cm x 60cm x 60cm in the continuous contour trenches (CCT) of dimensions 0.60 m x 0.30m over entire area. Number of plants to be planted per hectare was to be decided as per the ecological index of the site. The total target fixed for tree Plantation was 1000 ha per year. Continuous planting of grass tussocks and shrubs preferably by seed sowing was to be done on the piled up earth on the lower side of the trench. In all 4000 cum. soil conservation works were to be undertaken per year. Afforestation cycle was of 20 years duration.

Results

Afforestation and SMC works were taken up in this WC under different schemes. The sequence of coupes and schedule of working was not followed. Pit in trench model prescribed in the Plan was not found to be practically and financially feasible since most of the sites did not have that much soil depth. Afforestation works in this WC was done in 2 x 0.60 x 0.30m trenches or continuous trenches and produced reasonably good results. From the available Non-Plan funds since 2001-02, 16928.45 cum SMC works were carried out and afforestation of mixed species on an area of 240 ha was undertaken during the year 2004-05 & 2005-06. The sources of various Plan schemes were tapped and afforestation on 476.20 ha area and 596011.68 cum SMC works were undertaken in this WC during the Plan period. CCT of size 0.60x0.30 mtrs or trench of size 2x0.60x0.30mtr and planting of 3 mixed species seedlings on 2mtr trench gave by and large good results. Generally plant species like Sissoo, Shiras, Acacia, Babul, Karanj, Anjan and Ficus etc showed fairly good results. Though survival of teak as well as misc. species is good at many places yet their overall growth is found to be stunted at most of the places.

5. Non Timber Forest Produce (Overlapping) Working Circle

This WC overlapped with the entire area of the Satara division. NTFPs like Chilhar, Apta leaves, Pisa fruits, Hirda, Shikekai, Kadi-patta, Arrow-root, grasses etc. were found in the division. Special object of management was to collect and to increase the yield of NTFPs for meeting local and industrial demands. Prescriptions regarding sustainable collection and improvement operations of important NTFP species like Hirda, Shikekai, Apta, Tembhurni leaves, Kadi patta etc. were given. Plantations of these species were to be done to an extent of 5 % to 10 % of the net area afforested.

Results

Treatments prescribed were not followed strictly; hence no beneficial effect was noticed.

6. Wildlife (Overlapping) Working Circle

This WC overlapped with the entire area of the Satara division. Objects of management were to manage, protect, conserve and multiply the wildlife and to conserve and develop suitable habitats at selected sites such as Mayani in Dahiwadi range, Kas lake area in Satara range. It was prescribed to implement the provisions of Wild Life (Protection) Act 1972 strictly and to create awareness among the local inhabitants regarding protection of wild life. Water, salt licks

and shelter were to be provided wherever required. For developing suitable habitats in each range, at least one site of 100 ha or above was to be selected. Such sites were to be strictly protected against fire, grazing by domestic animals and poaching. Plantation of fruit trees were to be raised at each such site. Natural salt licks were to be identified and protected. Artificial salt licks were to be provided where required. Existing water holes were to be cleaned and deepened. New water holes, anicuts were to be created at the selected sites. At least one perennial water source was to be developed at each such site. Monitoring regarding wild animal population, health etc by means of census was to be done. Cattle immunization was to be done every year in surrounding villages.

Results

Most of the prescriptions were not followed due to non availability of adequate grants; hence no beneficial effects were noticed.

SECTION 3: SPECIAL WORKS OF IMPROVEMENT UNDERTAKEN

A number of special works of improvement were undertaken in the past in the tract dealt with.

1. Plantations

A number of teak and other miscellaneous species plantations have been raised in the past. In the Western part of the division, the Plantations of miscellaneous species are quite satisfactory whereas, in the Eastern part in number of places though survival percentage is somewhat satisfactory but the growth is not encouraging mainly due to degraded sites, fire, heavy grazing, illicit-cutting and hacking etc.

2. Establishment of Nurseries

There are seven nurseries established in the division of which four are the important nurseries viz., Godoli in Satara range(area 4 ha), Rasati and Koyana in Patan Range-areas-(21.85 and 10.00 ha each) and Ner in Dahiwadi Range-area- 4.94 ha for raising large number of seedlings of various species to undertake large scale plantation programmes under massive afforestation and other schemes and also to supply seedlings to public.

3. Establishment of Pratap Sinh Park at Mahabaleshwar

To combine the aesthetic beauty of Mahabaleshwar hill station and its economic development with recreation and education of the public, a forest park known as Pratap Sinh Park was established at Mahabaleshwar in 1956 in an area of 10 ha.

The park has a children's corner with facilities for children to play, botanical section with various exotic species of Cypresses, Eucalyptus, Casuarina and pines Planted, forest museum and herbarium with mounted specimens of different botanical species and various forest products of state displayed are the main features of the park.

4. Creation of mobile squads

The mobile squads units consisting of Range Forest Officer, one armed constable, one Forest Guard with a jeep and its driver for each unit has been created in the division. One mobile squad unit is specially created for Mahabaleshwar range. The object of creation of these two units is to strengthen the organization for the protection of resources from illicit-cutting, encroachments etc. by antisocial element.

5. Sanctuaries

Koyana wildlife sanctuary has been established at Koyana. A part of Dhebewadi range adjoining Sangli district has been included in Chandoli National Park in order to preserve the wildlife in the tract dealt with.

SECTION 4: PAST YIELD

Statement showing annual out turn of timber / firewood and revenue realised is given in **Appendix No. 3.2** of Volume II.

SECTION 5: PAST REVENUE AND EXPENDITURE

The details of revenue and expenditure are given in the **Appendix No. 7.1** of Volume II.

CHAPTER - 8

STATISTICS OF GROWTH AND YIELD

SECTION 1: GROWTH

The area under teak and other commercially important species has been reduced considerably. In fact, the eastern part of the district comprising of Maan, Phaltan, Khatav and Koregaon tahsils hardly have any forests. The acquired forest from the Revenue department is also devoid of any worth while tree cover. The stocking in the division has gone down over the successive years. Stem analysis is not carried out as felling is not proposed in this revised Working Plan. The data collected during Maitland - Kirwan's Plan and J.A. Singh's Plan can be made use of wherever required.

The data collated by Maitland-Kirwan for Karad, Patan and Shirala Working Plan showed that in Ghotil forests the average age for teak tree to attain 30.5 cms diameter was 32.3 years, at Salve 45 years and at Korivle it was 69.5 years, whereas at Khusgaon and Saikade apparently the trees had never grown above 20.3 cm. diameter. The details of his observations are as under:

Table No. 9

Forest		Average age of trees Measured (years)	Average girth of trees measured (Inches)
Khusgaon		59.5	31.1
Ghotil		55.4	35.6
Saikade		52.6	27.8
Salve		53.5	36.8
Korivle		60.7	36.6
Korivle		56.0	34.5
Total	:	337.7	202.4
Average	:	56.2	33.7

It was pointed out by him that trees which were measured, were the largest and oldest sound trees met with in that year's (presumably 1907) fellings and he deduced that the average life of teak tree in that area was 56 years when it attained an average circumference of 8.83 cm. at breast height. The growth in the deciduous zone varies considerably in quality from place to place. To collect data for his Working Plan J.A. Singh distinguished teak into two qualities viz. good quality teak and poor quality teak. The results obtained by him from stem analysis of teak trees from both the qualities were as under:

Good quality teak

16 teak trees were cut from the below mentioned places for the purpose of stem analysis.

Table No. 10

Name of forest	Coupes as per Singh,s WP	Number of trees cut
Kalgaon	65	2
Bhosgaon	2	2
Salve	6	3
Dhoroshi	40	2
Gavdi	16	2
Ghot	53	1
Kokisra	10	2
Kuthra	59	2

	Total :	16

The results derived from the average curves were as under:

Table No. 11

Age	Height In feet	Girth-B.H.O.B. in inches	Volume Mean in cubic Feet	Current annual incremnt	annual increment
10	13.0	9.58	0.6	0.065	0.080
20	25.0	18.53	2.2	0.124	0.200
30	33.5	26.79	5.7	0.176	0.378
40	39.5	32.03	9.0	0.220	0.470
50	44.0	35.48	11.9	0.242	0.317
60	47.0	37.92	14.6	0.245	0.258
70	53.0	---	17.0	0.244	0.223
80	---	---	19.3	0.241	0.240

Poor quality teak

Stem analysis of 22 teak trees selected from forests all over the division was carried out and the results obtained from the average curves were as under.

Table No. 12

Age	Height In feet	Girth-B.H.O.B. in inches	Volume Mean in cubic Feet	CAI annual increment	
10	9.5	5.97	0.2	0.017	0.027
20	17.5	12.56	0.8	0.043	0.073
30	24.0	18.21	2.0	0.070	0.124
40	28.5	23.24	3.5	0.091	0.163
50	32.0	27.45	5.2	0.105	0.180
60	33.8	31.09	6.8	0.113	0.159
70	34.5	33.60	8.1	0.120	0.100
80	---	---	---	---	---

From the above data it is seen that average teak of good quality attains a girth of 37.92 inches (96.32 cm) and height of 47 feet (14.32 meters) at the age of 60 years, whereas the average teak of poor quality attains a girth of 33.8 inches (85.85 cm.) and height of 31 feet (9.45 meters) in the same period. The volume of average teak of good and poor qualities at 60 years is 14.6 and 6.8 cubic feet (0.413 and 0.192 cu. meters) respectively. The current and mean annual increment curves cross at 63 ½ years in case of good quality teak and 66 ½ years in case of poor quality teak. In the case of poor quality teak the growth being poor from the very start, the trees show signs of considerable deterioration at the age of 66 years.

SECTION 2: STOCKING

Enumeration have been carried out by the Survey of Forest Resources unit Nasik, in protection working circle and selection-cum-Improvement working circle by stratified random sampling method and the data complied by the forest statistician, Maharashtra state, Nagpur.

Some noteworthy results on comparison of past and current enumerations are given below:

Table No. 13

Name of working circle	No. of trees 1963-64	Current Enumeration Per ha. 1990-91
S.C.I.	--	354
Protection W.C.	--	319
Hirda W.C.	712	--
Fuel W.C.	482	--
Teak Timber W.C.	248	--
Total (Weighted Average)	652.31	339.73

Results

The area of Main Working Circle of Satara division is distributed in the S.C.I., Protection, Improvement, Afforestation, Pasture and Kuran Working Circles in the Working Plan written by shri B.P. Desai, D.F.O. W.P. Pune.

Information furnished below reveals that 52 % stock of standing trees is available in current enumeration as compared to previous one. This change is observed within a period of 17 years.

Table No. 14 : Number of sound trees per hectare

Sr. No.	Name of Working Circle	Total utility species	General utility species	special species	other	Teak
1)	SCI WC	354	21	25	308	0.55
2)	Protection W.C.	319	28	30	261	0.00
	Total (Weighted Average)	340	24	27	289	0.55
	Percentage of stock	100%	7%	8%	85%	Negligible

From the results of the enumeration as given above it is observed that species of general utility viz. Ain, Nana, Siras, Teak, Bibla, Kakad are 7% to the total growing stock. The species of special utility viz Hirda, Pisa, Sawar, Kalam, Behada are 8% and other miscellaneous species are 85% to the total growing stock. Teak is negligible in this working circle in Satara Division.

In the year 1963-64 and 1990-91, tree enumeration work was carried out in the Main working circle of Satara Division. A comparative statement of these two surveys is given below.

Table No. 15 : No. of trees per hectare

Year of Survey	General utility species		Special utility Species	Misc. other species	Total
	Teak	other			
1963-64 survey	2.90	22.18	70.35	555.07	650
May '90 to June '91	0.33	23.61	27.17	288.62	340
Decrease of Stock in '91 survey over The stock of previous Survey in percentage	88.6	(+) 6.4	61.4	48	47.7

From the above statement it is seen that the over all stock is reduced to 47.7% as compared to the survey in the year 1963-64. From this statement it is observed that in 1963-64 survey, there was 5 % stock in 90 cm an above girth classes while in 1990-91 survey the stock under the same girth classes was 25 %. The distribution of stock under 15 to 60 cm. girth classes in 1990-91 was reduced by nearly about 35 % but the stock above 60 cm. girth classes was observed to have been increased.

Statistical analysis

The statistical analysis of Protection W.C. data has been carried out by the qualified personnel of the office of the Chief Forest Statistician M.S. Nagpur. The statistical analysis of S.C.I. W.C. data has been carried out on computer by the staff of Conservator of forests, Working Plans Division, Kolhapur under the guidance of Chief Forest Statistician M.S. Nagpur. The calculated estimates are not hundred percent accurate but subject to certain error. The percentage standard error calculated for each working circle is as under.

Enumeration during present plan

While revising the Plan by Kulkarni – Pethkar the enumeration of the forest crop was carried out by the 'Forest Resources Survey Scheme Unit' Nashik along with the active cooperation of the field staff from February 2008 to December 2008. The sampling design and overall technical guidance was given by the Chief Forest Statistician, MS, Nagpur. The Sampling design of 'Systematic Lone Plot sampling with random start' was adopted with the samble plot size of 30 X 30 i.e. 0.09 ha. roughly at an interval of 600 metres. Out of total 2638 plots which were laid in the field, 725 laid in the areas allotted to Protection cum reservoir catchment WC, 347 in Improvement WC, 1451 in SMC cum Afforestation

WC and 123 in Mahabaleshwar – Panchgani ESZ. WC. of the present plan. Around 237.42 hectare area out of total forest area of 130917.76 ha. is actually enumerated with a sampling intensity of 0.18 %.

The analysis of the data revealed the stocking of nearly 279 trees per hectare for the entire division. Stocking of trees per hectare for each of the WC is as follows : 310 for Protection cum reservoir catchment WC, 243 in Improvement WC, 434 in Mahabaleshwar – Panchgani ESZ WC. and 127 Afforestation WC. A detailed statement showing Working Circle wise enumeration results in given in **Appendix No. 8.1** of Volume II. A statement showing number of trees per hectare and their percentage distribution in various Working Circles as per the previous Plan is given in the **Appendix No. 8.2** of Volume II.

Table No. 16 : Distribution of trees per hectare in different W Cs.

Sr. No.	Name of W.C.	General utility species	Special utility species	Other species	Grand total	NTFP Spp.
1	Prot cum reservoir catchment WC	117.88	20.63	171.96	**310.47**	20.63
	% distribution	37.97	6.64	55.39	**100**	6.71
2	Afforestation WC	15.69	8.11	103.19	**126.99**	8.16
	% distribution	12.36	6.38	81.26	**100**	6.43
3	Improvement WC	100.67	37.27	105.12	**243.06**	6.10
	% distribution	41.42	15.33	43.25	**100**	2.51
4	Mahabaleshwar – Panchgani ESZ WC	5.04	52.73	376.42	**434.19**	53.00
	% distribution	1.16	12.15	86.69	**100**	12.21
	Total	239.28	118.74	756.69	**1114.71**	87.89
	% of stock to total stock	21.47	10.65	67.88	**100**	7.88
NTFP. Spp. shown in column no 7 are included in column No. 3,4 and 5						

Table No. 17 : A comparative statement of girth class wise percentage distribution to total stock of species

Survey Period: Feb. 08 to Dec. 08

Sr. No.	Working circle	GIRTH CLASS								
		16-30	31-45	46-60	61-75	76-90	91-105	106-120	121-135	Above 135
1	Prot. cum reservoir catchment WC	45.51	20.83	11.49	8.50	4.74	3.67	2.14	0.97	2.015
2	Afforestation WC	77.83	14.63	3.37	1.74	0.49	0.83	0.06	0.59	2.46
3	Improvement WC	8.32	22.99	6.67	1.02	0.39	0.26	0.12	0.11	0.12
4	Mahabaleshwar – Panchgani ESZ WC	57.52	25.15	8.18	3.89	1.44	2.41	0.43	0.90	0.08

SECTION 3: YIELD

It is not proposed to carry out felling in any of the working circle hence estimation of yield is not required.

PART – II

FUTURE MANAGEMENT DISCUSSED AND PRESCRIBED

CHAPTER - 9

BASIS OF PROPOSALS

SECTION 1: NATIONAL FOREST POLICY

In 1952 the Govt. of India, vide Ministry of Food and Agriculture, Resolution No. (Agri.) 13-1/ 52, dated 13.5.1952, declared the National Forest policy. Since then development of far reaching consequence in social, economic and political field took place and role played by forests in various spheres of national life came to be better understood. In 1988, therefore the National Forest policy of 1952 has been revised by Govt. of India vide No.3-/86-EP, Ministry of Environment and forest dated 7th December, 1988. It will be the guiding principle to decide the general object of management.

The basic objectives governing the new National forest policy of 1988 are as under:

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

ii) Conserving the National heritage of the country by preserving the remaining natural forests with the vast variety of flora and fauna which represents the remarkable biological diversity and genetic resources of the country.

iii) Checking soil erosion and denudation in the catchment areas of rivers, lakes, reservoirs in the interest of soil and water conservation for mitigating floods and droughts and for the retardation of siltation of reservoirs.

iv) Increasing substantially the forest/tree cover in the country through massive afforestation and soil conservation programmes, especially on all denuded, degraded and unproductive lands.

v) Meeting the requirements of fuel wood, fodder, non-timber forest produce and small timber of rural and tribal populations.

vi) Increase the productivity of forest to meet essential national needs.

vii) Encouraging efficient utilization of forest produce and maximizing substitution of wood.

viii) Creating a massive people's movement with the involvement of women for achieving these objectives and so minimize pressure on existing forests.

ix) The derivation of direct economic benefit must be subordinated to environmental stability and maintenance of ecological balance.

Strategy and salient features of National Forest Policy of 1988 are as under:

i) Bring one third of the total land area under forest or tree cover.

ii) Severe restriction on schemes and projects which interface with forest that clothe steep slopes, catchments of rivers, lakes and reservoirs.

iii) No working of forests without the Government having approved the management plan.

iv) Non-introduction of exotic species without long-term scientific trials.

v) The rights and concession including grazing, to always remain related to the carrying capacity of the forests.

vi) Rights and concessions which cannot be met from the forests to be met by development of social forestry.

vii) The rights and concessions enjoyed by the tribals should be protected. Their domestic requirements of fuel wood, fodder, non-timber-forest produce and construction timber should be the first charge.

viii) Forest management plans to take special care of the needs of wildlife conservation.

ix) Effective action should be taken to prevent encroachments on the forest lands and the existing encroachments should not be regularized.

x) Forest based Industries should raise the raw material needed by themselves in arrangement with the private cultivators.

xi) Survey of forest resources to be completed on scientific lines.

xii) For domestics energy, fuel wood needs to be substituted as far as practicable with alternative sources like biogas, L.P.G. and solar energy. Fuel efficient “Chullahs” as a measure of conservation of fuel wood needs to be popularized in rural areas.

xiii) Diversion of forestlands for non-forest purpose should be subjected to careful scrutiny.

xiv) People should be made forest conscious through extension.

SECTION 2: FOREST CONSERVATION ACT, 1980

In the past large tracts of forest lands were dis-forested for providing land for different developmental projects such as irrigation dams, hydro-electric projects, roads, railways, transmission lines, rehabilitation of project affected persons etc. As the country was already short of the desired forest cover, the need for some legislation to restrict and regulate further diversion of forest lands in the name of developmental projects resulted in the Forest Conservation Act, 1980. It came into force from the 25th Oct. 1980 and extends to the whole of India, except the State of Jammu and Kashmir. It places restrictions on the de-reservation of forest or use of forest land for non forestry purposes. It mainly stipulates that:

1. No State Government or other authority shall make, except with the prior approval of the Central Government, any order directing that any reserved forest or any portion thereof shall cease to be reserved and that any forest land or any portion thereof may be used for any non-forestry purpose.
2. The Central government may constitute a committee to advise the Government with regards to this Act and any other matter connected with the conservation of forests.
3. The Central Government may by notification in the Official Gazette make rules for carrying out the provisions of this Act.

SECTION 3: MAHARASHTRA FOREST DEPARTMENT'S MISSION

The Maharashtra Forest Department carried out institutional reforms under the Maharashtra Forestry Project and came out with a clear mission statement and objectives of the Forest Department. This mission and the objectives were approved by the Govt. of Maharashtra vide GR No. R&FD-FDM/1098/CR-540/F-11 dated 22nd April 1998. The mission statement and the objectives are as follows:

The Mission

To activate the sector by catalyzing the positive involvement of all the stakeholders in enrichment, expansion and sustainable development of the forest resources by being a responsive and transparent learning organization.

Core Elements of the Mission

- Transformation of forestry into an important sector in the States economy.
- Ensuring stability of the Eco-system.
- Ensuring equity of the various stakeholders in using the forest resource (especially needs of the local community)
- Enhancing productivity of the resources.
- Increasing forest cover.
- Conservation of Gene pool and Bio-diversity.
- Becoming a responsive and transparent organization.

Primary Objectives

Sectoral

- To recommend to the State and Central government, policies which will provide an enabling environment for various non-governmental players to play an active role in this sector.
- To generate and disseminate knowledge and information relevant to the sector to various stakeholders and provide Research & Development support to the sector.
- To regulate the activities of various players involved in forestry sector development.
- To undertake and co-ordinate planning along with the other government departments and agencies

- To develop a pro-active interface with the political and executive arm of the government and public.
- To act as a nodal agency at the grass-root levels in the forest lands.

Institutional

- To develop a skilled manpower base for the sector.
- To ensure technology upgradation.
- To promote a strong research base and build up an effective institution for effective knowledge management.

Operational

- To maintain accurate and reliable data and information on forest resources and undertake periodic resource monitoring.
- To ensure effective and efficient management of forest estates under its control.
- To Upgrade the quality of the land by soil and water conservation measures.
- To identify, map and conserve the bio-diversity rich areas.
- To promote the efficient utilization and value addition of forest produce including promotion of substitutes.

SECTION 4: FACTORS INFLUENCING THE GENERAL OBJECTS OF MANAGEMENT

The important factors which have influenced the objects of management are as follows:

1. The forests of Satara Forest Division have been worked under the prescription of Wagle's working scheme, Singh's Plan, Desai's Plan in the past. But the results show that not much improvement of forests has taken place. Most of the forest area of this division represents scanty growth and this would have to be improved by undertaking soil conservation and plantation works.

2. A large portion of the Western Ghat falls under the catchment areas of important irrigation/ hydroelectric projects like Koyana, Dhom, Venna, Chandoli etc. Removal of tree cover will increase the soil erosion resulting in siltation of these projects. Therefore the areas which come under the catchment of these projects will have to be protected from the siltation of dams.

3. The forests areas around famous hill stations viz. Mahabaleshwar and Pachgani have been the places of attraction for the tourists. The forests of these areas have to be conserved and improved aesthetically by way of complete ban on felling and total protection.

4. Local people depend on forests for various minor forest produce like Shikekai, Hirda fruits, Agave fibers, Apta leaves, Kadi-nimb leaves. It would, therefore, be necessary to make adequate provisions to meet these demands to the best possible extent.

5. The Eastern part of this division is drought prone area, hence measures should be taken to harvest whatever rain water received by adopting soil conservation cum afforestation measures.

6. About 84% population in the district is rural which mainly uses firewood, cow-dung and agricultural waste for domestic purposes. Heavy destruction to the forests have been caused on account of use of wood for domestic energy. To stop this custom of the people, the alternatives to the wood are to be provided to them.

SECTION 5: GENERAL OBJECTS OF MANAGEMENT

Taking into consideration the above facts and guidelines elaborated in National Forest Policy 1988, the objects of management of these forests are set out as under.

1. Maintenance and conservation of ecological balance and natural heritage by preserving the natural forests and biological diversity.
2. Checking soil erosion and denudation in the catchment areas of rivers, reservoirs, tanks to protect them from siltation.
3. Increasing the productivity of forests to meet essential local needs.
4. Increase forest cover through massive afforestation especially on denuded and unproductive lands.
5. Meeting the requirements viz. fuel, food, fodder, non timber forest produce etc. of rural and tribal population.
6. To maintain and improve forest areas of Mahabaleshwar Pachgani eco-sensitive zone.

The recent National Forest Policy clearly emphasizes that the derivation of direct economic benefit must be subordinated to the principle aim of environmental stability and maintenance of ecological balance for sustenance of life forms of human, animal and plant.

SECTION 6: FUNCTIONAL CLASSIFICATION OF FORESTS

The state government vide R & FD resolution no. MRF-1365/1322 11/Y dated December 6, 1968 recognized following classes of forests on functional basis:

a. *Protection forests*: It includes forests on very steep slopes (25^0 and above) or along river banks and forests that have become depleted due to maltreatment and further exploitation of which shall accentuate soil erosion and adversely affect the productivity of agricultural lands in the lower region. The management shall aim at soil and moisture conservation measures.

b. *Tree forests*: These forests are situated in remote areas on which there is little or no local demands and which are mainly capable of growing large sized timber and other products of commercial value.

c. *Minor forests*: It includes forests that are interspersed with cultivated lands and the areas capable of producing small timber and firewood and providing grazing which are indispensable needs of the adjoining population.

d. *Pasture forests*: These are openly stocked forests or scrub lands that have ceased to yield even small timber but which are conveniently situated for providing grazing to the cattle.

e. *Miscellaneous forests*:

i. *Grass reserves*: They are small block of forests situated amidst intensively cultivated tracts carrying scrubby growth and are capable of producing good fodder grasses.

ii. Remaining areas: Areas needed for other purposes

Keeping in view the above mentioned classification, the forests in this tract can be classified into the following classes:

i) *Protection forests*

These forests which occur on very steep and precipitous slopes (25^0 and above) forming the catchment of irrigation and hydroelectric projects, streams and rivers, have depleted through maltreatment and further exploitation of which will accelerate soil erosion. These forests are confined to Sahyadri and Mahadev Ranges in the Western part of the division. These forests are important from soil and moisture conservation point of view. Protection forests are included under the Protection and Reservoir Catchment Working Circle and Mahabaleshwar-Panchgani Eco-sensitive Zone Working Circle of this Working Plan.

ii) *Minor Forests*

These are the forests which can yield small timber, firewood, fodder and provide grazing but are incapable of providing middle size to big size timber. These forests have suffered a lot due to adverse biotic factors such as grazing, illicit cutting and encroachments. Major portion of these forests are easily accessible. Growth by and large is stunted. They include the Western sub-tropical hill forests and semi- evergreen forests of Patan, Dhebewadi and Mahabaleshwar ranges as well as Dry mixed deciduous and thorn forests and blanks of Karad, Satara, Phaltan, Dahiwadi ranges. Minor Forests are included under Improvement Working Circle and Afforestation Working Circle of this Plan.

SECTION 7: METHOD OF TREATMENT PROPOSED

In view of the above considerations, the method of treatment to be proposed to the forest dealt with under this Plan according to their functional classes are as under:

1) Treatment for Protection forests

These forests occur on very steep slopes of the Sahyadri ranges forming the catchment of major irrigation and hydroelectric projects. In these areas rainfall exceeds 1750 mm. This class also includes forests that have depleted through maltreatment in the past.

The main object governing the management of these forests is to prevent soil erosion and thus to avoid silting of dams and further deterioration of site. In conformity with this object it will be necessary not to disturb whatever scantly forest cover they are having. Moreover, steps in improving the site should be taken and the area should be protected from felling, illicit cutting, fire and grazing which are common reasons for deterioration of site.

2) Treatment for minor forests

These forests are spread over from heavy rainfall areas of Mahabaleshwar range to the drier parts of Dahiwadi, Phaltan, and Khandala ranges. These forests have suffered a lot due to adverse biotic factors. These are incapable of providing middle size to large size timber. Reproduction of important economic species is not satisfactory. Growth is by and large stunted. These are the only forests, which supply small timber required for agricultural works and firewood to the local people. These forests require sincere attempt of improvement both in quality as well as in quantity. As a matter of fact, the primary treatment for these forests will be improvement of stock qualitatively and quantitatively by planting, singling out of congested and stunted coppice growth and soil conservation works. The material that will be obtained incidentally will cater the needs of the local people.

SECTION 8: FORMATION OF WORKING CIRCLES AND THEIR DISTRIBUTION

The main criteria for the formation of Working Circles are as under:

a) Topography and accessibility of terrain.

b) Type and quality of the forest.

c) Silvicultural requirement of forests.

d) Compactness of areas.

e) Availability of labour for intensive working such as artificial regeneration etc.

f) Nature and quantum of local demand of forest produce.

In view of the above considerations, the following Working Circles have been constituted:

Table No. 18: Area allotment to working circles

Sr. No.	Name of Working Circle	Area (ha.)	% of total area
1.	Protection and Reservoir Catchment W.C.	36051.41	27.54
2.	Mahabaleshwar Panchgani Eco-sensitive Zone Management Working Circle	16141.10	12.33
3.	Improvement Working Circle	24257.87	18.53
4.	Afforestation Working Circle	54467.38	41.60
5.	Wild life (overlapping) Working Circle	-----	-----
6.	Old Plantations Management (overlapping) W.C.	-----	-----
7.	Bamboo management (overlapping) W.C.	-----	-----
8.	NTFP Management (overlapping) W.C.	-----	-----
	TOTAL	**130917.76**	**100.00**

THE PROTECTION AND RESERVOIR CATCHMENT WORKING CIRCLE

This working circle includes all forest areas which are on very steep to precipitous slopes, areas which come under catchment of the hydroelectric project at Koyana nagar and irrigation project at Dhom and also the areas that have been depleted through maltreatment, illicit cutting, illicit grazing and fire in the past and further exploitation of which will accelerate soil erosion. It includes very steep to precipitous and inaccessible areas of Mahabaleshwar, Patan and Dhebewadi ranges. The area of the forest included in this working circle is **36051.41 ha.**

MAHABLESHWAR PANCHGANI ECO-SENSITIVE ZONE MANAGEMENT WORKING CIRCLE

This WC includes all the forest areas of Mahabaleshwar and Pachgani plateau that has been declared as Eco sensitive Zone by Ministry of Environment and Forests Notification dated 17th January, 2001. This area is also important from the tourism point of view. The forest area included in this working circle is **16141.10 ha.**

IMPROVEMENT WORKING CIRCLE

This Working Circle includes all forest areas of Enrichment Working Circle of previous WP and part areas of Afforestation Working Circle. It includes areas capable of producing small and medium sized timber. It also includes areas having sparse growth and low percentage of economically valuable species. The area of forest included in this working circle is **24257.87 ha.**

AFFORESTATION WORKING CIRCLE

This Working Circle includes the forest areas which have sparse tree growth and open blank areas in degraded state. It also includes the areas transferred from other department to this forest division, which were not under any management before. The forest area included in this working circle is **54467.38 ha**.

WILD LIFE MANAGEMENT (OVERLAPPING) WORKING CIRCLE

This overlapping Working Circle covers the entire forest area of this Plan.

OLD PLANTATIONS MANAGEMENT (OVERLAPPING) WORKING CIRCLE

This overlapping Working Circle covers the entire forest area of this Plan.

BAMBOO MANAGEMENT (OVERLAPPING) WORKING CIRCLE

This overlapping Working Circle covers the entire forest area of this Plan.

NON-TIMBER FOREST PRODUCE (OVERLAPPING) WORKING CIRCLE

This working circle covers the entire forest area of this plan.

SECTION 9: BLOCKS AND COMPARTMENTS

The area dealt with under Desai's plan was divided into 858 compartments which also includes compt.No.789 to 858 of Jath and Malshiras ranges of present Solapur Forest Division. Out of 788 compartments 11 compartments were cancelled in Desai's plan itself, 113 compartments were transferred to other Division/ Sub division during the course of reorganization of divisions. The average extent of a compartment under Desai's plan is about 186 hectares. Areas and serial number of 664 compartments are kept as it is in Desai's plan (Numbered from 1 to 788). Area newly added by acquisition or transfer is divided into compartments and serial number either from 789 onwards are given or area is given as comptt. 'A" to the adjoining compartment no. The average extent of a newly formed compartment is about 186.13 hectares. Since the wild life Division at Kolhapur has been created, the Koyana Sanctuary having 124 no of comptts and area of Chandoli Sanctuary having 7 compartments have been handed over to Wild life Division. The boundaries of the compartments have been carefully selected so that they can form permanent territorial units.

SECTION 10: ANALYSIS AND VALUATION OF THE CROP

First time the forests of Satara Forest Division were stock mapped during the preparation of Desai's plan. The work of stock mapping was done by the territorial staff of Satara forest division.

SECTION 11: PERIOD OF THE PLAN

This Plan has been prepared for ten (10) years from 2010-11 to 2019-20. The mid term review of this Working Plan shall be undertaken in the 5th year of its implementation. The plan has been sanctioned by Govt. of India's Ministry of Environment and Forests letter No. 12-27 / 2010 (FOR) 1677, Dated : 31/8/2010 and approved by Govt. of Maharashtra vide letter No. FDM 2010 / CR – 53 / F -2, Dated : 18/9/2010.

CHAPTER - 10
PROTECTION AND RESERVOIR CATCHMENT WORKING CIRCLE

SECTION 1: GENERAL CONSTITUTION

This Working Circle includes all the forest areas which are on very steep to precipitous slopes (i.e. $25^0$and more) as well as forest areas occurring on the slopes forming the catchment of hydro-electric project at Koyana nagar and irrigation projects at Dhom, Veer, Maan and Kas. It includes very steep to precipitous and inaccessible areas of Mahabaleshwar, Satara, Patan, Wai, Medha and Dhebewadi ranges. The precipitous slopes are mostly devoid of tree growth and vegetation occurs only in sheltered valleys and on steep slopes which are inaccessible. The mean annual rainfall in these areas ranges between 2000mm to as high as 6000mm. These are highly vulnerable areas where retention of tree cover is essential to protect the soil from erosion and laterization due to heavy rainfall. The area of this Working Circle is 36051.41 ha. that is 27.54 % of the total area being dealt in this Plan.

Table No. 19 : Allotment of area to WC (area in ha.)

Sr.No.	Range	Area in ha.	No. of compartments		Area allotted to W.C.	% to area of range	% to area of division.
			Full	Part			
1	Dhebewadi	10111.80	34	2	5921.63	58.56	4.52
2	Medha	8922.21	37	3	5259.21	65.67	4.48
3	M.shwar	20386.74	31	5	5339.55	26.27	4.09
4	Patan	12708.97	55	1	8508.37	66.95	6.50
5	Satara	8773.60	24	13	3955.15	45.08	3.02
6	Wai	13061.87	30	~	7067.50	53.98	5.39
		Total	**211**	**24**	**36051.41**		

SECTION 2: GENERAL CHARACTERS OF THE VEGETATION

This WC comprises of areas bearing evergreen and semi evergreen types of vegetation belonging to 'Western subtropical hill forest type' i.e. $_8A/C_2$ and 'West coast semi evergreen forest type' i.e. $_2A/C_2$ as per Champion and Seth's revised survey of the forest types of India. The site quality ranges between IVb to IVa. Occasional patches of site quality III are observed on gentle slopes or in valleys but such areas are negligible in extent. The areas occurring on very steep and precipitous slopes are almost blank with shrubby growth while it is better on lower slopes. There is hardly any tree-growth over vast stretches of exposed rocks, which have little or no soil cover while it is fairly dense in

patches on gentle and moderate slopes. The quality in sheltered patches and valleys is better as compared to the areas exposed to high velocity winds, mist and foggy atmosphere during the monsoon where it is stunted and malformed. In general evergreen species show stunted growth with a height of 5-8 metres. The crop is middle aged to mature. The principle species are Actinodaphne angustifolia, Terminalia chebula, Terminalia tomentosa, Catunaregam spinosa, Syzigium cumini, Mangifera indica, Phyllanthus emblica, Memecylon umbellatum etc.

Reserved forest

The areas are susceptible to soil erosion. The grazing is light to medium. Natural regeneration of these species is generally poor.

In the Western Ghats, there are many lateritic flat formations called 'Table Lands' or 'Sadas'. One such formation is near village Kas and is called as 'Kas Plateau' or 'Kas Pathar'. The total geographical area of the plateau is about 1792 ha out of which about 1142 ha is forest area of villages viz. Kas, Akiv, Andhari, Phalani, Atoli, Kamathi and Sawali. Among the surrounding plateaus in this region, there is basin like formation where lake for water supply was built more than 100 years ago. The water supply to Satara town is made from this lake through a pipe line which works on gravitational force.

Kas plateau at an elevation of 3500 ft from msl and at a distance of 25-30 kms from Satara and nearly 30 kms from Mahabaleshwar is known for its floral biodiversity and has been of great interest amongst the botanists and taxonomists apart from being popular amongst the tourists. The plateau area is open and is devoid of any major tree growth while slopes around Kas plateau bear dense semi-evergreen tree cover. The plateau area is full of ephemeral plants during monsoons and hence has become of vital importance from the environmental and ecological point of view. More than 850 species of flowering plants have been reported. 39 species find mention in the Red Data book of the total 624. Many of the endemic and endangered plants are found on and around the plateau area. The vast expanse of the plateau becomes alive with vibrantly coloured wild flowers of different colour and hue, pertaining to different species between August and October every year, lasting for nearly three months. Hence, it is said that the Kas plateau is next only to the valley of flowers. It draws many tourists and researchers during these months.

Many endemic, endangered plants are found on the Kas Plateau which are in the Red Data Book. There are some species reported recently viz., *Aponogeton satarensis, Arisaema sahyadricum* var. *ghaticum, Eulalia shrirangi, Mnesithea veldkampii* forming new records for Botanical Science. These plant species are endemic to Kas plateau and hence, there is an urgent need to take effective measures to protect this area in order to conserve the unique Plant-diversity of rare and endangered flora of this Kas plateau.

The tiny ephemeral plants blossoming from the beginning of the monsoon to the end of October on the plateau is the unique feature of the Kas plateau. The flowering period of various species is followed rapidly, giving rise to a rainbow pattern and hence in every week or two, new flowers of new colours can be seen on the plateau. There are so many plateaus in the North Western Ghats but this feature is and unique to the Kas Plateau. Hence, the Kas Plateau is compared to the "**Valley of Flowers**" of Gharhwal (Uttarakhand) and Kashmir valleys, as regards the volume and variety of flowering plants over a particular period is concerned.

Kas plateau possess very characteristic herbaceous ephemeral vegetation. It is observed that of the 56 genera endemic to Peninsular India, 10 Monotypic genera endemic to Western Ghats are found in this area (Carvia, Dicoelospermum, Erinocarpus, Helicanthes, Indopoa, Moullava, Polyzygus, Pseudodicanthium, Seshagiria, and Trilobachne). High flat mountain tops, table lands, escarpments, valleys, strong hill forts and peaks and spurs of Sahyadri provided unique habitats for the growth of various kinds of plant species and plant communities.

Recent studies on the rocky outcrops on Kas plateaus, led to observe that, it support a natural herbaceous vegetation complex, adapted to survive in adverse conditions. A. Watve (2003) observed that 'Cyanbobacterial' crust on the rocky outcrops, Lichens, desiccation tolerant ferns, varied mosses occur abundantly on such rocky octcrops. Further observations revealed that members of Poaceae abound in such microclimate, with insectivorous plants dominantly present. The natural herbaceous vegetation surviving in stressful conditions is a unique presence in this part of southern Sahyadri plateau, a phenomenon not observed elsewhere on the Western Ghats.

Further, a plan for the management of the 'Kas Plateau' as a UNESCO's World Heritage site was submitted to the Wildlife Institute of India, Dehradun and PCCF (Wildlife), MS by CF (Wildlife), Kolhapur vide his letter dated 24th August 2009.

SECTION 3: SPECIAL OBJECTS OF MANAGEMENT

1. To conserve the biodiversity in the ecologically sensitive and biodiversity rich Western Ghats falling in Satara forest division.
2. To maintain the existing vegetal cover to prevent leaching out and laterization of the soil by heavy rainfall.
3. To protect and improve the catchment areas of dams at Koyana nagar and Dhom to minimise soil erosion and to reduce the rate of siltation in these reservoirs.
4. To protect, maintain and improve the existing vegetation for the protection and maintenance of the physio-geographic and climatic factors of the locality and to ensure that the vegetal contiguity of the Western Ghats is not broken to prevent isolation of species.
5. To improve sub-soil water regime.

SECTION 4: COMPARTMENTS AND WORKING SERIES

The compartments allotted to different Working Series and the statements showing the Working Series and sequence of working of annual coupes are given in the **Appendix No. 10. 3 of Volume II.**

SECTION 5: ANALYSIS AND VALUATION OF CROP

i. *Stock mapping*

The area is being stock mapped on 4": 1 mile scale toposheets with the help of local territorial staff. Steep and precipitous slopes are practically blank and devoid of any tree growth due to absence of soil on the exposed rocks. There is however dense growth of evergreen species in the valleys comprising Amba (Mangifera indica), Jambhul, Hirda (Terminalia chebula), Kalamb (Mitragyna parviflora), Gela (Randia dumatorum), Anjani (Memecylon edule) etc. **The details of the stock mapping exercise for the areas included in this Working Circle are given below.**

Table No. 20 : Extent of planimetred area as per stock maps

Sr.No.	Range	Area in ha.					Total
		Well stocked	Under stocked	Eroded scrub	Plantation	Blank	
1	**Dhebewadi**	4324.70	735.22	49.67	35.81	776.23	5921.63
3	**Medha**	2230.75	1216.65	189.04	15.81	1606.96	5259.21
2	**M.shwar**	2737.12	968.73	0	10.36	1623.34	5339.55
4	**Patan**	4904.63	1418.80	0	116.04	2068.90	8508.37
5	**Satara**	1577.76	911.40	17.31	118.64	1330.04	3955.15
6	**Wai**	5277.17	0	82.03	133.29	1575.01	7067.50
	Total	**21052.13**	**5250.80**	**338.05**	**429.95**	**8980.48**	**36051.41**
	% to WC	**58.39**	**14.56**	**0.94**	**1.19**	**24.88**	**100**

ii. *Age & Density* :

The crop in this WC is middle aged to mature. The upper hill slopes have poor density or blank areas while the density on the lower slopes and in valleys varies from 0.5 to 0.8.

iii. *Enumeration*:

Enumeration work in the field was completed by the FRSS unit, Nashik while its analysis was done in this office. Average total number of trees per hectare is found to be 310 out of which nearly 73% fall within 16-60 cm girth class while nearly 22% fall within a larger girth class of 46-75 cm. It implies majority of the crop is young and is in pole stage. Anjani, Jambhul, Ain, Hirda and Gela are the top five species in terms of number of trees

per hectare. Ten important NTFP species have been identified and listed below. Hirda, Awala, Amba, Pangara, Biba, Amruta, Bor, Khair, Wavding and Karanj are the top ten NTFP spp in the descending order. A detailed statement showing WC wise enumeration results is given in **Appendix 8.1** of Volume II.

Table No. 21 : Number of trees per hectare

Girth Classes (cms)									
16-30	**31-45**	**46-60**	**61-75**	**76-90**	**91-105**	**106-120**	**121-135**	**Above 135**	**Total**
114.34	71.61	41.54	27.33	19.83	14.46	9.66	4.95	6.75	**310.47**

Table No. 22 : Species having maximum number of trees/ha in descending order

Sr.No.	Species	No. of trees / ha.	Percentage
1	**Anjani**	86.05	27.72
2	**Jambhul**	29.39	9.47
3	**Ain**	29.19	9.40
4	**Gela**	21.92	7.06
5	**Pisa**	10.55	3.40
6	**Hirda**	9.20	2.96
7	**Bhoma**	8.32	2.68
8	**Parjambhul**	7.51	2.42
9	**Hadka**	7.35	2.36
10	**Kumbha**	6.74	2.17

Table No. 23 : Estimated number of NTFP species per hectare

Sr. No	NTFP Spp.	No./ha
1	**Hirda**	9.20
2	**Awala**	4.92
3	**Amba**	2.32
4	**Pangara**	1.45
5	**Biba**	0.98
6	**Amruta**	0.62
7	**Bor**	0.12
8	**Khair**	0.08
9	**Wavding**	0.08
10	**Karanj**	0.04
	Total	**19.81**

Table No. 24 : No. of plants / ha. in natural regeneration.

Hight class (cms)			
0-90	**91-300**	**Above 300**	**Total**
82.81	14.88	2.73	**100.42**

Table No. 25 : Species having maximum number of plants / ha. in descending order (N.R.)

Sr.No.	Speceis	No. / ha.	Percentage
1	**Anjani**	32.72	32.58
2	**Jambhul**	20.94	20.85
3	**Gela**	7.14	7.11
4	**Ain**	4.79	4.76
5	**Pisa**	4.63	4.61
6	**Rametha**	3.31	3.30
7	**Silver Oak**	1.79	1.78
8	**Awala**	1.70	1.69
9	**Eucalyptus**	1.35	1.34
10	**Bhoma**	1.27	1.26

SECTION 6: WORKING CYCLE

Working cycle shall be of 20 years duration.

SECTION 7: DEMARCATION OF COUPES AND PREPARATION OF THE TREATMENT MAP

Demarcation: The annual coupes shall be demarcated one year in advance.

Preparation of Treatment map:

After the demarcation of the coupe, a treatment map shall be prepared and shall be verified by a gazetted officer emphasising the suitability of sites for plantations if any as well as promising NR areas.

The following areas shall be shown distinctively in the map:

I. Area 'A' - Protection Areas: include following areas

i. Areas with steep slopes i.e. more than $25^{0.}$

ii. Eroded areas or areas liable to erosion.

iii. Twenty meters wide strip on either side of the water courses.

II. Area 'B' - Under stocked Areas: include areas with crop density less than 0.4.

III. Area 'C' - Old plantation areas: include areas under old plantations.

IV. Area 'D' - Well stocked areas: include areas with crop density more than 0.4.

The TM shall also show all prominent nallas, perennial sources of water, water bodies etc. which shall be numbered.

Treatment:

The various treatments proposed for the above mentioned areas are as follows:

I. Area 'A' :

i. The SMC works including nalla-bunding and gully plugging will be carried out wherever essential. Sites with perennial sources of water locally known, as 'jivant jhirra' should be tackled appropriately as explained under 'general prescriptions'.

ii. In the accessible under stocked areas having good soil depth, seed-dibbling shall be done to suitably clothe the area. Bamboo and other suitable species shall be planted in accessible under stocked areas within 20 meters wide strip on either side of water courses.

iii. Felling is not prescribed.

II. Area 'B' :

i. The SMC works like van tale, bandharas, nalla-bunding, gully plugging etc will be carried out wherever required. Sites with perennial sources of water locally known, as 'jivant jhirra' should be tackled appropriately as explained under 'general prescriptions'.

ii. Suitable miscellaneous species shall be planted in the accessible under stocked areas having good soil depth and which are more than 2 hectares in extent in a compact block. In smaller areas seed dibbling shall be done.

iii. Rooted stock shall be properly tended.

iv. Felling is not prescribed.

III. Area 'C' :

i. Felling or thinning is not prescribed.

IV. Area 'D' :

i. The SMC works like van tale, cement bandhs, nalla-bunding, gully plugging etc will be carried out wherever required. Sites with perennial sources of water locally known, as 'jivant jhirra' should be tackled appropriately as explained under 'general prescriptions'.

ii. No planting shall be done in these areas.

SECTION 8: GENERAL PRESCRIPTIONS

Most of the areas included in this Working Circle are situated in the Western Ghats and has hilly and rugged terrain. The main objective is to manage the runoff water and maintain the vegetation cover. This will mitigate the rate of soil erosion in the various catchments and will also check the silt inflow in the reservoirs, thereby increasing their life.
Hence the following prescriptions shall be followed:

i. A detailed survey of the flora of Kas plateau, their occurrence, status and conservation strategies with a focus on the endemic and endangered species should be undertaken by the expert agencies appointed by the forest department. A database shall be prepared identifying all endemic and endangered species of flora, surveying their environs and habitats to establish the current level of security and the nature of threats.

Periodic reviews of flora status should be conducted to help frame conservation strategies.

Action points proposed for conserving the identified endemic and endangered plants in Kas plateau.

1. Grazing should not be allowed to avoid any trampling of the plants by the cattle.
2. Planting of any exotic plant species should not be done in the Kas region.
3. Nursery should be developed to propagate endemic and endangered plant species of the Kas area. The plants raised should be planted in the blanks / gaps in the surrounding area of Kas plateau with the proper supervision and permission of DCF.
4. Tourist vehicles should not be allowed on the Kas plateau as the area is ecologically highly sensitive. Tourist entry (on foot) should be allowed in the Kas region only being accompanied by the assigned forest guard / tourist guide.
5. Plucking of flowers, collection of plant cuttings, uprooting of plants is totally prohibited in the Kas plateau.
6. Carrying of plastic bags and bottles should not be allowed in the region.
7. Information boards should be displayed at various places with do's & don'ts for the tourists in the Kas region.
8. Kas plateau and the surrounding areas should be protected from fire.

9. Natural Habitat of the region should be protected and any kind of modification in habitat should not be permitted.

10. Additional staff should be deployed at Kas plateau during monsoon (June to November) with vehicles for protection and conservation of the ephemeral and valuable biodiversity,

ii. Management of run-off water will be of utmost importance as most of the villages suffer from water scarcity for few months during summers. All major nallas, perennial sources of water, water bodies etc. shall be shown prominently in the treatment map. All prominent nallas shall be numbered and a plan shall be chalked out to treat all these nallas, gullies from ridge towards valley. Each selected nalla shall be treated completely with series of loose boulder structures (LBS) at the top to arrest the speed of the run off along with the fertile soil being washed away. At the appropriate sites downstream, suitable water harvesting structures like forest tanks i.e 'van talis'

Kolhapuri bandharas etc. shall be taken. In addition, various soil moisture conservation works like gully plugging, gabion structures, brushwood dams, Vanrai bandharas, contour bunding, contour trenching, van talis etc. shall be done as per suitability and requirement of the area. Ridge of valley concept shall be followed while treating the watershed Water level in the village wells shall be monitored regularly by the forest staff and raised water level in the village wells during the scarcity period or raised ground water level and resulting changes in land use pattern and increased productivity of crops and vegetables shall be taken as indicators of success.

iii. Sites with perennial sources of water locally known, as 'jivant jhirra' within the forest areas shall be identified and their locations shall be marked on the map of each Range, which shall be displayed prominently in each Range office. These sites shall be tackled appropriately through various means like desilting, deepening, diverting small trickles into dug out troughs adjacent to nallahs, construction of Forest tanks locally known as

'Van-talis' in the nearby vicinity. This will ensure availability of water sources for wild animals and reduce straying of those animals into agricultural fields thus reducing conflict situations.

iv. Accessible under-stocked areas with good soil-depth and more than 2 hectares in extent in a compact block shall be planted with suitable local species. In smaller areas, seed-dibbling shall be done to suitably clothe the area. Follow the various prescriptions for tending of regeneration in the accessible areas, which have been discussed under Section 8 of chapter on 'Afforestation Working Circle'.

v. Any fellings in these areas will enhance the soil erosion and landslides. It is also not feasible to work these areas systematically and economically due to their remoteness and inaccessibility. Hence, no fellings are prescribed in this Working Circle. All areas included in this Working Circle shall be given complete protection.

vi. Wind fallen material shall be removed from the accessible areas.

vii. Collection of Non Timber Forest Produce (NTFP) shall be permitted according to prescribed Rules. Care shall be taken to not to cause any harm to the plants while collecting NTFP.

viii. Each village in a watershed shall be taken as a unit of holistic development. It shall be endeavored to integrate forestry management interventions with development schemes of other departments under JFM, FDA, IWDP, DRDA, District Plan etc. for socio-economic upliftment of the village communities with an objective to develop clusters of villages in various watersheds. Proper linkages shall be developed with other departments like Animal husbandry, Fisheries, Horticulture, Minor irrigation, Social forestry, MEDA, PWD, MSEDC etc. for convergence of various developmental schemes of different agencies in the same village to develop cluster of villages into model villages, the areas of excellence.

SECTION 9: OTHER REGULATIONS

i. **Fire Protection**: The area needs to be strictly fire protected annually. These areas are quite susceptible to fires. Effective protection against fire for the period from February 15th to June 15th is a must to ensure survival and establishment of natural regeneration of all species for developing them into future growing stock. Special fire lines shall be provided and they should be cleared annually. Firewatchers shall be appointed during the summer season. Entire area of this Working Circle shall be

rigidly fire-protected and shall be classified as class I forest areas with reference to fire protection, the details of which are given in the 'Miscellaneous Regulations'.
Joint forest management committees' shall be formed and a comprehensive fire fighting scheme shall be chalked out, the details of which are given in the 'Miscellaneous Regulations'.

ii. **Closure to Grazing**: Entire area shall remain closed to grazing completely for a period of 5 years from the 1st year of its working.

iii. **Protection Measures**: The area will be strictly protected from illicit felling and encroachments including seasonal encroachment for the purpose of agriculture.

iv. Resolving conflict with Micro Plans made under JFM/ FDA: If any conflict is noticed between the prescriptions given in this WC and the Micro Plan written under JFM, FDA etc. for the same area, then the said area shall be treated in accordance with the special objects of management pertaining to this W.C. and suitable amendments shall be made in the Micro Plan, if necessary.

v. The prescriptions of this WC will not be applicable on areas bearing Seed Orchards, Sample Plots, Candidate Plus Trees, Plantations, nurseries etc falling in the areas allotted to this WC and which are otherwise in possession of the Silva MS. These areas are managed with a perspective of research and extension in forestry and hence will be managed as per their Silviculture requirements as included in the Plan of Operations duly approved by Research and Advisory Committee (RAC), MS chaired by the PCCF.

vi. The Workshops should be organized in each Range to sensitize and train the field staff in implementing the prescriptions of this WP. The induction training of the field staff should be organised on priority by the CF, Education Circle which will help in effective implementation of various WP prescriptions.

CHAPTER –11

MAHABALESHWAR - PANCHGANI ECO-SENSITIVE ZONE WORKING CIRCLE

SECTION 1: GENERAL CONSTITUTION

This Working Circle comprises of the forest areas of Mahabaleshwar Panchgani region that has been declared as Eco sensitive Zone by Ministry of Environment and Forests Notification dated 17th January, 2001. This region is environmentally sensitive and includes the entire forest area within the boundaries of Mahabaleshwar taluka, part of Wai taluka and the villages of Bondarwadi, Bhuteghar, Danwali, Taloshi and Umbri of Javli taluka of Satara district. The forest area under this Working Circle is 16141.10 ha. which is 12.33 % of the total forest area being dealt in this Plan.

Table No. 26 : Allotment of area

Sr.No.	Range	Area of range	No. of compartments		Area allotted to the W.C.	% to area of the range	% to area of the division.
			Full	Part			
1	**Medha**	8922.21	2	6	840.52	9.42	0.6
2	**M.shwar**	20386.74	71	8	15031.11	73.72	11.48
3	**Wai**	13061.87	~	2	269.47	2.06	0.20
		Total	**73**	**16**	**16141.10**		

SECTION 2: GENERAL CHARACTERS OF THE VEGETATION

The forests of Mahabaleshwar and Panchgani belong to $_8A/C_2$ i.e. Western sub tropical hill forest as described by Champion and Seth. The area receives very heavy rainfall and is the source of important rivers like Krishna and Koyana. The high rainfall and some what temperate climate is found very suitable to the luxuriant growth of shade bearing vegetation. Trees of evergreen species predominate largely and under their canopy climbers, ferns, orchids,

Venna lake : Mahabaleshwar range

mosses and other herbaceous undergrowth are found in abundance. The important species found in the forest are Syzigium cumini, Memecylon umbellatum, Actinodaphne angustifolia, Glochidion lanceolarium, Dolichandron falcata, Terminalia chebula, Olea dioica etc. Shikekai (Acacia concinna) is found all over the forest. The rocky sides of cliffs are either bare or covered with sparse stunted vegetation. The crop is generally young to middle aged.

The reproduction of the above species is scanty. The forests are rich in biodiversity but are ecologically highly sensitive. Lopping of trees to meet the demand for fuel wood is noticed mainly around Mahabaleshwar and Panchgani townships.

SECTION 3: SALIENT FEATURES OF NOTIFICATION ON ECO-SENSITIVE ZONE

The complete text of this notification dated 17th January, 2001 notifying Mahabaleshwar Panchgani region as Eco-sensitive Zone is given in the **Appendix No. 11. 2** of Volume II. The salient features of the notification are as follows:

a. *Zonal Master Plan*: A master plan for the entire Zone shall be prepared by the State Government and approved by the MoEF, Government of India. It shall clearly indicate those limited areas where industries may be permitted. The said master plan shall clearly demarcate all the existing forests, green areas, horticultural areas such as strawberry farms, raspberry farms, orchards and other environmentally sensitive areas. No change of land use from green uses such as horticultural areas, agriculture, parks and other like places to non-green uses shall be permitted.

b. *Industrial Units*: Location of industries shall be only in the designated industrial areas and has to be as per guidelines drawn up by the Government of Maharashtra as well as the guidelines issued from time to time by the MoEF. In future only non polluting, non hazardous service industries, units making footwear from processed and ready made leather, floriculture, horticulture based or agro based industries producing products from indigenous goods from the Eco-sensitive zone shall be permitted in this zone provided that these do not result in polluting effluent, emission or impacts.

c. *Quarrying and mining*: Quarrying and mining activities shall be banned in this area. No fresh mining lease shall be granted in the Eco sensitive zone. However the Monitoring Committee shall be the authority to give special permission for limited quarrying of materials required for the construction of local residential housing and traditional road maintenance work only, provided that such quarrying is not done on forestlands.

d. *Trees*: There shall be no felling of trees whether on Forests, Government, Revenue or private lands within the Eco-sensitive zone, without the prior permission of the state government in case of forest land and the respective District Collector in case of Government, Revenue and private land.

e. Tourism: The tourism master plan shall be based on a detailed carrying capacity study of the Eco-sensitive zone, which may be carried out by the state government and submitted to the MoEF for approval. All new tourism activities, developments for tourism or expansion of existing tourism activities shall be permitted only within the parameters of this tourism plan.

Boating : Attraction of tourist

f. *Natural Heritage*: The sites of valuable natural heritage in the zone shall be identified, particularly rock formations, waterfalls, pools, gorges, groves, caves, points, walks, rides etc and plans for their conservation in their natural setting shall be incorporated in the zonal/ sub zonal master plans.

g. *Man-made Heritage*: Buildings, structures, artifacts, areas and precincts of historical, architectural, aesthetical and cultural significance shall be identified and plans for their conservation particularly their exteriors shall be prepared and incorporated in the Zonal master Plan.

h. *Ground Water*: Extraction of ground water shall be permitted only for the bonafide agricultural and domestic consumption of the occupier of the plot.

i. *Use of Plastics*: The use of plastics within the Eco-sensitive Zone shall be regulated by the Monitoring Committee.

j. *Protection of hill slopes*: The Master Plan shall indicate areas on hill slopes where construction shall not be permitted.

k. *Discharge of effluents*: The discharge of any untreated effluent is prohibited within the Eco- sensitive zone.

l. *Solid wastes*: The local authorities shall draw up Plans for the segregation of solid wastes into biodegradable and non-biodegradable components.

SECTION 4: SPECIAL OBJECTS OF MANAGEMENT

i. To conserve and protect the biodiversity in the ecologically sensitive and biodiversity rich forests of Mahabaleshwar Panchgani region.

ii. To improve and enrich the forests in and around Mahabaleshwar Panchgani region.

iii. To preserve the aesthetic and climatic amenities of the famous hill stations.

iv. To maintain and improve soil cover over the catchments of Krishna and Koyana rivers by undertaking plantations and soil conservation works.

v. Promoting eco-tourism in forest areas to increase awareness amongst people regarding importance of conservation and protection of forests and wildlife.

SECTION 5: COMPARTMENTS AND WORKING SERIES

The details of the compartments and WS allotted to this Working Circle are given in **Appendix No. 11.3**

SECTION 6: ANALYSIS AND VALUATION OF CROP

i. *Stock mapping*

All the forests included in this Working Circle are being stock mapped on 4"=1 mile scale topo-sheet. The analysis of the stock mapping exercise is given below.

Table No. 27 : Extent of plani metered area as per stock maps

Sr.No	Range	Area in ha.					Total
		Well stocked	Under stocked	Eroded scrub	Plantati-on	Blank	
1	**Medha**	402.59	0	0	0	437.93	840.52
2	**M.shwar**	11720.65	345.31	95.140	71.48	2798.53	15031.11
3	**Wai**	269.47	0	0	0	0	269.47
	Total	**12392.71**	**345.31**	**95.14**	**71.48**	**3236.46**	**16141.10**
	% to WC	**76.78**	**2.14**	**0.59**	**0.44**	**20.05**	**100**

iii. *Age & Density* :

The crop in this WC is middle aged to mature. The upper hill slopes have poor density or blank areas while the density on the lower slopes and in valleys varies from 0.5 to 0.8.

iii. *Enumeration*

The enumeration of the growing stock has been done and is being analysed below. Average total numbers of trees per hectare are found to be 434 out of which nearly 43% fall within 16-30 cm girth class while nearly 83 % fall within a larger girth class of 16-60 cm. It implies majority of the crop is young and is in pole stage. Jambhul, Anjani, Gela, Hirda, Medsing, Pisa, Bhoma, Tambat, Hadka and Nilgiri are the top ten species in terms of number of trees per hectare. 8 important NTFP species along with their stocking per hectare have been listed viz. Hirda, Medsing, Amruta, Waras, Awala, Amba, Mad and Bibi. The detailed statement showing WC wise enumeration results is given in **Appendix 8.1** of Volume II.

Table No. 28 : Number of trees per hectare

Girth Classes (cms)									
16-30	**31-45**	**46-60**	**61-75**	**76-90**	**91-105**	**106-120**	**121-135**	**Above 135**	**Total**
187.58	111.20	62.66	36.57	18.50	9.20	3.88	3.07	1.53	**434.19**

Table No. 29: Species having maximum number of trees/ha in descending order

Sr.No.	Species	No. of trees / ha.	Percentage
1	**Jambhal**	111.92	25.78
2	**Anjani**	98.64	22.72
3	**Gela**	62.32	14.35
4	**Hirda**	29.98	6.90
5	**Medsing**	19.87	4.58
6	**Pisa**	16.53	3.81
7	**Bhoma**	16.35	3.77
8	**Tambat**	15.89	3.66
9	**Hadaka**	11.84	2.73
10	**Nilgiri**	8.85	2.04

Table No. 30: Estimated number of NTFP species per hectare

Sr. No	NTFP Spp.	No./ha
1	**Hirad**	29.98
2	**Medsing**	19.87
3	**Amruta**	1.26
4	**Waras**	0.72
5	**Awala**	0.54
6	**Amba**	0.27
7	**Mad**	0.27
8	**Bibi**	0.09
	Total	**53.00**

Table No. 31 : No. of plants / ha. in natural regeneration.

Hight class (cms)			
0-90	**91-300**	**Above 300**	**Total**
340.19	255.01	14.18	**609.38**

Table No. 32 : Species having maximum number of plants / ha in descending order (N.R.)

Sr.No.	Species	Nos. / ha.	Percentage
1	**Anjani**	151.94	24.93
2	**Pisa**	96.93	15.90
3	**Jambhul**	80.67	13.24
4	**Vahiti**	52.40	8.60
5	**Bhoma**	31.34	5.14
6	**Tippan**	24.66	4.05
7	**Tambat**	17.44	2.86
8	**Amruta**	15.54	2.55
9	**Phafutaki**	13.55	2.22
10	**Medsing**	13.10	2.15

SECTION 7: WORKING CYCLE

Working cycle shall be of 20 years duration.

SECTION 8: DEMARCATION OF COUPES AND PREPARATION OF THE TREATMENT MAP

Demarcation: The annual coupes shall be demarcated one year in advance.

Preparation of Treatment map:

After the demarcation of the coupe, a treatment map shall be prepared by the field staff and shall be verified by a gazetted officer emphasising the suitability of sites for plantations if any as well as promising NR areas.

The following areas shall be shown distinctively in the map:

I Area 'A' - Protection Areas: include following areas

i. Areas with steep slopes i.e. more than $25^{0.}$

ii. Eroded areas or areas liable to erosion.

iii. Twenty meters wide strip on either side of the water courses.

II Area 'B' - Under stocked Areas: include areas with crop density less than 0.4.

III. Area 'C' - Old plantation areas: include areas under old plantations.

IV. Area 'D' - Well stocked areas: include areas with crop density more than 0.4.

The TM shall also show all prominent nallas, perennial sources of water, water bodies etc. which shall be numbered.

Treatment:

The various treatments proposed for the above mentioned areas are as follows:

I. Area 'A' :

i. The SMC works including nalla-bunding and gully plugging will be carried out wherever essential. Sites with perennial sources of water locally known, as 'jivant jhirra' should be tackled appropriately as explained under 'general prescriptions'.

ii. In the accessible under stocked areas having good soil depth, seed-dibbling shall be done to suitably clothe the area. Bamboo and other suitable species shall be planted in accessible under stocked areas within 20 meters wide strip on either side of water courses.

iii. Felling is not prescribed.

II. Area 'B' :

i. The SMC works like van tale, bandharas, nalla-bunding, gully plugging etc will be carried out wherever required. Sites with perennial sources of water locally known, as 'jivant jhirra' should be tackled appropriately as explained under 'general prescriptions'.

ii. Suitable miscellaneous species shall be planted in the accessible under stocked areas having good soil depth and which are more than 2 hectares in extent in a compact block. In smaller areas seed dibbling shall be done.

iii. Rooted stock shall be properly tended.

iv. Felling is not prescribed.

III Area 'C' :

i. Felling or thinning is not prescribed.

IV Area 'D' :

i. The SMC works like van tale, bandharas, nalla-bunding, gully plugging etc will be carried out wherever required. Sites with perennial sources of water locally known, as 'jivant jhirra' should be tackled appropriately as explained under 'general prescriptions'.

ii. Felling is not prescribed.

SECTION 9: GENERAL PRESCRIPTIONS

Most of the areas included in this Working Circle are situated in the Western Ghats and has hilly and rugged terrain. The main objective is to manage the runoff water and maintain the vegetation cover. This will mitigate the rate of soil erosion in the various catchments and will also check the silt inflow in the reservoirs, thereby increasing their life. The following prescriptions shall be followed:

i. Management of run-off water will be of utmost importance as most of the villages suffer from water scarcity for few months during summers. All major nallas, perennial sources of water, water bodies etc. shall be shown prominently in the treatment map. All prominent nallas shall be numbered and a plan shall be chalked out to treat all these nallas, gullies following ridge to valley concept. Each selected nalla shall be treated completely with series of loose boulder structures (LBS) at the top to arrest the speed of the run off along with the fertile soil being washed away. At the appropriate sites downstream, suitable water harvesting structures like forest tanks i.e. 'van talis', Kolhapuri bandharas etc. shall be taken. In addition, various soil moisture conservation works like gully plugging, gabion structures, brushwood dams, Vanrai bandharas, contour bunding, contour trenching, van talis, etc. shall be done as per suitability and requirement of the area. Ridge to valley concept shall be followed while treating the watershed. Water level in the village wells shall be monitored regularly by the forest staff and raised water level in the village wells during the scarcity period or raised ground water level and resulting changes in land use pattern, and increased productivity of crops and vegetables shall be taken as indicators of success.

ii. Sites with perennial sources of water locally known, as 'jivant jhirra' within the forest areas shall be identified and their locations shall be marked on the map of each Range, which shall be displayed prominently in each Range office. These sites shall be tackled appropriately through various means like desilting, deepening, diverting small trickles into dug out troughs

adjacent to nallahs, construction of Forest tanks locally known as 'Van-talis' in the nearby vicinity. This will ensure availability of water sources for wild animals and reduce straying of those animals into agricultural fields thus reducing conflict situations.

iii. Accessible under-stocked areas with good soil-depth and more than 2 hectares in extent in a compact block shall be planted with suitable local species. In smaller areas, seed-dibbling shall be done to suitably clothe the area. In blank areas with shallow soil where plantations of trees species cannot be raised, Agave species especially Agave sisalana will be planted. Natural tussocks forming grasses should be introduced. Follow the various prescriptions for tending of regeneration in the accessible areas, which have been discussed under Section 8 of chapter on 'Afforestation Working Circle'.

iv. Any fellings in these areas will enhance the soil erosion and landslides. It is also not feasible to work these areas systematically and economically due to their remoteness and inaccessibility. Hence to preserve the environment and eco system of this region, fellings and thinnings are not prescribed in this Working Circle. All areas included in this Working Circle shall be given complete protection.

v. Only dead and wind fallen trees/ fire wood shall be removed from the accessible areas, leaving 2 dead trees per hectare. The collection of firewood from the annual coupes will be done departmentally by engaging local labourers. The dead and wind fallen trees will be converted into billets in the coupe itself which will be transported to suitable depots during fair season and will be sold as per the Government directives in force. This will be done on experimental basis for 2-3 years after which review will be taken to facilitate further decision.

vi. Forest protection in this region is of utmost importance. It should be ensured that non-forest activities are not carried on in forest areas except in accordance with law. The lopping of trees in forests by 'head loaders' for rising fuel demand needs to be tackled on both fronts i.e. by providing cheaper and easily available alternatives as well as preventing it by heavy protection measures. The Hon. Bombay High Court in Writ Petition No. 2754 of 1997 had directed the state government to expeditiously and favourably consider the question of infrastructural requirements and facilities, especially as to the provision of adequate housing and vehicles for forest department staff, stationing of women police personnel, granting of subsidy for wood depot, establishing a kerosene pump in a suitable location in Mahabaleshwar to serve as an alternative fuel source and making available funds for soil conservation and forest preservation. These directions should be implemented so as to ease the pressure off the forests.

vii. Collection of Non Timber Forest Produce (NTFP) shall be permitted according to prescribed rules. Care shall be taken to not to cause any harm to the plants and trees while collecting NTFP. Karvi (*Strobilanthes callosus*) has become a major weed in the forests of Mahabaleshwar-Panchgani region. It otherwise has large demand to be used as fencing material. It blooms once in seven years and dies thereafter to become a major fire hazard in the forests. Hence it shall be allowed to be removed on rated passes only in the areas wherever gregarious flowering is noticed within the eco-sensitive zone.

viii. No quarrying or mining permissions would be given considering the highly sensitive eco system of this area.

ix. Forest areas should be surveyed and well demarcated with pillars to prevent any kind of encroachments. All authorized stalls in the forest areas around Venna Lake should be relocated and all unauthorised stalls around Venna Lake should be removed as per the directions given by the Hon. Bombay High Court in Writ Petition No. 2754 of 1997.

x. All 'View Points' and 'Horse Rides' require regular maintenance and protection. Hence all necessary measures should be taken to maintain and protect them. Railings and steps leading to 'View Points' should be repaired wherever necessary. The bushes as well as branches of trees hindering the views from various 'View points' should be pruned if necessary in the month of October every year. Trenches should be dug across the entry points of all 'Horse Rides' in such a way that only pedestrians and horses could enter. It will ensure protection to forests around the 'Rides' as well as least damage to the paths. The eco-tourism projects can be developed in and around such forest areas having scenic spots. Infrastructure for awareness creation like setting up of Nature interpretation centres, Nature trails, Watch towers, Pagodas, Log huts and Camping sites etc may also be developed. Necessary prior permission under FCA from the competent authority should be taken wherever required.

xi. The competent authority may think of levying parking fee for the tourist vehicles being parked at the assigned parking areas within forests near and around different 'View Points'. A mechanism may also be developed by the competent authority if feasible to plough back the revenue so generated through parking of vehicles as well as by way of entry fee to Pratap Sinh Van Udhyan for the maintenance of 'View Points' and Udhyan.

xii. The DCF should also ensure that no sewage is being discharged into forest lands, lakes or rivers as per the directions given by Hon. Bombay High Court in Writ Petition No. 2754 of 1997.

xiii. Each village in a watershed shall be taken as a unit of holistic development. It shall be endeavored to integrate forestry management interventions with development schemes of other departments under JFM, FDA, IWDP, DRDA, District Plan etc. for socio-economic upliftment of the village communities with an objective to develop clusters of villages in various watersheds. Proper linkages shall be developed with other departments like Animal husbandry, Fisheries, Horticulture, Minor irrigation, Social forestry, MEDA, PWD, MSEDC etc. for convergence of various developmental schemes of different agencies in the same village to develop cluster of villages into model villages, the areas of excellence.

SECTION 10: CHOICE OF SPECIES

The main tree species to be planted shall be Hirda, Pisa, Jambul, Bhoma, Anjani, Par- Jambhul and other local species. All these species will be favoured to others and their growth will be encouraged. In addition, the plantable under stocked areas, blanks and view points will be planted with fast growing species like *Grewelia robusta, Eucalyptus grandis, Casuarina cunnighamiana, Acrocarpus fraxinifolious, Khayaa senegalensis, Khaya grandifolia, Populus*

ciliate, Populus eufretic, Cuprenus, Pinus patula, Pinus roxburghii, Pinus gnegii, Pinus elliottii, Quarcus serrata, Salix (willow) on nalla side, Podocarpus spp. and other species occurring naturally in the areas of Matheran, Khandala and Karnala in and around Mahabaleshwar. In blank areas with shallow soil local species like Karvi, Lantana, Vitex, Toran, Murudishing, Lokhandi, Amruta etc shall be planted while Agave suckers and Grass tussock shall be planted in the blank areas. Agave species especially Agave sisalana will be planted.

SECTION 11: OTHER REGULATIONS

i. **Fire Protection**: The area needs to be strictly fire protected annually. These areas are quite susceptible to fires. Effective protection against fire for the period from February 15th to June 15th is a must to ensure survival and establishment of natural regeneration of all species for developing them into future growing stock. Special fire lines shall be provided and they should be cleared annually. Firewatchers shall be appointed during the summer season. Entire area of this Working Circle shall be rigidly fire-protected and shall be classified as class I forest areas with reference to fire protection, the details of which are given in the 'Miscellaneous Regulations'. 'Joint Forest Management committees' shall be formed and a comprehensive fire fighting scheme shall be chalked out, the details of which are given in the 'Miscellaneous Regulations'.

ii. **Closure to Grazing**: Entire area shall remain closed to grazing completely for a period of 5 years from I year of its working.

iii. **Protection Measures**: The area will be strictly protected from illicit felling and encroachments including seasonal encroachment for the purpose of agriculture.

iv. **Clearing of "View Points":** The work of clearing the "View Points" will be done annually in October by the forest department.

v. **Resolving conflict with Micro Plans made under JFM/ FDA:** If any conflict is noticed between the prescriptions given in this WC and the Micro Plan written under JFM, FDA etc. for the same area, then the said area shall be treated in accordance with the special objects of management pertaining to this W.C. and suitable amendments shall be made in the Micro Plan, if necessary.

vi. The prescriptions of this WC will not be applicable on areas bearing Seed Orchards, Sample Plots, Candidate Plus Trees, Plantations, nurseries etc falling in the areas allotted to this WC and which are otherwise in possession of the Silva MS. These areas are managed with a perspective of research and extension in forestry and hence will be managed as per their Silviculture requirements as included in the Plan of Operations duly approved by Research and Advisory Committee (RAC) MS chaired by the PCCF.

vii. The Workshops should be organized in each Range to sensitize and train the field staff in implementing the prescriptions of this WP. The induction training of the field staff should be organised on priority by the CF education which will help in effective implementation of various WP prescriptions.

CHAPTER - 12
IMPROVEMENT WORKING CIRCLE

SECTION 1: GENERAL CONSTITUTION

This Working Circle includes areas that are capable of producing medium size timber of teak and valuable miscellaneous species viz. Ain, Bibla, Kalamb, Shisham, Tiwas, Sawar, Shiras and Khair. The area of the forest included in this Working Circle is 24257.87 ha. which is nearly 18.53 % of the total forest area.

Table No. 33 : Allotment of area to the WC

Sr.No.	Range	Area in ha.	No. of compartments		Area allotted to W.C.	% to area of range	% to area of the division
			Full	Part			
1	**Dhebewadi**	10111.80	33	~	4057.99	41.44	**3.20**
2	**Karad**	13031.18	35	1	5519.23	42.64	**4.24**
3	**Khandala**	6147.38	2	~	578.48	9.41	**0.44**
4	**Khatav**	7073.23	8	3	1227.25	12.44	**0.68**
5	**Koregaon**	10171.22	15	4	3164.53	32.99	**2.56**
6	**Medha**	8922.21	1	1	59.30	6.34	**0.43**
7	**Patan**	12708.97	22	1	3307.57	24.72	**2.40**
8	**Satara**	8773.60	19	2	3276.58	31.98	**2.14**
9	**Wai**	13061.87	19	~	3066.94	24.36	**2.43**
		Total	**154**	**12**	**24257.87**		

SECTION 2: GENERAL CHARACTER OF VEGETATION

The forest largely belongs to the type $_5A/C_{1b}$ i.e. Dry teak bearing forest. The forests are rather of poor quality. The growing stock has been considerably damaged due to frequent fires, over-grazing and illicit cutting. At many places teak is the predominant species but in stunted coppice form. It is found in association with Ain, Dhaoda, Hela, Shisham, Bibla and Khair etc. The area is mostly under stocked or blank. Regeneration of teak is poor.

SECTION 3: SPECIAL OBJECTS OF MANAGEMENT

i. To improve and enrich the condition of the existing growing stock within the forests
ii. To manage the run-off water and to improve the water regime within the forests.
iii. To maintain and improve soil cover within forest areas by undertaking plantations and soil conservation works.
iv. To meet demands of local people for fuel wood and small timber to some extent.

SECTION 4: COMPARTMENTS AND WORKING SERIES

This Working Circle is divided into 20 Working Series. The details of the compartments and WS allotted to this Working Circle is given in **Appendix No. 12.3 of Volume II.**

SECTION 5: ANALYSIS AND VALUATION OF CROP

i. S*tock mapping*

All the forest areas included in this WC are being stock mapped on 4"= 1 mile scale toposheets with the help of local territorial staff. The details of the stock mapping exercise for the areas included in this Working Circle are given below.

Table No. 34 : Extent of planimetered area as per stock maps

Sr. No	Range	Area in ha.					Total
		Well stocked	Under stocked	Eroded scrub	Plantati -on	Blank	
1	**Dhebewadi**	1696.23	1334.16	226.38	94.60	706.62	4057.99
2	**Karad**	2595.82	268.47	597.37	73.76	1983.81	5519.23
3	**Khandala**	55.35	55.00	80.78	294.22	93.13	578.48
4	**Khatav**	621.12	136.87	26.77	54.78	387.71	1227.25
5	**Koregaon**	1034.45	21.45	481.63	502.68	1124.32	3164.53
6	**Medha**	00	00	00	22.33	36.97	59.30
7	**Patan**	1043.14	975.00	30.37	288.98	970.08	3307.57
8	**Satara**	1014.93	714.79	122.88	314.94	1109.04	3276.58
9	**Wai**	1596.22	66.17	443.04	604.32	357.19	3066.94
	Total	**9657.26**	**3571.91**	**2009.22**	**2250.61**	**6768.87**	**24257.87**
	% to WC	**39.81**	**14.72**	**8.28**	**9.28**	**27.88**	**100**

ii. Age and Density:

The crop in general is young to middle aged. The mature and over mature trees are few and scattered in the area. The forests included in this WC are generally under stocked and density varies from 0.1 to 0.4. Few scattered patches are with high-density up to 0.5 to 0.8.

iii. *Enumeration* **:**

The enumeration of the growing stock has been done and is being analysed below. Average total numbers of trees per hectare are found to be 243 out of which nearly 61% fall within 16-30 cm girth class while nearly 96 % fall within a larger girth class of 16-60 cm. It implies majority of the crop is young and is in pole stage. Sag, Glyricidia, Dhawada, Ain, Salphal, Mohi,Acacia, Khair, Nilgiri, Kashid are the top ten species in terms of number of trees per hectare. 9 important NTFP species along with their stocking per hectare have been listed below. Palas, Bibi, Karanj, Apta, Awala, Hirda, Jambhal, Medsing and Chinch. are the top nine NTFP species in terms of stocking. A detailed statement showing WC wise enumeration results is given in **Appendix 8.1** of Volume II.

Table No. 35 : Number of trees per hectare

Girth Classes (cms)									
16-30	**31-45**	**46-60**	**61-75**	**76-90**	**91-105**	**106-120**	**121-135**	**Above 135**	**Total**
147.26	66.44	20.46	5.84	1.65	0.55	0.43	0.34	0.09	**243.06**

Table No. 36 : Species having maximum number of trees/ha in descending order

Sr.No.	Species	Nos. / ha.	Percentage
1	**Teak**	83.78	34.46
2	**Glyricidia**	28.93	11.90
3	**Dhawada**	23.34	9.60
4	**Ain**	15.88	6.53
5	**Salphal**	14.37	5.91
6	**Mohi**	8.76	3.60
7	**Acacia**	7.63	3.14
8	**Khair**	5.29	2.18
9	**Nilgiri**	2.96	1.22
10	**Kashid**	2.19	0.90

Table No. 37 : Estimated number of NTFP species per hectare

Sr. No	NTFP Spp.	No./ha
1	**Palas**	1.48
2	**Bibi**	1.29
3	**Karanj**	1.10
4	**Apta**	1.08
5	**Awala**	0.34
6	**Hirda**	0.27
7	**Jambhal**	0.24
8	**Medsing**	0.24
9	**Chinch**	0.06
	Total	**6.10**

Table No. 38 : No. of plants / ha. in natural regeneration.

Hight class (cms)			
0-90	**91-300**	**Above 300**	**Total**
56.16	40.13	1.35	**97. 64**

Table No. 39 : Species having maximum number of plants / ha. in descending order (N.R.)

Sr.No.	Species	Nos. / ha.	Percentage
1	**Dhavada**	27.97	21.32
2	**Dhayati**	27.97	21.32
3	**Glyricidia**	12.04	9.39
4	**Hekal**	12.04	9.39
5	**Teak**	9.95	7.76
6	**Ain**	5.20	4.05
7	**Khair**	3.98	3.10

SECTION 6: SILVICULTURAL SYSTEM

The crop is young to middle aged and is mainly situated on moderate slopes. Number of mature trees for harvesting purpose is very few. Therefore any silvicultural system involving selection fellings and creating larger openings in the canopy is not suitable to these areas. The objective here essentially is to improve and enrich the existing growing stock by carrying out improvement works including 'improvement fellings'. But 'improvement fellings/ works' do not constitute any silvicultural system; they are being carried out only with a view to improve the crop which may be worked under a suitable silvicultural system in future.

Misc. forest in Dhebewadi range

SECTION 7: WORKING CYCLE

The Improvement cycle has been fixed at 20 years. The period is also sufficient for the successful establishment of the regeneration.

SECTION 8: HARVESTABLE GIRTH

Improvement fellings shall include removal of dead, diseased, unsound and malformed trees for which there is no need to prescribe any harvestable girth. Removal of malformed trees should be limited to only coppicing species. The removal of such trees shall help establishment of NR along with overall improvement of the forest flora. No such fellings shall however be done to create permanent openings in the canopy.

SECTION 9: FORMATION OF COUPES

The details of sequence of working of annual coupes are given in **Appendix no. 12.3 of Volume II.**

SECTION 10: REGULATION OF YIELD

Since only improvement fellings have been prescribed, the yield of timber will be negligible and hence has not been calculated.

SECTION 11: AGENCY OF HARVESTING

The coupes will be worked departmentally or by an agency as per the prevalent government rules/ policy.

SECTION 12: DEMARCATION OF COUPES AND PREPARATION OF THE TREATMENT MAP

Demarcation: The main annual Improvement coupes shall be demarcated in advance.

Preparation of Treatment map:

After demarcation of the coupe, a treatment map shall be prepared by the field staff and shall be verified by a gazetted officer emphasizing the suitability of sites for SMC as well as other improvement works.

The following areas shall be shown distinctively in the map:

I. Area 'A' - Protection Areas : It shall include the following areas.

i. Areas with steep slopes i.e. more than $25^{0.}$

ii. Eroded areas or areas liable to erosion.

iii. Twenty meters wide strip on either side of the water courses.

II. Area 'B' - Under stocked Areas : include areas with crop density less than 0.4.

III. Area 'C' - Old plantation areas **:** include areas under old plantations.

IV. Area 'D' - Well stocked areas : include areas with crop density more than 0.4.

Treatment: The various treatments proposed for the above mentioned areas are as follows:

I. Area 'A' :

i. The SMC works including nalla-bunding and gully plugging will be carried out wherever essential. Sites with perennial sources of water locally known, as 'jivant jhirra' should be tackled appropriately as explained under 'general prescriptions'.

ii. In the accessible under stocked areas having good soil depth, seed-dibbling shall be done to suitably clothe the area. Bamboo and other suitable species shall be planted in accessible under stocked areas within 20 meters wide strip on either side of water courses.

II. Area 'B' :

i. The SMC works like van tale, bandharas, nalla-bunding, gully plugging etc will be carried out wherever required.

ii. Accessible under stocked areas having good soil depth and more than 2 hectares in extent in a compact block shall be planted with suitable miscellaneous species while in areas less than 2 ha. in extent, seed dibbling shall be done.

iii. Rooted stock shall be properly tended.

III. Area 'C' :

i. Old plantations shall be treated as given under 'Marking Rules'.

IV. Area 'D' :

i. No planting shall be done in these areas.

ii. Improvement fellings shall be done as prescribed under 'Marking Rules'.

SECTION 13: MARKING TECHNIQUE AND MARKING RULES

a. Marking technique for the trees to be marked for felling is discussed in the chapter on 'Miscellaneous Regulations'.

b. Marking Rules: Marking shall be done under the close supervision of the R.F.O. The ACF and the DCF shall inspect majority of the marked coupes to impart proper guidance and instructions to the staff as well as to guard against excessive marking if any.

I. Area 'A' :

i. No tree shall be marked for felling.

II. Area 'B' **:**

i. No tree shall be marked for felling.

ii. All live high stumps shall be cut flush to the ground and shall be dressed thereafter with a sharp axe to get vigorous coppice shoots.

iii. The established multiple coppice shoots and poles shall be reduced to one per stool retaining the vigorous one while the newly risen coppice shoots shall be removed.

iv. The undesirable under-growth which is preventing or likely to prevent the development of seedling regeneration of the desired species shall be removed.

III. Area 'C' :

i. Old successful plantations shall be treated as per the prescriptions and sequence of working as given in the 'Old Plantations Management W.C.'.

ii. Any other successful old plantation or its part on slopes less than 25° that is not included in 'Old Plantations Management WC' inadvertently but falls within the coupe shall be worked as per its year of formation and sequence of working given for other plantations.

IV. Area 'D' :

i. All climbers on the trees except those having medicinal properties and which are used and traded shall be cut.

ii. Only dead, diseased, unsound and malformed trees shall be marked for felling, retaining two dead trees per hectare for the benefit of the wild-life.

iii. All live high stumps shall be cut flush to the ground and shall be dressed thereafter with a sharp axe to get vigorous coppice shoots.

iv. The entire multiple coppice tree or pole crop shall be marked to reduce the number of stems or poles to one per stool retaining the most promising one.

v. No fruit tree shall be marked for felling.

vi. The undesirable undergrowth which is preventing or likely to prevent the development of seedling regeneration of the desired species shall be removed.

- *A tree will be considered as*

(a) ***Unsound*** *when its bole emits a hollow sound when struck by any hard object or when it does not have any marketable timber.*

(b) ***Malformed*** *if it is badly shaped having defective stem or abnormal crown occupying more space than its future value warrants and includes conditions like stag headedness, gnarls, twists, or constrictions due to climbers or crookedness etc., heavily burnt by fire at its base and likely to fall down, with general cavities dug in the stem for taking out honey or has many ant holes or fungus, rots or other diseased portion.*

SECTION 14: SOIL AND MOISTURE CONSERVATION WORKS

The area gets heavy average rainfall of about 2000 mm. per year but most of the valuable rain water goes waste as run-off into the streams, rivers and ultimately into the sea. Therefore a large tract of this division especially on the eastern side faces shortage of water during the summer months. The soil becomes compact during the pinch period resulting in poor drainage as well as poor aeration of the soil. Intensive SMC works viz. gully plugging, nalla-bunding, contour trenching, van-tali and other appropriate water harvesting structures shall help young regeneration to establish easily. Ridge to valley concept shall be followed while treating the watershed. A village shall be taken as a unit of holistic development. For this purpose, it shall be endeavored to integrate forestry management interventions with development schemes of other departments within the selected villages. Prescriptions 1 and 2 under Section 10 of Chapter on 'Protection and Reservoir Catchment Working Circle' should be followed.

SECTION 15: REGENERATION

The young recruits of Ain, Kinjal, Anjani, Aonla, Karvand, Jamun, Pisa, Katak, Kumbhi, Chandada, Umbar etc. appear profusely after first few showers of the season. Areas having good NR of the above species will be identified. NR within such patches shall be properly spaced and tended as well as protected from fire and grazing. The various prescriptions have been discussed in detail under Section 8 in the chapter on 'Afforestation Working Circle'.

SECTION 16: PRE-PLANTING AND PLANTING OPERATIONS

The various pre-planting and planting operations have been discussed in detail under Section 9 in the chapter on 'Afforestation Working Circle'.

SECTION 17: SUBSIDIARY SILVICULTURAL OPERATIONS

CBO: The cutting back operations shall be carried out one year after the main working in the coupe as per the following rules -

i. All left over established multiple coppice shoots and poles shall be reduced to one per stool.

ii. All newly risen coppice shoots from the freshly felled tree stumps shall be reduced to two per stool retaining the most promising ones.

iii. All newly risen coppice shoots from the old stumps shall be removed.

iv. NR shall be tended as per the prescriptions given in the Section 15.

SECTION 18: OTHER REGULATIONS

i. **Fire Protection:** Main Improvement coupe shall be fire-traced and rigidly fire-protected for a period of five years from the Ist year of its working. The area shall be cleared-off of all the dry and cut remains of bushes, leaves etc. by end of February to avoid fire hazards to standing crop as well as to NR. Effective protection against fire for a period between Feb.15 to June 15 is a must to ensure survival and establishment of NR of all species for developing it into the future growing stock. 'Joint Forest Management committees' shall be formed and a comprehensive fire fighting scheme shall be chalked out, the details of which are given in the 'Miscellaneous Regulations'.

ii. **Closure to grazing:** Main Improvement coupes shall remain closed to grazing for a period of 5 years from 1st year of its working.

iii. **Resolving conflict with Micro Plans made under JFM/ FDA:** If any conflict is noticed between the prescriptions given in this WC and the Micro Plan written under JFM, FDA etc. for the same area, then the said area shall be treated in accordance with the special objects of management pertaining to this W.C. and suitable amendments shall be made in the Micro Plan, if necessary.

iv. The prescriptions of this WC will not be applicable on areas bearing Seed Orchards, Sample Plots, Candidate Plus Trees, Plantations, nurseries etc falling in the areas allotted to this WC and which are otherwise in possession of the Silva MS. These areas are managed with a perspective of research and extension in forestry and hence will be managed as per their silviculture requirements as included in the Plan of Operations duly approved by Research and Advisory Committee (RAC) MS chaired by the PCCF.

v. The workshops should be organized in each Range to sensitize and train the field staff in implementing the prescriptions of this WP. The induction training of the field staff should be organised on priority by the CF, Education Circle which will help in effective implementation of various Working Plan prescriptions.

CHAPTER – 13

AFFORESTATION WORKING CIRCLE

SECTION 1: GENERAL CONSTITUTION

This Working Circle includes all such compartments which have sparse tree growth and open blank areas in degraded state. These areas are degraded due to biotic pressure and environmental factors. Soil depth is poor. The district has much larger population of the cattle and sheep than the carrying capacity of the forests and as such faces acute shortage of fodder especially during summer months. Large cattle and sheep population hamper the regenerative capacity of the forests. This Working Circle also includes areas having good potential to raise fodder grasses. Such areas could be the ones which are either being auctioned or allotted to JFM committees regularly or were previously allotted to 'Kuran WC' and 'Pasture WC' in Desai's Working Plan (1975-76 to 1989-90) Plan but were later allotted mainly to Afforestation WC.

The total area of this WC is 54467.38 ha. comprising mainly Maan, Khandala, Khatav and partly Phaltan tahsils and is nearly 41.60 % of the total forest area being dealt in this Plan.

Table No. 40 : Allotment of area

Sr.No.	Range	Area in ha.	No. of compartments		Area allotted to W.C.	% to area of range	% to area of the division
			Full	Part			
1	**Karad**	13031.18	49	2	7474.39	57.35	5.70
2	**Khandala**	6147.38	29	1	5468.90	88.96	4.17
3	**Khatav**	7073.23	25	13	6193.45	87.56	4.73
4	**Koregaon**	10171.22	31	15	6815.88	67.01	5.20
5	**Man**	12270.22	53	~	12270.21	100	9.37
6	**Medha**	8922.21	13	1	2257.17	25.29	1.72
7	**Patan**	12708.97	7	~	1048.38	8.32	0.80
8	**Phaltan**	8359.34	44	~	8368.63	100	6.39
9	**Satara**	8773.60	11	3	2012.42	25.21	1.69
10	**Wai**	13061.87	13	3	2557.95	19.58	1.93
	Total		**275**	**38**	**54467.38**		

SECTION 2: GENERAL CHARACTERS OF VEGETATION

This Circle includes the forests of the following main types viz. Southern dry mixed deciduous forests- $_5A/C_3$, Dry teak forests- $_5A/C_{1b}$, Dry grass lands- $_5D/S_4$. These forest areas have either sparse tree growth with bushes or totally blank and eroded areas situated on poor sites with shallow soils. The areas are over grazed. The site quality is at the most IV-b. The crop consists of bushy, thorny scrub forest with a predominance of unpalatable grasses and other weed

species. The old plantations are mostly with stunted growth and have poor stocking. The better stocked patches are due to partially successful plantations or natural crop.

There areas are largely degraded yet few green patches in the valleys, along the nallahs etc found scattered in between. In the kuran areas, prescriptions regarding developing fodder resources as given in Desai's WP were not followed and instead large scale plantations of Acacia auriculiformis, Glyricidia etc. were taken in the past. As a result, patches with good growth of grasses are few and found scattered in between largely degraded kuran areas. Grasses of lesser nutritional value like Kusali, Kunda, are the main species found growing in these areas. The site quality is IV b. The crop consists of bushy, thorny scrub forest with a predominance of unpalatable grasses and other weed species. Intention here is to maintain and improve the existing fodder resources especially the grasses in these areas. Felling of plantations of Acacia, miscellaneous species, Glyricidia etc during the Plan period will eventually open up the area under Kurans for the introduction of good quality fodder grasses.

SECTION 3: SPECIAL OBJECTS OF MANAGEMENT

i. To increase the vegetal cover and to increase the productivity of the land.

ii. To identify and develop areas having good potential to raise fodder grasses so as to augment fodder supply to meet the needs of the locals and their cattle.

iii. To conserve soil and moisture in the area by taking appropriate SMC measures.

iv. To improve the quality and quantity of fodder resources in the forests by introducing improved varieties of fodder grasses.

v. To reduce the grazing incidence in the forests and thereby improving their regenerative capacity.

vi. To recharge ground water supplies.

SECTION 4: COMPARTMENTS AND WORKING SERIES

The list of compartments allotted to different Working Series and sequence of annual coupes is given in **Appendix No. 13.4 of volume II.**

SECTION 5: ANALYSIS AND VALUATION OF CROP

i. *Stock mapping*:

The area of this Working Circle is being stock mapped on 4 inch = 1 mile toposheets and 8 inch=1 mile village maps with the help of territorial staff. Steep and precipitous slopes are practically blank and devoid of any tree growth due to absence of soil in the exposed rocks. The results of the stock mapping are given as follows.

Table No. 41 : Extent of planimetered area as per stock maps

Sr. No	Range	Area in ha.					Total
		Well stocked	Under stocked	Eroded scrub	Plantation	Blank	
1	**Karad**	2495.16	30.01	918.27	128.39	3902.56	7474.39
2	**Khandala**	920.81	293.79	1509.45	302.18	2442.67	5468.90
3	**Khatav**	2523.38	913.83	183.26	375.32	2197.66	6193.45
4	**Koregaon**	1803.97	554.93	1589.06	698.21	2169.71	6815.88
5	**Man**	3403.97	2784.52	2448.14	371.95	3261.63	12270.21
6	**Medha**	231.88	261.55	56.17	161.76	1545.81	2257.17
7	**Patan**	12.19	597.48	00	16.06	422.65	1048.38
8	**Phaltan**	1257.22	1559.03	368.55	692.57	4491.26	8368.63
9	**Satara**	292.34	310.78	23.10	246.13	1140.07	2012.42
10	**Wai**	1228.97	201.21	242.96	70.10	814.71	2557.95
	Total	**14169.89**	**7507.13**	**7338.96**	**3062.67**	**22388.73**	**54467.38**
	% to WC	**26.02**	**13.78**	**13.47**	**5.62**	**41.01**	**100**

ii. Age & Density :

The crop in this WC is middle aged to mature. The upper hill slopes have poor density or blank areas while the density on the lower slopes and in valleys varies from 0.5 to 0.8.

iii. *Enumeration* **:**

The enumeration of the growing stock has been done and is being analysed below. Average total numbers of trees per hectare are found to be 119 out of which nearly 58% fall within 16-30 cm girth class while nearly 94 % fall within a larger girth class of 16-60 cm. It implies majority of the crop is young and is in pole stage. Jambhul, Anjani, Gela, Hirda, Medsing, Pisa, Bhoma, Parjambhul, Tambat, Hadka and Kumbha Nilgiri are the top ten species in terms of number of trees per hectare. 10 important NTFP species along with their stocking per hectare have been listed viz. Khair, Palas, Bor, Medsing, Karanj, Hirda, Awala, Biba, Apta, Pangara. The detailed statement showing WC wise enumeration results is given in **Appendix 8.1** of Volume II.

Table No. 42 : Number of trees per hectare

Girth Classes (cms)									
16-30	**31-45**	**46-60**	**61-75**	**76-90**	**91-105**	**106-120**	**121-135**	**Above 135**	**Total**
69.42	33.39	8.58	5.19	1.07	0.93	0.11	0.09	0.05	**118.83**

Table No. 43 : Species having maximum number of trees/ha in descending order

Sr.No.	Species	No. of trees / ha.	Percentage
1	**Anjani**	86.05	72.41
2	**Jambhul**	29.39	24.73
3	**Ain**	29.19	24.56
4	**Gela**	21.92	18.45
5	**Pisa**	10.55	8.88
6	**Hirda**	9.20	7.74
7	**Bhoma**	8.32	7.00
8	**Parjambhul**	7.51	6.32
9	**Hadka**	7.35	6.19
10	**Kumbha**	6.74	6.67

Table No. 44 : Estimated number of NTFP species per hectare

Sr. No	NTFP Spp.	No./ha
1	**Khair**	3.48
2	**Palas**	1.33
3	**Bor**	1.14
4	**Medsing**	0.54
5	**Karanj**	0.34
6	**Hirada**	0.32
7	**Awala**	0.24
8	**Biba**	0.21
9	**Apta**	0.09
10	**Pangara**	0.08
	Total	**7.77**

Table No. 45 : No. of plants / ha. in natural regeneration.

Hight class (cms)			
0-90	**91-300**	**Above 300**	**Total**
25.91	14.32	1.56	**41.79**

Table No. 46 : Species having maximum number of plants / ha. in descending order (N.R.)

Sr.No.	Species	Nos. / ha.	Percentage
1	**Dhawada**	9.45	22.73
2	**Khair**	3.32	7.94
3	**Tambat**	1.78	4.26
4	**Ain**	1.77	4.24
5	**Amoni**	1.55	3.71
6	**Glyricidia**	1.42	3.40
7	**Hiwar**	1.33	3.18

SECTION 6: PREPARATION OF THE TREATMENT MAP

The proposed annual working units will be demarcated one year in advance of working. After demarcation of the area a treatment map shall be prepared by the field staff and shall be verified by a gazetted officer. The following areas shall be shown distinctively in the map:

I. Area 'A' - Protection Areas : include the following areas.

i. Areas with steep slopes i.e. more than $25^{0.}$
ii. Eroded areas or areas liable to erosion.
iii. Twenty meters wide strip on either side of the water courses.

II. Area 'B' - Under stocked areas: include areas with crop density less than 0.4.

III. Area 'C' - Old Plantation areas**:** include areas under old plantations.

IV. Area 'D' - Well stocked areas: include areas with crop density more than 0.4.

In addition, the TM shall also show prominently the type and location of SMC works to be undertaken.

Treatment:

The various treatments proposed for the above mentioned areas are as follows:

I. Area 'A' :

i. The SMC works including nalla-bunding and gully plugging works shall be carried out wherever needed.

ii. Cuttings of Ficus, Vitex spp. (Nirgudi), bulbils of Agave etc. shall be planted for binding the soil where ever possible.

II. Area 'B' :

These areas shall be treated in following two stages:

A) Restorative Phase: During this phase, soil and moisture conservation works shall be carried out during the initial first year. The area of the annual working unit shall be protected completely from biotic interference by digging a T.C.M. During this phase various works will be taken up as under:

i. Preparation of the T.C.M. and/ or live hedge around the working area. Preparation for the live hedge should be started before the rains set in so that the seeds/ cuttings/ seedlings of suitable local species should be sown/ planted at the onset of the rains. TCM may be dug after the rains.

ii. The SMC works like van tale, nalla-bunding, gully plugging, contour trenches etc will be carried out wherever required and as per the suitability of the area before the rains set in.

iii. Species like Chillar, Agave, Vitex negundo, Shembati (*Acacia pinnata*), bamboo, Karvand and other suitable local species should be grown on the mound of the live hedge and TCM.

iv. Singling and cutting back of the rooted stock

v. Motivating the villagers for J.F.M. shall be done during this period.

B) Productive Phase: In the second year, the planting activity shall be taken in the same annual working unit.

i. Rooted stock shall be properly tended.

ii. Suitable local miscellaneous species including medicinal plants will be planted in the under-stocked areas having good soil depth. Preferred species are indicated in the Section 8 on Regeneration. Areas prone to excessive grazing shall be excluded from planting activity.

iii. Areas with existing good growth of fodder grasses as well as areas suitable for growth of fodder grasses shall be identified and closed to grazing.

iv. Seeds of superior fodder grasses like Sheda, Pawnya, Marvel, Dinanath etc. should be sown on the freshly excavated and heaped soil bund on the lower side of the contour trenches in the suitable areas. Other suitable models for raising fodder grasses may also be used after getting prior approval from the CF (T), Kolhapur.

v. All obnoxious weeds, thorny shrubs and bushes shall be uprooted from these identified areas.

vi. No other tree species except for only suitable fodder tree species may be introduced in the erstwhile Kuran areas.

III. Area 'C' :

i. The plantations shall be treated as per the prescriptions and sequence of working as given in the 'Old Plantations Management W.C'.

ii. Any other successful old plantation or its part on slopes less than 25^0 that is not included in 'Old Plantations Management WC' inadvertently but falls within the coupe shall be worked as per its year of formation and sequence of working given for other plantations.

IV. Area 'D' :

i. No planting shall be done in these areas.

SECTION 7: SOIL AND MOISTURE CONSERVATION WORKS

The area gets heavy average rainfall of about 2000 mm. per year but most of the valuable rain water goes waste as run-off into the streams, rivers and ultimately into the sea. Therefore a large tract of this division especially on the eastern side faces an acute shortage of water during the summer months. The soil becomes compact during the pinch period resulting in poor drainage as well as poor aeration of the soil. Intensive SMC works viz. gully plugging, nalla-bunding, contour trenching, van-tale and other appropriate water harvesting structures shall be undertaken as per site requirement for helping young regeneration to establish easily. A village shall be taken as a unit of holistic development. For this purpose, it shall be endeavored to integrate forestry management interventions with development schemes of other departments within the selected villages. Prescriptions 1 and 2 under Section 8 of Chapter on 'Protection and Reservoir Catchment Working Circle' should be followed.

Smc work in Dhebewadi range

SECTION 8: REGENERATION

The young recruits of Ain, Kinjal, Anjani, Aonla, Karvand, Jamun, Pisa, Katak, Kumbhi, Chandada, Umbar etc. appear profusely after first few showers of the season. The status of NR in general can be treated as satisfactory in the western part except for the forest patches adjoining villages that are prone to fires and unregulated grazing. So to help the young recruits of above mentioned species to establish and to further induce the NR, the following prescriptions shall be followed:

i. The areas containing promising NR shall be identified inside the coupe.
ii. The undesirable undergrowth which is preventing or likely to prevent the development of seedling regeneration of the desired species shall be removed.
iii. Identified NR patches shall be properly spaced and tended and rigidly fire-protected.
iv. Coppice shoots interfering with the development of young seedlings shall be removed.

v. Soil working should be done in such a way as to loosen the top soil up to 1 mtr. (diameter) around the plants to maintain granulation of small lumps not less than about 1-2 cm size and porosity. This ensures that the top layers act not only as efficient infiltration layers but also as an effective soil mulch.

Artificial Regeneration and Choice of the Species :

The limiting factors of a plantation to be successful are listed below. They should be properly addressed before taking up any new plantation activity-

i. Timely plantation targets.
ii. Selection of suitable plantation sites.
iii. Choice of species as per the sites and as per the requirement of the village communities.
iv. Analysis and eradication of reasons for previous failures.
v. Timely release of budgetary grants.
vi. Seed procurement from known sources.
vii. Healthy and hardy nursery stock.
viii. Proper depth of trenches or pits.
ix. Proper soil-working.
x. Full protection from biotic-interference.

The choice of the species to be planted shall depend upon the area suitability of the species and its local demand and shall be decided by the DCF in close consultation with the local village communities. Local plant species should be preferred. Many of the areas like Karad, Patan, Satara and Mahabaleshwar ranges were originally teak bearing areas. So planting of teak by stumps should also be tried to some extent. The species suitable for these areas for planting are Aonla, Jambhul, Amba, Hirda, Behada, Ain, Shisham, Shiwan, Khair, Shikekai, Karvand, Asana (Grewia nervosa), Sawar, Palas, Tamal patra, Amruta, Bhokar (Cordia sp.), Bamboo etc. Areas suitable for bamboo plantations should be identified and planted preferably with locally available and sought after bamboo species viz. Managa bamboo (Oxytenanthera stocksii) using offset planting or Kanak bamboo (Bambusa bambos). However, the list of all suggested species is only indicative and not exhaustive.


Mix plantation - Satara range

Care shall be taken to give due representation to local fuel and fodder tree species (about 15% of the misc. stock) as well as to the edible fruit and NTFP tree species (another 15% of the misc. stock). Seedlings raised preferably in root-trainer containers shall be used. Tall plants of 1.5 to 2.5 years old should also be raised in the nurseries and few plantations may be raised using these tall plants in 1x1 mt deep pits on the barren hillocks on experimental basis. The DCF should consult the Silva MS for seeking his guidance to introduce certain new/exotic/endangered species for field trials in a limited way which have been found to

successfully establish after fair trials in the research areas. The DCF may also try to raise plantations using drip irrigation at suitable places having permanent source of water.
Suitable fodder grasses shall also be raised either on the mounds of the contour- trenches or on the fodder beds as per the plantation model adopted. The objective shall be to provide fuel and fodder to the local community under JFM and to encourage them to raise fast growing fuel and fodder trees and fodder grasses on the mounds of their fields or fallow lands and community lands under appropriate schemes of the Social Forestry department so as to make them self-sufficient and to reduce their dependence on forests. Fodder so produced shall be disposed of to the JFMCs of the area as per the provisions pertaining to JFM given in the Government of Maharashtra, Resolution no. MSC/ 2000/ case no. 143/ F-2 dated 25.04.2003 and fodder grass disposal as formed by Govt. of Maharashtra vide order No. TAG / 1089 / C.R./ 2161 / Mumbai 11, dt. 20/10/1989

SECTION 9: PRE-PLANTING AND PLANTING OPERATIONS

i) Pre-planting operations:

PPO shall be carried out during the restorative phase i.e. one year before the actual planting works are to be taken up.

(a) Soil Working:

It will include digging up of pits/trenches along with nalla-bunding, check-dams and other SMC works. Proper depth of the pits/trenches as per the plantation model is essential for the early establishment of the seedlings and therefore should be given appropriate attention by the inspecting officers.

(b) Fencing:

The area to be planted shall be fenced with a TCM but care shall be taken not to dig it across the contour and instead live-hedge fencing shall be provided across the contour. On the mound of the TCM, a row of suitable fast growing species like Chillar, Ipomoea, Vitex negundo, Acacia pinnata (Shembati) shall be planted along with Agave bulbils and tussocks of Khus and Sabai grasses on either side. Karvand and Bamboo may also be planted at suitable places on the TCM. In the drier areas on the eastern side of the district, Prosopis and Parkinsonia can be the preferred species to be planted on the mound. Repair of the TCM in the following years shall be attended to, if required in order to keep it effective and cattle-proof. Live-hedge fencing works should be started before the rains.

(c) *Nursery:*

Nursery shall be raised well in time using root trainers/ poly pots as per the yearly requirement of the stock. *Only good quality seeds of known origin should be used. The Silva MS has maintained many seed orchards across the State*. The DCF should first try to procure good quality seeds of the required species from the Silva as well as from the seed units of the FDCM for raising nurseries. Adequate budgetary grants must be provided to the DCF in time so as not to affect the nursery operations. Nursery stock should be a judicious mix of indigenous species valuable to the local community for their daily needs like that of timber, fuel, fodder, NTFP as well as of bamboo. *Tall plants (1.5 to 2.5 years old) of miscellaneous species should also be raised in the nursery so as to introduce them in the field at a large scale.* The stock should be

tended with great care so that the seedlings of various species grow into healthy and hardy planting stock and attain sufficient height and age before they are planted out. The sorting and grading of the planting stock should be done on regular basis and only healthy and hardy seedlings of sufficient height and age should be allowed to leave the nurseries for planting in the field. A list of central nurseries are given in **Appendix no. 13.1 of Volume-II.**

ii) Planting Operations :

(a) Planting

The planting of miscellaneous species shall be done in the pits/ trenches during the Productive phase in the next year. It shall be completed within a fortnight from the outbreak of monsoons. *The DCF should also try to raise irrigated plantations using drip irrigation at suitable places having permanent source of water. Afforesting barren, degraded sites, hillocks with tall plants in deep pits/ trenches as per the requirement of the site should also be tried.*

(b) *Weedings, Soil-working and Casualty-replacement*

Weedings, Soil-working and Casualty-replacement shall be done timely and as per the plantation model adopted. Proper soil-working of the seedlings planted is absolutely essential and therefore close attention should be given to it by the inspecting officials.

SECTION 10 : OTHER REGULATIONS

i. **Fire Protection:** Main Afforestation coupe shall be fire-traced and rigidly fire-protected for a period of five years from the Ist year of its working. The area shall be cleared-off of all the dry and cut remains of bushes, leaves etc. by end of February to avoid fire hazards to standing crop as well as to NR. Effective protection against fire for a period between Feb.15 to June 15 is a must to ensure survival and establishment of NR of all species for developing it into the future growing stock. 'Joint Forest Management committees' shall be formed and fire tracing and other related works will be carried out through these committees.

ii. **Closure to grazing:** Coupe shall remain closed to grazing for a period of 5 years from the Ist year of its working.

iii. **Resolving conflict with Micro Plans made under JFM/ FDA**: If any conflict is noticed between the prescriptions given in this WC and the Micro Plan written under JFM, FDA etc. for the same area, then the said area shall be treated in accordance with the special objects of management pertaining to this W.C. and suitable amendments shall be made in the Micro Plan, if necessary.

iv. The prescriptions of this WC will not be applicable on areas bearing Seed Orchards, Sample Plots, Candidate Plus Trees, Plantations, nurseries etc falling in the areas allotted to this WC and which are in possession of the Silva MS. These areas are managed with a perspective of research and extension in forestry and hence will be managed as per their Silviculture requirements as included in the Plan of Operations duly approved by Research and Advisory Committee (RAC) MS chaired by the PCCF.

v. The Workshops should be organized in each Range to sensitize and train the field staff in implementing the prescriptions of this WP. The induction training of the field staff should be organised on priority by the CF, Education Circle.

CHAPTER – 14

WILD LIFE (OVERLAPPING) WORKING CIRCLE

SECTION 1: GENERAL CONSTITUTION

The forests along the western side of Satara district are rich in wildlife biodiversity. Their continued existence is crucial for the long-term survival of the biodiversity and the ecosystems supporting them. This WC overlaps with the entire area being dealt in the WP.

SECTION 2: SPECIAL OBJECTIVES OF MANAGEMENT

i. To conserve and protect the rich wildlife bio-diversity.

ii. To reduce man-animal conflict situations.

iii. To strengthen the corridors connecting the two sanctuaries in this district along the Western Ghats.

iv. To increase habitat suitability in areas rich in wild animal populations or endemic and rare species such as Kukudwad or Mayani in Dahiwadi Range, Kas lake area in the Satara Range etc.

v. To train the staff and to strengthen the infrastructure to handle wildlife emergencies.

SECTION 3 : GENERAL DESCRIPTION OF VEGETATION

The forest types that occur in this WC as per Champion and Seth classification are 1) Western sub tropical hill forest 2) West coast semi evergreen forest 3) Southern moist mixed deciduous forest 4) Southern dry mix deciduous forest, 5) Dry teak forest and 6) Dry grass lands. The floristics of these forest types have already been discussed in the previous chapters. From wild life point of view, by and large two regions of the division can be considered I) Eastern portion of the division mainly comprising of Southern dry mix deciduous forest, Dry teak forest and Dry grass lands and ii) Western portion of the division mainly comprising of rest of the forest types.

However, the increase in human population resulting in increasing demands for housing and agricultural land, easy access into forest areas through the development of an extensive road network, diversion of forest for various “developmental” projects, mining, hangover of shikar traditions, paucity of staff and no specific schemes for wildlife conservation in areas other than sanctuaries have all contributed to the decline of wildlife in the district. The habitats of the wild animals have been drastically reduced and the populations of wild animals that remain feel cornered in small isolated pockets of wilderness. The contiguous patches of forests are lost in most areas of the district. It is important to note that although the focus of wildlife protection has normally been on the bigger wild animal species like the Tiger and Gaur, the Western Ghats harbour innumerable small endemic and extremely rare species of plants and animals many of

which may not even have been reported as yet. These gene pools assume great significance in today's shrinking world and all out efforts are required to ensure their protection and conservation.

The Western Ghats running along the western boundary of the district and the adjoining forest areas however still have good populations of wild animals and plants. The two areas in the district viz. Koyana and Chandoli were declared wild life sanctuaries vide Govt. notification no. WLP 1085 / CR-588 / V / F-5, dated 16/9/1985 and WLP 1085 / CR-588 / II / F-5, dated 16/9/1985 respectively. Chandoli sanctuary area has been declared as a National Park vide. Govt. notification no. WLP 1099 / CR 117 / F-1, dated 14/5/2004.

SECTION 4 : DISTRIBUTION OF WILD LIFE

Wild life is rich and varied in the Western part of the division i.e. along the Western Ghat where there is natural protection due to inaccessibility and scanty population. In this part the animals found are Tiger, Panther, Bear, Gaur, Sambar, Bhekar, Wild boar, Wild dog, Indian giant squirrel etc.; in the Eastern part where climate is comparatively dry and dry grass lands occur, the animals found are Chinkara, Hyaena, Wolf, Jackal, Fox etc. Animals found in both Eastern and Western parts are Hare, Porcupine, Jungle cat, Common tree cat, Grey mongoose, Monkeys etc.

Indian sand grouse, Green pigeon, Stone plover, Bald coot, Egrets are common throughout the division. Jungle bush quail, Rain quails, Painted partridge, Jungle fowl etc. are mostly found in the Western part of the division. Grey partridge is generally found in the sugar cane fields in the East.

The Pelicans, Spoon bills, White ibis, Whistling teals, Brahminy ducks are found in large rivers.

Mayani Lake – Waduj range

White necked storks and Black necked storks are found only in winter season. The Demoiselle crane is the only crane seen in the rivers around March. Other birds viz. Indian roller, Pied kingfisher, Koel, Paradise fly catcher, Crow pheasant, Bulbul, Parakeets, Oriole, Hawks, Eagles and Owls are common in the division. In the lake at Mayani, the local as well as migratory birds especially the Siberian cranes, Flamingoes, Demoiselle cranes etc are found.

SECTION 5 : LEGAL POSITION

There were no written regulations for control over hunting when these areas were under the erstwhile Sansthan and Jahagiris except that hunting by people other than the Rulers

was generally not permitted. The Wild Birds and Animal Protection Act of 1912 was the first legislation which was implemented in the forests under British regime. However the provisions of this Act were not enough to control the hunting of wild animals. The Indian Forest Act of 1927 had provisions under section 26 (1) (i) and 32 (j) for protection of wild animals in notified Reserved and Protected Forests but these provisions were not applicable outside notified Reserved and Protected forests.

The Bombay Wild Animals and Wild Birds Protection Act 1951 was a more comprehensive piece of legislation affording much wider protection to wild animals and wild birds and also included constitution of a State Wildlife Advisory Board, Procedures for issuing licences for hunting certain wild animals and birds, Constitution and control of game sanctuaries, Regulations for dealing in trophies and Prevention and detection of offences and penalties for contravention of the provisions of the Act.

Accordingly the Indian Board for Wildlife was first constituted in 1952 to advise the Government on policies related to Wildlife Conservation and Protection. In 1972 the Wildlife (Protection) Act was passed and the long title of the Act was as follows. "An Act to provide for the protection of Wild animals, birds and plants and for the matters connected therewith or ancillary or incidental thereto".

The Wildlife (Protection) Act 1972 underwent major amendments in 1982 (Amendment Act. 23 of 1982), 1986 (Amendment Act. 28 of 1986), 1991 (Amendment Act 44 of 1991), 1993 (Amendment Act 26 of 1993) and 2003 (Amendment Act 16 of 2003). The long title of the recently amended Act 2003 reads as follows.

"An Act to provide for the Protection of Wild animals, birds and plants and for matters connected therewith or ancillary or incidental thereto with a view to ensuring the ecological and environmental security of the country".

It is thus evident that the scope of the recently amended Wildlife Protection Act has been broadened to correlate the ecological and environmental security of the country with the protection of Wild animals, birds and plants.

The first National Wildlife Action plan was adopted in 1983 and recently i.e. in 2002 this has been modified by the second National Wildlife Action Plan (2002 – 2016). The Preamble of this new National Wildlife Action Plan is as follows:

"The first National Wildlife Action Plan was adopted in 1983 based on the decisions taken in the XVth meeting of the Indian Board for Wildlife held in 1982. The plan had outlined the strategies and action points for Wildlife Conservation, which is still relevant. In the mean while, however, some problems have become more acute and new concerns have become apparent, requiring a change of priorities. Increased commercial use of natural resources, continued growth of human and live stock populations and changes in consumption patterns are causing greater demographic impacts. Biodiversity conservation has thus become a focus of interest. The National Forest policy was also formulated in 1988, giving primacy to conservation hence this new National Wildlife Action Plan (2002 – 2016)".

Thus the present policies and legislation concerning Wildlife conservation / protection are as follows:

1. National Wildlife Action Plan (2002-2016)
2. Wildlife (Protection) Act 1972 as Amended in 2003
3. National Zoo Policy 1998
4. The Biological Diversity Act 2002

SECTION 6 : RIGHTS AND CONCESSIONS

There are no rights and concessions granted to people in respect of wild animals and birds for capturing, hunting or shooting.

SECTION 7 : STATISTICS OF WILD ANIMALS

The population estimation for wild animals in the territorial division is done once every four years. The estimation of Tigers and Leopards was basically done using the Pug Mark Estimation technique between the 18th and 22nd of April 2005 (both days inclusive) and the estimation of other animals was done using the Waterhole Count method on 2 occasions in 2005 viz. the 23rd – 24th April and the 22nd – 23rd May in the entire state including Satara territorial division.
According to the state level committee report, 2005 the population estimates for various wild animals in Satara division are as follows:

Table No. 47 : Population Estimates of Wild animals in Satara territorial division-2005

Name	Nos.
Tigers	001
Leopards	017
Gaur	058
Sambar	008
Sloth Bear	002
Barking Deer	109
Wild Boar	309
Jackal	006
Wolf	016
Giant Squirrel	001
Fox	001

One important recommendation made in the Report of the State level Committee on population Estimation, 2005 is as follows:

"*Tiger presence in Kolhapur circle including its Protected Areas needs closer monitoring through a system of keeping records of direct sightings by the field staff at the lowest level and proper follow up of all cattle kill cases to find out probable territories of the predator. This is important considering that getting pugmarks is very difficult in these areas".*
A statement showing population estimates of wild animals in Kolhapur Wild life division is given in **Appendix No. 14.1** of Volume II of the Plan.

SECTION 8 : MAN-ANIMAL CONFLICT

Incidents of man-animal conflict have increased manifold over the years. While increasing man-animal conflict is an outcome of shrinkage, fragmentation and deterioration of habitats, it has caused destruction of wildlife and generated animosity against wild animals. Habitat destruction to meet the ever increasing needs of the human population force large herbivores like Gaur (*Bos gaurus*) and wild boar to enter agricultural fields leading to incidents of crop depredation. Incidents of Panthers attacking and killing cattle, goats and humans have also been reported frequently leading to man-animal conflict situations.

Table No. 48 : Wild Life Conflicts

Year	Details of Cattle killed		Human		Crop Compensation	
	Goat	Cow / Buffalo	Injured	Killed	No.	Amount
1996-97	5	4	--	--	--	--
1997-98	6	4	1	--	--	--
1998-99	45	3	1	--	--	--
1999-2000	15	2	--	--	--	--
2000-01	22	4	--	--	--	--
2001-02	38	6	1	--	--	--
2002-03	20	5	1	1	--	--
2003-04	49	9	6	--	--	--
2004-05	22	--	3	--	24	1166
2005-06	36	14	3	2	50	8207
2006-07	133	22	4	1	50	18972
2007-08	65	24	8	--	50	27417

There were five incidents of attacks on humans each in the year 2005-06 as well as in 06-07 leading to 2 and 1 human death in the respective years. There is also rising trend of amount given as compensation for crop damage in the last three years.

SECTION 9 : MEASURES ADOPTED FOR WILDLIFE PROTECTION AND CONSERVATION

1. The main achievement towards this goal is the notification of the Koyna sanctuary and the Chandoli sanctuary in the district. These areas have been transferred to the Kolhapur wildlife division and thus it is expected that intensive management of these two sanctuary areas on the basis of prescriptions given in separate Management Plans would improve the status of wildlife conservation in these areas.

2. The practice of giving shooting permits has been stopped after the 1991 amendment to the Wildlife (Protection) Act.

3. The Wildlife week is observed in the first week of October every year with an objective to create awareness amongst the people regarding the importance of wildlife conservation.

4. The rates of compensation for cattle killed by wild animals have been substantially increased since January 2003 and compensation upto a maximum of Rs. 9000/- is now payable to the cattle owner. The compensation payable for human deaths and injuries has also been substantially increased since January 2003 and in case of human death or permanent handicap, the compensation now payable is Rs. 200000/- . This was earlier Rs. 40000/- for adults and Rs. 20000/- for children upto 18 years of age.

Goat killed by a Leopard

SECTION 10 : METHODS OF TREATMENT

i. A detailed survey of the fauna and flora of the district, their occurrence, status and conservation strategies with a focus on the endemic and endangered species should be undertaken by the expert agencies appointed by the forest department. A database shall be prepared identifying all endemic and endangered species of flora and fauna, surveying their environs and habitats to establish the current level of security and the nature of threats. Periodic reviews of flora and fauna species status should be conducted and the same should be correlated with the IUCN Red data list of this region every three years.

ii. An expert committee shall be constituted to explore possibilities for developing suitable habitat sites at selected places such as Mayani, Kankatre lake, Yeralwadi, Rajewadi in Dahiwadi Range, Kas lake area in Satara Range, Valmiki Pathar in Dhebewadi Range, Veer Dam (Shirval), Tathawada Ghat, Khambatki Ghat in Phaltan Range and Agashiv hills in Karad Ranges and for developing continuous corridors of contiguous blocks of forested land for the free movement of the wild animals. The committee shall also explore the possibility of constituting the conservation reserves or declaration of certain areas as ecologically sensitive areas and give its recommendation.

iii. Since water is the major limiting factor in the forest during the summers, so development of various water sources by gully-plugging and by erecting nalla-bunds, check-dams, bandharas etc. needs to be done. Sites with perennial sources of water locally known, as ‘jivant jhirra’ within the forest areas shall be identified and their locations shall be marked on the map of each Range, which shall be displayed prominently in each Range office. These sites shall be tackled appropriately through

various means like desilting, deepening, diverting small trickles into dug out troughs adjacent to nallahs, construction of Forest tanks locally known as 'Van-talis' in the nearby vicinity. Water holes shall be created at the appropriate places. This will ensure availability of water sources for wild animals and reduce straying of those animals into agricultural fields thus reducing conflict situations.

iv. Areas where fodder availability can be increased to prevent straying of wild animals like gaurs, wild boars, deers etc into agricultural lands should be identified and tackled. Fodder and fruit tree species favoured by the wild fauna shall be planted as part of the various afforestation schemes. Seeds of superior fodder grasses like Sheda, Pawnya, Marvel, Dinanath etc. should be sown on the freshly excavated and heaped soil bund on the lower side of the contour trenches in the suitable areas. Other suitable models for raising fodder grasses may also be used after getting prior approval from the CF, Kolhapur. Natural salt licks should be identified and protected. Artificial salt licks should be provided where required.

v. Cattle immunization camps in villages surrounding Koyna wild life sanctuary & Chandoli National park shall be taken periodically.

vi. The infrastructural facilities to handle wildlife emergencies should be strengthened. One set of tranquilizing equipment along with capture and trapping equipment like cages etc. shall be provided to each Range within the first two years of the Plan. A Rescue centre at an appropriate place should be established to handle wildlife emergencies.

vii. To mitigate man-animal conflict situations, the DCF should prepare an analytical report in consultation with the wildlife wing, NGOs etc. suggesting the affectivity and necessity of different measures required along with the financial projections.

viii. The forest staff and officers at different levels shall be trained and equipped fully to handle wildlife emergencies including handling of tranquilizing as well as trapping equipment. Well trained and well equipped 'Rescue team' with advance communication facilities should be kept under the control of DCF at division level.

ix. Insufficient or badly presented evidence often coupled with non-availability of witnesses, frivolous appeals and interim orders stall most wildlife offence cases at trial courts. The frontline staff should be trained to provide adequate professional skills in prosecution matters related to wildlife offences.

x. Mass awareness camps should be organized as a part of sustained campaign to educate masses regarding man-animal conflict situations, the reasons, the analysis and the management being done by the forest department. The awareness can be enhanced by personal contact, by publishing and distributing written material. The local press should also be educated and properly briefed from time to time.

xi. The willing veterinarians preferably from the government departments shall be imparted basic and advanced training in the wildlife medication in different batches. The outstanding wildlife trained veterinarians should be empanelled by the forest department and a list of the same should be sent to the wildlife and the territorial wings to handle the wildlife emergencies in the field.

xii. Felling shall not be allowed near the water holes as well as on the paths frequently used by the wild animals. Two dead trees per hectare shall be retained in each coupe where felling is prescribed, for nesting and resting of the wild-life. These trees shall preferably be of low commercial value. Also during harvesting of the coupes, some unsound and hollow logs of commercially low utility may also be left in the forest to serve as shelter to the wild-life.

xiii. Complete and effective protection of the wild-life from poaching and hunting is a must. For this purpose, watch-towers will be erected at suitable locations and the provisions contained in the Wildlife Protection Act, 1972 will be enforced rigidly. All important entry and exit points from the forests of this division should have check posts which shall be manned by staff for 24 hours. They should have a system of wireless communication.

CHAPTER - 15

OLD PLANTATIONS MANAGEMENT (OL) WORKING CIRCLE

SECTION 1: GENERAL CONSTITUTION

This Working Circle overlaps with the entire area of the Working Plan and deals with the management of old successful plantations of Acacia auriculiformis, Eucalyptus species, Miscellaneous species and Teak taken since sixties till 1994-95.

SECTION 2: SPECIAL OBJECTIVES OF MANAGEMENT

1. To improve the silvicultural conditions and productivity of old successful plantations by using tending operations.
2. To enrich the area by taking AR of suitable species.
3. To supply small timber and firewood to the local communities.
4. To create employment opportunities for the natives.

SECTION 3: COMPARTMENTS AND WORKING SERIES

The details of the Compartments allotted to Working Series and sequence of working is given in **Appendix no. 15.1 and 15.3 of Volume–II.**

SECTION 4: ANALYSIS AND VALUATION OF THE CROP

This WC being overlapping in nature, no separate enumeration of the growing stock has been done.

In the II stage Evaluation report of plantations taken in 2006-07 (Compiled Report No. 225) it has been observed that *'the plantation area lies in the rocky and of steep gradient. The area showed more no. of naturally regenerated teak i.e., about 100-120 teak per ha. Among other species Karvand, Mai, Jambhul, Ain, Biba and Salai are seen. Teak and Bamboo seedlings found to be surviving along the nallas and slopes but less in numbers. Good natural regeneration observed and requires protection. The area being used by the wild fauna was confirmed by their evidences'.*

SECTION 5: WORKING CYCLE

Since area under old plantations vary considerably in different ranges, hence working cycle will vary depending upon the species and the total area to be tackled in each range.

SECTION 6: DEMARCATION OF COUPES

The annual coupes shall be demarcated one year in advance.

SECTION 7: METHOD OF TREATMENT

For its continuous healthy development, a tree crop requires food, light and adequate space to grow. The individual members of the forest crop have to compete amongst themselves for getting these essentials. The requirement of the individual members increase with age and their growth is seriously hampered if the forest crop is not tended properly.

'Tending' is defined as operations carried out for the benefit of a forest crop at any stage of its life between the seedling and mature stages; it essentially covers operations on the crop itself and on the competing vegetation and includes weeding, cleaning, thinning and pruning and does not include regeneration fellings and ground operations like soil working, drainage and controlled burning. The tending operations required for the management of the old plantations are explained below.

I. Cleaning: It is done in the sapling crop involving the removal or topping of inferior growth including individuals of favoured species, climbers etc, when they are interfering with the better grown individuals of the favoured species. It merges with thinnings as saplings grow into poles. It is done to improve light conditions and to reduce root competition and transpirational water loss. It shall be done in the 7^{th} year of the formation of the crop. The following operations will be carried out:

i. All climbers shall be cut in the plantation area.

ii. Individuals of inferior species interfering or likely to interfere with the growth of planted saplings shall be cut back.

iii. Malformed, diseased and damaged individuals of the planted saplings shall also be cut back.

iv. Coppice shoots arising from the stumps shall also be cut.

II. Thinning: It is defined as a felling made in an immature stand for the purpose of improving the growth and form of the trees that remain, without permanently breaking the canopy. Few years after the plantations are raised; there starts an intense competition amongst the saplings for limited light, minerals and water. Therefore, to avoid the adverse affects on the growth of the future crop, thinnings are required to gradually reduce the number of saplings, poles and trees per unit area, as the crop advances in age. It consists of series of successive felling operations before the crop matures and is carried out in a crop after it reaches the sapling stage and continued upto the beginning of the regeneration period. The interval between two successive fellings may be fixed but it depends upon the time required for canopy closure.

The following norms are laid down to adjudge success or failure of plantations as per the 'Evaluation Code'.

Table No. 49 : Norms for plantations as per Evaluation code

Area category	Successful plantations	Partially Successful plantations	Failure plantations
Suitable sites with soil depth > 2', rainfall 50" to 150", average prevalence of adverse biotic factors, gentle to moderate slopes	60% and above	33% to 60%	Less than 33%
Medium quality sites with soil depth > 1', rainfall 35" to 50", average prevalence of adverse biotic factors, moderate slopes	50% and above	25% to 50%	Less than 25%
Poor sites with soil depth < 1', rainfall < 35" or > 125", excessive prevalence of mist and fog, adverse biotic factors	40% and above	20 % to 40%	Less than 20%

The RFO shall inspect the plantations due for tending operations and shall prepare treatment map for the successful as well as partially successful plantations as per the norms laid above and will show the following areas.

I. Area 'A' - Protection Areas : include the following areas.

i. Areas with steep slopes i.e. more than 25^0.

ii. Eroded areas or areas liable to erosion.

iii. Twenty meters wide strip on either side of the water courses.

II. Area 'B' - Under stocked Areas: include areas with crop density less than 0.4

III. Area'D'-Well Stocked Areas: include areas with crop density more than 0.4

The plantations, which are found to be failure as per the evaluation code, shall be evaluated by the DFO evaluation to ascertain the causes of failure so as to avoid and overcome them in future. Deviation proposals shall be prepared for such plantations and sent to CF Kolhapur/ CF WP.

I. Miscellaneous Plantations

Areas containing successful plantations of miscellaneous species are included in this part. Extensive forest areas were brought under these plantations since late sixties. Due to poorer site quality, most of the plantations show stunted

growth and are usually sparse. Felling or Thinning of such mature plantations is not found to be suitable for this fragile area, considering the fact that most of such plantations are sparse and are generally not congested. Therefore, only improvement works have been prescribed for such plantations as follows:

Mix plantation in Dhebewadi range

iv. The SMC works like van tale, bandharas, nalla-bunding, gully plugging etc will be carried out wherever required.

v. Rooted stock of the planted species shall be properly tended.

vi. The undesirable under growth which is preventing or likely to prevent the development of seed based NR of the desired species, shall be removed.

vii. Accessible under stocked areas having good soil depth and more than 2 hectares in extent in a compact block shall be planted with suitable miscellaneous species while in areas less than 2 ha. in extent, seed dibbling shall be done.

II. Teak Plantations

Teak plantations have been raised mainly in Satara, Karad, Dhebewadi ranges however these have not been tended and thinned as per the prescriptions of the earlier Plans, thus affecting their growth. Followed by 'Ordinary thinning' or Low Thinning' a type of silvicultural thinning which shall be resorted to in the 15th and every 10th year subsequently till the plantation attain the age of 65 years. Successful Teak plantations which have been left out inadvertently shall also be thinned as per the above schedule.

Teak plantation in Dhebewadi range.

The method of treatment shall be as follows

i. Cleaning shall normally be done in the 7th year of the plantation but since cleaning operations have not been carried out in the past, they shall be taken in the older plantations which were not cleaned previously as given in the **Appendix No. 15. 4 of Volume-II.** In the plantations due for 'Thinning' in the very first year of the operation of WP, 'Cleaning' will precede 'Thinning' in the same year.

ii. 'C' grade ‘Ordinary thinning’, a kind of silvicultural thinning shall be done which consists of removal of inferior individuals of the crop, starting from the suppressed class to the dominated class to some of the dominants but not creating any permanent gap in the canopy. The trees selected for retention are the trees with good boles and crown, evenly distributed over the area, with space on all sides for proper development. In this grade, few suppressed or dominated trees whose removal is of no economic or hygienic value may be left as soil cover in the gaps created by the removal of dominant trees.

iii. Thinning shall be done as per the Yield Tables which give the number of trees per unit area left after thinnings at different ages by site qualities. Site quality of the area where the plantation is raised and the age of the crop shall be ascertained. Site quality is measured in terms of average height of dominant trees in the plantation area. Yield tables prepared for teak plantations by the FDCM may be consulted if local yield tables are not available.

iv. Girth class wise distribution of poles or trees in the plantation area shall be obtained by random sampling. Sample plots of size 0.5 ha i.e. of 100x50 meters dimensions shall be laid with sampling intensity of 10% only. Corresponding to age and site quality the number of stems per ha and their distribution among different girth classes shall be obtained from the Yield Table, which shall then be compared with the number of stems actually available per ha in the stand to obtain the number of stems to be retained girth class-wise after the thinning. The deficiency in stems in any girth class shall be compensated with the surplus and healthy stems in nearest girth classes on the basis of basal area.

v. After sample marking, basal area per ha of the stand excluding trees already marked for felling, shall be obtained by using wedge prism. This shall be compared with that of Yield Table value, to ascertain the correctness of thinning marking. Deficiencies if any shall be removed and thinning marking shall be completed by the RFO. The detailed marking list shall be prepared which shall be checked and verified by the concerned ACF and the DCF in the field. Thinning shall be completed after removal of deficiencies, if any.

The following rules shall be observed while thinning.

a) The dead, dying, diseased and malformed poles shall be marked first for thinning.

b) The multiple pole crop shall also be thinned to one pole per stool retaining the most promising one.

c) Care shall be taken to remove the poles of coppice origin first while retaining the poles of seedling origin.

d) All live high stumps shall be cut flush to the ground and shall be dressed thereafter with a sharp axe to get vigorous coppice shoots.

e) The established multiple coppice shoots shall be reduced to one per stool retaining the vigorous one while the newly risen coppice shoots shall be removed.

f) The undesirable under growth which is preventing or likely to prevent the development of seed based NR of the desired species, shall be removed.

III. Glyricidia plantations

These plantations have largely been taken on the refractory sites in the eastern part of the district. The objective was to green such areas and to control soil erosion. These plantations do not require any thinnings since there is no congestion in the plantation areas. Fellings of any kind shall only lead to soil erosion. Hence these plantations will be retained as they are.

SECTION 8: OTHER REGULATIONS

i. The prescriptions of this WC will not be applicable on areas bearing Seed Orchards, Sample Plots, Candidate Plus Trees, Plantations, nurseries etc falling in the areas allotted to this WC and which are in possession of the Silva MS. These areas are managed with a perspective of research and extension in forestry and hence will be managed as per their silvicultural requirements as included in the Plan of Operations duly approved by Research and Advisory Committee (RAC) MS chaired by the PCCF.

ii. The Workshops should be organized in each Range to sensitize and train the field staff in implementing the prescriptions of this WP. The induction training of the field staff i.e. Forest guards and Foresters should be organised by the CF education on priority for the effective implementation of the Plan.

CHAPTER -16

BAMBOO MANAGEMENT (OVERLAPPING) WORKING CIRCLE

SECTION 1: GENERAL CONSTITUTION

Bamboo is found mainly along the hilly slopes and along the nallahs in scattered patches in Dhebewadi, Patan, Satara and Mahabaleshwar ranges of Satara division. Old bamboo plantations and naturally occurring bamboo covering an extent of 268.77 hectares area is in Dhebewadi range. In other ranges, stocking is inadequate to harvest bamboos in sustainable manner.

SECTION 2: GENERAL CHARACTERS OF THE VEGETATION

Bamboo crop is both natural as well as planted in origin. Within forest areas, *Dendrocalamus strictus* has been planted largely while *Bambusa bambos* (Kanak bamboo) has also been planted to limited extent. *Bambusa bambos* and *Oxytenanthera monostigma* (Chiva Kathi) are generally found growing naturally in the wild in the forest areas mainly on tops of ridges and hills. *Oxytenanthera stocksii* (Managa/ Chivari/ Mes) on the other hand is found growing luxuriantly on the bunds of private cultivations in the western region of the district but is rarely seen in the forest.

Majority of the old bamboo clumps found growing naturally or in plantations in the forest areas have never been worked before and show lot of congestion bearing dead, deformed and over mature bamboos. The culms of *Bambusa bambos* are found to be badly entangled within the clumps due to over congestion. The growing stock is also damaged due to forest fires and illicit cutting

Matured bamboo clumps in Dhebewadi range

These clumps therefore require immediate management interventions.

SECTION 3 : SPECIAL OBJECTS OF MANAGEMENT

i. To harvest bamboos scientifically to get maximum yield on sustainable basis.

ii. To improve bamboo productivity by using various management interventions.

iii. To meet the local market demand by regular harvesting of bamboos.

iv. To generate employment to the local people.

SECTION 4 : COMPARTMENTS AND WORKING SERIES

The compartments allotted to different Working Series and the statement showing the Working Series and annual coupes is given in **Appendix No. 16.1** of volume II.

SECTION 5 : CUTTING CYCLE

A Cutting cycle of 3 years duration is kept for bamboo harvesting. The details of cutting cycle are shown in **Appendix No. 16.2** of volume II.

SECTION 6 : AGENCY FOR HARVESTING

The coupes will be worked departmentally or as per the prevailing Government policy.

SECTION 7 : METHOD OF TREATMENT

Considering heavy congestion and entanglement of culms in the clumps especially in the case of Bambusa bambos, practicing following prescriptions in the annual coupes being worked for the first time may not be easy. Harvesting of highly entangled bamboos may not be possible without breaking them. *Such clumps of Bambusa bambos or other species which are difficult to work as per standard bamboo working due to heavy congestion should be worked so as to retain culms in 'U' shape or to retain bamboo culms on the periphery of the clumps. This should be done only once after which following standard bamboo working prescriptions should be strictly followed.* Considering the difficulties in working of the bamboo clumps for the first time, special wage rates may be sanctioned by the CF Kolhapur based on the work study report submitted by the DCF Satara.

i. Bamboo harvesting will not be permitted during June 15 to September 30, the period of culm formation.

ii. Bamboo plantations or their parts on steep slopes i.e. more than 25^0 will not be worked.

iii. Bamboo cutting will be done with a sharp axe. A bamboo culm must be cut in a single stroke with a slant cut so that cutting is above the first inter-node and the height of the cut is between 15 cm to 45 cm above the ground, to avoid drying of the rhizome due to capillary action.

iv. All clumps will be cleaned during the coupe working. Cleaning operations in bamboo clumps will include the following:

   a. Climbers infesting bamboo clumps will be removed.
   b. All dead, decayed and dry culms will be removed.
   c. All culms will be cut above the first internode.
   d. Twisted culms will be removed.
   e. Top broken culms with more than half of the top damaged and malformed culms will be removed.

v. No clump shall be considered fit for harvesting unless it contains more than 12 culms of one year or older in age.

vi. While extracting bamboo, it should be ensured that the reserved culms are evenly spaced and some mature culms are present on the periphery of the clumps.

vii. All current year and previous year culms will be retained. Current year culms have the culm sheath on the lower half and abundant bloom i.e. white powdery dust which comes off easily when touched. Previous years culms do not have the culm sheath and the patchy bloom does not come off easily. Older or mature culms have blackish grey bloom.

viii. The mature culms equal in numbers to the current year culms subject to minimum of 8 culms must be retained to provide support to the younger culms.

ix. The remaining mature culms after reserving as described in the preceding paragraph may be harvested. No culm shall be extracted without cleaning the clump which should be an integral part of the bamboo harvesting.

x. Debris after cutting the bamboos should be stacked atleast 3 metres away from clumps.

xi. Digging of rhizomes, removing tender parts of older culms or cutting of current or previous year culms will be strictly prohibited.

xii. The culms at the periphery of the clump will not be removed except where it is absolutely necessary for facilitating working in the interior portion of the clump.

xiii. The leading exterior culms may not be cut under any circumstances even if they are malformed. Their relation is in the interest of the outward growth of rhizome and clump as they support new culms.

xiv. In order to make whole of the clump accessible, removal of all the culms in the form of a wedge may be permitted but the width of the wedge shall not be more than one metre.

xv. The working of the clump will be such that the culms after working are well spaced.

xvi. The bamboo extraction should end by March when the culms are almost devoid of starch and attract less insect borers.

xvii. Areas suitable for bamboo plantations should be identified and planted preferably with Managa bamboo (Oxytenanthera stocksii) or Kanak bamboo (Bambusa bambos).

Gregarious flowering

The period, extent and location of the gregarious flowering shall be recorded in the divisional notebook. The clumps will be clear felled after seeds are matured and have been collected. The areas after gregarious flowering will be provided with strict protection from fire and grazing so as to facilitate germination and establishment of bamboo seedlings. Seed collection, disposal of bamboos from dried clumps after flowering and tending operations

for bamboo seedlings requires extensive planning and timely action. In case the seeds after the gregarious flowering are subjected to fungus attack, then the area should be sprayed with a light solution of a fungicide.

To induce formation of healthy clumps, evenly distributed clump foci of 1 meter diameter at 5x5 meter spacement (from centre of one clump foci to another) will be formed in the area having good bamboo regeneration. Groups of bamboo seedlings showing good growth will be preferred for the foci formation. Weeds, climbers and other bamboo seedlings upto 2 meter around bamboo foci should be cleared in July- August to assist growth of bamboo seedlings in the selected foci.

Silviculturally untreated bamboo

The entire area will strictly be protected from fire. Immature crop will receive cleaning operations till the crop becomes harvestable. All badly grown, twisted and damaged culms will be removed from the selected foci. Weeds, climbers and other bamboo seedlings upto 2 meter around bamboo foci should be cleared and soil working should be carried out in August. The entire area will continue to receive protection from fire and grazing. Fully mature clumps may be harvested in the eighth year onwards depending upon location in the annual coupe.

CHAPTER – 17

NON-TIMBER FOREST PRODUCE (OVERLAPPING) WORKING CIRCLE

SECTION 1: GENERAL CONSTITUTION

This is an overlapping WC, covering the entire forest area being dealt in this WP. Many species yielding Non Timber Forest Produce (NTFP) including the medicinal plants are found in these forest areas. The important NTFP found in Satara district are Hirda fruits, Shikekai, Apta, Honey and Kadi patta etc. The non-timber forest produce collected in this tract are numerous and they contribute a sizeable revenue to state exchequer as well as provide work to local people during the time they are not busy with their agricultural works.

NTFPs account for 70% of India's forest product exports. India has probably the oldest, richest and most diverse cultural traditions in the use of medicinal plants. Exploration for forest-based plant products for pharmaceuticals and the demand for medicinal plants are increasing in both developing and developed countries. In India, medicinal plants are widely used by all sections of the population and it has been estimated that, in total over 7500 species of plants are used by several ethnic

Indian Gooseberry (Awala) Trees

communities (Anthropological survey of India 1994). The bulk of the traded material is still from the wild and a very small number of species are cultivated. According to the data compiled by the International Trade Centre, Geneva, India is ranked second amongst the exporting countries, after China, with an annual export of 326 000 tonnes with a value of Rs 45.95 million (about US$ 1.4 million) during 1992-93. Recent trends have indicated further increase in this trade with the herbal cosmetic industry playing a major role in fuelling the demand for herbals worldwide. The expanding trade in medicinal plants has serious implications on the survival of several plant species, many of which are under threat of becoming extinct. Today this rich biodiversity of medicinal plants is facing a serious threat because of the rapid loss of natural habitats and overexploitation of plants from the wild. To meet the demands of the Indian herbal industry, which has an annual turnover of about US$ 300 million, medicinal plants are being harvested every year from some of 165 000 ha of forests (FRLHT, 1997). A list of important medicinal plants and their uses and a list of NTFP based industries in Satara district is given in the **Appendix no.17.2 and 17.3.**

The ownership rights over certain NTFP in the scheduled areas have been vested in the village communities through statutory provisions. Rights over the trees and the land however remain with the government. Tendu, Apta and Bamboo are excluded from this list. However there are no scheduled areas presently in Satara district.

SECTION 2: SPECIAL OBJECTIVES OF MANAGEMENT

i. To identify and conserve the forest areas rich in NTFP.
ii. To build up a database on NTFP.
iii. To promote sustainable methods of harvesting NTFPs.
iv. Identification of Medicinal Plants Conservation Areas (MPCA) for long term in-situ protection to rare and endemic medicinal plants.
v. To improve the socio-economic condition of the local communities by generating employment.

SECTION 3: NON TIMBER FOREST PRODUCTS OF THE AREA

The following are the Non-Timber Forest Products that occur in the division.

1.	Apta leaves (Bauhinia racemosa)	2.	Tembhurni(Diospyros melanoxylon)
3.	Pisa fruits (Actinodaphne angustifolia)	4.	Hirda (Terminalia chebula)
5.	Shikekai (Acacia concinna)	6.	Kadi patta (Murraya Koenigii)
7.	Arrow-root (Hitchenia caulina)	8.	Tamalpatra
9.	Kokam	10.	Honey
11.	Jatropha	12.	Karanj
13.	Biba	14.	Variety of grasses
15.	Canes	17.	Karvi

18. Sticks of Medshing (*Ligustrum neilgherrense*), Pandhari (*Murraya paniculata*), Kolusra (*Capparis longispina*), Atki (*Maesa indica*) and Gela (*Catunaregam spinosa)* But out of the above mentioned NTFP, only Shikekai, Hirda and Honey are auctioned.
19. Narkya

SECTION 4 : DESCRIPTION OF SOME IMPORTANT NTFPs

Terminalia chebula (Hirda)

Hirda trees are quite common on hill slopes of western ghat forests. Fruits are pendulous, ellipsoid, brown in colour and obscurely five ribbed and are used in the manufacture of triphala churna. Current level of collection of the fruits is quite erratic. Felling of trees as well as lopping of tree branches for the collection of fruits is strictly prohibited. Fruits should be plucked without damaging the trees. Compartments having good NR of Hirda should be identified and tended to remove the congestion in each range.

Acacia concinna (Shikakai)

It is a prickly, scandent shrub occurring commonly in the western ghat forests especially in Mahabaleshwar region. Leaves are bipinnate; flowers are in yellow, globose, auxillary heads; pods are brown, wrinkled and depressed between the seeds and contain 6-10 seeds in each pod. The pods are extensively used as a shampoo as well as in the manufacture of shampoos for

cleaning the hair and the dry ones are powdered and perfumed, and sold in the market as soap nut powder.

Cinnamomum tamala (tamala patra, *tej patta)*

Cinnamomum tamala is a moderate sized evergreen tree attaining a height of 8 m, and a girth of nearly 150 cm. Leaves are alternately placed, opposite and short stalked and are 3-nerved from the base. The ease with which essential oils can be obtained from this plant's material makes it ideal for cash crop farming. Leaves are ready for harvesting when trees are 10 years. Tree longevity is up to 100 years, and they continue bearing in old age. Leaves are collected every year from vigorous plants. Collections are made in dry weather from October-March. Small branches with leaves are dried in the sun for 3 or 4 days and tied up into bundles for marketing. The leaves are used extensively as a spice, especially in the famous Mogul cuisine that was developed at the Imperial courts in Delhi and Agra. Mature leaves can be plucked with hand or pruned with secateurs. Care should be taken not to damage the plant while plucking the leaves.

Murraya koenigii (Kadi patta)

Murraya koenigii or Kadi-patta tree is a tropical to sub-tropical tree in the family Rutaceae, which is native to India. It is a small tree, growing 4-6 m tall, with a trunk up to 40 cm diameter. The leaves are pinnate, with 11-21 leaflets, each leaflet 2-4 cm long and 1-2 cm broad. The flowers are small white, and fragrant.

The curry leaf tree is native to India, Sri Lanka, Bangladesh and the Andaman Islands. Later spread by Indian migrants, they now grow in other areas of the world where Indian immigrants settled. Widely cultivated, the leaves are particularly associated with south Indian cuisines to provide flavourings for curries. The use of the curry leaf tree to treat diabetes has attracted a great deal of interest. Special compounds have been found which might make it an effective new medicine for diabetes sufferers. The branches of Murraya koenigii are very popular for cleaning the teeth as datun and are said to strengthen the gums and the teeth. Mature leaves can be plucked with hand or pruned with secateurs. Care should be taken not to damage the plant while plucking the leaves.

Nothapodytes nimmoniana (Narkya/ Amruta)

It is a small shrubby tree, widely distributed in Western Ghats from Satara, Kolhapur and Konkan southwards- Nilgiris, Anamalais and common in North Kanara. In Maharashtra, it is found in forests and non forest areas in and around Radhanagari in Kolhapur district and Mahabaleshwar, Koyna, Patan, Dhebewadi in Satara district and Mulshi in Pune district. The species can easily be recognised in field during its blooming season by its strong foetid odour leading to its earlier scientific name- Mappia foetida. Leaves are alternate and simple, broad, ovate and acute at both ends with whitish yellow in colour. Bark is rough, grey coloured with peculiar lenticels. The plant shows good coppicing when cut or pollarded. It is not preferred as fodder by the cattle or as fuel due to its bad taste and bad smell. The plant yields from its stem and root bark, an alkaloid called 'Camptothecin' (CPT) having anti cancer properties and as a result, the wood of the plant has a high demand in the pharmaceutical market world wide. It is feared that as a consequence of its overexploitation and habitat loss, the natural populations of

this species have declined by 50 to 80 percent in the last one decade. Hence it is now designated as an endangered species in the North Western Ghats and threatened in the remaining parts of Western Ghats.

The individuals of this species can bear only male flowers, only female flowers, male and female flowers, male and hermaphrodite flowers, female and hermaphrodite flowers or only hermaphrodite flowers. The flowers emit fowl odour of rotting meat to attract the pollinators such as dipteran flies. The species usually flowers during August and the fruits ripe till December. Only the female and hermaphrodite flowers can bear the fruits. Birds like Bulbuls, Barbets are known to feed on the pulp, thus helping in seed dispersal.

The fruits can be collected from December to February. At maturity, seeds turn black in colour. It is preferable to collect seeds from the plant itself since fallen ones are highly susceptible to fungal attacks. The fruits or de-pulped seeds after collection should be dried in the shade. The seeds should be stored in airtight containers under ordinary room conditions if not required immediately for sowing. Such storage may give 100% viability of seeds upto 45 days which may decrease upto 50 % in 120 days.

Pongamia pinnata (Karanj)

It is a small or middle sized tree, found commonly in the forests. The Karanj trees have also been extensively used as avenue trees in and around Satara city. Seeds and seed oil are used in ayurvedic medicines. Oil cakes are used as manure and keeps off white ants.

Garcinia indica (Kokum, Amsul)

Trees are with conical crown usually buttressed at the base. Fruits are spherical, purple red and the pulp is red, acidic and fleshy. Fruits are eaten and are also used for making syrups. The dried fruit skins i.e. Amsul is used in the curries.

Adhatoda vasica (Adulsa)

It is a branched, evergreen shrub with broad leaves tapering at both ends. Flowers are white, bi-lipped arranged in dense and short spikes. It is found commonly in the forest areas. Its leaves are used in curing the cough and respiratory troubles, hoarse throat, burning sensation of feet, menstrual disorders and the roots are used to cure the fever. Mature leaves can be plucked with hand or pruned with secateurs. Care should be taken not to damage the plant while plucking the leaves.

Asparagus racemosus (Shatawari)

It is a spiny climbing shrub with leaf like rudimentary branchlets arranged in whorls. It bears white, fragrant flowers in spikes and small black pepper like fruits. Its roots are clusters of cylindrical tubers. It is also cultivated as an ornamental. The plant likes sunlight and thrives well in hot and dry conditions. Its tuberous roots are used for curing acidity, burning feet, hoarse throat, menstrual disorders, scanty breast milk and increasing general immunity. Root tubers can be collected from a year old plant. A ‘C’ shaped pit can be dug around the plant and a few tubers can be collected without uprooting the plant. The pit should then be filled with the dug earth.

Cymbopogon citratus (Lemon grass)

It is a tall grass that grows into about 2 metres tall clumps. Leaves are long with rough margins and are strongly aromatic. The aromatic leaves are used in cough and respiratory troubles. Mature leaves should be cut from near the base while dried leaves should also be removed along with.

Tinospora cordifolia (Guduchi, Gulvel)

It is a large spreading climber with stems having papery bark and many small eruptions. The plant bears small flowers and round pea sized seeds that turn attractive red on maturity. It can be found climbing upon the trees with thread like aerial roots dangling from the stems. The stem of the climber is used for curing acidity and fever. Stem extracts are also used as a liver tonic, for increasing the general immunity and for hair care. Mature stems of pencil thickness can be cut with the help of sharp knife.

Embelia ribes (Vavding)

It is a large spreading shrub. Leaves are 2 to 4 inches long. Fruits are globose and turn black when ripe. Seeds are used against the flat worms' infestation of the humans.

Gum

Dhaoda (Anogeissus latifolia), Ain and Kulu (Sterculia urens) are three main species found in these forests which produce edible gum. The tapping rules as derived by the FRI, Dehradun are listed below:

i. The tapping season will commence from November to the end of May each year. No tree below 90 cm in girth shall be tapped.

ii. Tapping will be confined to the main bole of trees between 15 cm from ground level to the point from which first branch is given off.

iii. Only trees above 90 cm in girth at breast height will be tapped.

iv. Each tree will be tapped continuously for three years and will be given a rest for three years thereafter. The second tapping cycle will begin in the 7^{th} year after the commencement of tapping season and will continue for another period of three years.

v. The initial blaze of 20 cm wide and 30 cm in length or height may be made in the month of November on trees at 15 cm above ground level with a sharp edge having 7.5 cm wide blade. The blaze made is 0.6 cm deep in the bark.

vi. Blazes shall be made horizontally leaving approximately equal space between the two blazes. The blazes should not have any loose fiber. The lower surface of the blaze should be slightly slopping outwards to avoid lodging of gum in the blazed pocket.

vii. The gum starts oozing out soon after the blazes are made and may be collected initially after a month. i.e. around December when the blazes may also be freshened. Subsequent collections and freshening may be done fortnightly upto May. Overall, 12 freshening are required to be made during the year.

viii. In each freshening, the lower surface is not to be freshened. The edges may be scraped so that only 3.8 cm is increased on either side in width, at the end of 12th freshening. This means that about 0.3 cm should be scraped off from either side in width in each freshening.

ix. The lowest row of blazes will be at one meter above the ground level. The next row of blazes will be made at the height of 60 cm from the lower. The vertical portion of the blaze of upper row will alternate with similar portion of the row and no two blazes of the two rows will be directly one above the other.

x. The number of blazes to be made on each tree will depend on its girth at breast height, as given below:

Table No. 50 : Girth wise blaze table

Category	Girth at BH	Maximum blazes allowed on each tree
I	0.9 m to 1.3 m	2
II	1.3 m to 2.0 m	3
III	2.0 m to 3.0 m	4
IV	over 3 m	One blaze for each 45 cm girth in addition to the category III, above.

xi. No fresh blaze will be made on the partially healed up surface or old wounds.

xii. Each blaze will be in a shape of parabola with a 2.5 cm wide base. The curved side of the parabola will be upwards and of height not more than 7.5 cm and the depth of the blaze will not exceed 0.6 cm in the wood.

xiii. At the end of the season, the height of the blaze shall not be greater than 12.50 cm. Maximum permissible dimension of each blaze shall be 10 cm x 12.5 cm x 0.6 cm in width, height and depth, respectively.

xiv. Since tapping is to be done continuously for three years, the total height of the blaze at the end of three years of tapping will be 37.50 cm, the width and the depth remaining the same.

xv. In the second cycle that is, in the 7th year new blazes will be made in the same way in the unblazed portion, in between the blazed portions of the first cycle. This blazing will continue for another three years in the manner described above and the operations will be repeated till un-blazed portion is fully covered.

SECTION 5 : METHOD OF TREATMENT

Out of the listed NTFP above only Hirda fruits, Shikekai, Honey are yielding reasonable revenue annually. The stocking of the rest of the NTFP is not adequate enough for harvesting on sustainable basis. Hence for the systematic harvesting of these non-timber forest produce on sustainable basis following recommendations are made.

1. Hirda fruits and Shikekai

In the areas carrying Hirda and Shikekai trees, following improvement operations be carried out.

i. All climbers except Shikekai interfering with trees and advance growth of Hirda should be cut.

ii. Mature and fruit bearing Hirda trees should be freed from over head and lateral shade.

iii. To increase the proportion of Hirda and Shikekai, the planting of these species should be taken up along with other species. Rooted cuttings of Shikekai in polythene bags will be planted soon after pre monsoon showers.

2. Apta and Tembhurni leaves

i. Plantations of Apta and Tembhurni should be raised in suitable localities covering at least 5% of the net area afforested annually under the Afforestation Working Circle.

ii. The species propagate well by root- suckers. In order to stimulate the development of root- suckers, soil around the base of the trees should be worked. Care should be taken not to damage the roots, by deep digging and exposing them.

iii. Plucking of the leaves should be restricted to the lower $2/3^{rd}$ of the crown leaving upper $1/3^{rd}$ portion intact.

3. Kadi patta leaves

The leaves have a good market in Mumbai where it is used for flavour in curry making. The shrub comes up in the Evergreen forests of Mahabaleshwar, Satara, Patan and Dhebewadi ranges. The existing growth of this shrub should be freed from suppression. It should be raised by sowing seeds in suitable areas to the extent possible. Sowing should be done in pits on the onset of monsoon. It also propagates well by root-suckers. In order to stimulate the development of root- suckers, soil around the base of these shrubs should be worked. Care should be taken not to damage the roots by deep digging and exposing them.

4. Agave species

Agave species viz. Agave vereguz, Agave americana, Agave cantala and Agave sisalana yield fibers of varying utility. Agave sisalana produces the sisal fiber of commerce. Agave americana also yields excellent fiber which is durable for ropes and cordage. These species grow usually under semi- arid environment. They are drought resistant and will grow where most other species will fail. In blank areas with shallow soil under the Enrichment working circle and Afforestation working circle where plantation of tree species can not be raised the above Agave species especially Agave sisalana will be planted. It should also be raised on TCM in three rows one meter apart. The species can be raised successfully by planting two year old nursery raised plants. Harvesting of Agave should normally be started from 4^{th} year onwards on a regular cycle of 12 months, 8 months or 6 months depending on the growth in the locality. The length of the leaves to be cut should be more than one meter and after cutting, the plant should not have less than 8 to 18 leaves depending on the cutting cycle.

5. Cane (Rattan)

Two species of cane i.e. Calamus pseudotenuis and C. thwaitesii are found mainly in western part of Satara district. Majority of such areas now fall in Koyana Wildlife sanctuary. The status of regeneration of canes is poor but no special efforts have been made in the division to obtain regeneration of cane. Cane regenerates mainly by seed and also by root- suckers. The cane especially in Koyana valley and in parts of Protection Working Circle should be raised artificially. Cane is considered mature at the age of about six years when it attains a girth over 6 cm. For processing, cane is kept under water for 15 days and cleaned. Simultaneously, the bends are removed manually and then it is cut in required sizes depending upon the requirements. The usual market sizes are 2 to 4 meters. Cane is mainly used for making sofa sets, tables, garden chairs, Italian chairs etc.

SECTION 6 : GENERAL PRESCRIPTIONS

i. Make a resource inventory of all Non Timber Forest Produce in every Range of the Division and mark areas rich in such NTFP including Medicinal Plants. A database for unit (Beat, Range, Division) wise potential and production for various NTFPs should be compiled.

ii. The areas having promising regeneration of NTFP species and which is not less than half hectare in extent in a compact block will be identified in the annual coupes of each year and will be properly spaced and tended to remove congestion and promote their growth.

iii. Important NTFP species to the extent of 10 to 15 % will be planted in the various afforestation schemes to increase the stocking of these species. Emphasis should be laid on species like Hirda, Narkya, Jamun, Karanj, Tamal patra, Kokum and Shikakai etc. amongst tree species and Adulsa, Shatawari, Gulvel etc. amongst herbs/ shrubs.

iv. Use sustainable methods of harvesting of NTFP and develop expertise for training villagers to put these non-destructive methods into practice. Leaves and fruits shall be plucked from the tree or shrub branches in a non destructive manner. The collection and disposal of various NTFPs should be done as per the provisions pertaining to JFM given in the Government Resolution no. MSC/ 2000/ case no. 143/ F-2 dated 25.04.2003 of Maharashtra state. Lopping of branches or felling of trees/ shrubs for collecting NTFP should be strictly dealt with.

v. Karvi (Strobilanthes callosus) has become a major weed mainly in the forests of Mahabaleshwar, Dhebewadi and Patan ranges. It flowers gregariously in 7 years and dries up to become major fire hazard within the forest areas. It has a large demand as fencing material in the construction of huts in the villages. Hence it should be allowed to be removed on rated passes outside the Mahabaleshwar-Panchgani eco-sensitive zone while after the gregarious flowering it should be allowed to be removed from the eco-sensitive zone as well so as to avoid the fire hazard to the forests.

vi. Identify and demarcate areas rich in medicinal plants, preferably with an area of 200 ha or more as 'Medicinal Plant Conservation Areas' (MPCA) for long term in situ protection to rare and endemic medicinal plants.

vii. The weekly markets should be surveyed to know the extent of various NTFP reaching the markets, methods of harvesting, their market price and purpose of their utilisation in domestic or international markets. The analytical report based on this data should be prepared by the DCF and submitted to the Working Plans, Research and Education wings of the Forest department for further analysis.

viii. The auction period for the NTFP species should be specified and the sanction to the auction should be given in time by the competent authority e.g. Wavding/ Kadi patta by July/August, Shikekai/ Tamalpatra/ Hirda by September, Honey by September, Grasses by August etc.

ix. Training programmes in association with the Research and Education wing of the department should be organized to impart training for non-destructive and sustainable methods of NTFP harvesting, their value addition and marketing.

x. The Research Circle which has done field trials on medicinal plants should be consulted to promote use of such medicinal plants in various plantation programmes.

xi. The provisions of 73rd amendment will be translated into practice for NTFP in the scheduled areas. For rest of the NTFP in such areas and for all NTFP in all other areas, handling of the same will be attempted through Joint Forest Management Committees and/ or the items may be sold by open auction subject to the existing exercise of privileges for the specific items.

JOINT FOREST MANAGEMENT

SECTION 1 : GENERAL CONSTITUTION

Forests are facing severe threats detrimental to their survival. These threats are mostly in the form of biotic pressures like illicit felling, encroachments, grazing, fires etc. The increased pressure of burgeoning population is subjecting forests to high pressures resulting in increase in area of degraded forests and decrease in the dense forest cover. Considering these realities, the concept of befriending the stakeholders in forests by way of a participatory process was conceived in the revised National Forest Policy of 1988. Based on this the Government of India in 1990 issued directives in this regard and the GOM by its GR dated March 16, 1992 resolved to introduce Joint Forest Management in degraded forest areas and laid down the procedure for this purpose. The provisions of the same were revised and extended to urban areas also vide a GR dated April 25, 2003. Accordingly the stakeholders are assured of a certain share in the usufructs and they are taken into confidence in the planting and management of the forest areas. Managing forests with the active cooperation of village communities will not only help in protecting our forests but will also safeguard the interest of the village communities.

SECTION 2: SPECIAL OBJECTIVES OF MANAGEMENT

1. Making forestry more relevant by balancing between the needs of the community and forest protection.
2. Protecting and conserving the bio-diversity in the forests with the active participation of the local communities.
3. Integrating forestry management interventions with development schemes of other departments for holistic development of the villages.
4. Promoting eco-tourism in forest areas to increase awareness amongst people regarding importance of conservation and protection of forests and wildlife.
5. Empowering local communities by generating employment for the local people in forestry activities, SMC works, eco-tourism and by imparting new skills for alternative income sources to the Self Help Groups.

SECTION 3: GENERAL DESCRIPTION

JFM: There are 858 villages in the vicinity of forests. Joint Forest Management committees (JFMCs) are formed in all these villages. Joint forest management program was implemented in 81 villages under World Bank program, 100% centrally sponsored schemes, Forest Development Agency and IWDP scheme. SMC and afforestation works were carried out under JFM scheme in 20 villages since 1996-97 up till 2006-07 and PPO works are proposed in other 4 villages in the year 2008-09.

People's participation in some of the villages is very good. Following 3 villages have been awarded by the State Government under **"Sant Tukaram Vangram Yojana"** at district level.

1) Vill. Pilani, Tal-Satara, Range - Satara	:-	1st Prize	- Rs.25,000/-
2) Vill. Pandewadi, Tal-Wai, Range- Mahabaleshwar:	-	2nd Prize	- Rs.15,000/-
3) Vill. Karate, Tal-Patan, Range- Patan	:-	3rd Prize	- Rs. 7,500/-

IWDP : On the lines of the JFM, an Integrated Wasteland Development Programme i.e. IWDP has also been implemented as well as a Forest Development Agency (FDA) has also been established. Integrated Wasteland Development Programme i.e. IWDP, a centrally sponsored project was sanctioned for 20 villages in National Watershed No. KR-21 falling in Karad taluka of Satara district out of which 13 villages have forest area to the extent of 1958 hectare. The project was implemented by two different Project Implementing Agencies (PIAs) out of which PIA-I is Deputy Director SFD Satara and PIA-II is Assistant Director, SFD Satara. The main objective was to achieve the holistic development of the villages by treating their watersheds as well as to empower the village communities by providing them adequate training and by establishing Self Help Groups. Various developmental works in the forest as well as non forest areas were executed with the active cooperation of the village communities. SMC works like CCT, nalla bunding etc. were undertaken along with raising plantations within forest areas since 2003-04. PIA-I deals with 8 villages in Karad taluka viz. Riswad, Antwadi, Pachund, Chikhli, Kiwad, Khodjaiwadi, Baburwadi and Nigudi while PIA-II deals with 12 villages in Karad taluka viz. Kaadgaon, Belwade, Kharade, Gosawiwadi, Kachrewadi, Waniachiwadi, Gholapwadi, Masur, Shahapur, Madwadi, Pimpri and Kambirwadi.

FDA : The proposal for constitution of Forest Development Agency (FDA) for 52 villages and with proposed budgetary grant of 2.47 crores was sanctioned for Satara division vide Forest and Environment ministry's letter dated 07.07.03. The main objective of this programme is to integrate all schemes aimed at the development of the villages in and around forest areas and to avoid the delay in transfer of the funds from the Government of India to the implementing agencies. Accordingly 52 villages i.e. 6 in Satara, 10 in Karad, 13 in Patan-Dhebewadi, 10 in Dahiwadi, 9 in Phaltan and 4 in Mahabaleshwar Ranges have been selected and the Societies have been registered according to the provisions of the Maharashtra Registration of Societies Act 1950 and Mumbai Public Trust Act. 1950. The details are given in the table below.

Table No. 51 : Villages under FDA

S.No.	Range	No. of Villages	Villages
1.	Satara	06	Ambwade-Wagholi, Pilani, Valse, Uchat, Kamthi, Lamaj
2.	Karad	10	Mhasoli, Shibewadi, Sakharwadi Chore, Yevti, Tulsan, Ghogav, Dhondewadi, Saalshirambe, Vajroshi, Vadolinileshwar
3.	Patan- Dhebewadi	13	Bondri, Korivade, Khivshi, Karate, Kokisare, Yerad, Atoli, Sadwe, Palshi, Kasani, Shendewadi, Kaadne, Marali
4.	Dahiwadi	10	Wavarhire, Vadai, Pedgoan, Bombade, Cutgun, Bitlewadi, Jakhangaon, Navlewadi, Vardhangad, Kanharwadi
5.	Phaltan	09	Badali(Kh), Gadgewadi, Dhawad, Dhumalwadi, Kanheri, Ghatdare, Javali, Ahire, Bori
6.	Mahabaleshwar	04	Malatpur, Vyahali, Pandewadi, Bopardi

The development works under the FDA were started since 2003-04 and till 2008-09, SMC works and afforestation works to the extent of 1275 ha have been completed with an expenditure of 1.80 crores. Out of 52 villages, afforestation works were not proposed in 5 villages, works could not be started in other 3 villages and so development works were taken up in 44 villages only. In addition under 'entry point activities' permanent assets like construction of compound wall around a Primary school, construction of drinking water storage tank, construction of a public library hall, road repairs, construction of retaining wall of well, construction of pucca bandharas, concretization of roads, erection of STD booths, digging of bore-wells, construction of public toilets etc have been created in certain villages while set of utensils, sewing machines, chairs, tables etc have been provided in some villages.

DPAP : Development works have been taken under Drought Prone Area Programme (DPAP) in 4 drier talukas of Satara district viz. Maan, Khatav, Koregaon and Khandala talukas. Works were taken in forest areas of 15 villages- 2 in Karad range, 9 in Dahiwadi range and 4 in Satara range by the active involvement of their Joint Forest Management committees (JFMCs).

SECTION 4: METHOD OF TREATMENT

Following initiatives should be taken by the DCF as a part of the strategy for the success of JFM:

i. Principles of participatory management, usufruct sharing, eco-system protection, democratic set-up, gender equality, open communication, rights and duties of the community, effective conflict resolution, effective monitoring and evaluation and Shramadaan should be adhered to during the implementation of JFM in any village.

ii. A comprehensive publicity and awareness campaign regarding JFM should be taken up by organizing mass awareness camps in the villages, by distributing pamphlets, by publishing success stories in the print media etc. with the active participation from the schools, NGOs and gram panchayats. The village communities should be sensitized to the concept of sustainable forest management, the tangible and intangible benefits of the forests, the perils of depleting forests, the benefits of stall feeding to the cattle and benefits of using bio gas, LPG, fuel efficient chullahs, solar cookers etc over using fuel wood.

iii. The villagers owning land should be convinced to grow the fuel-wood and fodder trees species on their field bunds or fallow lands by involving Social Forestry department.

iv. Short orientation courses should also be conducted for the forest staff, to equip them with better communication skills and to orient them towards the forestry extension.

v. It shall be endeavored to integrate forestry management interventions with development schemes of other departments as well as eco-tourism under JFM for holistic development of the villages. Proper linkages should be developed with other departments like Animal husbandry, Fisheries, Horticulture, Minor irrigation, Social forestry, MEDA, PWD and MSEDC etc. for convergence of various developmental schemes of different agencies in the same village.

vi. The DCF should select the scenic spots having potential to develop into excellent ecotourism spots. Infrastructure for awareness creation like setting up of Nature interpretation centres, Nature trails, Watch towers, Pagodas, Log huts and Camping sites should be developed. All ‘View Points’ and ‘Horse Rides’ in Mahabaleshwar and Panchgani hill stations require regular maintenance and protection hence all necessary measures should be taken to maintain and protect them. Railings and steps leading to ‘View Points’ should be repaired wherever necessary. Local communities shall be involved in these projects and the benefits should go to the 'host communities' and in the long run capacity building in this regard should be built in for forging partnership with the local people. Rules and Regulations of visitors’ conduct need to be framed and widely circulated to tourists and tourist agencies as well as prominently displayed on notice boards. These eco-tourism complexes should be run primarily by the local management committees formed under JFM. Necessary prior permission from the competent authority under FCA should be taken wherever required.

vii. Establish Self Help Groups in the villages and organize necessary training camps for imparting new skills like manufacture of herbal oils, herbal face packs, and bamboo craft etc., resulting in alternative employment generation to the local communities. Select Eco-guides from the local communities, who shall be trained to impart knowledge of nature conservation and prevention of abuse of identified sites.

viii. The DCF should periodically monitor and evaluate the success of the JFM by considering parameters like reduction in number of forest offences, watershed development, involvement of other development agencies, increased alternative sources of employment generation, women empowerment, effective conflict resolving, voluntary shramdaan by

community members, well established SHGs, reduction in migration to urban areas, increase in annual household income, usufruct sharing etc.

SECTION 5 : GENERAL REGULATIONS

The area to be included under JFM, FDA or other JFM related schemes will be treated according to the Micro Plans for the area which will be prepared in consultation with the villagers as per the guide lines given by the Government of Maharashtra R & F D G.R. of 25th April 2003. But while writing the Micro Plan, it would be mandatory to adhere to the special objectives of management mentioned for the concerned Working Circle to which the area has been allotted in the Working Plan. If any conflict is noticed between the prescriptions given in the WC to which the area is allotted and the Micro Plan written under JFM, FDA etc. then the said area shall be treated in accordance with the special objectives of management pertaining to the concerned WC and suitable amendments shall be made in the Micro Plan, if necessary.

CHAPTER-19

FOREST PROTECTION

SECTION 1: GENERAL CONSTITUTION

The rich bio-diversity of forests of Satara division needs to be protected against the incidents of illicit felling, poaching, fires, encroachments and unregulated grazing. These injuries to the forests are generally man made and are largely inflicted due to ignorance, poverty, needs and greed of the communities living around. Protection of forests from the biotic interference is completely essential for prescribed management interventions to be effective.

SECTION 2: SPECIAL OBJECTIVES OF MANAGEMENT

i. To protect forests in their pristine forms with the active participation of the people.
ii. Empowering local communities by generating employment and alternative income sources for the local people.
iii. To link up forest protection with JFM initiative.

SECTION 3: INJURIES TO THE FOREST

The forests are inflicted injuries mainly by the humans and their cattle for their needs and greed. Major factors causing damage to the forest are listed below.

i. ***Forest fires:*** The forests are susceptible to fires during summers which are mostly man-made. Fires are caused intentionally sometimes to get good flush of grass or for hunting of wildlife or for making encroachments. Sometimes fires caused for rab burning or burning agricultural wastes accidentally stray into the adjoining forests while at times careless throwing of lighted cigarette or bidi butts in the forests by the villagers cause the fires. Recurrent fires badly affect the regeneration status of the forest by killing the young recruits and seedlings. Fires also destroy the soil cover as well as humus on the forest floor as a result of which there is less moisture absorption and more run-off, thereby resulting into soil erosion and degradation of the site.

ii. ***Grazing:*** Unregulated grazing in the forests is rampant in the district. Milch cattle belonging to developed milk dairies are usually stall fed. The district is having larger area under sugarcane cultivation and therefore the green leaves of the sugarcane are largely used as fodder for the cattle. In addition, *Kadba*, the dried lops, tops and remains of the jowar and bajari after the final harvest, is also used as fodder and is mainly procured from Satara and Sangli. Apart from these two, kadval, makka and grasses coming on the field bunds or fallow lands are also used as fodder. Unregulated grazing by the cattle in the forest areas badly affects the NR status of different species. Frequent trampling and browsing not only destroys the young seedlings and coppices but also has resulted into compaction and hardening of soil, thus hampering the establishment and growth of the young recruits and seedlings and thereby affecting the natural process of restocking of the forests.

iii. ***Illicit-Felling:*** The forest crop comprises of miscellaneous species mainly. The percentage of commercially valuable trees in the forest is very less. Therefore the extent of illicit felling in the district is not very serious. Yet illicit-felling and lopping of the trees for small timber, poles, firewood and fencing material is often resorted to, mainly for fulfilling the domestic requirements of constructing or repairing the huts and firing the hearth. It results into further depletion of the growing stock and degradation of the forest area.

iv. ***Encroachments:*** The state of boundary demarcation is not satisfactory in almost all the ranges. Such situation leads to encroachments in forest areas. Encroachments in the forest lands for cultivation as well as for habitation cause a lot of damage to the forests. Encroachments lead to forest- fires, illicit-cutting of trees as well as tahal-cutting. Rab-burning i.e. burning the field before planting paddy and tahal-cutting are common practices along the western side of the district. The areas need to be protected against the encroachments.

v. ***Poaching:*** The jungles of the district were known to be the favourite hunting grounds of the shikaris in the past. The hangover of these shikar traditions still persists. Though the incidents of poaching have comparatively reduced over the years but it is mainly because of the dwindling population of wild animals in the district. The wild boars, hares and peacocks are still available in good numbers in and around the forests and are hunted secretively. The preys are hunted either by electrocuting them using live wires around the fields, by shooting them using guns procured for crop protection or self-defence as well as by using small explosive bombs, locally called '*daru-che-gole*'. Pet dogs are also used sometimes to chase the prey to a point where it can be shot easily.

SECTION 4: METHOD OF TREATMENT

Following are the ***general prescriptions*** for the forest protection

i. Each check naka should be adequately staffed to run day and night as well as should be connected to the division/ range HQ through wireless/ telephones. Proper checking of vehicles should be ensured by the staff at the check nakas. The check nakas should be frequently visited by the senior officers to review their working.

ii. The Range HQs and mobile squad units should be strengthened by providing faster mode of communications like telephones/ wireless, jeeps etc.

iii. The field staff should be imparted professional training for handling fire arms, martial art forms for self defence and for keeping them fit.

iv. Identified extra sensitive and sensitive beats should be patrolled in group formations atleast once or twice a week.

v. A system of timely rewards for the informants and the field staff may be introduced for facilitating early detection and reducing the quantum of offences.

vi. Considering the inadequate knowledge of the forest law with the field staff and the special nature of forest offences, calls for strengthening the legal support at the division level. A forest prosecutor may be provided at the divisional level to meet the requirement of handling the legal cases effectively.

vii. Field staff should be sensitized to protect forest areas in possession of research wing.

viii. A schedule of beat checking and saw mill checking by RFOs, ACFs and DCF as prescribed by the CCF (Protection) shall be strictly adhered to.

ix. Forest protection should be effectively linked up with the JFM initiative in the villages and village forest protection committees should be strengthened.

x. To seek cooperation of local village communities, they should be empowered financially by generating employment opportunities through JFM/ FDA/ other developmental activities, skill upgradations, formation of SHGs etc.

xi. Awareness campaign should be organised from time to time highlighting ill effects and gravity of forest fires, grazing, lopping/ tahal cutting, poaching and their legal complications.

Following are the ***specific prescriptions*** for forest protection

4.1 Fire Protection

This important operation in forest management has been neglected in the past. The characteristics of the system of fire protection in the area under the Plan are a) a very low rate of expenditure per square kilometer, b) a high percentage of area actually burnt year after year and c) a high proportion of failure to protect the forest from fire. The successful protection year after year of a comparatively small area of valuable forest is of greater importance than imperfect protection of a large area.

The forests of the area under Plan are liable to recurrent annual fires which cause considerable damage to young regeneration as well as the old crop, especially if they occur late in the hot season. Some of the plantations, even though fire protected, have been damaged severely due to such fires. In view of the occurrence of repeated fire, some of the very valuable areas should be completely fire protected. For this purpose, special fire lines of 20 metres width should be cleared. Besides all along the boundary of the forest a line of 10 metres will be cleared of all growth and burnt every year. This will prevent fire from entering from the malaki areas. All new fire lines to be prepared should be got approved from Conservator of Forests, Kolhapur circle.

The expenditure on fire protection is very low compared to the area involved and their vulnerability to fire. Hence, more funds should be made available for this purpose. It is also essential to take steps to educate the public in this connection as more often fires occur due to carelessness or neglect of elementary precautions on the part of passers by or the residents of adjoining villages. Without the cooperation and good will of the neighboring villagers, no scheme of fire protection, however perfect, will give the desired results. Often the burning of fire lines along the fire protected coupe has found to be fatal because of carelessness on the part of the subordinates. Hence, this should be seen with great care or else the object with which it is prescribed will be defeated.

Rules for fire protection operations

The forest areas of the division will be divided into three classes for the purpose of protection against fire by orders of the CF, Kolhapur Circle.

The areas would be classified as follows.

Class I Areas: Strictly Protected areas

This class includes the following

i. Regeneration areas
ii. Young regeneration in the Watershed Management WC, Improvement WC and Afforestation WC upto 5 years.
iii. Such other areas as the CF, Kolhapur may by special reasons direct e.g. important sacred groves etc.

All areas in this class will be isolated by means of fire lines and cut guide lines which will be patrolled by fire watchers. Any fire occurring in them will be a calamity and must be reported along with the area burnt, the date of occurrence and the amount of loss.

Class II areas generally protected

This class includes

i. All forests under systematic working but not included in class I and
ii. Such other areas as the CF Kolhapur circle may for special reasons direct.

All areas in this class, will be isolated from the surrounding country by means of external fire lines, and divided into convenient blocks by interior fire lines. Guide lines will be cut, but all fire lines, roads, paths, suitable ridges, grassy maidans, etc will be burnt in successive stages as the grass dries sufficiently to become combustible. Fire watchers may be employed only if sanctioned by the CF, Kolhapur circle. The DCF, Satara division will submit a proposal for all such areas in the forest.

Class- III areas Protected by provisions of law only

In this class are included all forests not included in the two foregoing classes. In forests of this class deliberate burning is prohibited, but no special measures of protection will be undertaken. The forest guards, however, will be responsible for ensuring fire protection through extensive patrolling.

Fire lines

Fire lines are of two kinds, exterior and interior. The responsibility for their up keep rests with the DCF, Satara division. The following instructions will be carefully attended to by the staff in the performance of this duty-

1. It is an established principle in case of exterior fire lines that as far as practicable they should be within the limits of the Government forest and that they should follow the boundary thereof. Occasions may sometimes arise when, in order to secure efficiency, it is necessary to deviate from this.

2. Interior fire lines are made within Government forest and are intended to restrict within limits, fires which have broken out in protected areas and cannot be controlled except by

counter firing. These fire lines should follow the course of roads open to the public and the beds of rivers and streams which in addition to other advantages; themselves constitute natural efficient interior fire lines. Interior fire lines should, as far as possible, not be constructed along ridges, as there the effect of wind is greatest and water is scarce.

3. Fire lines should be selected and laid out on the ground such that it will be not only practicable, but easy to traverse them with speed. Steep gradients and rough ground should be avoided as far as possible. Where ever practicable fire lines should be following natural clearings such as open edges of cultivated plains, or the beds of wide ravines and streams. They should be located to be as near water as possible and the localities where wells exist or should be made and all spots where water can be procured should be marked on the fire maps.

In Class - I Forests: The following measures are prescribed:

i. The first consideration is the isolation of the forest from the surrounding country. This will be affected by clearing the exterior fire lines of all inflammable material to a width determined by local circumstances, ordinarily not less than 40 feet or more than 100 feet. Not later than the month of November two guide lines will be cut one on either side of the area on the fire line. The width of guide lines will depend on the height of the grass through which they run and they must be carefully cleared. This work must be completed by the end of December.

ii. Exterior lines include coupe lines which form the boundary between class 1 area and areas of class II and III. In adjoining Class II & III areas no fire lines will be cleared but a guide line will be cut and burnt.

iii. Interior fire lines will be similarly treated, but will usually be narrower than exterior lines.

iv. As the season advances, the grass in the center of the fire lines will dry and should either be burnt off standing or cut close to the ground over the whole width of the line. If the latter course is followed, the cut grass should be spread over the fire line between the guides and burnt as soon as dry.

v. Dry leaves and other dry material on fire lines must be collected from time to time and deposited along the edge of the fire lines, but burning such material on the lines after the hot weather has commenced, is strictly prohibited.

vi. Except with the express order of the DCF, Satara division and in the presence of the RFO or any other subordinate authorized by the DCF, Satara division no fire lines shall be burnt after January 31st every year.

***In Class II areas*:** Fire protection measures will be taken by fire tracing the existing roads, cart-tracks, range boundaries, etc. All operations of fire tracing and burning should be over by 31st Jan every year.

Existing fire lines will be utilized as far as possible, new lines will not be made without the sanction of the CF, Kolhapur Circle.

Fire Watchers

It is the duty of fire watchers constantly to patrol the fire lines in their beats, to keep them entirely free from inflammable material, to prevent the carrying or making of fire within or in the vicinity of the protected area, to give immediate notice of the occurrence of a fire to the beat officer to collect assistance and themselves to aid in extinguishing any fire that may occur.

Fire watchers must always be on their beats. The DCF, Satara division will see that proper machans for the men to stay on by night and fair accommodation below for cooking by day are provided at suitable places. Fire stations must be situated on elevated spots, so that the watchers may command a good view of the forest they are watching.

Fires

Any RFO, Forester or Forest Guard who may see smoke rising any where in or near the forest shall at once collect such aid as is immediately available and proceed in person to the spot. He must not sit quiet and send some one else to enquire or report. The forest official who arrives at a spot where a fire is burning shall at once proceed to extinguish it even if the fire is outside his own beat or range, unless the fire is so strong as to demand further help. This rule applies to all three classes of forests.

Greatest care must be taken that fires are thoroughly extinguished and all smoldering materials are absolutely quenched. No official shall leave the burnt locality till the senior Forest Officer present has satisfied himself that no smoldering material remains. All men assisting in extinguishing fire in a Government forest shall be paid according to the amount of assistance rendered, at rates fixed by DCF, Satara division in consultation with the CF, Kolhapur circle.

The RFO will be held personally responsible for the efficiency of the fire protection in his range. Where protected forests of two ranges adjoin, the responsibility for efficient protection and clearing on the common fire line will rest with one of the RFO to be selected, by the DCF, Satara division.

The DCF, Satara division will be personally responsible for carrying out efficiently the fire protection measures in the division. He must satisfy himself that the exterior fire lines have been properly cleared and thoroughly burnt before danger from external fire arises, and that at the same time all interior fire lines are in good order. He must by continual inspection assure himself that the protective staff is efficient and he must continue to attend to this work until arrangements for the efficient protection of the forest from fire are made. He must, during his tour, satisfy himself by constant enquiries that no fires in fire protected areas have gone unreported and that the areas of reported fires have been accurately estimated. These checks require extensive and thorough personal inspection by him.

Fire Reports

The RFO shall report the outbreak of a fire to the DCF, Satara division at once, using special dispatch if the fire extends over a large area. The RFO must provide for rapid communication between himself and his staff in fire protected areas so that no delay may occur in his receiving

report of the outbreak of a fire and in transmission by him of such intimation to the DCF, Satara division. The inspection of the area burnt and submission of a full final report with a sketch map by the RFO shall not, without a valid excuse, be delayed for more than a fortnight after the outbreak.

The DCF, Satara division will submit a monthly summary to the CF, Kolhapur circle of fires showing the serial number, date of occurrence, cause, area burnt and extent of damage. Measures taken to extinguish the fire and further precautionary measures taken will be included in the summary. The summary must consist of the following:

(a) All fires in class I areas,

(b) All fires that have occurred in class-II areas after the date fixed for completion of the time of the burning prescribed in the paragraph above and

(c) All fires that have occurred in class-II areas before that date if obviously of a serious nature.

A record of fires in a map form will be maintained for class-I areas only, and will be filed in the Compartment histories form no V.

4.2 Grazing and Fuel wood Regulations

Inadequate protection of regenerated areas from grazing has been one of the main adverse factors responsible for failure of plantations carried out in the past. Traditional methods of TCM/ Live hedge fencing around the regenerated areas and plantation watchmen etc. have not proved to be very effective. Protection can be further ensured by encouraging the people to raise their own resources by raising fodder and firewood species on their farm lands and by popularizing stall feeding efforts to reduce the dependence of local people on forests for grazing and fire wood to whatever extent feasible. The practice of 'Cut and carry' with regards to fodder should be popularized.

Efforts should be made to popularise the use of energy saving devices like more efficient smokeless chullahs. Use of solar cookers and alternate sources of energy like biogas and gobar gas plants etc should be promoted to curtail the dependence of local people on forests for meeting their fuel wood needs. JFM committees should be involved in the promotion and distribution of material earmarked and also in containing the problem of removals by head loads. LPG connections which are now easily available should be promoted through JFM/ FDA programmes. Efforts should also be made to promote and popularize alternate source of gainful self employment by net working with the other departments and private institutions for development of dairy, sericulture, apiculture and cottage based industries in the rural areas to curtail the dependence of local people on the removal and sale of firewood by head loads as source of livelihood. Grazing will be controlled according to the policy formulated by the Government of Maharashtra vide its Resolution No. MFP-1365/13221/Y dated 6-12-1968 and the grazing rules as framed by the Govt. of Maharashtra vide its Resolution No. MFP-1371/237035-Z dated 13-11-1973 and the grazing settlement report for Satara district.

4.3 Sacred Groves

There are many sacred groves i.e. *Devrais* in the district, few within the forests belonging to the government while others on the community lands near the villages. The village communities had been protecting them since ages because of their religious beliefs. But of late, because of the increasing biotic pressure, these groves are being encroached upon for cultivation, housing and fuel wood etc. Following prescriptions shall help the cause of their revival.

i. Identify all the Government owned Sacred Groves in the division and undertake clear demarcation along with measurement of areas.

ii. Undertake fencing of these Sacred Groves using chain linked fencing for areas even upto 25 ha.

iii. Proposals to notify privately owned Sacred Groves as 'Community Reserves' under section 36-C of the Wildlife (P) Act 1972, should be made with the consent of the local community for their effective protection.

iv. Proposals to notify Government owned Sacred Groves as 'Conservation Reserves' under section 36-A of the Wildlife (P) Act 1972, should be made for their effective protection.

v. Undertake floristic inventory studies in all the Sacred Groves.

vi. Create small Information Centres in all big Sacred Groves and use these centres to promote awareness on the importance of bio diversity conservation.

4.4 Research Areas

There are many research areas bearing Seed Orchards, Sample Plots, Plantations, Candidate Plus Trees, nurseries etc being managed by the Silva, MS. These assets formed by the research wing over the years need to be protected and therefore the territorial staff should be sensitized towards protection of these assets. A list showing 'Research areas' is given in the **Appendix no. 20.7**

CHAPTER-20

ECO-TOURISM

SECTION 1 : GENERAL CONSTITUTION

The eco-tourism sustainable nature- tourism can be developed in and around forest areas

Venna lake

having scenic spots or places of historical or religious importance. There are many old forts, temples and places of tourism interest in and around Satara forest areas e.g., Bhairavgad fort, Chandan-vandan fort, Kamalgad fort, Sadashivgad fort and Tathawada fort in Jawali, Karad, Mahabaleshwar, Patan, Phaltan, Satara and Wai talukas respectively.

Forests around Mahabaleshwar, Koyana, Patan, Kas and Mayani are very scenic and popular with the tourists and therefore can be developed into popular eco tourism spots. Waterfalls at Thoseghar in Satara range is also very popular scenic spot. In addition, there is one popular forest park viz., Pratap Sinh udhyan at Mahabaleshwar as well as many 'View Points', 'Horse Rides', forest nature trails and tracking routes all around which are very popular with the tourists. An exhaustive list of the same is enclosed as appendix no. in Volume-II. Since eco-tourism is distinguished from the resort-tourism for requiring lesser infrastructure development and a lower impact on the environment, it can generate more revenue at lesser costs to the Forest Department as well as can generate employment to the local inhabitants. The Forest Department should take lead to involve various stake-holders like local communities, Forest Department, tourism department and local tour operators and seek their active participation and cooperation to make the eco tourism projects successful ventures.

SECTION 2: SPECIAL OBJECTIVES OF MANAGEMENT

i. To provide livelihood opportunities to local community through their involvement in services delivery through eco-tourism.

ii. Promoting eco-tourism in forest areas to increase awareness amongst people regarding importance of conservation and protection of forests and wildlife

iii. To utilise the potential of forest areas for tourism as a key economic force for the conservation of nature

SECTION 3: POTENTIAL SITES FOR DEVELOPMENT

Following are some of the important historical, religious and irrigation project sites of the district with the potential for promoting as the ecotourism spots.

Agashiv hills – Situated at 4 kms South-West of the Karad city. The Agashiv hills are having the ancient (more than 2000 years old) Buddhist caves spreading the message of peace to the world. These caves were discovered by Sr. Bartle Frere in 1849. Out of total 101 caves excavated, 64 are in intact condition.

Ajinkyatara Fort - Satara city is spread over the slope of Ajinkyatara Fort, an historical fort in the district. A good motor road of 5 kms takes you to top of the fort. A view of Satara city from the fort top is one of the nice experiences.

Aundh - 30 kms away from Satara was previously the Capital of Princely State of Aundh province. The Yamai Devi Temple and the Museum are famous spots for visit. Museum has over 8000 precious articles in its collection.

Chaphal - Situated at about 35 kms from Satara and 15 kms away from Umbraj (Pune-Banaglore national highway). Samarth Ramdas, (Guru of Chatrapathi Shivaji), found idols of Shri Ram in the river near Angapur and built a temple at Chaphal. The temple built in marble is a good example of architecture.

Kuraneshwar (Khinditil Ganapati) - Temple of Lord Ganesh and Lord Shiva, situated on old Satara-Kolhapur road, 1 km away from Satara City. It is a famous historical temple of 'Swyambhu Ganesh', the 'Gram daivat' of Satara.

Sajjangarh Fort - During Chatrapathi Shivaji's period, Raigad was the political capital of Shivshahi, while Sajjangad was the spiritual Capital. Sajjangarh (Fort) is situated just 9 kms away from Satara city where Samarth Ramdas took 'Samadhi'. There are 750 steps to enter this Fort. Sajjangad is 3000 feet above the mean sea level. There are 2 lakes on the fort. Samarth Ramdas inspired Chatrapathi Shivaji in his fight for Swaraj. He was the spiritual teacher (Guru) of Chatrapathi Shivaji. On the day of Dasara Navami, people gather here and take part in the festival.

Shikhar Shinganapur – There is an ancient temple of lord 'Shiva' on the hill called Shikhar Shingnapur. Situated at about 89 Kms from Satara on Satara-Akluj road. Huge number of devotees gather here on the eve of 'Mahashivratri' every year. It has many historical references about the visit of Chatrapathi Shivaji Maharaj.

Wai - Wai (the Dakshin kashi of India) is situated at about 33 kms from Satara. It is famous for its temples and ghats. "Maha Ganpathi Temple" is worshipped by many from all over. It is an important Pilgrim and Cultural centre of Maharashtra. The office of Marathi Encyclopedia (Vishwa Kosha) is situated here.

Yevateshwar Temple - The temple of Lord Shiva is very ancient and has historical references. On the day of 'Mahashivratri' and in 'Shravan' month, people visit this temple with great holy spirit. The ghat starts from the Satara City and temple is situated at about 5 kms away and is at a height of above 2500 feet above the mean sea level.

Thoseghar water falls

Thoseghar Waterfalls - The waterfall is situated at about 36 kms away from Satara city. The waterfall is very attractive accompanied by a clean lake, dark woods and highly hilly region. The best season to visit Thoseghar is between July to November.

Kas - Kas Plateau is at height of above 3500 feet above the mean sea level and built in 1844. Kas talav is the main source of drinking water supply for Satara City. It is situated at about 22 kms from Satara city. It is an unique place comparable to 'Valley of Flowers' attracting lot of visitors.

Karad - Priti Sangam - Karad is situated on the confluence of Krishna and Koyna river. Also, the Samadhi of Late Yeshvantrao Chavan (the then Dy. Prime Minister of India) is built on the banks of river Krishna near the confluence. Some of the well known places are Krishnamai Temple, the high minarets.

Dhom Dam - Built in 1978 on Krishna river, hydro-electric Project of 2 MW, with a storage of 13.50 TMC, Dhom Dam is very beautiful spot to visit. It is situated at a distance of 44 Kms from Satara City (9 Kms from Wai). Boat Club facility available here. This place can be seen from the Pachgani plateau.

Kanher Dam - Built in 1986 on Venna river, hydroelectric Project of 4 Mw, with a storage of 10.10 TMC Kanher Dam is a good spot to visit. Situated at about 8 Kms from Satara City on Satara - Medha road. One can enjoy the scenic view of this dam from Yevateshwar Hills.

Satara district has following distinct features which make it a centre of attraction for tourists.

1. It has many places of historical and religious importance. Agashiv Caves, Bhairavnath Temple (Tambve), Bhojling Devsthan, Chavneshwar (Karanjkhop), Datta Temple (Dhumalwadi), Jarandeshwar, Kartikswami Temple (Ambheri village), Khandoba Temple (Pali), Kubditirth, Paneri (Walmiki), Rameshwar, Satoba Temple (Tondale), Shikhar Shingnapur are the attractions for religious tourists. Agashiva hills, Bhairavgarh, Pandavgarh, Pratapgarh, Sadashivgarh, Tathawada fort and Vardhangarh are important historical forts which are added attraction for tourists.
2. Being part of western ghat the district has rich evergreen/ semi-evergreen forest cover in Western portion of the district. Mahabaleshwar Plateau, Panchagani Plateau, Kas Plateau and various scenic spots like Arthur Sit Point, Bobignton .

Point, Canot Pic Point, Casol Point, Catus Point, Elephant Point, Elphiston Point, Fockland Point, Lodwick Point, Marjurian Point, Monkey Point, Mumbai Point, Robbers' Caves, Sawitri Point and Wilson Point attract innumerable tourists.

3. The district also has many reservoirs under different projects like Koyana hydro-electric project and irrigation projects at Dhom, Veer, Maan and Kas. Most of the reservoirs of these projects are located in forest areas and are surrounded by rich forests creating beautiful natural spot for tourists.

SECTION 4: METHOD OF TREATMENT

1. The DCF, Satara Forest Division should select the scenic spots having potential to develop into excellent ecotourism sites as per the ecotourism policy of Maharashtra vide Govt. resolution No. WLP / 002 / C.R. 53 / F-1, dt. 20/ 2/ 2008 and the guidelines for forest and wildlife eco-tourism issued by National Tiger Conservation Authority, Ministry of Environment and Forests, New Delhi
2. The planning should be flexible, site-specific and participatory, and should form part of a larger regional plan for the area, within the normative standards of a Landscape Code
3. Assessment of existing infrastructure, surface transportation, air service, road, electricity, water supply, law and order situation
4. Infrastructure for awareness creation like setting up of Forest information centres (Van chetan kendras), Reception centres, Orientation centres, Visitor centres, Museums, Amphitheatres, Souvenir shops, Nature interpretation centres, Light and sound display, Literatures, Signages, Way-side exhibits, Self-guided Nature trails, Observation towers, Vehicular excursions, Public conveniences, Garbage disposal facilities, Pagodas, Log huts and Camping sites should be developed.
5. Simple, adequate boarding and lodging facilities, in tune with the environment and the general setting of the landscape.
6. All 'View Points' and 'Horse Rides' in Mahabaleshwar and Panchgani hill stations require regular maintenance and protection hence all necessary measures should be taken to maintain and protect them. Railings and steps leading to 'View Points' should be repaired wherever necessary.
7. Devise mechanism to ensure continuous monitoring of adverse effects of tourism for quick redressal.
8. Periodic training programmes on eco-tourism should be conducted for tourism administration, planners, operators and general public.
9. Ensuring periodic training programme to the local community in (a) Lodge ownership/ management, (b) Basic education and awareness, (c) Health and sanitation, (d) Codes of conduct, (e) Forest and wildlife conservation, (f) Litter control, (g) Environmental management, (h) Skill development for preparation of local souvenirs as appropriate, (i) Forging partnerships with tourist and tourism industry.

10. Local communities shall be involved in these projects and the benefits should go to the 'host communities' and in the long run capacity building in this regard should be built in for forging partnership with the local people.
11. Rules and Regulations of visitors' conduct – Do's and Don'ts should be framed and widely circulated to tourists and tourist agencies as well as prominently displayed on notice boards.
12. Select suitable eco-guides from the local communities, who shall be trained to impart knowledge of nature conservation and prevention of abuse of the ecotourism sites.

SECTION 5: OTHER REGULATIONS

i. Fire Protection: The area needs to be strictly protected against fire annually. These areas are quite susceptible to fires. Effective protection against fire for the period from February 15th to June 15th is a must to ensure survival and establishment of natural regeneration of all species for developing them into future growing stock. Special fire lines shall be provided and they should be cleared annually. Firewatchers shall be appointed during the summer season. Entire area of this Working Circle shall be rigidly fire-protected and shall be classified as class I forest areas with reference to fire protection, the details of which are given in the 'Miscellaneous Regulations'. 'Joint Forest Management committees' shall be formed and a comprehensive fire fighting scheme shall be chalked out, the details of which are given in the 'Miscellaneous Regulations'.

ii. Closure to Grazing: Entire area shall remain closed to grazing completely for a period of 5 years from the 1st year of its working.

iii. Protection Measures: The area will be strictly protected from illicit felling and encroachments including seasonal encroachment for the purpose of agriculture.

iv. Clearing of "View Points": The work of clearing the "View Points" will be done annually in October by the forest department.

v. Resolving conflict with Micro Plans made under JFM/ FDA: If any conflict is noticed between the prescriptions given in this WC and the Micro Plan written under JFM, FDA etc. for the same area, then the said area shall be treated in accordance with the special objects of management pertaining to this WC and suitable amendments shall be made in the Micro Plan, if necessary.

vi. The prescriptions of this WC will not be applicable on areas bearing Seed Orchards, Sample Plots, Candidate Plus Trees, Plantations, nurseries etc falling in the areas allotted to this WC and which are otherwise in possession of the Silva MS. These areas are managed with a perspective of research and extension in forestry and hence will be managed as per their Silviculture requirements as included in the Plan of Operations duly approved by Research and Advisory Committee (RAC) MS chaired by the PCCF.

vii. The Workshops should be organized in each Range to sensitize and train the field staff in implementing the prescriptions of this WP. The induction training of the field staff should be organised on priority by the CF, Education Circle, which will help in effective implementation of various WP prescriptions.

CHAPTER - 21

FINANCIAL FORECAST AND COST OF THE PLAN

SECTION 1: FINANCIAL FORECAST

Anticipated Annual Yield and Revenue:

The present Working Plan emphasizes on the development of forests and conservation of biodiversity in the ecologically sensitive Western Ghat areas of Satara division. Therefore revenue generation is not the prime objective. Annual yield of timber, poles and firewood will be negligible as only improvement workings are prescribed. Some small timber, poles and firewood are anticipated from the areas included in the Improvement Working Circle by way of improvement fellings while some yield is expected from the Old Plantations Management WC by way of improvement workings and thinnings. The following table gives an estimate of the anticipated annual yield and revenue as part of the tangible benefits derived from the forest. Though, due to unstable market trends, it is not possible to forecast the anticipated revenue accurately.

Table No. 52 : Anticipated Annual Yield and Revenue

Sr.No.	Working Circle	Forest Produce	Annual Yield	Anticipated annual Revenue (Lakhs)	Rates
1.	Improvement	Firewood	200 m^3 (App)	0.20	@Rs 100/m3
2.	Old Plantations Management	Teak Timber Firewood	6 m^3 200 m^3	0.30 0.20	@Rs 5000/m3 @Rs 100/m3
3.	Bamboo (OL)	Bamboo	20000 nos.	2.00	@Rs10/bamboo
4.	Fodder resources (OL)	Fodder grass	----	0.50	-----
5.	NTFP (OL)	Tamal patra, Shikekai, Cashew, Hirda	----	4.00	-----
	TOTAL			**7.20**	

The intangible benefits of the forests e.g. mitigating climatic changes, carbon sequestering and providing shelter to the wildlife etc are very high. It is, however not easy to assign economic value to the intangible benefits. Yet some of the parameters contributing to the environmental services provided by a medium sized tree of 50 tonnes during its 50 years life span (excluding the value of timber, fruits and flowers) have been assigned notional values by Professor TM Das in 1980 using surrogate market techniques as given in ***'The value of a tree by TM Das 1980- Proceedings of Indian Science Congress'.***

Table No. 53 : Environmental benefits derived from a medium sized tree

Sr. No	Environmental benefits	Single tree Rs (Lakhs)	Forest type	
			Tropical Lakhs/ha	Sub tropical Lakhs/ha
1.	Oxygen Production	2.50	22.50	20.50
2.	Conversion to animal protein	0.20	1.80	01.64
3.	Control of soil erosion	2.50	22.50	20.50
4.	Recycling of water & control of humidity	3.00	27.00	24.60
5.	Shelter for birds, squirrels, insects, plants	2.50	22.50	20.50
6.	Control of Air Pollution	5.00	45.00	41.00
	Total	**15.70**	**141.30**	**128.74**

So, according to Das, from 1 hectare of subtropical forest, environmental benefits worth Rs. 128.74 lakhs are accrued over a period of 50 years i.e. benefits worth Rs. 2.60 lakhs per hectare are accrued per year at 1980-81 rates. Hence the intangible benefits being accrued from the well stocked forests of Satara forest division (approx. 1,30,920 hectares) are worth Rs. 3,404 crores per year at 1980-81 rates.

Estimated Annual Expenditure and Mandays Generation

The anticipated expenditure for the implementation of the WP prescriptions along with the mandays generated is given below. Wage board rates as fixed by the CF, Kolhapur for the year 2006-07 have been used for calculation purposes. Calculations for expenditure on Afforestation activities have been made on the basis of the sanctioned estimate of Afforestation model for zone III by pit planting at 2 x 2 meter spacing. The annual expenditure on the various activities for the next 10 years has been calculated by progressively increasing 10% in the previous year's rate.

Table No. 54 : Estimated Annual expenditure

Sr. No.	Working Circles	Mandays generated annually (Lakhs)	Estimated annual expenditure during first 3 years of Plan period (Lakhs Rs.)		
			Ist Yr	IInd Yr	IIIrd Yr
I	Protection cum Reservoir Catchment WC	0.43	40.54	44.59	49.05
II	Mahabaleshwar Pachgani ESZ WC	0.19	18.15	19.97	21.96
III	Improvement WC	0.48	46.31	50.84	55.90
IV	Afforestation WC	6.54	628.36	691.20	760.32
	Total	**7.64**	**733.36**	**806.60**	**887.23**

Cost Benefit Analysis

Cost

Estimated average annual expenditure for the prescribed operations = 809 lakhs

Benefit

Estimated annual Revenue from tangible benefits = 7.20 lakhs
Estimated annual intangible environmental benefits = 340400 lakhs
Total benefits accrued from forests of Satara Forest division annually = 340407.20 lakhs
The cost benefit ratio is 810 lakhs: 340407 lakhs i.e. 1:421

SECTION 2: COST OF THE PLAN

The total expenditure incurred on the preparation of this Plan is Rs 29.65 lakhs which works out to be Rs 21.33 per hectare. It has been worked out by summing up the expenditure incurred from September 2008 to December 2009 and does not include the expenditure incurred on the enumeration of the forest stock undertaken by the FRSS unit at Nashik.

CHAPTER - 22

ESTABLISHMENT AND LABOUR

The DCF, Satara division is assisted by 4 ACFs, 16 RFOs, 51 Round Officers and 196 forest guards, 2 Police Constables, 5 drivers etc for managing the field while 1 Chief accountant, 18 Accountants, 20 Clerks, 3 Surveyors, 1 Junior Engineer etc assist him in performing his office job. In addition 65 Van majoors are also part of the establishment. Overall, Satara forest division has an establishment of 393 personnel.

The DCF had submitted a reorganisation proposal of Satara forest division in December 2008. In this Proposal existing 7 ranges in 11 talukas have been proposed to be reorganized into 12 ranges in 11 talukas thereby increasing the number of proposed ranges from present 7 to 12, proposed rounds from present 27 to 38 and beats from present 105 to 141. The division has a large cadre of 65 van majoors whose services should be put to maximum and appropriate use.

Adequate health and education facilities are usually not available at many beat and round head quarters in the interior locations. Even staff quarters at many such places are either not available or are not in use due to poor maintenance. Therefore majority of the staff members posted in interior areas had to keep their families at other places out of compulsion.

Various Staff welfare activities can be undertaken under newly created Forest welfare fund apart from the regular government schemes. The staff should be encouraged to first become the member of the Fund to become eligible to avail the facilities. It is also seen that the staff is not adequately trained to handle the wild life emergencies, court cases etc. They are usually unaware of the latest developments in the field of forestry and wild life. Therefore forest guards and foresters should be imparted induction training at the time of recruitment itself that will help equip them with the knowledge pertaining to various aspects of forestry. The trained field personnel can shoulder the overall responsibilities of their job as well as the implementation of the prescriptions of this WP in more efficient and effective manner. Short-term training modules should also be devised by the CF, education wing to train the officers as well as field staff at regular intervals to keep them abreast of the latest developments in the field of forestry.

CHAPTER -23

MISCELLANEOUS REGULATIONS

SECTION 1: PETTY FELLING

It is tree felling of small nature to meet departmental demands, research needs and special grants in exceptional circumstances. Forest produce required for departmental works and free grants may be removed on the orders of the DCF under the provisions contained in Article 256 of BFM Vol. I and Article 147 of BFM Vol. III respectively up to the limits of his power. The fellings under these provisions however must be on silvicultural lines and as far as possible will be confined to the coupe of the year or to the coupe to be worked next. Felling of fruit trees will be excluded and fellings in a radius of 40 mt. from the perennial water-holes, nalas and springs will be prohibited. The detailed guidelines regarding the procedure and quantum of petty felling should be fixed for the state by the PCCF.

In addition removal of dead, fallen firewood on rated passes is permitted from all parts of the forest except in the coupes due for working. Every year in the month of October each beat guard will report the availability of dead fallen firewood compartment wise to the concerned RFO. The DCF will compile this information and fix the quantum of the dead fallen firewood to be removed from each range by mid November. Each RFO under the guidance of the concerned ACF will distribute the targets of the available material amongst various gram panchayats as per their demand and availability along with the location of the area from where it could be collected. The list of the persons so prepared by each gram Panchayat will be handed over to the concerned RFO latest by 15th December. Based on this list, the rated passes will be issued to the concerned persons by the RFO No felling of trees will be permitted to obtain firewood. The DCF may however stop extraction of firewood on rated passes from a specified area, in case, he is satisfied that no firewood exists in that area for such removal.

Felling of trees on forest land required by the other departments such as Irrigation, B & C etc. should only be undertaken after the proposals for the use of forest land for non- forestry purposes are approved by the GOI under the provisions of Forest (Conservation) Act, 1980. The cost of harvesting of trees is to be provided by the concerned agency.

SECTION 2: DEVIATIONS

Petty fellings carried out as mentioned in Para under Petty fellings as well as removal of dead fallen firewood will not be constituted as deviation from the Working Plan.

All other deviations can be classified into following two categories as per National Working Plan Code, 2004:

1. **Deviations which do not permanently alter the basis of management**

1a. *Minor deviations which would seek to alter the schedule of working given in the Working Plan, for example:*

i. Both non-working a coupe in the prescribed year or working the coupe in the year not prescribed by the WP.

ii. Changes in the areas of coupe on account of disforestation or undertaking areas for execution of any special scheme under plan programme.

2. Deviations which permanently alter the basis of management

2a. *Minor deviations which would involve alteration in the silvicultural treatment, for example:*

i. Stopping or curtailing fellings or planting because of shortage of labour, funds, material for plantation work, or unsuitability of terrain and soil or excessive biotic pressure for undertaking plantations to the extent prescribed by the WP.

ii. Fellings involving modifications in the prescribed marking rules etc.

2b. Major deviations of the following nature

i. Change in Silvicultural system

ii. Clear felling of natural forest

iii. Formation of new Felling Series

iv. Large scale felling due to natural calamities, which cannot be adjusted against future yield

Procedure for obtaining sanction for deviations:

1a. In case of deviations of the type '1a' above, the territorial DCF will submit in quadruplicate the proposals of deviations yearly with his copy of control forms to the CCF, Working Plans, Pune through the territorial CF who will forward it to CF WP. The CF, WP will submit it to CCF, WP, Pune along with his remarks. No explanatory remarks are required on the deviation form but these should be given in the forwarding letter. One copy each of the statement will be returned to the DCF, CF (T) and CF, WP after the deviations have been sanctioned by the CCF, WP. In case of difference of opinion between the CCF, WP and CF (T), the former will refer the matter to the PCCF for instructions.

2a. In case of deviations of the type '2a' above, the DCF (T) should submit in quadruplicate the proposals of deviations with a copy of control form to the PCCF through the CF (T), CF WP and CCF WP. The PCCF will then issue necessary sanction orders.

2b. In case of the deviations of the type '2b' above, the DCF (T) should submit in quadruplicate the proposals of deviations with a copy of control form to the PCCF through the CF (T), CF WP and CCF WP. The PCCF, before sanctioning the specified major deviations, will necessarily take prior approval of the Regional CCF, Bhopal.
The format of the deviation statement is given in **Appendix No. 22.1** of Volume II.

SECTION 3: RESEARCH AREAS

The prescriptions of this WP will not be applicable on the Research areas bearing Seed Orchards, Experimental and Sample Plots, Candidate Plus Trees, Plantations, nurseries etc which have been handed over to the State Silviculturist and are in his possession. These areas

are managed with a perspective of research and extension in forestry and hence will be managed as per their Silviculture requirements as included in the Plan of Operations duly approved by Research and Advisory Committee (RAC) MS chaired by the PCCF. A list of research areas is given in **Appendix No. 20.7** of Volume II.

SECTION 4: DEMARCATION AND MARKING TECHNIQUE

The annual coupes shall be demarcated one year in advance of its due year of working as shall be specified in the appendix.

A. Demarcation of Coupes :

i. Annual coupes shall be demarcated by cutting and clearing bushy undergrowth on 3 meter wide line.

ii. Trees selected at suitable intervals along the coupe boundary will be given two coaltar bands and a geru band in between after scrapping the loose dead bark except where the coupe boundary runs along a permanent feature like a big nalla, a fire-line or a road.. Lower coaltar band will be at the breast height while the upper coaltar band will be 15 cm. above it. The tree shall also bear the coupe number, name of the F.S. and the W.C. on the side away from the area of the coupe.

iii. Tree serial number will be given just below the lower coaltar band and away from the area of the coupe. Serial number of such trees will be maintained in the marking register in the following form :

Sr. No.	Species	G. B. H.	Remarks
1.	2.	3.	4.

iv. No tree bearing coupe demarcation bands will be marked for felling.

B. Demarcation of Protection Areas :

22.8 Selected trees on periphery of the protection areas shall be given two geru bands, 15 cm apart with the lower one at the bh. In addition a cross (X) mark in geru shall also be given in between the bands, on the side away from the protection area. The tree serial number shall be given just below the lower geru band on the side bearing the cross. If the number of protection areas is more than one in a coupe, then all the PA's shall be numbered in Roman numerals and the trees standing on periphery of each PA shall be numbered in Arabic. For example, the trees on periphery of PA No. I shall bear the Sr.No.I/1; II/2 etc. while the trees on the periphery of the PA No. II shall bear the Sr.No. II/1, II/2 and so on.

C. Demarcation of other areas given in the treatment map :

The other categories of areas if any shall be marked by giving one geru band and one coaltar band 5 cm apart with the geru band at the bh. The coupe demarcation shall be certified by the R.F.O. in the following format.

"I, ----------, RFO, ----------certify that I have personally inspected the demarcation of coupe No --------- in compartment No ---------- of –

---------- F. S of----------W.C on dated ----------and found that coupe has been demarcated as prescribed in the Working Plan. The area of the coupe is ---------- hectares."

Date: Signature of the RFO

D. Marking Technique :

i. All trees to be marked for felling shall be given a geru band at bh and shall bear marking hammer mark at the bh as well as on the base of the tree on a clear blaze of size 10 cm X 10 cm

ii. All trees marked for felling shall bear serial nos. in coaltar only. The number of the trees marked shall be written vertically on the blaze as shown below :

For tree No. 123 xx

1

2

3

Where xx gives marking hammer inscription and 123 is the serial no. of the marked tree.

iii. All trees bearing serial nos. will be recorded in marking book in the following format :

Serial No.	Species	gbh (ob)	Remarks
1.	2.	3.	4.

iv. Abstract of trees marked for felling shall be made in 15 cm girth classes. Timber, poles and firewood trees shall be indicated in the marking book.

** *If a tree is capable of yielding 30% of the timber expected form it as per the form factor, it is classed as 'Timber tree'. 10% to below 30% as "carpentry tree" and below 10% as "Fire wood tree*".

SECTION 5: MAINTENANCE OF BOUNDARIES

The forest boundaries have not been properly maintained and boundary marks are not seen at many places. The survey and demarcation of acquired private forest has not yet been done. At many places, there is no boundary distinction between this class of RF and the adjoining private agricultural fields or revenue lands. Hence, it is necessary that the DCF, Satara division should attend to this work without loss of time and get the accurate maps prepared. One trace map showing the boundary pillar numbers should be given to the C.F., Working Plans Kolhapur showing these pillar numbers on the master set maintained in his office. A statement showing the extent of natural and artificial boundaries is given in **Appendix No. 20.5** of Volume II.

The following works are required to be carried out for these areas

1) The village maps and 7/12 extracts of all types of forest lands will be obtained from the DILR and compared with the records of the forest department. The discrepancies found will be identified and removed with the help of DILR by carrying out survey and final maps of the areas will be prepared and demarcated on the ground as suggested in the Bombay Forest manual Volume II article 120 – 129, except that the cairns will be replaced with cement concrete pillars. The specifications of cement concrete pillars for boundary demarcation work, viz. size, design and cost are already approved by the PCCF, Maharashtra state, Nagpur.

2) Compilation of forest area notifications. All Gazette notifications under various Indian forest Acts, (1878, and its amendments from time to time, 1927 IFA) declaring lands as reserved and disforested will be collected.

3) Updating the area statement in Form No. 1

4) Updating the forest maps and survey records

5) After survey and demarcation the area will be included in the annual boundary maintenance programme according to the one fifth boundary demarcation programme.

The work of survey, mapping and demarcation for all areas of the Division will be completed within a period of 2 years. The $1/5^{th}$ boundary demarcation programme will continue according to the schedule which will be prepared after the completion of the survey and demarcation.

The boundaries of the forests will be maintained as given below.

A 12 meter wide outer boundary of the forest will be cut by clearing off the brushwood and shrubs so that one boundary mark is visible from its neighbouring one. Trees on the boundary line will not be felled so long as they do not obscure the view of the boundary marks one from the other. Demarcation will be done erecting concrete pillars on the boundary line except where the natural features form the boundary. The pillars will be of the specifications as approved by the PCCF office. These concrete pillars will eventually replace the cairns. But till the time, the concrete pillars replace all the cairns, the cairns also need to be maintained annually.

<u>Rules for the inspection and maintenance of forest boundary marks</u> :

(i) The forest beat guard shall be responsible for the maintenance and protection of all the boundary marks in his beat. He shall himself colour wash them annually after rains and shall make a special report of having performed this work. Each forest boundary mark in his beat shall be specially inspected by the beat guard atleast once every year and a record of his inspection shall be entered in his diary.

(ii) The Round Officer shall be responsible for the maintenance and protection of all the boundary marks in his round and shall see that they are maintained and properly repaired and colour washed by the beat guard. He shall check all the boundary marks in a year which come up for maintenance and repair as per the $1/5^{th}$ boundary demarcation scheme.

(iii)A mention of this shall be made by him in his diaries. He shall also annually submit the R.F.O. a certificate in the following form –

"I, Shri. _____ R.O.

_____ certify that the annual length of the boundary lines as prescribed under the scheme given in the Appendix of the Working Plan for Satara forest division has been verified by me personally and that boundary line and marks are found to be correct as per the maps. I further certify that each cairn bears a correct serial number and next cairn is visible from either side of each cairn. There are no encroachments or encroachments are as detailed below:

Signature of the R.O. with date.

Legal provisions available for protection of the boundary marks:

Under Section 63 (c) of IFA 1927, altering, moving, destroying or defacing any boundary mark of any forest to which the provisions of this Act apply, is punishable with imprisonment for a term which may extend to two years, or with fine, or with both. This offence is non-compoundable under Section 68.

A statement showing details of 5 year boundary demarcation programme is given in **Appendix 20. 6** of Volume-II.

SECTION 6: USE AND DISPOSAL OF MAPS

The different categories of maps and their scale are as under:

Stock maps

As a general rule, if the stock maps of previous WP are available they should only be checked and if they are found to be reasonably accurate, no further action is required. But if they do not already exist, they will have to be prepared on 1:50,000 scale. Normally a stock map will show the crop composition, crop density, quality age classes, regeneration and blank areas. A statement showing signs used in stock maps is given in **Appendix No. 22.2** of Volume II.

Management maps

It will show divisional, range, block, compartment boundaries and boundary pillars with their numbers. In addition it will bear the name and boundaries of Working Circle, Felling/ Working Series and coupes. It will be prepared on 1:50,000 scale.

Working Plan maps

These are prepared on 1:25,000 scale. These are like management maps which in addition to silvicultural units like WC, FS/ WS, Coupes etc, show as many management, administrative and physiographic features as possible.

Reference map

When reading a WP, it is inconvenient and unnecessary, except when detailed information is sought, to have to refer to a separate WP/ management map. Thus each WP will include a small reference map on the inside of the back cover. The map will be of such a convenient size as can be simply folded once or twice to the size of the printed volume. It should show the main boundaries, the forests, ranges, roads, canals, FRH, neighbouring towns and villages and such other relevant features as can be shown without overcrowding it.

Disposal of maps

Eight sets of fresh maps have been prepared as follows:

1. Stock maps - 3 sets (1 cut and mounted + 2 uncut and mounted)
2. Management maps - 3 sets (1 cut and mounted + 2 uncut and mounted)
3. Working Plan maps- 2sets (2 uncut and mounted)

The distribution of these maps will be as follows:

I. Conservator of Forests, Working Plans :

One rough uncut and mounted 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.

i. Management maps - 1 master set (cut and mounted)

ii. Stock maps- 1 master set (cut and mounted)

II. Deputy Conservator of Forests, Satara division :

i. Management maps - 1 set (1 uncut and un mounted)

ii. Stock maps- 1 set (uncut and un mounted)

iii. Working Plan maps- 1 set (uncut and un mounted)

III. Chief Conservator of Forests, Working Plans Circle, Pune :

i. Management maps - 1 set (uncut and un mounted)

ii. Stock maps- 1 set (uncut and un mounted)

iii. Working Plan maps- 1 set (uncut and un mounted)

Additional copies of these maps may be made by the DCF, Satara forest division as per their requirement.

SECTION 7: ROADS AND BUILDINGS

Most of the forest areas are connected by district roads. But in the interior hilly areas the road network is not well developed. The paths are maintained by the department for going to plantations and nursery sites. There are a few short roads which are maintained by the Satara division.

The position of the buildings both for office and residential purposes in the Division is not very satisfactory. Sufficient residential accommodation is not available for the Range officers, field staff, and the ministerial staff. Under the Maharashtra Forestry Project some residential buildings have been constructed in Satara division but these are not sufficient to fulfill the requirement of the whole staff. The office building of DCF, Satara forest division is very old and is in dilapidated condition. It is owned by the PWD. It is neither properly designed nor has sufficient space. Therefore an office building for DCF, Satara forest division is absolutely essential and hence should be constructed urgently. Apart from that, the Forest Rest Houses viz. Hirda and Lingmala at Mahabaleshwar draw many tourists but are in bad shape. They need major repairs and needs to be renovated at the earliest. Similarly Log hut in Pratap Sinh Udhyan at Mahabaleshwar is in shambles and need to be renovated.

CHAPTER- 24

CONTROL AND RECORDS

SECTION 1: CONTROL FORMS

The records of all harvesting, subsidiary silvicultural operations, regeneration works and soil and moisture conservation works carried out in each Working Circle as per the Working Plan prescriptions will be maintained in the control forms. The prescribed performae of the coupe control forms and felling control forms shall be given in the **Appendix no.24.1 of Volume-II.**

The DCF (T) will annually make entries in his copy of the control forms and send them together with the deviation statement in triplicate to the CCF WP Pune through the CF (T) After the entries have been checked and approved, the CCF WP will first get his copy completed and then send the DCF's copy to the CF (T). The later will then complete his copy and finally return the DCF's set for deposit in the latter's office till next year. The CCF WP Pune will send three copies of deviation statement to the PCCF for sanction. After the sanction, one copy each will be sent to the CF (T) and the DCF for their record and the CCF WP will keep the third copy for his set of control forms.

The control forms should be submitted by the DCF to the CF (T) on or before December 1 and the latter should send them to the CCF WP on or before January each year.

SECTION 2: COMPARTMENT HISTORIES

Compartment histories i.e. the record of various forestry activities and observations made in the past year will be maintained in Form Nos. 1 to 5 as given below.

i. Form No. 1 : Compartment description to be filled by the CF WP

ii. Form No. 2 : Compartment enumeration to be filled by the CF WP

iii. Form No. 3 : Trees marked for felling to be filled by the DCF (T)

iv. Form No. 4 : Compartment out-turn to be filled by the DCF (T)

v. Form No. 5 : Compartment History to be filled by the DCF (T)

The formats for the different forms shall be given in the **Appendix no.24.2 of Volume-II.**

If compartment history with full entries already exists, past entries made by the DCF, Satara forest division will be scrutinized by the CF, WP who may edit them if necessary. Usually no condensation should be necessary.

The DCF is responsible for recording current events as they occur and will make his entries on the separate sheet of the form and not on that prepared by the CF, WP. At the next revision of the WP, the CF, WP will scrutinize these entries and edit them if necessary.

The principal information, which the DCF, Satara forest division should record, is as follows:

Felling, Subsidiary Silvicultural Operations, Slash disposal with costs, Plantations, Control burning with costs, Fire incidences and damage caused, Damage by other factors like drought, storm, snow, insect, fungi, grazing etc. Remedial measures taken along with costs, good seed or seedling years of important species.

The entries should be brief and concise; whole or part compartment that was involved should be made clear. For event timings- month or months should be given.

SECTION 3: PLANTATION AND NURSERY REGISTERS

Plantation registers will be maintained for all the areas regenerated artificially in the Form Nos. 1 to 9 in standard format.

Nursery registers will be maintained in Form Nos. 1 to 10 in standard format.

SECTION 4: DIVISIONAL NOTE BOOK

The matters of divisional importance will be recorded under standard headings for records and ready reference in the divisional note-book. A brief note of the plantations will also be recorded by the Deputy Conservator of Forests, Satara forest division under the appropriate heads.

CHAPTER - 25

SUMMARY OF PRESCRIPTIONS

THE TRACT DEALT WITH

This Working Plan deals with the entire forest area including all reserved forests, protected forests, unclassed forests, and finally acquired forests in charge of the Satara forest division within the geographical boundaries of Satara district. This Plan however excludes the areas notified as Koyana sanctuary and Chandoli National Park within Satara district as these are covered by separate Management Plans and are under the administrative control of the Kolhapur wildlife division.

As per the latest 'India State of Forest Report 2009' (SFR), published by Forest Survey of India, Dehradun, the 'total forest cover' of Satara district is 1276 km^2 that is 12.18 % of the geographic area out of which, 'Very dense forest cover' is nearly 9.3 % while 'Moderately dense' is 44.6 % of the total forest cover. The 'Open forest cover' constitutes 46.1 % of the total area under forest cover. This means about 53.9 % of the total forest cover within the district is moderately dense to very dense.

The geographical area of Satara district is 10,480 km^2 and is spread over 11 talukas viz. Satara, Koregaon, Jaoli, Mahabaleshwar, Wai, Khandala, Phaltan, Maan, Khatav, Patan and Karad. The recorded forest area of the district including sanctuary areas is 1570.51 sq.km that is 14.98% of the geographical area of the district. The Satara forest division however has a forest area of 1,309.18 km^2 that is spread over 12 forest ranges and all 11 talukas and is 12.49 % of the geographical area. The division has twelve forest ranges viz. Dahiwadi, Dhebewadi, Karad, Khandala, Koregaon, Mahabaleshwar, Medha, Patan, Phaltan, Satara, Waduj and Wai.

The forest area of Satara forest division extends over in scattered blocks throughout the civil territories of Satara district. The Satara division is bounded to the North by Nira River and Pune district, to the East by Solapur district; to the South by Sangli district, and to the west by Raigad and Ratnagiri districts.

The soils in the Satara district belong to three main classes Viz. (a) Reddish brown soil in the hills (b) Black and (c) Light coloured soil in the plains, depending on the nature of underlying rocks. The red clayey soil in the Sahyadri hill ranges is formed from the disintegration of laterite. The typical laterite soil found in Mahabaleshwar, Pachgani plateau. Rich black soil is found in Wai, Jaoli, Patan and Karad tahsils especially along the banks of leading streams. In the Krishna valley it is found in the broadest belt and is said to be one of the richest in the South. Medium to deep black alluvial soil is found in the central portion of Satara district. The leading light coloured soil is in the 'malran' or 'murummal' a poor and hard rocky soil common at the bases of mere Eastern hills.

The climate of the district on the whole is moderate. It does not show extremities. However, three distinct seasons are experienced. These are monsoons from June to September while October and November are the post-monsoon months with warmer climate, winters from end November upto middle of February followed by a warm to hot summer from mid February upto first or second week of June.

There are two river drainage systems within the limits of Satara district Viz. the Bhima system which is in small part of the North and North-Eastern portion and the Krishna system throughout the rest of the district. The Bhima river has two tributaries; the Nira and the Maan. A narrow belt beyond the Mahadev hills drains north into the Nira, which flows east into the Bhima and the north-east corner of the district beyond the Mahimangad-Panhala spur drains south-east along the Maan which afterwards flows east and north-east to join the Bhima. **This Working Plan covers 1,30,917.76 ha. of area falling within the jurisdiction of Satara forest division.**

THE FLORA AND FAUNA

The Western Ghats region is considered as one of the eight 'hottest' biodiversity hotspots of the 34 identified biodiversity hotspots worldwide.

The region boasts of a tremendous diversity of plant and animal life.

According to the Champion and Seth classification of the forests types of India, the main forest types found in Satara forest division are as follows.

7. **$_{8}A/C_{2}$ – Western sub-tropical hill forests**
8. **$_{2}A/C_{2}$ – West coast semi-evergreen forests**
9. **$_{3}B/C_{2}$ – Southern moist mixed deciduous forests**
10. **$_{5}A/C_{3}$ – Southern dry mixed deciduous forests**
11. **$_{5}A/C_{1b}$ – Dry teak forests**
12. **$_{5}D/S_{4}$ – Dry grass lands**

Nearly 1,452 species of plants belonging to 680 genera of 156 families have been recorded as per the Ph.D. Thesis on ***'Flora of Vasota and its surroundings'*** of Satara district by Dr. Madhukar Y. Cholekar (Bachulkar) under the guidance of Dr. S.R. Yadav of Shivaji university of Kolhapur. Out of the total taxa '**endemic'** to peninsular India, 694 are found in Maharashtra (Singh and Karthikeyan, 2000) of which 175 species are recorded in the study area. Similarly, a total of 251 species are reported to be '**endangered'** in Maharashtra state (Singh and Karthikeyan, 2000) of which 20 species are found in the study area. India harbors over 2000 '**medicinal plants'** of which over 400 plant species of some therapeutic value have been enumerated in the study area. The Satara forest division is also rich in forest fauna. 7 species of mammals of endangered status namely Leopard, Sloth bear, Gaur, Mouse deer and Pangolin and two endangered species of reptiles namely Indian python and Indian Monitor lizard are also been found in the district. The wild animals are mainly confined to the hilly regions of the Sahyadri and its foot hills. Due to natural inaccessibility and scanty population in Dhebewadi, Mahabaleshwar and Koyana catchment areas and also availability of water, forest cover and protection, the wild animals are sighted more frequently.

UTILISATION OF THE FOREST PRODUCE

The population of Satara district is 28.09 lakhs as per 2001 census out of which nearly 86% live in the rural areas. The 2003 live stock census estimated 15.79 lakhs domestic cattle in the district. Agriculture is the main occupation of the people. The important agricultural crops of Satara district are Rice, Jowar, Nachni, Wheat, Sugarcane, Ground nut and Soybean.

The major thrust in the Western ghats forests is on the conservation. The miscellaneous forests of Satara district otherwise also have few timber species of commercial importance. Percentage of Teak trees in the forests is very less. Species like Ain, Kinjal, Nana, Katak etc are used locally for use as small timber in the house-hold constructions. The supply of timber and bamboo locally from the forests is much less than the demand and is met with by the supply made from the other surplus areas. The farmers produce a large share of the total fodder requirement themselves. Few cases of illicit felling of trees for use as small timber and illegal grazing are reported at places in the forests though the pressure on the forests due to these two threats is not very serious.

STAFF AND LABOUR SUPPLY

The division has sanctioned staff strength of 328 and in addition has a large contingent of 65 van majoors. Labourers required for forestry works are not easily available within the district. The increased industrial activities and the overall increase in the standard of living of the people considering better irrigation facilities also fail to attract labourers for the hard work and low returns they get in forestry activities. For nearly all the forestry works, labour is brought mainly from the nearby Belgaum and Bijapur districts of Karnataka state. They are mostly from the 'Lambani' tribe and work as camping labourers.

PAST SYSTEMS OF MANAGEMENT

General history of Forests

From the point of view of management, the forests fall in the following three categories:

A. Forests of Ex-Bombay State.
B. Forests of Ex-States of Aundh and Phaltan.
C. Acquired forests.

The general history of the forest is described separately for each category as under:

A. <u>Forests of the Ex-Bombay State</u>

- Prior to 1818, during the rule of Marathas, the forests were preserved in the West of the Satara division to make the approach to hill forts more difficult.
- The system was introduced to reserve all teak, sandal and black wood, as "Royal trees."
- Sheri or crown lands reserved to produce hay for the state cavalry and elephants.
- Patches of teak forests were preserved to exercise the "Royalty right."
- Village common lands as set apart as "gairan" where free grazing was allowed.
- After territory acquisition, the British let out Sheri lands for cultivation and some retained as forest/ grazing lands.
- "Gavat- Katai" or 'grass-cess' levied in lieu of the supply of grass free of charge to Raja.
- Dr. Gibson, Superintendent of the Botanical Garden, was appointed as the first Conservator of Forests under the Bombay Presidency from 19th December 1846 and Satara was added to his charge in 1848.
- He remarked in his report, that the previous destruction of the forests on the Ghats was so great that it could take many years to build up anything like wood-preserves.
- In 1859-60, he suggested levying a tax on Hirda from the forests around Mahabaleshwar.
- In 1875, Messrs. Shuttleworth and Winter carried out a joint demarcation to fix minimum essential forest reserves.

- In 1879, after the introduction of Indian Forest Act 1878, a total area of 5,94,606 acres was proclaimed to be reserved forest.

- During these years exploitation gradually extended, boundaries were demarcated, survey and mapping work was completed and the staff was gradually organized.

C. *Forests of ex-states of Aundh and Phaltan*

- The former states of Aundh and Phaltan were merged with Bombay State in 1948.
- Before, the management was primarily in the hands of Revenue officers.
- During the period, no scientific treatment was given, resulting in deterioration of forests.
- Heavy illicit cutting and un-controlled grazing and browsing by large herds of cattle, sheep and goats resulted in heavy loss to forests.

C. *Acquired Forests:* Besides these two categories, areas added in Satara forest division from 1973 onwards under different categories were as under:

e) Area transferred from Bhor sub division
f) Area acquired under Private Forest Acquisition Act 1975
g) Area transferred from Revenue Department
h) Area acquired for compensatory afforestation under Forest Conservation Act 1980

These areas were included in the previous WP by Kulkarni and Pethkar.

a. Forests of the Ex-Bombay State

Fagan's Provisional Working Plan (1892-93 to 1933-34)

- Prescribed coppice with standards on 40 years rotation for the teak forests.
- For babul clear felling on a 40 years rotation with artificial regeneration was prescribed.
- Light improvement felling on 30 years cycle was prescribed for the evergreen forest.

Bourke's Plan (1909-1917)

- The prescription of light improvement felling on 30 years cycle continued.
- Forests were included in Block I (Forests under Fagan's Plan), Block II and III (remaining forests on the plateau).
- Coupes were closed to grazing for 10 years.

Master's Plan (1917-18 to 1922-23)

- The prescription of light improvement felling on 30 years cycle continued.
- Old blocks I to III were retained and new areas were included in blocks IV to IX.
- Climber cutting was prescribed and coupes were closed to grazing for 10 years.

Hodgson's Plan (1922-23 to 1933-34)

- To meet the fuel demand at Mahabaleshwar and Pachgani, more forest was included.
- Prescribed light improvement fellings on 30 years cycle.
- Some blocks were kept reserved to meet the future increased demand.
- Exploited coupes were closed to grazing for 10 years.

Maitland- Kirwan's Plan (1907-08 to 1933-34)

- Best teak forests (Karad, Patan and Shirala teak forests) were located.
- The main prescriptions were retained unaltered.

- Additional areas were brought under regular management.
- Allocation to felling series and coupes was modified in some cases.

Singh's Plan (1934-35 to 1972-73)

- In evergreen zone, 4 Working Circles
- Fuel Working Circle 18,316.1ha.
- Experimental Working Circle 552.40 ha.
- Hirda and Shikekai Working Circle 5,20,966 ha.
- In-exploitable Working Circle 93,353 ha.
- In deciduous zone, 3 Working Circles were constituted.
- Teak Timber Working Circle 2513.20 ha.
- Main Working Circle 23,518.40 ha.
- Pasture Working Circle 27,048 ha.

B. Forests of the Ex-State of Aundh and Phaltan

V.M. Wagle's Scheme (1949-50 to 1957-58)

- In Phaltan region, five year felling scheme was introduced for exploitation of babul.
- Selection-cum-Improvement felling added with artificial regeneration was prescribed.

S.M. Wagle's Scheme (1958-59 to 1972-73)

- Three earlier schemes, prepared for Aundh, Akkalkot and Phaltan forests were combined and consolidated into one scheme
- 3 Working Circles.
- Pasture Working Circle 4,534.50 ha.
- Kuran Working Circle 1,722.80 ha.
- Fuel Working Circle

Working Plan of Shri. B.P. Desai (1975-76 to 1989-90)

- 7 Working Circles; 6 main WC along with 1 overlapping WC.
- Protection Working Circle 36,362.911 ha.
- Selection cum Improvement Working Circle 32,764.205 ha.
- Improvement Working Circle 4,435.294 ha.
- Afforestation Working Circle 27,857.485 ha.
- Pasture Working Circle 55,547.333 ha.
- Kuran Working Circle 3,042.559 ha.
- Minor Forest Produce (Overlapping) Working Circle

Working Plan of Shri. L.G.Kulkarni and Shri. N.Y. Pethkar (1996-97 to 2005-06)

The WP had 6 Working Circles; 4 main WCs and 2 overlapping WCs as given below.

1. Protection and Reservoir Catchment Working Circle

This WC included all forest areas which were on very steep to precipitous slopes, areas which came under catchments of hydroelectric project of Koyana nagar, Dhom dam and also the areas that had been depleted through maltreatment, illicit cutting, illicit grazing and fires and exploitation of which accelerate soil erosion. The area included in this WC was 43682.75 ha. The objects were to maintain existing vegetal cover, to prevent soil erosion for avoiding silting

of dams, to improve the forest cover by gap Planting and under Planting wherever possible and to improve subsoil water regime. Soil conservation works were to be taken up in the accessible areas. Removal of dead and wind fallen trees in accessible areas were allowed to meet local demand of firewood, retaining 4 dead trees per ha for the benefit of wild life. The minor forest produce like Hirda, Shikekai etc were allowed to be extracted.

Results:

The funds made available were not sufficient. Only 50 ha of afforestation works and 1724.88 cum SMC works were done under these funds. The sequence of coupes as given in the WP was not followed. Mixed species Plantations were raised in the protection areas on the moderate slopes during the WP period and majority of them are found to be partially successful. Plant species like Awala, Silver Oak, Acacia auriculiformis, Jambhul, Acrocarpus, and Eucalyptus have shown good results. Acacia and Eucalyptus have at most places suppressed other miscellaneous species. Vegetation cover is improved by gap planting. Erosion and silting is controlled to some extent.

2. Mahabaleshwar Plateau Working Circle

This WC included all the forest areas of Mahabaleshwar and Panchgani plateau. The area of the forests included in this Working Circle was 5567.97 ha. The objects of management were to maintain and improve the forests to preserve the aesthetic & climatic amenities of the famous hill station as well as to maintain and improve soil cover over the catchment of Krishna and Koyana rivers by undertaking Plantation & soil conservation works. Works like afforestation in blanks, Planting of Agave in blank areas with shallow soil depth, Soil & Moisture Conservation works as per the site requirement, Introducing the various species of grasses, Removal of dead & wind fallen trees were prescribed.

Results:

Afforestation & SMC works were taken up in this WC under different schemes. Sequence of coupes and schedule of working was not followed. Only afforestation on 25 ha area was done in the year 2005-06 in this WC under Non-Plan funds and 150.06 ha afforestation along with 2258.32 cum SMC works were carried out under various Plan schemes during the Plan period. High rainfall, temperate & foggy climate of the area resulted in stunted growth and low survival rate (30%) in the Plantations. The tree species like Jambhul & Silver Oak are doing well under these climatic conditions.

3. Enrichment Working Circle

This WC included all forest areas allotted to Improvement Working Circle and part forest area of Afforestation Working Circle of Desai's Plan. The area included in this WC is 22,352.65 ha. The objects of management were to improve the condition of the existing growing stock, to restock the over exploited areas and areas adversely affected by illicit cutting and grazing with suitable species as well as to prevent soil erosion and improve water regime and site quality. In patches of teak coppices, it was prescribed to free teak crop of thorny bushes, illicitly cut stools were to be cut flush to the ground and two best shoots from one stool were to be retained as future crop. All plantable blanks and under stocked areas were to be enriched with valuable species like Teak, Sissoo, Shivan, Kalamb, Shiras, Khair, Bibla, Tendu, Apta, Hirda to restock the areas along with soil and moisture conservation measures. In plantable blanks of minimum 2 ha area where tree species could not be raised, Agave species was to be planted. Felling cycle of 20 years was fixed.

Results:

Afforestation and SMC works were taken up in this WC under various sources of fund. The sequence of coupes as given in the WP was not followed. An extent of 342 ha area was planted; during the year 2003-04 under Non-Plan schemes. SMC works of 5546.81cum were also under taken from the year 2001-02 to 2005-06 under Non-Plan. Crow bar method of Teak stump planting on an area has resulted in poor survival of teak stumps and stunted growth of survived stumps. Mixed species afforestation works by and large are successful. Other prescriptions like improvement fellings, CBO etc were not followed.

4. Afforestation Working Circle

This WC included the forest areas having sparse tree growth and open blank areas in degraded state. The total area of this WC is 57332.39 ha. The objectives of management were to conserve soil and moisture, to increase the productivity of forest and to improve the stocking and growth of old Plantations and miscellaneous species. Pit in trench model was prescribed for afforestation. Number of plants to be planted per hectare was to be decided as per the ecological index of the site. Continuous planting of grass tussocks and shrubs preferably by seed sowing was to be done on the piled up earth on the lower side of the trench.

Results:

Afforestation and SMC works were taken up in this WC under different schemes. The sequence of coupes and schedule of working was not followed. Pit in trench model prescribed in the Plan was not found to be practically and financially feasible since most of the sites did not have that much soil depth. Afforestation works in this WC produced reasonably good results. Generally plant species like Sissoo, Shiras, Acacia, Babul, Karanj, Anjan and Ficus etc showed fairly good results. Though survival of teak as well as misc. species is good at many places yet their overall growth is found to be stunted at most of the places.

5. Non Timber Forest Produce (Overlapping) Working Circle

This WC overlapped with the entire area of the division. NTFPs like Chilhar, Apta leaves, Pisa fruits, Hirda, Shikekai, Kadi-patta, Arrow-root, grasses etc. were found in the division. Special object of management was to collect and to increase the yield of NTFPs for meeting local and industrial demands. Plantations of these species were to be done to an extent of 5 % to 10 % of the net area afforested.

Results:

Treatments prescribed were not followed strictly; hence no beneficial effect was noticed.

6. Wildlife (Overlapping) Working Circle

This WC overlapped with the entire area of the division. Objects of management were to manage, protect, conserve and multiply the wildlife and to conserve and develop suitable habitats. Water, salt licks and shelter were to be provided wherever required. Wildlife habitats were to be strictly protected against fire, grazing by domestic animals and poaching. Existing water holes were to be cleaned and deepened. New water holes, anicuts were to be created at the selected sites. Monitoring regarding wild animal population, health etc by means of census was to be done.

Results:

As the prescriptions were not followed due to paucity of grants, no beneficial effects were noticed.

STATISTICS OF GROWTH AND YIELD

Enumeration during present Plan

While revising the Plan by L.G. Kulkarni and N.Y. Pethkar, the enumeration of the forest crop was carried out by the 'Forest Resources Survey Scheme Unit' Nashik along with the active cooperation of the field staff from February to December 2008. The sampling design and overall technical guidance was given by the Chief Forest Statistician, MS, Nagpur. The sampling design of 'Systematic Line Plot sampling with random start' was adopted with the sample plot size of 30 x 30 meters i.e. 0.09 ha roughly at an interval of 600 meters. Out of total 2638 plots which were laid in the field, 725 laid in the areas allotted to Protection cum Reservoir Catchment WC, 123 in Mahabaleshwar Panchgani Eco-sensitive Zone Management WC, 347 in Improvement WC and 1443 in Afforestation WC.

The analysis of the data revealed the stocking of nearly 279 trees per hectare for the entire division. Stocking of trees per hectare for each of the WC is as follows: 310 for Protection cum Reservoir Catchment WC, 434 in Mahabaleshwar - Panchgani Eco-sensitive Zone Management WC, 243 in Improvement WC, and 127 in Afforestation WC.

AREA ALLOTTED TO VARIOUS WORKING CIRCLES IN THE REVISED PLAN

Four main WC along with 4 overlapping WCs are proposed in the revised Plan.

Sr. No.	Working Circle	Area allotted (ha.)	%age of area allotted
1.	Protection cum Reservoir Catchment Working	36051.41	27.54 %
2.	Mahabaleshwar Panchgani Eco-sensitive Zone Management Working Circle	16141.10	12.33 %
3.	Improvement Working Circle	24257.87	18.53 %
4.	Afforestation Working Circle	54467.38	41.60%
5.	Wild Life Management (O.L.) Working Circle	----	----
6.	Old Plantation Management (O.L.) Working Circle	----	----
7.	Bamboo Management (O.L.) Working Circle	----	----
8.	NTFP Management (O.L.) Working Circle	**----**	----
	TOTAL	**1,30,917.76**	**100.00**

1. PROTECTION AND RESERVOIR CATCHMENT WORKING CIRCLE

This Working Circle includes all the forest areas which are on very steep to precipitous slopes (i.e. $25^0$and more) as well as forest areas occurring on the slopes forming the catchment of hydro-electric project at Koyana nagar and irrigation projects at Dhom, Veer, Maan and Kas. It includes very steep to precipitous and inaccessible areas of Dhebewadi, Mahabaleshwar,

Medha, Patan, Satara and Wai ranges. The precipitous slopes are mostly devoid of tree growth and vegetation occurs only in sheltered valleys and on steep slopes which are inaccessible. The mean annual rainfall in these areas ranges between 2000mm to as high as 6000mm. These are highly vulnerable areas where retention of tree cover is essential to protect the soil from erosion and laterization due to heavy rainfall. The area of this Working Circle is 36051.41 ha. that is 27.54 % of the total area being dealt in this Plan. The main objective is to manage the runoff water and maintain the vegetation cover. This will mitigate the rate of soil erosion in the various catchments and will also check the silt inflow in the reservoirs, thereby increasing their life. Each village in a watershed shall be taken as a unit of holistic development. Various soil moisture conservation works like gully plugging, gabion structures, brushwood dams, Vanrai bandharas, contour bunding, contour trenching, van talis etc. shall be done as per the suitability and the requirement of the area. Accessible under-stocked areas with good soil-depth and more than 2 hectares in extent in a compact block shall be planted with suitable local species. In smaller areas, seed-dibbling shall be done to suitably clothe the area. No exploitation of timber or fuel-wood shall be done. Wind fallen material shall be removed from the accessible areas. Collection of Non wood Forest Produce (NTFP) shall be permitted according to prescribed rules. Care shall be taken to not to cause any harm to the plants while collecting NTFP. It shall be endeavored to integrate forestry management interventions with development schemes of other departments under JFM, FDA, IWDP, DRDA, District Plan etc. for socio-economic upliftment of the village communities with an objective to develop clusters of villages in various watersheds.

2. MAHABLESHWAR PANCHGANI ECO-SENSITIVE ZONE MANAGEMENT WORKING CIRCLE

This Working Circle comprises of the forest areas of Mahabaleshwar Panchgani region that has been declared as Eco sensitive Zone by Ministry of Environment and Forests Notification dated 17th January, 2001. This region is environmentally sensitive and includes the entire forest area within the boundaries of Mahabaleshwar taluka and the villages of Bondarwadi, Bhuteghar, Danwali, Taloshi and Umbri of Javli taluka of Satara district. The forest area under this Working Circle is 16141.10 ha. which is 12.33 % of the total forest area being dealt in this Plan. Each village in a watershed shall be taken as a unit of holistic development. It shall be endeavored to integrate forestry management interventions with development schemes of other departments under JFM, FDA, IWDP, DRDA, District Plan etc. for socio-economic upliftment of the village communities with an objective to develop clusters of villages in various watersheds. Proper linkages shall be developed with other departments like Animal husbandry, Fisheries, Horticulture, Minor irrigation, Social forestry, MEDA, PWD, MSEDC etc. for convergence of various developmental schemes of different agencies in the same village to develop cluster of villages into model villages, the areas of excellence.

3. IMPROVEMENT WORKING CIRCLE

This Working Circle includes all forest areas of Enrichment Working Circle of previous WP and part areas of Afforestation Working Circle. It includes areas capable of producing small and medium sized timber. It also includes areas having sparse growth and low percentage of economically valuable species. The area of forest included in this working circle is **24257.87**

ha. The objective is to improve and enrich the growing stock and to meet the demand for small timber and fuel which will be achieved by carrying out improvement works with an emphasis on soil and moisture conservation works along with improvement fellings. NR will be tended and supplemented with AR wherever needed. The SMC works like van tale, nalla-bunding, gully plugging etc will be carried out wherever required. Accessible under stocked areas having good soil depth and more than 2 hectares in extent in a compact block shall be planted with suitable miscellaneous species while in areas less than 2 ha. in extent, seed dibbling shall be done. Rooted stock shall be properly tended. All climbers on the trees except those having medicinal properties and which are used and traded shall be cut. Only dead, diseased, unsound and malformed trees shall be marked for felling, retaining two dead trees per hectare for the benefit of the wild-life. All live high stumps shall be cut flush to the ground and shall be dressed thereafter with a sharp axe to get vigorous coppice shoots.

4. AFFORESTATION WORKING CIRCLE

This Working Circle includes all such compartments which have sparse tree growth and open blank areas in degraded state. These areas are degraded due to biotic pressure and environmental factors. Soil depth is poor. The total area of this WC is 54467.38 ha. comprising nearly 41.60 % of the total forest area being dealt in this Plan. These areas bear sparse vegetation, the soil condition is deteriorated due to heavy grazing and frequent fires in the past. The under stocked areas shall be treated in two phases; the restorative phase during which the soil and moisture conservation works shall be carried out during the initial first year and the productive phase during which, the planting activity will be taken in the second year.

5. OLD PLANTATIONS MANAGEMENT (OVERLAPPING) WORKING CIRCLE

This Working Circle overlaps with the entire area of the Working Plan and deals with the management of old successful plantations of Acacia auriculiformis, Eucalyptus species, Miscellaneous species and Teak taken since sixties till 1994-95. The main objectives are to improve the condition of plantations by using tending operations as well as to enrich the area by taking AR of suitable species. Due to poorer site quality, most of the non-teak plantations show stunted growth and are usually sparse. Felling or Thinning of such mature plantations is not found to be suitable for this fragile area considering the fact that most of such plantations are sparse and are generally not congested. Therefore, only improvement works have been prescribed in such plantations. The entire regeneration of miscellaneous species including trees if any will be retained and tended. Teak plantations have been raised mainly in Satara, Karad, Dhebewadi ranges however these have not been tended and thinned as per the prescriptions of the earlier Plans, thus affecting their growth. First mechanical thinning will be done in the 10^{th} year of formation of the plantation followed by 'Ordinary thinning' or 'Low Thinning' a type of silvicultural thinning which shall be resorted to in the15th and every 10^{th} year subsequently till the plantation attain the age of 65 years. Successful Teak plantations which have been left out inadvertently shall also be thinned as per the above schedule.

6. BAMBOO MANAGEMENT (OVERLAPPING) WORKING CIRCLE

Bamboo is found mainly along the hilly slopes and along the nallahs in scattered patches in Dhebewadi, Patan, Satara and Mahabaleshwar ranges of Satara division. Old bamboo plantations and naturally occurring bamboo covering an extent of 605 hectares area is in Dhebewadi range. In other ranges, stocking is inadequate to harvest bamboos in sustainable

manner. Majority of the old bamboo clumps found growing naturally or in plantations in the forest areas have never been worked before and show lot of congestion bearing dead, deformed and over mature bamboos. The culms of Bambusa bambos are found to be badly entangled within the clumps due to over congestion. All clumps will be cleaned during the coupe working. All dead, decayed, dry and twisted culms will be removed. No clump shall be considered fit for harvesting unless it contains more than 12 culms of one year or older in age. All current year and previous year culms will be retained. The mature culms equal in numbers to the current year culms subject to minimum of 8 culms must be retained to provide support to the younger culms. The remaining mature culms after reserving as described in the preceding paragraph may be harvested. *Such clumps of Bambusa bambos or other species which are difficult to work as per standard bamboo working due to heavy congestion should be worked so as to retain culms in 'U' shape or to retain bamboo culms on the periphery of the clumps. This should be done only once after which following standard bamboo working prescriptions should be strictly followed.* No culm shall be extracted without cleaning the clump which should be an integral part of the bamboo harvesting.

7. WILDLIFE MANAGEMENT (OVERLAPPING) WORKING CIRCLE

The forests along the western side of Satara district are rich in wildlife biodiversity. Their continued existence is crucial for the long-term survival of the biodiversity and the ecosystems supporting them. This WC overlaps with the entire area being dealt in the WP. With mounting agricultural, industrial and demographic pressures, wilderness areas, which are the richest repositories of wildlife and biodiversity have either shrunk or disappeared. Their continued existence is crucial for the long-term survival of the biodiversity and the ecosystems supporting them. This WC overlaps with the entire area being dealt in the WP. The wild animals are mainly confined to the hilly regions of the Sahyadri and its foot hills. Due to natural inaccessibility and scanty population in Dhebewadi, Mahabaleshwar and Koyana catchment areas and also availability of water, forest cover and protection, the wild animals are sighted more frequently. There are seven species of mammals viz. Leopard, Sloth bear, Gaur, Mouse deer and Pangolin and two species of reptiles viz. Indian python and Indian monitor lizard which are endangered.

While increasing man-animal conflict is an outcome of shrinkage, fragmentation and deterioration of habitats, it has caused destruction of wildlife and generated animosity against wild animals. Habitat destruction to meet the ever increasing needs of the human population force large herbivores like Gaur (*Bos gaurus*), Sambar (*Cervus unicolor*) to enter agricultural fields leading to crop depredation and man-animal conflict situations. A detailed survey of the fauna and flora of the district, their occurrence, status and conservation strategies with a focus on the endemic and endangered species should be undertaken by the expert agencies appointed by the forest department. Since, water is the major limiting factor in the forest during the summers, so development of various water sources by gully-plugging and by erecting nalla-bunds, check-dams etc. needs to be done. Areas where fodder availability can be increased to prevent straying of wild herbivores like gaur into agricultural lands should be identified and tackled. The infrastructural facilities to handle wildlife emergencies should be strengthened. The forest staff at different levels shall be trained and equipped fully to handle wildlife emergencies including handling of tranquilizing as well as trapping equipment. The frontline staff should be trained to provide adequate professional skills in prosecution matters related to wildlife offences. Mass awareness camps should be organized as a part of sustained campaign

to educate masses. The willing veterinarians preferably from the government departments shall be imparted basic and advanced training in the wildlife medication in different batches.

8. NON-TIMBER FOREST PRODUCE MANAGEMENT (OL) WORKING CIRCLE

This is an overlapping WC, covering the entire forest area being dealt in this WP. Many species yielding Non Timber Forest Produce (NTFP) including the medicinal plants are found in these forest areas. The important NTFP found in the Satara district are Tamal patra, Cashew, Shikekai, Hirda, Karanj, Kadi patta, dink etc. It is proposed to make a resource inventory of all Non Timber Forest produce in every Range of the Division and mark areas rich in such NTFP including Medicinal Plants. The areas having promising regeneration of NTFP species and which is not less than 0.5 hectare in extent in a compact block will be identified in the annual coupes of each year and will be tended to remove congestion and promote their growth. The weekly markets should be surveyed to know the extent of various NTFP reaching the markets, methods of harvesting, their market price and purpose of their utilisation in domestic or international markets. The DCF should prepare an analytical report based on this. Only sustainable methods of harvesting of NTFP should be used and expertise for training villagers to put these non-destructive methods into practice should be developed. Leaves and fruits shall be plucked from the tree or shrub branches in a non destructive manner. Lopping of branches or felling of trees/ shrubs for collecting NTFP should be strictly dealt with.

JOINT FOREST MANAGEMENT

Forests are facing severe threats detrimental to their survival. These threats are mostly in the form of biotic pressures like illicit felling, encroachments, grazing, fires etc. Considering these realities, the concept of befriending the stakeholders in forests by way of a participatory process was conceived. Managing forests with the active cooperation of village communities will not only help in protecting our forests but will also safeguard the interest of the village communities. There are 858 villages in the vicinity of forests. Joint Forest Management committees (JFMCs) are formed in all these villages. On the lines of the JFM, an Integrated Wasteland Development Programme i.e. IWDP has also been implemented as well as a Forest Development Agency (FDA) has also been established. Similarly eco-tourism or sustainable nature-tourism under JFM can also be developed in and around forest areas having scenic spots or places of historical importance. Principles of participatory management, usufruct sharing, eco-system protection, democratic set-up, gender equality, open communication, rights and duties of the community, effective conflict resolution, effective monitoring and evaluation and shramdaan should be adhered to during the implementation of JFM in any village. A comprehensive publicity and awareness campaign regarding JFM should be taken up. The villagers owning land should be convinced to grow the fuel-wood and fodder trees species on their field bunds or fallow lands by involving Social Forestry department. Short orientation courses should also be conducted for the forest staff, to equip them with better communication

skills and to orient them towards the forestry extension. Establish Self Help Groups in the villages and organize necessary training camps for imparting new skills.

ECO-TOURISM

The eco-tourism or sustainable nature-tourism can be developed in and around forest areas having scenic spots or places of historical importance. There are many old forts and places of tourism interest in and around Satara forest areas e.g., Kamalgad fort, Bhairavgad fort, Sadashivgad fort, Chandan-vandan fort and Tathawada fort in Mahabaleshwar, Patan, Karad, Satara and Phaltan ranges respectively. Forests around Mahabaleshwar, Koyana, Patan, Kas and Mayani are very scenic and popular with the tourists and therefore can be developed into popular eco tourism spots. Waterfall at Thoseghar in Satara range is also very popular scenic spot. In addition there is one popular forest park viz. Pratap Sinh Udhyan at Mahabaleshwar as well as many 'View Points', 'Horse Rides', forest nature trails and tracking routes all around which are very popular with the tourists. A complete list of the same is enclosed as appendix. Since eco-tourism is distinguished from the resort-tourism for requiring lesser infrastructure development and a lower impact on the environment, it can generate more revenue at lesser costs to the Forest Department as well as can generate employment to the local inhabitants. The FD should take lead to involve various stake-holders like local communities, FD, tourism department and local tour operators and seek their active participation and cooperation to make the eco tourism projects successful ventures. The DCF should select the scenic spots having potential to develop into excellent ecotourism spots.

FOREST PROTECTION

The rich bio-diversity of forests of Satara needs to be protected against the incidents of illicit felling, poaching, fires, encroachments and unregulated grazing. Protection of forests from the biotic interference is completely essential for prescribed management interventions to be effective. This chapter contains general forest protection regulations along with regulations on fire protection, grazing etc.

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सत्यमेव जयते

भारत सरकार
GOVERNMENT OF INDIA
पर्यावरण एवं वन मंत्रालय
MINISTRY OF ENVIRONMENT & FORESTS

क्षेत्रीय कार्यालय, पश्चिम क्षे
Regional Office, Western Regio
"केन्द्रीय पर्यावरण भवन
"Kendriya Paryavaran Bhavan
लिन्क रोड नं0-3/Link Road No.
E-5, रविशंकर नगर/Ravishankar Nagar
दूरभाष /Phone: 2466525,2465496, 246310
फैक्स /Fax: 0755-246310
भोपाल (म0प्र0)/Bhopal-462016 (M.P.)
अणुडाक /E-mail: rccfbhopal@gmail.com

No. : 12-27/2010 (FOR)/ 1677,

Dated : 31/08/2010

To,

The Principal Secretary,
Revenue and Forest Department,
Mantralaya,
MUMBAI

मुख्य वनसंरक्षक
(कार्य आयोजना) नागपूर
20 SEP 2010
आवक क्र. 2093.
कक्ष D-14

Sub : **Working Plan proposal for Satara Forest Division, written by Shri Vikas Gupta and N. Mohan Karnat, IFS for the period of 2010-11 to 2019-20.**

Ref : Revenue and Forests Department., Government of Maharashtra letter No. FDM 2010/CR-53/F-2, dated 29.7.2010.

Sir,

With reference to the above mentioned subject, and the reference cited I am directed to say that after careful examination of the Working Plan of Satara Forest Division, the Central Government hereby conveys its approval to the said working plan in accordance with the powers vested under Forest (Conservation) Act, 1980 subject to following conditions:-

(1) The currency of the Working Plan shall be for a period of 10 years i.e. from 2010-11 to 2019-20.

(2) The orders of Hon'ble Supreme Court in the matter of Godaverman Therumalkpad Vs Union of India in W.P. (Civil) No. 202/95 and related Inter Locutory 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.

) Further, in compliance with orders of Hon'ble Supreme Court's dated 22.09.2000, the State Government of Maharashtra shall ensure that regeneration of forests is commensurate with fellings carried out under this working plan.

No felling shall be carried out without allocating necessary fund for implementation of regeneration operation so as to make regeneration commensurate with fellings. In the event 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) Following the directions of the Hon'ble Apex Court in their order dated 22.09.2000, a Core Group has been constituted under the Chairmanship of the Director General of Forests and Special Secretary for deciding the extent of harvesting that could be permitted under approved Working Plans for ensuring regeneration to be commensurate with fellings. Instruction/directions of the Central Government in the matter to be issued in future shall be strictly complied with. Felling to be done by State Government only after seeking permission from Core Group constituted by the MOEF, New Delhi.

(6) No forests bearing naturally grown trees shall be clear felled for any purpose whatsoever.

(7) Prescriptions of microplans for JFM (if made) should not deviate the broad framework/guidelines of the working plan and shall be in accordance with various orders of Hon'ble Supreme Court.

(8) 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/following years to compensate this removal.

(9) No deviations shall be made from the prescriptions of working plan read with the conditions stipulated herein without prior approval by the Central Government under Forest (Conservation) Act, 1980. However, deviations of positive nature i.e. out of turn plantations carried out outside the worked area under any project, schemes and compensatory afforestation may be approved by the competent authority of the State Government.

(10) The Central Government reserves the right to review, modify, withdraw this approval at any time if any of the conditions of approval are not implemented or relevant modification in the working plan is required 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.

Yours faithfully,

(Pradeep Vasudeva)
Dy. Conservator of Forests (Central)

Copy to :

1. The Additional Director General of Forests (FC), Ministry of Environment and Forests, Paryavaran Bhawan, CGO Complex, Lodi Road, New Delhi - 110 003.
2. The Principal Chief Conservator of Forests, Govt. of Maharashtra, Seminary Hills, Nagpur.
3. The Chief Conservator of Forests (Working Plan), Government of Maharashtra, Nagpur.

(Pradeep Vasudeva)
Dy. Conservator of Forests (Central)

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E-mail for F-2 Desk :- R&FD_Forests_DO_F2@maharashtra.gov.in Tel. No. 022-22[illegible]

GOVERNMENT OF MAHARASHTRA

NO. FDM 2010/CR-53/F-2
Revenue and Forests Department,
Mantralaya, Mumbai-400 032
Dated :- 18.9.2010

SUBJECT :- **APPROVAL OF WORKING PLAN OF SATARA FOREST DIVISION WRITTEN BY SHRI VIKAS GUPTA & N. MOHAN KARNAT, IFS FOR THE PERIOD OF 2010-2011 TO 2019 - 2020.**

MEMORANDUM:

The undersigned presents compliments to the Additional Chief Conservator of Forests (Production & Management) and, with reference to his letter no. Desk-14/WP/CR-66/56/09-10, dated 1.7.2010 on the above subject, is directed to convey the sanction of Government of Maharashtra to the working plan of SATARA FOREST DIVISION, SATARA, Maharashtra state for the period of 2010-11 to 2019-20 prepared by **SHRI VIKAS GUPTA & N. MOHAN KARNAT, IFS**

The Government of India, Ministry of Environment and Forests has already conveyed its approval to the above said working plan vide its letter No.12-27/2010/(FOR)1677, dated 31.8.2010 under certain conditions. These conditions should be strictly followed.

By order and in the name of the Governor of Maharashtra .

(NITIN KARODKAR)
Joint Secretary
Revenue and Forests Department

To,

THE ADDITIONAL CHIEF CONSERVATOR OF FORESTS, (PRODUCTION & MANAGEMENT) MAHARASHTRA STATE, NAGPUR.

Copy to :

1. Chief Conservator of Forests , Working Plan Circle, Pune.
2. Conservator of Forests , Working Plan Circle, Kolhapur.

ISUED

20/9/2010

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WORKING PLAN FOR SATARA FOREST DIVISION.
For the period from 2010-11 to 2019-20

Reference : Addl. Principal Chief Conservator of forests, (Production and Management) Maharashtra State, Nagpur's letter No. Desk 14 / WP / CR. 561 / (08-09) / 83 , Nagpur, dt. 12/05/2009

The Working Plan for Satara Forest Division was discussed under the Chairmanship of Principal Chief Conservator of Forests, M.S. Nagpur and approved vide his letter No. under reference.

Prepared by

Vikas Gupta,
Conservator of forests,
Working Plan Division,
Pune

Prepared by

N. Mohan Karnat,
Conservator of forests,
Working Plan Division,
Kolhapur

Counter signed by

Chief Conservator of forests,
Working Plan Circle, Pune.

Counter signed by

Dy. Conservator of forests,
Satara Division, Satara.

Counter signed by

Collector, Satara district

Counter signed by

Conservator of forests,
Kolhapur circle, Kolhaur

Counter signed by

Chief Conservator of forests,
(PT & SP), M.S. Nagpur

Counter signed by

Chief Conservator of forests,
(Conservation), M.S.Nagpur

Counter signed by

Addl. Principal Chief Conservator of forests
(P & M) M.S. Nagpur

Counter signed by

Addl. Principal Chief Conservator of forests,
(HRM) M.S. Nagpur

Counter signed by

Principal Chief Conservator of forests
(Wild Life) M.S. Nagpur.

Counter signed by

Principal Chief Conservator of Forests,
M.S. Nagpur