सत्यमेव जयते

State Report on
National Programme on Promoting Medicinal Plants Conservation and Traditional Knowledge for Enhancing Health and Livelihood Security for West Bengal

(UNDP - CCF-II Project No. 13047)

जहाँ है हरियाली ।
वहाँ है खुशहाली ॥

FRLHT

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Research Circle, Directorate of Forests
Government of West Bengal

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Gloriosa superba

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FRLHT

UNDP

RESEARCH CIRCLE
DIRECTORATE OF FORESTS
GOVERNMENT OF WEST BENGAL

Sponsored by

Ministry of Environment and Forests, Government of India and
United Nations Development Programme (UNDP)

Coordinated by

Foundation for Revitalisation of Local Health Traditions [FRLHT],
Bengaluru, India

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Foreword

Major source of medicinal plants in West Bengal is within forest areas, which are having rich plant diversity in wide range of forest types supporting innumerable medicinal plants both in hills and plains. Out of 11,879 sq. km. of forests in the State, the reserve forest comprises of 7,054 sq. km. i.e. 54% of the total forest area and 3,772 sq. km. i.e. 30% of the total forest area constitutes protected forest. Again 34% of the total forest area in the State are declared as Protected Areas where conservation of the habitat get due emphasis. Thus medicinal plants resources in the Protected Areas and remaining Reserve Forests and Protected Forests get satisfactory protection, though the resource in the remaining forest areas is under great stress in view of human interference and other biotic factors. Efforts have, however, been put since 1996 by the Research Wing of the Forest Directorate, West Bengal to have collection of different medicinal plants available from forest areas by way of creation of medicinal plants garden at different nursery sites or other suitable sites.

In 2002 and again in 2005, two projects on Medicinal Plants Conservation were sponsored by National Medicinal Plants Board (NMPB) under Ministry of Health, Government of India. A number of *in-situ* and *ex-situ* conservation measures were taken in different agro-climatic zones of the State. Demonstration and Propagation centres were also established. Pilot plantations of medicinal trees, shrubs and herbs were attempted successfully. Trainings in this regard were imparted to all stakeholders.

Thereafter since 2006, a United Nations Development Programme (UNDP) sponsored project "National Programme on Promoting Medicinal Plants Conservation and Traditional Knowledge for Enhancing Health and Livelihood Security", UNDP-CCF-II Project No.13047, was launched in West Bengal by Ministry of Environment and Forests (MoEF), Government of India and the Bengaluru based "Foundation for Revitalisation of Local Health Traditions (FRLHT)" who was the coordinating agency. A grant of Rs. 88.98 lakhs was released in stages so far.

The project targeted two components of work in West Bengal for execution by the State Forest Department as follows:

1. Rapid Threat Assessment (RTA)
2. Establishment of Medicinal Plants Conservation Area (MPCA)

A third component, Home Herbal Garden (HHG) was to be executed by an NGO, Tagore Society for Rural Development, funded directly by FRLHT.

Under the RTA component, a workshop was held at Kolkata during 4th to 7th December, 2007 wherein multiple stakeholders' discussions were held among the botanists, taxonomists, researchers, plant collectors, forest officers and members of FRLHT, Bengaluru. During this workshop, a list of 46 medicinal plant species of the State needing immediate attention for protection/conservation/propagation was prepared after thorough discussion and deliberations over four days.

Under the MPCA component, 7 (seven) MPCAs were selected across the length and breadth of the State forests spreading over a total of 1,560 ha. Of these three viz. North Sevoke, Sursuti and North Rajabhatkhawa are in North Bengal Plains (Duars & Terai area), two viz. Dhotrey and Tonglu in Darjeeling Hills and two viz. Bonniecamp in Sundarbans and Garpanchakot in Purulia, are in South Bengal.

As per project guidelines, botanical inventory was carried out in the MPCAs with leading technical experts in taxonomy from the Universities. During the inventory process, photographs of important species were taken and herbarium specimens were collected. These are being maintained as permanent records as part of the plethora of medicinal plants found in the state of West Bengal.

Now that the Project is nearing completion however, Forest Directorate, Government of West Bengal has to carry on the endeavours of medicinal plant biodiversity assessment and conservation initiated in these areas which are being incorporated in the working plans with appropriate prescriptions. It is hoped that in the coming years the efforts will be intensified and our knowledge base would be augmented. Ideally the conservation measures being adopted will reduce the threat status of the medicinal plant species and the future generations too benefit with this unique treasure.

M A Sultan, IFS
Principal Chief Conservator of Forests,
Research, Monitoring & Development,
West Bengal

Dated: 1st June 2010.

Acknowledgement

With the UNDP-CCF-II Project No.13047 funded by the United Nations Development Programme (UNDP) through Ministry of Environment and Forests (MoEF), Government of India (GoI) and Foundation for Revitalisation of Local Health Traditions (FRLHT), Bengaluru, the State Forest Department in West Bengal established seven Medicinal Plant Conservation Areas (MPCAs). This unique attempt has created awareness and interest which is expected to aid the conservation of the medicinal plant species' biodiversity in the state of West Bengal. The Research Circle is truly thankful for this opportunity.

A Conservation Assessment and Management Prioritisation (CAMP) workshop was held at Kolkata in 2007 wherein multiple stakeholders' discussions were held among the botanists, taxonomists, researchers, plant collectors and forest officers. During this workshop, a list of 46 medicinal plant species was prioritised for West Bengal for focussing of future conservation efforts. A book was subsequently published in 2008 on the proceedings entitled "Conservation Assessment and Management Prioritisation for the Medicinal Plants of West Bengal".

The success of the workshop would not have been possible without the time and expertise shared by many well-versed in the taxonomy of medicinal plants. Later, as per the Project guidelines, botanical inventorization was carried out in the MPCAs with the technical expertise from professors specialising in taxonomy. A separate list of the resource persons consulted outside of the Forest Directorate is given in this Report along with their contact details. During inventorization herbarium specimens and photographs were taken which will serve as permanent records of the unique wealth of these MPCAs.

Within the Forest Directorate there have been several officers without whose concerted efforts the Project could not have been implemented. Sri A.K. Raha, IFS, Sri M.A. Sultan, IFS, Sri A.B. Ray Chaudhuri, IFS, Sri M. Pandey, IFS, Sri A.K. Saha, IFS, Sri R.R.P. Singh, IFS and Sri S. Barari, IFS are foremost among those who guided the Project through its tenure in different capacities.

Work in the MPCAs has been mainly executed by staff of the Silviculture (Hills) Division (led by Sri A.K. Dubey, IFS, Divisional Forest Officer), of the Silviculture (North) Division (led by Sri D. Mallick, IFS, Divisional Forest Officer) and of the Silviculture (South) Division (led by Dr Anupama, IFS, Divisional Forest Officer). They have been very ably assisted by their ADFOs, Sri D.K. Basnet Chettri, WBFS, Sri Y.B. Yonzone, WBFS and Sri B.R. Chakrabarty, WBFS, respectively. The field personnel have shown considerable aptitude in the MPCA-related work and the contribution of all those involved is gratefully acknowledged.

The state report has been prepared by Prof. Asis Mazumdar and his team at Regional Centre, NAEB, Jadavpur University and this commendable work is greatly appreciated.

Dr. Kana Talukder, IFS
Conservator of Forests, Research Circle
&
Dated: 1st June, 2010. Nodal Officer for West Bengal for UNDP-CCF-II Project 13047.

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Executive Summary

Demand for herbal medicine is increasing at a geometrical progression through out the world. In consequence the natural resource base of medicinal plants is under tremendous pressure and many valuable species are under the threat of extinction. For conservation purpose, rapid understanding of the nature, status and priority of threat is necessary. The International Union for Conservation of Nature (IUCN) is addressing this issue, world over, through participatory, Rapid Threat Assessment (RTA) exercises by organizing Conservation Assessment and Management Prioritization (CAMP) workshop, involving Scientists, Managers and User Groups and categorizing the degree of endangerment of each endangered species, using IUCN's Red List System.

The United Nations Development Programme (UNDP) project funded in West Bengal through Ministry of Environment and Forests (MoEF), Government of India with Foundation for Revitalisation of Local Health Traditions (FRLHT) as the Coordinating Agency, envisages two components of work viz. Establishment of a system for Rapid Threat Assessment (RTA) for prioritized conservation action and Establishment of a network of Medicinal Plants Conservation Areas (MPCAs) for execution by the State Forest Department.

Under the RTA component, a workshop was held at Kolkata during 4th to 7th December, 2007 wherein multiple stakeholders' discussions were held involving Botanists, Taxonomists, Researchers, Plant collectors, Forest Officers and members of FRLHT, Bengaluru. The proceedings were published in March 2008 as a Report titled "Conservation Assessment and Management Prioritisation for the Medicinal Plants of West Bengal". During the CAMP workshop, after thread bare discussion, 46 medicinal plant species were identified to be in different priority categories within the state of West Bengal and Taxon Sheets were prepared for each of the 46 species.

The State of West Bengal is a Mega Biodiversity State. Out of 16,779 species of Angiosperms recorded in India, West Bengal is having 3,580 species (21.33%), spread over 10 Forest Types of the State out of 16 Forest Types found in India, covering Northern Montane Wet Temperate Forests of Darjeeling to Littoral and Swamp Forests the Mangroves of Sundarban. The floral diversity of West Bengal existing over four distinct Biogeographic zones ranging from Eastern Coast (8B) to Central Himalayas (2C) and represent a wide range of rare, threatened and endemic flora.

On the basis of recommendations of CAMP workshop, considering the Forest Types and Biogeographic Zones seven MPCAs, representing at least one flagship species in the MPCA, have been created in West Bengal under the Project. Established MPCAs are Dhotrey (180 ha) and Tonglu (230 ha) in Silviculture Hills Division; North Sevoke (100 ha), Sursuti (100 ha) and North Rajabhatkhawa (400 ha) in Silviculture North Division; Garpanchkot (250 ha) and Bonnie Camp (300 ha) in Silviculture South Division.

MPCAs have been suggested to be managed as "hands off" area with certain interventions to encourage identification, preservation, natural regeneration, monitoring etc. by involving Forest Protection Committee (FPC) members through awareness and confidence building exercises.

Currently all the MPCAs have been established after observing the required formalities like generating awareness, building up confidence by creating desired infrastructures under entry point activity component, highlighting the MPCA area with attractive and matching gate etc. Management Plans of all the 7 MPCAs mentioned above have been prepared. Management Teams and Monitoring Groups in respect of all the 7 MPCAs have been formed for the tenure of the project.

Under the Exit Phase of the project, it has been proposed that these Management Plans be included in the Working Plans Management Plans of the respective Divisions during next revision to ensure continuity of the conservation measures currently adopted through the UNDP-CCF-II Project. Besides, permanent exhibits relating to the above MPCAs are proposed to be displayed in the renowned dissemination centres like Lloyd Botanical Garden, Darjeeling, Bengal Natural History Museum, Darjeeling, BF School, Dowhill and Sukna, Nature Interpretation Centre at Aranya Bhavan, Kolkata and also in local interpretation centres in consultation with the territorial divisions.

Apart from *in-situ* conservation of threatened species of medicinal plants, the outcome of the programme is likely to breed a series of activities like creating income opportunities to local FPC/EDC members as tour guides, dissemination of information and knowledge, *ex-situ* conservation of endangered species by building up stock of the same outside MPCAs and processing and marketing of the same, replicated plantlets may be grown by FPC villages and sold to villagers for herbal gardens or to local healers for practicing traditional medicine, providing research options on different parameters of medicinal plants to the Universities, Medicinal Plant Boards etc. in the established MPCAs.

The programme has been successfully completed but this is perhaps, only the end of the beginning. There are yet many miles to go. MPCAs so far established contain 42 out of 46 priority species. Similar coverage need to be provided to the remaining species also. Moreover, for sustained preservation, uses of medicinal plants have to be appropriately linked with livelihood issues. The goal will perhaps be achieved when, all or most of the threatened species of medicinal plants are successfully protected and rehabilitated to support the Indian System of Medicine in its meaningful application in the rural areas, for the benefit of the poorer section of the society.

Summary Sheet

Sl. No.	MPCA	Location				Area (ha)	No. of Identified Species①	Flagship Species	FPC/ EDC Associated
		Lat. & Long	District	Territorial Division	Silviculture Division				
1.	Bonnie Camp	21°50′ N 88°38′ E	24- Parganas (South)	24- Parganas (South)	South	300	**30** (4: CR-1, EN-1, VU-2)	*Nipa fruticans*	Binodepur-Baikunthapur FPC
2.	Dhotrey	27°03′ N 88°04′ E	Darjeeling	Darjeeling	Hills	180	**154** (5: CR-3, EN-2)	*Taxus wallichiana, Panax pseudoginseng, Swertia chirayita*	Dhotrey & Relling FPC
3.	Garpanchkot	23°38′ N 86°46′ E	Purulia	Kangsabati (North)	South	250	**206** (10: EN-3, VU-6, LC-1)	*Pterocarpus marsupium*	Bagmara FPC
4.	North Rajabhatkhawa	26°41′ N 89°33′ E	Jalpaiguri	Buxa Tiger Reserve (East)	North	400	**249** (25: CR-2, EN-13, VU-7, NT-1, LC-2)	*Gynocardia odorata, Aristolochia indica, Dioscorea prazeri, Cinnamomum cecidodaphne*	Buxa Road EDC
5.	North Sevoke	26°52′ N 88°27′ E	Darjeeling	Wildlife - I	North	100	**209** (22: CR-2, EN-11, VU-6, NT-1, LC-2)	*Abelmoschus moschatus, Alpinia calcarata, Celastrus paniculata, Steriospermum colais, Rauwolfia serpentina*	Sevoke & 10th Mile FPC
6.	Sursuti	26°45′ N 88°47′ E	Jalpaiguri	Jalpaiguri	North	100	**216** (25: CR-2, EN-13, VU-7, NT-1, LC-2)	*Toona ciliata, Cinnamomum bejolghota, Asparagus racemosus*	Sawaphulli & Kumarpara FPC
7.	Tonglu	27°02′ N 88°05′ E	Darjeeling	Darjeeling	Hills	230	**254** (10: CR-5, EN-3, VU-2)	*Aconitum bisma, A. ferox, A. spicatum, Berberis aristata, Panax pseudoginseng, Picorhiza kurroa, Podophyllum hexandrum, Swertia chirayita, Thalictrum foliolosum*	Dhotrey & Relling FPC
Total	**7**	-	**4**	**6**	**3**	**1560**	**892②(42)**	**24**	**FPC - 8, EDC - 1**

① -Nos. in the parenthesis and their details represent priority species present in the MPCA out of 46 priority species according to CAMP workshop.

② The total number has been arrived after deducting the repeated ones.

MPCA Medicinal Plants Conservation Area; CAMP Conservation Assessment and Management Prioritization, FPC Forest Protection Committee, EDC - Eco-Development Committee, CR - Critically Endangered; EN - Endangered; VU - Vulnerable; NT - Near threatened; LC - Least concern.

List of Abbreviation

ADFO	Assistant Divisional Forest Officer
AYUSH	Ayurveda, Yoga & Naturopathy, Unani, Siddha & Homeopathy
BCMP	Bonnie Camp
BS	Bana Shramik
BSI	Botanical Survey of India
BTR	Buxa Tiger Reserve
CAM	Complementary and Alternative Medicines
CAMP	Conservation Assessment and Management Prioritization
CBO	Community Based Organization
CCF	Chief Conservator of Forests
CCF-II	Country Cooperation Framework-II
CF	Conservator of Forests
CKR	Community Knowledge Register
CR	Critically Endangered
DFO	Divisional Forest Officer
DR/Fr	Deputy Ranger/Forester
DTRY	Dhotrey
EDC	Eco-Development Committee
EN	Endangered
FG	Forest Guard
FPC	Forest Protection Committee
FRLHT	Foundation for Revitalisation of Local Health Traditions
FV	Forest Village
GEF	Global Environment Facility

GIS	Geographical Information System
GOI	Government of India
GPKT	Garpanchkot
GPS	Geographic Positioning System
HHG	Home Herbal Garden
ICFRE	Indian Council of Forestry Research and Education
INR	Indian Rupees
IPR	Intellectual Property Right
ISM	Indian Systems of Medicine
IUCN	International Union for Conservation of Nature
JFM	Joint Forest Management
JFMC	Joint Forest Management Committee
JU	Jadavpur University
LC	Least Concern
MFP	Minor Forest Produce
MoEF	Ministry of Environment and Forests
MOU	Memorandum of Understanding
MPCA	Medicinal Plants Conservation Area
NAEB	National Afforestation and Eco-Development Board
NBSAP	National Biodiversity Strategy and Action Plan
NGO	Non Governmental Organisation
NMPB	National Medicinal Plants Board
NRVK	North Rajabhatkhawa
NSVK	North Sevoke
NT	Near Threatened
NTFP	Non Timber Forest Produce
PA	Protected Areas
PBR	People's Biodiversity Register
PCCF	Principal Chief Conservator of Forests
PEEST	Policy Ecological Economic Social and Technological

PF	Protected Forests
RC	Regional Centre
R&D	Research and Development
R&M	Research and Monitoring
RF	Reserved Forests
RMD	Research, Monitoring and Development
RO	Range Officer
RTA	Rapid Threat Assessment
RV	Revenue Village
SC	Scheduled Caste
SFD	State Forest Department
SHG	Self - Help Group
SRST	Sursuti
ST	Scheduled Tribe
SWOT	Strength Weakness Opportunity Threat
TNLU	Tonglu
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USD	United States Dollar
VU	Vulnerable
WB	West Bengal
WRI	World Resources Institute
WWF	World Wide Fund for Nature


Mesua ferrea

CHAPTER-I

PROJECT PROFILE

1.1 Introduction

1.1.1 General Overview

India has one of the richest, medicinal plant related, health cultures in the world. It has a codified and an oral tradition with over 1.5 million carriers of this tradition. The oral culture has traditionally been rooted in the 4,635 ethnic communities in the country. This tradition in India is largely due to the diverse medicinal plants resource base, cultural rootedness, flexibility, easy accessibility and affordability, especially for the poorest. Government of India has reported that for 65% of its population, traditional medicine is the only available source of health care (Planning Commission, Government of India, 2001). Over 1,00,000 herbal formulations are used for a wide range of health condition by both the local health cultures and the codified system of medicine (Singh, *et. al.*, 2008).

Box 1: Medicinal Plants in India

Communities know the use of ~ 8000 species (2000 spp. in Unani, Tibetan, Siddha etc., 1800 spp. in Ayurvedic system, 500 in Homoeopathy, 4700 in Folk) out of 17,564 plants identified.

For 65% of population, traditional medicine is the only available source of health care.

9,000 registered and licensed manufacturers of traditional medicines

The domestic trade of AYUSH industry in 2007- Rs. 80 to 90 billion

National Medicinal Plants Board (NMPB) set-up in November 2002

National Biodiversity Strategy and Action Plan (NBSAP), November 2008

Increasing tendency of indiscriminate removal from forests and therefore the medicinal plants need to be conserved in places of their natural occurrence.

Across various ecosystems, local communities know the use of around 8000 species (2000 spp. in Unani, Tibetan ,Siddha etc., 1800 spp. In Ayurvedic system, 500 in Homoeopathy, 4700 in Folk) out of 17,564 plants identified for human, veterinary and plant health care. These medicinal plants are distributed across all biogeographic regions, vegetation types and landscape elements in the country from the Trans Himalaya down to the coast (UNDP, 2003).

The rising trend in demand of herbal products, there is a possibility of an increasing tendency of indiscriminate and unrecorded removal of medicinal plants from forests and therefore the medicinal plants need to be conserved in places of their natural occurrence.

1.1.2 Economic context

Medicinal plants are not only a major resource base for the traditional medicine and herbal industry but also provide livelihood and health security to a large segment of Indian population. Micro-level studies indicate that significant savings are made in family health expenditure on account of the use of locally available plants for human and livestock health care. This saving of millions of households if translated in money terms constitutes an enormous economic benefit to the local communities.


Tonglu MPCA

There are around 9,000 registered and licensed manufacturers of traditional medicines in the country. About 95% of them are in the cottage and small-scale sector and rest five percent in the small and medium scale range. The domestic trade of the 'Ayurveda, Yoga & Naturopathy, Unani, Siddha & Homeopathy' (AYUSH) industry is of the order of Rs. 80 to 90 billion (1US$ = Rs.50). The Indian medicinal plants and their products also account for exports in the range of Rs. 10 billion (Department of AYUSH, 2007).

The economic potential of this sector both in terms of use values and market values is very promising. The dramatic growth of Complementary and Alternative Medicines (CAM) in the West is evidence of this which is due to concerns about the adverse effects of chemical drugs and greater public access to health information. Here the challenge lies in ensuring that the majority of the market benefits are equitably shared with the

rural poor and tribal communities who have been the conservators of both the natural resources as well as the traditional knowledge.

1.1.3 Policy context

The over arching goals of the work of United Nations system in India is to work towards the promotion of sustainable development and elimination of poverty and inequalities as well as the global mandate of United Nations Development Programme (UNDP) is to establish 'partnership to fight poverty'. The Government of India (GOI) UNDP Country Programme Country Cooperation Framework-I (CCF-I) during 2003 to 2007 is aligned with this priority, and is a reflection of the recognition that international co-operation can play a significant role in supporting GOI in addressing these issues.


Dhotrey MPCA

In recent years several policies of the national level refer to promotion of conservation and sustainable use of medicinal plants and associated traditional knowledge. The Planning Commission, GOI has recognized medicinal products and herbal products as key area for national focus. There is emerging policy support at the national and international levels for the medicinal plants and traditional knowledge sector. This is evident from a review of the various policies and programmes of different ministries of the GOI and international agencies. International support for this sector is reflected, *inter alia*, through ongoing UNDP- Global Environment Facility (GEF) funding to Foundation for Revitalisation of Local Health Traditions (FRLHT) for the development of a GEF-funded project on conservation of medicinal plant biodiversity in India, which forms an integral part of this broad initiative.

The Ministry of Environment and Forests, GOI, in the Tenth Five Year Plan has identified medicinal plants conservation as one of the thrust areas in its conservation agenda.

The National Medicinal Plants Board (NMPB) setup in November 2002 by the Government of India has the primary mandate of coordinating all matters relating to

medicinal plants and support policies and programmes for growth of trade, export, conservation and cultivation. The Board is located in the Department of AYUSH, Ministry of Health and Family Welfare.

The National Biodiversity Strategy and Action Plan (NBSAP), Govt. of India (November 2008), supported by the MoEF and UNDP, has underlined the need for both *in-situ* and *ex-situ* conservation of medicinal plant resources given their enormous social, cultural and economic role and potential.

Threatened Species Policies: The MoEF is required under The Biodiversity Act (2002), to set up an effective mechanism for identifying and notifying "threatened taxa" and to regulate access and trade in threatened species.

Indian Systems of Medicine (ISM) Policy: The latest National Policy on Indian Systems of Medicine of the GOI has for the first time in the post independence period identified (under section 9-1) "Revitalization of Local Health Traditions" as one of the new thrust areas of the National Policy.

The Ministry of Science and Technology has an all India coordinated project for encouraging rural women to engage in cultivation and value addition of medicinal plants. The Ministry of Rural Development has provision to support innovative schemes for 'Women Self-Help Groups (SHG)' to involve them into activities that will support both their health and livelihood security.

In these general, economic and policy context, a multicomponent, multistakeholder and multidisciplinary project, titled "National Program on Promoting Conservation of Medicinal Plants and Traditional Knowledge for Enhancing Health and Livelihood Security" is being implemented from 2006-07. This project is approved by the Ministry of Environment and Forests (MoEF), Government of India with the financial assistance from UNDP. While MoEF is the Executing agency, FRLHT is responsible for the technical coordination. This project has a geographical coverage across 9 states: Orissa, Madhya Pradesh, West Bengal, Rajasthan, Karnataka, Tamil Nadu, Kerala, Andhra Pradesh and Maharashtra.

1.1.4 Uniqueness of the project

This project was first of its kind in West Bengal (WB) which emphasizes conservation of medicinal plants and inventorization in its natural habitats.

To make the report comprehensive and complete an assessment was made by the Regional Centre, National Afforestation and Eco-Development Board (NAEB), Jadavpur University (JU) to find out involvement of other Government Departments dealing with medicinal plants in the state of West Bengal and the following

Departments, prominently functioning in the state were identified. On detailed enquiry, however, it transpired that none of these Departments are directly concerned with the conservation of medicinal plants. Department wise, brief accounts of their activities are furnished below.

Department of Science and Technology, WB - Promotes research activities on Drug Development and propagation through universities and research institutes.

State Medicinal Plants Board, WB - Promotes propagation, training and input supply of a few selected commercially viable medicinal plants through NGOs mainly.


Garpanchkot MPCA

Department of Biotechnology, WB - Promotes research activities on assessing alkaloid contents of selected medicinal plants, artificial creation of propagules (tissue culture) etc. through research institutes.

State Biodiversity Board, WB - This Board looks after the status of Biodiversity of the state and maintains a very interesting and important document namely Peoples' Biodiversity Register (PBR), at Gramsabha/Gram Panchayat/Panchayat Samity as the case may be. Amongst other components of Biodiversity, accounts of medicinal plant and traditional knowledge available in the region are also recorded in the register.

1.2 Project Details

1.2.1 Project Background

The richness of Indian medicinal plants (~8000 species), the wealth of traditional knowledge about these plants for human health, nutraceuticals, cosmoceuticals, veterinary care and for plant care (e.g. for biopesticides and biofertilizers) and the growing domestic and global interest in safe, organically grown herbal products, had prompted the MoEF, GoI, to sponsor the designing of a major multidimensional national programme on medicinal plants with UNDP/GEF assistance. The national programme was proposed for implementation in a 10-year time frame and across many states of India, including Maharashtra, Andhra Pradesh, Rajasthan, Kerala, Tamil Nadu, Karnataka, Orissa, West Bengal , Madhya Pradesh, Chhattisgarh, Sikkim, Meghalaya, Arunachal Pradesh, Himachal Pradesh, and Uttaranchal.

This project will cover the initial five-year time frame of the national programme and will operate in nine states. The UNDP project Country Cooperation Framework - II (CCF-II) started the programme in 2006 in nine states Kerala, Tamil Nadu, Karnataka, Madhya Pradesh, Andhra Pradesh, Rajasthan, Maharashtra, Orissa and West Bengal - which were most prepared for immediate action, with an outlay of 3 million USD (13,73,10,000 INR) (UNDP, 2003). Out of this a total of Rs 88.98 lakhs has been released to West Bengal since 2006.

Box 2: Project details

UNDP-CCF-II: a multi-component, multi stakeholder and multi-disciplinary project to emphasize

- Biodiversity conservation
- Rejuvenation of Indigenous knowledge
- Promoting Rural livelihood
- Promoting south cooperation
- Emphasizes Research and Development
- Policy Implications.

Project Component I: Establishment of a system for rapid threat assessment [RTA] for prioritized conservation action.

Project Component II : Establishment of a network of Medicinal Plants Conservation Areas (MPCAs)

1.2.2 Project Goals and Stages

1.2.2.1 Goals (UNDP, 2003)

Goal - 1: Forestry sector, biodiversity conservation

a. To secure the conservation of the germplasm of wild population of medicinal plants via establishment of a network of Forest Gene Banks in order to ensure its longterm availability to the Indian people and more immediately to supply genuine and high quality planting materials to user groups.

b. To design and implement a self-financing system for afforestation and sustainable harvest selected medicinal plant species from forest habitats in both degraded and non-degraded and often illegal harvest of plants from the wild and gear the forestry sector to meet 20-30% of the raw material needs of the user community.

c. To put in place an institutional mechanism for: a) identifying threatened species, b) undertaking species recovery in order to prevent their extinction and c) for regulating trade in threatened species.

Goal 2: Indigenous knowledge

a. To document local health traditions in order to protect their Intellectual Property Rights and promote their rapid assessment and promotion.

b. To contribute to the self-reliance of rural and urban households in primary health care revitalizing sound traditional health practices of households and the folk healing traditions.

c. To contribute to the broadening of the intellectual and cultural base of the school education system at primary, secondary and high school levels, and in medical schools, by undertaking pilot experiments to introduce modules on traditional knowledge of medicinal plants into the curricula.

d. To undertake pilot experiments for integration of safe and efficacious traditional remedies into official primary health care programmes in order to improve the quality of primary health care and reduce its long-term delivery costs.

e. To undertake similar pilot experiments in collaboration with reputed private sector health centres/hospitals/nursing homes.

Goal 3: Rural livelihood

a. To generate rural livelihoods particularly targeted for women and the rural poor by commercializing medicinal plants and their products in the national and international markets via community owned enterprises engaged in cultivation, collection, processing and marketing of medicinal plants. The lessons learnt with respect to R&D inputs, marketing and efforts at strengthening gender equality from previous experiences will be incorporated into this component.

b. Efforts will also be made to develop strong partnerships between rural communities and Indian commercial enterprises dealing with medicinal plants. The project will provide the platform and also facilitate the development of these partnerships while ensuring that it is just and strongly anchored with gender and equity considerations.

Goal 4: Promoting south- south cooperation

a. To establish working links with traditional medicine associations in countries in Asia, Africa, South America in order to exchange experiences and develop joint strategies for i) revitalization of local health cultures, ii) IPR protection, iii) community owned enterprise development.

Goal 5: Research and Development

a. To widen the scope of institutions engaged in natural products research by encouraging them to creatively apply modern laboratory tools to reaffirm traditional health theories, practices and products and disseminate their results to the public.

Goal 6: Policy Implications.

a. To impact policy in forestry, health, rural livelihood, R&D and IPR sectors and make them more supportive of the medicinal plants and traditional knowledge sectors.

1.2.2.2 Stages:

The four major stages of the national project are

a. The conservation of medicinal plants and the revitalization of local health traditions and traditional knowledge

b. Development of community enterprises and sustaining local use.

c. Development of public-private partnerships and the development of the national market.

d. Development of the international market and its linkages for the Indian traditional medicines

1.2.3 Project Components

There are 16 components to be implemented through State Forest Departments and NGOs of the respective states. The project targets two components of work in West Bengal for execution by the State Forest Department as follows:

- Project Component I: Establishment of a system for Rapid Threat Assessment [RTA] for prioritized conservation action.
- Project Component II: Establishment of a network of Medicinal Plants Conservation Areas (MPCAs).

Another component of the project in West Bengal is Project Component III: Establishment of Home Herbal Gardens (HHGs) and prepare Community Knowledge Registers (CKRs), by Tagore Society, an NGO.

1.3 Project Partners

The National Programme on promoting conservation of medicinal plants and traditional knowledge health and livelihood security has been planned for 16 states in the country in a phased manner. This project covers nine states out of CCF-II funds. The remaining seven states were covered through GEF support, and additional resources were mobilized from bilateral donors and government programmes. Efforts were made to envisage that gender concerns are integrated in the project strategy as well as in the activities. This project also envisages inter-ministerial convergence and coordination, for leveraging of resources from ongoing government programmes and schemes. A major thrust area of this project is to mainstream conservation strategies for medicinal plants and applications of local health traditions and associated traditional knowledge into the existing policies and programmes of the forestry and health sectors.

Box 3: Project Partners

Funding Agency
United Nations Development Programme (UNDP)

Implementing Agency
Ministry of Environment and Forests (MoEF)

National Facilitator
Foundation for Revitalisation of Local Health Traditions (FRLHT)

Executing agency
State Forest Department (SFD), West Bengal Research Circle

Local Facilitator
Forest Protection Committees (FPCs)/ Eco-Development Committees (EDCs); Universities, Research Institutions, Experts, Local Practitioners

The project strategy critically involves partnerships among the Ministry of Environment and Forests, Ministry of Rural Development, Ministry of Health, Ministry of Science and Technology, Ministry of Agriculture, UNDP, State Forest Departments, Foundation for Revitalisation of Local Health Traditions (FRLHT), NGO partners and participating Community Based Organizations (CBOs). The broader initiative was to include an important partnership with the Global

Environment Facility (GEF), through a parallel UNDP-GEF project currently undergoing.

The project was coordinated and technically guided at the national level by the FRLHT, Bengaluru, an autonomous body. A Memorandum of Understanding (MOU) defining the roles and responsibilities, reporting structure and related details, was signed between the MoEF (the Executing Agency) and FRLHT (the Implementing Agency). FRLHT appointed a project co-ordinator and team who will be responsible for day-to-day management of the project activities. A project management unit was also being setup in the MoEF to manage all the three UNDP projects (Sundarban, Medicinal Plants and Biodiversity Conservation) under CCF - II.

Further, the main institutional mechanism for monitoring the project was the Project Management Board, and the Empowered Project Standing Committee, at the national level and state level Project Management Committees at the State level. At the request of the Executing /Implementing Agency, UNDP also provided support for implementing specific activities under the project.

State Forest Department, West Bengal

Forestry research has always played an important role in the development of technology to enhance productivity of the forests. For practical foresters, therefore research, especially in field and nursery applications has been and will always be, of special significance so far as production is concerned. Forestry research in West Bengal has been initiated decades ago and has resulted in standardization of nursery practices, plantation techniques, choice of species, and introduction of exotics.

Research Circle:

Forestry research, in the state, is looked after by the Research Circle having three divisions, namely, Silviculture (North), Silviculture (Hills) and Silviculture (South) Divisions. Silviculture (North) Division with headquarter at Siliguri covers the Dooars and Terai region. Silviculture (Hills) Division, headquarter at Darjeeling covers the hill areas of Darjeeling, Kurseong and Kalimpong. Silviculture (South) Division with headquarters at Midnapur has extended its activities allover South West Bengal.

Box 4: Flow chart of SFD Research Wing

Principal Chief Conservator of Forests
Research, Monitoring & Development
Headquarters; Kolkata

↓

Chief Conservator of Forests
Research & Development
Headquarters; Kolkata

↓

Conservator of Forests
Research Circle
Headquarters; Kolkata

↓

Divisional Forest Officer,
Silviculture Hills Division
Headquarters: Darjeeling

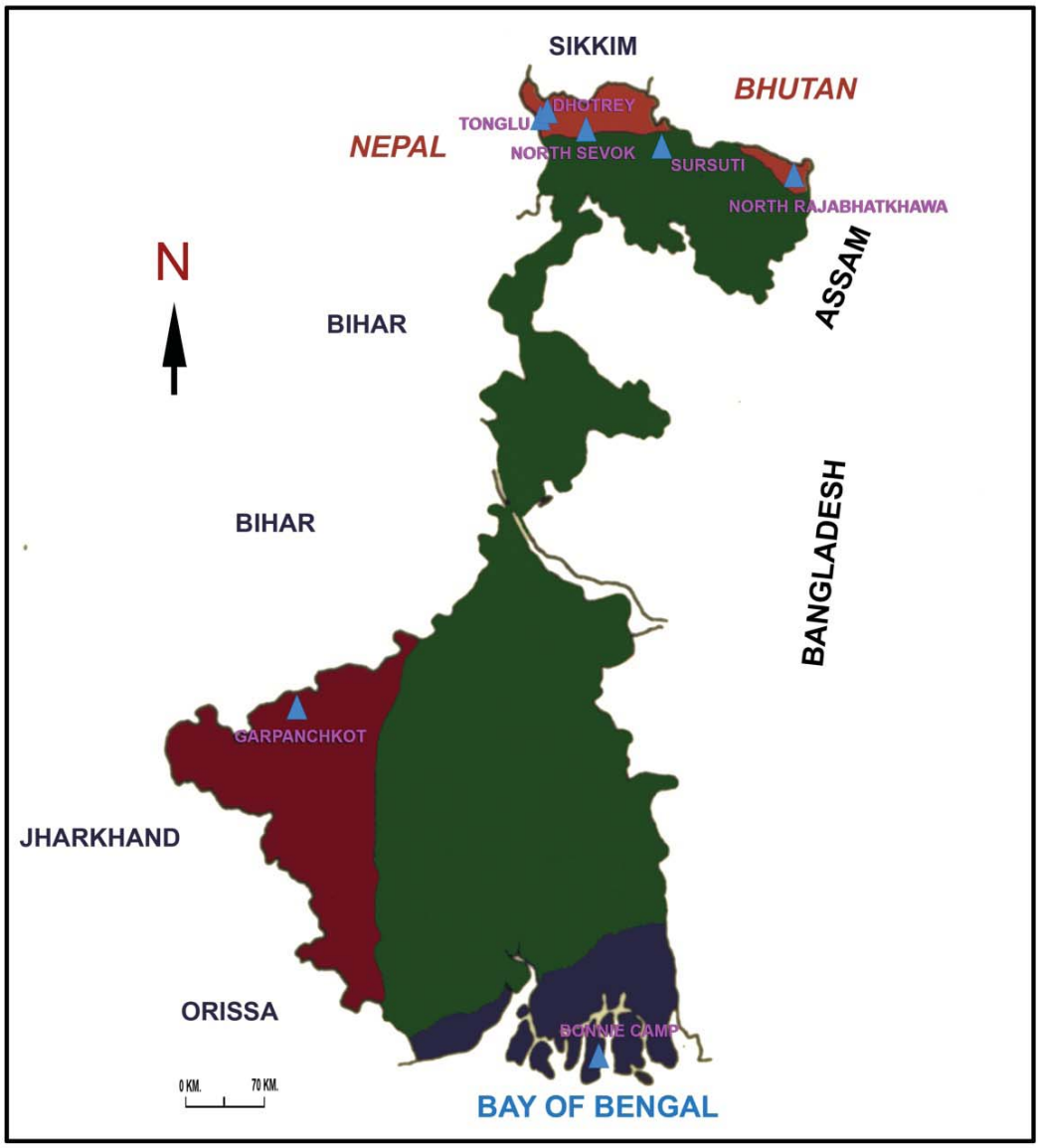
Divisional Forest Officer,
Silviculture South Division
Headquarters: Midnapur

Divisional Forest Officer,
Silviculture North Division
Headquarters: Siliguri

Conservator of Forests (CF), Research Circle works under the guidance of Chief Conservator of Forests (CCF), Research & Development and Principal Chief Conservator of Forests (PCCF), Research, Monitoring & Development (RMD).

Bonnie Camp

LOCATIONAL MAP OF MPCAs OF WEST BENGAL



BIOGEOGRAPHIC ZONES

- 2C CENTRAL HIMALAYA
- 7B LOWER GANGETIC PLAIN
- 6B CHHOTANAGPUR
- 8B EAST COAST


Abelmoschus moschatus

CHAPTER-II

PROJECT AREA and METHODOLOGY

2.1 Project Area

2.1.1 Biogeographic Zones

The State of West Bengal is a Mega Bio-Diversity State. Out of 16779 species of Angiosperms recorded in India, West Bengal is having 3580 species (21.33%), spread over 10 Forest Types of the State out of 16 Forest Types found in India, covering Temperate and Sub-Alpine forests of Darjeeling to Estuarine Plains of Sundarban. The floral diversity of West Bengal occurs over four out of 10 in India (Rodgers and Pawar, 1990) distinct Bio-Geographic Zones ranging from 8B-East Coast (littoral forest of Sundarban) to 2C-Central Himalayas (temperate and sub-alpine forests of Darjeeling District) and represent a wide range of rare, threatened and endemic flora.


Sundarban

2.1.2 Forest Types

Total recorded forest land in the state is 11,879 sq.km. of which 7,054 sq.km. is Reserved Forest, 3,772 sq.km. is Protected Forest and 1,053 sq.km. is Unclassed State Forest, thus constituting 13.38% of the geographical area of the state. The forest cover including the forests created outside the recorded forest area is 15.68% of the geographical area as assessed by the GIS Cell of the WB Forest Department in the

year 2006 on the basis of Satellite Imagery procured from NRSA, Hyderabad. The vegetation cover of the state is around 27% of the geographical area, which includes village orchards/groves, tea garden and horticulture plantations. As per Champion's classification, out of 16 Forest types present in India, West Bengal represents 10 Forest types ranging from Darjeeling Hills to Sundarban Mangroves.

Table 1: Forest types in West Bengal

Group	Forest Type	Distribution in West Bengal	Area (sq.km.)
1B	Northern Tropical Wet Evergreen Forests	Plains of North Bengal up to 150 m. altitude.	167
2B	Northern Sub-Tropical Semi-Evergreen Forests	North Bengal Middle hills	25
3C	North India Moist Deciduous Forests	North Bengal- duars and terai area	1757
4B	Littoral and Swamp Forests - The Mangroves	The tidal mangrove forests of Sundarban	4263
4D	Littoral and Swamp Forests-Tropical Seasonal Swamps	Malda and Dinajpur (N & S)	20
5B	Northern Tropical Dry Deciduous Forests	Bankura, Purulia, Midnapur, Birbhum, Burdwan	4527
8B	Northern Sub-Tropical Broad-Leaved Wet Hill Forests	North Bengal hills 300m-1650m altitude	800
11B	Northern Montane Wet Temperate Forests	North Bengal hills 1650m-3000m altitude.	150
12C	East Himalayan Moist Temperate Forests	North Bengal hills 1500m-1800m altitude.	150
14C	Sub-Alpine Forests	North Bengal hills 3000m-3700m altitude.	20

Table 2: Forest types and Biogeographical zones of MPCAs

Sl. No.	MPCA	Location (Block)	Forest Type*	Bio-Geographic Zone	Altitude (m)
1.	Bonnie Camp	Mathurapur	4B	8B-Eastern Coast	7.5
2.	Garpanchakot	Neturia	5B	6D-Chotanagpur Plains of Deccan Peninsula	643
3.	North Sevoke	North Sevoke	3C	7B-Lower Gangetic Plain	221
4.	Sursuti	Sursuti	3C	7B-Lower Gangetic Plain	165
5.	North Rajabhatkhawa	North Rajabhatkhawa	3C	7B-Lower Gangetic Plain	158
6.	Dhotrey	Selimbong & Kankibong	11B	2C- Central Himalayas	1923-2665
7.	Tonglu	Tonglu & Kankibong	11B	2C- Central Himalayas	2600-3036

* *please refer the earlier table 1*


Impatiens

2.1.3 Wildlife Status

Due to the diversity of elevation and vegetation, the range of wildlife species found in the vicinity of MPCA is varied. Considering the extent of the tract, however the number of individual species is also varied

Footprint of Tiger at Bonnie Camp

- The Sundarban (Bonnie Camp MPCA) is the natural habitat of royal bengal tiger, spotted deer, wild boar and different kinds of reptiles, avifauna, cetaceans, insects etc.

- Wild pig, jackal, langur, indian wolf, spotted deer, hyena, python, porcupine, pangolin, wild boar, different kinds of birds etc. are seen commonly in the forest area of Kangsabati (North) (Garpanchkot MPCA).

- The major wildlife in an around Sursuti MPCA are bison, elephant, wild boar, monkey, deer and rhino.

- The major wild animals prevalent in North Rajabhatkhawa MPCA are tiger, elephant, leopard, bison, barking deer, jungle cat, spotted deer, sambher, monkey, squirrel etc.

Caterpillar at North Rajabhatkhawa

- North Sevoke MPCA area is the habitat of the wild elephants, gaur, tiger, different species of deer, wild boar and a large number of species of birds, reptiles, amphibians and insects.

2.1.4 Joint Forest Management

West Bengal is the pioneer state in India initiating Joint Forest Management (JFM). This movement of JFM had its genesis at Arabari in Midnapur district in West Bengal when 618 families of the 11 (eleven) villages, were motivated in early 70's to rejuvenate 1,186 ha degraded Sal forest by roping in their participation through a set of activities of employment generation and sharing of NTFP from such forest. This was followed by adoption of the Government's decision in 1989 to share 25% of usufructs and net profit of the intermediate and final yield respectively.


Garpanchkot MPCA

As on March 2009, there are 4,253 FPCs in the State (3,766 Nos. in South West Bengal, 436 in North Bengal and 51 Nos. in Sundarban) comprising of total number of 4,82,753 members protecting the total forest areas over 557,063.13 ha. The total number of EDCs in the State are 115 (96 Nos. in North Bengal, 19 Nos. in South Bengal including 14 Nos. in Sundarban) comprising of 22,396 members protecting 89,021 ha. of Protected Area (PA). In all FPCs and EDCs, the spouses are joint members.

The process of formation and subsequent consolidation of JFM led to reckonable success in rejuvenating the degraded forests and bringing about economic upliftment of fringe population constituting the FPCs and EDCs through series of measures including implementation of people oriented development programmes.

The factors which are considered important for success of JFM in the State are:

1) Realization of the natural resource managers regarding the failure of custodial system of management in containing degradation of forests and their growing perception that only participation of stake-holders can bring in a change in an otherwise bleak scenario.

2) Empowerment of the people at grass-root level through inclusion of Panchayati Raj Institution at different levels of management.

3) Adoption of micro-planning through PRA as a tool for involvement of communities of developmental activities, management of NTFPs, silvicultural and harvesting operations.

4) Community/Eco-development activities by way of infrastructural development, vocational training and input support for increased productivity of land-based systems, creation of assets for supplemental income and generation of adequate employment in forestry and allied activities on a sustainable basis.

5) Sharing of usufructs with participating communities as envisaged in the resolution, resulted in credibility to the Govt.'s intention to carry forward the mission of JFM. Marketing of timber and other forest produce to ensure optimum realization of usufractory share reflected Department's concern for the communities.

6) Persistent efforts by forest personnel, NGOs and natural leaders of FPCs to motivate and build awareness through face to face communication, group meetings, workshops, awareness campaigns etc.

2.1.4.1 JFM-Support Activities

The people around forests are integral part of forest-ecosystem and their livelihood needs is to be reckoned as very important for ensuring long term conservation of resources. While direct benefit flow to the members of FPC/EDCs from forest resources by way of sharing of usufructs and employment generation is limited, there is scope of improvisation of traditional activities and allied land-based or skill-based activities like:-

i) Agricultural development through creation of irrigation facility and supply of improved inputs.

ii) Animal husbandry through improvement of breeds and veterinary care.

iii) Promotion of small scale cottage industries.

iv) Vocational trainings for income generation activities namely mushroom cultivation, sal-leave plate making, pisciculture, tailoring, weaving, sericulture, bee-keeping, lac culture, muri making etc

.

v) Agro-forestry and farm forestry practices including intercropping in plantations raised by Forest Department.

vi) Self-employment group oriented activities both for men and women (Self-Help Group activities) Dairy farming, Poultry farming, Piggery, Pisciculture etc.

vii) Development of marketing facilities.

viii) Value addition of NTFP resources.

Community oriented activities have been mostly relied upon as they have the following endowments:-

- More effective, as they directly involve the FPCs and EDCs
- Benefits maximum number of people.
- Leads to infrastructure development.
- Helps in creation of assets for sustained income generation.
- Leads to all round development of the village.

In spite of the fact that, individual beneficiary oriented schemes tend to have higher investment per FPC family and are fraught with risk of transfer of assets in some cases such schemes have to be taken up for execution, as a very large part of FPC beneficiaries belong to the group of landless and small/marginal farmers.

Table 3: FPC/EDC details of Forest Divisions where MPCAs have been established

SL No.	Name of the Division	No. of FPC / EDC	Area (ha) Protected	No. of Members					
				Male	Female	Total	SC	ST	Others
1.	24 Parganas (S)	40	43734	12383	12281	24664	13185	517	10962
2.	Darjeeling	73	14376.06	3812	415	4227	139	1006	3082
3.	Wildlife-I (Mahananda)	15	10611.54	1200	163	1363	230	370	763
4.	Kangsabati (N)	246	17711.22	23639	869	24508	5707	8070	10731
5.	Buxa Tiger Reserve (E)	14	23328	1454	173	1627	223	612	792
6.	Jalpaiguri	63	20248.16	11431	638	12069	5255	3399	3415

(Source: West Bengal State Forest Report 2008-09)

Table 4: FPCs/EDCs associated with MPCAs in West Bengal

Sl. No.	Name of MPCA	Division Name	MPCA Area (ha)	FPC/EDC Associated
1.	Bonnie Camp (BCMP)	24- Parganas (South)	300	Binodepur-Baikunthapur FPC
2.	Dhotrey (DTRY)	Darjeeling	180	Dhotrey & Relling FPC
3.	Garpanchakot (GPKT)	Kangsabati (North)	250	Bagmara FPC
4.	North Rajabhatkhawa (NSVK)	Buxa Tiger Reserve (East)	400	Buxa Road EDC
5.	North Sevoke (NSVK)	Wildlife - I	100	Sevoke & 10th Mile FPC
6.	Sursuti (SRST)	Jalpaiguri	100	Sawaphulli & Kumarpara FPC
7.	Tonglu (TNLU)	Darjeeling	230	Dhotrey & Relling FPC
Total	MPCA -7		1,560	FPC - 8, EDC - 1

Box 5: MPCA in news


গরুমারার ওষধি উদ্যান পাহারা দিচ্ছে বামনবস্তি

'A tower to watch movement of elephant, built by FD, at the request of the villagers of Baman Basti near Sursuti MPCA, motivated the villagers to undertake training on identification of medicinal plants and inspired them to protect the MPCA, an encouraging example of mutual trust and cooperation.'

2.2 Methodology

National programme on promoting conservation of medicinal plants and traditional knowledge for enhancing health and livelihood security (CCF-II project No. 13047) has 16 components implemented through State Forest Departments and NGOs of the respective states. Out of these only two components are implemented by Forest Department in West Bengal. They are as follows:

1. Establishment of a system for Rapid Threat Assessment (RTA) for prioritized conservation action
2. Establishment of a network of Medicinal Plants Conservation Areas (MPCAs)

2.2.1 Rapid Threat Assessment

Rapid Assessment of the Threats to the medicinal plants was done through Conservation Assessment and Management Prioritization (CAMP) workshop at the state level. The workshop aimed at assigning the IUCN's quantitative Red list system to categorize each species to a degree of endangerment based on the estimates of the threats to the population and their habitat. A total of 148 plants was proposed for assessment of which 46 species were assessed according to the IUCN Red List Criteria. Specialized taxonomists (Forest Officials, Scientists, University Teachers and Researchers) assessed their distribution and prepared the taxon sheets for each of 46 species prioritized for conservation in West Bengal.

2.2.2 Network of Medicinal Plants Conservation Areas Establishment

Based on the inputs from the CAMP workshop, different conservation sites were selected in each state for *in-situ* conservation of Medicinal Plants. These sites were selected so as to cover each of 4 Biogeographic zones of West Bengal, different forest types, distribution and abundance of medicinal plants and the habitats important for them. In the state 7 (seven) sites were selected for establishing the MPCAs for critically endangered and endangered species.

Table 5: Biogeographic zones, Forest types and Forest Divisions of Established MPCAs

SL. No.	MPCA	Forest Division	Forest Type	Biogeographic Zones
1.	Dhotrey	Darjeeling (Silviculture Hills)	11B: Northern MontaneWet Temperate Forests	2C: Himalaya - Central Himalaya
2.	Tonglu			
3.	Garpanchakot	Kangsabati -North (Silviculture South)	5B: Northern Tropical Dry Deciduous Forests	6B: Deccan Peninsula - Chotanagpur Plains
4.	North Rajabhatk-hawa	Buxa Tiger Reserve East (Silviculture North)	3C: North India Moist Deciduous Forests	7B: Gangetic Plain - Lower Gangetic Plain
5.	North Sevoke	Wildlife I (Silviculture North)		
6.	Sursuti	Jalpaiguri (Silviculture North)		
7.	Bonnie Camp	South 24-Parganas (Silviculture South)	4B: Littoral and Swamp Forests - The Mangroves	8B: Coasts - East Coast

2.2.2.1 Parameter for selection of MPCAs

1. The area is having a varied diversity of vegetation with some known plant species having proven medicinal value.
2. The area is relatively undisturbed and has a reasonable accessibility.
3. The vegetation cover of the areas is representative of forest/vegetation type.
4. The area is traditionally known for its medicinal plant richness.
5. The area is selected as a compact block under Biodiversity Conservation Working Circle in territorial and wild life areas so that no felling operations are allowed even in future.
6. The area is under legal protection such as those forming part of Protected Area or of Reserve Forest or of Tiger Reserve area etc.

2.2.2.2 Field Enumeration:

The designated area of each MPCA was surveyed by Remote Sensing method using Geographic Positioning System (GPS) Receiver. The GPS data was then plotted in Google map (through http://www.earthpoint.us) and the relevant portion was selected for map preparation of the sites.

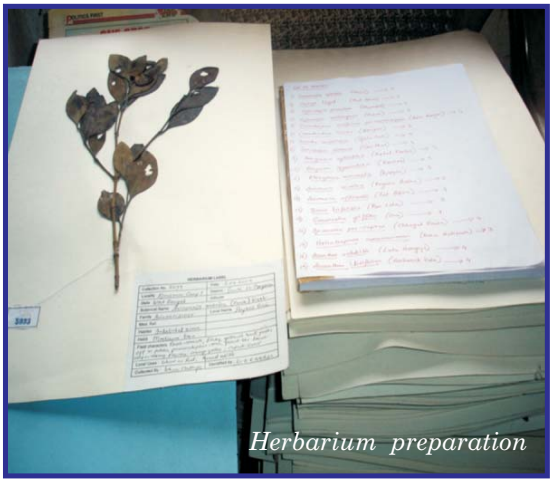
The demarcated forest area for creation of MPCA was divided into several belt transects. The belt transect have been located taking due care of environmental significance of having representation of the habitat variability to capture priority species. To get an overview of tree flora, representative plots of 20m x 20m were laid down, sub plots of 5m x 5m were laid out diagonally in each major plot for regeneration status as well as for shrubs and climbers. The quadrates of 1m x 1m size were laid out in each of the major plots for quantification of herbs layers.

The plant species (Tree, Shrubs, Herbs and Climbers) were identified and tabulated with scientific name, author citation, family and habits. Important medicinal plant species parts were collected for herbarium preparation.

The meetings with nearby FPC/EDC members of each MPCA were organized to generate awareness regarding the conservation, importance and management of the specific areas with some JFM support activities.

2.2.2.3 Implementation Flow chart

The flow chart (Box-6) explains the process of implementation of the project by West Bengal State Forest Department and their exit strategy. The boxes lined red represents the assessment stage, boxes lined green represents the implementation stage and boxes lined blue represents the exit stage/ strategy.


Herbarium preparation

After the CAMP Workshop, the areas short listed were identified, surveyed and

demarcated using a GPS system. Further establishment of the MPCA was undertaken. The establishment of the MPCAs involved demarcation of the area and an entry point activity. This was followed by Inventorization through sampling process, enumeration and plant specimen collection, preparation of herbarium through processing and accession of the specimens, involving the local people in conservation activity through trainings and meetings, JFM support activities, and preparation of the Management Plans in a participatory way involving both communities and the Forest Department. The consolidation of all the management plans and final report writing process was completed in June 2010.


CAMP Workshop


Sundarban


Field Survry


Inventorization of trees


Area Demarcation


Inventorization of herbs

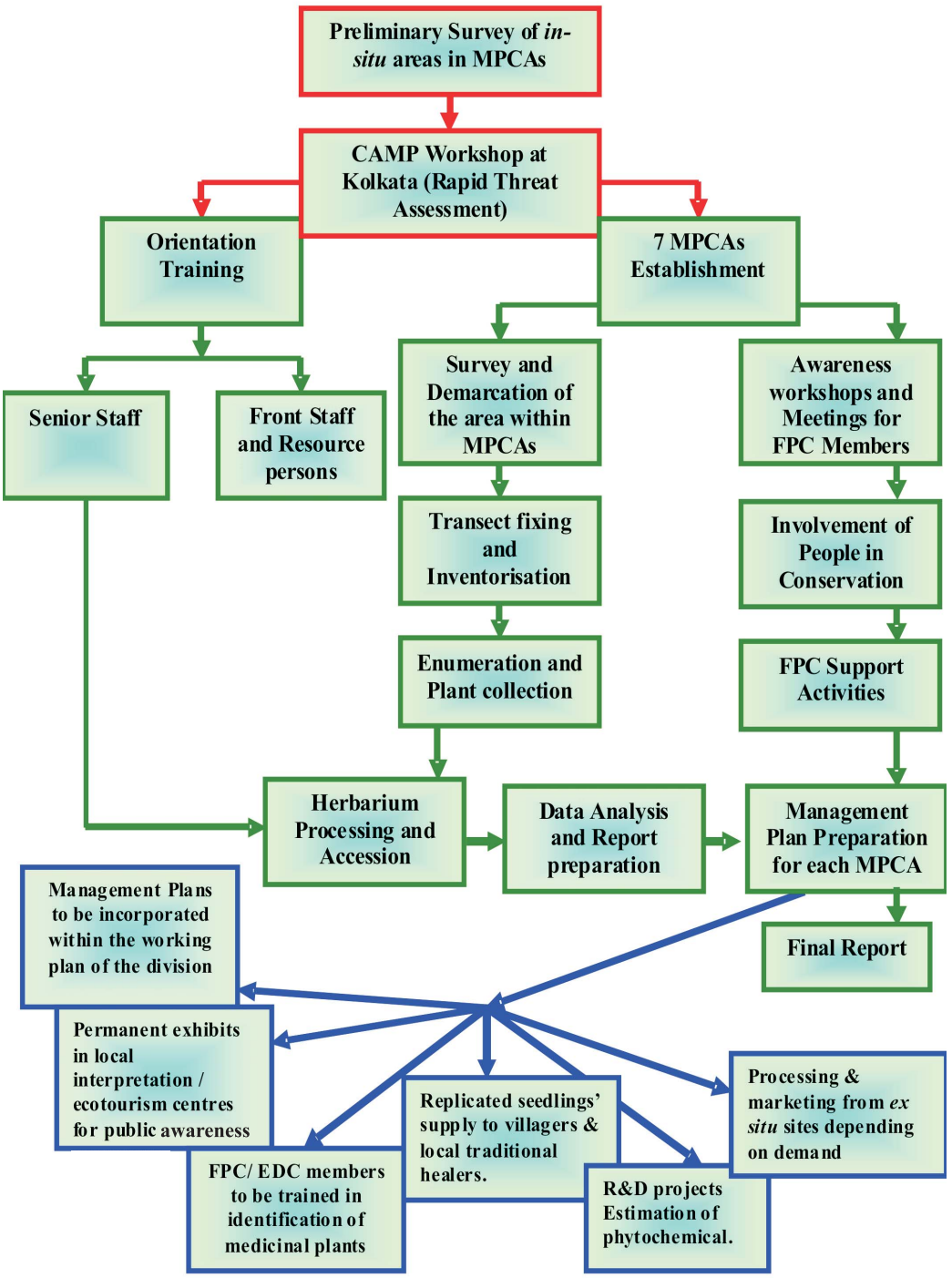
2.2.3 Exit Strategies

The Forest Department has planned for logical exit strategies that include

- Management Plans of MPCAs to be included in Working Plan / Management Plan of Divisions.
- Continued protection of MPCAs by Divisions from biotic interference.
- Permanent exhibits of MPCAs proposed in local interpretation / ecotourism centres for public awareness.
- Processing and marketing from *ex situ* sites depending on demand.
- Local FPC/EDC members, depending on their personal abilities and interest, may be trained in identification of the medicinal plants to work as tour guides.
- *Ex-situ* Conservation of the rare and endangered species identified in the MPCA are being done by seed collection on a sustainable basis from within the MPCA and germinating these in nurseries to aid building up of stock of these rare and endangered species.
- Plantlets replicated as above, may be supplied to villagers for home herbal gardens and to local healers who practice traditional medicine outside the MPCAs Network.
- Depending on the demand in the market, processing and marketing of the medicinal plants and their products from the *ex-situ* conservation sites may be considered and developed through appropriate agencies.
- Different parameters such as phyto-chemical contents may be analyzed by different universities to aid cultivation and marketing so that the local FPC/EDC members taking up medicinal plants cultivation may have earnings.

Thespesia populnea

Box 6: Implementation flow chart




Rauwolfia serpentina

CHAPTER-III

CONSOLIDATED REPORT on CAMP and MPCA

3.1 Consolidated report on CAMP workshop

For conservation purpose, rapid understanding of the nature, status and priority of threat is necessary. The International Union for Conservation of Nature (IUCN) is addressing this issue, world over, through participatory, Rapid Threat Assessment (RTA) exercises by organizing Conservation Assessment and Management Prioritization (CAMP) workshop, involving Scientists, Managers and User Groups and categorizing the degree of endangerment of each endangered species, using IUCN's Red List System.

Figure 1 : Habit of targeted species

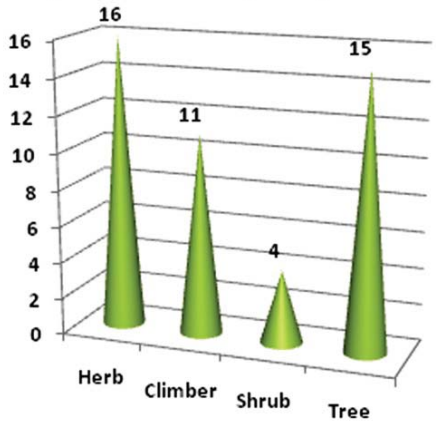
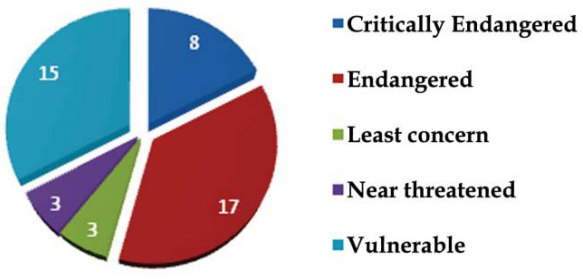


Figure 2 : Threat status of 46 priority species



Under the RTA component, a workshop was held at Kolkata during 4th to 7th December, 2007 wherein multiple stakeholders' discussions were held among the Botanists, Taxonomists, Researchers, Plant collectors, Forest Officers and members of FRLHT, Bengaluru. The proceedings were published in March 2008 as a Report titled *"Conservation Assessment and Management Prioritisation (CAMP) for the Medicinal Plants of West Bengal"*. During the CAMP workshop, after thread bare discussion, 46 medicinal plant species were

identified to be in different threat categories within the state of West Bengal and Taxon Sheets were prepared for each of the 46 species.

3.2 Consolidated report on MPCAs

Forests in the State of West Bengal, occurring in four (4) Bio-Geographical zones of the state (Rodger & Panwar 1998), represent ten (10) out of sixteen (16) Forest Types found in India. Its floral diversity ranges from the Littoral, Tidal Swamp Forests of Sundarban to the Dry Deciduous of the western part and Moist Deciduous in the north, ending at the Temperate and Sub Alpine Forests of Darjeeling hills. The region harbours more than 550 species of medicinal plants used by different ethnic groups. Some of these species are highly valued, endemic to the locality and are on the verge of extinction.


Marking quadrate during inventorization

It is evident that demand of herbal medicine is on the rise, world wide and many highly valued endemic medicinal plants are over exploited threatening their very existence. In order to preserve the gene pool of rare and endangered medicinal plants it is necessary to provide protection by establishing, habitat specific protected area network and the concept of MPCA emerged. On the basis of threadbare discussion in the CAMP workshop held at Kolkata during 4th-7th December 2007, sites of 8 MPCAs were proposed to be established in West Bengal for preservation of the 46 threatened species of the state identified in the same CAMP workshop and specific flagship species were earmarked for each MPCA. Description of the seven (7) established MPCAs are given below in consolidated tabular form. (The proposed MPCA at Jambudwip with the earmarked flagship species *Sonneratia caseolaris* could not be established on account of certain unavoidable reason.)


Processing plants' specimens

3.2.1 General Information

Table 6: General information of MPCAs

MPCA / ITEM	Bonnie Camp (BCMP)	Garpanchkot (GPKT)	North Rajabhatkhawa (NRVK)	North Sevoke (NSVK)	Sursuti (SRST)	Dhotrey (DTRY)	Tonglu (TNLU)
Legal Status	Protected Forests	Protected Forests	Tiger Reserve	Wildlife Sanctuary	Reserve Forests	Reserved Forests	Reserved Forests
Lat. Long.	21˚50′ N 88˚38′ E	23˚38′ N 86˚46′ E	26˚41′ N 89˚33′ E	26˚52′ N 88˚27′ E	26˚45′ N 88˚47′ E	27˚03′ N 88˚04′ E	27˚02′ N 88˚05′ E
Area (in ha.)	300	250	400	100	100	180	230
District	24-Parganas (South)	Purulia	Jalpaiguri	Darjeeling	Jalpaiguri	Darjeeling	Darjeeling
Forest Division	24-Parganas (South)	Kangsabati (North)	Buxa Tiger Reserve (East)	Wildlife-I	Jalpaiguri	Darjeeling	Darjeeling
Sub Division	Diamond harbour	Raghunathpur	Alipurduar	Kurseong	Rangpur	Darjeeling	Darjeeling
Forest Range	Raidighi	Raghunathpur	Buxaduar	10th mile	Lataguri	Dhotrey	Tonglu
Block	Mathurapur II	Neturia	NRVK-8 & NRVK-9	North Sevoke 1 (a) & 1(b)	Sursuti	Selimbong 3, Selimbong 4, Kankibong 1	Tonglu 2, Kankibong 3, Kankibong 4
FPC / EDC	Binodepur-Baikunthapur FPC	Bagmara FPC	Buxa Road EDC	Sevoke & 10th Mile FPC	Sawaphulli & Kumarpara FPC	Dhotrey & Relling FPC	Dhotrey & Relling FPC
Nearest Town	Raidighi (4 hours by boat)	Raghunathpur (25 km.)	Alipurduar (25 km.) 28th mile Jayanti	Siliguri (20 km.)	Lataguri	Maneybhanjyang (25 km)	Maneybhanjyang (19 km.)
Nearby Villages	Maipit - Sombarer Bazar, Nalgara, Raidighi	Baghnara, Sewlibari, Puyapur Lalpur	Santalbari Rajabhatkhawa	10th mile, Sevoke bazaar, Chamakdangi, Toribari Singhijhora	Baradigh, Bamani Basti, Bichabhanga & Sursuti	Dhotrey, Palmajua, Relling, Samsu-Majua	Dhotrey, Relling, Selingbong, Palmajua

MPCA / ITEM	Bonnie Camp (BCMP)	Garpanchkot (GPKT)	North Rajabhatkhawa (NRVK)	North Sevoke (NSVK)	Sursuti (SRST)	Dhotrey (DTRY)	Tonglu (TNLU)
Soil Types	5 broad groups : Clay soil, Heavy soil, Sandy soil with Clay, Sandy soil, Silty soil	Red lateritic, Sedimentary	Boulders in the sub-soil and alluvial soil with gravels on the surface and in some places sandy loam on the surface	Sandy loam but dark coloured due to the deposition of ash from repeated forest fires	Sandy to clay loam with thin layer of humus	Sandy loam, Red & yellow podzolic soil	Sandy loam, Red & yellow podzolic soil
Average Rainfall	1924.2 mm	1375.2 mm	3600mm	3500 mm	3390.8mm	3624.2 mm	3624.2 mm
Temperature Max. Min.	38ºC 13.7ºC	45^{0} C 9^{0} C	33^{0}C 11^{0}C	36^{0}C 12^{0}C	32^{0}C 15.5^{0}C	21.0°C 8.7°C	21.0°C 8.7°C
Water Sources	River, Perennial water, Seasonal water source and Wetland and Marshes.	Spring, rain-fed streams	Dima, Jainty, Bala rivers, streams and Jhoras like Buxa Jhora, Guenala & Hatinala	Teesta river, two spring fed water courses - Mahanadi & Gulma khola and Nandi khola water course	Rivers like Chel, Neora, Mal and Teesta and perennial Jhoras - Bamoni Jhora, Sursuti Jhora and Monpala Jhora	Perennial hill streams, Lhodoma river catchment, which ultimately join River Teesta	Perennial hill streams, Lhodoma river catchment, which ultimately join River Teesta
Forest Type	4B Littoral and Swamp Forest mangrove	5B Northern Tropical Dry Deciduous Forest	3C North India Moist Deciduous Forest	3C - North India Moist Deciduous Forest	3C - North India Moist Deciduous Forest	11B - Northern Montane Wet Temperate Forests	11B - Northern Montane Wet Temperate Forests

3.2.2 Major Disturbances

Forest fire, mostly human intervened ground fire, is found to be the major problem in the sites and that affects basically the ground vegetation which counts for the most for medicinal plants. Among other factors grazing, fuel wood and Non-Timber Forest Produce (NTFP) collections, plant disease and soil erosion affects the conservation of medicinal plants. The table below shows the disturbances in different MPCA areas. All these disturbances have been taken care of by the Forest Department and FPC members near the MPCAs.

Table 7: Disturbances in MPCAs

MPCA / Disturbances	DTRY	TNLU	NRVK	SRST	NSVK	GPKT	BCMP
1. Forest Fire	✓	✓	✓	✓	✓	✓	✓
2. Grazing	✓	✓	✓		✓	✓	
3. Fuel Wood Collection		✓			✓	✓	✓
4. NTFP collection		✓				✓	✓
5. Plant Disease			✓	✓	✓		
6. Weeds			✓	✓	✓	✓	
7. Erosion/Landslide	✓	✓	✓			✓	

3.2.3 Targeted Species Present in the MPCAs

As per the recorded and identified inventory list of all seven MPCAs in West Bengal, 42 targeted priority species (out of 46 targeted species) were found so far (up to 2009). MPCAs (NRVK & Sursuti) in Silviculture North Division found to be the richest in the occurrence of threatened species, whereas Bonniecamp is having least number of targeted species.

Table 8: Occurrence of 46 listed species in different MPCAs

Sl. No.	Name	Family	NRVK	SRST	NSVK	TNLU	DTRY	BCMP	GPKT
1	*Abelmoschus moschatus*	Malvaceae	**P**	**P**	**P**				
2	*Aconitum bisma*	Ranunculaceae				**P**	**P**		
3	*Aconitum ferox*	Ranunculaceae				**P**			
4	*Aconitum spicatum*	Ranunculaceae				**P**	**P**		
5	*Alpinia calcarata*	Zingiberaceae	**P**	**P**					
6	*Ampelocissus barbata*	Vitaceae	**P**	**P**	**P**				
7	*Aphanamixis polystachya*	Meliaceae	**P**	**P**	**P**				
8	*Aristolochia indica*	Aristolochiaceae	**P**						**P**
9	*Asparagus racemosus*	Liliaceae	**P**	**P**	**P**				**P**
10	*Berberis aristata*	Berberidaceae				**P**			
11	*Celastrus paniculatus*	Celastraceae	**P**	**P**	**P**				
12	*Cinnamomum bejolghota*	Lauraceae	**P**	**P**	**P**				
13	*Cinnamomum cecidodaphne*	Lauraceae	**P**	**P**					
14	*Desmodium motorium*	Fabaceae							**P**
15	*Dioscorea prazeri*	Dioscoreaceae	**P**	**P**	**P**				
16	*Drosera burmanii*	Droseraceae	**P**	**P**	**P**				
17	*Gloriosa superba*	Liliaceae		**P**					**P**
18	*Gymnema sylvestre*	Asclepiadaceae							**P**
19	*Gynocardia odorata*	Flacourtiaceae	**P**	**P**	**P**				
20	*Helminthostachys zeylanica*	Ophioglossaceae	**P**	**P**	**P**				
21	*Ipomoea mauritiana*	Convolvulaceae							
22	*Litsaea glutinosa*	Lauraceae	**P**	**P**	**P**				**P**
23	*Lumnitzera racemosa*	Combretaceae						**P**	
24	*Lycopodiella cernua*	Lycopodiaceae	**P**	**P**	**P**				
25	*Mesua ferrea*	Clusiaceae	**P**	**P**	**P**				
26	*Morinda citrifolia*	Rubiaceae	**P**	**P**	**P**				**P**
27	*Mucuna pruriens*	Fabaceae	**P**	**P**	**P**				**P**
28	*Nipa fruticans*	Arecaceae						**P**	
29	*Olax nana*	Olacaceae							
30	*Ophioglossum reticulatum*	Ophioglossaceae	**P**	**P**	**P**				**P**
31	*Panax pseudoginseng*	Araliaceae				**P**	**P**		
32	*Pericampylus glaucus*	Menispermaceae	**P**	**P**	**P**				
33	*Persea glaucescens*	Lauraceae	**P**	**P**	**P**				
34	*Picrorhiza kurroa*	Scrophulariaceae				**P**			
35	*Podophyllum hexandrum*	Podophyllaceae				**P**			
36	*Pterocarpus marsupium*	Fabaceae	**P**	**P**	**P**				**P**

Sl. No.	Name	Family	NRVK	SRST	NSVK	TNLU	DTRY	BCMP	GPKT
37	*Rauwolfia serpentina*	Apocynaceae	P	P	P				
38	*Sonneratia caseolaris*	Sonneratiacaeae						P	
39	*Stereospermum colais*	Bignoniaceae	P	P	P				
40	*Swertia chirayita*	Gentianaceae				P	P		
41	*Taxus wallichiana*	Taxaceae				P	P		
42	*Thalictrum foliosum*	Ranunculaceae				P			
43	*Toona ciliata*	Meliaceae	P	P	P				
44	*Tylophora indica*	Asclepiadaceae							
45	*Viscum articulatum*	Viscaceae							
46	*Xylocarpus granatum*	Meliaceae						P	
	Total Species		**25**	**25**	**22**	**10**	**5**	**4**	**10**

P= Present *Please refer Annexure - I for details*

Morinda citrifolia

3.2.4 Inventorization of plant species in the MPCA

3.2.4.1 MPCA wise inventory details

The table-9 represents the number of plant species inventorized in each MPCA with different Habits (Trees, Shrubs & Herbs). The MPCA sites are very rich in biological diversity (except Bonnie Camp).

Table 9: Medicinal plants inventory details

Name of MPCA	NRVK	SRST	NSVK	TNLU	DTRY	BCMP	GPKT
No. of Trees	91	59	75	46	34	18	50
No. of Shrubs	81	97	74	46	37	7	31
No. of Herbs	77	60	60	162	83	5	125
Total*	249	216	209	254	154	30	206
No. of Unidentified spp.	28	8	32				

* *please refer Annexure IV for species details*

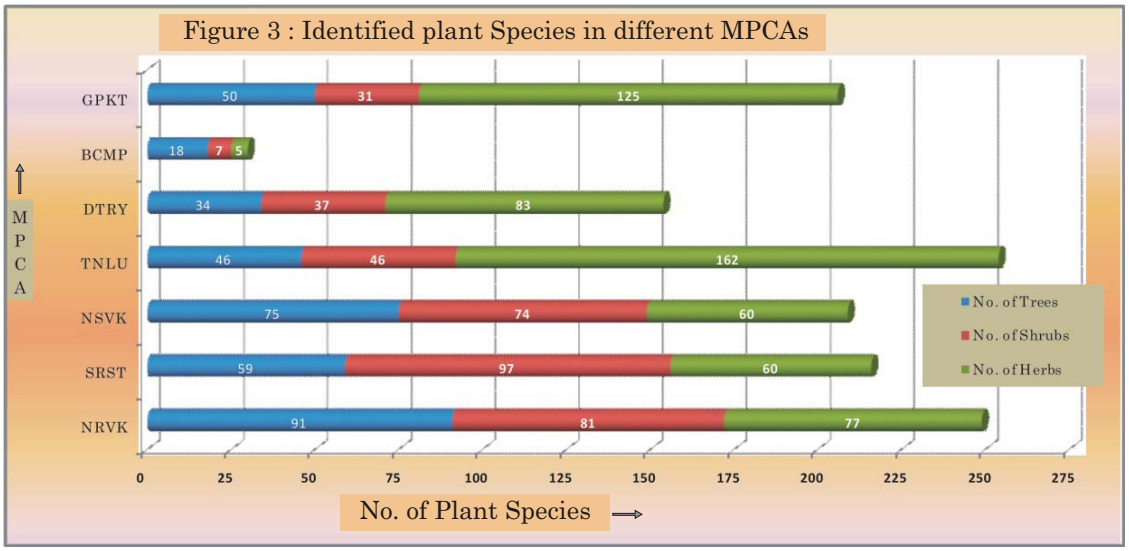


Table 10: Presence of priority species in MPCAs

Name of MPCA	NRVK	SRST	NSVK	TNLU	DTRY	BCMP	GPKT	Covered in MPCAs	Targeted Species
No. of Targeted Species	25	25	22	10	5	4	10	42	46

As per the last inventorization details (up to 2009) 42 number of targeted priority species has been found in the 7 MPCAs out of 46 species listed in the CAMP workshop. MPCAs of Silviculture North Division were found to have the most occurrence of priority species as shown in the graph below:

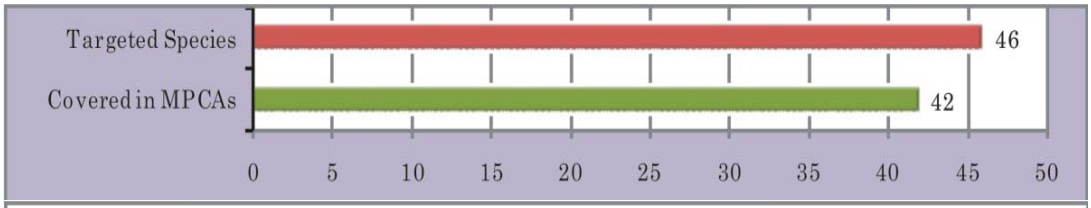
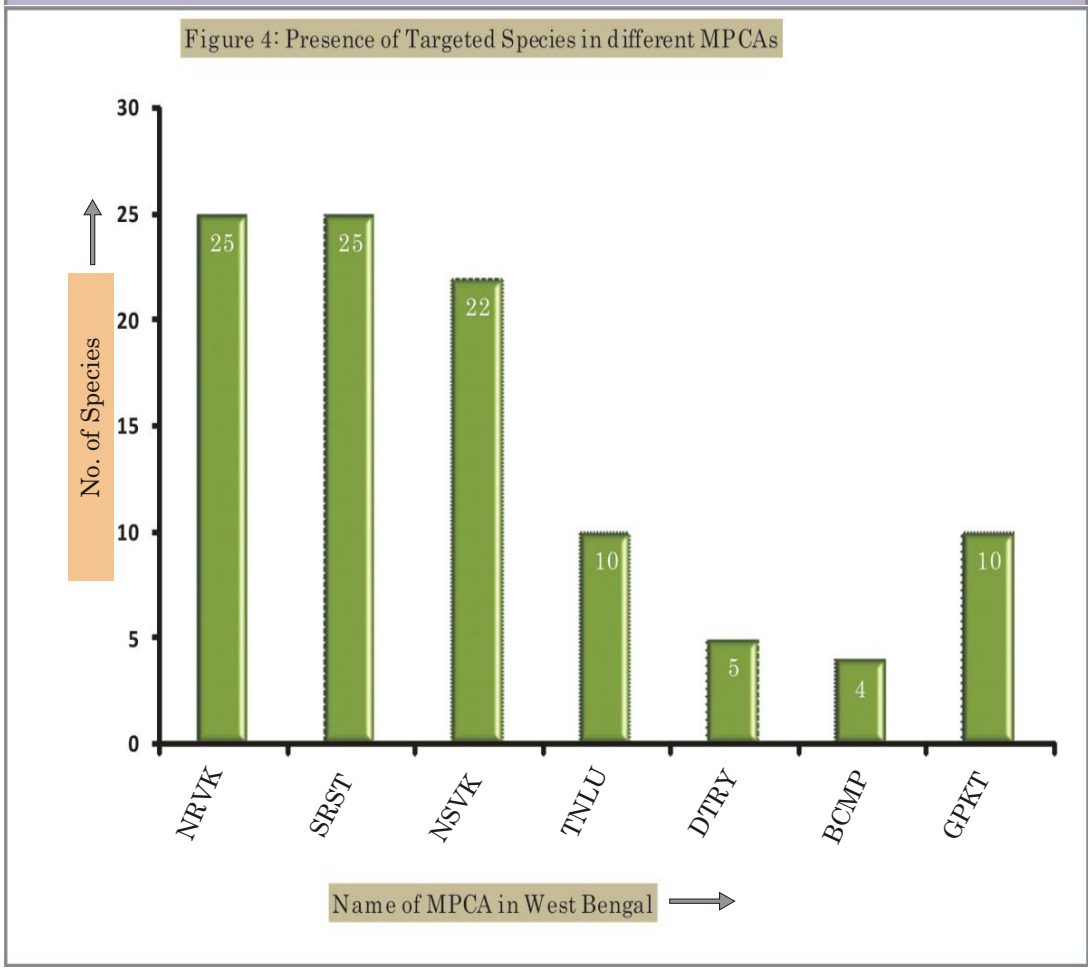


Figure 4: Presence of Targeted Species in different MPCAs



3.3 Recommendations for Management of MPCAs

Though the MPCAs are located in different biogeographical zones, from Himalaya to Sundarban, the recommendation for the conservation of medicinal plants and especially enrichment of the targeted species, the recommendations mentioned below are applicable more or less in all MPCAs.

- Suspension of extraction of fuel wood and NTFP.
- Fire management: Creation of Fire lines and subsequent maintenance thereon.
- Weed management and encouraging native regeneration of target species by uprooting major weeds infestation with the help of FPC members.
- Soil and water conservation: Soil and moisture conservation in the area should be taken up to protect the areas as well as to augment the natural drainage system in the area.
- Collection of germplasm for research and propagation (*in-situ* and *ex-situ*) of the same.
- The target species which are available at site may be monitored with the help of enthusiastic FPC members, selected and duly trained for the purpose.
- Assessment of the socioeconomic aspects of trade in herbs and medicinal plants, especially on the livelihood and income generation aspects of the local forest dependent community.
- Identification and fostering of indigenous knowledge and practices of herbs and medicinal plants and their use, emphasizing particularly the role of women and FPC members in its conservation and use.
- Preparation of a list of institutions having drug testing laboratories facilities, agrotechniques and infrastructure for raising planting materials. Such organizations are universities, Research Wing of Forest Department, herbals research development institutes, reputed NGOs etc. These centers could act as 'center of excellence' for not only ensuring quality planting materials but also for drug testing laboratory facilities, certification, validation etc.


Litsaea glutinosa

CHAPTER-IV

ANALYSIS and DISCUSSION

4.1 Stakeholder Analysis

Stakeholders (and beneficiaries) are individuals or groups with a direct, significant and specific stake or interest in a given territory or set of resources and, thus, in policies or projects relating to those resources.

Meeting with FPC members

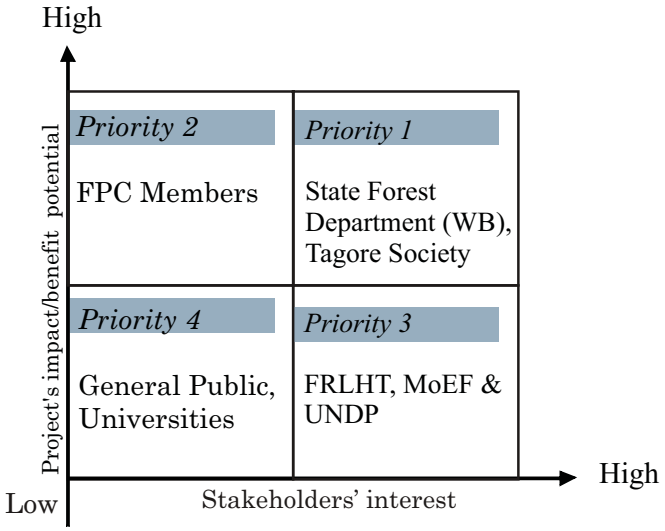
Stakeholder analysis is a crucial initial step in situation analysis. The Table-11 identifies all primary and secondary stakeholders who have a vested interest in the issues with which the project is concerned. The goal of stakeholder analysis is to develop a strategic view of the human and institutional landscape, and the relationship between the different stakeholders and the objectives under consideration. Stakeholder analysis is a continuing process, which should engage different groups, issues, activities, and agendas evolve. This table will form the basis of the project's capacity building strategy.


Sundarban

Table 11: Stakeholder Analysis

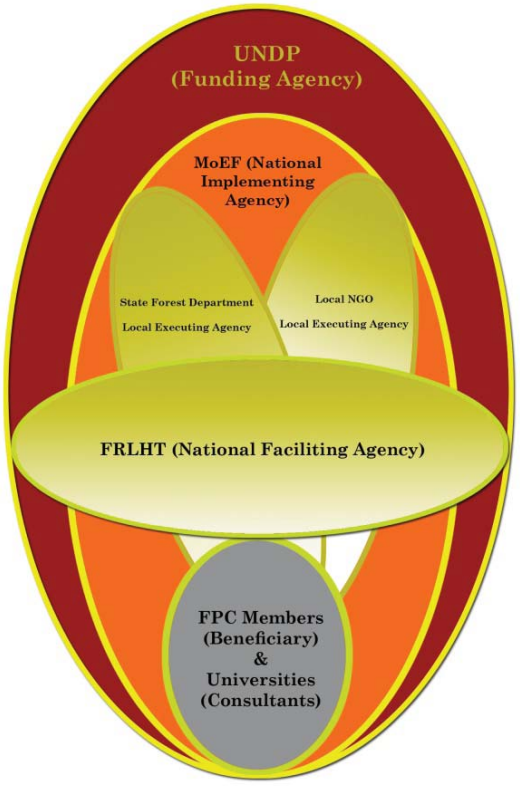
Stakeholder	Type	Stake	Basis	Resources	Role	Remarks
UNDP	Primary	Sponsorship	Funding	Financial and Technological	Funding Agency	—
MoEF	Primary	Policy, Manpower, Natural Resources	Implementation in 9 states of India	Human, Technological, Knowledge, Financial, Forests	Implementing Agency	—
FRLHT	Primary	Manpower, and Livelihood	Advocacy & fund disbursement,	Knowledge, Human, Technological, Research Inputs	National Facilitator	—
West Bengal State Forest Department	Primary	Natural Resources, NTFP market, FPCs	State ownership	Human resources, Natural resources,	Executing agency at state level	—
FPC Members	Primary	Livelihood	Administrative rights	Human resource , Traditional knowledge	Field execution, protection	Need Training
Tagore Society	Primary	Human resource, livelihood,	Obligations to funding agency partner in implementing at state level	Human resource , field level experience & knowledge capital	Implementing Home Herbal Gardens and Community Knowledge Registrar	—
Universities	Secondary	Knowledge, Human resource	Consultants	Subject expertise	Consultancy and Report Writing	Less Exposure on field.
General Public	Secondary	Social obligation, Ecosystem Services	Constitutional rights	Knowledge capital	Viewer	Need mass awareness

Figure 5: Priority grid of stakeholders



Stakeholders are further prioritized accordingly with the help of Prioritizing grid given in figure. The priority analysis grid shows that State Forest Department (West Bengal) and Tagore Society are of priority number 1 because of their high interest and high involvement in executing the project. The impacts and benefits are in the higher side for FPC members though their interest is lower side for the project, so they fall in prioritized number 2. While FRLHT, MoEF and UNDP are prioritized number 3 as they have a high interest in the project implementation but the impact is not so prominent. Further the Venn diagram on the margin shows how the stakeholders are interrelated and the process of implementation.

Figure 6 : Stakeholders diagram



4.2 PEEST Analysis

PEEST (Policy Ecological Economic Social and Technological) is a strategic planning tool used to evaluate the impact of the project on policy, ecology, economics, social conditions, and technological factors that might be on the implementing sites. It involves an organization (3rd Party) considering the external environment. In this project in West Bengal the Regional Centre, NAEB, MoEF, GoI, JU has been taken as consultant to evaluate and analyze the impacts.


Curcuma aromatica

The major Project achievements are

1. A successful CAMP workshop was held at Kolkata during 4th to 7th December, 2007 wherein multiple stakeholders' discussions were held among the Botanists, Taxonomists, Researchers, Plant collectors, Forest Officers and members of FRLHT, Bengaluru.

2. During the CAMP workshop 46 medicinal plant species were identified as endangered and taxon sheet prepared.

3. Under the MPCA component, 7 MPCAs have been demarcated with 42 identified targeted priority species.

4. Management Plans of all the 7 MPCAs have been prepared and this will envisage continuity of the conservation measures currently adopted through the UNDP-CCF-II Project.

5. Additional MPCA related exhibits are being considered at local Eco-tourism Centres for Education of the public and attracting tourists to visit the MPCA.

6. Uploading of MPCA related information in the Website of Forest Directorate for public awareness generation.

4.2.1 Policy Impact

1. Demarcation of seven new medicinal plants conservation areas which would be having a separate management plan with emphasis on listed endangered species conservation.

2. The project has helped to recognize the role of local health traditions in contributing to the health security of rural poor living in and around the forest.


Dicliptera bupleuroides

3. The project clearly spelled out the role of Forest Department in the conservation of medicinal plants.

4. The project has demonstrated the rural employment potential of medicinal plant resources.

5. Strategies for protection of IPRs of the village folk and household knowledge of the women on medicinal plants are documented.

6. The CAMP workshop has brought the policy makers and the primary and secondary stakeholders together on a common platform to exchange views and implement the project together.

4.2.2 Economic Impact

1. The Local communities (FPCs/EDCs) are getting some direct economic benefits through JFM support activities from the project fund.

2. Non-availability of modern treatment in most of the remote areas, low capability of spending for health care, dependency on herbs and shrubs available locally has matched with tribal social values and resulted in economic benefit to house-hold.

3. Sustainable harvesting techniques and value added to medicinal plants at village level will help in quality improvement and in getting high prices.

4. The local herbal medicine practitioners are getting popularity and hence their income is rising.

5. The project envisages women participation and empowers them to tackle issues of health care and livelihood. So socially backward economically weaker classes are involved in the project directly or indirectly.


JFM support activity

4.2.3 Ecological Impact

1. CAMP workshop short listed 46 (forty six) medicinal plants for conservation priority.

2. 7 MPCAs (Medicinal Plants Conservation Areas) to conserve the endangered medicinal plants as long term conservation measure are established. These are *in-situ* forest gene banks ensuring survival of the selected species. Target species oriented MPCA is perhaps the first such initiative in the country.

3. Mass Awareness Generation: Effective posters on state wise prioritized medicinal plants of West Bengal and complete check list of medicinal plants are developed and are generating interest in stake holders like forest officials, students, farmers, traders etc.

4. Forest users' awareness and value of sustainable harvesting methods increased. Awareness of the benefits of sustainable harvesting, such as improved continuity and stability of the resource, promotes adoption of methods.

5. Attitudes towards harvesting changed; less destructive, more traditional methods tested and readopted.

6. Further improvements anticipated after implementation of revised management plans

7. The Rapid Threat Assessment exercise has led to listing of species and their vulnerability status with respect to climate change also. The present listing would serve as baseline / bio-indicator to study climate change effects in near future.

8. The project has led to the change of social, institutional and ecological context of resource management in the state thus affecting rural livelihoods. It enables community members to explore the factors affecting such change, and to propose and test adaptations to such change. It explicitly draws on and combines local and scientific knowledge processes, ensuring the benefits of both small and large scale awareness of change.
9. Disturbances in the site for local community needs, demand and utilization are Reduced.

4.2.4 Social Impact

1. Poor and marginalized community (FPC/EDC) members gained the confidence to draw up a management plan for the forest (MPCAs), thereby enhancing legitimacy of collaborative forestry.
2. Through discussions, exchange of knowledge with scientists and scientific testing of different management regimes, perceived value of local ecological knowledge raised.
3. In partnership with external agencies, information pathways developed on which to base adaptive forest management decisions.
4. Through such information and capacity building rural forest users improve control of access to resources (particularly in relation to illicit harvesters, and neighboring communities).
5. Tenure of forest more secure with good community management.
6. Health improved where access to medicinal plants is assured.
7. Community to Community training for conservation and sustainable harvesting methods spreads to other areas.
8. Community cohesion is increased.
9. Eco-tourism spots and community owned infrastructure are built for environmental recreation, social interactions and income generation.
10. The project envisages women participation and empowers them to tackle issues of health care and livelihood.

4.2.5 Technological and Management Impact

1. Skills in scientific sampling and enumeration techniques combined with rigorous observation of different experimental regimes raise capacity of individuals/ forest officers, who in turn contribute to more informed management decisions.

2. Increased knowledge of resource through monitoring and assessment.

3. Tools gained to reduce variability and risk in production.

4. Forest users' awareness and value of sustainable harvesting methods increased.

5. New lessons on long term and continued medicinal plants management are learnt.

The achievements of the Project were remarkable, and the objectives and outputs of the Project were met for the main part. The Project was in many aspects pioneering new ways of conserving medicinal plants *in-situ* as well as *ex-situ*, cultivation of medicinal plants for income generation by the local population, mainly tribal women, and cultivation of medicinal plants on a family basis in small herbal gardens.


Kaempferia galanga

4.3 SWOT Analysis

SWOT (Strength Weakness Opportunity Threat) is a strategic planning tool used to evaluate the strengths, weaknesses, opportunities, and threats to a project or in a business venture. It involves specifying the objective of the project and identifying the internal and external factors that are favorable and unfavorable to achieving that objective. The strengths and weaknesses usually arise from within an implementing or executing organization, and the opportunities and threats from external sources.

The objectives of the UNDP- CCF-II project in West Bengal are:

1. Identification of the medicinal plants species which have over time become rare and endangered in their natural habitats (Inventorization).

2. Establishment of a system for Rapid Threat Assessment (RTA) for prioritized conservation action (Threat Assessment).

3. Establishment of a network of Medicinal Plants Conservation Areas (MPCAs) (*in-situ* Conservation).

4. Establishment of Home Herbal Garden (HHGs) and Prepare Community Knowledge Registers (CKRs), by Tagore Society, an NGO.

Given below is the SWOT analysis of the project in West Bengal undertaken by State Forest Department (first three components).

4.3.1 Strengths (Internal Factors)

1. High end, multi lateral and multi stakeholder projects with goal of conservation and livelihood generation.

2. Department of Forest has gained sufficient experience in the propagation of Medicinal Plants through this project which was conceived for conservation, identification and development of medicinal plants aiming at revival of traditional system apart from general socioeconomic benefit and health care at grass root level.

3. Availability of Human capital, Natural capital and Knowledge capitals resources.

4. The implementing agency i.e. Forest Department of West Bengal is having prior experience, skilled staff, field level expertise and high reputation on managing tasks with involvement of local communities/FPC members.

5. Reaching out to large number of beneficiaries (Poor people living in and around forests).

6. Local people trained in Identification and use of medicinal plant as part of *in-situ* conservation and development.

7. The project deals with the issues relevant to local, national and global importance to conserve threatened species of medicinal plants.

8. The project would propagate knowledge base of medicinal plant use and rejuvenation of tribal medicine, indigenous practice and resources enrichment.

9. Rapid Threat Assessment - leading to high amount of awareness on status of Medicinal plants in West Bengal and their use.

4.3.2 Weaknesses (Internal factors)

1. The project deals with the issues, which has long term impact and instant benefit is very limited.
2. Needs more funding and improvement of fund flow system.
3. Executing agency is already packed up with various programmes and projects. This project puts an extra pressure on them and specially completing within time limits.
4. One proposed MPCA (Jammudwip under Silviculture South Division) could not be taken up during the project period.
5. Four (4) priority species could not be covered in the selected MPCA areas out of 46 priority species considered for conservation.
6. The success of the initiatives depends upon the community protection and they are going to get very little out of the project and this may lead to decline in the interest for conservation.

4.3.3 Opportunities (External Factors)

1. Technology and infrastructure development
2. Documentation of lost / suppressed traditional/ local knowledge.
3. Changing beneficiaries' behavior towards sustainable consumption of medicinal plants.
4. Identification of emerging and developing markets for tradable medicinal plants.
5. Large discretionary income at disposal of consumers.
6. Provision of identification of more medicinal plants as targeted species and their Conservation.
7. Enhanced health security for poor people living in forest fringe villages.
8. Enhanced livelihood security for poor people living in forest fringe villages.
9. Rising appreciation for medicinal value of the medicinal plants by consumers in the developed countries.
10. Growth in search made by retail chains in major importing countries for suitable products and reliable suppliers. Opportunity for agencies to promote marketing activities.

11. Formation of new MPCAs to protect rest of the threatened species and conservation of similar species in more areas in their natural occurrence.

12. Promotion of health tourism/ ecotourism centers for naturopathy and aromatherapy.

13. Boost to traditional medicine practitioners.

14. Open an opportunity in many field i.e. organic pesticides and other chemical extracts for use in modern medicine.

15. Contribute to the revival of traditional system of medicine.

16. Maintaining critical equilibrium in demand and supply positions of medicinal plant materials.

4.3.4 Threats (External Factors)

1. The conservation area is small and so is the quantity. There is a chance of intrusion of illegal collectors/traders to exploit the resources.

2. Alternative healthcare systems are easily accessible, available in common market and ready to use/consumptions.

3. Stricter standards to harvest medicinal plants leading to negative effect on the livelihood of the local people.

4. Even medicinal plants that are rare and were not in much use would be exposed for public reference and would get threatened in coming years if not protected.

5. Intellectual Property Rights (IPRs) of the traditional knowledge bearers are not looked upon.

Resource Persons during inventorization

CAMP Workshop

CHAPTER-V

MONITORING AND EVALUATION

Table 12: Monitoring and Evaluation

Expected outputs	Key Activities	Indicators	Status and Progress*
List of Medicinal Plants Conservation sites in state	Selection of conservation area for establishment of MPCA network in the state: Short listing, identification and finalization of areas for location of MPCAs Prepare an exhaustive list of areas rich in medicinal plants: by number and occurrence of threatened species Categorize them by forest types, Altitude with details of rainfall data etc. Finalize locations to be operationalized under this Project, giving preference to sites in different forest types and altitudes, and occurrence of threatened medicinal plant species.	List of MPCA sites in the state.	7 Nos. of MPCAs selected & finalized
List of reference related to Medicinal Plant Conservation Areas (MPCAs)	Collect relevant information about site selected: Preliminary survey and literature search gathering field information related to the selected sites through participatory methods.	List documents such as books, reports, thesis, Journal articles etc, (index of reference material).	Done

**Given details of activities completed in the context of activities and indicators listed herein.*

Expected outputs	Key Activities	Indicators	Status and Progress
Profile of the MPCA locations in the state	Prepare profile of MPCA sites: Location of the sites on the maps and demarcation of the sites in the field on Forest Division Map and State Map. Initiate discussion with the local people(Panchayats, JFM committees, other local bodies, Folk healers, other stakeholders etc). Organize public awareness campaigns in each of the areas (nearby villages) of MPCAs to ensure that local community and resource users are familiar with demarcation and objectives of the MPCA.	MPCA wise profile With location maps. Report on community awareness programmes.	Done
Work plans of MPCAs in the state	Preparation of management plan for MPCA: Marking of the MPCA with boundaries, fix arch and name plates, name it by thematic area (conservation, tourism etc). Notification to constitute MPCAs, to afford a special management status to the area. Prepare Work plans for each of the selected sites. Ensure and muster involvement of local people.	Management plans for each MPCA.	Done

Expected outputs	Key Activities	Indicators	Status and Progress
Medicinal plants inventory of MPCAs	Preparation of medicinal Plants inventory: Floristic inventorization of MPCAs, to prepare checklist of Species. Refer secondary sources and prepare the preliminary list of medicinal plants and NTFPs in the selected area. Enlist the taxonomists and field Botanists/foresters who have knowledge about the distribution of NTFPs and medicinal plants in the state and obtain information from them. Constitute Taxonomic Survey teams from among the available experts and field workers. Prepare schedule for the survey and inventorization of the medicinal plants diversity in the selected areas. Design and Conduct multi-season population studies for selected medicinal plants species of conservation concern.	Checklist of species (all flora). Checklist of medicinal plants and NTFP species. List of taxonomist and botanists. Details of team constituted and schedule of activities. Report related to Floristic surveys.	Done
Herbarium sheets for medicinal plants of MPCAs	Establishment or enriching the State level Herbarium for preserving the Specimen: List currently available Herbaria in the state and assess their status regarding number of species and the level of competence available to take on such works. Make an assessment as to whether the existing infrastructure can be adopted for the Medicinal Plants herbarium, if not. *Cntd.*	Report on existing herbarium/s in the State. Report on Location and details of proposed herbarium. Details of botanical team. Herbarium data sheets with field Inputs.	Done

Expected outputs	Key Activities	Indicators	Status and Progress
	Decide in consultation with the State Forest Department and Universities / Research organizations a suitable location for the Bio-cultural Herbarium and Raw Drug repository. Assess the requirement of additional infrastructure. Build a Botanical Team by engaging botanists and taxonomists, on a contract basis. Organize seasonal survey as per the requirement of the vegetation so as to capture diversity in the forest area. Prepare herbarium database (Formats and process).		
Database of medicinal plants	Centralized support activities: Establishment and maintenance of database. Research and development programmes. Policy and budgetary support for medicinal plants conservation programme. Develop and put in place regular monitoring mechanism along with formats and schedule. Linkages and networking.	Database Action Report on R & D, policy and budget.	In progress

Expected outputs	Key Activities	Indicators	Status and Progress
List of reference material for the state	Collection of relevant Literature: Contact/ write to all various agencies in the state. Summary of the references Collected.	List of books, journal articles, reports, unpublished thesis.	Done
Eco-region wise referenced Information about medicinal plant flora in the state	Data entry related to Medicinal plants of the state and preparation of checklists: Review of reference. Sort out references related to medicinal plants in the state. Enter data in the computer.	Checklist of selected medicinal plants eco region wise.	Done
List of experts to be involved in CAMP and for targeted research	Collection and compilation of list of experts: List out the author/s of the reference material. Contact universities and other organization with field knowledge about vegetation. Prepare list of experts to be involved in the rapid threat assessment process. Compilation of brief resume for each expert.	List of experts and their brief resume. List of institutions to be involved in CAMP Workshop.	Done
List of important medicinal plants of the state	Preparations for Pre CAMP workshop: Prepare Checklist of Medicinal plants of state. List of medicinal plants species for assessment. Collection of distribution information. Preparation of briefing book.	Refined checklist of medicinal plants for assessment. Briefing book.	Done

Expected outputs	Key Activities	Indicators	Status and Progress
Biological information sheets of the medicinal plants listed for assessment	Preparation of Biological information sheet for important Species: Biological Information sheets. Prior surveys - Eco-region wise. Compiling responses of field Experts.	Biological information sheets of important Medicinal Plant species.	Done
List of invitees for CAMP Workshop	Pre workshop Arrangements: Prepare list of invitees. Preparation of Invitation letters and final intimation to participants. Preparation of Publicity note (pre & post CAMP workshop). Workshop arrangements: Decide on Venue. Pool books related to state and Indian flora. Infrastructure for conducting the workshop. Administrative support. Organize CAMP workshop.	List of invitees for CAMP workshop. Publicity material. Programme list. Registration folder. List of contact persons and facilities available. Report on CAMP workshop.	Done Done Done
Taxon sheet for prioritized medicinal plants	Preparation of taxon sheets	Taxon Sheets.	Done
An action list of Threatened medicinal plants species of the state with threat categorization	Preparation of species list for Conservation Action.	List of species with Threat status.	Done

Box 7: Review of project some excerpts

Some excerpts relevant to West Bengal from Minutes of the Meetings held to review UNDP-CCF-II Project.

1. Eighth Meeting of the Empowered Project Standing Committee (EPSC) Chaired by Dr.B.P. Nilaratna, Jt. Secretary, MoEF.

(GOI, MoEF F.No.J-13/6/2002-CSC Volume - II dt. 22.02.10)

"West Bengal representative Dr. Kana Talukder, CF informed that their work is as scheduled and has achieved good progress during this year. She highlighted some of the difficulties in field in West Bengal and pleaded for more time for the field work reporting and requested for validation of funds beyond March. The Chairman expressed that the expenditure need to be carried out before March 31st" 2010. The exit plan including research programme involving universities and SFD on prioritized species was highlighted by her."

2. Minutes of the Meeting of Evaluation Report of UNDP for Project Chaired by Dr.B.P. Nilaratna, Joint Secretary. MoEF on 25.11.09

(GOI, MoEF F.No.l3/6/2002-CSC-Volume-IV dt. 11.01.10**).**

"Study for ..... West Bengal"

Mr. Rajeev Senwal made a presentation for the State of .....West Bengal for the following components:

Component	State	Implementing agency
Establishment of MPCA	West Bengal	SFD
Rapid Threat Assessment	West Bengal	SFD

Mr. Rajeev felt that keeping in view the period, the success achieved so far in the above State could be considered satisfactory. He felt that the components like MPCA will require still more some time to be fully achieved. Continuous support for another two years would be required to complete certain project activities that inherently take longer time for completion and often depend on borrowing the expertise not necessarily available with the key implementing partner(s). He also insisted for an exit plan by the States for carrying out the activities beyond the project."

3. Seventh Meeting of the EPSC held at MoEF on 24.03.09 Chaired by Dr. B.P. Nilaratna, Jt. Secretary, MoEF.

"It was strongly felt that enormous work has been carried out under CCF-I and II Projects and now the State Governments should develop the Exit Strategies to sustain all the infrastructure created and activities undertaken under the project ..... The following action points emerged during the meeting:.....

- All States to use Logos of MoEF, UNDP, FRLHT and State Forest Department on the Technical Publications.
- States to start preparing the States Report of the Project.
- States to upload information of the Project on their Website.
- States to develop Exit Strategies to sustain the activities under the Project."

Epiphytic ferns at NRVK

CHAPTER-VI

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The work on the various aspects of medicinal plants in the country was fragmented and the whole picture was not readily available. Documentation of the work being done on different aspects of medicinal plants was necessary. Therefore, National Programme on Medicinal Plants Conservation and Sustainable Use had been helpful to fill the knowledge gap which may impede conservation and sustainable use efforts relating to medicinal plants in the country.

The project UNDP-CCF- II in West Bengal has built a list of reference material for the state on various aspects related to Medicinal plants. It has led to development of Eco-region wise referenced information about medicinal plants flora in the state. Seven Medicinal Plants Conservation Areas (MPCAs) have been identified by forest type and altitude. All the general, social, economic and ecological information are gathered and inventoried in the MPCAs. List of threatened species and their abundance in each MPCA has been recorded. A whole profile of the MPCAs had been recorded including the FPC members, forest division within and in and around the MPCAs. The FPC members would be further responsible for the protection of the areas.

A Biological information sheet called 'Taxon sheet' of the medicinal plants listed as priority species has been prepared. The taxon sheet would reveal the Morphology, Taxonomy, Status, Abundance, Habit, Habitat and relevant biological information for ready reference. A list of experts (Annexure - V) on various aspects of taxonomy and biodiversity conservation in West Bengal was drawn out for use in near future. An action list of threatened medicinal plant species of the state with threat categorization was also produced.

Many training workshops and meetings were arranged with the local people, FPC members, SHGs, Panchayats and traditional medicine practitioners on conservation of these areas. With the help of these members a whole inventory has been prepared

that contains information on list and abundance of species availability, list of other NTFPs used or are available in the area, use of NTFPs, quantity in which NTFPs and medicinal plants are used and traded and to which area the trade is taking place. Further a herbarium has been prepared to preserve specimens of the species found in wild for future reference.

The long term outputs of the project would be continued protection of species and habitats of threatened medicinal plant species, economic and social development of the farmers and collectors for increased food security and the scientific measurement and reinforcement of biodiversity in the MPCAs.

6.1.1 Lessons learnt

- Pragmatic approach is necessary in the matter of selection of sites for establishing MPCAs.
- Orientation training on establishment and maintenance of MPCAs is required for front line Officers.
- Motivation and capacity building of FPC is essential for maintenance of MPCAs.
- Awareness programme should be location specific, focused and action oriented.

6.1.2 Areas of concern

- Over exploitation of natural resource of medicinal plants by market driven Entrepreneurs.
- Attitude of indifference and complacency on the part of common man and also experts.

6.1.3 Gaps

- Non existence of transparent marketing channels.
- Inadequate data on availability of Medicinal plants from natural resource base.
- There is acute dearth of taxonomists with expertise on species, especially tree species within forest area.

6.2 Recommendations

- State level strategy and action plan for conservation of threatened species.
- Eco-region / Eco-niche wise floristic inventory for assessment of natural herbal resources.
- Preparation of Herbarium Sheet for preservation and display.
- Eco-niche for each of the threatened species to be clearly specified for meaningful cultivation.
- Infrastructural facilities like Seed banks, Nurseries etc. for *ex-situ* conservation and cultivation.
- The end users to have their own or promoted herbal farms, if possible through enactment.
- Market study to correlate local name, trade name with the scientific name of the respective species and also to collect other relevant market information.
- Mechanism to assess chemical constituents, therapeutic uses and efficacy of medicinal plants.
- Concerned front line staff and FPC members to be trained in maintenance of MPCAs.
- Organizing the commercial collectors (mostly women) in a cooperative that will be under the umbrella of the Forest Department towards regulating harvesting from the wild, which is currently depleting the populations of the globally significant medicinal plant species.
- Awareness generation by organizing Nature Camp, Awareness Programme, Publication of hand books, folders, leaflets etc. and inclusion of the topic in the curricula of Schools, Colleges and Universities.
- A certification and eco-labeling system, according to the international standards, can be put in place and certificates be issued to those collectors who follow the sustainable harvesting practices. The certification process will help in adding value to the medicinal plant products and fetch high price in the market.

6.2.1 Future action strategy

One strategy to address the issues raised by the SWOT analysis would be to develop coherent set of policies for maintaining or increasing biodiversity and farmers' prosperity through the systemic development of Small and Micro Forest Enterprises (SMFEs) for trading of medicinal plants, which would be owned by farmers and assisted by professionals to access the national and international markets with high-quality products. To assure high quality, transparent control and certification procedures and infrastructures have to be developed and implemented. The development of organic production systems is one such avenue that not only would produce environmental benefits, but could also generate value-added income. The later requires the establishment of adequate infrastructure for training, production, processing, certification and marketing.

It appears from the initiatives of the project that creating opportunities for cultivation of medicinal plants is not enough. Similarly, the collection process may lead to non-beneficial or damaging consequences for many members of the local community and for biodiversity. Hence, there is a need for a coherent, transparent and equitable process from cultivators/collectors to marketing. This process has to be scalable so that benefits are not confined to a limited geographical area only.

In this context, development of SMFEs would be extremely beneficial leading to empowerment and self sustainability. This could be established by the FPC members only. The initiative would be directed mainly towards achieving the demands of sustainable utilization of natural resources, production of quality produce for industry and for providing social justice to the growers. In the process of making a difference, some of the beneficial intermediate mechanisms that will be realized are:

- A healthy, safe and transparent procurement chain.
- Fair trade practices & assured stable markets for medicinal plants.
- Improvement in existing processing practices.
- Value addition through additional processing mechanisms.
- Conservation of species in the wild.
- Self sustainability of the FPC committees.
- Farmer-centered process for the entire production, processing and marketing chain.
- Market stability through the assurance of export quality products and through catering to a mix of national and international demand with long-term contract. The protection of consumers through organic production methods for medicinal plants.


Panax pseudoginseng

CHAPTER-VII

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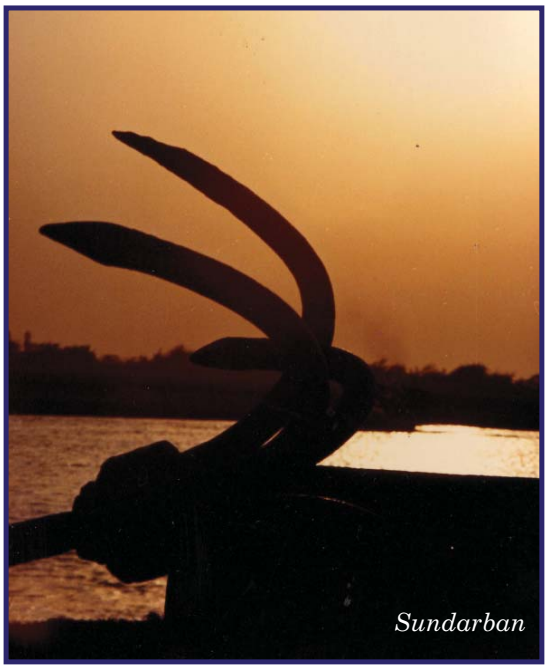


Sundarban


Sundarban

ANNEXURE

Annexure: I: Details of 46 targeted plant species for conservation identified in CAMP workshop

Sl. No.	Botanical Name	Family	Synonym	Trade Name	Local Name	Habit	Parts traded	Threat Status
1.	*Abelmoschus moschatus* Medik	Malvaceae	*Hibiscus abelmoschus*	Muskdana, Lata kasturi	Lata Kasturi, Kal Kasturi, Mushkdana,	Undershrub	Seeds	NT
2.	*Aconitum bisma* (Buch.-Ham.) Rapaics	Ranunculaceae	*Aconitum palmatum, Caltha bisma*	——	Bikhma	Perennial-herb	Root	EN
3.	*Aconitum ferox* Wall. ex Seringe	Ranunculaceae	——	Atish meethi	Bish	Perennial-herb	Root	EN
4.	*Aconitum spicatum* (Bruhl) Stapf	Ranunculaceae	*Aconitum ferox* var. *spicata*	——	——	Perennial herb	Root	EN
5.	*Alpinia calcarata* Roscoe	Zingiberaceae	——	——	Toroni	Herb	Rhizome	EN
6.	*Ampelocissus barbata* (Wall.) Planch.	Vitaceae	*Vitis barbata*	——	Jarila-lahara	Liana (Climber)	Stem	CR
7.	*Aphanamixis polystachya* (Wall.) Parker	Meliaceae	*Aglaia polystachya, Amoora rohituka, Andersonia rohituka*	Rohitak	Tiktaraj, Pittaraj, Harin-hara	Tree	Stem bark and seeds	LC
8.	*Aristolochia indica* Linn.	Aristolochiaceae	——	Ishwar mul	Ishwarmul, Sapsan, Bhedi Janetet	Climber	Leaves and roots.	VU
9.	*Asparagus racemosus* Willd.	Liliaceae	——	Satawari	Satamuli, Shatawari	Shrub	Leaves and roots.	EN
10.	*Berberis aristata* DC.	Berberidaceae	*Barberis sikkimensis*	——	Chotra	Shrub	Branchlets, fruits, bark, and root	VU
11.	*Celastrus paniculatus* Willd.	Celastraceae	*Celastrus multiflorus, C.mutans,C.rothiana, Swertia paniculata*	Malkangni	Mulkangni, Jyostimati,Kujari	Climber	Seeds and bark.	EN
12.	*Cinnamomum bejolghota* (Buch.-Ham.) Sweet	Lauraceae	*Laurus bejolghota, Cinnamomum obtusifolium*	Bejolghota	Bhale Sinkohli, Tezpata	Tree	Leaves and bark	VU

Sl. No.	Botanical Name	Family	Synonym	Trade Name	Local Name	Habit	Parts traded	Threat Status
13.	*Cinnamomum cecidodaphne* Meissn.	Lauraceae	——	——	Malagiri	Tree	Wood and seeds	EN
14.	*Desmodium motorium* (Houtt.) Merr.	Fabaceae	*Desmodium gyrans*	Ban Chandal	Ban Chandal	Undershrub	Roots	VU
15.	*Dioscorea prazeri* Prain & Burkill	Dioscoreaceae	*Dioscorea clarkei, D. deltoidea var. sikkimensis*	Kukur, Tarul	Kukur, Tarul	Climber	Underground root tuber and bulbils	EN
16.	*Drosera burmannii* Vahl.	Droseraceae	——	'Sun-dew'	Surija-sisir	Herb	Whole Plant	EN
17.	*Gloriosa superba* Linn.	Liliaceae	——	Kali Hari	Ulat Chandal, Agnisikha	Tendril climber	Tubers	VU
18.	*Gymnema sylvestre* R.Br.	Asclepiadaceae	*Periplocoa sylvestris*	Gurmar	Gurmar , Mesh shringi, Meda singi	Climber	Entire plant	VU
19.	*Gynocardia odorata* R. Br.	Flacourtiaceae	——	Chaulmoogra	Chaulmgra	Tree	Seeds	EN
20.	*Helminthostachys zeylanica* (Linn.) Hook. F.	Ophioglossaceae	*Helminthostachys dulcis*	Ekbir	Ekbir	Rhizomatous herb	Whole plant and rhizome.	EN
21.	*Ipomoea mauritiana* Jacq.	Convolvulaceae	*Ipomoea digitata, I. paniculata, Convolvulus paniculata*	Bhumikumra, Bhumikus-hmanda	Bhumikumra, Bhumikushmanda	Climber	Roots and tubers	NT
22.	*Litsaea glutinosa* (Lour.) Robinson	Lauraceae	*Sebifera glutinosa, Litsaea chinensis, L. Sebifera*	Maida Lakri, Maida Lakadi	Piplus, Kukur Chita, Maida Lakadi	Tree	Leaves, flower buds, fruits, roots.	LC
23.	*Lumnitzera racemosa* Willd.	Combretaceae	——	——	Kripa	Small tree	Leaves, barks, fruits	CR

Sl. No.	Botanical Name	Family	Synonym	Trade Name	Local Name	Habit	Parts traded	Threat Status
24.	*Lycopodiella cernua* (Linn.) Pichli-Sermolli	Lycopodiaceae	*Lycopodium cernuum, Palhinhaea cernua*	Lycopodium	Nag beli	Herb (Perennial)	Whole plant	EN
25.	*Mesua ferrea* Linn.	Clusiaceae	——	Nagkesar	Nagkesar	Tree	Bark, timber and flowers buds	EN
26.	*Morinda citrifolia* Linn.	Rubiaceae	——	Noni	Ach, Chaili, Bartundi, Surangi, Aal	Small tree	Leaves, stems, fruits and roots.	VU
27.	*Mucuna pruriens* (Linn.) DC.	Fabaceae	*Dolichos pruriens, Carpopogon pruriens, Mucuna prurita*	Kanso, Kuach	Kanso, Kuachi	Climber	Pod and seed.	EN
28.	*Nipa fruticans* Wurmb	Arecaceae	——	Golpata	Golpata	Tree	Leaves and fruits.	VU
29.	*Olax nana Wall.* ex Benth.	Olacaceae	——	Bhadu, Olax	Bhadu Shak, Merom Met	Undershrub	Leaves and ripened fruit.	VU
30.	*Ophioglossum reticulatum* Linn.	Ophioglossaceae	*Ophioglossum cordifolium*	Adder's tongue/ Ektir	Ektir	Terrestrial Fern	Tuber	EN
31.	*Panax pseudo ginseng* Wall.	Araliaceae	*Panax sikkimensis*	Ginseng	Jara-okhati, Mangan	Herb	Rhizome	CR
32.	*Pericampylus glaucus* (Lamk.) Merr.	Menispermaceae	*Pericampylus incanus*	Pipal-pati	Pipal-pati, Lahara	Climber	Root tuber	VU
33.	*Persea glaucescens* (Nees.) Long	Lauraceae	*Machilus villosa*	Kawla	Kawla, Atilo	Tree	Bark and wood.	CR
34.	*Picrorhiza kurroa* Royle ex Benth.	Scrophulariaceae	*Picrorhiza kurrooa*	Kutki	Kutki, Kutaki	Perennial herb	Whole plant	CR
35.	*Podophyllum hexandrum* Royle	Podophyllaceae	*P. emodi, P. emodi* var. *Jaeschkei*	Ban kakri	Ban Kakri, Panchpatey	Perennial herb	Whole plant, fruit and root.	CR

Sl. No.	Botanical Name	Family	Synonym	Trade Name	Local Name	Habit	Parts traded	Threat Status
36.	*Pterocarpus marsupium* Roxb.	Fabaceae	___	Bijasal	Bijasal, Piyasal	Tree	Bark, wood and gum.	VU
37.	*Rauwolfia serpentina* (Linn.)*Benth.* ex Kruz	Apocynaceae	*Ophioxylon serpentinum*	Rauwolfia, Sarpagandha	Sarpagandha, Chandra, Chhotachand	Shrub	Leaves, seeds, roots	EN
38.	*Sonneratia caseolaris* (Linn.) Engl.	Sonneratiacaeae	*Rhizophora caseolaris, Sonneratia acida*	Archa, Ora	Ochra, Archa, Archaka	Tree	Fruits and wood.	EN
39.	*Stereospermum colais* (Dillwyn) Mabb.	Bignoniaceae	*S. tetragonum, S. personatum*	Parao, Padri	Parania, Padri	Tree	Bark	VU
40.	*Swertia chirayita Roxb.* ex (Fleming) Karst	Gentianaceae	*Gentiana chirayita, Ophelia chiraita*	Chirayata	Chireta, Chirayata	Herb	Whole plant	CR
41.	*Taxus wallichiana* Zucc.	Taxaceae	*Taxus baccata sub. sp. Wallichiana*	Taxus	Dhengre salla	Tree	Leaf twigs and bark.	CR
42.	*Thalictrum foliolosum* DC.	Ranunculaceae		Dampate	Dampate	Herb	Whole plant and root.	VU
43.	*Toona ciliata* Roem.	Meliaceae	*Cedrella toona*	Toon	Toon	Tree	Seed, bark and wood.	VU
44.	*Tylophora indica* (Burm. f.) Merr.	Asclepiadaceae	*Tylophora asthmatica, Cynanchum indicum*	Anantamul	Anantamul, Ananthamul	Perennial climber	Leaves and roots.	NT
45.	Viscum articulatum Burm. f.	Viscaceae	*Viscum nepalense*	Viscum	Bunda, Mandada	Shrub	Whole plant	LC
46.	*Xylocarpus granatum* Koer.	Meliaceae	*X. obovatus, Carallia obovata, Carallia moluccensis*	Pussur	Pussur, Dhandul	Tree	Wood	VU

CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near threatened; LC = Least concern.

Annexure II: Abridged Management Plans of MPCAs

DHOTREY

1. General information

1.1 Forest Information

Name of the Site	Dhotrey MPCA
Legal Status	Reserve Forests
MPCA Area	180 ha
Division	Darjeeling
Forest Range	Dhotrey
Block	Selimbong, Kankibong
Compartment	Selimbong 3 & 4, Kankibong 1

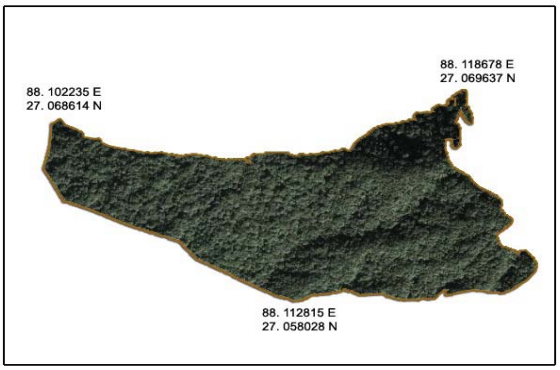
1.2 Approach Information

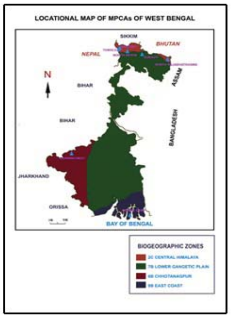
Approach	Name of the Place	Distance in km from the selected site
Approach by Road	Dhotrey	21
Approach by Train	Ghoom R.S.	47
Approach by Air	Bagdogra	128

1.3 Physical Description of the Site

Physical	
Latitude	27˚03′ N
Longitude	88˚04′ N
Geology/Rock Formation	Darjeeling Genesis, unaltered sedimentary rocks, metamorphic rock
Soil Types	Sandy loam, Red and yellow podzolic soil
Climate	
Average Rainfall	3624.2 mm
Temperature	
Maximum	21.0°C
Minimum	8.7°C
Water Resources	Perennial hill streams, Lhodoma river catchment, which ultimately join River Teesta

AREA MAP OF DHOTREY MPCA
(PRODUCED BY USING GPS DATA)





2. Technical Description of the MPCA

2.1 Major Components of Forest

2.1.1 Upper Hill Forest

11B-East Himalayan Wet Temperate Forests of Northern Montane Wet Temperate group:

The altitudinal variation of flora is well marked in the MPCA. *Castanopsis indica, Meliosma wallichii, Erythrina indica, Machilus edulis, Castanopsis tribuloides, Engelhardita spicata, Bucklandia populnea, Nyssa sessiflora, Juglans regia,* with *Eurga japonica, Symplocos theiolia, Hovenin dulcis, Prunas nepaleasis* are the major species below 2100m and the major dominant top storey above 2400m are of *Quercus pachphyll, Quercus lamellosa, Quercus lineata, Acer campbellia, M. campbellia, M. excelsa, Acer spp., Michelia spp., Castanopsis hystrix, Rhododendron grifithianum, Betula spp., Taxus wallichiana* etc. and middle and under storey is of *Symplocos thaefolius, Eurya japonica* etc. with scattered, *Taxus baccata* in Kankibong and Selimbong block.


Field enumeration

Major Shrubs / Herbs found here are *Viburnum erubescens, Daphne bholua, Berberis spp.* (Shrubs) *Mahonia acanthifolia, Yushania maling, Helwingia himalaica, Panax pseudo ginseng, Swertia chirayita, Smilax rigida, Viola serpens* and major climbers seen are *Polygonum mollay, Rubus spp.* etc.

2.2 Past System of Management: The MPCA area of Dhotrey is covered under the Biodiversity and Wildlife Conservation and Preservation Working Circle. The main prescription within this working circle is to coordinate and execute the research, extension, land use, planning and educational activity with a provision to address the soil conservation and wildlife preservation measures through specialized agencies and line departments.

2.3 Disturbance in Site: With the formation of FPC the grazing has been totally stopped in the area. There was a forest fire in recent past in the year 1995-96.

3. Socioeconomic Conditions of Villages near MPCA


Field Survey

The MPCA area is under the FPC managed forest area of Dhotrey and Relling FPCs. The means of livelihood of villagers are Agriculture, Animal husbandry as well as NTFP collection and forestry works. The socio-economic profile as per Microplan Darjeeling Forest Division is as follows:

Category	Village 1	Village 2	Village 3
Name	Dhotray Forest village	Relling	Samsu
Area (ha)	7.5	Revenue village	Revenue village
Population	410	110	350
Males	210	60	200
Females	200	50	150
Means of Livelihood	NTFP collection, forestry work, Animal husbandry and Agriculture	Agriculture, Animal husbandry, Forestry activity, etc	—
Nearby Forest Area	Kankibong, Tonglu, Relling block.	Relling, Selimbong	Selimgbong RF
No. of Tradition/Folk Medicine Practitioners	Narman Tamang N.K. Rai, Prasad Rai Madan Gurung	—	—
No. of SHGs	Women's SHG (18 membs.)	—	—
No. of NTFP/ Medicinal Plant Collector	>60% (appr.)	55% (appr.)	40%
No. of NTFP Traders	5-6 persons	2-3	

4. Medicinal Plants Collected from the MPCA Site

Species	Part collection	Season of collection	Quantity collected	Unit price in Rs./qtls.
Aconitum bisma	Root	July-August	Not assessed	—
Aconitum spicatum	Root	August - Sept.	—	—
Swertia chirayita	Whole plant	July-August	—	150/kg
Potentila fulgen	Root	July-August	—	—
Taxus wallichiana	Leaf and Bark	Year round	—	—
Mahonia napaulensis	Stem	Year round	—	—
Polygonum amplexicaulis	Root	August - Sept.	—	—
Rhododendron arboretum	Flower	March-April	—	—
Lycopodium clavatum	Strobilus	August - Sept.	—	—
Panax pseudoginseng	Root/rhizome	July - Sept.	—	—

5. NTFPs/MFPs Collected from the MPCA Site

NTFPs/ MFPs	Quantity Traded (Kg)	Unit Price	Sold
Yushania maling (young shoot)	>4000kg	@10/kg	Yes
Edible fungi	>1000kg	@30/kg	-do-

6. Number of JFM Committees and their Details

Name	Year of formation	Area assigned (ha)	Number of members	Name of the president	Contact number	Avalability Micro plan
Dhotrey	2001	301.00	57	Pradip Rai	—	Yes
Relling	2005	304.72	20	Sangey Sherpa	—	Yes

7. Strategies within the MPCA

The MPCA will be managed as "hands off" area with the following intervention wherever required:

- Suspension of all harvesting operations in the wake of which there will be no extraction of fuel wood and therefore it is proposed to arrange some alternative.
- Awareness to the local FPC villagers.
- Fire management: Creation of Fire lines and subsequent maintenance thereon.
- Weed management/encouraging native regeneration of target species by uprooting major weed (lime Maling) infestation with the help of FPC members.
- Soil and water conservation: Soil and moisture conservation in the area can be taken up to protect the areas as well as the natural drainage system in the area.
- For the botanical survey it is proposed that the guideline issued by the FRLHT shall be followed to that extent possible. As indicated 1-2% field sampling shall be attempted. The plots size would be 20mx20m for tree, 5mx5m for shrubs and 1mx1m for herbs. Botanical survey is to be conducted as a resource study and also collection of medicinal plant specimens and preparation of herbarium sheets as identified voucher specimens and maintain a herbarium for preserving the native plant specimens by way of improving herbarium at Lloyd Botanical Garden Darjeeling.
- Collection of Germplasm for research and propagation (*in-situ* and *ex-situ*) of the same.
- Construction of an "entry gate" befitting to the site as a special measure to make visitors aware.
- The target species which are available at site shall be monitored with the help of enthusiastic FPC members, selected for the purpose.
- A concise hand book containing information of medicinal plants shall be published in vernacular language.

TONGLU

1. General information

1.1 Forest Information

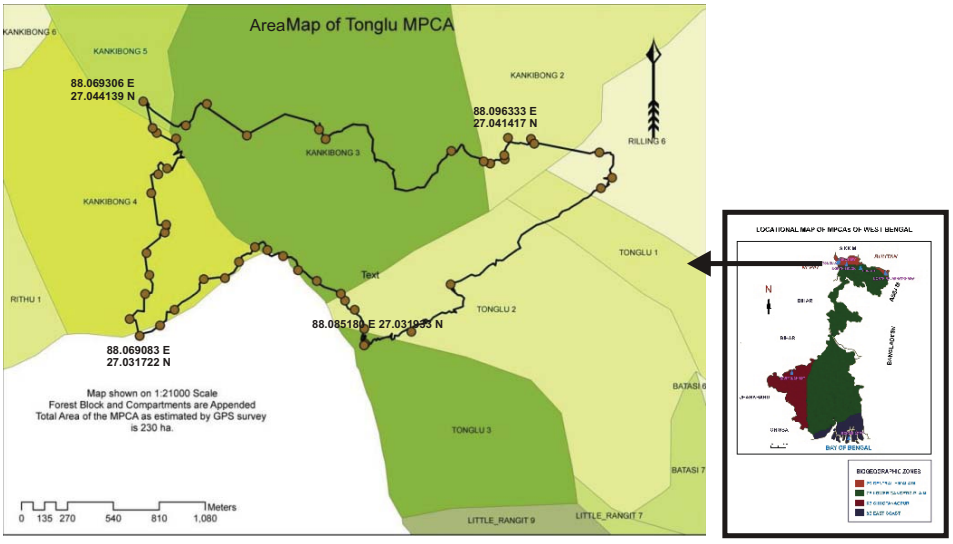
Name of the Site	Tonglu MPCA
Legal Status	Reserve Forests
MPCA Area	230 ha
Division	Darjeeling
Forest Range	Tonglu
Block	Tonglu, Kankibong
Compartment	Kankibong 3& 4

1.2 Approach Information

Approach	Name of the Place	Distance in km from the selected site
Approach by Road	Maneybhanjyang Dhotrey	19 km 8 km
Approach by Train	Ghoom R.S.	47 km
Approach by Air	Bagdogra	128 km

1.3 Physical Description of the Site

Physical	
Latitude	27˚02′ N
Longitude	88˚05′ E
Geology/Rock Formation	Unaltered sedimentary rocks, confirmed to the hills on the south, and metamorphic rock over the rest of the area
Soil Types	Sandy loam, Red and yellow podzolic soil
Climate	
Average Rainfall	3624.2 mm
Temperature	
Maximum	21.0°C
Minimum	8.7°C
Water Resources	Perennial hill streams, Lhodoma river catchment, which ultimately join River Teesta


AreaMap of Tonglu MPCA
KANKIBONG 6
KANKIBONG 5
KANKIBONG 2
KANKIBONG 3
KANKIBONG 4
RILLING 6
TONGLU 1
TONGLU 2
TONGLU 3
RITHU 1
BATASI 6
BATASI 7
LITTLE_RANGIT 9
LITTLE_RANGIT 7
88.069306 E
27.044139 N
88.096333 E
27.041417 N
88.069083 E
27.031722 N
88.085186 E 27.031933 N
Text
Map shown on 1:21000 Scale
Forest Block and Compartments are Appended
Total Area of the MPCA as estimated by GPS survey
is 230 ha.
0 135 270 540 810 1,080
Meters
N
BAY OF BENGAL


TONGLU MEDICINAL PLANT CONSERVATION AREA
तोंगलु औषधीय वनस्पती संरक्षण क्षेत्र

2. Technical Description of the MPCA
2.1 Major Components of Forest

2.1.1 Forest Type: The Forest Type of Tonglu MPCA, more or less corresponds to 11B-Northern Montane Wet Temperate Forests (Champion & Seth, 1968).

2.1.2 Forest Composition: The composition of vegetation consisting of top storey of *Acer campbellii, Magnolia campbellii, Lithocarpus pachyphylla, Machilus odoratissima, Quercus spp.* etc. and middle and under storey is of *Rhododendron barbatum, R. triflorum, R. arboreum, Lyonia ovalifolia, Sorbus cuspidata, Symplocos glomerata,* etc. Major Shrubs/Herbs found here are *Viburnum erubescens, Daphne bhoula, Berberis spp.* (Shrubs) *Aconitum spp. Panax pseudoginseng, Iris clarkie, Paris polyphylla, Trillidium spp., Polygonatum verticellatum* and major climbers seen are *Holboellia latifolia, Schindra grandiflora, Lonicera hispida, Biswarea tongloensis, Rubia wallichina.* Presence of weed *Yushania maling* is observed.


Area demarcation with GPS Receiver

2.2 Past System of Management: The MPCA area of Tonglu is under Biodiversity and Wildlife Conservation and Preservation Working Circle. Main prescription under this circle is to coordinate those phases of research, extension, land use planning and educational activities of those specialized agencies of forestry which ensures provisions for soil conservation and wildlife preservation measures.

2.3 Disturbance in Site: Seen mainly in form of moderate fuel wood collection and low Non Wood Forest Product collection. It is worth mentioning that there is an availability of adjoining forest for grazing etc. With the formation of FPC the grazing has been totally banned in the area, but still the stray cattle from the Nepal area graze. There is a mention of frequent out break of forest fire in the year 1878, 1879, 1882, 1903, 1909 and 1939 causing considerable fire damage (12th working plan).

3. Socioeconomic Conditions of Villages near MPCA

The MPCA area is under the FPC managed forest area of Dhotrey and Relling FPCs. The means of livelihood of villagers are Agriculture, Animal husbandry as well as NTFP collection and forestry works.

The Socioeconomic profile as per Microplan Darjeeling Forest Division is as follows:

Category	Village 1	Village 2	Village 3
Name	Dhotray Forest village	Relling	Samsu Forest Village
Area (ha)	7.5	Revenue village	Revenue village
Population	410	110	350
Males	210	60	200
Females	200	50	150
Means of Livelihood	NTFP collection, forestry work, Animal husbandry and Agriculture	Agriculture, Animal husbandry, Forestry activity, etc	—
Near by Forest Area	Kankibong, Tonglu, Relling block.	Relling, Selimbong	Selimgbong RF
No. of Tradition/Folk Medicine Practitioners	Narman Tamang N.K. Rai, Prasad Rai Madan Gurung	—	—
No. of SHGs	Women's SHG (18 mebs.)	—	—
No. of NTFP/ Medicinal Plant Collector	>60% (appr)	55% (appr)	40%
No. of NTFP Traders	5-6 persons	2-3	—

4. Medicinal Plants Collected from the MPCA Site

Species	Part collection	Season of collection	Quantity collected	Unit price in Rs./qtls.
Aconitum bisma	Root	July-August	Not assessed	—
Aconitum spicatum	Root	August - Sept.	—	—
Swertia chirayita	Whole plant	July-August	—	150/kg
Potentila fulgen	Root	July-August	—	—
Taxus wallichiana	Leaf and Bark	Year round	—	—
Mahonia napaulensis	Stem	Year round	—	—
Polygonum amplexicaulis	Root	August - Sept.	—	—
Rhododendron arboretum	Flower	March-April	—	—
Lycopodium clavatum	Strobilus	August - Sept.	—	—
Panax pseudoginseng	Root/rhizome	July - Sept.	—	—

5. NTFPs/MFPs Collected from the MPCA Site

NTFPs/ MFPs	Quantity Traded (Kg)	Unit Price	Sold
Yushania maling (young shoot)	>4000kg	@10/kg	Yes
Edible fungi	>1000kg	@30/kg	-do-

6. Number of JFM Committees and their Details

Name	Year of formation	Area assigned (ha)	Number of members	Name of the president	Contact number	Availability of Microplan
Dhotrey	2001	301.00	57	Pradip Rai	—	Yes
Relling	2005	304.72	20	Sangey Sherpa	—	Yes

7. Strategies within the MPCA

The MPCA will be managed as "hands off" area with the following intervention wherever required:

- Suspension of all harvesting operations in the wake of which there will be no extraction of fuel wood and therefore it is proposed to arrange some alternative.
- Awareness to the local FPC villagers.
- Fire management: Creation of Fire lines and subsequent maintenance thereon.
- Weed management / encouraging native regeneration of target species by uprooting major weed (lime Maling) infestation with the help of FPC members.
- Soil and water conservation: soil and moisture conservation in the area can be taken up to protect the areas as well as the natural drainage system in the area.
- For the botanical survey it is proposed that the guide line issued by the FRLHT shall be followed to the extent possible. As indicated 1-2% field sampling shall be attempted the plots size would be 20mx20m for tree, 5mx5m for shrubs and 1mx1m for herbs. Botanical survey is to be conducted as resource study and also collection of medicinal plant specimens and preparation of herbarium sheets as identified voucher specimens and herbarium at Lloyd Botanical Garden Darjeeling.

- Collection of Germplasm for research and propagation (*in-situ* and *ex-situ*) of the same.
- Construction of an "entry gate" befitting to the site as a special measure to make visitors aware.
- The target species which are available at site shall be monitored with the help of enthusiastic FPC members, selected for the purpose.
- A concise hand book containing information of medicinal plants shall be published in vernacular language.

Betula spp.

Field Survey

SURSUTI

1. General information

1.1 Forest Information

Name of the Site	Sursuti MPCA
Legal Status	Reserve Forests
MPCA Area	100 ha
Division	Jalpaiguri
Forest Range	Lataguri
Block	Sursuti
Compartment	Sursuti-4

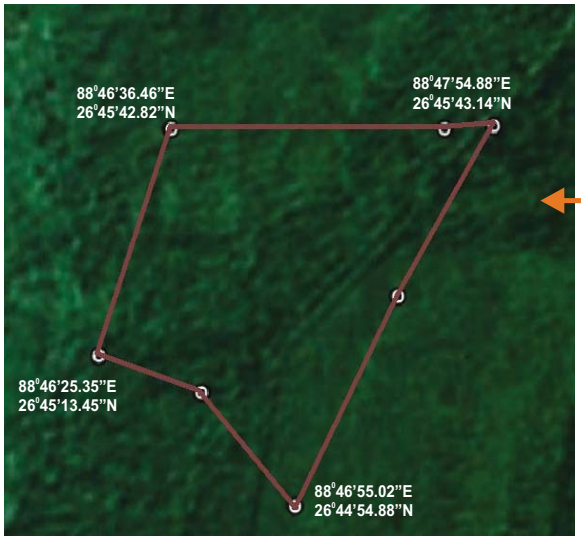
1.2 Approach Information

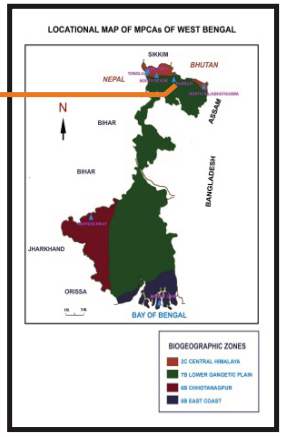
Approach	Name of the Place	Distance in km from the selected site
Approach by Road	Siliguri & Lataguri	75 km & 8 km respectively
Approach by Train	Chalsa	12 km
Approach by Air	Bagdogra	83 km

1.3 Physical Description of the Site

Physical	
Latitude	26˚45′ N
Longitude	88˚47′ E
Geology/Rock Formation	Rock formation - Recent to sub-recent, Miocene, Permo-carboniferous, Precambrian
Soil Types	Sandy loam, Red and yellow podzolic soil
Climate	
Average Rainfall	3390.8 mm
Temperature	
Maximum	32°C
Minimum	15.5°C
Water Resources	Rivers like Chel, Neora, Mal and Teesta and perennial Jhoras - Bamoni Jhora, Sursuti Jhora and Monpala Jhora

AREA MAP OF SURSUTI MPCA
(PRODUCED BY USING GPS DATA)





2. Technical Description of the MPCA
2.1 Major Components of Forest

2.1.1 Forest Type: The forest type of the MPCA has been classified as 3C - North India Moist Deciduous Forests. The forest composition consists of predominantly Sal *(Shorea robusta)* associated with Champ *(Michelia champaca)*, Odal *(Sterculia villosa)*, Chilaune *(Schima wallichii)*, Gamar *(Gmelina arborea)*, *Chikrasi (Chukrasia tabularis)*, Simul *(Bombax ceiba)*, Pakasaj *(Terminalia spp.)* etc. The undergrowth consists mostly of *Leea, Urina, Indigofera, Acacia species* etc. The chief climbers prevalent in this MPCA are *Mikania, Smilax spp*., Pani lahara, *Tinospora spp*.

2.1.2 Wildlife: The major wildlife in and around this MPCA are Bison, Elephant, Wild Boar, Monkey, Deer and Rhino.

2.2 Past System of Management: For planned management the first Working Plan of the area was drawn up in 1892-93. In the 8th Working Plan submitted as 9th Working Plan (1997-98 to 2017-18) the area was managed under the Bio-diversity and Wildlife Conservation and Preservation Working Circle.

The prescriptions of the Working Circle for complete preservation and development of floral and faunal bio-diversity were approved. Wind fallen, dead and diseased trees shall be salvaged. Wherever clear felling was prescribed it was not allowed.

2.3 Disturbances in Site:

2.3.1 Plant Disease: The important insects common to this MPCA are Sal borer *(Hoplocerambyx spinicornis)*, Champ bug, Teak skeletoniser.

2.3.2 Weeds: The most common weeds in an around the MPCA are *Lantana camara*, Bhant, *Cassia tora, Solanum nigrum, Clerodendron species*.

2.3.3 Erosion: There is no major erosion in the MPCA site.

2.3.4 Fire: The major crops of the area are broadly deciduous in nature for which incidental fire at forest floor is common which is effectively managed by creating fire lines.

2.3.5 Biotic Interference: Fuel wood collection and grazing in the MPCA site is negligible.

2.4 Rights and Concessions

Rights and concessions are provided as per the relevant provisions laid under Indian Forest Act, 1927, Wildlife Protection Act, 1972 and the Schedule Tribes and Traditional Forests Dwellers (Recognition of Forest Rights) Act, 2006.

3. Socioeconomic Conditions of Villages near MPCA

Name of the Village	Bichabhanga	Sursuti	Baradighi	Bamni
Area (ha)	83.0 acre	56.0 acre	125.0 acre	60.0 acre
Population	160	184	186	131
Males	82	94	94	67
Females	78	90	92	64
Means of Livelihood	Daily labour	Farmer	Seasonal labour	Farmer & Wage earner
Near by Forest Area	Sursuti - 3,4	Sursuti - 3,4	Sursuti - 3,4	Sursuti - 3,4
No. of Tradition/Folk Medicine Practitioners	5	4	3	5
No. of SHGs	3	4	Nil	1
No. of NTFP/ Medicinal Plant Collector	30	18	11	7
No. of NTFP Traders	1	1	1	Nil

4. Medicinal Plants Collected from the MPCA Site

Species	Part collection	Season collection	Quantity collected	Unit price in Rs./qtls.
Rauwolfia serpentina	Root	Winter	50 kg	80/-P/kg
Mushroom	Whole fruit body	Monsoon	2.5 to 3 Qtn.	15-20/-P/kg
Haritoki/ Bahera	Fruit	Winter	12 to 15 Qtn.	10-15/-P/kg
Amloki	Fruit	Winter	3-4 Qtn.	10/-P/kg

5. NTFPs/MFPs Collected from the MPCA Site

NTFPs/ MFPs	Quantity Traded (Kg)	Unit Price	Sold
Odal Bark	60-70 Qtn.	5/-P/ kg	6/-P/ kg
D. Lali seed cover	40,000 - 50,000 nos.	0.10/-P/ Pc.	0.25 P/ kg
Totala Flower	8000 - 10000 nos.	4/-P/ kg	6.00 P/ kg
Totala Seed cover	4500 - 5000 nos.	1.0P/ pc.	1.50 P/ kg

6. Number of JFM Committees and their Details

Name	Year of formation	Area assigned (ha)	Number of members	Name of the president	Contact number	Availability of Micro plan
Sawa Phulli FPC	1996-97	559.26 ha.	99	Gopal Orawn	—	—
1064 Kumarpara FPC	- do-	653.15 ha.	254	Laxman Munda	98320 87751	—

7. Activities within the MPCA

As per project guideline, a specific management plans are to be adopted for *in-situ* conservation of MPCA at Sursuti-4 Compartment. The MPCA will be managed as "hands off" area with the following intervention wherever required:


Elephantopus scaber

- Suspension of all harvesting operations.
- Fire managements.
- Weed management/encouraging native regeneration of target species.
- Soil and water conservation.
- Botanical survey as resource study also collection of medicinal plant specimens and preparation of herbarium sheets as identified voucher specimens and maintain a state level herbarium for preserving the native plant specimens.
- Collection and Germplasm for research and propagation (*in-situ* and *ex-situ*) of the same for gene pool conservation of the desired species.
- Construction of an "entry gate" with a mark of icon befitting to the site and study without any damage to the existing plants and animals of in and around of the MPCA.

NORTH RAJABHATKHAWA

1. General information

1.1 Forest Information

Name of the Site	North Rajabhatkhawa MPCA
Legal Status	Reserved Forests
MPCA Area	400 ha
Division	Buxa Tiger Reserve (East)
Forest Range	Buxaduar
Block	NRVK
Compartment	NRVK-8 & NRVK-9

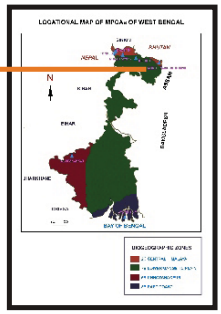
1.2 Approach Information

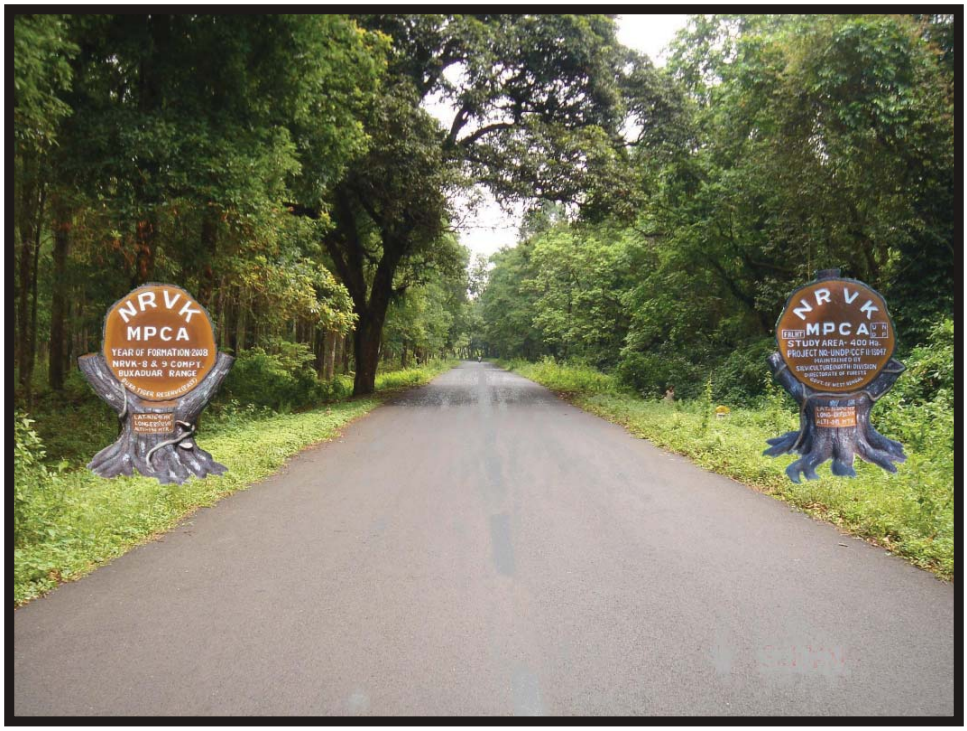
Approach	Name of the Place	Distance in km from the selected site
Approach by Road	Rajabhatkhawa	10
Approach by Train	Rajabhatkhawa	10
Approach by Air	Bagdogra	180

1.3 Physical Description of the Site

Physical	
Latitude	26˚41′ N
Longitude	89˚33′ N
Geology/Rock Formation	The rock consists of the Himalayan formation of Darjeeling Genesis, mainly represented by slates, phyllite, quartzite, banded haematite, dolomite, quartz, mica, graphite and schists.
Soil Types	Boulders in the sub-soil and alluvial soil with gravels on the surface and in some places sandy loam on the surface
Climate	
Average Rainfall	3600 mm
Temperature	
Maximum	33°C
Minimum	11°C
Water Resources	Dima, Jainty, Bala rivers, streams and jhoras like Buxa Jhora, Guenala and Hatinala

AREA MAP OF NORTH RAJABHATKHAWA MPCA
(PRODUCED BY USING GPS DATA)





2. Technical Description of NRVK MPCA

2.1 Major Components of Forest

2.1.1 Forest Type: This type corresponds to Champion and Seth's classification of North India Moist Deciduous Forests (3C). Sal forests of this area cover the maximum extent over the plains and the foot hills. Eastern Bhabar Sal Forests occur in North Rajabhatkhawa Block.

2.1.2 Forest Composition: The most common species found within the forest which covers the top storey are Sal, Champ, Chilauni, Chikrasi, Bahera, Sidha, Toon, Lali, Lampate, Simul and Sirish. In the Sal forest the middle storey consists of Lasune, Totala, Kumbhi, Dabdabe, Malata, Guelo, Khira, Jam, Tanki, Gineri etc. The ground floor is mainly composed of Assamlata, Coffea, Bhant, Haldi kath, Curry pata, Arare kanta *(Mimosa species)*.

The climbers are mainly *Mikania cordata*, Kowchu (*Mucuna pruriens*), *Bauhinia vahllii, Tinospora cordifolia, Smilax spp. Cissus repanda, Spatholobus roxburghii* and *Acacia species*.

2.1.3 Wildlife Status: The major wild animals prevalent in this MPCA are tiger, elephant, leopard, bison, barking deer, jungle cat, spotted deer, sambhar, monkey, squirrel etc.

2.2 Past System of Management: Consequent to the constitution of the Buxa Tiger Reserve (BTR) in the year 1983 the first Management Plan of the reserve was prepared for the period from 1983-84 to 1989-90. The management strategy was to identify the limiting factors of the habitat and to seek to mitigate these by ameliorative management and compulsory development.

The site of MPCA comes within the purview of Bio-Diversity Conservation Working Circle. This Working Circle is prescribed with the special objective to co-ordinate those phases of research, extension, land use planning and educational activities of those specialized agencies of forestry, which are related to a unify regional Biodiversity conservation and development programme at Buxa Tiger Reserve.

2.3 Disturbances in the Site:

2.3.1 Plant Disease: The important insects prevalent in the MPCA are Toon Twig borer *(Hypsiphyla robusta)*, Sal and Gamar defoliators, Sal borer *(Hoplocerambyx spinicornis)*, Champ bug, Teak skeletoniser etc.

2.3.2 Weeds: Main weeds are *Leea species, Lantana camara, Ageratum conizoides, Clerodendron spp, Cassia tora, Solanum nigram* etc.

2.3.3 Erosion: Due to recurrent flood the river erosion has become a great menace to the forest crop of the MPCA. As such there is no such major erosion noticed except moderate erosion by the formation of Channels and Jhoras here and there.

2.3.4 Biotic Interferences: Dry fuel wood collection is almost nil but illicit grazing exists.

2.3.5 Fire line creation and maintenance around the MPCA: The forest being broad leaved and deciduous in nature, so there is always chance of incidental fire at forest floor.

2.4 Rights and Concessions: Rights and concessions are provided as per the relevant provisions laid under Indian Forest Act 1927, Wildlife Protection Act 1972 and The Schedule Tribes and Traditional Forests Dwellers (Recognition of Forest Rights) Act, 2006.

3. Socioeconomic Conditions of Villages near MPCA

Name of the Village	Village 1	Village 2
Name	28th mile	29th mile
Area	810 acre	999 acre
Population	195	256
Males	55	71
Females	140	185
Means of Livelihood	NTFP collection	NTFP collection
Nearby Forest Area	1809 acre	1809 acre
No. of Tradition/Folk Medicine Practitioners	2	1
No. of SHGs	3	—
No. of NTFP / Medicinal Plant Collector	26	19
No. of NTFP Traders	2	1

Medicinal plant collected from the MPCA site by the local villagers are Satamuli and Sarpagandha. The chief NTFP items which are collected by the villagers are Cane fruits, Purundi fruits, Pan leaves, Naglata, Lycopodium stick, Totala pods and seeds, Golden and sponge mushroom, Odal fruits, Fern Bud, Mahogony floral axis, Lali fruit, Simal floss and floral axis broom stick etc.

4. Medicinal Plants Collected from the MPCA Site

Species	Part collection	Season of collection	Quantity collected	Unit price in Rs./qtls.
Satamuli	Root	Round the year	5 quintal/year	20/- kg
Sarpagandhya	Whole plant	Round the year	1 quintal/year	30/- kg
Bahera	Fruit	January - February	8-10 quintal/year	5/- kg
Haritaki	Fruit	January - February	1 quintal/year	20/- kg
Amloki	Fruit	January - February	5 quintal/year	10/- kg
Ritha	Fruit	November - January	1.5 quintal/year	20/- kg

5. NTFPs/MFPs Collected from the MPCA Site

NTFPs/ MEPs	Quantity Traded (Kg)	Unit Price	Sold
Odal, Narkeli, Chikrasi, Chillauni Fruit cover	600 quintal approx.	5/- per kg	—
Mushroom	2 quintal approx.	3/- per kg	—
Fern	100 kg approx.	1/- per kg	—

An Eco-Development Committee named as Buxa Road EDC has been formed in the year 1994 nearby this selected site of MPCA. Various developmental activities were taken up under the Eco-Development Scheme within the forest villages as well as in some fringe villages. The main object of formation of EDC was for joint management of natural resources in a sustained yield basis.

6. Number of JFM Committees and their Details

Name	Year of formation	Area assigned (ha)	Number of members	Name of the president	Contact number	Availability of Micro plan
Buxaroad EDC	1994	1809 acre	53	Sri Indra Bh. Rai	97334 26509	IDP project, FDA works

7. Activities within the MPCA

As per project guideline, a specific management plans are to be adopted for *in-situ* conservation of MPCA at NRVK 8 & 9 Compartment The MPCA will be managed as "hands off" area with the following intervention wherever required:

- Suspension of all harvesting operations.
- Fire managements.
- Weed management/encouraging native regeneration of target species.
- Soil and water conservation.
- Botanical survey as resource study also collection of medicinal plant specimens and preparation of herbarium sheets as identified voucher specimens and maintain a state level herbarium for preserving the native plant specimens.
- Collection and Germplasm for research and propagation (*in-situ* and *ex-situ*) of the same for gene pool conservation of the desired species.
- Construction of an "entry gate" with a mark of icon befitting to the site and study without any damage to the existing plants and animals of in and around of the MPCA.

Field survey

GARPANCHKOT

1. General information

1.1 Forest Information

Name of the Site	Garpanchkot
Legal status	Protected Forests
MPCA Area	250 ha.
Division	Kangsabati North
Forest Range	Raghunathpur
Block	Neturia

1.2 Approach Information

Approach	Name of the Place	Distance in km from the selected site
Approach by Road	Raghunathpur	24
Approach by Train	Adra	32
Approach by Air	Dum-Dum	300

1.3 Physical Description of the Site

Physical	
Latitude	23˚38′ N
Longitude	86˚46′ N
Altitude	643 mt
Geology/Rock Formation	Upper Gondwana Sedimentaries. At many places black stone is seen exposed from the soil indicating the lava sediments.
Soil Types	Sedimentary
Climate	
Average Rainfall	1375.2 mm
Temperature	
Maximum	45°C
Minimum	9°C
Water Resources	
Natural	Spring, rain-fed streams

AREA MAP OF GARPANCHKOT MPCA
(PRODUCED BY USING GPS DATA)

2. Technical Information of the MPCA Site

2.1 Forest Type: The forest type of the Garpanchkot MPCA corresponds to Champion & Seth's classification 5B-Northern Tropical Dry Deciduous forests.

2.2 Forest composition: The common trees here are *Shorea robusta, Madhuca indica, Bridelia squamosa, Buchanania lanzan, Schleichera oleosa, Tectona grandis, Terminalia arjuna. T. chebula, Butea monosperma, Cochlospermum religiosum, Sterculia urens, Haldina cordifolia, Diospyros exsculpta* etc. In the hilly tracts of Ajodhya and Susunia, the common trees are *Bursera serrata, Dalbergia latifolia, Garuga pinnata, Helicteres isora, Mallotus philippensis, Acacia catechu, Desmodium oojeinense* etc. The shrubs of this forest consist of *Holarrhena pubescense, Zizyphus mauritiana, Z. rugosa, Antidesma acidum, Woodfordia fruticosa, Flacourtia indica, Meyna spinosa* etc. The climbers are *Asparagus racemosus, Combretum roxburghii, Tinospora cordifolia, Derris scandens, Aristolochia indica* etc.

2.3 Wildlife Status: Wild pig, Jackal, Langur, Indian wolf, Spotted deer, Hyena, Python, Porcupine, Pangolin, Wild boar, different birds etc., are seen commonly in the forest area.

2.4 Past System of Management: As per the reports the hillock has 70% Sal and 30% miscellaneous species with a total area of about 1340.42 ha. of which 800 ha is under the Sal Working Circle, 500 ha is under the Conservation Working Circle and 11 ha is under the Development Working Circle. The balance area is denoted as Unworkable Circle.

2.5 Disturbance in the MPCA Site

2.5.1 Weeds: The weeds like *Lantana camara*, Shialkanta, Shiakul etc., are seen to be quite common in the forest area.

2.5.2 Erosion: Rill and gully erosion is seen in the area.

2.5.3 Biotic Interference: Fuel wood collection is seen at many places in the area The cattle from the local villages have also created quite noticeable grazing pressure on the forest resources. Fire incidences are also common.

2.5.4 Rights and Concessions: Usufractory benefits for FPC.

3. Socioeconomic Conditions of Villages near MPCA

Name of the Village	Village 1	Village 2	Village 3	Village 4
Name	Bagmara	Puyapur	Lalpur & Paharpur	Sewlibari
Area	384 Ac	700 Ac	600 Ac	250 Ac
Population	500 no.	1000 no.	500 no.	450 no.
Males	260 no.	600 no.	225 no.	200 no.
Females	240 no.	400 no.	275 no.	250 no.
Means of Livelihood	Cultivation	Cultivation	Cultivation	Cultivation
Near by Forest Area	Garpanchkot	Garpanchkot	Garpanchkot	Garpanchkot
No. of Tradition/Folk Medicine Practitioners	8	2	1	4
No. of SHGs	2	2	3	2
No. of NTFP/ Medicinal Plant Collector	8	2	1	4
No. of NTFP Traders	3	1	1	3

4. Medicinal Plants Collected from the MPCA Site

Species	Part collection	Season of collection	Quantity collected	Unit price in Rs./qtls.
Anantamul	Roots	—	1kg	—
Satamul	Roots	—	2kg	—
Raipan	—	—	4kg	—

5. Number of JFM Committees and Their Details

Name	Year of formation	Area assigned (ha)	Number of members	Name of the president	Contact number	Availability of Micro plan
Bagmara FPC	1995	100	6	Tarapada Mahata	99326 10350	—
Puapur FPC	1995	50	7	Saktipada Majhi	99322 17729	—
Lalpur & Paharpur	2003	30	10	Umapada Bauri	97320 92646	—
Sewlibari	2003	20	10	Rabilal Kisku	—	—

6. Management of MPCA at Garpanchkot

- To assess the floristic biodiversity and inventorisation of the same along with preparation of the herbarium specimens.
- To assess the present scenario of herbs and medicinal plants in the biodiversity rich area of Garpanchkot hillock with relation to availability, production (including harvesting and procurement), processing, transportation and marketing.
- To assess the socio-economic aspects of trade in herbs and medicinal plants, especially on the livelihood and income generation aspects of the community involved in its trade.
- To look at the policy environment to assess the degree to which present concerned policies promote sustainable management of herbs and medicinal plants.
- To identify and foster indigenous knowledge and practices of herbs and medicinal plants, emphasizing particularly the role of women and FPC members in its conservation and use.
- To identify the role and importance of herbs and medicinal plants of Garpanchkot area and propose as an instrument in successful implementation of Community Forest Management.
- To study the existing system of collection and marketing of herbs and medicinal plants in the area.

- To prepare a list of pharmaceutical companies, viz. Govt. and, private pharmacies and other agencies, if any, utilizing medicinal plants for herbal drugs and products.
- To prepare a list of institutions having drug testing laboratories facilities, agrotechniques and, infrastructure for raising planting materials. Such organizations are universities, research wing of Forest Department, herbals research development institutes, reputed NGOs etc. These centers could act as 'center of excellence' for not only ensuring quality planting materials but also for drug testing laboratory facilities, certification, validation etc.
- The area being under the jurisdiction of the Territorial Division for which a working plan is prevailing. Any work proposed or executed would be executed by duly and strictly adhering to the working plan.


Garpanchkot MPCA

BONNIE CAMP

1. General information

1.1 Forest Information

Name of the Site	Bonnie Camp MPCA
Legal Status	Reserve Forests
MPCA Area	300 ha.
Division	24-Parganas (South)
Forest Range	Raidighi
Block	Mathurapur II
Compartment	Ajmalmari 4-10, Dhulibasani 3-5

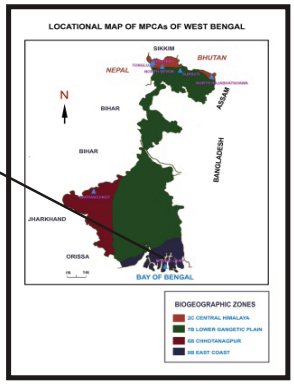
1.2 Approach Information

Approach	Name of the Place	Distance in km from the selected site
Approach by Road	Diamond harbour	Raidighi 96 km then by boat 4 hours
Approach by Train	Diamond harbour	Raidighi 96 km then by boat 4 hours
Approach by Air	Dumdum	Mathurapur to Raidighi then by boat 4 hours.

1.3 Physical Description of the Site

Physical	
Latitude	21˚50′ N
Longitude	88˚38′ N
Geology/Rock Formation	Largest prograding delta on globe, built up in the sea board by alluvial find clay, silt and sand particle from the great Himalaya and Chotanagpur hills.
Soil Types	5 broad groups : Clay soil, Heavy soil, Sandy soil with clay, Sandy soil, Silty soil
Climate	
Average Rainfall	1924.2 mm
Temperature	
Maximum	38°C
Minimum	13.7°C
Water Resources	River, Perennial water, Seasonal water source and Wetland and Marshes.

AREA MAP OF BONNIE CAMP MPCA
(PRODUCED BY USING GPS DATA)



2. Technical Information

2.1 Forest Type: The forest type of the MPCA corresponds to Champion & Seth's Classification 4B- Littoral and Tidal Swamp Forests.

2.2 Forest Composition: Vegetation consists of *Heritiera, Excoecaria, Ceriops, Xylocarpus, Bruguiera* etc.

2.3 Wildlife Status: The Sundarban contain tigers (*Panthera tigris*), the largest single population of the species. The spotted deer (*Axis axis*), wild boar (*Sus scrofa*) and Rhesus macaque (*Macaca mulatta*) are particularly common. Marine mammals include the *Cetaceans, Sousa plumbea, Delphinus delphis, Orxaella brevirostris* and *Neophocaena phocanoides*. The Ganges river dolphin (*Platanista gangetica*) lives all along the estuaries.

2.4 Past System of Management: The earliest official effort to preserve and manage the forests of Sundarban deltas dates back to 1878 when the forests were declared as Protected Forests following the efforts of Mr. A. L. Home, DCF, Dr. Schlich and Sir Richard Temple (1st Working Plan of 24 Parganas Division).

Due to inaccessibility of the hostile Sundarban terrain, it is almost impossible even for the Forest Department staff to carry out land-based survey of the mangrove forest and enumeration of the crop. To overcome these physical problems, remote sensing technique was tried out for the region to test the effectiveness of the technology in monitoring the mangrove ecosystem of Sundarban. The forest areas in Sundarban could be mapped in some detail only in 1988-89, after a gap of nearly six decades, when the State Forest Department took up the project of forest cover mapping of the entire state using IRS-1A satellites, in collaboration with Regional Remote Sensing Service Centre, Kharagpur, Department of Space. The study showed that a lot of changes had taken place in the quality of the forest cover of Sundarban and had indicated the prospect of application of the Remote Sensing Technology in detailed and real-time mapping of the terrain.

2.5 Disturbances in the Site

2.5.1 Plant Disease: Top-dying disease taking a heavy toll on the trees, the 'sundari' and other trees of the Sundarban are affected drastically due to the top-dying disease. The top-dying disease of 'sundari' and others were first detected in 1930 and the disease gradually started spreading subsequently.

2.5.2 Biotic Interference

The social needs of the communities that are directly or indirectly involved with nearby mangroves are as below and need to be considered in the process of coastal zone planning. Firewood for household consumption or for small scale marketing, Wood for charcoal making, Wood and poles for housing, *Nipa* leaves for roof/thatch, *Nipa* juice collection, Honey collection and Open fishing.

3. Socioeconomic Conditions of the Villages near MPCA

Name of the Village	Population Structure						Means of livelihood	Nearby forest area	Medicinal practitioners	No.of SHGs
	M	F	SC	ST	GEN	TOTAL				
Ambikanagar	4180	1620	2320	——	3480	5800	Cultivation, Fishing, Honey collection	Ajmalmari-4,5,6,7,8,9, 10,11,12	Nil	14
Nagenabad	2820	1880	1920	212	2568	4700	- do-	- do-	Nil	15
Domkal	4620	2880	3542	——	3958	7500	Cultivation, Fishing,	Bhubaneswari and Swan char Island	Nil	09
K-Plot	5946	3967	3965	——	5948	9913	- do-	Dulibhasan i 1,2,3,4	Nil	07
Purba Sreedhar-pur-I	4328	2582	3200	——	3710	6910	Cultivation, Fishing, Honey collection	Bhubaneswari and Swan char Island	Nil	——
Purba Sreedharpur	7292	5028	5544	——	6776	12320	- do-	Thakuran char and Ajmolmari 12	Nil	——
Purba Sreedhar-pur-II	4193	3177	3316	——	4054	7370	- do-	Bhubaneswar i and Swan char Island	Nil	07
Kishorimo-hanpur	3720	2480	2215	——			Cultivation, Fishing,	Ajmalmari-4,5,6,7,8,9, 10,11,12	Nil	12
Binodepur - Baikunthapur	8150	3550	4220	——	7480	11700	- do-	- do-	Nil	21

4. Medicinal Plants Collected from the MPCA Site

No medicinal plant are collected from this site.

5. NTFPs/MFPs Collected from MPCA Site

No NTFP / MFP collection are being done from this MPCA site except fuel wood for their own consumption and honey and wax as bi-product. The collected honey and wax sold to the Forest Department at the rate of Rs.42.00 and Rs.4.00 per kg respectively. A table given below shows the collection of honey and wax during 2007-08 and earned amount from honey collection.

Name of the Village	Honey collected			Wax collected			Total Amount
	Kg.	Rate/ Kg	Amount (Rs)	Kg.	Rate/ Kg	Amount (Rs)	
Ambikanagar	320	42.00	13,440.00	48	40.00	1,920.00	15,360.00
Nagenabad	225	42.00	9,450.00	32	40.00	1,280.00	10,730.00
Purba Sreedharpur-I	300	42.00	12,600.00	45	40.00	1,800.00	14,400.00
Purba Surendrapur	415	42.00	17,430.00	55	40.00	2,200.00	19,630.00
Purba Sreedharpur-II	140	42.00	5,880.00	17	40.00	680.00	6,560.00

6. Number of JFM Committees and their Details

Name of FPC/EDC	Year of formation	Area (ha)	Number of FPC/EDC members						No. of SHGs	Remark
			M	F	SC	ST	GEN	Total		
Ambikanagar	1993	500	432	432	233	–	631	864	14	–
Nagenabad	1993	500	68	65	70	3	60	133	15	–
Domkal	1993	500	166	165	222	–	109	331	09	–
K.Plot	1993	500	200	195	220	–	195	395	07	
Sreedharpu-I	1993	970	44	44	72	–	16	88	–	–
Purba Surendra-nagar	1997	500	317	310	246	–	381	627	–	–
Sreedharpu-II	1997	2500	171	170	146	–	195	341	07	–
Kishori Mohanpur	1997	2500	25	24	13	–	36	49	12	–
Binodepur Baikanthapur	1997	1065	63	63	64	–	62	126	21	–

7. Management of MPCA at Bonnie Camp in Sundarban under 24 Parganas (South) Division

Tasks should be carried out to ensure that medicinal plants are conserved effectively for the future and that where medicinal plants are taken from the wild, they are taken on a basis that is sustainable.

- The Guidelines conform to the principles of Caring for the Earth, prepared in partnership by IUCN, UNEP, and WWF. Caring for the Earth extends the message and scope of the World Conservation Strategy to an ethic of sustainable living, and explains how to integrate conservation with development. Its message is particularly relevant to the issue of medicinal plants, which in many parts of the world are being seriously depleted due to over-exploitation and loss of habitats, resulting in a lack of essential medicines and so reducing options for the future.
- The Guidelines also implement one of the recommendations of the Global Biodiversity Strategy, jointly produced by the World Resources Institute (WRI), IUCN and UNEP, as a set of specific proposals to safeguard the world's biological diversity.
- This Medicinal Plants Conservation Area is within the area of Sundarban Biosphere Reserve which is having a particular Management Plan, for the conservation of MPCA there is nothing to do inside the forest area, being the hands off area and accordingly even the boundaries of the MPCA demarcated are the natural boundaries of rivers and creeks. Moreover as the area is tiger infested the accessibility to the area needs lots of safety and cautious measures.
- Though the area is proposed to be hands off area even then for the management of the MPCA the socio-economic upliftment of the forest fringe people must be taken care of who are below the poverty line and due to their poverty, are compelled to depend on the forests and its resources.
- Management practices to be promoted within the confines of the Management Plan for the Biosphere area that are already under implementation specifically for:
  - Conservation and extension of forests of mangrove.
  - Encouragement of voluntary participation of fringe dwellers in conservation of mangrove flora and fauna through formation of forest protection and eco-development committees.

- Research, education activities would be promoted like inventorisation, GIS mapping of the area to extent possible, involvement of the locals for promotion of the same, collection of germplasm for research, propagation and conservation, preparation of herbarium for the floral species etc.
- MPCA area is as such managed under Biosphere programme and the same would be strictly adhered to for all the MPCA activities proposed.

Sundarban

Nipa fruticans

NORTH SEVOKE

1. General information

1.1 Forest Information:

Name of the Site	North Sevoke MPCA
Legal Status	Wildlife Sanctuary
MPCA Area	100 ha
Division	Wildlife-I
Forest Range	10th mile
Block	North Sevoke
Compartment	North Sevoke 1 (a) & 1(b)

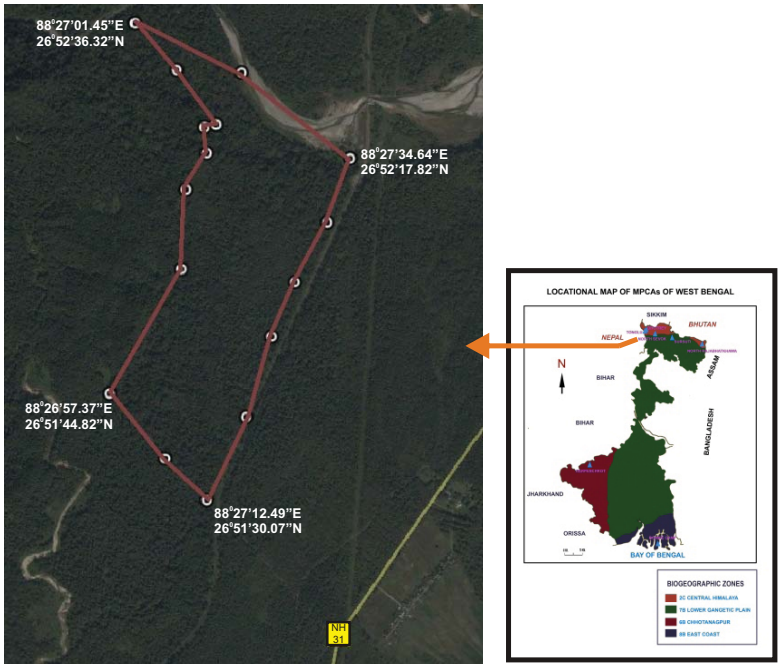
1.2 Approach Information

Approach	Name of the Place	Distance in km from the selected site
Approach by Road	Siliguri Town	20
Approach by Train	Siliguri Railway Junction	27
Approach by Air	Bagdogra	33

1.3 Physical Description of the Site

Physical	
Latitude	26˚52′ N
Longitude	88˚27′ N
Geology/Rock Formation	Rock formation - Recent to sub-recent and Pleistocene, Miocene, Permian, Arachean
Soil Types	Sandy loam, Red and yellow podzolic soil
Climate	
Average Rainfall	3500 mm
Temperature	
Maximum	36°C
Minimum	12°C
Water Resources	Teesta river, two spring fed water courses -Mahanadi and Gulma khola and Nandi khola water course

AREA MAP OF NORTH SEVOK MPCA
(PRODUCED BY USING GPS DATA)



2. Technical Description of the MPCA

2.1 Forest Type: The forest type in the MPCA area represents Champion & Seth's classification 3C- North India Moist Deciduous Forests.

2.1.1 Forest composition: In the upper storey, Sal is sporadic in these forests in association with *Carya arborea, Terminalia crenulata, Tetrameles nudiflora, Sterculia villosa, Gmelina arborea, Acrocarpus fraxinifolius, Lagerstroemia parviflora, Duabanga sonneratoides, Chukrasia tabularis* and *Albizzia spp*. The lower storey is composed of *Bauhinia purpurea, Phoebe lanceolata, Macaranga spp., Oroxylum indicum, Pterospermum acerifolia, Fagara budrunga, Alstonia scholaris, Cinnamomum tamala* and *Bacaurea sapida*. The under growth is formed mainly by *Thysanolaena maxima, Argeratum spp, Clerodendron viscosum, Eupatorium odoratum, Lea spp.* and *Dendrocalamus hamiltonii* (sometime in pure patches).

The climbers generally found are *Mimosa himalyana, Bauhinia vahlii, Tinospora cordifolia , Mikania.*


Mucuna pruriens

There is a series of plantations at North Sevoke Block from 1941 to 1979 comprising over 663 Acre in area. (as per Annexure-4 of Mahananda Wildlife Sanctuary management plan). The species grown are mainly Teak and Sal. The other species grown are *Michelia champaca, Lagerstroemia speciosa, Salmalia malabarica, Dalbergia sissoo, Gmelina arborea, Terminalia crenulata, Schima wallichii, Terminalia myriocarpa* and *Chukrasia tabularis*.

2.1.2 Wildlife Status: Due to the diversity of elevation, of vegetation, the range of species found in the vicinity of MPCA is varied. Considering the extent of the tract, however the number of individual species is very limited. This area is an extremely important habitat of the wild elephants which is the principal species of the sanctuary. The other associated species of the area are gaur, tiger, different species of deer, wild boar and a large number of species of birds, reptiles, amphibians and insects. The tigers (*Panthera tigris*) range widely all over the area.

2.2 Past Management Practices: With the constitution of the Core Area of the Sanctuary in June, 1976 all forestry operation were prohibited. The steep and unstable areas of the hill forests were allotted to the Protection Working Circle, Prescriptions were made for retention of forest cover on such land permanently. No felling was prescribed under this Working Circle, although removal of dead and fallen trees was allowed.

2.3 Disturbances in the Site:

2.3.1 Plant Disease: The insects noticed within MPCAs are Teak defoliator (*Hyplaea puera*), Teak skeletoniser (*Hapilia machaeralis*), Anker grub (*Dihammus cervinus*), Twig borer (*Hypsipyla robusta*), Champ bug (*Urostylis punctigers*), defoliator (*Calopepla leayana*), Shoot borer (*Rynchitis bucklandis*), Sal defoliator (*Limentria vivilata*), Longicorn beetle (*Hoplocerambyx spinicornis*). These insects have been noted mainly to damage plantation crops.


Aphanamixis polystachya

2.3.2 Weeds: Weeds that are commonly found in the MPCA are *Lantana camara, Eupatorium odoratum. Clerodendron infortunatum., Cassia tora* and *Solanum nigrum* etc.

2.3.3 Biotic Interference: Uncontrolled removal of dry firewood collection is leading to the destruction in and around the MPCA. Grazing also poses a great threat to the habitat.

2.3.4 Fire line creation and maintenance around the MPCA: Major crops of the area are of broad leaved deciduous in nature, so there is always chance of incidental fire at forest floor.

2.4 Rights and Concessions: The rights and concessions within the area of sanctuary does not arise at all as per the management plan of the sanctuary and may be provided as per the relevant provisions laid under Indian Forest Act, 1927, Wildlife Protection Act, 1972 and The Schedule Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.

3. Socioeconomic Conditions of Villages near MPCA

Name of the Village	Village 1	Village 2	Village 3	Village 4
Name	10th Mile	Sevoke Bazar	Chamakdangi	Toribari Singhijhora
Area	23 ha.	17 ha.	21 ha.	145 ha.
Population	242	881	351	568
Males	137	449	196	302
Females	105	432	155	266
Means of Livelihood	Fuel wood/ charcoal	Firewood/ boulder	Fodder & Fuel Wood	Fodder & Fuel Wood
Near by Forest Area	1 km.	2 km.	5 km.	8 km.
No. of Tradition/Folk Medicine Practitioners	2(M)	NIL	3	5
No. of SHGs	2	1	NIL	NIL
No. of NTFP/ Medicinal Plant Collector	1 (F) 3 (M)	NIL	NIL	NIL
No. of NTFP Traders	NIL	NIL	NIL	NIL

4. Medicinal Plants Collected from the MPCA Site

Species	Part collection	Season of collection	Quantity collected	Unit price in Rs./qtls.
Totala Bark	Bark	Throughout the year	As per their requirement	—
Swarnalata	Tendril	Throughout the year	As per their requirement	—

5. NTFPs/MFPs Collected from the MPCA Site

NTFPs/ MEPs	Quantity Traded (Kg)	Unit Price	Sold
Bahera	For their own use	NIL	NIL
Haritaki	For their own use	NIL	NIL

6. Number of JFM Committees and their Details

Name	Year of formation	Area assigned (ha)	Number of members	Name of the president	Contact number	Availabilityof Micro plan
10th Mile	1994	1147	54	Kiran Goley	99321 46741	NIL
Sevoke Bazar	1994	1222	181	Tulsi Pradhan	94340 19622	NIL
Chamakdanghi	1994	1033	72	Chamu Mukhia	N/A	NIL
Toribari Singhijhora	1994	835	112	Kumar Sharma	N/A	NIL

7. Activities within the MPCA

As per project guideline, specific management plans are to be adopted for *in-situ* conservation of MPCA at North Sevoke 1 (a) Compartment. The MPCA will be managed as "hands off" area with the following intervention wherever required:

- Suspension of all harvesting operations.
- Fire managements.
- Weed management/encouraging native regeneration of target species.
- Soil and water conservation.
- Botanical survey as resource study also collection of medicinal plant specimens and preparation of herbarium sheets as identified voucher specimens and maintain a state level herbarium for preserving the native plant specimens.
- Collection and Germplasm for research and propagation (*in-situ* and *ex-situ*) of the same for gene pool conservation of the desired species.
- Construction of an "entry gate" with a mark of icon befitting to the site and study without any damage to the existing plants and animals of in and around of the MPCA.

Annexure III: List of Publications

1. Management Plan of Dhotrey Medicinal Plants Conservation Area, Silviculture (Hills) Division (2008).

2. Management Plan of Tonglu, Medicinal Plants Conservation Area, Silviculture (Hills) Division (2008).

3. Management Plan of North Rajabhatkhawa, Medicinal Plants Conservation Area, Silviculture (North) Division (2008).

4. Management Plan of North Sevoke Medicinal Plants Conservation Area, Silviculture (North) Division (2008).

5. Management Plan of Sursuti Medicinal Plants Conservation Area, Silviculture (North) Division (2008).

6. Management Plan of Garpanchkot Medicinal Plants Conservation Area, Kangsabati (North) Division (2008).

7. Management Plan of Bonnie Camp Medicinal Plants Conservation Area, 24 Parganas (South) Division (2008).

8. Darjeeling Parbatya Kshetra Ka Kehi Durlabh Aushadhiya Vanaspati in Local Vernacular language (Nepali), Silviculture Hills Division (2009).

9. Plants of MPCAs of North Bengal Plains, Silviculture North Division, Siliguri, West Bengal (2010).

10. Plants of MPCAs of South Bengal Plains, Research Circle, West Bengal (2010).

11. Poster publication of Dhotrey Medicinal Plants Conservation Area, Silviculture Hills Division (2010).

12. Poster publication of Tonglu Medicinal Plants Conservation Area, Silviculture Hills Division (2010).

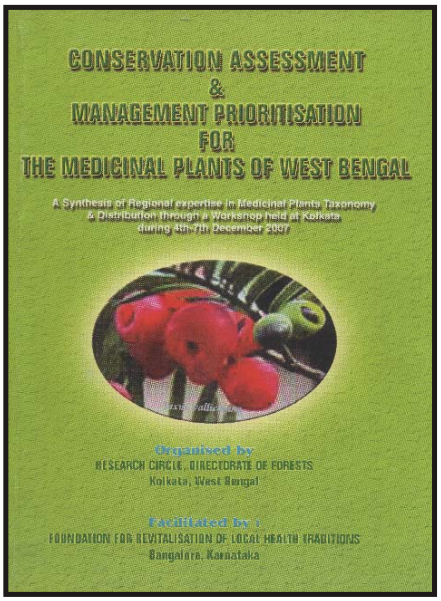
13. Poster publication of North Rajabhatkhawa Medicinal Plants Conservation Area, Silviculture North Division (2010).

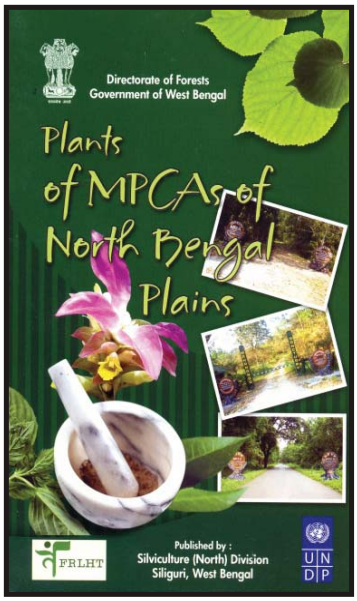
14. Poster publication of North Sevoke Medicinal Plants Conservation Area, Silviculture North Division (2010).

15. Poster publication of Sursuti Medicinal Plants Conservation Area, Silviculture North Division (2010).

16. Poster publication of Garpanchkot Medicinal Plants Conservation Area, Silviculture South Division (2010).

17. Poster publication of Bonnie Camp Medicinal Plants Conservation Area, Silviculture South Division (2010).





Annexure IV: List of Species Inventorized

Dhotrey MPCA

*** indicates Flagship species and * indicates Targeted species out of 46 enlisted*

Herbs	Shrubs	Trees
1. *Aconitum bisma** (Buch.-Ham.) Rapaics	1. *Aconogonum molle* (D.Don) Hara	1. *Acer campbellii* Hk.f. & T.
2. *Aconitum spicatum** (Bruhl) Stapf	2. *Agapetes serpens* (Wight) Sleumer	2. *Acer hookeri* Miq.
3. *Aconogonum molle* (D.Don)Hara	3. *Clematis buchananiana* DC.	3. *Betula alnoides* D.Don
4. *Acrophorus stipellatus* (Wall) Moor	4. *Clematis montana* Buch.-Ham. Ex DC.	4. *Castanopsis hystrix* A.DC
5. *Adiantum edgeworthii* Hook.	5. *Daphne bholua* D.Don var bholua	5. *Cinnmomum bejolghota* (Hamilton) Sweet
6. *Aeschynanthus hookeri* C.B.Clarke	6. *Enkianthus deflexus* (Griffith)Schneider	6. *Cryptomeria japonica* (L.f.) D.Don
7. *Agrostis micrantha* Steudel	7. *Ficus foveolata* Wall.	7. *Daphne bholua* D.Don var. *glacialis* (Smith&Cave)B.L.
8. *Ainslea aptera* DC.	8. *Helwingia himalaica* Hook.f& Thoms.ex C.B.Clarke	8. *Eurya acuminata* DC.
9. *Anapahlis contorta* (D.Don)Hook.f.	9. *Heracleum wallichii* DC.	9. *Ilex dipyrena* Wall.
10. *Anaphalis margaritaceae* (L.) Benth. & Hook.f.	10. *Jasminum dispermum* Wallich	10. *Ilex sikkimensis* Kurz. Photonia(Bakalpatey)
11. *Arisaema speciosum (*Wall) Martius	11. *Lonicera acuminata* Wallich	11. *Lindera assamica* (Meissner) Kurz..
12. *Arisaema tortuosum* (Wall.) Schott.	12. *Lycopodium clavatum* Linn.	12. *Lithocarpus fenestratus* (Roxb.) Reheder *(Arkawlo)*
13. *Aster sikkimensis* Hooker.f.	13. *Myrsine semiserrata* Wallich	13. *Lithocarpus pachyphyllus* (Kurz.) Rehder
14. *Astilbe rivularis* D.Don	14. *Persicaria chinensis* (L) H.Gross	14. *Litsaea albescens* (Hook.f.) Long
15. *Athyrium atkinsoni* Bedd.	15. *Pieris formosa* (Wallich) D.Don	15. *Litsaea elongata* (Nees) Hook.f.
16. *Athyrium foliolosum* (Wall.) Moore ex Sim.	16. *Piper suipigua* D.Don *Or P. nepalense* Miq.	16. *Lyonia ovalifolia* (Wall) Drude
17. *Athyrum fimbriatum* (Wall)*Moore*	17. *Piptanthus nepalensis* (Hook.) Sweet	17. *Magnolia campbellii* Hook.f. & Thom.
18. *Begonia josephii* A.DC.	18. *Rubia manjith* Roxb.ex Fleming	18. *Michelia doltsopa* Buch.- Ham. Ex DC
19. *Boennighausenia albiflora* (Hook.)Reichb.	19. *Rubus accimunatus* Smith	19. *Osmanthus suavis* Clarke

Herbs	Shrubs	Trees
20. *Calanthe puberula* Lindl.	20. *Rubus ellipticus* Smith	20. *Persea fructifera* Kostermans
21. *Carex cruciata* Wahlenb.	21. *Rubus hypergyrus* Edge.	21. *Persea kurzii* (Hook.f.) Kostermans
22. *Carex filicina* Nees	22. *Rubus lineatus* Blume	22. *Pieris formosa* Wall D.Don
23. *Crowfordia speciosa* Wall.	23. *Rubus paniculatus* Smith	23. *Prunus nepaulensis* (Seringe) Steudel.
24. *Didymocarpus pulcher* C.B.Clarke	24. *Rubus rosifolius* Smith	24. *Quercus lamellosa* Smith
25. *Diplazium japonicum* (Thunb.)Bedd.	25. *Rubus rugosus* Smith	25. *Quercus thomsoniana* A.DC.
26. *Dryopteris chrysocoma* (Christ.)C.Chr.	26. *Rubus splendidissimus* Hara	26. *Rhododendron grifithianum* Wight.
27. *Elastostemma obtusum* Weddel	27. *Rubus wardii* Merrill	27. *Rhododendron arboreum* Smith.
28. *Elastostemma sessile* Forster	28. *Sarcococca wallichii* Stapf.	28. *Rhododendron grande* Wight.
29. *Fragaria nubicola* (Hook.f.) Lacaita	29. *Schisandra grandiflora* (Wall.) Hook.f & Thoms.	29. *Schefflera impressa* (Clarke) Harms
30. *Galium elegans* Roxb.	30. *Smilax elegans* Wall.	30. *Symplocos glomerata* Clarke
31. *Gallium holfmeisteri* (Klotzsen) Mill	31. *Smilax myrtilus* A.DC. *Var. rigida*	31. *Symplocos lucida* (Thunb.) Siebold & Zuccarini
32. *Gaultheria fragrantissima* Wall.	32. *Symplocos racemosa* Roxb.(Chamlane)	32. *Taxus wallichiana*** Zuccarini
33. *Gaultheria nummulariodes* D.Don	33. *Tetrastigma serrulatum* (Roxb.)Planchon	33. *Tetradium fraxinifolium* (Hook.) Hartley
34. *Gentiana capitata* D.Don	34. *Thalictrum chelidonni* DC.	34. *Viburnum erubescens* (Wallich ex DC et Thom.)Hook.f.
35. *Gentiana pedicillata* (D.Don) Grisebach	35. *Thunbergia lutea* T.Ander.	
36. *Gerenium donianum* Sweet.	36. *Yushania maling* (Gamble) R.B.Majumdar	
37. *Gleichenia glauca* (Thbg.) Hook	37. *Zanthoxylum oxyphyllum* Edgew.	
38. *Hemiphragma heterophyllum* Wall.		
39. *Impatience stenantha* Hook.f.		
40. *Impatiens urticifolia* Wall.		

Herbs	Herbs	Herbs
41. *Impetiens puberula* DC.	56. *Pilea umbrosa* Blume	70. *Rumex nepalensis* Sprengel
42. *Lactuca disecta* D.Don	57. *Plagiogyria scandens* Mett.	71. *Saxifraga strigosa* Wallich
43. *Maianthemum fuscum* (Wall.) La Frankie.	58. *Poa ludens* R.R.Stewart.	72. *Sphenopmeris chinensis* (Linn.) Maxon
44. *Microsorium membranaceum* (Don)Ching	59. *Poa rajbhandari* Noltie	73. *Stellaria media* (L.) Villars
45. *Myriactis nepalensis* Lessing	60. *Polygonum runcinata* (D.Don)H.Gross	74. *Strobilantus divericata* (Nees) And.
46. *Notochaeta hamosa* Benth.	61. *Potentila lineata* Treviranus	75. *Swertia bimaculata* (Siebold & Zucc.) Clarke
47. *Oleandra pistillaris* (Sw) C.Chr..	62. *Poulzolzia hirta* (Blume) Hasskarl.	76. *Swertia chirayita* ** (Roxb.) Karsten
48. *Ophiopogon intermedius* D.Don	63. *Pseudo gnaphalium affine* (D.Don) Anderberge	77. *Thalictrum chelidonii* DC.L.
49. *Osmunda claytoniana* Linn.	64. *Pteris aspericaulis* Wall ex Ag.	78. *Thelypteris arida* (D.Don) Morton
50. *Oxalis corniculata* L.	65. *Pteris cretica* Linn.	79. *Trifolium pratense* L.
51. *Panax pseudoginseng*** Wall.	66. *Pteris excelsa* Gaud	80. *Tripterospermum volubile* (D.Don) Hara
52. *Paris polyphilla* Smith.	67. *Pteris quadriaurita* Retz.	81. *Tupestra aurantiaca* (Wall. Ex Baker) Hook.f.
53. *Phymatodes erythrocarpa* (Mett.) Ching.	68. *Ranunculous diffusus* DC.	82. *Valeriana hardwickii* Wall.
54. *Pilea bracteosa* Weddell	69. *Rubus calycinus* D.Don	83. *Viola pilosa* Blume
55. *Pilea ternifolia* Weddell		

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*** indicates Flagship species and * indicates Targeted species out of 46 enlisted*

Herbs	Shrubs	Trees
1. *Aconitum bisma*** (Hamilton)Rapaics	1. *Aconogonon campanulatum* (Hook.f.) Hara	1. *Abies densa* Griff.
2. *Aconitum ferox*** Wall. ex Seringe	2. *Actinidia strigosa* Hook.f.& Thoms.	2. *Acer campbellii* Hiern.
3. *Aconitum spicatum*** (Bruehl) Stapf	3. *Aristolochia griffithii* Duchartre	3. *Acer pectinatum* Nicholson
4. *Aconogonon campanulatum* (Hook.f.)Hara	4. *Arundinaria racemosa* Munro (Red stem)	4. *Acer sikkimense* Miquel.
5. *Acrophorus stipellatus* (Wall.) Moore	5. *Berberis thomsoniana* Schneider (Syn. *B.umbellata)*	5. *Berberis angulosa* Hook.f.& Thom.
6. *Agrostis micrantha* Steudel	6. *Berberis angulosa* Hook.f	6. *Berberis thomsoniana* Schneider
7. *Ainsliaea aptera* DC.	7. *Berberis aristata*** *DC.*	7. *Betula utilis* D.Don
8. *Ainsliaea latifolia* (D.Don) Schulz-Bip.	8. *Berberis hookeri* Lemaire	8. *Buddleja colvailei* Hook.f.& Thomson
9. *Ajuga lobata* D.Don	9. *Berberis insignis* Hook.f.& T.	9. *Castanopsis hystrix* A.DC.
10. *Allium wallichii* Kunth.	10. *Biswarea tonglensis* (Clarke) Cogniaux	10. *Corylus ferox* Wall.
11. *Anaphalis busua* (D.Don) DC.	11. *Clematis acuminata* DC.	11. *Cryptomeria japonica* (L.f.)D.Don
12. *Anaphalis controta* Hook.f.	12. *Elsholtzia fruiticosa* (D.Don) Rehder.	12. *Daphne bholua* D.Don
13. *Anaphalis margaritaceae* (L) Benth.	13. *Euonymous viburnoides* Prain	13. *Eurya acuminata* DC.
14. *Anaphalis triplinervis* (Sims.) Cl.	14. *Eurya acuminata* DC.	14. *Gamblea ciliata* Clarke
15. *Androsae sermentosa* Wall.	15. *Gaultheria fragrantissima* Wall.	15. *Hydrangea aspera* D.Don
16. *Anemone rupicola Cambessedes*	16. *Gaultheria nummulariodes* D.Don.	16. *Hydrangea heteromalla* D.Don
17. *Arisaema griffithii* Schot	17. *Holboellia latifolia* Wall.	17. *Ilex dipyrena* Wall.
18. *Arisaema nepanthoides* (Wall)Martius-ex Schott	18. *Hypericum hookerianum* Wight & Arnot.	18. *Ilex kingiana* Coskevell
19. *Artemisia indica* Willdenow.	19. *Leycesteria glaucophylla* (Hk.f et Thom) Hook.f	19. *Ilex sikkimensis* Kurz.

Herbs	Shrubs	Trees
20. *Aster sikkimensis* Hooker	20. *Lonicera glabrata* Wall.	20. *Lithocarpus pachyphyllus* (Kurz) Rehd.
21. *Aster tricephalus* Clarke	21. *Lonicera hispida* Phallas ex Willd.	21. *Litse sericea* (Nees) Hook.f.
22. *Athyrium foliolosum* Moor	22. *Neillia thyrsiflora* D.Don	22. *Lyonia ovalifolia* (Wall.) Drude
23. *Bidens biternata* (Lour.) Merril & Sch.	23. *Neohymenopogon parasiticus* (Wall.)Bennet	23. *Lyonia villosa* Clarke
24. *Bistorta amplexicaulis* (D.Dopn)Green	24. *Persicaria chinensis* (L) H.Gross	24. *Magnolia campbellii* Hook.f.& Thom.
25. *Bistorta emodi* (Meissner) Hara	25. *Piplanthus nepalensis* (Hook)Sweet	25. *Magnolia globosa* Hook.f.& Thom.
26. *Biswarea tonglensis* (Clarke)Cogniaur	26. *Rhododendron triflorum* Hook.f.	26. *Merilopanax alpinus* (Clarke) Shang
27. *Campanula pallida* Wall.	27. *Ribes acuminata* G.Don	27. *Neolitsea cupiala* (D.Don) Kostermans
28. *Cardiocrinium gigantium* (Wall) Makino	28. *Rosa sericea* Lindley	28. *Osmanthus suavis* Clarke
29. *Carex cruciata* Wahlenb.	29. *Rubia manjith* Roxb.	29. *Pentapanax fragrans* (D.Don) Ha.
30. *Carex decora* Boott	30. *Rubus calyciynoides* Kuntze	30. *Pieris formosa* (Wall.) D.Don
31. *Carex fusiformis* Nees	31. *Rubus rogosus* Smith	31. *Prunus rufa* Hook.f.
32. *Carex munda* Boot.	32. *Rubus wardii* Merill	32. *Rhododendron arboreum* Smith.
33. *Carex pulchra* Boot.	33. *Salix thomsoniana* Anderson	33. *Rhododendron barbaratum* G.Don
34. *Cerastium glomeratum* Thuillier	34. *Sambucus adnata* DC.	34. *Rhododendron falconeri* Hook.f.
35. *Cheilanthes farinosa* (Forsk.)Kaulf.	35. *Sarcococca wallichii* Stapf.	35. *Rhododendron grande* Wight.
36. *Chelianthes chrysophylla* Hook.	36. *Schisandra grandiflora* (Wall.) Hook.f.& Thoms.	36. *Salix obscura* Anderson
37. *Chrysoplenium lanuginosum* Hooker f. et Thomson	37. *Schisandra neglecta* A.C.Smith	37. *Schefflera impressa* (C.B.Clarke) Harms.
38. *Circae alpina* L.	38. *Skimmia laureola* (DC) Walpers	38. *Sorbus foliolosa* (Wall.)Spach.
39. *Cirsium falconeri* (Hook.f.) Petrak	39. *Smilax elegans* Wall ex Kunth	39. *Sorbus vestita* (G.Don)Loddiges
40. *Cirsium verutum* (D.Don) Sprengel	40. *Smilax myrtillus* A.DC.*var. Rigida*	40. *Symplocos dryophila* Clarke

Herbs	Shrubs	Trees
41. *Comellina maculata* Edgeworth	41. *Spiraea micrantha* Hook.f .	41. *Symplocos glomerata* Clarke
42. *Corydalis chaerophylla* DC.	42. *Spiraea bella* Sims. Rosa laevigata	42. *Symplocos lucida* (Thunb.) Siebold & Zuccarini
43. *Corydalis casimiriana* Duthie & Prain	43. *Strobilanthus divericatus* (Nees) Ande.	43. *Taxus wallichiana** Zucc.
44. *Corydalis longipes* DC.	44. *Vaccinum nummularia* Clarke	44. *Tsuga dumosa* (D.Don) Eichler
45. *Crawfurdia speciosa* Wall.	45. *Vaccinum retusum* (Griff) Hook.f.ex C.B.Clarke	45. *Viburnum erubescens* Wall.
46. *Dichrocephala integrifolia* (L.f.)Kuntze	46. *Yushania maling* (Gamble) R.B.Majumdar	46. *Viburnum mullaha* D.Don
Herbs	**Herbs**	**Herbs**
47. *Didymocarpus oblongus* D.Don	61. *Fragaria nubicola* (Hook.f.) Lacaita	75. *Impatience urticifolia* Wall.
48. *Diphylax Urceolata* (C.B. Clarke) Hook.f.	62. *Gallium asperuloides* Edgeworth	76. *Iris clarkie* Hook.f.
49. *Dipsacus inermis* Wall.	63. *Gallium elegans* Roxb.	77. *Meconopsis napaulensis* DC.
50. *Dryopteris chrysocoma* (Christ.) C.Chr.	64. *Gallium hirtiflorum* DC.	78. *Miscanthus nepalensis* (Trin) Hack.
51. *Dryopteris paleaceae* (Sw.) C.Chr.	65. *Gaultheria numulariodes* D.Don	79. *Myriactis nepalensis* Less.
52. *Duchesnea indica* (Andrews) Focke.	66. *Gentiana capitata* D.Don	80. *Notochaeta hamosa* Benth
53. *Elastostema obtusum* Weddel.	67. *Gentiana pedicellata* (D.Don) Grisebach	81. *Onychium japonicum* (Thumberg) Kunze.
54. *Elatostema sessile* Forster	68. *Geranium nepalense* Sweet	82. *Ophiopogon intermedius* D.Don
55. *Elatostema surculosum* Wight	69. *Halenia elliptica* D.Don	83. *Oxalis acetocella* L.
56. *Elsholtzia strobilifera* (Benth.)Benth.	70. *Hemiphragma heterophyllum* Wall.	84. *Panax pseudoginseng* **Wall. Subsp. *himalaicus* Hara var. *angustifolius* (Burkill) Li
57. *Epilobium cylindricum* D.Don	71. *Holboellia latifolia* Wall.	85. *Paris polyphylla* Smith.
58. *Epilobium wallichianum* Husskn.	72. *Hypericum elodeoides* Choisy	86. *Parnassia nubicola* Royle
59. *Euonymus echinatus* Wall.	73. *Hypericum monanthmum* Dyer	87. *Parochaetus communis* Hamilton
60. *Fragaria daltoniana* Gay	74. *Impatience stenantha* Hook.f.	88. *Paspalum thunbergii* Kunthe ex Steudel

Herbs	Herbs	Herbs
89. *Pedicularis pantlingii* Prain	114. *Primula irregularis* Craib.	139. *Stellaria sikkimensis* Edgw. & Hook.f.
90. *Peracarpa cornosa* (Wall) Hook.	115. *Primula petiolaris* Wall.	140. *Stipa roylei* (Nees.) Mez.
91. *Persicaria capitata* (D.Don.) Green	116. *Primula rotundifolia* Wall.	141. *Swertia bimaculata* (Siebold& Zucc.) Clarke
92. *Persicaria chinensis* (L.) H. Gross	117. *Primula scapigera* (Hook.f.) Craib.	142. *Swertia chirayita*** (Roxb.) Karsten
93. *Phlomis microphylla* Benth.	118. *Prunella vulgaris* L.	143. *Swertia ciliata* (G.Don) Burtt
94. *Phymatodes erythrocarpa* (mett.) Ching	119. *Pseudo naphalium affine* (D.Don) Anderberge	144. *Swertia paniculata* Wall.
95. *Picrorhiza kurroa*** Royle ex Benth.	120. *Pteris aspericaulis* Wall ex Ag.	145. *Synotis tetrantha* (DC.) Jeffrey
96. *Pilea ternifolia* Weddell	121. *Pteris quadriaurita* Retz.	146. *Tahlictrum chelidonii* DC.
97. *Pimpinella diversifolia* DC.	122. *Ranunculus diffusus* DC.	147. *Thalictrum cultratum* Wall.
98. *Plantago erosa* Wallich	123. *Ranunculus ficarifolius* Leveille & Vaniot	148. *Thalictrum foliolosum*** *D.C.*
99. *Platanthera biermanniana* (King.& Pantling) Kranzlin	124. *Rhodiola himalensis* (D.Don)Fv.	149. *Thalictrum rostellatum* Hook.f. & Thom.
100. *Pleione hookeriana* (Lindl.)Rchb.f.	125. *Rubia wallichiana* Decaisne	150. *Thalictrum virgatum* Hook.f.
101. *Poa ludens* R.R.Stewart.	126. *Rumex nepalensis* Sprengel	151. *Thelypteris arida* (D.Don) Morton
102. *Poa rajbhandari* Noltie	127. *Sanicula elata* D.Don	152. *Tiarella polyphylla* D.Don
103. *Podophyllum hexandrum*** Royle .	128. *Satyrium nepalense* D.Don	153. *Trifolium dubium* Sibthorp
104. *Polygonatum verticillatum* (L.)Allioni.	129. *Saxifraga gagaena* W.W.Smith	154. *Tripterospermum volubile* (D.Don)Hara
105. *Polygonum runcinatum* (D.Don) H.Gross	130. *Selaginella monospora* Spr.	155. *Tupistra aurantiaca* (Wall.ex Baker) Hook.f.
106. *Polystichium lentum* (Don) Moore	131. *Selenium tenuifolium* Wall. Ex C.B. Cl.	156. *Vaccinium retusum* (Griffith)Hook.f.ex.C.B.Clarke
107. *Potentila polyphylla* Lehmann	132. *Selenium Wallichianum* (D.C)	157. *Valeriana hardwickii* Wall.
108. *Potentilla anserina* L.	133. *Senecio acuminata* (DC) Jeffrey & Chen	158. *Veronica robusta* (Prain) Yamazaki
109. *Potentilla lineata* Treviranus	134. *Senecio graciliflorous* DC.	159. *Viola biflora* L.
110. *Potentilla microphylla* D.Don	135. *Senecio raphanifolius* DC.	160. *Viola hookeri* Thomson
111. *Potentilla polyphylla* Lehmann.	136. *Senecio wallichii* DC.	161. *Viola pilosa* Blume
112. *Primula capitata* Hook.f.	137. *Stellaria decumbens* Edgeworth	162. *Zeuxine goodyeroides* Lindl.
113. *Primula denticulata* J.E.Smith	138. *Stellaria lanata* Hooker	

Bonnie Camp MPCA

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Herbs	Shrubs	Trees
1. *Acanthus volubilis* Wall.	1. *Acanthus ilicifolius* Linn.	1. *Avicennia alba* Blume.
2. *Heliotropium curassavicum* Linn.	2. *Aegialitis rotundifolia* Roxb.	2. *Avicennia marina* Forsk.
3. *Ipomoea pes-caprae* Linn.	3. *Aegiceras corniculatum* Linn.	3. *Avicennia officinalis* Linn.
4. *Porteresia coarctata* Roxb. Tateoka	4. *Clerodendron nerifolium* Wall.	4. *Bruguiera cylindrica* Linn.
5. *Suaeda maritima* (L.) Dumort.	5. *Clerodendrum inerme* Gaertn.	5. *Bruguiera gymnorhiza* Linn.
	6. *Derris trifoliata* Lour.	6. *Ceriops decandra* Griff.
	7. *Sarcolobus globosus* Wall.	7. *Ceriops tagal* (Perr.) Robinson
		8. *Excoecaria agallocha* Linn.
		9. *Heritiera fomes* Buch.Ham.
		10. *Lumnitzera racemosa** Willd.
		11. *Nipa fruticans*** Wurumb.
		12. *Phoenix paludosa* Roxb.
		13. *Rhizophora mucronata* Lamk.
		14. *Sonneratia caseolaris** (L.) Engl.
		15. *Sonneratia griffithii* Kurz.
		16. *Thespesia populnea* (L.) Soland.ex Correa
		17. *Xylocarpus granatum** Koen.
		18. *Xylocarpus mekongensis* Pierre

Pneumatophores in Sundarban

Garpanchkot MPCA

*** indicates Flagship species and * indicates Targeted species out of 46 enlisted*

Herbs	Shrubs	Trees
1. *Adiantum lunulatum* Burm.	1. *Aristolochia indica** L.	1. *Acacia auriculiformis* A. Cunn. ex Benth.
2. *Aerua lanata* (L.) Juss.	2. *Asparagus racemosus** Willd	2. *Aegle marmelos* (L.) Correa
3. *Ageratum conyzoides* L.	3. *Abutilon indicum* (L.) Sweet.	3. *Anogeissus latifolia* (Roxb.exDC.)Wall.ex Guill.&Perr.
4. *Alocasia macrorrhiza* (L.) G. Don. (=*A. indica*)	4. *Anisomeles indica* (L.) Kuntze (=*Anisomeles ovata* R.Br.)	4. *Azadirachta indica* A. Juss
5. *Alternanthera sessilis* (L.) R. Br. ex DC.	5. *Antigonon leptopus* Hook. & Arn.	5. *Bauhinia acuminata.* L.
6. *Alysicarpus monilifer* (L.) DC.	6. *Calotropis procera* (Ait.) R.Br.	6. *Bridelia retusa* (L.) A. Juss.
7. *Amaranthus spinosus* L.	7. *Capparis spinosa* L.	7. *Buchanania lanzan* Spreng
8. *Amorphophallus paeoniifolius* (Dennst.) Nicolson	8. *Carandus spp*	8. *Butea monosperma* (Lam.) Taub
9. *Andrographis paniculata* (Burm.f) Nees	9. *Cassia sophera* L.	9. *Canthium dicoccum* (Gaertn.) Teys. & Binn.
10. *Andropogon aciculatus* Retz. .	10. *Clerodendron viscosum* Vent.	10. *Careya arborea* Roxb.
11. *Aristida adscenscionis* L.	11. *Combretum decandrum* Roxb.	11. *Cassia fistula* Linn.
12. *Atylosia indica*	12. *Croton bonplandianum* Baill.	12. *Castanopsis indica* (Roxb.) A. Dc.
13. *Atylosia scarabaeoides* Benth.	13. *Dendrophthoe falcata* (L. f.) Ettingsh.	13. *Cleistanthus collinus* (Roxb.) Hook.f.
14. *Barleria hispida*	14. *Duranta erecta* L.	14. *Cochlospermum religiosum* (L.) Alston
15. *Barleria prionitis* L.	15. *Eugenia jambos* L. (=*Syzygium jambos*)	15. *Croton roxburghii* N. P. Balakr
16. *Bauhinia vahlii* Wight & Arn.	16. *Eupatorium odoratum* L.	16. *Dalbergia lanceolaria* Linn.
17. *Bidens pilosa* L.	17. *Gardenia gummifera* L.f.	17. *Dalbergia latifolia* Roxb.
18. *Biophytum sensitivum* (L.) DC.	18. *Ixora arborea* Sm.	18. *Dillenia pentagyna* Roxb.
19. *Blumea bifoliata* L.	19. *Jatropha curcas* L.	19. *Diospyros melanoxylon* Roxb.

Herbs	Shrubs	Trees
20. *Bonnaya brachiata* Linn.	20. *Jatropha gossypifolia* L.	20. *Diospyros montana* Roxb.
21. *Botrychium daucifolium* Wall. ex Hooker & Grev.	21. *Lantana camara* L.	21. *Erythrina stricta* var. *suberosa* Roxb.
22. *Butea superba* Roxb.	22. *Mimosa rubricaulis* Lam.	22. *Ficus racemosa* (syn. Ficus glomerata Roxb.)
23. *Caesalpinia bonducella* (L.) Fleming	23. *Rauwolfia tetraphylla* L.	23. *Flacourtia jangomus* (Lour.) Raeusch.
24. *Capsicum annuum* L. *var. acuminata*	24. *Ricinus communis* L.	24. *Gardenia latifolia* Ait.
25. *Caseria vareca* Roxb.	25. *Tephrosia purpurea* (L.) Pers.	25. *Haldina cordifolia* (Roxb.) Ridsdale (syn. *Adina cordifolia)*
26. *Cassia obtusifolia* L.	26. *Thespesia lampus* (Cav.) Dalz. & Gibs.	26. *Helicteres isora* Linn.
27. *Cassia occidentalis* L.	27. *Vangueria spinosa* Roxb.	27. *Hollarrhena antidysenterica* (Roth.) Wall.
28. *Cassia tora* L. var. *humilis* Collad.	28. *Vitex negundo* L.	28. *Lagerstroemia parviflora* Roxb.
29. *Celosia argentia* L.	29. *Zizyphus horrida* Roth.	29. *Lannea coromandelica* (Houtt) Merrill
30. *Centela asiatica* (L.) Urb.	30. *Zizyphus jujuba* Mill. Olijf.	30. *Litsaea glutinosa** (Loureiro) C. B. Robinson
31. *Cissus adnata* Roxb.	31. *Zizyphus oenoplia* (L.) Mill.	31. *Madhuca latifolia* L.
32. *Chrozophora rottleri* (Geiseler) A.Juss. ex Spreng.		32. *Miliusa velutina* (Dunal) Hook. f. et Thorns.
33. *Coccinia grandis* (L.) Voigt. (=*Cephalandra indica*)		33. *Mitragyna parvifolia* (Roxb.) Korth.
Continued in the next page....		34. *Morinda citrifolia**
Trees	**Trees**	35. *Nyctanthes arbortristis* Linn
41. *Pterocarpus marsupium*** Roxb	46. *Symplocos racemosa*. Roxb.	36. *Ougeinia oojeinensis* Roxb.
42. *Schleichera oleosa* (Lour.) Oken.	47. *Syzygium cumini* L.	37. *Pavetta indica* Linn.
43. *Semecarpus anacardium* Linn.	48. *Syzygium operculatum* (Roxb.) Nied.	38. *Phoenix sylvestris* Roxb.
44. *Shorea robusta* Gaertn. f.	49. *Terminalia alata* Heyne ex Roth.	39. *Phyllanthus emblica* Linn.
45. *Stereospermum suaveolens* (Roxb.) A. DC.	50. *Terminalia chebula* (Gaertn.) Retz.	40. *Polyalthia cerasoides* (Roxb.) Bedd.

Herbs	Herbs	Herbs
34. *Commelina maculate* Edgew. (=*C. Oblique*)	55. *Cynodon dactylon* (L.) Pers.	76. *Fimbristylis dichotoma* (L.) Vahl.
35. *Corchorus aestuans* L.	56. *Cyperus iria* L.	77. *Fimbristylis japonicum* Siebold & Zucc. Ex Stud.
36. *Crinum asiaticum* L.	57. *Cyperus kyllingia* Endl.	78. *Globba bulbifera* Roxb.
37. *Cryptolepis buchanani* Roem and Schult	58. *Cyperus rotundus* L.	79. *Habenaria diphylla* (Nimmo) Dalzell
38. *Desmodium gangeticum** (L.) DC.	59. *Dactyloctenium aegyptium* (L.) Willd.	80. *Hedyotis corymbosa* (L.) Lam. *(=Oldenlandia corymbosa)*L.
39. *Dioscorea bulbifera* L.	60. *Desmodium triflorum* (L.) DC.	81. *Heliotropium indicum* L
40. *Dioscorea floribunda* M. Martens & Galeotti.	61. *Desmodium volubilis*	82. *Hydrilla verticillata* (L. f.) Royle.
41. *Gloriosa superba** L.	62. *Digitaria sanguinalis* (L.) Scop.	83. *Hyptis suaveolens* (L.) Poit.
42. *Gymnema sylvestre** I.Br.	63. *Dioscorea alata* L.	84. *Imperata arundinacea* subsp. *hookeri* Rupr. ex Andersson
43. *Hemidesmus indicus* R.Br.	64. *Dioscorea pentaphylla* L.	85. *Ionidium suffruticosum* DC.
44. *Icnocarpus frutescens* (L.) R. Br.	65. *Eclipta prostrata* L.	86. *Kalanchoe pinnata* (Lam.) Pers. *(Bryophyllum calycinum)*
45. *Lygodium japonicum* (Thunb.) Sw.	66. *Eichhornia crassipes* (Mart.) Solms. *(=E. speciosa)*	87. *Launaea sonchifolia* (L.) DC.
46. *Mucuna pruriens** (L.) DC.	67. *Elephantopus scaber* L.	88. *Limnobium spongia* (Bosc) Rich. ex Steud.
47. *Ophioglossum spp.* *	68. *Eleusine indica* (L.) Gaertn.	89. *Lindernia crustacea* (L.) F. Muell.
48. *Passiflora foetida* L.	69. *Emilia sonchifolia* (L.) DC.	90. *Lippia javanica* (Burm. f.) Spreng.
49. *Rivea hypocrateriformis* (Desr.) Choisy.	70. *Eragrostis tenella* (L.) P. Beauv. ex Roem. & Schult.	91. *Lygodium japonicum* (Thunb.) Sw.
50. *Smilax macrophylla* Roxb.	71. *Eragrostis uniloides* (Retz.) Nees ex Steud.	92. *Martynia annua* L. (=*M. diandra*)
51. *Curculigo orchioides* Gaertn.	72. *Euphorbia hirta* L.	93. *Merimea tridentate* Hook
52. *Curcuma amada* Roxb.	73. *Euphorbia microphylla*	94. *Mimosa pudica* Linn.
53. *Curcuma aromatica* Salisb.	74. *Evolvulus alsinoides* L. var. *angustifolius* Torr.	95. *Nicotiana plumbaginifolia* Viv.
54. *Curcuma zedoaria* (Roscoe)	75. *Evolvulus nummularius* L.	96. *Ochna pumila* Ham.

Herbs	Herbs	Herbs
97. *Ocimum sanctum* L.	107. *Pistia stratiotes* L.	117. *Spermacoce hispida* (L.) Schum.
98. *Panicum repens* L.	108. *Polygala crotalarioides* Buch.-Ham. ex DC.	118. *Stephania harnandifolia* (Willd.) Walp.
99. *Parthenium hysterophorus* L.	109. *Pteris spp.*	119. *Trichuriella monsoniae* (L. f.) Bennet (=*Aerva monsoniae*)
100. *Paspalidium flavidum* (Retz.) A. Camus	110. *Rungia parviflora* Nees.	120. *Tridax procumbens* L.
101. *Paspalum scrobiculatum* L.	111. *Scoparia dulcis* L.	121. *Triumfetta rhomboidea* Jacq.
102. *Pathos scandns* Linn.	112. *Setaria glauca* (L.) P. Beauv.	122. *Urena lobata* L.
103. *Pennisetum setosum* (L.) Schult. ssp. *setosum* (Sw.) Brunken.	113. *Sida cordifolia* Linn.	123. *Vernonia cinerea* L.
104. *Perotis indica* (=*P. latifolia*)	114. *Sida rhomboidea* Roxburgh ex Fleming	124. *Xanthium indicum* J.Koenig ex Roxb.
105. *Phyllanthus amarus* Schum. & Thonn.	115. *Solanum torvum* Sw.	125. *Zornia diphylla* (L.) Pers. var. *gracilis* (DC.) Benth.
106. *Phyllanthus niruri* L.	116. *Solanum zylanicum* Blume.	

Garpanchkot MPCA

North Rajabhatkhawa MPCA

*** indicates Flagship species and * indicates Targeted species out of 46 enlisted*

Herbs	Shrubs	Trees
1. *Achyranthes bidentata* Blume	1. *Abelmoschus moschatus** Medik	1. *Actinodaphne obovata* (Nees) Blume
2. *Achyrospermum wallichianum* Bentham	2. *Acacia pennata* (L.) Willdenow	2. *Ailanthus integrifolia* Lamarck
3. *Acmella uliginosa* (Swartz) Cassini	3. *Actinodaphne obovata* (Nees) Blume	3. *Alangium chinense* (Loureiro) Harmes
4. *Ageratum conyzoides* L.	4. *Aglaia perviridis* Hierm.	4. *Alstonia scholaris* R. Brown
5. *Ageratum houstonianum* Miller.	5. *Albizia lucidior* (Steud.) Neilson ex Hara	5. *Amoora spectabilis* (Miquel) Jain & Bennet
6. *Alocasia fallax* Schott.	6. *Ampelocissus sikkimensis* (Lawson) Planchon	6. *Ampelocissus barbata** (Wall.) Planch.
7. *Alpinia calcarata** Roscoe	7. *Ardisia solanacea* Roxb.	7. *Antidesma acuminatum* Wight
8. *Amischotolype hookeri* (Hasskarl) Hara	8. *Aristolochia tagala* Chamisso	8. *Aphanamyxis polystachya** (Wall.) Parker
9. *Argyreia roxburghii* Choisy	9. *Artocarpus chaplasha* Roxb.	9. *Baccaurea ramiflora* Loureiro
10. *Aristolochia indica*** Linn.	10. *Bauhinia acuminata* Linn.	10. *Bauhinia variegata* L.
11. *Asparagus racemosus** Willd.	11. *Berchemia floribunda* (Wall.) Brongniart	11. *Bombax ceiba* L.
12. *Athyrium spp.*	12. *Caesalpinia cucullata* Roxb.	12. *Bridelia retusa* (L.) Sprengel
13. *Axonopus compressus* (Swartz) P. Beau.	13. *Canarium sikkimense* King.	13. *Callicarpa arborea* Roxb.
14. *Borreria alata* (Aublet) DC.	14. *Capparis acutifolia* Sweet	14. *Capparis olacifolia* Hook.f. & Thomson
15. *Bytneria grandifolia* DC.	15. Casearia graveolens Dalz.	15. *Careya arborea* Roxb
16. *Cassia tora* L.	16. *Catunaregam longispina* (Link) Trivengadum	16. *Casearia vareca* Roxb.
17. *Centella asiatica* (L.) Urban.	17. *Cayratia trifolia* (L.) Domin.	17. *Castanopsis indica* (Roxb.) A. DC.
18. *Chloranthus elatior* Link	18. *Celastrus paniculatus** Willd.	18. *Cephalanthus tetrandra* (Roxb.)Ridsdale &Bakhuizen f.
19. *Chromolaena odorata* (L.) King & Robinson	19. *Chonemorpha fragrans* (Moon.) Alston	19. *Chisocheton cumingianus* (C. DC.) Harms.

Herbs	Shrubs	Trees
20. *Clausena excavata* Burman	20. *Cinnamomum bijolghota** (Hamilton) Sweet	20. *Chukrasia tabularis* Jussieu.
21. *Cyperus pangorei* Rottboell	21. *Clerodendrum indicum* (L.) Kuntze	21. *Cinnamomum cecidodaphne*** Meissn.
22. *Dicliptera bupleuroides* Nees	22. *Clerodendrum viscosum* Ventenat	22. *Combretum decandrum* Roxb.
23. *Digitaria ciliaris* (Retzius) Koeler	23. *Cloranthus elatior* Link.	23. *Crateva religiosa* Forst.f.
24. *Dillenia indica* L.	24. *Coffea benghalensis* Schultes	24. *Croto roxburghii* Balakrishnan
25. *Diplazium esculentum* (Koenig *ex* Retz.) Sw.	25. *Costus speciosus* (J.Konig) Smith	25. *Dalber stipulacea* Roxb.
26. *Drosera burmannii** Vahl.	26. *Croton caudatus* Geiseler	26. *Dalbergia pinnata* (Lour.) Prain
27. *Drymaria diandra* (Blume) Duke	27. *Cryptolepis sinensis* (Loureiro) Merrill	27. *Dalbergia stipulacea* Roxb.
28. *Duchesnea indica* (Andrews) Focke	28. *Cyclea bicristata* (Griffith) Diels	28. *Dellenia indica* L.
29. *Elatostema monandrum* (D. Don) Hara	29. *Debregeasia longifolia* (Burmann f) Weddell	29. *Dendrocnide sinuata* (Blume) Chew.
30. *Elephantopus scaber* L.	30. *Deeringia amaranthoides* (Lamarck) Merrill.	30. *Dillenia pentagyna* Roxb.
31. *Eurya acuminata* DC.	31. *Dioscorea bulbifera* L.	31. Dysoxylum binectariferum (Roxb.) Bedd.
32. *Floscopa scandens* Loureiro	32. *Dioscorea prazeri*** Prain & Burkill	32. Dysoxylum excelsum Blume
33. *Girardinia diversifolia* (Link) Friis	33. *Dryopteris sikkimensis* (Bedd) O. Ktze	33. *Entada phaseoloides*
34. *Gomphostemma ovatum* Bentham	34. *Eupatorium odoratum* L.	34. *Garuga floribunda* Decaisne
35. *Helminthostachys zeylanica** (L.) Hook.	35. *Ficus hederacea* Roxb.	35. *Glycosmis cymosa* (Kurz) Narayanaswami
36. *Homalium zeylanicum* (Gard.) Bentham	36. *Ficus hispida* L.f.	36. *Gmelina arborea* Roxb.
37. *Homalomena rubescens* (Roxb.) Kunth	37. *Glycosmis pentaphylla* (Retz.) DC.	37. *Grewia serrulata* DC.
38. *Impatiens balsamina* L.	38. *Gouania leptostachya* DC.	38. *Gynocardia odorata*** R. Brown
39. *Lagerstroemia reginae* Roxb.	39. *Hodgsonia macrocarpa* (Blume) Cogniaux	39. *Heynea trijuga* Sims
40. *Lepidagathis incurva* Buch-Ham ex D. Don	40. *Ichnocarpus frutescens* (L.) Aiton	40. *Holarrhena pubescens* (Buchanan-Hamilton) G. Don

Herbs	Shrubs	Trees
41. *Lindenbergia grandiflora* (D. Don) Benth.	41. *Ipomoea linifolia* Blume	41. *Ixora athroantha* Bremekamp
42. *Lycopodiella cernua** (Linn.) Pichli-Sermolli	42. *Jasminum laurifolium* Roxb.	42. *Knema erratica* (Hook.f. & Thomson) Sinclair
43. *Merremia hirta* (L.) Merrill	43. *Leea aequata* L.	43. *Lagerstroemia hirsuta* (Lamarck)Willdenow
44. *Michelia champaca* L.	44. *Leea asiatica* (L.) Ridsdale	44. *Lagerstroemia parviflora* Roxb.
45. *Mikania micrantha* Willd.	45. *Leucas mollissima* Bentham	45. *Leea guineensis* G. Don
46. *Mimosa pudica* L.	46. *Lygodium flexuosum* Sw.	46. *Litsaea glutinosa** (Lour.) Robinson
47. *Murraya paniculata* (L.) Jack	47. *Machilus villosa* (Roxb.) Hook.f.	47. *Litsaea monopetala* (Roxb.) Persoon
48. *Nelsonia canescens* (Lamarck) Sprengel	48. *Measa indica* (Roxb.) A. DC	48. *Magnolia pterocarpa* Roxb.
49. *Ophioglossum reticulatum** L.	49. *Melothria sp.*	49. *Mallotus philippensis* (Lamarck) Mueller
50. *Ophiopogon wallichianus* (Kunth) Hook.f.	50. *Merremia vitifolia* (Burman f.) Hallier f.	50. *Meliosma simplicifolia* (Roxb.)Walpers
51. *Oplismenus burmanni* Beauv.	51. *Mikenia macrantha* Kunth.	51. *Mesua ferrea** Linn.
52. *Oplismenus compositus* (L.) P. Beauv.	52. *Mucuna pruriens** (Linn.) DC.	52. *Meyna spinosa* Link.
53. *Oxalis corniculata* L.	53. *Naravalia zeylanica* (L.) DC.	53. *Michelia velutina* DC.
54. *Peristrophe speciosa* (Roxb.) Nees	54. *Natsiatum herpeticum* Arnott	54. *Micromelum integerrimum* (Coolebrooke) Roemer
55. *Persicaria tenella* (Blume) Hara	55. *Paederia foetida* L.	55. *Morinda angustifolia* Roxb.
56. *Phaulopsis imbricata* (Forsskal) Sweet	56. *Pericampylus glaucas** (Lam.) Merr.	56. *Morinda citrifolia** Linn.
57. *Piper mullesua* D. Don	57. *Persicaria chinensis* (L.) H. Gross	57. *Morus laevigata* Brandis
58. *Plectranthus barbatus* Andrews	58. *Phlogacanthus thyrsiflorus* (Hardwicke) Mabberley	58. *Murraya koenigii* (L.) Sprengel
59. *Pollia subumbellata* C. B. Clarke	59. *Piper chuvya* (Miquel) C. DC.	59. *Neolamarckia cadamba* (Roxb.)Bosser
60. *Polygonum hydropiper* L.	60. *Piper longum* L.	60. *Oroxylum indicum* (L.) Ventenat
61. *Pouzolzia zeylanica* (L.) Bennett & Brown	61. *Piper retrofractum* Vahl	61. *Persea glaucescens** (Nees) Long

Herbs	Shrubs	Trees
62. *Pronephrium nudatum* (Roxb.in Griff.) Chandra	62. *Pothos scandens* L.	62. *Phyllanthus emblica* L.
63. *Pteris biaurita* L.	63. *Psilanthus bengalensis* (Schultes) Leroy	63. *Polyalthea simiarum* Hook. f. & Thomson
64. *Pteris semipinnata* L.	64. *Pueraria sikkimensis* Prain	64. *Polyalthia symiarum*
65. *Pterygota alata* (Roxb.) R. Brown	65. *Pupalia lappacea* Moq.	65. *Premna bengalensis* Clarke
66. *Pupalia atropurpurea* Moq.	66. *Rauwolfia serpentina** (Linn.)Benth. ex Kruz.	66. *Premna mucronata* Roxb.
67. *Rungia pectinata* (L.) Nees	67. *Sloanea sterculiacea* (Bentham) Rehder & Wilson	67. *Pterocarpus marsupium** Roxb.
68. *Scoparia dulcis* L.	68. *Smilax orthoptera* A. DC.	68. *Pterospermum acerifolium* (L.) Willdenow
69. *Sida acuta* Burm.f.	69. *Solanum khasianum* Clarke	69. *Pterygota alata* (Roxburgh) R. Brown
70. *Synedrella nodiflora* (L.) Gaertner.	70. *Stephania japonica* (Thunberg) Miers	70. *Sapium baccatum* Roxbergh
71. *Tectaria dubia* (C. B. Clarke and Baker) Ching	71. *Streblus asper* Loureiro	71. *Sauropus compressus* Mueller
72. *Toddalia asiatica* (L.) Lamarck	72. *Syzygium tetragonum* (Wight) Walpers	72. *Schima wallichii* (DC.) Korthals.
73. *Torenia diffusa* D. Don	73. *Tetrastigma bracteolatum* (Wall.) Planchon	73. *Shorea robusta* L.
74. *Triumfetta rhomboidea* Jacq.	74. *Tetrastigma serrulata* (Roxburgh) Planch	74. *Sloanea sterculiacea* (Bentham) Rehder & Wilson
75. *Tropidia angulosa* Blume.	75. *Thunbergia grandiflora* Roxburgh	75. *Sorindeia madagascariensis* Baill
76. *Youngia japonica* (L.) DC.	76. *Trema orientalis* (L.) Blume	76. *Sterculia villosa* Smith.
77. *Zingiber rubens* Roxb.	77. *Trichosanthes tricuspidata* Lour.	77. *Stereospermum colais** (Dillwyn) Mabberley
	78. *Valleris solanacea* (Roth.) O. Kuntze	78. *Syzygium cumini* (L.) Skeels
	79. *Wattakaka volubilis* (L.f.) Stapf.	79. *Syzygium formosum* (Wallich) Masamune
	80. *Wrightia arborea* (Dennstaedt) Mabberley	80. *Syzygium* praecox (Roxb.) Rathkr.
	81. *Zanonia indica* L.	81. *Tabernaemontana divaricata* (L.) Roemer & Schultes
Trees	**Trees**	82. *Talauma hodgsonii* Hook. f. & Thomson
86. *Tetrastigma planicauli* (Hook. f.) Gagnepain	89. *Turpinia pomifera* (Roxb.) DC.	83. *Terminalia bellirica* (Gaertner) Roxb.
87. *Toona ciliata** Roemer	90. *Uvaria hamiltonii* Hooker f. & Thomson	84. *Terminalia myriocarpa* Heurck & Meuller
88. *Trewia nudiflora* L.	91. *Zanthoxylum nitidum* (Roxb.) DC	85. *Tetrastigma campylocarpum* (Kurz.) Planchon

North Sevoke MPCA

*** indicates Flagship species and * indicates Targeted species out of 46 enlisted*

Herbs	Shrubs	Trees
1. *Abrus pulchellus* Wall. ex Thw.	1. *Abelmoschus moschatus*** Medik	1. *Adina cordifolia* (Roxb.) Benth & Hook f.
2. *Achyranthus bidentata* Blume	2. *Acacia pennata* (L.) Willdenow	2. *Aglaia perviridis* Hiern.
3. *Achyrospermum wallichianum* Bentham	3. *Aganosma marginata* (Roxb.) G. Don	3. *Ailanthus integrifolia* Lamarck
4. *Ageratum houstonianum* Miller.	4. *Ampelocissus sikkimensis* (Lows.) Planc.	4. *Alangium chimnense* (Loureiro) Harmes
5. *Ardisia solanaceae* Roxb.	5. *Argyreia roxburghii* Choisy	5. Albizia procera (Roxb.) Bentham
6. *Arisaema tortuosum* (Wall.) Schott	6. *Aristolochia cathcartii* Hook.f.	6. *Alstonia scholaris* R. Brown
7. *Axonopus compressus* (Swartz) P. Beau.	7. *Asparagus racemosus** Willd.	7. *Amoora spectabilis* (Miquel) Jain & Bennet
8. *Barleria strigosa* Willdnew	8. *Bauhinia vahlii* Wight & Arnott	8. *Ampelocissus barbata** (Wall.) Planch.
9. *Biophytum sensitivum* DC.	9. *Berchemia floribunda* (Wall.) Brongniart	9. *Antidesma bunius* (L.) Sprengle
10. *Boehmeria hirta* (Blume) Hasskarl.	10. *Caesalpinia cucullata* Roxbergh	10. *Aphanamyxis polystachya* * (Wall.) Parker
11. *Borreria alata* (Aublet) DC.	11. *Celastrus paniculatus*** Willd.	11. *Baccaurea ramiflora* Loureiro
12. *Caryota urens* L.	12. *Chonemorpha fragrans* (Moon) Alston	12. *Bauhinia variegata* L.
13. *Chukrasia tabularis* Jussieu.	13. *Clausena excavata* Burman	13. *Beilschmiedia brandisii* Hook.f.
14. *Colocasia esculenta* (L.) Schott.	14. *Clerodendrum viscosum* Vent.	14. *Bischofia javanica* Blume.
15. *Commelina suffruticosa* Blume	15. *Coffea bengalensis* Schultes	15. *Bombax ceiba* L.
16. *Crinum amoenum* Roxb.	16. *Combretum decandrum* Roxburgh	16. *Bridelia retusa* (L.) Sprengel
17. *Crotalaria alata* Buch-Ham ex D. Don	17. *Cryptolepis sinensis* (Loureiro) Merrill	17. *Bridelia stipularis* (L.) Blume
18. *Croton caudatus* Geiseler	18. *Daphne involucrata* Wall.	18. *Callicarpa arborea* Roxb.
19. *Curculigo orchioides* Gaertn.	19. *Deeringia amaranthoides* (Lamarck) Merrill.	19. *Capparis acutifolia* Sweet

Herbs	Shrubs	Trees
20. *Digitaria ciliaris* (Retzius) Koeler	20. *Dicliptera bupleuroides* Nees	20. *Carya arborea* Roxb.
21. *Diplazium esculentum* (Koenig *ex* Retz.) Sw.	21. *Dioscorea bulbifer* L.	21. Casearia graveolens Dalz.
22. *Drosera burmannii** Vahl.	22. *Dioscorea prazeri** Prain & Burkill	22. *Castanopsis indica* (Roxb.) A. DC.
23. *Dryopteris sikkimensis* (Bedd.) O.Ktze.	23. *Eupatorium adenophorum* Spreng.	23. *Cephalanthus tetrandra* (Roxb.) Ridsdale & Bakhuizen f.
24. *Globba racemosa* Smith	24. *Firmiana colorata* (Roxb.) R. Brown	24. *Chisocheton cumingianus* (DC.) Harms.
25. *Helminthostachys zeylanica** (L.) Hook.	25. *Floscopa scandens* Loureiro	25. *Chukrasia tabularis* Jussieu.
26. *Kaemoferia rotunda* L.	26. *Flueggea virosa* (Willd.) Voigt	26. *Cinnamomum bejolghota** (Buch.-Ham.)Sweet
27. *Lagerstroemia regine* Roxb.	27. *Gmelina arborea* Roxb.	27. *Crateva religiosa* Forster f.
28. *Leea guineensis* G.Don	28. *Gynocardia odorata** R. Brown	28. *Dalbergia stipulacea* Roxburgh
29. *Lepidagathis incurva* Buch-Ham ex D. Don	29. *Hodgsonia macrocarpa* (Blume) Cogniaux	29. *Dellenia indica* L.
30. *Leucas mollissima* Bentham.	30. *Holmskioldia sanguinea* Retzius.	30. *Dysoxylum binectariferum* (Roxb.) Bedd.
31. *Lycopodiella cernua* * (Linn.) Pichli-Sermolli	31. *Ichnocarpus frutescens* (L.) Aiton	31. *Dysoxylum reticulatum* King
32. *Merremia hirta* (L.) Merrill	32. *Ichnocarpus volubilis* (Lour.) Merr.	32. *Flacourtia jangomas* (Lour.) Raeuschel
33. *Ophioglossum reticulatum** Linn.	33. *Ixora undulata* Roxb.	33. *Holarrhena pubescens* (Buchanan-Hamilton) G.Don
34. *Ophiopogon wallichianus* (Kunth) Hook.f.	34. *Jasminum laurifolium* Roxbergh	34. *Lagerstroemia hirsuta* (Lamarck) Willdenow
35. *Oplismenus burmanni* Beauv.	35. *Lagerstroemia speciosa* (Linn.) Pers.	35. *Lagerstroemia parviflora* Roxb.
36. *Oplismenus compositus* (L.) P. Beauvois	36. *Lantana camara* L.	36. *Lannea coromandelica* (Houtt.) Merr.
37. *Peristrophe speciosa* (Roxb.) Nees	37. *Lasia spinosa* (L.) Thw.	37. *Litsaea glutinosa** (Lour.) Robinson
38. *Persicaria chinensis* (L.) H. Gross	38. *Leea asiatica* (L.) Ridsdale	38. *Litsaea monopetala* (Roxb.) Persoon
39. *Phaulopsis imbricata* (Forsskal) Sweet	39. *Lindernia parviflora* (Roxb.) Haines	39. *Mallotus philippensis* (Lamarck) Mueller
40. *Phrynium pubinerve* Blume	40. *Lygodium flexuosum* (L.) Sw.	40. *Mangifera indica* L.

Herbs	Shrubs	Trees
41. Piper betel L.	*41. Macaranga denticulata* (Blume) Mueller	*41. Meliosma simplicifolia* (Roxb.) Walpers
42. Piper longum L.	*42. Maesa indica* (Roxb.) A. DC.	*42. Mesua ferrea** Linn.
43. Piper peepuloides Roxb.	*43. Melastoma melabathricum* L.	*43. Meyna spinosa* Link.
44. Pothos scandens L.	*44. Merremia vitifolia* (Burman f.) Hallier f.	*44. Morinda angustifolia* Roxb.
45. Pronephrium nudatum (Roxb. in Griff.) Chandra	*45. Mikania micrantha* Willd.	*45. Morinda citrifolia** Linn.
46. Pteris biaurita L.	*46. Mucuna pruriens** (Linn.) DC.	*46. Murraya paniculata* (L.) Jack
47. Pupalia atropurpurea Moq.	*47. Murraya koenigii* (L.) Spreng.	*47. Persea glaucescens** (Nees) Long
48. Saccharum narenga (Nees ex Steudal) Hackel	*48. Naravelia zeylanica* (L.) DC.	*48. Phlogacanthus thyrsiformis* (Hardwicke) Mabberley
49. Setaria palmifolia (Koen.) Stapf.	*49. Natsiatum herpeticum* Arnott.	*49. Phyllanthus emblica* L.
50. Sida acuta Burm.f.	*50. Nayariophyton zizyphifolia*	*50. Polyalthea simiarum* Hook.f. &Thomson
51. Sida rhombifolia L. var *rhomboidea*	*51. Paederia foetida* L.	*51. Premna bengalensis* Clarke
52. Strobilanthes sabiniana (Lindl.)Nees	*52. Pericampylus glaucus** (Lam.) Merr.	*52. Premna mucronata* Roxb.
53. Synedrella nodiflora (L.) Gaertner.	*53. Phyllanthus sikkimensis* Mueller	*53. Pterocarpus marsupium** Roxb.
54. Tetrastigma serrulata (Roxburgh) Planch	*54. Piper retrofractum* Vahl	*54. Pterospermum acerifolium* (L.) Willdenow
55. Thunbergia fragrans Roxb.	*55. Porana paniculata* Roxb.	*55. Pterygota alata* (Roxburgh) R. Brown
56. Toddalia asiatica (L.) Lamarck	*56. Pothos scandens* L.	*56. Pueraria sikkimensis* Prain
57. Triumfetta rhomboidea Jacq.	*57. Premna bengalensis* Clarke	*57. Schima wallichii* (DC.) Korthals.
58. Tropidia angulosa Blume.	*58. Pseuderanthemum palatiferum* (Nees)Radlkofer	*58. Shorea robusta* Gaertn.
59. Zingiber rubens Roxb.	*59. Pterospermum acerifolium* (L.) Willdenow	*59. Sloanea sterculiacea* (Bentham) Rehder & Wilson
60. Zizyphus rugosa Lamarck	*60. Randia sikkimensis* Hook. f.	*60. Sorindeia madagascariensis* Baill
	*61. Rauwolfia serpentina*** (Linn.)Benth. ex Kruz.	*61. Sterculia villosa* Smith.

Shrubs	Shrubs	Shrubs
62. *Sauropus compressus* Mueller	67. *Syzygium cumini* (L.) Skeels	71. *Thunbergia grandiflora* Roxb.
63. *Smilax orthoptera* A. DC.	68. *Tabernaemontana divaricata* (L.) Roemer & Schultes	72. *Urena lobata* L.
64. *Stephania glabra* (Roxb.) Miers	69. *Tetrastigma campylocarpum* (Kurz) Planchon	73. *Uvaria hamiltonii* Hooker f. & Thomson
65. *Sterculia lanceifolia* G. Don	70. *Tetrastigma serrulata* (Roxburgh) Planchon	74. *Vallaris solanacea* Kuntze
66. *Styxis suaveolens* (Roxb.) Pierre		
Trees	**Trees**	**Trees**
62. *Stereospermum colais* ** (Dillwyn) Mabberley	67. *Terminalia bellerica* (Gaertner) Roxb.	72. *Trewia nudiflora* L.
63. *Streblus asper* Lour.	68. *Terminalia chebula* Retz.	73. *Turpinia pomifera* (Roxb.) DC.
64. *Suzygium cumini* (L.) Skeels	69. *Terminalia crenulata* Roth.	74. *Wrightia arborea* (Dennstaedt) Mabberley
65. *Syzygium formosum* (Wallich) Masamune	70. *Tetrameles nudiflora* R.Br.	75. *Zanthoxylum armatum* DC.
66. *Tectona grandis* L.f.	71. *Toona ciliata** Roem.	


Litsaea glutinosa

Sursuti MPCA

*** indicates Flagship species and * indicates Targeted species out of 46 enlisted*

Herbs	Shrubs	Trees
1. *Acacia pennata* (L.) Willdenow	1. *Abelmoschus moschatus** Medik	1. *Actinodaphne obovata* (Nees) Blume
2. *Achyranthes bidentata* Blume	2. *Abrus pulchellus* Wall. ex Thw.	2. *Alangium chinense* (Loureiro) Harms
3. *Acmella uliginosa* (Swartz) Cassini	3. *Acronychia pedunculata* (L.) Miq.	3. *Albizia lucidior* (Steud.) Neilson ex Hara
4. *Ageratum conyzoides* L.	4. *Actinodaphne obovata* (Nees) Blume	4. *Alcimandra cathcartii* (Hook. f. & Thomson) Dandy
5. *Ageratum haustonianum* Miller	5. *Aeschynanthus hookeri* C. B. Clarrke	5. *Alstonia scholaris* (L.) R. Brown
6. *Alpinia calcarata** Roscoe	6. *Albizia chinensis* (Osbeck) Merrill	6. *Amoora spectabilis* (Miquel) Jain & Bennet
7. *Amischotolype hookeri* (Hasskarl) Hara	7. *Alpinia nigra* (Gaertn.) Burtt.	7. *Ampelocissus barbata** (Wall.) Planch.
8. *Ardisia solanacea* Roxburgh	8. *Angiopteris evecta* (Forst.) Hoffman	8. *Aphanamyxis polystachya** (Wall.) Parker
9. *Asparagus racemosus*** Willd.	9. *Aralia foliolosa* Seemann	9. *Artocarpus lekucha* Book.-Ham.
10. *Axonopus compressus* (Sw.) P. Beauv.	10. *Argyreia roxburghii* Choisy	10. *Baccaurea ramiflora* Loureiro
11. *Begonia roxburghii*	11. *Aristolochia saccata* Wallich	11. *Bauhinia malabarica* Roxb.
12. *Borreria alata* (Aublet) DC.	12. *Artocarpus chama* Buch.-Ham.	12. *Bauhinia variegata* L.
13. *Curculigo recurvata* Dryander	13. *Bambusa* nutans Wall. ex Munro	13. *Casearia vareca* Roxb.
14. *Desmodium oblongum* Bentham	14. *Barleria strigosa* Willdnew	14. *Castanopsis indica* (Roxb.) A.DC.
15. *Dicliptera bupleuroides* Nees	15. *Bauhinia purpurea* L.	15. *Chisocheton cumingianus* (C. DC.) Harms.
16. *Digitaria ciliata* (Retz.) Koeler	16. *Berchemia floribunda* (Wall.) Brongniart	16. *Cinnamomum bejolghota*** (Hamilton) Sweet
17. *Dioscorea prazeri* Prain & Burkill	17. *Bridelia retusa* (L.) Sprengel	17. *Ciannamomum cecidodaphne** Meissn.
18. *Diplazium esculentum* (Koenig *ex* Retz.) Sw.	18. *Caesalpinia cucullata* Roxb.	18. *Dillenia pentagyna* Roxb.
19. *Dracena angustifolia* Vandelli	19. *Calamus latifolius* Roxb.	19. *Dysoxylum binectariferum* (Roxb.) Beddome

Herbs	Shrubs	Trees
20. *Drosera burmannii** Vahl.	20. *Callicarpa arborea* Roxb.	20. *Dysoxylum excelsum* Blume
21. *Elatostemma rupestre* (D. On) Wedd.	21. *Carex phacota* Sprengel	21. *Erythrina stricta* Roxb.
22. *Eragrostis nigra* Nees ex Steudel	22. *Cayratia trifolia* (L.) Domin.	22. *Eurya ceracifolia* (D. Don) Kobuski
23. *Ficus recemosa* L.	23. *Celastrus paniculatus** Willd.	23. *Glochidion multiloculare* (Willd.) Muel.
24. *Flemingia strobilifera* (L.) Aiton	24. *Chloranthus elatior* Link	24. *Gynocardia odorata** R. Brown
25. *Gloriosa superba** Linn.	25. *Chonemorpha fragrans* (Moon) Alston	25. *Holarrhena pubescens* (Buchanan-Hamilton) G. Don
26. *Helminthostachys zeylanica** (L.) Hook.	26. *Chromolaena odoratum* (L.) King & Robinson	26. *Ilex godajam* (Colebr.) Hook.f.
27. *Homalomena rubescens* (Roxb.) Kunth	27. *Clerodendrum viscosum* Vent.	27. *Litsaea glutinosa** (Lour.) Robinson
28. *Hygrophila phlomoides* Nees	28. *Cocculus laurifolius* DC.	28. *Litsaea monopetala* (Roxb.) Persoon
29. *Impatiens balsamina* L.	29. *Coffea bengalensis* Schultes	29. *Magnolia hodgsonii* (Hook.f. & Thoms) Keng.
30. *Isodon ternifolius* (D.Don.) Kudo	30. *Combretum decandrum* Roxburgh	30. *Meliosma simplicifolia* (Roxb.) Walpers
31. *Jasminum laurifolium* Roxb.	31. *Commelina suffruticosa* Blume	31. *Mesua ferrea** Linn.
32. *Leucas mollissima* Bentham.	32. *Costus speciosus* (Koen. ex Retz.) Smith	32. *Michelia velutina* DC.
33. *Ludwigia perennis* L.	33. *Croton caudatus* Geiseler	33. *Micromelum integerrimum* (Roxb.) Roem
34. *Lycopodiella cernua* * (Linn.) Pichli-Sermolli	34. *Cryptolepis sinensis* (Loureiro) Merrill	34. *Morinda citrifolia** Linn.
35. *Macaranga denticulata* (Blume) Mueller	35. *Cyclea bicristata* (Griffith) Diels.	35. *Oroxylum indicum* (L.) Vent.
36. *Ophioglossum reticulatum** L.	36. *Dalbergia stipulacea* Roxburgh	36. *Phlogacanthus thyrsiformis* (Hardwicke) Mabberley
37. *Oplismenus burmannii* (Retz.) P. Beauv.	37. *Debregeasia longifolia* (Burmann f) Weddell	37. *Phoebe lanceolata* Nees
38. *Oplismenus compositus* (L.) P. Beauv.	38. *Deeringia amaranthoides* (Lamarck) Merrill	38. *Polyalthea simiarum* Hook. f. & Thomson
39. *Oreocnide frutescens* (Thunb.) Miq.	39. *Dendrocnide sinuata* (Blume) Chew.	39. *Premna mucronata* Roxb.
40. *Peliosanthes griffithii* Baker	40. *Desmos chinensis* Loureiro	40. *Pterocarpus marsupium** Roxb.

Herbs	Shrubs	Trees
41. *Phaius tankervilleae* (Banks ex Heritier) Blume	41. *Dillenia indica* L.	41. *Pterospermum acerifolium* (L.) Willdenow
42. *Phrynium pubinerve* Blome	42. *Dioscorea prazeri** Prain & Burkill	42. *Pueraria ovata* (Willd.) Ohwi
43. *Piper betel* L.	43. *Diplazium esculentum* (Koenig *ex* Retz.) Sw.	43. *Pueraria sikkimensis* Prain
44. *Piper longum* L.	44. *Dracena angustifolia* Roxb.	44. *Saurauia roxburghii* Wall.
45. *Polygonum hydropiper* L.	45. *Dryopteris sikkimensis* (Bedd.) O.Ktze.	45. *Schima wallichii* (DC.) Korthals
46. *Pouzolzia hirta* (Blume) Hasskarl	46. *Eurya acuminata* DC.	46. *Semecarpus anacardium* L. f.
47. *Pronephrium nudatum* (Roxb.in Griff.) Chandra	47. *Floscopa scandens* Loureiro	47. *Shorea robusta* Gaertn.
48. *Psilanthus bengalensis* (Schultes) Leroy	48. *Globba macroclada* Gagnepain	48. *Sorindeia madagascariensis* Baill.
49. *Pteris biaurita* L.	49. *Glycosmis cymosa* (Kurz) Narayanaswami	49. *Sterculia villosa* Smith.
50. *Pteris semipinnata* L.	50. *Gouania leptostachya* DC.	50. *Steriospermum colais** (Dill.) Mabberley
51. *Pupalia atropurpurea* Moq.	51. *Hedychium thyrsiforme* Smith	51. *Syzygium cumini* (L.) Skeels
52. *Rhaphidophora grandis* Schott	52. *Hedyotis scandens* Roxb.	52. *Syzygium formosum* (Wallich) Masamune
53. *Rubus treutleri* Hook.f.	53. *Holmskioldia sanguinea* Retzius	53. *Terminalia bellirica* (Gaertner) Roxb.
54. *Rungia pectinata* (L.) Nees	54. *Hoya parasitica* (Roxb.) Wight.	54. *Tetrameles nudiflora* R. Br.
55. Setaria plicata (Lam.) T. Cooke	55. *Hygrophila auriculata* (Schumacher) Heine	55. *Tetrastigma planicaule* (Hook.f.) Gagnepain
56. *Sida acuta* Burm.f.	56. *Ichnocarpus frutescens* (L.) Aiton	56. *Toona ciliata*** Roemer
57. *Smilax lancifolia* Roxb.	57. *Ipomea linifolia* Blume	57. *Turpinia pomifera* (Roxb.) DC.
58. *Synedrella nodiflora* (L.) Gaertner	58. *Lasia spinosa* (L.) Thw.	58. *Uvaria hamiltonii* Hooker f. & Thomson
59. *Triumfetta rhomboidea* Jacq.	59. *Leea asiatica* (L.)	59. *Wrightia arborea* (Dennst.) Mabb.
60. *Zingiber rubens* Roxb.	60. *Leea guineensis* G. Don	
	61. *Ludwigia perennis* L.	

Shrubs	Shrubs	Shrubs
62. *Maesa indica* (Roxb.) A.DC	74. *Pegia nitida* Coelbr.	86. *Sloanea sterculiacea* (Benth) Rehder & Wilson
63. *Mallotus philippensis* (Lamarck) Mueller	75. *Pericampylus glaucus** (Lam.) Merr.	87. *Smilax orthoptera* A. DC.
64. *Maranta arundinacea* L.	76. *Persea glaucescens** (Nees) Long	88. *Stenoclaena paustris* (Burm.f.) Under
65. *Melastroma malabathricum* L.	77. *Persicaria chinensis* (L.) H. Gross	89. *Stephania glabra* (Roxb.) Miers
66. *Merremia vitifolia* (Burman f.) Hallier f.	78. *Piper peepuloides* Roxb.	90. *Sygigium ramosissima* (Blume) Balkr.
67. *Mikania micrantha* Willd.	79. *Piper retrofractum* Vahl	91. *Tetrastigma campylocarpum* (Kurz.) Planchon
68. *Morinda angustifolia* Roxb.	80. *Porana paniculata* Roxb.	92. *Tetrastigma serrulatum* (Roxb.) Planchon
69. *Mucuna pruriens** (L.) DC.	81. *Pothos cathcarti* Schott	93. *Thunbergia grandiflora* Roxb.
70. *Natsiatum herpeticum* Arnott	82. *Pothos scandens* L.	94. *Uncaria scandens* (Smith) Hutchinson
71. *Oreocnide rubescens* (Blume) Miq.	83. *Rauwolfia serpentina** (Linn.)Benth. ex Kruz.	95. *Urena lobata* L.
72. *Paederia foetida* L.	84. *Sapium baccatum* Roxb.	96. *Vallaris solanacea* Kuntze
73. *Pandanus unguifer* Hook.f.	85. *Sauropus compressus* Mueller	97. *Zizyphus rugosa* Lamarck

Sursuti MPCA

Annexure V: Persons involved in the project from outside Forest Department

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32.	Mr. Rajib Biswas	Field Botanist	Dept. of Botany, N. B. H. University	9434061591
33.	Prof. S. K. Mukherjee	Professor	Department of Botany, Kalyani University, Kalyani -741235	033-2581 8750/9432224984 sobhankr@yahoo.com
34.	Sri. S.K. Bandyopadayay	Soil Chemist	Tagore Society for Rural Dev. Kol-70	03218-214398/9432362877
35.	Dr. Saykat Naskar	Lecturer	A B N Seal College Cooch Behar	-
36.	Sri. T.K. Pradhan	Herbalist	Himalayan Industries Darjeeling	0354-2264635
37.	Dr. Tapan Kumar Mishra	Principal	Vidyasagar College, Kolkata-6	03222-276554/9434139011 mishratapan@hotmail.com
38.	Dr. U.C. Bhattacharya	Ex. Joint Director	Botanical Survey of India	033-2461 9809
39.	Dr. Upkar Rai	Lecturer	Department of Botany, St. Joseph's College, Darjeeling	9832093569

Annexure VI: Financial Summary

Financial Statement for the UNDP-CCF-II Project 13047 for West Bengal

Financial year	Receipts (Rs.)		Expenditure (Rs.)	
	Amount	Cumulative Amount	Amount	Cumulative Amount
2006-2007	1134600	1134600	0	0
2007-2008	6011400	7146000	479428	4,79,428.00
2008-2009	1587000	8733000	2781418	3,26,0846.00
2009-2010	165000	8898000	4325000	7,58,5846.00
2010-2011	0	8898000	1312154	8,89,8000.00
Total	**8,89,8000**	**8,89,8000**	**8,89,8000**	**8,89,8000.00**

Sundarban

Bruguiera gymnorhiza

GOVERNMENT OF WEST BENGAL
OFFICE OF THE DIVISIONAL FOREST OFFICER
SILVICULTURE (SOUTH) DIVISION, MIDNAPORE

FRLHT

MEDICINAL PLANTS CONSERVATION AREA
BONNIE CAMP

UNDP

BONNIE
SUNDARIKATI ECO-CONSERVATION CAMP
RAIDIGHI RANGE
24-PARGANAS SOUTH DIVISION
SUNDERBAN BIOSPHERE RESERVE

PAST HISTORY

'Sunderbans'

The history of the area can be traced back to 200-300 AD. A ruin of the city built by Chand Sadagar has been found in the Baghmara Forest Block. During the Mughal Empire, Raja Basand Rai and his nephew took refuge in the Sunderbans from the advancing armies of Emperor Akbar. Many of the buildings which were built by them later fell to hands of Portuguese pirates, salt smugglers and dacoits in the 17th century. Evidence of the fact can be traced from the ruins at Netidhopani and other places scattered all over Sunderbans. During the Mughal period (1203-1538), the local kings leased the Forests of the Sunderbans out.

LOCATION INFORMATION

The area falls under compartment 7 of Ajmalmari block under Nalgora station Beat of Raidighi Range under 24 Parganas (South) Division. The MPCA area of 237.03Ha (103.51 (land) + 111.73 (water) = 237.03) is in reserved forest of the Bonniecamp area in Sunderbans. The Sunderbans Biosphere Reserve lies between Latitude 20°32' and 22°32' N and between Longitude 80°05' and 89° E covering an area of 9,630 Km² with an average altitude of 7.5mts.

UNIQUENESS OF THE MPCA

It is the first marine MPCA demarcated in India for 4 flagship species identified through RTA during CAMP in West Bengal. The area is demarcated by natural boundaries like Matla river on one side and other creeks on the other limits.

FOREST TYPE AND FLORAL DIVERSITY

As per Champion and Seth Classification the Major Group is Tropical, Group is 4 i.e., Littoral and Swamp Forests, Sub Group is 4B-Tidal Swamp Forests. The vegetation is peculiar to tidal swamps influenced primarily by salinity of water and secondarily by the nature of soil, tides and activities of the human agency.

The regions which are less saline may be included in the "Salt Water Heitiera Forest" type. They have upper storey composed of Gnewa, Passur, Dhundal and Sundari. Keora, Khalsi, Garan, Kankra,Tora and Baen are in mud blanks of river. Baen sometimes occurs almost pure. Pure patches of Tora are found above the blanks of rivers and khals. Pure patches of Hental are common on the dry elevated banks of river and creeks. Khalsi grows as bushes only on the edges of river and khals. The bil and maidan areas occupying the interior of the islands are either bare or occupied by very scattered dwarf (Jhamti) Garan, Baen and Tora. Golpata prefers the ever most mud blanks and is confined to a few blocks only. The new chars are covered mainly with Baen. The general height is 20-35 ft. The tallest tree in the type is Keora which attains a maximum height of about 50 ft.

The regions that are more saline may be included in the "Low Mangrove Forest" type. They have similar composition as preceding type except that Sundari and Golpata are almost absent and the height, growth and density are much lower. The formation of new chars and islands is common in this region. Dhani ghash appear first upon the newly formed chars and nurses Baen which is second in succession. When Baen is established, Genwa comes in gradually and it is only when Genwa attains a sufficient height that Goran comes as an understorey. Tora and other species come in the intermediate period.

Another structural characteristic of mangrove forests is the frequent absence of understory species, which are usually found in other forest system.

Xylocarpus Granatum Keon.

Nypa fruticans Wurumb

PROPOSED STRATEGIES AND ACHIEVEMENTS WITHIN AND OUTSIDE MPCA

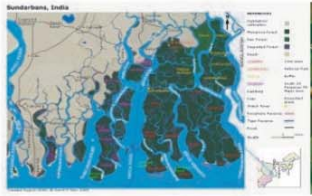
- Awareness to the local JFM villager by frequent meetings and training programmes for cultivation of medicinal plants along with the staff of local territorial Division
- Boards befitting the site as a special measure to make visitors aware. Putting up MPCA information related boards at various sites along the creeks around the demarcated MPCA for the benefit of information of the travelers by boats/launch etc. The area being Tiger habitat such steps have helped in disseminating information without having to get down in the demarcated area.
- Botanical survey, Inventorisation and plant specimen collection for Herbarium preparation was done for the site.
- As per enumeration (4 times) the demarcated MPCA is shown to have 30 species. Among these 16 Trees, 7 Shrubs, 4 Herbs, 2 Palms and 1 Grass species were identified.
- 2 fresh water tanks and a road approx. 1 Km was the works executed as entry point activities under the project.

Tiger Prawn Collection

Salinity testing

IMPORTANCE OF BONNIECAMP MPCA

- Of the 4 flagship species for study at the site after RTA it was found that all 4 were present in the demarcated site of the MPCA.
- Among the 4 flagship species *Sonneratia caseolaris* (L.) Engl. under IUCN Criteria - A2cd Status- EN. and *Nypa fruticans* Wurumb., *Xylocarpus granatum* Koen. and *Lumnitzera racemosa* Willd., under IUCN Criteria - A2cd Status- VU
- The species observed in the demarcated Bonnie Camp MPCA were 30. It has all the four flagship species in the same island though the population of *Sonneratia caseolaris* (L.) Engl. was very poor.
- Medicinal plants in the area are a part of traditional health care systems since the ancient times. The locals have amazing knowledge about these herbs and trees in curing various diseases. However the rich knowledge requires systematic documentation. Medicinal plants were seen cultivated in some areas adjacent to the MPCA.
- The wild populations of the species in the MPCA are of specific ecological importance as the site is an island and a part of mangrove system of sunderbans.
- People enter the area to collect firewood, honey, bees wax, tiger prawn seeds etc. These activities cause damage to the mangrove forest and also to the ecosystem as a whole and regeneration of many species.



Sonneratia caseolaris (L.) Engl

HOW TO REACH

To reach the site one has to reach Raidighi that is about 96 km from Diamond Harbour and 130 km from Kolkata. From Raidighi boat journey is needed to reach Bonnie camp that takes 4 hours.

The visitors who visit the Bonnie Camp Ecotourism spot would be halting near the MPCA and can visit the site while their stay at the site.

Tiger Pug Marks

June, 2010

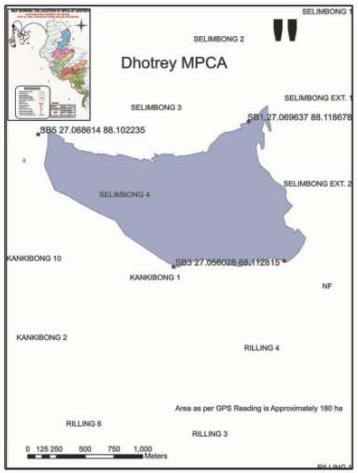
Designed by :- Dr. Anupama, IFS / DFO / Silvi(S) Divn. :: Prepared by :- Anjan Kar

GOVERNMENT OF WEST BENGAL
OFFICE OF THE DIVISIONAL FOREST OFFICER
SILVICULTURE (HILLS) DIVISION, DARJEELING

MEDICINAL PLANT CONSERVATION AREA
DHOTREY

Location & General Information:

Dhotrey MPCA is situated within the Reserved Forest falling under Dhotrey Range,Darjeeling Forest Division.The MPCA is located at Latitude 27°06.8'6.14"N & Longitude 88°11.8'6.7"E. with an altitudinal variation from 1923-2665m (asl). It has an approximate area of 180 ha.

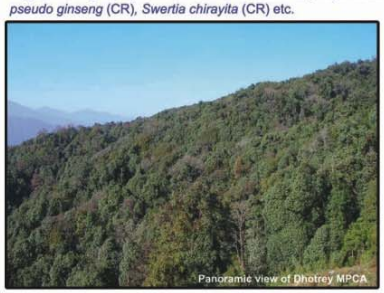


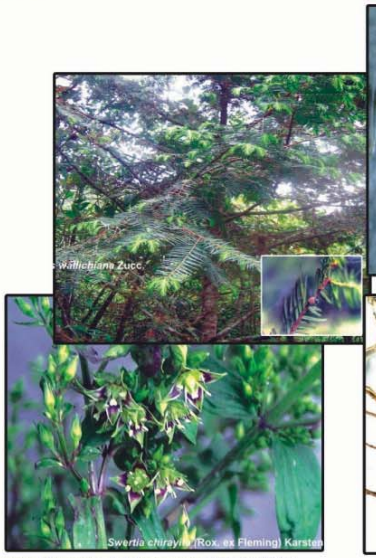
Forest Type & Floral Diversity:

The MPCA area falls within the 10b/CI-East Himalaya Wet Temperate forest of Northern Wet Temperate group (Champion and Seth Classification). The area is rich in floris tic diversity, consisting species of trees, species of shrubs & climbers and more than species of herbs The major tree species as per recent floristic survey appear to be are *Lithoscarpus pachyphylla, Quercus lineata, Rhododendron spp.* etc. Among the shrubs and climbers *Daphne papyraceae, Rubus spp.* etc.

Importace of Dhotrey MPCA

- Existence of more than 40% of the assessed medicinal plant species under different threat category.
- There is long traditional of local use of medicinal plants and people have a vast knowledge of their uses, which requires a systematic documentation.
- Medicinal Plants are over exploited due to excessive demand as evident from the result or RTA.
- The wild populations of high altitude medicinal plants are with specific ecological requirement.
- The Dhotrey MPCA having altitude variation of 1923-2665m is capable of capturing viable population for majority of the targeted & flagship species viz. *Taxus wallichiana* (CR), *Panax pseudo ginseng* (CR), *Swertia chirayita* (CR) etc.


Panoramic view of Dhotrey MPCA




Panax pseudo-ginseng Wall.


Rhizome of Panax pseudo-ginseng Wall.

Proposed Strategies & Achievement within the MPCA

Awareness to the local JFMC villager with by conducting frequent meetings before any activities.

Construction of 'entry gate' befitting to the site as a special measure to make visitors aware.

Weed & Fire Control measures.

Soil & Water Conservation.

Botanical Survey, inventorisation & plant collection for Herbarium preparation completed. As per enumeration about 55 species of trees, 35 species of shrubs & climbers, 40 species of herbs were identified.

A concise hand book in local vernacular language viz. 'Darjeeling Parbatiya Chetraka Kehi Durlavh Aushaydhiya Vanashpati' has already been pulbished.

How to Reach:

From Siliguri Ghoom Railway Station & Dhotrey Forest Village via Sukhia by Taxi / Bus 117 km. and from Darjeeling town 56 km.

From Dhotrey Forest Village 3 km. on foot.

Divisional Forest Officer, Silviculture (Hills) Division, Shankar Villa, Ladenla Road, Darjeeling - 734 101
Phone No. & Fax 0354-2252372 (O), email- silviculturehillsdivision@gmail.com

Photo: D.B. Basnet, WBFS
Designed: Sachin Rai / Parasmani Barmay

Rauvolfia serpentine (L).Benth. ex Kurz.

GOVERNMENT OF WEST BENGAL
OFFICE OF THE DIVISIONAL FOREST OFFICER
SILVICULTURE (SOUTH) DIVISION, MIDNAPORE

FRLHT

MEDICINAL PLANTS CONSERVATION AREA GARPANCHAKOT

UNDP

PAST HISTORY

'Garpanchkot'

The name Garpanchkot is derived from the hillock in the area called Panchkot Giri, which has a village by name 'Garpanchkot' in the valley towards its southern direction.

Geologically the area is a part of ancient Gondwana Lands with lot of alluvial deposits and lateritic soils. It falls in the district of Purulia.

Story behind the Ruins

In the ancient times the area was part of East Indian Kingdom known as Rajchakla Panchkot, locally called 'Panchet'. Damodar Shekhar, a descendant of Vikramaditya in 81A.D, laid down the foundation of the empire. Memoirs of 1st Lt. Governor of Bengal Sir Fredrick James Halliday mentions the battle of Purulia Raja Nilmani with Britishers. The Raja was captured by Capt. Oaks while leading the Santhal revolt. The remnants of temples, pillars, etc., in close proximity to hillock, speak the story of these battles and other incidents. Ruins clearly depict extensive terracotta work prevalent in those times. Many such works have survived the vagaries of battles and nature till date

LOCAL CULTURAL TRADITIONS/FOLK CULTURE

Bhadoo and Tusu are the important local festivals in this area. Holi is celebrated with gaiety in the temple of Birinchi Baba.

LOCATION INFORMATION

The area falls under Neturia Beat of Raghunathpur Range under Kangsabati North Division. The MPCA area of 250 Ha is in protected forest of the Garpanchakot hillock (Latitude 23° 37' N and Longitude 86° 37' E and maximum altitude 643 mt).

FOREST TYPE AND FLORAL DIVERSITY

Major Forest type is 5B/CIC (Champion and Seth Classification) that is distributed over the districts of Purulia. The forest management is based on Participatory Forest Management / JFM and the Silvicultural system followed is Coppice with reserves.

It is a Dry Deciduous forest is found in red laterite tract and is species-rich. These forests assume unusual significance for conservation since they are also the most depended on and used and hence the most threatened ecosystems. The common trees here are *Shorea robusta, Madhuca indica, Bridelia squamosa, Buchanania lanzan, Schleichera oleosa, Terminalia arjuna. T. chebula, Butea monosperma, Cochlospermum religiosum, Sterculia urens, Haldina cordifolia,* etc. The hillock is well stocked with the vegetation and the altitudinal variations are also seen from bottom to top of the hillock.

The major components of forest include Sal in Top storey and Sal with associates in Middle storey. The shrubs and herbs include Akanda, Atari, Bhant, Sarpagandha, Bankul etc. and the climbers include Alkusi, Lathpalash, Dudhilata etc. The crown density is medium (0.5-0.6) and the age structure of dominant species is 50-55 years.

***Morinda citrifolia* Linn.**

***Gloriosa superba* Linn.,**

IMPORTANCE OF GARPANCHAKOT MPCA

- Of the 11 flagship species for study at the site after RTA it was found that 10 were present in the demarcated site of the MPCA.
- Among the 10 flagship species *Pterocarpus marsupium* Roxb ., *Rauvolfia serpentine* (L).Benth. ex Kurz., *Asparagus racemosus* Willd., *Celastrus paniculatus* Willd. and *Mucuna pruriens* (Linn.) DC. are among the IUCN Criteria - A2cd Status- EN. *Aristolochia indica* Linn., *Gloriosa superba* Linn., *Gymnema sylvestre* (Retz) R.Br.ex Schult. and *Morinda citrifolia* Linn. are among the IUCN Criteria - A2cd Status- VU. *Litsea glutinosa* (Lour.) C.B.Robins. is under IUCN Criteria - A2cd Status- LC
- The species diversity in such a small area is very high. 210 species in the MPCA which was demarcated out of the vegetative rich Garpanchakot hillock that is 1340.42 m^2 (13.40 sq.km.) in area. So the MPCA area significantly samples out the vegetation of the Garpanchakot hillock and the area as a whole.
- Medicinal plants in the area are a part of traditional health care systems since the ancient times. The locals have amazing knowledge about these herbs and trees in curing various diseases. However the rich knowledge requires systematic documentation.
- Medicinal plants are overexploited due to excessive demand as evident from the results of RTA
- The wild populations of the species in the MPCA are of specific ecological importance as the site is a hillock and is one of the prominently vegetative rich areas in the whole location.

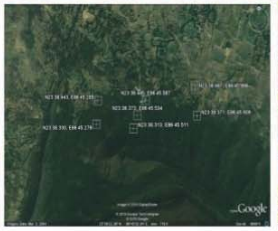
PROPOSED STRATEGIES AND ACHIEVEMENTS WITHIN AND OUTSIDE MPCA

- Awareness to the local JFM villager by frequent meetings and training programmes for cultivation of medicinal plants along with the staff of local territorial Division
- Construction of 'Entry Gate' befitting the site as a special measure to make visitors aware.
- The location (latitude and longitude) within the demarcated MPCA was shown at prominent sites for visitors.
- Weed and fire control measures and engagement of locals as fire watchers.
- Botanical survey, Inventorisation and plant specimen collection for Herbarium preparation was done for the site.
- As per enumeration (4 times) the demarcated MPCA is shown to have 210 species. Among these 50 Trees, 33 Shrubs, 110 Herbs and 17 Climber species were identified.
- An earthen dam and a road approx. 1 Km to Baghmara village was the works executed as entry point activities under the project.

HOW TO REACH

The site is about 300 km from NSCB Airport. It can be reached from Kolkata (Howrah) by train and the nearest station is Adra which is about 32 km. By road one has to hire a taxi to reach the site and it is about 24 km from Raghunathpur town in Purulia District or about 45 km from Asansol town. The nearest village to the site is Baghmara and it is about a kilometer away.

The visitors who visit the WBFDCLtd. Nature Resort of Garpanchakot would be halting at the base of the hillock where the MPCA is located. They can visit the site while their stay at the Nature Resort.



June, 2010

Designed by :- Dr. Anupama, IFS / DFO / Silvi(S) Divn. :: Prepared by :- Anjan Kar

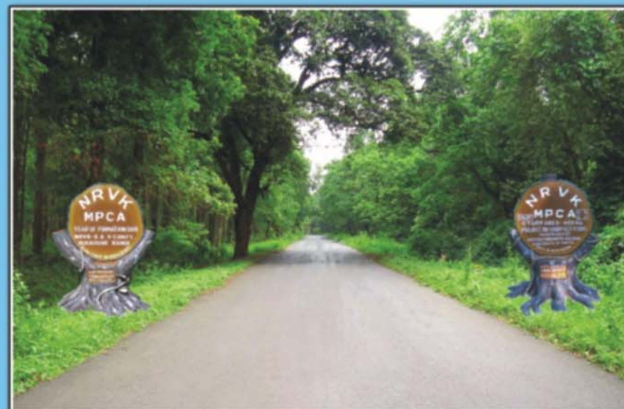
NORTH SEVOKE MEDICINAL PLANT CONSERVATION AREA (MPCA)
Project - UNDP/CCF-II / No. -13047
Management practices within MPCA:
• Suspension of all harvesting operation.
• Fire Management (Making fire line along the periphery as per field condition).
• Botanical Inventorization as resource study includes collection of plant specimens in three different seasons of a year , preparation of herbarium sheets and identification of specimens by an Expert group of Taxonomist of North Bengal University.
• Awareness Workshop/Meeting.
• Preparation of Management Plan.
• GPS survey and Mapping.
• Construction of Gate / Signage / Display Board.
• JFM Support Activities for MPCA associated FPC/EDC members.
Photographs of Important Species in NORTH SEVOKE MPCA
LOCATION MAP OF NORTH SEVOKE MPCA
Demographic features of NORTH SEVOKE MPCA:
Project Implemented by: Silviculture (North) Division
Project duration : 2006-07 to 2009-10
Study area: 100 ha.
Forest Division: Wild Life Division – I, Darjeeling
Forest Block/Compartment: North Sevoke – I (a).
Legal status of MPCA: Study area within plains timber working circle of Mahananda Wild Life Sanctuary.
District: Darjeeling. Sub-Division: Kurseong.
Lat: 26°37'27" N, Long: 88°12' 88° E, Gradient: Gentle
Aspect: Southern, Soil: Alluvial soil with gravel.
Altitude: 190 Mt. Above MSL, Configuration: Even
Near by Village and EDC: 10th Mile FV & Sevoke Bazar
JFM Support Activity: Erection of energised fencing for protection of school from wild elephants and also decorators item for income generation of community.
List of Important Species in NORTH SEVOKE MPCA
Botanical Name | Common Name | Family | Threat Status
Abelmoschus moschatus | Mashdana | Malvaceae | NT
Alpinia calcarata | Tezoni | Zingiberaceae | EN
Alstonia scholaris | Chhatim | Apocynaceae | LC
Asparagus racemosus | Setamuli | Asparagaceae | VU
Celastrus paniculatus | Malkangni | Celastraceae | EN
Costus speciosus | Bet lauro | Costaceae | LC
Curculigo recurvata | Talmuli | Hypoxidaceae | VU
Cinnamomum cecidodaphnae | Malogiri | Lauraceae | VU
Chlorophytum arundinaceum | Makjohel | Anthericaceae | VU
Curcuma aromatica | Jangli haldi | Zingiberaceae | Abundant
Desmodium triquetrum | Kodalia | Fabaceae | LC
Elephantopus scaber | Gojiyleta | Asteraceae | Abundant
Gymnema sylvestre | Gurmar | Asclepiadaceae | VU
Helminthostachys zeylanica | Ekkir | Helminthostachyaceae | EN
Holarrhena pubescens | Kurchi | Apocynaceae | Abundant
Litsea glutinosa | Sil-kimer | Lauraceae | LC
Persea gloveosceas | Kawla | Lauraceae | CR
Solanum torvum | Goth begun | Solanaceae | Abundant
Solanum khasianum | Tita Begun | Solanaceae | Abundant
Stereospermum colais | Padri | Anacardiaceae | VU
Abbr: NT - Near threatened, EN - Endangered, VU-Vulnerable, LC - Least Concerned, CR - Critically Endangered

NORTH RAJABHATKHAWA MEDICINAL PLANT CONSERVATION AREA (MPCA)

Project - UNDP/CCF-II / No. -13047

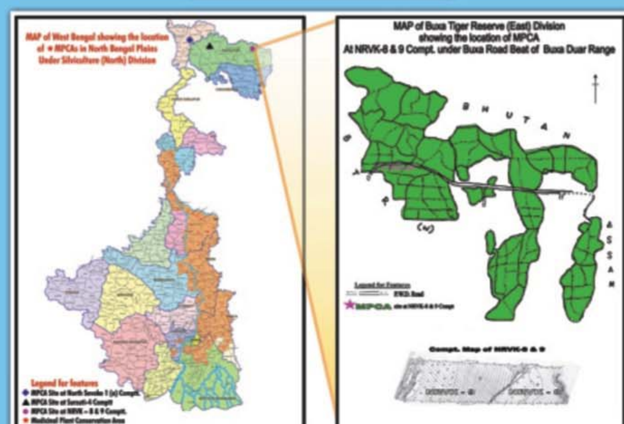
Management practices within MPCA:

- Suspension of all harvesting operation.
- Fire Management (Making fire line along the periphery as per field condition).
- Botanical Inventorization as resource study includes collection of plant specimens in three different seasons of a year , preparation of herbarium sheets and identification of specimens by an Expert group of Taxonomist of North Bengal University.
- Awareness Workshop/Meeting.
- Preparation of Management Plan.
- GPS survey and Mapping.
- Construction of Gate / Signage / Display Board.
- JFM Support Activities for MPCA associated FPC/EDC members.



Photographs of Important Species in NRVK MPCA

LOCATION MAP OF NRVK MPCA



Demographic features of NRVK MPCA:

Project Implemented by: Silviculture (North) Division
Project duration : 2006-07 to 2009-10
Study area: 400 ha.
Forest Division: Buxa Tiger Reserve (East)
Forest Compartment: NRVK – 8 & 9.
Legal status of MPCA: Reserve Forest, within buffer zone of Buxa Tiger Reserve, Bio-diversity conservation working circle.
District: Jalpaiguri, Sub-Division: Alipurduar.
Lat: 26°41' N Long: 89°33' E
Aspect: Southern Gradient: Gentle Soil: Sandy loam
Altitude: 158 Mt. Above MSL
Near by Village and EDC: 28th Mile FV & Buxa Road EDC
JFM Support Activity: Construction of Community Hall at Buxa Road Forest Village.

List of Important Species in NRVK MPCA

Botanical Name	Common Name	Family	Threat Status
Abelmoschus moschatus	Maskdana	Malvaceae	NT
Ampelocissus barbata	Jarila-lahara	Vitaceae	EN
Aristolochia indica	Isharmul	Aristolochiaceae	VU
Asparagus racemosus	Satamuli	Asparagaceae	EN
Celastrus paniculatus	Mulkangni	Celastraceae	EN
Cinnamomum bejolghota	Ram tespat	Lauraceae	VU
Cinnamomum cecidodaphnae	Malagiri	Lauraceae	EN
Discorea prazeri	Tarul	Dioscoreaceae	EN
Drosera burmanii	Surija-sisir	Droseraceae	EN
Gynocardia odorata	Chalmoogra	Flacourtiaceae	EN
Helminthostachys zeylanica	Ekbir	Helminthostacaceae	EN
Litsea glutinosa	Sil-timur	Lauraceae	LC
Lycopodiella cernua	Nagbeli	Lycopodiaceae	EN
Mesua ferrea	Nageswar	Clusiaceae	EN
Mucuna pruriens	Alkushi	Fabaceae	EN
Ophioglossum reticulatum	Ektir	Ophioglossaceae	EN
Pericampylus glaucus	Pipal pati	Menispermaceae	VU
Persea glaucescens	Kawla	Lauraceae	CR
Pterocarpus marsupium	Pia sal	Sterculiaceae	EN
Toona ciliata	Toon	Meliaceae	VU

Abbr: NT - Near threatened, EN - Endangered, VU-Vulnerable, LC - Least Concerned, CR - Critically Endangered

SURSUTI MEDICINAL PLANT CONSERVATION AREA (MPCA)

Project - UNDP/CCF-II / No. -13047

Management practices within MPCA:

- Suspension of all harvesting operation.
- Fire Management (Making fire line along the periphery as per field condition).
- Botanical Inventorization as resource study includes collection of plant specimens in three different seasons of a year , preparation of herbarium sheets and identification of specimens by an Expert group of Taxonomist of North Bengal University.
- Awareness Workshop/Meeting.
- Preparation of Management Plan.
- GPS survey and Mapping.
- Construction of Gate / Signage / Display Board.
- JFM Support Activities for MPCA associated FPC/EDC members.

Photographs of Important Species in SURSUTI MPCA

LOCATION MAP OF SURSUTI MPCA

Demographic features of SURSUTI MPCA:

Project Implemented by: Silviculture (North) Division
Project duration : 2006-07 to 2009-10
Study area: 100 ha.
Forest Division: Jalpaiguri Forest Division.
Forest Block/Compartment: Sursuti - 4.
Legal status of MPCA: Reserve Forest area under Bio-diversity Working Circle.
District: Jalpaiguri, Sub-Division: Malbazar.
Lat: 26°48' N, Long: 88°49' E, Gradient: Gentle
Aspect: Southern, Soil: Alluvial soil with gravel.
Altitude: 165 Mt. Above MSL, Configuration: Even
Near by Village and FPC: Bichabhanga & Kumarpara FPC.
JFM Support Activity: Construction of Watch Tower & Maintenance of forest road for the nearby Forest village.

List of Important Species in SURSUTI MPCA

Botanical Name	Common Name	Family	Threat Status
Abelmoschus moschatus	Muskdana	Malvaceae	NT
Alpinia calcarata	Toroni	Zingiberaceae	EN
Angelesissus barbata	Mikrom-dik	Vitaceae	EN
Celastrus paniculatus	Malkangni	Celastraceae	EN
Cinnamomum bejolghota	Ram Tejpat	Lauraceae	VU
Cinnamomum cecidodaphnae	Medogini	Lauraceae	EN
Dillenia indica	Chalta	Dilleniaceae	Abundant
Desmodium motorium	Ban chandul	Fabaceae	VU
Gynocardia odorata	Chaulmoogra	Flacourtiaceae	EN
Gymnema sylvestre	Gurmar	Asclepiadaceae	VU
Helminthostachys zeylanica	Ekkir	Helminthostaceae	EN
Litsea glutinosa	Sil-Timur	Lauraceae	LC
Lycopodiella cernua	Nag Beli	Lycopodiaceae	EN
Mesua ferrea	Nageswar	Clusiaceae	EN
Mucuna pruriens	Alkushi	Fabaceae	EN
Ophioglossum reticulatum	Ekkir	Ophioglossaceae	EN
Periconpsis glauca	Pipal Pati	Menispermaceae	VU
Persea glaucescens	Kawla	Lauraceae	CR
Rauvolfia serpentina	Sarpagandha	Apocynaceae	EN
Stereospermum colais	Padri	Bignoniaceae	VU

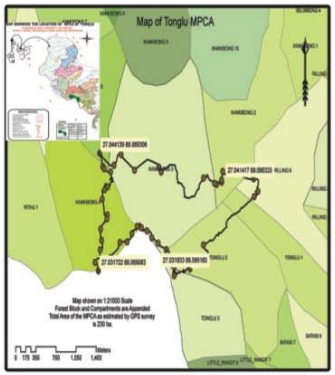
Abbr.: NT – Near Threatened, EN – Endangered, VU-Vulnerable, LC – Least Concerned, CR – Critically Endangered

OFFICE OF THE DIVISIONAL FOREST OFFICER
SILVICULTURE (HILLS) DIVISION, DARJEELING

MEDICINAL PLANT CONSERVATION AREA
TONGLU

Location & General Information:

Tonglu MPCA is situated within the Reserved Forest falling under Tonglu & Dhotrey Range, Darjeeling Forest Division. The MPCA is located at Latitude 27° 01'52.8"N & Longitude 88° 04'14.4"E with an altitudinal variation from 2600-3036m (asl). It has an approximate area of 230 ha.



Forest Type & Floral Diversity:

The MPCA area falls within the 11/CI (c)-Eastern Himalayan Moist Temperate group (Champion and Seth Classification, 1968). The area is rich in floristic diversity, consisting of Sub-alpine scrub dominated by *Rhododendron spp.*, *Viburnum erubescense*, *Sympolocos spp.*, *Lyonia villosa*, *L. ovalifolia*, *Daphne bholua* etc. including targeted flagship species of medicinal plants.


Survey team busy with the field work

Importance of Dhotrey MPCA

- Existence of more than 40% of the assessed medicinal plant species under different threat category.
- There is long traditional of local use of medicinal plants and people have a vast knowledge of their uses, which requires a systematic documentation.
- Medicinal Plants are over exploited due to excessive demand as evident from the result or RTA.
- The wild populations of high altitude medicinal plants are with specific ecological requirement.
- The Tonglu MPCA having altitude variation of 2600-3036m is capable of capturing viable population for majority of the targeted & flagship species viz. *Aconitum bisma* (EN), *Aconitum ferox* (EN), *Aconitum spicatum* (EN), *Berberis aristata* (VU), *Panax pseudo ginseng* (CR), *Picrorhiza kurroa* (CR), *Podophyllum hexandrum* (CR), *Swertia chirayita* (CR), *Thalictrum foliolosum* (CR) *etc.*


Panoramic view of Tonglu MPCA


Aconitum bisma (Buch. Ham) Rap


Aconitum spicatum (Brühl) Stapf

Proposed Strategies & Achievement within the MPCA

Awareness to the local JFMC villager with by conducting frequent meetings before any activities.

Construction of 'entry gate' befitting to the site as a special measure to make visitors aware.

Weed & Fire Control measures.

Soil & Water Conservation.

Botanical Survey, inventorisation & plant collection for Herbarium preparation completed. As per enumeration about 47 species of trees, 27 species of shrubs & climbers, 108 species of herbs were identified.

A concise hand book in local vernacular language viz. 'Darjeeling Parbatiya Chetraka Kehi Durlavh Aushaydhiya Vanashpati' has already been pulbished.


Panax pseudo-ginseng Wall.


Thalictrum spp.

How to Reach:

From Siliguri Ghoom Railway Station & Tonglu Forest Village via Sukhia & Manebhyanjyang by Taxi 130 km. and from Darjeeling town 50 km.

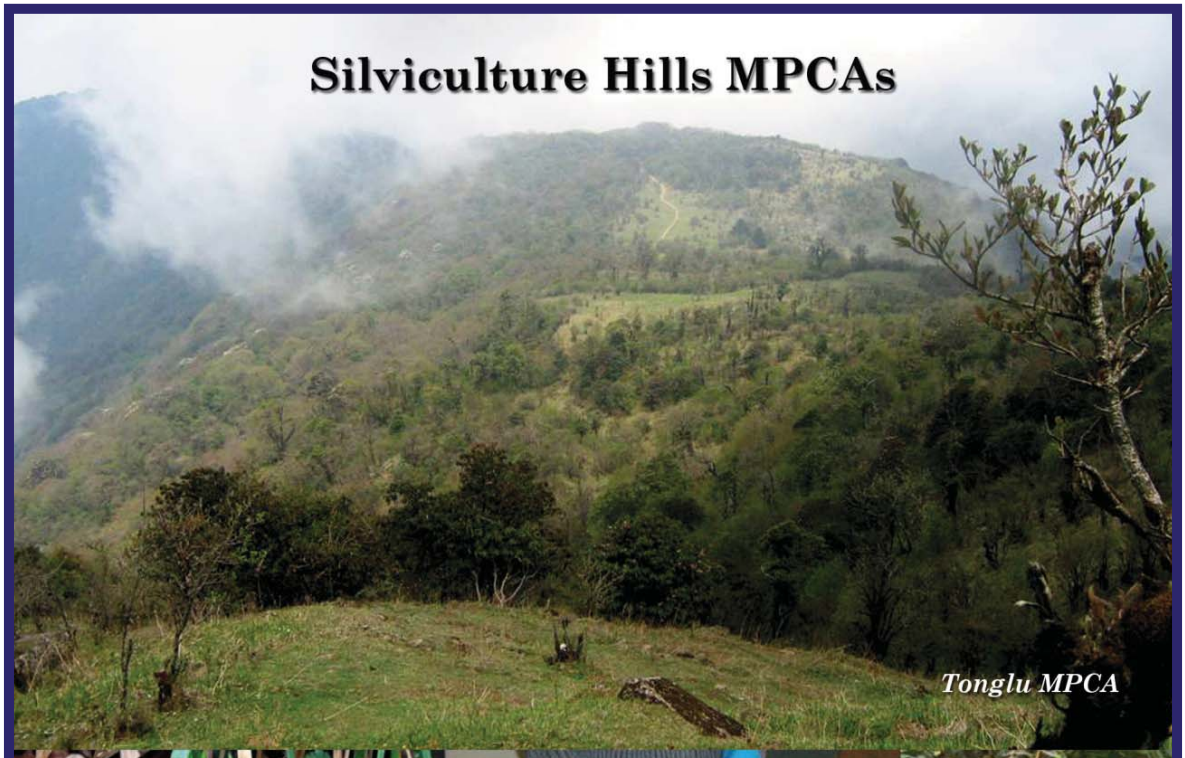
From Manebhyajyang 19 km. by Landrover.


Aconitum spp.

Divisional Forest Officer, Silviculture (Hills) Division, Shankar Villa, Ladenla Road, Darjeeling - 734 101
Phone No. & Fax 0354-2252372 (O), email- silviculturehillsdivision@gmail.com

Photo: D.B. Basnet, WBFS
Designed: Sachin Rai / Parasmani Barmay

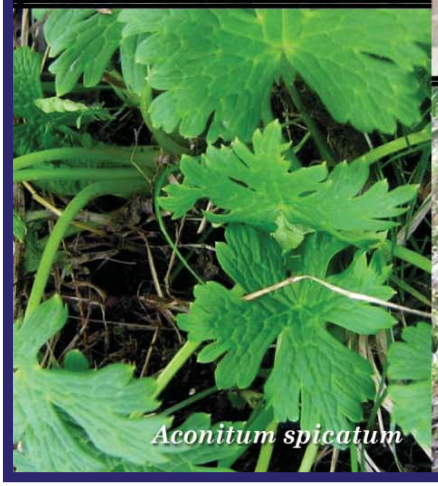
Silviculture Hills MPCAs


Tonglu MPCA

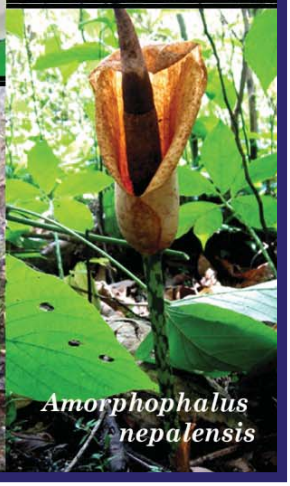

Panax pseudoginseng


Herbarium preparation

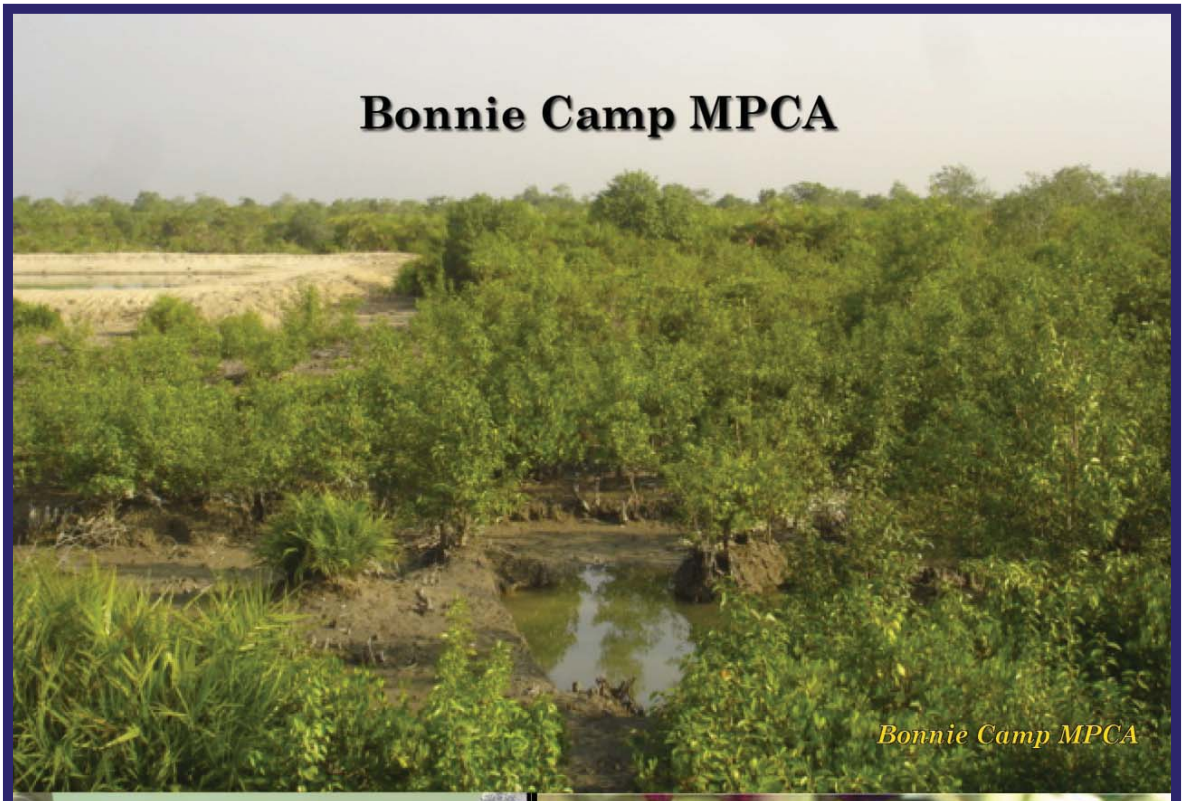

Taxus wallichina


Aconitum spicatum


Field Inventorization


Amorphophalus nepalensis

Bonnie Camp MPCA

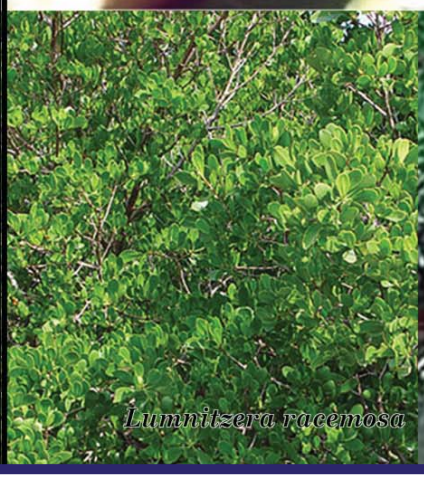


Bonnie Camp MPCA

Staff of Forest Department

Xylocarpus granatum

Sample collection for testing

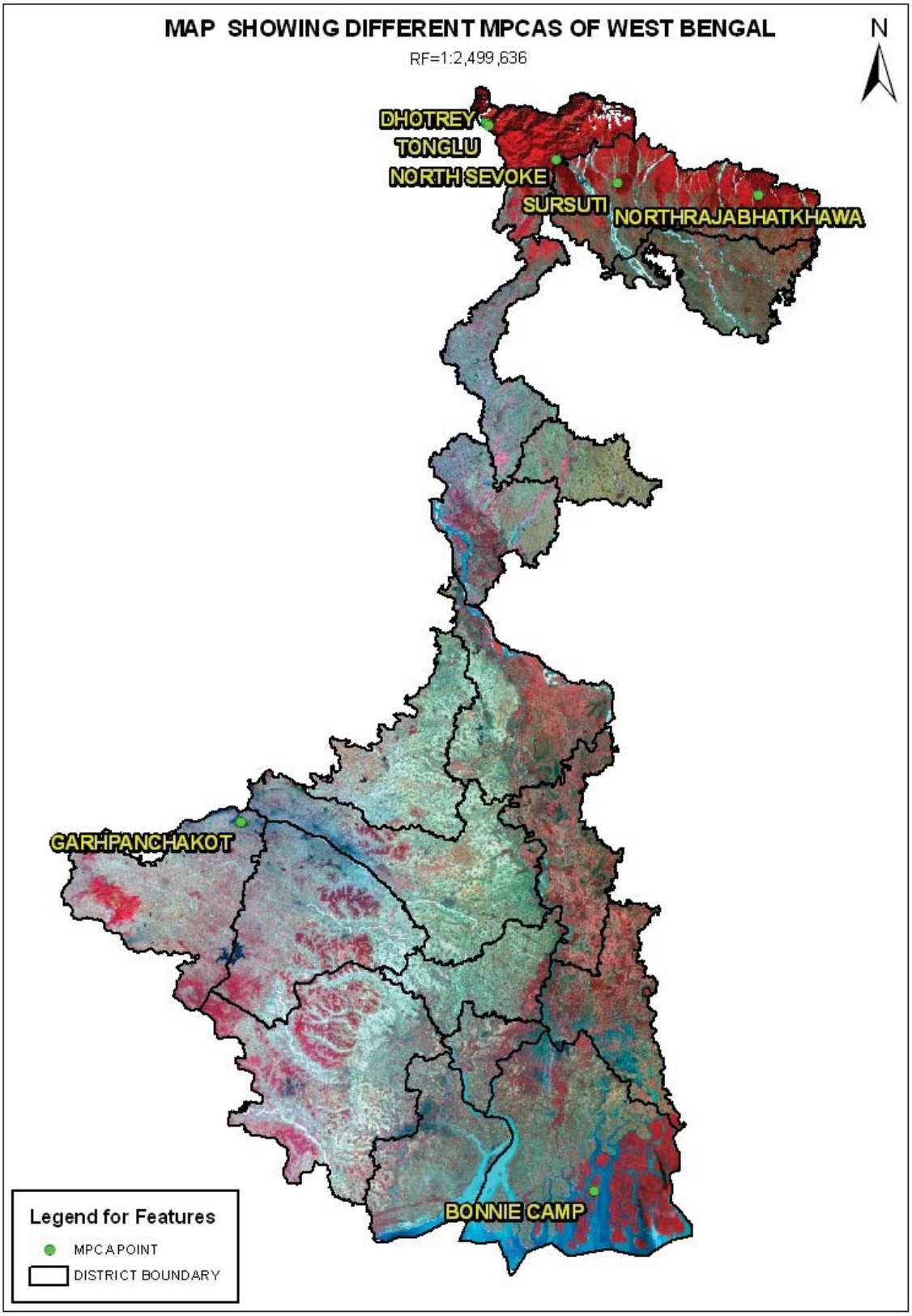


Lumnitzera racemosa

Nipa fruticans


Garpanchkot MPCA
Garpanchkot MPCA
Garpanchkot MPCA
Garpanchkot MPCA
Gymnema sylvestre
Banashramik during inventorization
Aristolochia indica


Silviculture North MPCAs
Rauwolfia serpentina
Gynocardia odorata
Celastrus paniculatus
Morinda citrifolia
Cinnamomum bejolghota
Asparagus racemosus


MAP SHOWING DIFFERENT MPCAS OF WEST BENGAL
RF=1:2,499,636
N
DHOTREY
TONGLU
NORTH SEVOKE
SURSUTI
NORTHRAJABHATKHAWA
GARHPANCHAKOT
BONNIE CAMP
Legend for Features
MPCA POINT
DISTRICT BOUNDARY