

CHAPTER - 1

INTRODUCTION OF THE AREA

1.1 Name, location, constitution and extent

Kurinjimala Sanctuary was notified on 6th October, 2006 vide GO (MS) NO.36/06/Forest of the Government of Kerala (Annexure I) with objective of long term conservation of plant species namely Neelakurinji (*Strobilanthes kunthianus*). The Sanctuary is located on the eastern slopes of the Vattavada valley of the High Ranges of the Southern Western Ghats of Kerala and shares its boundary with Kodaikanal Forest Division of Tamil Nadu. It is located 40 Kms away from Munnar town. Location map given in Map. 1. The approximate extent is 32km². The area was formerly revenue *poromboke* in Block No. 58 of Kottakombur village and Block No. 62 of Vattavada village in Devikulam taluk of Idukki District. It was under the territorial jurisdiction of Marayur Range of Munnar Forest Division. As this area was revenue land, a significant portion of the sanctuary was encroach or obtained on fake documents by the people. A Forest Settlement Officer was appointed in 2007 as per the provision contained in their wildlife (protection) act, 1972 to look into all the claims and settle the rights within the notified area. The actual extent of the Sanctuary would be determined only after settlement of rights in and over the land. The google map and map of Kurinjimala sanctuary given in Map. 2 and Map. 3

1.2 Approach and access

The Sanctuary lies proximate to the villages of Vattavada, Kottakombur and Kovilur. It is situated about 40 Km. from Munnar town and accessible from Kochi (176 km) and Coimbatore (160 km) airports along main roads. The nearest railway station in Kerala is Aluva (180km) in kerala and Udumalpettai (120 km) in Tamilnadu. There is a fair weather extraction road from Kottakombur to Kadavary that was created by HNL. The local people from Kadavary use this route to Kottakombur. The Office of the Asst. Wildlife Warden is situated at Top Station and the Wildlife Warden's office is at Munnar.

1.3 Statement of significance

Kurinjimala Sanctuary is located in the uppermost regions of the southern Western Ghats between High Ranges and the Palani Hills. The area is home to vast stretches of *Neelakurinji*, a shrubby flowering plant which flowers gregariously flowering once in twelve years and convert the entire valleys with a blanket of bluish flowers. The beauty of gregarious flowering of Neelakurinji attracts thousand to the valley.

1.3.1 FLAGSHIP SPECIES OF KURUNJIMALA SANCTUARY

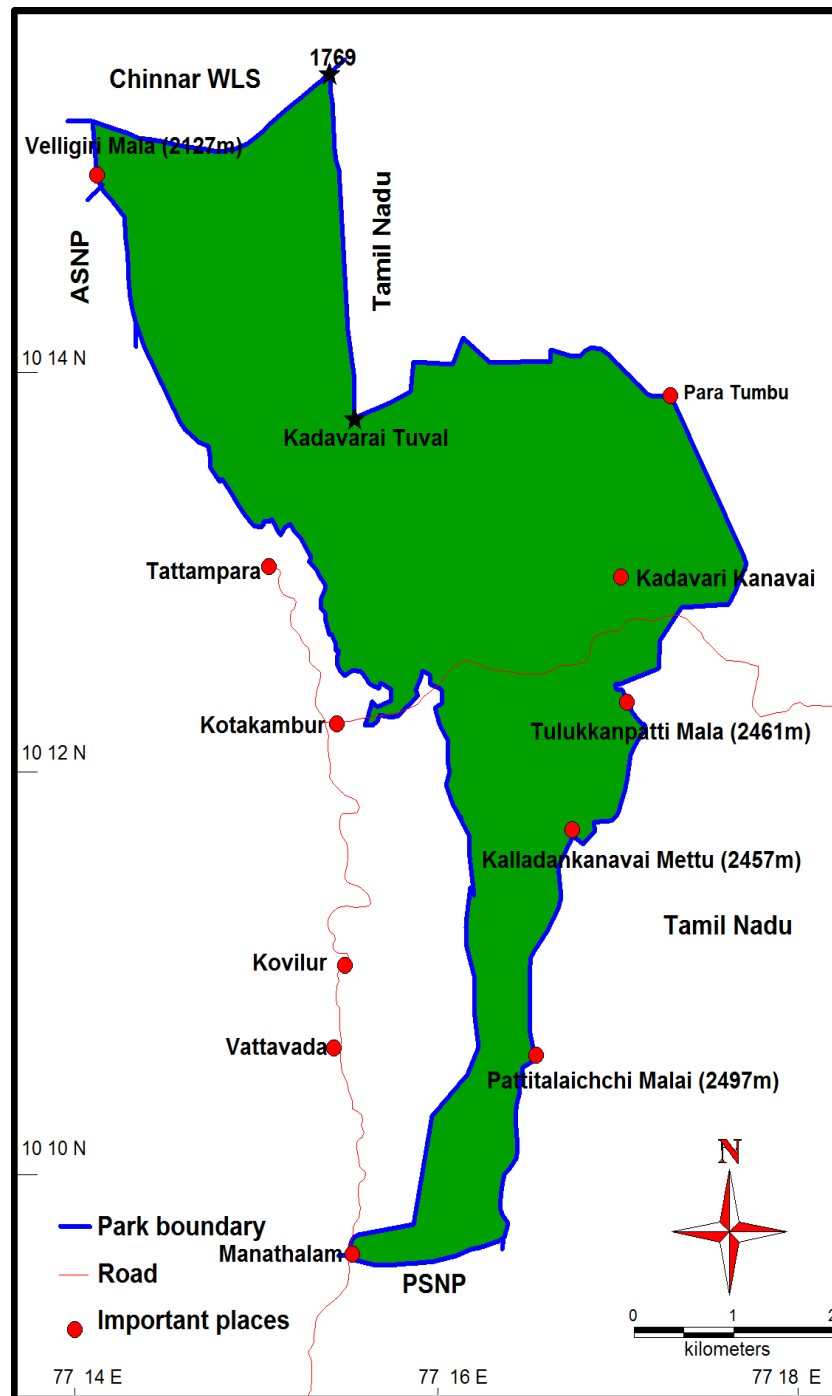


Fig : 1 Neelakurinji (*Strobilanthes kunthiana*)

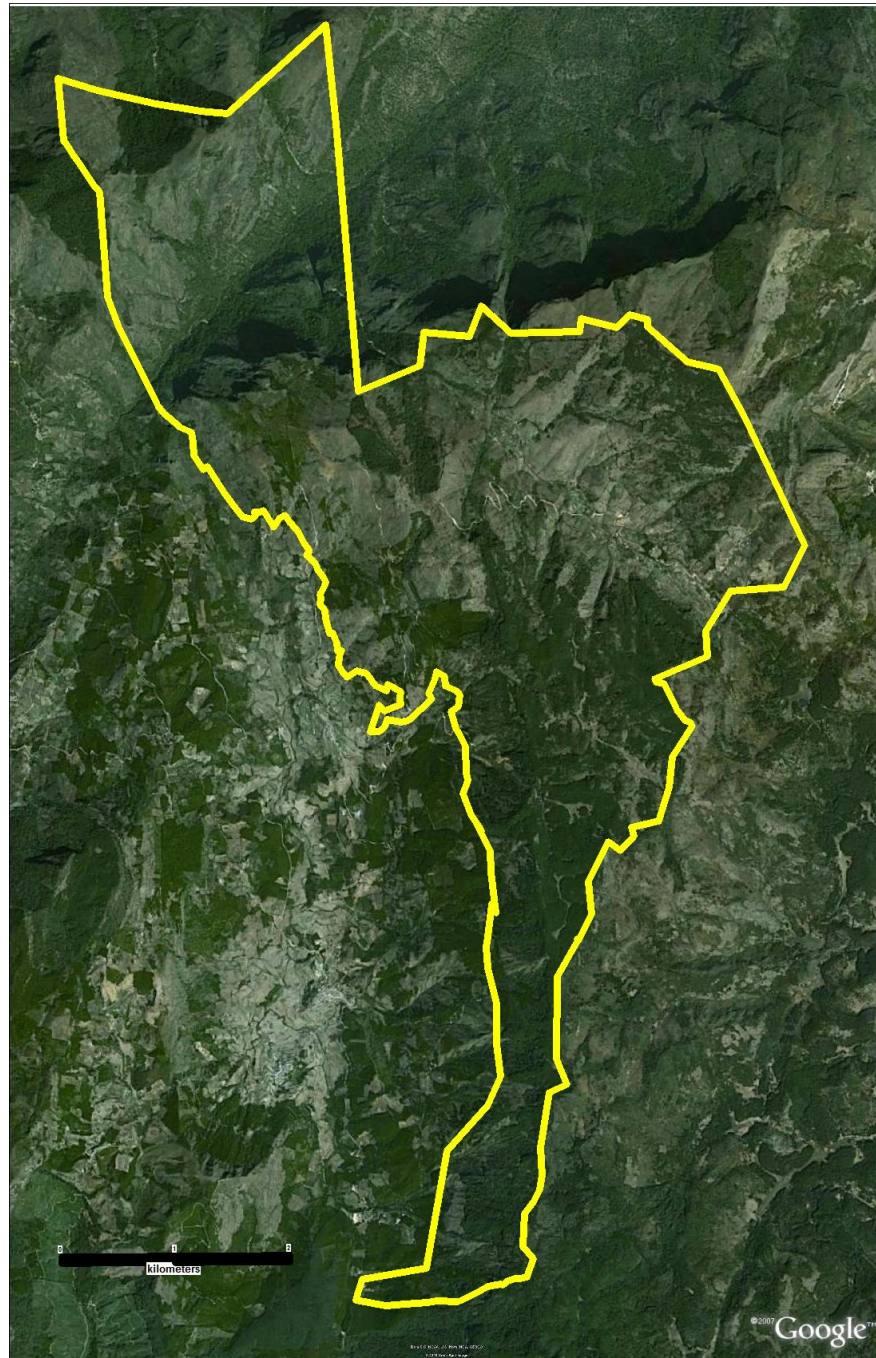
Neelakurinji (*Strobilanthes kunthiana*) is a shrub that grows abundantly in the Shola grasslands of the Western Ghats in South India above 1800 meters. The Nilgiri Hills, which literally means the blue mountains got their name from the purplish blue flowers of Neelakurinji that blossoms gregariously only once in 12 years. This plant belongs to the genus *Strobilanthes* which was first scientifically described by Nees in the 19th century. The genus has around 250 species, of which at least 46 are found in India. Most of these species show an unusual flowering behaviour, varying from annual to 16-year blooming cycles.

Kurunjimala Sanctuary was established to ensure the long term protection of the unique biodiversity of the area and the species in particular.

Map 2 : Kurinjimala sanctuary



Map. 3 : Kurinjimala sanctuary in Google earth



It is the first protected area of its kind in the state to be declared for the conservation of the flowering plant. Apart from being a prime habitat of Kurinji, the sanctuary is a potential habitat of an amazing variety of plant species, many of which are characteristic to the high altitude grassland. It is also home to a number of large mammals viz. Tiger, Leopard, Elephant, Gaur, Neelagiri thar and Sambar.

The Sanctuary is contiguous to Chinnar Wildlife Sanctuary to the north, Manjappetty National Park of Anamalai Tiger Reserve to the north-east, Anamudi

shola National Park to the north-west, Pampadum shola National Park to the south and the proposed Palani Hills National Park to the east and thus form a vast stretch of high altitude shola and grass land ecosystem of high ecological, floral, faunal and geo morphological significance. The area is also significant as an eco sensitive landscape which requires eco restoration activities due to its ecological, floral, hydrological and geo morphological importance.

Perennial streams sprung from the Sanctuary provide source of drinking water to the adjoining villages of Kadavary, Kottakombur, Kovilur and Vattavada.

1.4 Values of the Sanctuary

1.4.1 Biodiversity Values

- Prime habitat of Nilakurinji
- Exceptional plant community values ranging from moist deciduous forests to Southern sub tropical hill forests.
- Exceptional diversity of plants.
- Preponderance of endemic species.
- Sanctuary harbors a large number of Medicinal Plants.
- Potential corridor for animal movements.
- Exceptional diversity of birds.
- Significant population of insects especially butterflies.
- Forms a part of a contiguous stretch of high altitude shola grass land ecosystem.
-

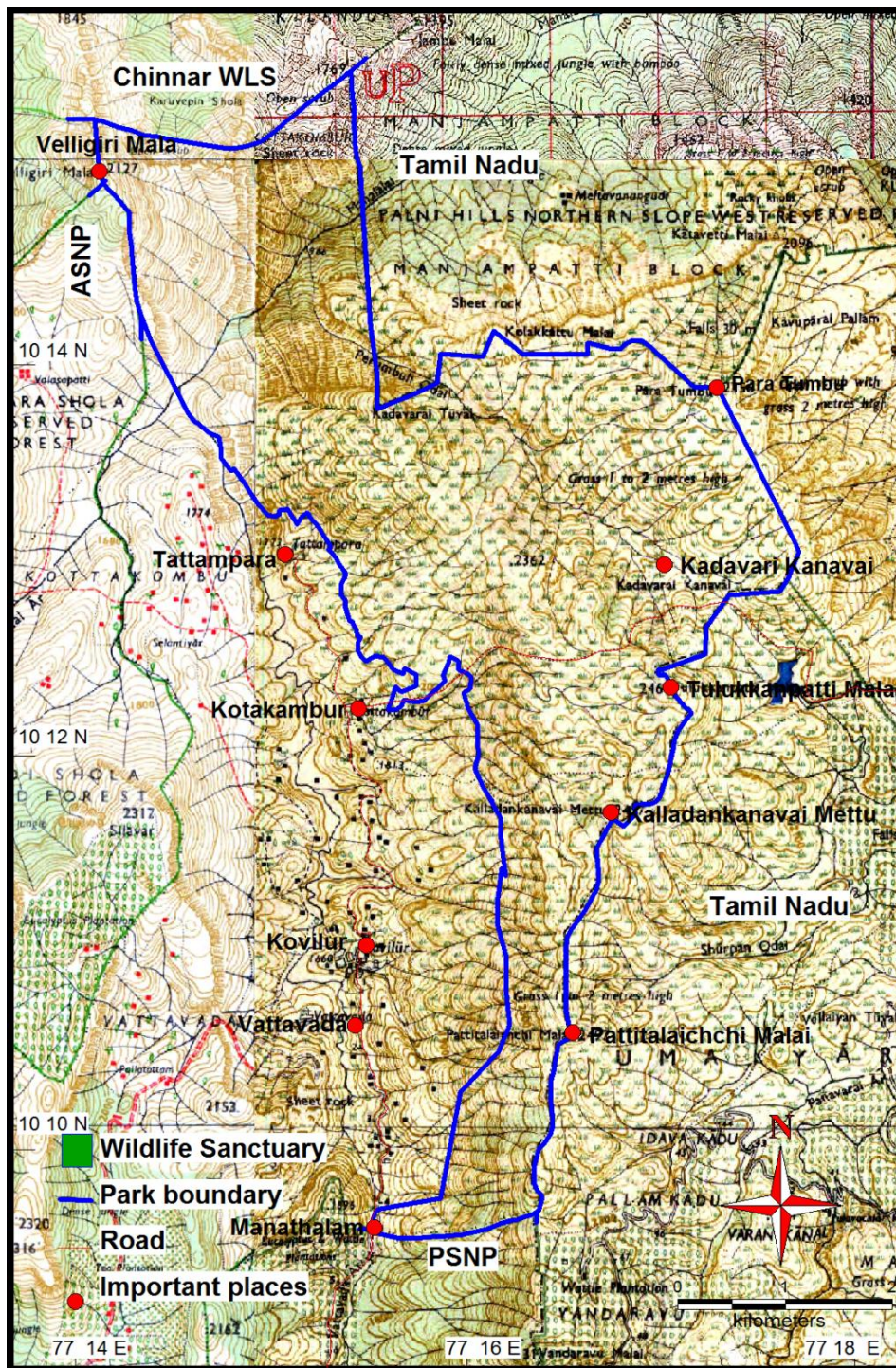
1.4.2 Watershed and Catchment Values

Vitally important watershed for providing drinking water and irrigation to low rain fall areas of Vattavada, Kottakomboor, Kovilur and Kadavari.

1.4.3 Education and research Values.

- Research and monitoring values associated with endemism, biodiversity, human-wildlife interaction, natural regeneration assessment and eco-restoration.
- Research values associated with programme planning, development and implementation in mountain eco systems.
- High potential for nature education and nature exploration.
- Values related to bird watching, trekking etc.
- Value related to nature interpretation
- Values related to aesthetic sensibility.

Map. 4 :Map of Kurinjimala on Topo sheet



CHAPTER - 2

BACKGROUND INFORMATION AND ATTRIBUTES

2.1: Boundaries

2.1.1. External boundaries: -

The boundary description as per the initial notification dated 6th October 2006 vide GO (MS) No. 36/06/Forest is as follows:

North:- Starting from the point on the north of Vellagiri peak (2127 mts) at the boundary of Chinnar Wildlife Sanctuary, the boundary follows east along the south- eastern boundary of Chinnar Wildlife Sanctuary along the Karuvepin Shola and thence runs along the Kottamboor sheet rock to the Point No. 1769 on the Inter – State boundary.

East:- Thence the boundary runs south along the Inter – State boundary up to the north – eastern extremity of Pampadum Shola National Park on the Inter – State boundary through the peaks Kolakkattu Malai (2066 m) Para Thumbu (2356 m), Kadavari Kanavai (2219 m), Tulukkanpatti Malai (2461 m), Kalladankanavai Mettu (2457 m) and Pattitalaichi (2494 m)

South:- From the north – eastern extremity of Pampadum Shola National Park at the Inter – State boundary, the boundary runs west along the northern boundary of Pampadum Shola National Park till it reaches the Munnar – Kovilur road.

West:- Thence the boundary runs in an northern direction along the western boundaries of the forest plantations in Block No. 62 of Vattavada Village till it reaches the southern boundary of Block No. 58 of Kottakkamboor Village and from there it runs in a north – western direction along the boundary of Block No. 58 till it reaches the north – eastern boundary of Anamudi Shola National Park and thence running north along the boundary of the Sanctuary and further north till it reaches the starting point on the north of Vellagiri Peak (2127 m) at the boundary of Chinnar Wildlife Sanctuary .

Though the boundaries are described as per the first notification, only the northern, eastern and southern boundaries are clearly identifiable. The western boundary which borders the private holdings is not demarcated.

The total extent notified is approximately 32 sq. kms. But later the area calculated as per GPS survey done by the officials of the Forest Department shows significant variation. The actual extent can be ascertained only after settlement of rights and a detailed survey.

2.1.2. Internal Boundaries

The internal boundaries are not demarcated as the settlement process remains incomplete.

2.1.3. Ecological Boundaries

The Sanctuary on the north is bordered by Chinnar Wildlife Sanctuary, on the east by Kodaikanal Forest Division in Tamil Nadu, on the south by Pambadum Shola National Park and on the west revenue land and human habitation. The Sanctuary is part of Anamudi Elephant Reserve and act as a corridor for long-ranging animals like elephant between the forests of Kodaikanal and Chinnar.

2. 2 Geology, rock and soil

General

The underlying rock formation consists principally of gneiss of a granite nature, very often foliated and composed of quartz, feldspar and biotite. The soil is deep in general and in ridges, grass lands and hilltops, the soil is shallow. Soil in lower slopes and valleys are considerably deeper and finer.

Soil sampling and analyses

There is no record available as the area was revenue *tarisu*.

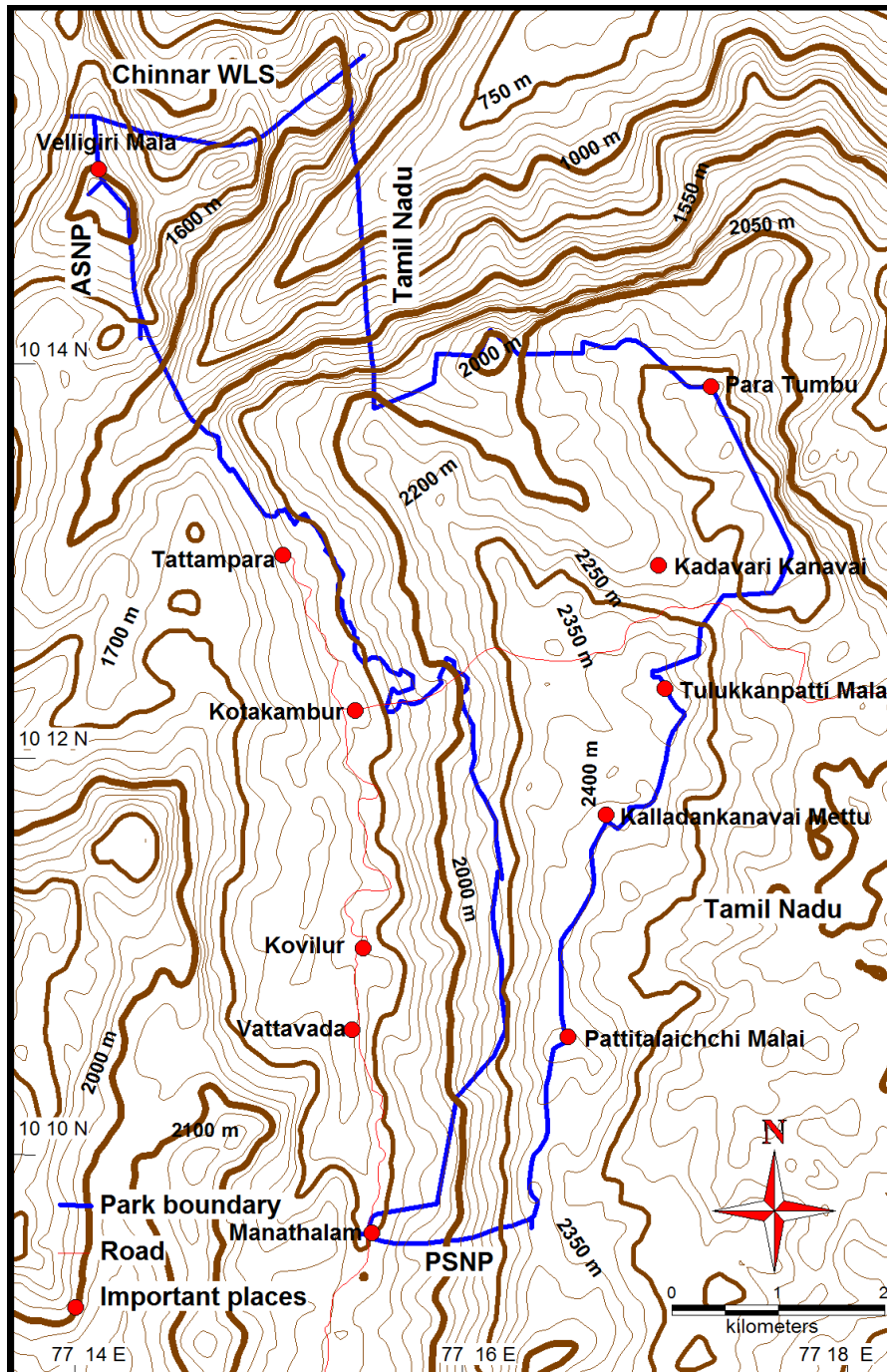
2.3 Terrain

The terrain is undulating with hillocks of varying heights. The altitude ranges between 1600-2400mts. The forest is seen as small patches dispersed among the grasslands that are planted up with wattle and Eucalypts. On the northern side of the Sanctuary a deep and spectacular gorge known as Kambakkallu runs from west to east. The area is traversed by numerous small streams, some of which drain west into Vattavada ar and the remaining into Kadavary thodu, both joining together inside Kambakkallu gorge to become Manaliar, a tributary of Thalinjiyar which feeds the Amaravathi reservoir.

Contour mapping

The contour maps of the area were also prepared using 1:50,000 SOI topo sheets. The digital output was generated using MapInfo software (Map:5)

Map. 5 : Contour Map of Kurinjimala Sanctuary



2.4 Climate

The climate is pleasant from April to September. The coldest months are December and January when the minimum temperature inside forests fall up to 6°C even at lower elevations. The average temperature varies with a minimum of 9.5°C (December) to a maximum of 28°C (April). There are 4-5 dry months, spanning between December and May.

As the area lies on the eastern boarder extending into the Palani Hills, the north – east monsoons are more active with heavy rains.

2.4.1 Temperature, a summary of year round pattern

The average temperature of past ten years varies with a maximum of 28 ° C and minimum of 9° C at Mattupty (Table 1)

Table 1 *Annual temperature details* (Mattupetty)

Year	Maximum in° C	Minimum in° C
1995	23.00	10.00
1996	25.50	8.90
1997	27.00	10.00
1998	28.00	9.00
1999	23.30	10.00
2000	18.90	12.20
2001	24.40	10.00
2002	25.00	10.00
2003	24.20	10.00
2004	27.00	9.00
2005	22.00	11.00
2006	22.72	12.48
2007	23.07	12.40
2008	22.63	11.87
2009	22.45	11.85
2010	23.21	12.35

The average temperature of past three years varies with a maximum of 23.08 ° C and minimum of 9.57° C at Chittuvurai (Table 2)

Table.2 Chittuvurai

Year	Maximum in° C	Minimum in° C
2008	23.08	9.70
2009	23.04	9.57
2010	23.05	9.88

2.4.2 Rainfall pattern and distribution

Kurinjimala Sanctuary receives most of its rainfall from the north-east monsoons. Rainfall from the south-west monsoon is comparatively less. Annual rain fall details for the past nine years are given in (Table 3)

Table 3 : Annual rain fall details

Year	Rain fall (mm)
2002	1138.882
2003	1134.110
2004	1684.274
2005	1678.432
2006	1077.468
2007	1300.734
2008	1262.126
2009	0914.400
2010	0853.948

Source. Mattuppetty estate

2.4.3 Humidity

The humidity of the area reaches its maximum during the month from Oct-January. It reads 85% - 90%. The minimum humidity of the area varies from 55% -70 % during the summer.

2.4.4 Wind speeds

Wind speed is high in higher elevation of the Sanctuary. However no authenticated records are available.

2.5 Water sources

The small streams that originate from the Sanctuary drain towards the river Thalinjiar in Tamil Nadu. Local people depend on these streams for their daily needs. These streams are the main source for drinking water to the wild animals too. There are 10 check dams, most of them made by the Panchayat for providing water for the local people. The drainage map of the sanctuary is given in Map 10.

2.6 Range of wildlife, status, distribution and habitat

The Sanctuary offers a wide range of habitat types to the flora and fauna. 50 species of grasses, 51 species of trees, 119 species of herbs and shrubs, 4 species of climbers, 14 species of birds, 10 species of mammals, 100 species of butterflies

and 108 species of moths have been recorded from the shola, grass lands and plantations. Rainfall, terrain, type of habitat and forest fires is the important factors that influence animal movements. Its location close to the Pampadum Shola National Park as well as Chinnar Wildlife Sanctuary and Indira Gandhi National Park of Tamil Nadu facilitates unimpeded movements of animals across wider land scape. Nilgiri tahr is found along the ridge of the Kambakkallu gorge. Gaur, sambar and wild boar are common. Elephant movements are seasonal. The Sanctuary is also significant as it forms part of Tiger territory.

2.6.1 Vegetation

2.6.1.1 Forest types

The original vegetation consisted mostly of the shola-grassland system. It now exists only in a few places (Kadavari, Kambakkallu etc). Other similar areas have been altered by plantations of wattle, pine and eucalyptus and cultivated lands. The Kambakkallu gorge has bamboo thickets and moist deciduous forests.

1. Southern Montane Wet Grasslands:

This vegetation type covered a major portion of the Sanctuary and is now restricted to certain pockets only. *Eulalia-Dichanthium-Sehema* is the association found in these grasslands. Major species of grasses are *Eulalia phaeothrix*, *Dichanthium polyptycum*, *Sehima nervosum*, *Cymbopogon martini*, *C. flexuosum*, *Chrysopogon ceylanicum*, *Apocopsis mangloreensis*, *Arundinella mesophylla*, *Arundinella vaginata*, *A. purpurea*, *A. pumila*, *Bothriochloa insculpta*, *Heteropogon contortus*, *Ischaemum commutatum*, *Tripogon bromoides*, *T. narayanii*, *Sporobolus indicus*, *S. piliferus*, *S. virginicus*, *Andropogon lividus*, *Dichanthium foulkesii*, *D. oliganthum*, *Digitaria ciliaris*, *D. setigera*, *D. wallichiana*, *Poa annua*, *Agrostis peninsularis*, *Eragrostis nigra*, *E. penisularis*, *E. pilosa*, *E. atrovirens*, *E. unioides*, *E. tef*, *Garnotia arundinacea*, *G. elata*, *G. exaristata*, *Helictotrichon virescens*, *Isachne kunthiana*, *I. borneora*, *I. globosa*, *Ischaemum indicum*, *Jansenella griffithiana*, *Microstegium nudum*, *Oplismenus comp-soitus*, *Panicum gardneri*, *Pseudanthistiria umbellata*, *Themeda cymbaria*, *T. tremula*, *Zenkeria elegans*, *Z. sebastinei*, etc. In addition to grasses, there are herbaceous dicotyledons like *Ranunculus wallichianus*, *R. reniformis*, *Viola betonicifolia*, *Polygala rosmarinifolia*, *P. sibirica*, *Geranium nepaulense*, *Biophytum intermedium*, *Crotalaria fysonii*, *C. clarkei*, *C. scabrella*, *C. umbellata*, *C. nana*, *C. walkerii*, *Flemingia grahamiana*, *Indigofera endecaphylla*, *Smithia blanda*, *S. racemosa*, *Fragariaa nilgherrensis*, *Kalanchoe grandiflora*, *Drosera peltata*, *D. indica*, *Osbeckia leschenaultiana*, *O. gracilis*, *Melothria perpusella*, *Bupleurum distichophyllum*, *B. mucronatum*, *Heracleum candolleanum*, *H. ceylanicum*, *Pimpinella candolleana*, *P. leschenaultiana*, *Galium asperifolium*, *Hedyotis bourdillonii*, *H. buxifolia*, *H. leschenaultiana*, *H. purpurascens*, *Neanotis*

decipiens, *N. tubulosa*, *Spermocoearticularis*, *Valeriana hookeriana*, *Adenostemma macropophylla*, *Ageratum haustonianum*, *Anaphalis barnesii*, *A. beddomei*, *A. bournei*, *A. meeboldii*, *A. subdecurrens*, *A. travancorica*, *Bidens pilosa*, *Blumea molle*, *Cicernbita cyanea*, *Cirsium wallichii*, *Crassocephalum crepidioides*, *Emelia scabra*, *Erigeron karvinskianus*, *E. sublyratus*, *Galinsoga parviflora*, *Gnaphalium luteo-album*, *Gnaphalium polycaulon*, *G. pulvinatum*, *Gynura nitida*, *Helichrysum buddleoides*, *Hypochoeris glabra*, *Kleinia walkerii*, *Launea acaulis*, *Moonia heterophylla*, *Phyllocephalum phylloleanum*, *P. rangacharii*, *P. scabriodum*, *Sigesbeckia orientalis*, *Sonchus oleraceus*, *Spilanthus paniculata*, *Vernonia indica*, *V. anamallica*, *V. conyzoides*, *V. divergens*, *V. peninsularis*, *V. salvifolia*, *Asyneuma fulgens*, *Campanula alphonsii*, *Lobelia leschenalutiana*, *Lysimachia procumbens*, *L. leschenaultia*, *Jasminim bignoniaceum*, *Tylophora mullesua*, *Exacum wightianum*, *Cynoglossum furcatum*, *Physalis peruvianum*, *Calceolaria mexicana*, *Pedicularis zeylanica*, *Utricularia graminifolia*, *Rhynchoglossum notonianum*, *Andrographis neesiana*, *Justecia simplex*, *Strobilanthes kunthiana*, *Thunbergia fragrans*, *Leucas angularis*, *L. vestita*, *Micromeria biflora*, *Pogostemon rotundatus*, *Scutellaria violacea*, *Plantago erosa*, *Chenopodium ambrosoides*, *Polygonum chinense*, *P. nepaulense*, *Phyllanthus gardnerianus*, *P. virgatus*, *Pauzolia wightii* and *P. bennettiana*.

Various species of orchids are also seen in these grasslands though lesser in number in comparison with similar untouched montane grasslands. Ground orchids like *Satyrium nepaulense*, *Brachycorythis iantha*, *B. wightii*, *Disperis neilgherrensis*, *Habenaria cephalotus*, *H. crassifolia*, *H. longicornu*, *Liparis odorata*, *Peristylis aristata*, etc are present in these grasslands.

Sedges like *Fibristylis dichotoma*, *F. narayanii*, *F. uliginosa*, *F. haspan*, *Cyperus iria*, *C. compressus*, *C. pubiscuma*, *C. digitatus*, *Carex spp.* *Scleria spp.* *Pycneus pumilus*, *P. ferrugineus*, *P. flavidus*, *Mariscus dubius*, *M. javanicus*, *Rhynchospora corymbosa*, *Kyllingia brevifolia*, *Lipocarpha chiensis*, etc are also recorded.

Shrubby dicotyledons like *Hypericum mysorense*, *Rubus ellipticus*, *R. racemosus*, *R. niveus*, *R. rugosus*, *Rhodomyrtus tomentosus*, *Osbeckia reticulata*, *Elaeagnus kologa*, *Desmodium ferrugineum*, *Smithia blanda*, etc are also seen in the grasslands. The bracken fern, *Pteridium aquelinum* is ubiquitous. The flagship species, ***Strobilanthes kunthianus*** is present in all areas as seedlings of 3-4 years growth.

2. Southern Montane Wet Temperate Forests (Shola Forests)

Most of the shola vegetation in Kurinjimala Sanctuary is too fragmented and heavily damaged. However, a few compact and very clearly defined

patches of original shola vegetation are maintained in some areas at Kadavary and Kambakkallu. The trees are very close and stunted and clothed with mosses, lichens, orchids and ferns. The flowering plant families Lauraceae and Myrtaceae are dominant. Lauraceae is represented by *Alseodaphne semecarpifolia*, *Actinodaphne campanulata*, *A. bourdillonii*, *Apollonias arnottii*, *Cinnamomum sulphuratum*, *C. wightii*, *C. perrottetii*, *Cryptocarya beddomei*, *Litsea wightiana*, *L. beddomei*, *L. floribunda*, *L. stocksii*, *L. bourdillonii*, *Neolitsea scrobiculata*, *N. fischerii*, *N. zeylanica* and *Persea macrantha*. Myrtaceae is represented by *Syzigium hemisphericum*, *S. montanum*, *S. gardnerii*, *S. cumini*, *S. arnottianum*, *S. caryophyllatum*, *S. densiflorum* and *Eugenia thwaitesii*. Other common trees are *Rhododendron arboretum* ssp. *Nilagiricum*, *Eleocarpus munronii*, *E. recurvatus*, *Ilex wightiana*, *Microtropis ovata*, *M. ramiflora*, *Bhesa indica*, *Archidendron clypearia*, *Symplocos cochinchinensis*, *Gomphandra coriacea*, *Photenia serratifolia*, *Ternstroemia japonica*, *Hydnocarpus alpine*, *Canthium ficiforme*, *Glochidion* spp. *Gordonia obtusa*, *Mahonia leschenaultia*, *Lasianthus* spp., *Michelia nilagirica*, *Rapanea thwaitesii*, *Ligustrum robustum*, *Pittosporum neelgherrense*, *Turpinia nepalensis*, *Fagraea ceylanica*, *Euonymus indicus*, *Schefflera racemosa*, etc. Shrubs like *Psychotria* spp., *Elatostemma lineolatum*, *Strobilanthes micranthus*, *S. luridus*, *S. heyneana*, *Saprosma foetens*, *Lasianthus* spp., *Symplocos* spp., etc. The margins of the shola forests are maintained by *Rubus* spp., *Ageratina adenophora*, *Ageratum haustonianum*, etc. Climbers like *Cissampelopsis corymbosa*, *Derris benthamii*, *Rubia cordifolia*, *Clematis gouriana*, etc are also present in these shola forests. *Cyathea nilghirensis*, a tree fern is common. Orchids like *Oberonia* spp., *Aerides ringens*, *Coelogyne nervosa*, *Bulbophyllum* sp. and the balsam, *Impatiens parasitica* dominate the epiphytic regime. The endemic wild rose ***Rosa leschenaultiana*** is present in the fringes of these shola forests.

3. Black wattle plantations:

Extensive areas of the Sanctuary are under the plantations of black wattle, *Acacia mearnsii*. These plantations have become poor in plant diversity as wattle dominates and blocks the growth of other plants. The high seed germination and sucker formation through roots help this tree to spread to other non-planted areas too



Fig. 2 : Dense wattle saplings

4. Eucalyptus plantations:

Blue gum (*Eucalyptus globules*) is also planted in large tracts. Regeneration of wattle plants is noticed within the eucalyptus plantations along the border.



Fig.3 : Eucalyptus plantation

5. Rocky cliffs and cuttings:

A considerable portion of the Sanctuary is covered by rocky barren areas or covered by shallow soil and grassy patches. The sheer drops on either sides of Kambakkallu gorge have grassy patches and patches of shola forests.



F

Fig.4 : View of rocky patches



Fig. 5 : Cool season vegetables - Kadavari

2.6.2 Animals

Apart from the rapid survey for biodiversity assessment, no systematic studies including that of fauna are carried out in the Sanctuary. Available information on faunal diversity is discussed here.

2.6.2.1 Mammals

Large mammals like elephants (*Elephas maximus*) are mostly confined to the sholas. Presence of Nilgiri langur, gaur (*Bos gaurus*), common mongoose and small carnivores were also recorded from the sholas. Sloth bear and jungle cat were recorded through indirect evidences. Indirect evidence of Blanford's rat (*Cremnomys blanfordi*), a rodent, was obtained by analyzing the small carnivore scat collected from the Sanctuary. Nilgiri tahr occurs on the ridge of the Kambakkallu gorge. Tigers are occasional visitors. List of mammals recorded during field visits is given in table 4.

Table 4. List of mammals recorded during field visit

No.	Order	Species	Common Name	Status
1	Rodentia	<i>Ratufa indica</i>	Indian giant squirrel	Vulnerable
2	Primates	<i>Semnopithecus johnii</i>	Nilgiri langur	Vulnerable Endemic to WG
3		<i>Macaca silensis</i>	Lion-tailed macaque	Endangered Endemic to WG
4	Carnivora	<i>Paradoxurus hermaphroditus</i>	Common palm civet	Least concern
5		<i>Cuon alpinus</i>	Asiatic wild dog	Near threatened
6		<i>Panthera pardus</i>	Leopard	Vulnerable
7		<i>Panthera tigris</i>	Tiger	Endangered
8	Artiodactyla	<i>Cervus unicolor</i>	Sambar	Least concern
9		<i>Bos gaurus</i>	Gaur	Vulnerable
10	Proboscidae	<i>Elephas maximus</i>	Asian elephant	Vulnerable

2.6.2.2 AVIFAUNA

Fourteen species of birds were recorded from the Kurinjimala Sanctuary in a rapid survey. A detailed survey during different seasons needs to be carried out for a complete check list.

2.6.2.3 HERPETOFAUNA

A total of eight species of herpeto faunal were recorded from the Kurinjimala Sanctuary during a recent study. These include three species of frogs, two skinks, two lizards and one species of snake. The list along with the frequency of the sighting and abundance are given in Table 5. The *Bufo melanostictus* was the most

abundant species followed by *Hemiphyllodactylus aurantiacus* and *Kaestlea laterimaculatu*.

Table 5 Herpetofauna recorded from Kurinjimala WLS

Scientific name	Common name	Status	Frequency	Abundance
<i>Bufo melanostictus</i>	Common Toad	EN	10	12
<i>Hemiphyllodactylus aurantiacus</i>	Western Ghat Worm Gecko	EN	3	3
<i>Kaestlea laterimaculatum</i>	Side Spotted Ground Skink	EN	3	4
<i>Philautus</i> sp1			3	3
<i>Kaestlea palnicum</i>	Palani ground skink	EN	1	1
<i>Philautus</i> sp2			1	1
<i>Salea anamalayana</i>	Anaimalai spiny lizard	EN	1	1
<i>Uropeltis ellioti</i>	Elliot's Sheildtail	EN	1	1



Fig. 6 : Gaur (*Bos gaurus*)



Fig. 7 : Indian giant squirrel (*Ratufa indica*)



Fig. 8 : Nilgiri langur (*Semnopithecus johnii*)

Species of herpetofauna reported from Kurinjimala WLS, Nov 2010

1. *Bufo melanostictus*

Class : Amphibia
Order : Anura
Family : Bufonidae

This is the largest among the Indian toads. First dinger is equal to or longer than the second. Toes are at least half webbed. The tarso-metatarsal articulation reaches the tympanum or the eye. Two series of warts are present along the middle of the back. The species is uniform grey on the dorsal side and uniform white on the ventral.

Type locality: not known

Distribution: throughout India.

Status: VU



Fig. 9 : *Bufo melanostictus*

2. *Hemiphyllodactylus aurantiacus*

Class : Reptilia
Order : Squamata
Suborder : Sauria
Family : Geckonidae

This small ground gecko described from the Anamalai Hills is brownish and spotted with dark brown back. A dark brown stripe is present from the side of the head to the shoulder. A dorso-lateral stripe with the reddish spots emerges from the eye and reaches the tail. Tail is banded with light brown and dark brown. Base of the tail is with a whitish black edged spot. Belly is whitish profusely spotted with dark brown. Snout is obtusely pointed. Upper labials are 10-12 and lower labials are 10-12.



Fig. 10 : *Aurantiacus*

Habitat : Moist deciduous forests
Distribution : Kerala part of Anaimalai Hills
Status : Rare

Fig. 11 *Kaestilae*

3. *Kaestlea laterimaculatum* (*Scincella laterimaculatum*)

Class : Reptilia
Order : Squamata
Suborder : Lacertilia
Family : Scincidae



Lateral aspects are not spotted with black. In the young and semi adult individuals, the tail is violet. There are 22-26 scales round the middle of the body.

Habitat : Plantations
Distribution : Travancore
Status : Unknown

4. *Kaestlea palnicum*

Class : Reptilia
Order : Squamata
Suborder : Lacertilia
Family : Scincidae



Fig. 12 : *Kaestlea palnicum*

5. *Salea anamalayana*

Class : Reptilia
Order : Squamata
Suborder : Lacertilia
Family : Agamidae

This was first described from Anamalai Hills in Tamil Nadu. It is slightly larger and more robust than *S. horsfieldi*. It is light brown with whitish spots on the dorsum and back with four most prominent triangular or V shaped deep brown marks. These triangular marks are separated from each other by narrow whitish inter spaces. Upper lip is white. A white stripe is seen on the shoulder. Limbs and tail are annulated with light brown and dark colour.

A short light streak is present on the lower thigh in continuation to the adjacent part of the tail. Belly is white. Upper labials 7-10 and as many lower labials.

Habitat : Evergreen and Moist Deciduous forests
Distribution : Travancore and Eravikulam in Kerala and TN
Status : EN, endemic to W. Ghats

Uropeltis ellioti

Class : Reptilia
Order : Squamata
Suborder : Serpents
Family : Uropeltidae

Type locality is Madras. It is uniformly dark brown or with yellow spots above. A yellow stripe is present on each side of the tail. Snout is more or less acutely pointed. Scales are in 17 rows at



Fig. 13 : *Salea anamalayana*



Fig. 14 : *Uropeltis ellioti*

middle body, ventrals 144-176 and sub caudals 5-11.

Distribution: Chinnar, Munnar in Kerala, hills of Peninsular India.

Status: lower risk.

Fig. 15 : Unidentified frogs from Kurinjimala WLS



2.6.2.4 Lepidoptera

Hundred species of butterflies have been recorded this area. Of these *Mycalesis*, *Oculus*, *Paranticanil*, *Giriensi*, *tirunala* *Limniace*, *Tirunala* *Septentrionis*, *Neptis* *Hylas*, *Vanessa* *Indica*, (*Nymophalidae*), *Acytolepas* *Puspa*, *Udara* *Singalensis*, *Janides* *Bochus*, *Udara* *Akasa*, (*Lycaenidae*), *Eurema* *blanda*, *Eurema* *hecabe* and *Pieris* *canidia* (*pieridae*) were the most ubiquitous species. *Mycalesis* *oculus*, *vanesa* *indica* and *pieris* *canidia* were the most abundant species and were found to be characteristic of sholas, not being represented frequently in other forest types. Certain rare species like *Libythea* *lepita*, *Pantoporia* *ranga*, *Rohana* *parisatis*, *Zipoetis* *saittis* (*NumPhalidae*) and *Jamides* *Alecto* (*Lycaenidae*) etc. have also been recorded

Endemism

Some of the endemic species of butterflies like *Zipoetis* *satis*, *Parantica* *nilgiriensis* (*Nymphalidae*), *Udara* *singalensis*, *Udara* *akasa* and *Curetis* *thetis* (*Lycaenidae*) are adapted to cool climatic conditions. The sholas seem to be an ideal habitat for the species *Parantica* *nilgiriensis* (*Nymphalidae*) that is restricted to some of the hills of south India and has been listed as threatened species by IUCN.

Due to the endemic nature, some of the species are included in the various schedules of the Wild Life Protection Act. They are *Papilio clytia* (Papilionidae), *Neptis jumbah* (Nymphalidae), *Castalius rosimon* (Lycaenidae) [Schedule I, Part IV]; *Appias indira* (Pieridae), *Athyma ranga*, *Eriboea athamas*, *Hypolimnas missipus*, *Libythea lepita*, *Zipoetis saitis* (Nymphalidae) [Schedule II, Part II]; *Euploea core*, *Euthalia lubentina* (Nymphalidae) and *Appias libythea* (Pieridae) [Schedule IV]

Heterocera (moths)

Out of 232 morph species of heterocerans recorded, 108 were identified as given in Appendix II. The families Pyralidae, Geometridae, Noctuidae and Arctiidae were ubiquitous being present in all the sampling sites. These families accounted for more than half of all the species collected from these sholas. Lymantriidae and Tortricidae were the next most abundant heteroceran families of the study area followed by Syntomidae, Pterophoridae, Lasiocampidae, Bombycidae, Tineidae, Sphingidae, Notodontidae, Cossidae and Phycitidae. The species *Sangatissa subcurvifera* (Lymantriidae); *Larentia flavistrigata*, *Racotis inconclusa* and *Spilosoma casignetum* (Geometridae) are some of the Himalayan species that are present.

Other insects

Other than the above listed species, fana beetles, bees, wasps, dragonflies as well as syrphid and tabanid flies were very abundant in the region



Fig. 16 : Red whiskered bulbul (*Pycnotus jocosus*)

CHAPTER-3

HISTORY OF MANAGEMENT AND PRESENT PRACTICES

3.1 General

As per GO (MS) NO.180/05/REVENUE DATED 08.06.2005, Government of Kerala handed over 305 acres of revenue land in Block no. 58 of Kottakomboor Village in Devikulam Taluk in Idukki District to the Forest Department in lieu of the forest land diverted for the implementation Sabarimala Master Plan.

Subsequently, as per order No GO(MS) 220/05 dated 06.7.2005, the entire revenue land in Block No 58 consisting of Kambakkallu-Kadavary areas was handed over to the Forest Department for protection. The Forest Department was directed to initiate action to protect the land for which a committee had to be constituted with Forest, Revenue and Police Departments under the chairmanship of District Collector.

Kabmakallu - Kadavary area was notorious for Ganja cultivation. In order to eradicate Ganja cultivation, Government of Kerala sanctioned two Forest Stations at Kambakkallu & Kadavari vide order GO (MS) NO.66/05/Forest Dated. 03-06-2005.) (Annexure – 4)

Subsequently Sub collector Devikulam was appointed as Forest Settlement Officer as per order No. GO (MS) 74/F&WLD dated 12.12.07 (Annexure - 3) to settle the rights within the notified area.

The status of the area prior to notification as a Sanctuary was Revenue *tarisu* that was being used by local people primarily as a source of water for drinking and agricultural purposes and also, as grazing land. The Forest Department had raised plantations of wattle and Eucalyptus in the grasslands of the upper reaches and these were extracted as per the Working Plan prescriptions of Munnar Division. The value of the area as kurinji bearing tract had begun to highlighted during the mass flowering of 1982 and later, in 1994. At the same time, places like Kambakkallu and Kadavari attained notoriety as major illicit ganja growing areas. Subsequently, people encroached some of the lands and a few *pattas* were issued in the Kadavary valley. Kambakkallu continued to remain as a major illicit ganja growing area till it was handed over to the Forest Department. With the rise of Munnar as a major tourism destination during the 90's, there was a rush of land prospectors towards the hinterlands and parts of the KMS area was occupied by outsiders with forged titles and without titles. These absentee land holders raised Eucalyptus in their lands. The titles of such lands are being verified by the Forest Settlement Officer.

Meanwhile, other land developers had purchased most of the Kadavary pattas that were issued in 1990's and are staking their claim over other uncultivated lands. A clear picture regarding the status of land will emerge only after the process of settlement is over.

3.2 Timber operations

The plantations of wattle and eucalyptus were regularly extracted as per Working Plan prescriptions of the Munnar Forest Division. In the remaining areas of grasslands and shola forest, no timber operation of any sort had been carried out. Extraction was being carried out in the private plantations also. (Fig. 2 and 3)

The list of plantations raised by the Forest Department and felling within the notified boundaries of the Sanctuary is given in Table 6.

Table 6 List of plantations raised by the Forest Department within the Sanctuary

Sl. No	Name of Plantation	Location	Extent(Ha)	Remarks
1	1991 - Wattle Plantation	Kadavari	31.6	The plantations lie in a stretch and it is not possible to separately identify each. There is thick presence of wattle and the undergrowth is very scarce.
2	1990 - Wattle Plantation	Bendher	63.2	
3	1982 - Wattle Plantation	Bendher	200.0	
4	1980 - Wattle Plantation	Bendher	199.0	
5	1979 - Wattle Plantation	Bendher	100.0	
6	1978 - Wattle Plantation	Bendher	50.0	
7	1981 - Wattle Plantation	Bendher	50.0	
8	1981 - Wattle Plantation	Bendher	20.0	
9	1992 - Wattle Plantation	Bendher	60.0	
10	1991 - Wattle Plantation	Kadavari	24.6	
11	1981- Eucalyptus Plantation	Bendher	52.0	These plantations were leased out to HNL. Company extracted the materials during. No operations carried out after declaration of sanctuary
12	1982- Eucalyptus Plantation	Bendher	50.0	
	Total		900.40	

3.3 NWFP collection

The agricultural villages namely Vattavada, Kovilur and Kottakombur lie adjoining to the boundary of Sanctuary and Kadavary lies inside the Sanctuary. The population is predominantly Tamil speaking. They mainly depend on agriculture for their livelihood. The forest dependency is mainly for the collection of firewood and a few products like honey.

3.4 Leases

An area of 102 ha of Eucalyptus plantations (given in Table 6) has been leased to HNL. The plantations are situated within the sanctuary. Being a wildlife sanctuary felling is not permitted so no operations are taking place.

3.5 Other programmes and activities.

As it is a newly formed Sanctuary no eco development committees have been formed till now. Efforts are on to form an eco development committee in Kadavary non-tribal settlement. Participatory fire management has been initiated with the co-operation of the local people.

3.6 Forest Protection

The Sanctuary shares its boundary at the east with Tamil Nadu. Chances of *ganja* cultivation in the remote areas are high. There are extensive wattle plantations on the border with Tamil Nadu and the frequent fires cause invasion of wattle in to the grasslands which results in the formation of bushy thickets threatening the wildlife habitat and generation of native species.

The western boundary of the Sanctuary is not demarcated except at a few stretches and hence the possibility of encroachments is very high. There are legal and illegal occupations within the notified boundary which have to be settled by the settlement officer. Proper demarcation becomes possible only after settlement of rights.

3.6.1 Legal Status

Considering the great ecological, faunal, floral, geographical and zoological significance, the revenue land in block no 58 of Kottakombur village and block no 62(part) of Vattavada village in Devikulam taluk was declared as Kurinjimala Sanctuary in October 2006 as per G.O. (P) 36/2006 /F&WLD of Kerala Government as per Section 18 of the WPA,1972. The rights within the notified boundary are yet to be settled by the Forest Settlement Officer.

3.6.2 Hunting

There is no history of legal hunting in the Sanctuary. In the past, the villagers of Vattavada used to practice ritual hunting during some of their festivals.

3.6.3 Illegal activities

3.6.3.1 Poaching

No case was registered for poaching since the declaration of the Sanctuary

3.6.3.2 *Illegal cutting of trees*

One case was registered for illegal cutting of trees in the Kurinjimala Sanctuary on 13-05-2004 value of seizures is Rs. 125 and there were 5 accused. The loss assessed is Rs. Rs. 1500.00

3.6.3.3 Encroachment

No new case under illegal encroachment has been recorded after the declaration of the Sanctuary. The nature of occupation within the notified boundaries will be known only when the settlement process is over. Many of the private areas are suspected to be unauthorized occupations.

3.6.4 Domestic livestock grazing

In the past, the area used to be the grazing lands of the local communities of Vattavada valley. The available stretches of grasslands are still being used by villagers for cattle grazing. Unregulated grazing may cause spread of many communicable diseases to the wild life of the Sanctuary. The ponies that are used for transportation of agricultural products as well as food materials also make use of the paths in the Sanctuary.

3.6.5 Wild fires

Local people used to set fire to the grasslands for getting fresh grass for grazing their cattle. These unmanaged fires inflicted heavy damage to the shola forests, grass lands and even the soil. The plantations of wattle and Eucalyptus inside the Sanctuary were also subjected to frequent fires. No reliable records of earlier fire occurrences are available.

3.6.6 Wildlife Health

The presence of cattle grazing on the grasslands and usage of ponies may cause out break of foot and mouth disease and other communicable diseases. The

invasion of grasslands by wattle and Eucalyptus causes loss of habitat, adversely affecting the fodder availability and its nutrition value. There is no system of wildlife health monitoring at present.

3.6.6.1 Census

No systematic census programmes have been carried out on the wild animals. A rapid survey of herpetofauna and butterflies has been carried out. An inventory of mammals also has been done. Tiger census, Elephant census and wildlife census are conducted along with the other forest areas of the State. The following data are appended in tables for reference. The data is for Munnar Wildlife Division as a whole and hence applicable to Kurinjimala Sanctuary as well.

1. Population estimation of major mammals in the Forests of Kerala conducted in 2002 by Kerala Forest Department and Kerala Forest Research Institute

Table . 7 : Population estimation of Major Mammals in Forests of Kerala in 2002

Species	Density/Sq.Km	Method
Elephant	0.29	Block Count
Gaur	0.45	
Sambar	0.11	
Wild boar	0.75	
Malabar Giant Squirrel	0.03	

2. Population estimation of Wild Elephants in the Elephant reserves of Kerala conducted by Kerala Forest Department, Periyar Foundation and Kerala Forest Research Institute

Table 8 : Details of Elephant Census

Year	Density/Sq.Km	Method
2005	1.14	Dung count method
2007	0.52	
2010	0.72	

3.6.7 Inter agency programmes and problems.

Apart from the 900.40 ha of plantations mentioned in Para 3.2, private plantations are also existing in the area. Being a Wildlife Sanctuary, felling is not permitted. The activities to the private plantation raised within the notified boundary can be prescribed only after the rights are settled.

3.7 Tourism and visitor management

Munnar is one of the best known hill stations in India. The cool and salubrious climate, easy accessibility and its aesthetic uniqueness beckon visitors of all hues to Munnar and the surrounding areas. On an average, 2,000 tourists visit Munnar every day.

Kurinjimala Sanctuary is located near Top Station, a major tourist attraction which is 34 Km away from Munnar. The Munnar-Kovilur main road reaches up to the adjoining agricultural village of Vattavada, famous for its vegetable cultivation.

Presently, the tourists visiting the Sanctuary are comparatively low because of the inaccessibility to the area and absence of facilities. Some hotels and resorts have sprung up in the Vattavada valley.

3.7.1 Conservation education

The Sanctuary lacks basic infrastructure facilities for conservation education. The presence of the mythical *Neelakurinji*, the high altitude shoal grass land eco system and its floral and ecological importance, make this area ideal for conservation education finds mention in Tamil literature and it has acquired mythical significance.

3.7.2 Nature based tourism

Presence of Neelakurinji and the serenity and beauty of the landscape attracts nature enthusiasts to the area. The Sanctuary has excellent areas for guided trekking and camping. The presence of Kadavary village inside and Vattvada village on the periphery offers ample opportunities for developing community based ecotourism programmes.

3.8 Research, monitoring and training.

3.8.1 Research & monitoring

The Sanctuary was formed due to its floral importance and hence, has great potential for botanical studies especially on *Strobilanthes* sp. Though considered as one of the last abode of the famed "*Neelakurinji*" (*Strobilanthes kunthianus*) which blooms once in twelve years, it has been subjected to various types of environmental degradation. There are excellent opportunities for research on eco-restoration and monitoring. The connectivity values are also yet to be studied.

3.8.2 Training

The present staff has not undergone any form of training in wildlife management, use of advanced equipments like GPS, camera trap etc. and maintenance and use of firearms and wireless. The lack of trained staff seriously affects the sanctuary management programmes.

3.9 Wildlife conservation strategies & evaluation

Prior to the notification of Kurinjimala Sanctuary, the area was revenue land under the territorial jurisdiction of Marayur Forest Division. Though part of the area was planted up by, the remaining areas were either used for various illegal activities like *ganja* cultivation or encroached upon by outsiders. Some areas were assigned for agricultural purposes. Hence, there is no history of wildlife conservation and management.

3.10 Administrative set up

Presently, Kurinjimala Sanctuary is one of the administrative units of Munnar Wildlife Division under the management of Wildlife Warden, Munnar. The Head Quarters of the Division is at Munnar situated 46 KM away. The Asst. Wildlife Warden, Shola National Parks whose office is situated at Top station, 8 KM away from the Sanctuary, is in charge of the Sanctuary in addition to three other National parks namely Pampadum shola, Mathikettan shola and the Anamudi shola. Two Forest Stations are sanctioned at Kadavary and Kambakkallu, with strength of 1 Dy Ranger, 4 Foresters and 16 Guards in each Station for the protection of Kambakkallu- Kadavary area. But majority of the staff sanctioned for Kambakkallu station is attached to Chinnar Sanctuary for sandal protection, keeping only 2 Foresters and 3 Guards at Kambakkallu Station for the protection of the very inaccessible and *ganja* prone Kambakkallu. Out of the staff sanctioned for Kadavary Station, only the Dy Ranger, 1 Forester and 4 Guards are in charge of the Sanctuary, the balance strength being deputed to other 3 Shola National Parks. All the four PAs come under the jurisdiction of the Dy Range Officer Kadavary. The day- to -day activities and protection of the Sanctuary is achieved/carried out through the employment of 6 protection *mazdoors* who are enlisted on NMR.

3.11 Infrastructure

3.11.1 Buildings

Infrastructure consists of one Forest Station at Kadavary, one barrack attached to the Station, four anti- poaching camp sheds and one semi permanent shed. Map of buildings in Kurinjimala sanctuary given in Map 6.



Fig : 17 Forest Station - Kadavari



Fig : 18 Barrack - Kadavari

Table 9 : List of buildings in Kurinjimala Sanctuary

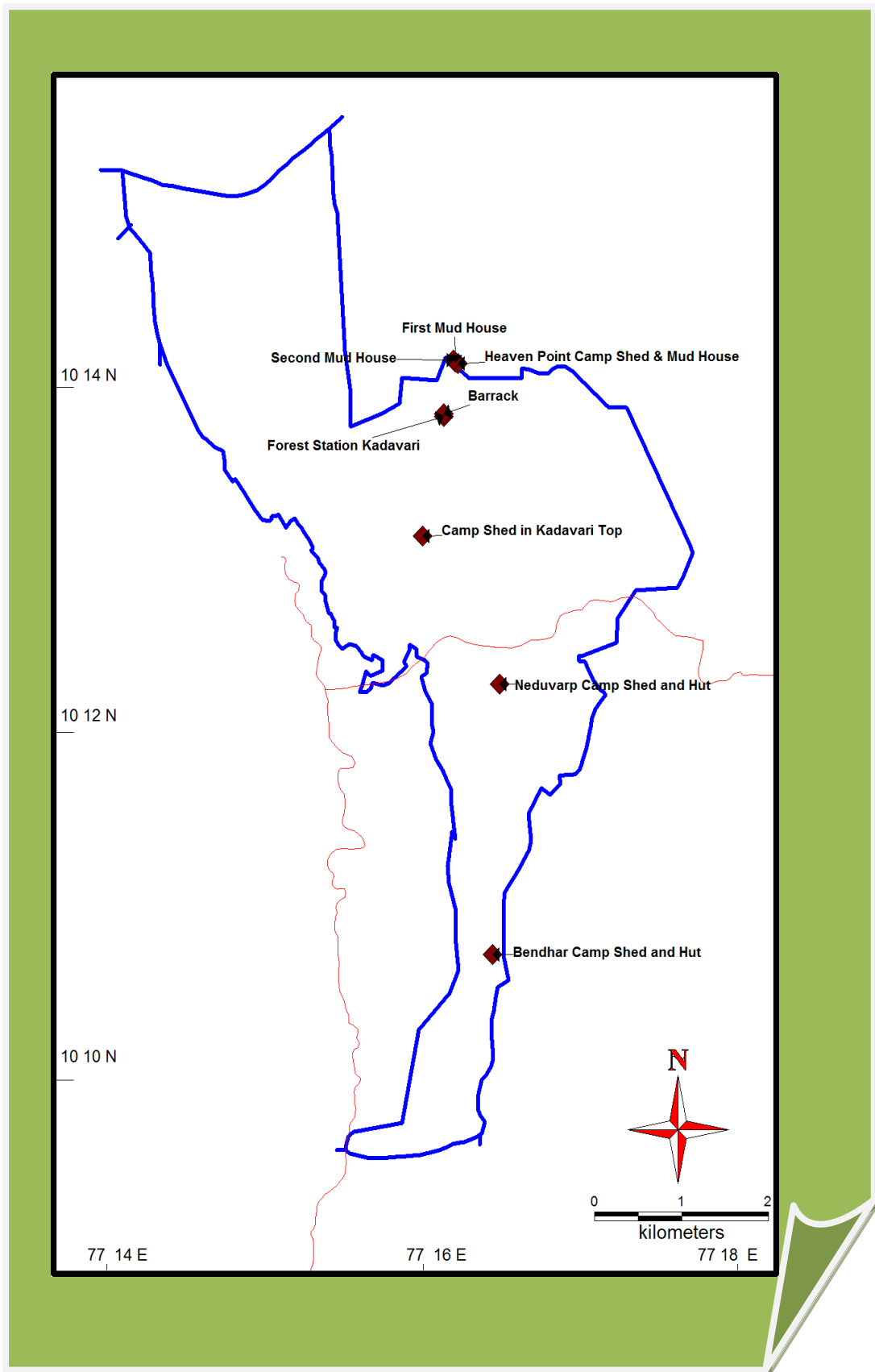
1	Forest Station	Kadavary
2	Barrack	Kadavary
3	Anti poaching camp sheds	Bendar Neduvarpul Neduvarp II Kadavary Top
4	Semi permanent Shed	Heaven point

3.11.2 Trek paths

Table 10 List of trek paths in Kurinjimala Sanctuary

1	KADAVARY – JANDAPARA	4.20 K M
2	KADAVARY – NEDUVARPPU	4.00 K M
3	KADAVARY – THAMPURAN CHOLA	5.00 K M
4	THARAVADU – KURANGUPARA	4.50 K M
5	MARAKANAM – THATTAMPARA	3.00 K M
6	NEDUVARPPU – CHECKDAM	5.00 K M
7	CHECKDAM – OORKKADU	5.60 K M
8	KADAVARY TOP – KURANGUPARA	4.40 K M
9	CHECK DAM – KADAVARY	5.00 K M
10	KADAVARY – EDATHATT	5.00 K M
11	THARAVADU – EDATHATT	5.00 K M
12	THARAVADU – KOTTARAM	5.00 K M
13	THARAVADU – MARAKKANAM	3.00 K M
14	TATTANPARA – MARAKKANAM	5.00 K M
15	THUPPAKAIMEDU – KOTTARAM	4.00 K M
16	V CUT – THAMPURANCHOLA	4.00 K M
17	CHECK DAM – KADAVARY KAVA	4.00 K M
18	THAMPURANCHOLA – HNL TOP	4.20 K M
	Total	79.90 KM

Map. 6 : Buildings in kurinjimala Sanctuary



3.11.3 Roads

The following fair weather mud roads are passing through the Sanctuary.

Table 11 Roads in Kurinjimala sanctuary

1	KOTTAKOMBUR - KADAVARY	8.00 K M
2	BANDHAR – KADAVARY	8.00 K M

3.12 Communication

Being a new Sanctuary, no basic communication facilities such as telephone and wireless are available. The Wildlife Warden's office at Munnar has telephone and e-mail facilities as well as mobile phones for the Warden and all the staff. The postal address of the Warden and the Assistant Wildlife Warden are given below.

The Sanctuary lies about 40 km from Munnar. It takes almost two hours to travel the distance. Wireless set fixed in the office of the Asst. Wildlife Warden, Shola National Parks at Top Station is used to communicate administrative messages. Mobile connectivity is limited to few places at Koviloor and Kadavari area.

POSTAL ADDRESS

Wildlife warden Munnar - 685612 Telephone No. 04865 231587 Email address: enpmunnar@gmail.com ww-munnar@forest.kerala.gov.in Mobile phone No.9447979093	Assistant Wildlife Warden Shola National Parks Vattavada Yellapatty P.O., Top Station. Mobile number: 8547603258
---	--

3.13 Summary of threats to wildlife

1. Invasive alien species

Old plantations of wattle and eucalyptus exist in the Sanctuary and the extension of wattle in the natural vegetation areas is causing shrinkage of natural grassland - shola ecosystem.

2. Ganja Cultivation

Kambakkallu and Kadavary areas within the Sanctuary were notorious for *ganja* cultivation. Ganja cultivators are known to cause depletion of wildlife by poaching. Though *ganja* has been eradicated, the suitability of the area for *ganja* calls for a continuous state of alertness.

3. NTFP collection

The availability of NTFP other than firewood is low.

4. Illicit felling

Illicit felling is not a big problem in this Sanctuary.

5. Firewood collection

Illicit firewood collection is a major problem within the Sanctuary. The practice is widespread due to the existence of a large number of forest dependents in the fringe area. Majority of the families are depending on firewood for domestic purpose. It is understood that a considerable quantity of firewood is also used for sale outside. Collection is mostly from the plantations.

6. Human-wildlife conflict.

The population of inhabitants inside (Kadavary) and in areas adjacent to the Sanctuary i.e. (Vattavada, Kottakombur and Kovilur) is estimated to be more than 1000. Majority of the people are engaged in agricultural activities. Since agriculture produce cultivated by the people attracts wild animals, crop depredation by wildlife in local agricultural areas is common. Wild boar constitutes the major threat to agricultural crops. There were about 40 cases of crop depredation by wild boar during the year 2011-12. In addition, the PA has all carnivores such as tiger, leopard and wild dog. Cattle lifting are also being experienced by these carnivores. During the year 2011-12, a total of 5 cattle lifting cases (cattle and mule) were reported.

7. Soil erosion

Soil erosion in this Sanctuary is mainly due to over grazing. The existing roads being mud roads the pony trial also causes severe erosion. Unscientific cultivation by the inhabitants at Kadavary also cause of erosion.

8. Encroachments

The boundaries of the Sanctuary are not demarcated except in a few patches. As this area was previously revenue land, a large chunk of land is the custody of outsiders. The extent of encroachment will be known only after the process of settlement. Much of the area under possession has been planted up with Eucalyptus and not properly demarcated. The enclosure within the

Sanctuary at Kadavary is also not demarcated. The procedure on demarcation can be initiated only after settlement of rights.

9. Poachers and smugglers

Poaching and smuggling are not serious problems.

10. Wildlife diseases

The Sanctuary is exposed to potential wildlife diseases as there is a high cattle population within and on the fringes. Ponies also traverse the area.

11. Inadequate protection staff

Kambakkallu and Kadavary Forest Stations came into existence prior to the formation of KMS. The intention was the eradication of ganja cultivation and control of sandal smuggling. The Kambakkallu Station staff was being engaged exclusively for the protection of Chinnar Wildlife Sanctuary. After the formation of the Sanctuary, the staff strength of Kadavary Station was deployed for this PA as well as the other 3 Shola National Parks. Hence, at present, there is shortage of field staff in enforcing proper protection, supervising developmental activities, implementing eco development and monitoring wildlife health and habitat etc.

CHAPTER –4

THE PROTECTED AREA AND THE INTERFACE LAND USE SITUATION

4.1 The existing situation in the zone of influence

As the rights remain unsettled, it is not possible to distinguish between the genuine right holders and the encroachers. The zone of influence within Sanctuary varies from the activities of those who occupy the lands within, to those outside who use the Sanctuary for livelihood purposes. Kadavary, on the eastern border, is a village within the Sanctuary. The villages of Vattavada, Kovilur, Kottakombur and Oorkadu lie outside the western boundary of the Sanctuary. Their means of livelihood is mainly agriculture and related works. The people depend on the Sanctuary mainly for firewood and cattle grazing. The status of the privately owned Eucalyptus plantations within the Sanctuary would be known only after the rights are settled.

4.1.1 PA- people interface

In the past, the area was mainly used by the villagers for grazing their cattle. People enter the Sanctuary for firewood and cattle grazing. The water sources from the Sanctuary meet their drinking water needs and irrigation purposes. The pony trail within the Sanctuary is used by people for transportation of goods from Kovilur to Klavara in Tamil Nadu. The large stretches of Eucalyptus plantations, raised by the Government as well as private parties, are said to cause water scarcity in the lean periods. The people frequently suffer crop raiding by the wild animals especially wild boar.

4.2 The development programmes and conservation issues.

The major development activity was the diversion of streams within the Sanctuary by erecting check dams for providing water to the villages in the Vattavada valley. The existence of large stretches of Eucalyptus plantations, departmental as well as private, is said to have depleted the water availability.

There are efforts to convert the existing fair weather mud road leading from Kottakombur to Kadavary as a segment of the proposed Sabarimala-Kodaikanal Interstate highway. This would, in effect, split the Sanctuary into two by continuous flow of traffic and also, impede animal movements. But this activity would necessitate sanction of the MOEF, NBWL and the Apex Court. Any activity towards this has to be consistent with (i) Conservation Act, 1980, (ii) Para 1.3(iii) of the Guidelines issued under Forest Conservation Act, 1980, (iii) Supreme Court Order dated 14-2-2000 in

WP© No.202 of 1995 and related directions of MOEF (letter no.F.No.11-48/2002-FC dated 29-4-2005), (iv) EIA Notification,2006 under EPA,1986.) This proposed highway has to pass through Reserved Forests on the Tamil Nadu side also.

4.2.1. An evaluation of Govt. and non- Govt. agencies

The main agency that had operated inside for developmental programmes is the local self Government. The Vattavada Panchayat had looked into the water supply issues. The formation of the mud road was carried out by the District Panchayat. Extraction of plantations was carried out by the HNL. At present, no activities are being carried out by the Department since the settlement process is not yet over.

4.2.2. The interplay of market forces and their impact

Due to the lack of proper marketing system, the marginal farmers of the area undergo exploitation by intermediaries. Most of the extracted Eucalyptus is being used by HNL. Eucalyptus plantations in this low rainfall tract, though financially attractive, are ecologically damaging.

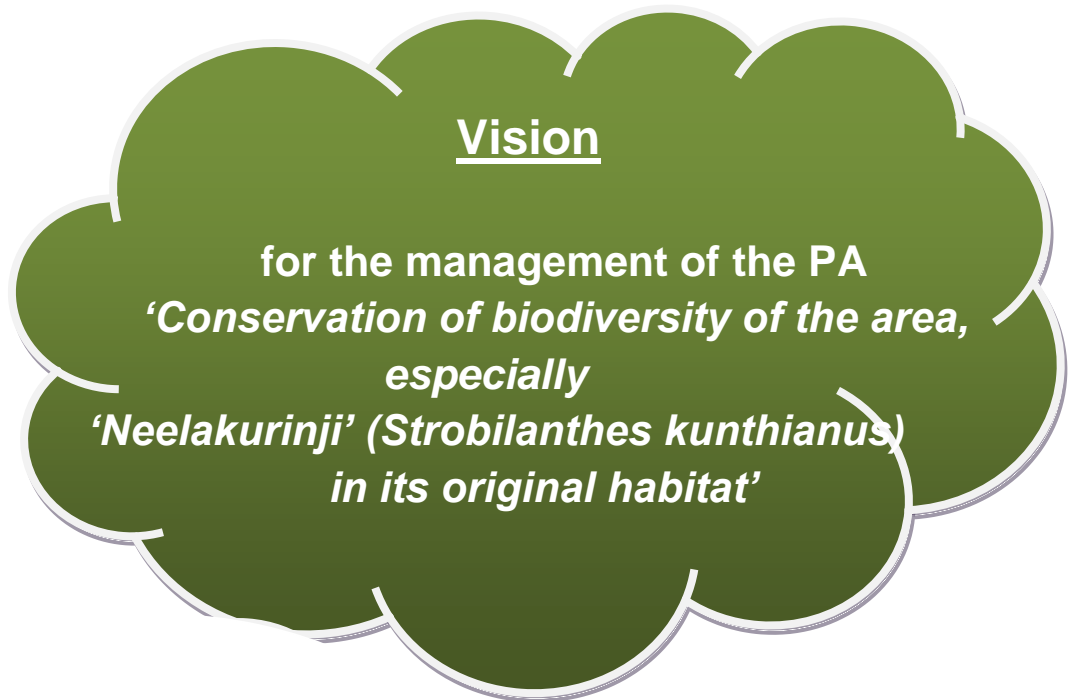
4.2.3. Eco developmental initiatives

Though dialogues have been initiated for ecodevelopment activities, it has not taken shape due to certain conflicts related to settlement of rights. Efforts towards meaningful ecodevelopment are still going on. The Sanctuary does not have a trained team for the planning, implementing and coordinating of eco development activities.

CHAPTER – 5

VISION, OBJECTIVES AND PROBLEMS IN ACHIEVING THE OBJECTIVES

The vision, objectives and the problems/constraints in achieving the objectives were discussed and finalized in the stakeholder workshop held on 24.11.2010. The following are the output of the workshop:



5.1 Management Objectives

1. To conserve the biological diversity with special emphasis on Neelakurinji (*Strobilanthes kunthianus*) and other rare, endangered, threatened and endemic species in the unique high altitude grassland ecosystem
2. To maintain the connectivity for movement of animals especially the long-ranging species such as elephants
3. To restore and maintain the grassland ecosystem and the associated species
4. To maintain and improve the watersheds

5. To facilitate nature-based regulated tourism and promote environmental conservation awareness
6. To strengthen People-PA interface

5.2. Problems in achieving objectives:

Sl. No.	Problems	Proposed strategies
<p>Objective 1: To conserve the biological diversity with special emphasis on Neelakurinji (<i>Strobilanthes kunthianus</i>) and other rare, endangered, threatened and endemic species in the unique high altitude grassland ecosystem</p> <p>Objective 2: To establish connectivity for movement of animals especially the long-ranging species such as elephants</p>		
1	Boundary not consolidated	<ul style="list-style-type: none"> Facilitate for settlement of rights and finalize & consolidate
2	Rights not determined / settled	
3	Pressure for interstate connectivity (highway) through the PA	<ul style="list-style-type: none"> Tackle with existing legal provisions Awareness creation/lobbying
4	Extensive eucalyptus and wattle plantations	<ul style="list-style-type: none"> Phased removal Explore the use wood for soil and moisture conservation measures Prepare and implement plan for habitat restoration
5	Human habitation (Kadavary) within the PA	<ul style="list-style-type: none"> Tackle through Eco-development Explore possibilities of relocation
6	Fire	<ul style="list-style-type: none"> Prepare and implement fire management plan Controlled burning in grasslands Participatory fire management Fire line around shoals
7	No zonation	<ul style="list-style-type: none"> Restoration zone and Eco-development zone within Protection zone
8	Firewood collection	<ul style="list-style-type: none"> Prevent firewood collection from natural vegetation Allow collection from plantations of exotics based

		on access rules & micro plans <ul style="list-style-type: none"> • Alternate energy efficient mechanisms
9	Grazing (60 cattle)	<ul style="list-style-type: none"> • Address through proper micro planning /FDA • Disease control measures
10	Presence of mules(73 no.) for transport	<ul style="list-style-type: none"> • Disease control measures • Explore alternate transportation mechanism
11	Weeds (Eupatorium, bracken fern etc)	<ul style="list-style-type: none"> • Eupatorium, Bracken fern etc in depressions be retained and monitor • Remove in small patches on experimental basis in other areas • Study the regeneration pattern of natural vegetation and recommend for future course of action (during 1st year of the plan)
12	Real estate pressure on the fringe lands	<ul style="list-style-type: none"> • Awareness creation • Propose for ESA
13	Potential threat of <i>ganja</i> cultivation	<ul style="list-style-type: none"> • Strengthen protection (protection plan) • Strengthen intelligence network • Awards/Rewards to staff and informants • Training of staff • Address through EDCs • Document changes in the <i>ganja</i> eradicated area in the past
14	Potential threat of poaching	<ul style="list-style-type: none"> • Strengthen protection (protection plan) • Strengthen intelligence network • Awards/Rewards to staff and informants • Training of staff • Address through EDCs • Create additional antipoaching camp at Marakkanam and Thamburanchola • Ensure presence of staff/watchers in all the anti-poaching camps • Maintenance of existing anti-poaching camps (Chapter 3.11) • Establish permanent wireless station at kadavary • Improve the communication network (equipments like walkie-talkie) • Strengthen the anti-poaching camps with basic amenities like solar lighting.
15	Tough terrain	<ul style="list-style-type: none"> • Assess the need of trek paths for effective

		protection and create <ul style="list-style-type: none">• Improve camping facilities like tents, field gears including GPS, compass, binoculars, digital camera, torches, etc
16	Long interstate boundary	<ul style="list-style-type: none">• Clear and maintain interstate boundary• Implement the protocol for interstate co-ordination
17	Lack of infrastructure	<ul style="list-style-type: none">• Assess the requirements and incorporate in the Plan
18	Lack of information on biodiversity	<ul style="list-style-type: none">• Collect available information• Identify gaps, list the studies required and propose in the Plan for conducting studies for inventory of flora and fauna by specifying time frame.(Chapter9.1)
19	Inadequate training and capacity building of staff	<ul style="list-style-type: none">• Identify the training needs• Impart training through appropriate agencies (chapter 9.3)• Maintain a database of trainings provided to the staff
20	Lack of institutional mechanism for assessing, documenting and monitoring vegetation dynamics	<ul style="list-style-type: none">• Co-ordinate with Experts from Scientific/Educational institutions, Periyar Foundation, etc• Develop required infrastructure• Develop monitoring protocols & implement
21	Lack of resource persons	
22	Lack of infrastructure facilities	
23	Lack of linkages with scientific institutions	
Objective 3: To restore and maintain the grassland ecosystem and the associated species		
1	Extensive eucalyptus and wattle plantations	<ul style="list-style-type: none">• Phased removal• Explore the use wood for soil and moisture conservation measures• Prepare and implement plan for habitat restoration• An extent of approx. 50ha (new area) /year to be tackled.

		<ul style="list-style-type: none"> • An extent of approx. 500ha to be tackled during the plan period • Repeated cutting /uprooting, if required • Explore possibility of utilizing college/NSS/students through nature camps for uprooting of young shoots. • Develop MOU for continuous monitoring with institutions / colleges through FDA • Plant saplings of Rhododendron sp. and other shola species with expert support (nursery technique to be developed) on experimental basis. • Monitor the survival of planted seedlings.
2	Destruction of grassland / kurinji / Nilgiri tahr habitat due to human interference (<i>ganja</i> cultivations & plantations)	<ul style="list-style-type: none"> • Maintain grasslands by uprooting weeds, controlled burning, fire protection, etc • Record daily wildlife sighting data • Annual monitoring of tahr and other wildlife population • Prepare and implement protocol for monitoring important faunal species including camera trap technique
3	Fire	<ul style="list-style-type: none"> • Prepare and implement fire management plan • Controlled burning in grasslands • Participatory fire management • Fire line around shoals
4	Grazing	<ul style="list-style-type: none"> • Address through proper micro planning /FDA • Disease control measures
5	No accepted method for restoration	<ul style="list-style-type: none"> • Collect details from Vattakkanal Shola Trust and other sources / Workshop proceedings • Implement suitable restoration methods • Monitor the status of restoration
6	Rights not settled	<ul style="list-style-type: none"> • Facilitate for settlement of rights and finalize & consolidate
7	Wattle and pine plantations along TN side	<ul style="list-style-type: none"> • Dialogue with TNFD officials and pursue action
8	Lack of information on the extent and species composition of the original habitat	<ul style="list-style-type: none"> • Study and compare with similar vegetation in the landscape (like Silent Valley plateau of KFDC) • Create baseline information for future monitoring

9	Lack of manpower	<ul style="list-style-type: none"> • Explore possibility of utilizing college/NSS/students through nature camps for uprooting of young shoots • Address through FDA • Use machines for reducing labour.
10	Weeds	<ul style="list-style-type: none"> • Eupatorium, Bracken fern etc in depressions to be retained and monitored • Experiment of removal by cutting and uprooting in smaller patches especially in regions where Neelakurinji occurs may be tried and monitored • Study the regeneration pattern of natural vegetation and recommend for future course of action (during 1st year of the plan)
Objective 4: To maintain and improve the watersheds		
1	Micro drainage maps not available	<ul style="list-style-type: none"> • Collect available maps from Periyar Foundation, FMIS, LUB, CESS, CWRDM, IFP, etc
2	Lack of awareness among local communities	<ul style="list-style-type: none"> • Create awareness • Address through FDA
3	Lack of awareness regarding optimization of water use	
4	Water harvesting structures not adequate	<ul style="list-style-type: none"> • Assess the demands and develop if necessary • Address through FDA
5	Steep slopes / Soil erosion	<ul style="list-style-type: none"> • Brushwood check dams using eucalyptus/wattle pole • Soil moisture conservation measures
6	No linkages with line departments	<ul style="list-style-type: none"> • Address through FDA
Objective 5: To facilitate nature-based regulated tourism and promote environmental conservation awareness		
1	No resource persons	<ul style="list-style-type: none"> • Appoint /hire services of Wildlife Assistant • Avail services of experts through FDA • Conduct TOT for local staff/EDC members

2	Inadequate infrastructure facilities	<ul style="list-style-type: none"> • Avail facilities from the adjoining PAs / Forest Divisions
3	No information materials / brochures etc.	<ul style="list-style-type: none"> • Create a website for the PA • Develop information materials professionally
4	Lack of healthy relationship with local forest dependent communities	<ul style="list-style-type: none"> • Address through FDA
Objective 6: To strengthen People-PA interface		
1	No proper marketing facilities (for crops) to Kerala side raised at Kadavary.	<ul style="list-style-type: none"> • Address through FDA • Explore eco-friendly alternatives for transportation
2	Crop damage by wildlife animals (wild boar, sambar, gaur, etc)& cattle lifting by large carnivores	<ul style="list-style-type: none"> • Timely payment of compensation • Erect barriers such as trenches etc through PFM • Prompt reporting of kills by large carnivores • Awareness creation • Precision farming to increase yield, liaison with agriculture department
3	Lack of co-ordination with line departments	<ul style="list-style-type: none"> • Address through FDA
4	Agriculture is the only means of livelihood	<ul style="list-style-type: none"> • Address through microplanning and FDA • Explore possibilities for alternate employment • Give preference in the forestry works
5	No educational facilities	<ul style="list-style-type: none"> • Address through FDA & line departments
6	No sanitation facilities	<ul style="list-style-type: none"> • Address through FDA & line departments
7	Potential threat of subleasing agriculture areas	<ul style="list-style-type: none"> • Address through FDA & line departments
8	No EDCs / PFM activities	<ul style="list-style-type: none"> • Form EDC and incorporate in FDA
9	Inadequate irrigation facilities	<ul style="list-style-type: none"> • Assess the demands and develop if necessary Address through FDA

CHAPTER- 6

THE STRATEGIES

BOUNDARIES, ZONATION, ZONE PLANS AND THEME PLANS

6.1. Boundaries

6.1.1. External

The Wildlife Warden shall facilitate for settlement of rights so that the final notification is issued with well defined boundaries. Along with the settlement process, the boundary on the western side has to be demarcated and consolidated with cairns/kayyala.

6.1.2. Internal

The Sanctuary area is actually under two Forest Stations namely Kambakkal and Kadavari. But presently the entire Sanctuary is being managed under a single Forest Station (Kadavari) as the staffs of Kambakkal Forest Station are put administratively under Chinnar WLS. Moreover, the staffs of Kadavari Forest Station are presently being utilized for the management of other PAs such as Anamudi Shola NP, Mathikettan Shola NP and Pambadum Shola NP.

There are 900.40 ha of plantations located in different areas within the Sanctuary. The exact boundaries of these plantations have not been mapped. **Detailed maps shall be prepared for plantations to delineate the plantations for the restoration zone.**

6.2. Zonation

The objectives of the zonation is to provide a geographical framework in which to manage the Sanctuary, indicate which management directions have priority in different parts of the Sanctuary, indicate the types and levels of use appropriate throughout the Sanctuary, assist in minimizing existing and potential conflicts between uses and activities, or between these and the protection of Sanctuary values and provide a basis for assessing the suitability of future activities and development proposals

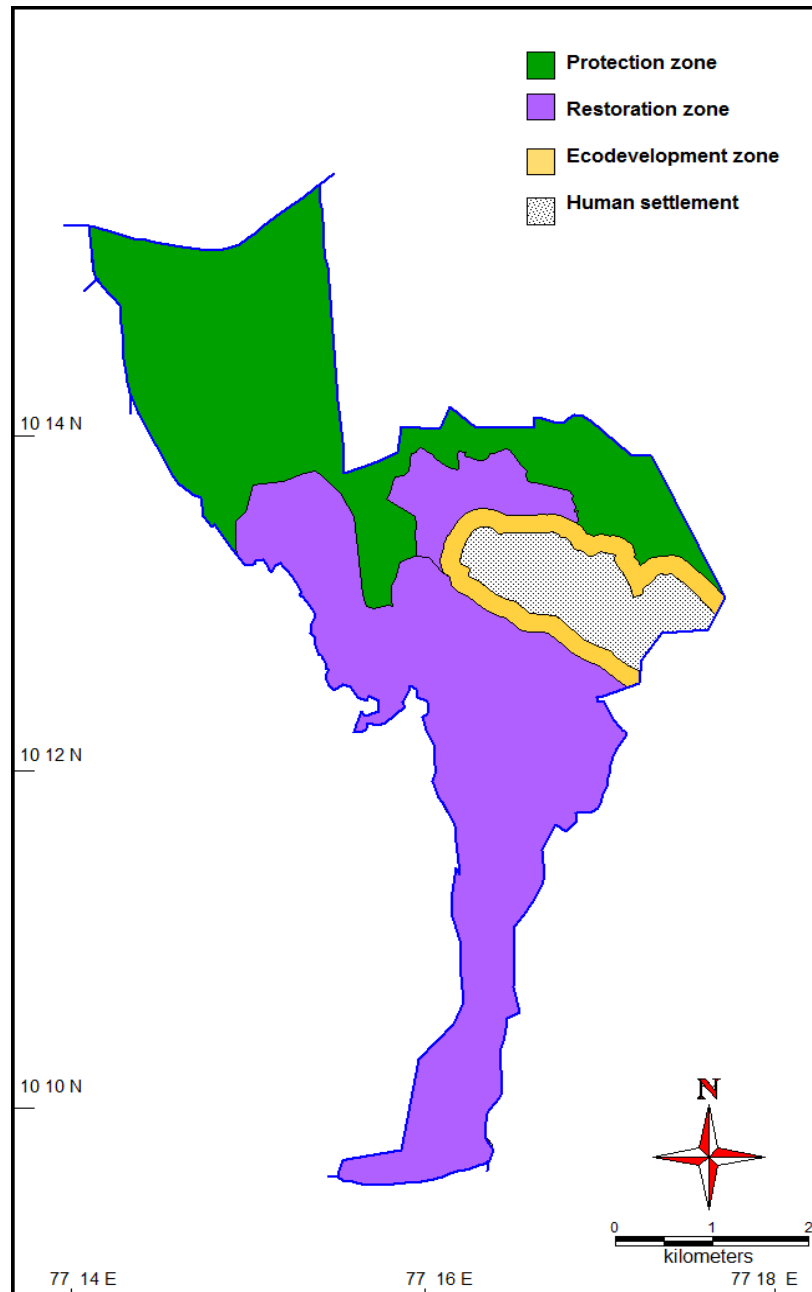
6.3. Zones

In order to achieve the objectives, the Sanctuary is divided into the following zones:

1. Core zone
2. Restoration zone
3. Ecodevelopment zone
4. Tourism zone

In addition, an Eco-sensitive zone is also proposed with areas adjacent to the PA.

As there is overlap of zones (Map 7), each zone would have a set of management strategies intended to achieve the main objectives or a combination of objectives. An extent of 900.4 ha. forest plantations was found earlier in the Sanctuary. In addition, the Sanctuary also had unmanaged revenue Poromboke which are still under the process of settlement of rights.



Map 7 : Zone Map of Kurinjimala Sanctuary

The restoration zone, ecodevelopment and tourism will be managed under the buffer zone. Proper demarcation is possible only after the settlement is over and management interventions start showing their results during the plan period.

6.3.1. Zone Plans

6.3.1.1. Plan for Core Zone

The natural vegetation located in the Kambakkal valley and the surrounding region and northern part of Kadavari settlement (Para Thumbu region), with a total extent of 915 ha, are considered as Core Zone (Map 7) as these areas are having good patch of natural forest with primary dry deciduous forest, scrub land and degraded formation of savannah grassland.

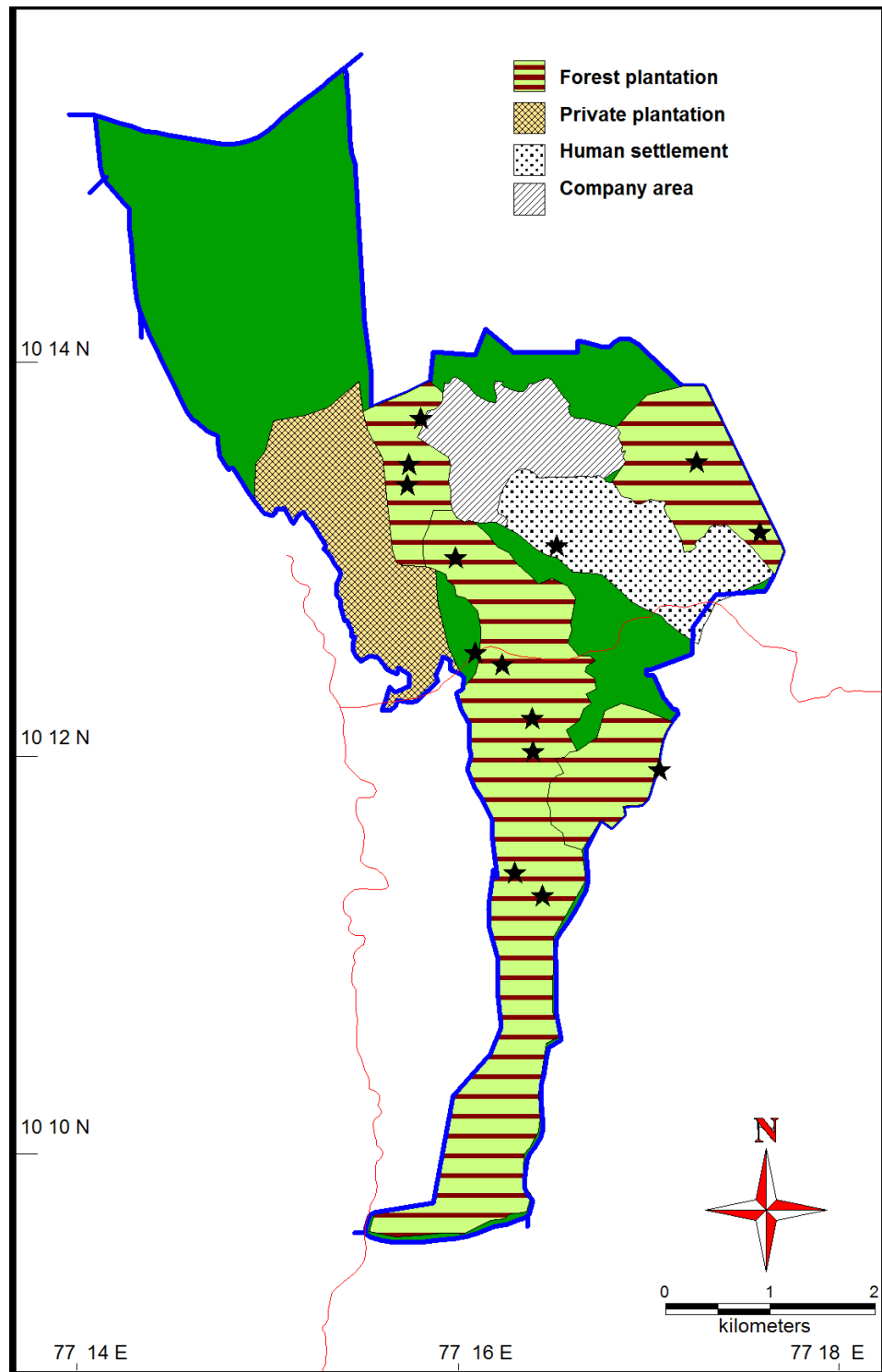
In the core zone, the following activities will be carried out during the plan period:

- Protection from illegal activities, which are detailed in the Theme Plan for 'Protection' in section 6.3.2.1.
- Fire protection activities including controlled burning and participatory fire management as given in theme plan for 'Fire Protection' under section 6.3.2.2.
- Water shed management activities as detailed in the Theme Plan for 'Water shed and Habitat Management' under section 6.3.2.6.
- Research studies to facilitate improved protection and management of core zone (Chapter 9).

6.3.1.2. Plan for Restoration Zone

The restoration zone would consist of 798.40 ha wattle plantations and 102.00 ha Eucalyptus plantations (Map 7). The legal status of the private eucalyptus plantations within the notified area is not clear and hence the inclusion of these plantations in this zone can be decided only after the settlement of rights is completed. This zone is a part of the buffer zone. The systematic removal of exotic plantations is prescribed for the management.

In order to restore the natural vegetation in the existing plantation areas, studies carried out elsewhere will be referred. A study carried out by Periyar Foundation (Balasubramanian, 2012 – report in preparation) in Anamudi Shola National Park on the elimination techniques of invasive plantation species will be consulted.



Map. 8 : Plantations in Kurinjimala Sanctuary

Balasubramanian (pers. comm.) conducted study in adjoining areas in Munnar reveals that in eucalypts plantations, the larger trees may be frilled (6.25 cm deep cut) around the base of trunk and applied with Glyphosate (an herbicide used in agriculture) to the wounds. The medium sized saplings will be felled and the seedlings to be uprooted. In case of pine plantations, the larger trees will be ring barked as they do not re-sprout. Wattle plantations, contrary to popular myth *Acacia*

meurnsii does not sucker from the roots, the stands will be killed by cutting at the base. Debris of such activities can be stacked along the fire line and burnt at a later time outside of the fire season. The plantations that are already having sufficient regeneration need not be managed as they are already in the process of converting to natural vegetation.

Before and during the restoration and maintenance of the original shola - grassland ecosystem, the following strategies are proposed.

- Collate information on the plantations from plantation journals and other documents and ground truthing
- For restoration, the plantations have to be removed in a phased manner. It cannot be used for commercial purposes. It is proposed to remove the fire prone material through participatory process under eco development for meeting the bonafide fuel wood requirements in the settlements.
- Removal of exotic species shall be carried out in an extent of about 50 hectare each year
- The possibility of utilising the removed material for carrying out Soil and Moisture conservation activities shall be explored.
- Based on the observation for two to three years, assisted regeneration of indigenous species may be tried if natural seedlings are not sufficiently coming up.
- Monitor regeneration status and soil erosion in the managed areas of plantations
- Establish a permanent plot for monitoring succession and eco restoration.

In the restoration zone, in addition to protection, fire management, watershed management and research activities as proposed in the protection zone, the following activities will be carried out:

- Habitat management activities as detailed in the Theme Plan for 'Watershed and Habitat Management' under section 6.3.2.1.
- Activities related to sustainable livelihood of the local tribal communities as described in Chapter 8 will be implemented in the restoration zone during the plan period.

6.3.1.3. Plan for Ecodevelopment Zone

The Ecodevelopment zone consists of areas of Kadavari settlement and the impact area (200 m from the periphery around the settlement). The total extent of this zone is 325ha which includes 200 ha of the settlement (Map 7).

The ecodevelopment zone will be intensively managed with the activities proposed in Chapter 8 for ensuring sustainable livelihood of the people living in the settlement without hampering the ecosystem and management objectives.

6.3.1.4. Plan for Tourism Zone

The trek paths leading from Kovilur to Neduvarpu and Kottakambur to Kadavari top are delineated as tourism zone of the PA. The trek paths are about 3 hours short walk (including up and down journey). The details of the proposed trekking programme are detailed in Chapter 7. This zone will be managed with focus on visitor management; nature-based regulated ecotourism programmes and promote environmental conservation awareness. All the activities in this zone will strictly be implemented as described in Chapter 7. 'Tourism, Interpretation and Conservation Education'. All activities prescribed in the protection and restoration zone will be applicable to the tourism zone.

6.3.2. Theme Plans

6.3.2.1. Theme Plan for Protection

The Kurinjimala Wildlife Sanctuary is having total extent of 32 km² (as per GPS Survey). The major threats like collection of NWFP, cattle grazing, forest fire still exists in the PA. The sanctuary is also having threats such as invasive alien species such as wattle, eucalypts and sporadic distribution of pine stands. In order to protect the natural resources of the PA the following strategies and activities are proposed in this protection plan.

The Wildlife Warden will be responsible for overall control of the PA. The Chief Conservator of Forests and Field Director, Project Tiger, Kottayam and Chief Wildlife Warden will be responsible to implement and review the protection plan. The Wildlife Warden is provided with office and residential buildings, electricity, telephone, wireless and water connections.

This protection plan is a guideline with effective patrolling strategies to mitigate spatial and temporal threats and the problems in achieving the objectives of management are stated in section 5.1. The nature and extent of threats are detailed in section 3.6.3 and 3.13. In order to tackle the threats and strengthen protection, strategies are identified and the protection plans are given below:

6.3.2.1.1. Consolidation and maintenance of boundary

The boundaries of the PA are not demarcated so far. Only the boundaries of the plantations are having few cairns. Hence the PA boundary will be surveyed and demarcated using cairns/kayyala during the plan period after settling rights. To achieve this, action will be immediately initiated by Settlement Officer.

6.3.2.1.2. Reorganization of administrative units

The Sanctuary area is actually under two Forest Stations namely Kambakkal and Kadavari. But presently the entire Sanctuary is being managed under a single Forest Station (Kadavary) as the staffs of Kambakkal Forest Station are put administratively under Chinnar WLS. Moreover, the staffs of Kadavari Forest Station are presently being utilized for the management of other PAs such as Anamudi Shola NP, Mathikettan Shola NP and Pambadum Shola NP. In order to effectively manage the PA, the staff of Kambakkal Forest Station deputed to Chinnar WLS will be brought back to the PA.

6.3.2.1.3. Protection Camps

6.3.2.1.3.1. Existing anti-poaching camps

There are four protection camps viz; Bandhar, Neduvarpu I and Neduvarpu II, Kadavari. These anti-poaching camps are used for camping for staff and watcher during their perambulation in the neighboring region. In addition, a semi-permanent structure exists for the staffs who patrol the region at heaven point.

Maintenance and improvement of the existing anti-poaching camps/chowkies (temporary camp sheds) and patrolling camps as detailed above will be periodically maintained as and when required.

6.3.2.1.3.2. Proposed anti-poaching camps

In addition to the above camps, effective patrolling is proposed to be achieved by construction of patrolling camp inside Kambakkallu gorge and construction of a staff quarters for the frontline staff at Kadavary. In addition, two new anti-poaching camp sheds are proposed at Thampuran chola and Marakkanam. The Wildlife Warden will initiate action for the construction of two camp sheds and maintenance of existing camp sheds as and when required. Basic amenities for the stay are also proposed in all the anti-poaching camps/chowkies during the plan period. The staff, during patrolling, should make frequent camps in the anti-poaching sheds. The Wildlife Warden will take action to man the anti-poaching camp sheds with suitable persons.

6.3.2.1.4. Official and residential buildings

The existing official and residential buildings as given in [Table 9](#) will be maintained as and when required. The basic amenities such as lighting, drinking water, etc will be improved in these buildings. A library will also be developed in the existing forest station.

At present the Office of the Asst. Wildlife Warden is functioning at Pambadum Shola and same shall be maintained as and when required.

6.3.2.1.5. Patrolling schedule

The Assistant Wildlife Warden will divide areas into patrolling units and communicate the perambulation schedule to the staff on monthly basis for implementation. Tentatively, the Sanctuary will be divided into 3 patrolling units namely, Kambakkallu, Kadavary and Block 62. The patrolling team would consist of 2 staff (one armed) and 3 watchers. Each unit will be fully perambulated once in 2 weeks. The Assistant Wildlife Warden and Wildlife Warden will also join for patrolling

and make frequent surprise checks. Frequent special ganja raids may also be arranged by the Wildlife Warden / Asst. Wildlife Warden. The staff will maintain the movement register and wildlife monitoring register which will be subject to frequent inspection by Assistant Wildlife Warden and Wildlife Warden. Special anti-ganja raids may also be arranged by the Wildlife Warden / Asst. Wildlife Warden.

The staff will maintain the movement register and wildlife monitoring register which will be subject to frequent inspection by Assistant Wildlife Warden and Wildlife Warden.

6.3.2.1.6. Interstate co-ordination

The PA shares a total length of 14 kms of interstate boundary with Tamilnadu. In addition to perambulation and monitoring of the region, frequent sharing of information between the officials of neighboring forest divisions within and outside the State are necessary. It is proposed to conduct meeting at the Range Officers level once a month. The Range Officers of Marayur Sandal Division will also be made part of the meeting. The existing approved protocol for interstate meeting will be strictly followed.

6.3.2.1.7. Strategies for Specific Issues in PA

6.3.2.1.7.1. Ganja cultivation

There have been instances of ganja cultivation in remote areas that calls for constant vigil on the part of Park management. The areas susceptible to ganja cultivation are Kambakkal-Kadavari region. These areas will be continuously monitored to prevent instances of ganja cultivation. Frequent special ganja raids especially during monsoon (monsoon patrolling) based on the information gathered through intelligence network will be arranged by the Wildlife Warden / Asst. Wildlife Warden. In addition, the following strategies will be implemented:

- Strengthen protection with adequate staff (proposed in section 6.4.1.2)
- Strengthen intelligence network (proposed in section 6.3.2.1.16)
- Awards/Rewards to staff and informants (proposed in section 6.3.2.1.16)
- Training of staff (proposed in section 6.4.2.4)
- Address through EDCs
- Document changes in the *ganja* eradicated area in the past

6.3.2.1.7.2. Cattle grazing

Livestock grazing is a problem to wildlife in the PA. There are about 60 cattle graze in the forest especially in the surrounding regions of Kadavari settlement. In

addition, about 100 cattle from Kovilur and Kottakombur region graze along the western boundary of PA. The problems associated with the livestock grazing are detailed in section 3.6.4.

In order to curb the effect of cattle grazing on the PA, the following strategies are proposed:

- Conduct a study to identify the problems associated with cattle grazing and to evolve strategies
- Reduce the number of cattle to a minimum in the settlement located within the sanctuary and on the periphery.
- Explore possibility of user-group EDCs (to be formed) and manage the issue through incorporating suitable activities in micro plan.
- Encourage to reduce the number of cattle by promoting high yielding varieties
- Promote stall feeding
- Ensure timely vaccination and deworming
- Collaborate with Panchayat, Animal Husbandry Department, Tribal Welfare and other line departments that supplies cattle to these settlement to reduce such activities.
- Address the livelihood of local tribal community especially who depend on cattle for their livelihood through alternate income generating activities.
- Construct a cattle pound to implement the provisions of the cattle trespass act, if necessary

6.3.2.1.7.3. Plantations of exotics

This problem is dealt separately under restoration plan.

6.3.2.1.7.4. Over exploitation of NWFP and collection of firewood

NWFP is collected mainly by the local people within and around the Sanctuary. The main products include fire wood, honey, badraksham, kattupadavalam, wild pepper etc. Collection of NWFP by persons will be permitted through EDC intervention only. The quantity of materials collected from the PA will be studied. However, this issue is dealt separately under ecodevelopment chapter.

6.3.2.1.7.5. Fire

This issue is also dealt separately under theme plan for 'Fire Protection'.

6.3.2.1.7.6. Pressure for interstate connectivity (through the PA)

There is proposal to establish a connecting road between Kochi and Kodaikanal. At present the road is paved upto Kovilur and it is proposed to connect

this road to Kodaikanal through Kadavari. This will lead to severe pressure on the high altitude grassland and associated ecosystem. Hence the following strategies are proposed:

- Tackle with existing legal provisions
- Awareness creation/lobbying

6.3.2.1.7.7. Human habitation (Kadavary) within the PA

Kadavari settlement is a human habitation within the Sanctuary has 79 families with about 250 members. The primary occupation of these people is agriculture and they depend on forest for collection of firewood and NWFP. These issues are dealt in Chapter 8. In addition, they also use mules (73 nos.) for transportation purpose which are grazing in the forest and may lead to disbursal of disease to wild animals.

- Reduce the number to a minimum
- Disease control measures
- Explore alternate transportation mechanism

6.3.2.1.7.8. Weeds

Species such as eupatorium and bracken fern are considered to be weeds. They can be retained and monitored in depressions. In the depressions the weeds are developed in the wattle plantation areas after its removal. It is better to retain these weeds patches as the same will suppress the germination of wattle seeds and re-generation of wattle. This will be moniterd over a period of time. They can be removed in small patches on experimental basis in few patches and study the regeneration pattern of natural vegetation and recommend for future action of management.

6.3.2.1.7.9. Real estate pressure on the fringe lands

There is a real threat due to pressure from real estate people who are mainly responsible for bringing up the connecting road between Kochi-Kodaikanal. Such development in this fragile ecosystem will exert pressure on the habitat and its associated rare, endangered and endemic species of flora and fauna. Moreover, there are possibilities of all sort of illegal activities in the region. Hence, this issue needs to be tackled through proposal of Eco-sensitive zone in the surrounding region of the PA and intensive awareness creation among the local communities.

6.3.2.1.7.10. Potential threat of poaching

After the notification of the PA, there was one incident of poaching recorded. The poaching was carried out by people from Kovilur region as part of their religious customs. However, this type of illegal activities will strictly be controlled by regular perambulation in the region and awareness creation among the public.

6.3.2.1.7.11. Tough terrain

This issue will be tackled through assessing the need of trek paths for effective protection and improving the camping facilities like tents, field gears including GPS, compass, binoculars, digital camera, torches, etc.

6.3.2.1.8. Infrastructure Development

6.3.2.1.8.1. Improvement of facilities in existing camping stations

The existing camping stations and anti-poaching camp sheds will be improved with at least the basic amenities such as solar power lantern, field cots, drinking water, etc in order to provide the basic amenities to the field staff.

6.3.2.1.8.2. Check posts and Chain gate

At present there is no check post exist in the PA. However, it is highly crucial to establish check posts at Kadavari and Kovilur to check the vehicles and trespassers passing through the PA. This check posts will permanently be manned for keeping vigil round the clock. Hence along with the check posts related infrastructures such as buildings for the stay of staff, power supply, drinking water and other basic amenities will be provided.

In addition, a chain gate is also highly essential at Neduvarpu to check illegal trekking and unauthorized vehicles passing through the PA.

All the infrastructures will be maintained as and when required during the plan period.

6.3.2.1.9. Roads

The following fair-weather roads are passing through the Sanctuary. The Kottakombur – Kadavari road (8Km) is mainly used by the settlers in Kadavari and the other road between Bandhar and Kadavari (8Km). These roads will be maintained (not exceeding three meters in width along with small bridges, culverts and barricades) as and when required during the plan period. No new road is proposed during the plan period.

6.3.2.1.10. Trek paths

A total length of 79.2 km of trek paths as given in the Table 10 exists in the PA. These trek paths were constructed for perambulation purposes and the same will be annually maintained to facilitate protection. New trek paths as demanded by the protection may be taken up with in the concern of Wildlife warden.

6.3.2.1.11. Communication facilities

At present there is no wireless station within the PA. There are only there are two fixed (Top Station and Bandhar) and one mobile (in the vehicle used by Assistant Wildlife Warden) wireless sets and three walky-talkies (each at RO's Office, Checkpost at Top Station and the staff on mobile) available in the shola range with four PAs. Steps will be taken to provide solar based wireless charging systems to out posts.

A new wireless station at kadavari is essential for the communication with Station at Kadavari, since there is no telephone/mobile connectivity or electricity facility. The Wildlife Warden may take action for the construction of new wireless station at Kadavari and the maintenance of wireless stations by putting suitable tribal watchers under his jurisdiction.

Possibility of providing WLL phones to important locations shall be explored and implemented.

6.3.2.1.12. Vehicle

At present, the Assistant Wildlife Warden with headquarters at Top Station has a vehicle and the Deputy Ranger, Kadavari Station has an another vehicle. These vehicles are used for the protection of Anaimudy shola NP, Pambadamshola NP, Mathikettan shola NP and Kurinjimala WLS. It is proposed that one more vehicle may be procured for Kurinjimala Sanctuary. Maintenance of these vehicles will be carried out as and when required during the plan period.

6.3.2.1.13. Arms and ammunition

At present the Asst. Wildlife warden is provided with 1 Revolver and the staff is provided with 4 Rifles (.315). Wildlife Warden may also take action to provide 2 guns to the section staff and one gun to check post and also provide the required ammunition. One extra gun may be spared for the other Parks under his jurisdiction. Maintenance of these arms and ammunition will be carried out during the plan period. Arrange necessary training to the staff to handle the weapons

6.3.2.1.14. Deployment of staff

All vacant positions will be filled up regularly. For effective protection of the Reserve, additional staff is proposed as part of redeploying the Kambakkal Forest Station presently with the management of Chinnar WLS.

6.3.2.1.15. Capacity Building

Training will be given to patrolling staff in unarmed combat, survival skills, usage of fire arms, first aid, swimming, driving etc. with the assistance of Police. Training will also be given in the preparation of offence reports. Selected staff will be trained as 'handlers' as part of intelligence gathering. Police should be approached for giving short term trainings on intelligence gathering at regular intervals. Exposure training to staff in identification of plants and animals will be periodically provided to staff working in the PA as part of building their capacity.

In addition to the above, local persons from the Kadavari settlement with aptitude will be identified and trained in basics of wildlife crime detection. Detailed training requirements are provided in Chapter 9.

6.3.2.1.16. Intelligence Gathering and Co-ordination

The Wildlife Warden, Assistant Wildlife warden and staff will develop liaison with NGOs, peoples' representatives, EDC members Tribal Heads, interstate officers, Crime Control bureau officials, in sharing information. The informants may be paid suitably. The Wildlife Warden may move proposal for fixing the rewards to the informants depending on the type of crime and information. Legal support will be made available as required. The wildlife Warden will review and monitor the implementation of the protection plan.

The Assistant Wildlife Warden will also collect credible information through confidential channels employing agents or sources. Confidential sources and agents will be identified, trained and placed in position to get confidential information.

6.3.2.1.17. Joint Patrolling and Meetings

Joint patrolling and meetings of various levels of officials will be held with the adjoining forest divisions within Kerala and Tamil Nadu side. This will be ensured by the Wildlife Warden and Assistant Wildlife Warden.

6.3.2.1.18. Exchange of Crime Dossiers

The Wildlife Warden /DFOs will exchange the crime dossiers with police to update and review with District Superintendent of Police at least once in six months. The information will also be shared with adjacent forest divisions in Tamil Nadu to ensure effective protection.

6.3.2.1.19. Review of protection issues

Based on the threats and protection issues, threat perception and vulnerability of various regions in the PA will be developed.

6.3.2.1.20. Maintenance of Records

Following records will be maintained by Wildlife Warden, Assistant Wildlife Warden and Section staff.

- Records of vehicles passing through check posts.
- Offence Registers at Division/Range/Station.
- Arms and ammunition Register (Range/Station)
- Records of dossiers of habitual/ incorrigible offenders in the Range.
- Regular supervision schedule for ROs.
- Records of surprise visit by Senior Officers (Field Director, Project Tiger and Wildlife Warden).
- Staff in each Section will maintain
- Movement Register
- Wildlife sighting/daily monitoring/observation Register (Wildlife Journal)

6.3.2.1.21. Equipment / Field Gears

It is proposed to procure field equipment such as Tents, Compass, GPS, Binoculars, Range finder, Digital camera, Rain Gauge, Thermometer, Hygrometer, Camera trap, field kits, etc. will be provided in the proposed check posts and Forest Station HQ at Kadavari. In addition the watchers will be provided with field uniform once a year during the plan period.

6.3.2.1.22. Staff welfare activities

The Wildlife Warden will have meetings with the staff and include the staff amenities items in the APO funded by Government of India. At present the Govt. of India is providing staff welfare inputs like residential accommodation for the children of frontline staff in nearby town/villages, supply of kerosene, medicine, field kit, mosquito net, torch, etc. Camp food shall be provided to staff and watchers stationed at interior camps.

6.3.2.2 Theme Plan for Fire Management

The PA being located in the vicinity of several human settlements, fire is frequently being experienced in the Sanctuary and cause considerable damage to the flora and fauna in the region.

A fire management plan shall be prepared each year in advance before the onset of fire season. While preparing fire plan, the natural features such as existing road, trek paths, rivers, etc will be considered. Fire protection measures in the PA will be taken in accordance with approved fire management plans.

The fire prone areas in the PA are Kambakkallu, high altitude grass lands in the surrounding regions of Company area, plantations on Tamilnadu boarder, areas on the periphery towards Kovilur, Kottakombur and areas adjoining the Kadavari settlement.

6.3.2.2.1 General guidelines for preparation of Fire Management Plan

- Identify the cause and consequences of fire at PA level.
- Prioritize and map fire prone areas based on local knowledge.
- Prepare plans on annual basis.
- Provide adequate training to fire-fighting squad in fighting fires and self-defence.
- Develop infrastructure by procuring necessary equipment and materials required for fire protection based on annual assessment.
- Develop proper monitoring protocols.
- Ensure timely implementation of interventions.
- Maintain fire records at Range and Division level.
- Report incidences of fire to Wildlife Warden and Field Director for evaluation and further action.
- Document the results of fire protection measures taken annually.

6.3.2.2.2 Fire Management Strategies

Following measures are proposed to prevent extensive fires.

6.3.2.2.2.1 Fire lines

The Assistant Wildlife Warden will maintain the fire lines in the fire prone areas given in the following. Necessity of additional fire lines will be examined by Wildlife Warden and shall carried out as required.

- Fire lines will be taken as per the guideline adopted by KFD.
- No fire line should be taken on the edge of the shola forest. The fire line around the shola should be taken giving the reasonable space for the extension of shola forest.
- In short grass around the sholas, scrapping shall be avoided. The system followed in Eravikulam NP by Muduvans for creation of fire line without scrapping may be followed.

Table 12 Existing fire lines in Kurinjimala Sanctuary

Sl.No.	Name of fireline	Length (km)
1	Choolakal - HNL	4 Km
2	Choolakal – Neduvarpp	6 Km
3	Kadavari Top – HNL	6 Km
4	Kurangupara - Thattmpara	2 Km
5	V cut - Tharavadu	6 Km
6	Thulakkanpetty – Kulakkadu	6 Km
7	Thampuranchola - Kadavarikava	6 Km
8	Kurangupara – Kadavari top	4 Km
9	Bandhar – Kadavari top	8 Km
10	Kadavari kava - Bandhar	5 Km
11	HNL – Kadavari kava	3 Km
12	Thuppakkimedu – Marakkanam	5 Km
	Total	61 Km

6.3.2.2.2 Controlled pre-burning

Controlled burning is prescribed for the grasslands in the bit I and bit II of the protection zone for providing fresh shoots to the population of Nilgiri tahr found in and around the regions and also to avoid late burns.

Guidelines for controlled pre-burning:

Controlled pre-burning is practised to avoid accumulation of combustible materials and to enrich food availability to herbivores. Following guidelines are to be followed:

- Grasslands to be burnt will be identified and divided into blocks using natural features such as streams, nullahs, roads, trek paths, etc. or grids.
- Controlled pre-burning will be practiced during December (just after the rains),
- Each block burnt will be surveyed and recorded using GPS.
- Blocks will be burnt on a three year rotation.

- Fire should not be set at night as this will attract nocturnal insects, birds and animals. Ideally burning is to be done during early morning or evening hours.
- Before burning, target area should be flushed to drive out animals and birds. Simultaneous setting of fires on all sides of the block should be avoided.
- Fire should be set opposite to the wind direction to control speed/ velocity and intensity.
- On hill slopes, fire is to be set from top down direction for better control.
- Controlled burning should be carried out only in the presence of staff.
- Necessary fire-fighting equipments should be procured in advance. Staff and labourers involved for burning should be trained in using fire-fighting instruments.

6.3.2.2.3 Fire Protection mazdoor

The fire watchers will be engaged throughout the fire season for efficient fire protection activities. In addition to the protection mazdoors 10 persons will be engaged from Kadavari settlement as fire protection mazdoors. During emergencies additional mazdoors will be engaged for fire protection works.

6.3.2.2.4 Participatory Fire Management

Participatory fire management shall be based on the guidelines circulated by the Principal Chief Conservator of Forests in Circular No. E&TW1-2002/08 dated 14.11.2008

People from Kadavari area will be engaged in fire prevention and protection activities. A micro plan for participatory fire management may be prepared annually for EDC detailing the extent of area, people involved, benefit sharing, etc. Funds for the prescribed operations will be placed in the EDC account on the basis of a MoU.

Participatory Fire Management Plan will include the causes/sources of fire, preventive measures and conditions specified in line with the above circular. The plan will be signed by a member of the EDC subgroup, President and Ex-Officio Secretary/Staff in-charge of the area. Plan will be approved by the Range Officer.

6.3.2.3 Awareness and Training

Awareness campaigns are essential for preventing fire especially in the surrounding areas of PA. Focus will be given to the 4 settlements and members of Vattavada Panchayat. These will be organized through notices and posters, stickers,

boards, etc. EDC-based awareness campaigns highlighting fire preventive and containment measures among children and youth in the localities will be held during the fire season. Creative programmes in this regard will also be developed.

6.3.2.4 Training programmes

Training programmes for staff, watchers and other members of the community involved in fire protection will be organized.

6.3.2.5 Fire watchtowers and communication network

The present infrastructure and communication facilities will be made use in fire protection to prevent the fire incidents and to mobilize additional forces in case of necessity. In addition to the existing infrastructure, one fire watch tower is essential at Kadavari Top to observe wild fire.

6.3.2.6 Fire fighting equipment

The equipment like gum boots, fire resistant suit, etc may be procured and made available to the fire camps.

6.3.2.7 Impact Monitoring

Incidents of fire will be documented and reported promptly to the Field Director and Chief Wildlife Warden. Controlled pre-burning areas will be monitored to assess their impact and streamline future activities.

The Wildlife Warden will review the fire plan every year after the fire season. The gap in fire protection will be identified and suitable proposals may be made in the ensuing year to make Kurijimala Sanctuary totally fire free.

6.3.3 Theme Plan for Watershed and Habitat Management

6.3.3.1. Theme plan for water shed management

There are 10 check dams exist in the PA (Map 9). These check dams were mostly constructed by the Local Panchayat to provide water to local community. However, these water sources are also meeting the needs of the wild animals. Maintenance of the check dams will be carried out during the plan period.

In relation to the watershed management, there is no micro drainage maps is available for the management. Moreover, the local communities are unaware about the usage of water and optimization of water use. Water harvesting structures are not adequate and soil erosion of found evident in steep slopes. The line departments involved in these activities are not having any linkages with KFD. Hence the following strategies are proposed:

- Collect available maps from FMIS, LUB, CESS, CWRDM, IFP, etc and prepare micro drainage maps for the PA
- Create awareness among the local communities for efficient use of water resources.
- Address the problem of water shortage for human-use through FDA
- Assess the shortage of water sources within PA and develop. The same may be addressed through FDA.
- Develop rain water harvesting structures in crucial locations.
- Develop brushwood check dams using eucalyptus/wattle pole
- Soil moisture conservation measures will be taken up in areas of severe soil erosion with the support of FDA.

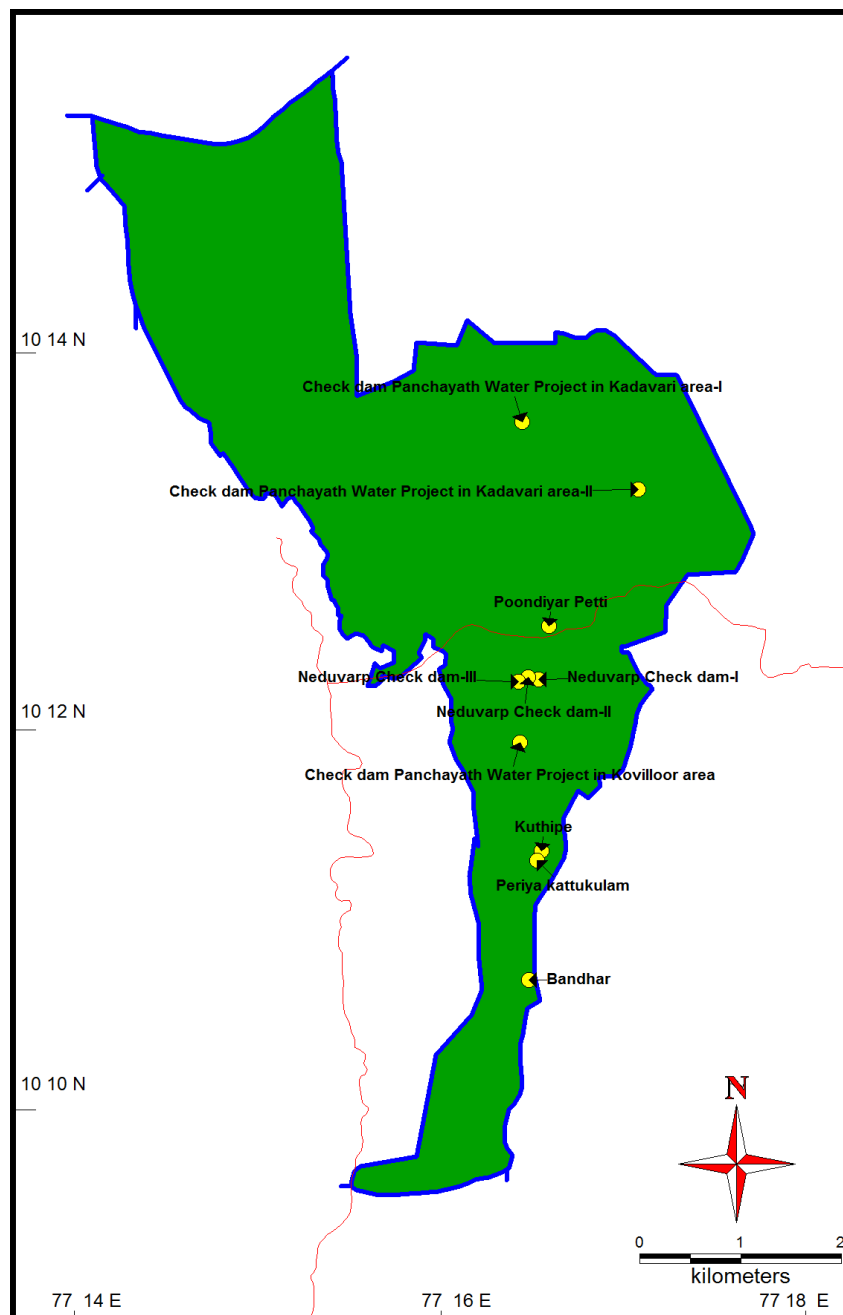
The utilization of habitat by the wild animals depends on the availability of water resources within their reach. The people within the Sanctuary and people residing at Kottakombur, Koviloor and Vattavada also depend on the water from the Sanctuary for drinking and irrigation purposes. To provide judicious distribution of water sources for wildlife and to fulfil the water needs of the local people, detailed information needs to be generated during the plan period. The following activities are proposed as part of water resource management

- Mapping of water sources – water holes, check dams, streams and other natural sources with seasonality.
- Installation of meteorological station at Kadavari for regular recording of weather data.
- Initiation of dialogue with local bodies and beneficiaries for water sharing and watershed conservation.

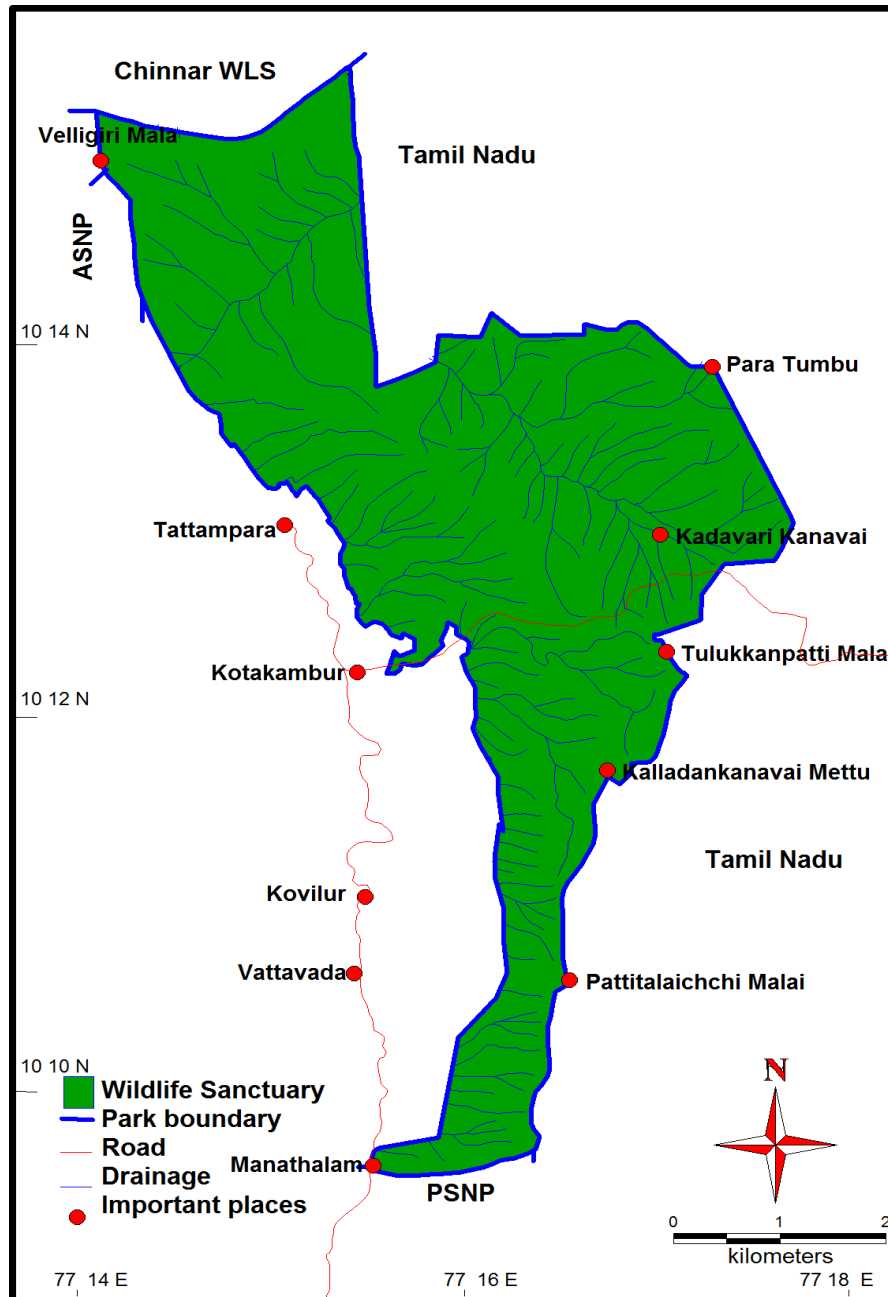
- Conduct feasibility study to retain water in crucial locations inside and outside PA.
- Implementation of suitable measures for maintaining and improving watersheds – bring back original vegetation in restoration zone, soil and moisture conservation measures etc.

The Wildlife Warden shall prepare a status paper on water resources and seasonality and propose future development of water holes and check dams /anicutts accordingly

Map. 9 : Map of Check dams in Kurinjimala sanctuary



Map 10 : Drainage map of Kurinjimala Sanctuary



6.3.3.1 Theme Plan for Habitat Management

Species such as Eupatorium and bracken fern were considered as weeds. However these species are found mainly in depressions which will be retained and monitored for any relation with water retention and ecosystem alteration. However, experiment of removal by cutting and uprooting in smaller patches especially in regions where Neelakurinji occurs may be tried and monitored. These treatment

areas will thoroughly studied for regeneration pattern of natural vegetation and recommend for future course of action during 1st year of the plan.

As part of habitat/species monitoring, studies like mapping of vegetation, wildlife health monitoring, documentation of flora and fauna including RET and endemic, population monitoring of selected flora and fauna, habitat utilization and movement pattern of elephants, invasive species that have negative impact on ecosystem, spatial and temporal distribution of water sources, mapping of water sources, drainage map, monitoring of burned areas, impact of controlled burning on the habitat utilization and distribution of small animals like amphibians, quantification of fire wood, grass and other forest produce moved out of the PA, eco restoration studies in plantation areas, regeneration status of RET and endemic flora, monitoring shola etc. will be taken up on priority basis during the plan period.



Fig. 19 : Rhododendron (Rhododendron arboreum)

CHAPTER – 7

Tourism, Interpretation and Conservation Education

The main goal is to strengthen the cause of conservation in general and of the management of the PA concerned in particular through conservation oriented visitor management. This can be achieved through (i) providing informed wilderness experience to visitors (ii) enabling the visitors to view a cross section of PA values.

Tourism, Interpretation and Conservation Education activities will be confined to the ecodevelopment zone. There are no facilities within the PA but the following facilities related to environmental conservation awareness and nature based tourism are available in the near by Pampadumshola National Park.

1. Amenity Centre at Oorkadu
2. Mud house at Oorkadu
3. Eco-huts (2 nos) at Oorkadu

7.1 Strategies and Activities

7.1.1 Environmental conservation awareness

- Create a post of Wildlife Assistant at Division level.
- Develop education materials focusing on kurinji and grasslands for various target groups - leaflets, brochures, pamphlets, posters, movies, etc
- Conduct nature awareness camps for various target groups and preference needs to be given to local schools and communities. These programmes would involve voluntary eco restoration works.
- Procure equipments such as computer, LCD projector etc for conducting nature education camps effectively.
- Create a website for the Sanctuary
- Develop appropriate hoardings and signage.

Once basic infrastructure facilities for conservation education are established in a central place at Manathalam in PSNP, nature camps for school/college students, NGOs, local communities etc. can be conducted regularly

7.1.2 Facilitating nature-based regulated tourism

- Engage trained resource persons through Anamudi FDA
- Capacity building & training to guides and staff on human behaviour, identification of flora and fauna (butterflies, birds, animal evidences etc)
- Procure adequate equipments to be given to tourists on rent (binoculars, leech proof socks, tents, sleeping bags, solar lights, torches etc.)
- Create awareness among local communities / visitors to PA
- Legal Enforcement with fine to control littering.
- Facilities made using locally available materials for arranging treks at Kadavari
- Develop appropriate nature based tourism packages considering protection of PA and ensuring livelihood security of dependant community and PA management
- Prepare site specific micro plan for each package with baseline information and conduct annual impact assessment through participatory process.
- Move proposal for recycling entry fee
- Provide facilities like information centre, toilet, snack bar etc. for tourists.

The Wildlife Warden will conduct annual review of environmental conservation awareness programmes and nature-based regulated tourism activities.

Importance of Nilakurinji can be high lighted and a limited student groups can be allowed in to the Sanctuary as part of awareness programme. These groups will be provided with basic amenities and also will be taken on guided treks by trained local trekkers. These groups will also be encouraged to take part in the eco restoration programmes such as removal of exotics, planting operations, environmental awareness

Ecotourism initiatives inside the Sanctuary will be developed in a phased manner and the EDC's will be fully responsible for the implementation of the ecotourism activities. The ecotourism activities will be mostly based on guided trekking and camping inside the Sanctuary in designated locations.

CHAPTER 8

Ecodevelopment

The major issues related to people-PA interface are human-wildlife conflict in the villages of Kadavari, Kottakombur, Kovilur etc. and their dependency on the PA. There is lack of information on the extent of human-wildlife conflict and dependency on the PA. The eco development programmes are yet to take off mainly due to the hostility of local people regarding settlement of rights and also due to paucity of funds and absence of trained staff and support team. The eco development zone overlaps with the restoration zone also.

To strengthen the People-PA interface, the following strategies and activities are proposed.

- Development of appropriate barriers to prevent wildlife esp. wild boar entering the farmlands Timely assessment of wildlife damages and payment of compensation
- Institution of crop insurance
- Undertaking appropriate habitat improvement programmes within the Sanctuary to prevent the animals from drifting outside.
- Study the extent of the wildlife damage problem including the wildlife and crops involved
- Constitution of EDCs and designing appropriate eco development programmes
- Design and implement community based ecotourism programmes
- Seeking funds from various sources (Local bodies / other line departments/ Govt. of India) through FDA.
- Identify and phase out the ecologically incompatible activities of line departments.
- Deployment of adequate trained support team including social workers /voluntary services
- Identification of the needs /aspirations and natural and cultural resources of local community
- Identification of the potentials to be utilized for ensuring the livelihood security of local people – nature based tourism packages,
- Imparting training to staff
- Conducting study tour for the appraisal of good practice in other Pas.

For regulating and control over grazing, firewood and NWFP collection and transportation of goods through mules, the following strategies are proposed.

8.1.1 Grazing

- Study and monitor the number, extent and impact of grazing
- Reduce number of cattle by providing alternate livelihood and encourage stall feeding
- Ensure vaccination of cattle – twice a year
- Ensure vaccination of cattle transported through the PA
- Form an user-group EDC
- Move proposal for notifying veterinary hospitals near PA as supporting agency.

8.1.2 Firewood collection

- Study the extent and impact of firewood collection
- Prevent collection of indigenous species as fuel wood
- Exotic species may be permitted to be collected as fuel wood with mutual commitments as part of phased removal of exotics
- Propose fuel wood plantation, wherever required within community land/ ecodevelopment zone.
- Provide energy-saving devices
- Form an user-group EDC

8.1.3 NWFP collection

- Study the extent and impact of NWFP collection (honey, badraksham, kattupadavalam, wild pepper etc)
- Evolve scientific/ sustainable collection methods
- Provide training to EDC members for scientific/ sustainable collection of NWFP resources & value addition
- Define zone of collection and frame access rules for sustainable collection
- Propose alternate livelihood to prevent unscientific/ unsustainable collection
- Encourage regeneration of NWFP & medicinal plant species
- Promote planting of selected endemic NWFP species in the homesteads.

8.1.4 Presence of mules for transportation of goods to settlements and vice versa

- Vaccination and health care of the existing ones – twice an year
- Monitoring by the staff –about animal health and vaccination certificate
- Explore the possibilities for developing an alternate arrangement with minimum impact in consultation with people.

CHAPTER –9

Research, Monitoring and Training

Research, monitoring and training are among the weakest areas in wildlife management. The need is acknowledged but there is very little progress. Research has mainly suffered due to lack of policy, clarity of objectives, priorities and therefore inadequate funding support; lack of adequate employment opportunities inclusive of reasonable career advancement prospects and therefore want of suitable personnel.

The Sanctuary was declared during 2006 and not explored much from the biodiversity point of view. In order to accomplish the Plan objectives, the following research, monitoring and training activities are proposed.

9.1 Research

1. Mapping of the extent of wattle, eucalyptus and pine plantations to restore the areas.
2. Mapping of vegetation types
3. Study & monitor the number, extent and impact of grazing
4. Conduct studies to document the flora and fauna of the PA including RET and endemics
5. Study and document traditional knowledge of indigenous communities
6. Study the extent and impact of NWFP collection (honey, badraksham, kattupadavalam, etc)
7. Evolve scientific/ sustainable collection methods for NWFP management.
8. Study and identify invasive species that have negative impact on ecosystem
9. Study and identify the spatial and temporal distribution of water sources and generate maps.
10. Studying the extent of the wildlife damage problem including the wildlife and crops involved.
11. Study the extent and impact of firewood collection.

9.2 Monitoring

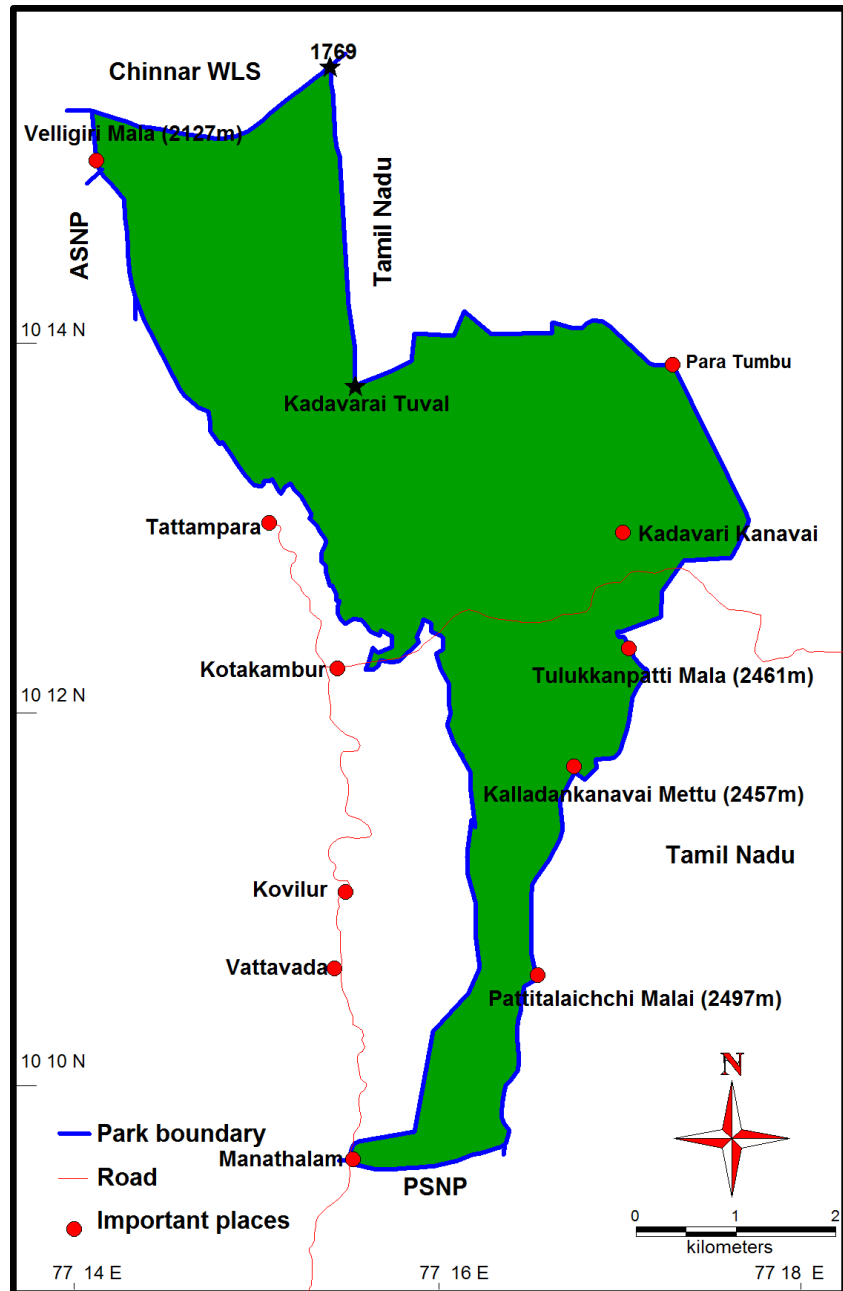
1. Monitoring regeneration status and soil erosion
2. Regular wildlife health monitoring
3. Population monitoring of selected species of flora and fauna
4. Monitoring of intrusion and regeneration of invasive species

5. Monitoring of regeneration of natural species in the restoration zone.
6. Monitor impact of ecotourism programmes

9.3 Training

1. Impart training to staff & EDC members on wildlife health monitoring
2. Provide training to EDC members for scientific/ sustainable collection of NWFP resources & value addition
3. Capacity building of local communities for ecotourism programmes
4. Capacity building for staff in intelligence gathering, identifying wildlife article, acts and rules, etc.
5. Capacity building & training to guides and staff
6. Training to staff on GPS.
7. Training on wildlife evidences, collection of biological materials and their interpretation.
8. Training in weapon handling and maintenance.
9. Training on modern fire fighting.

Map 11 : Important places in Kurinjimala Sanctuary

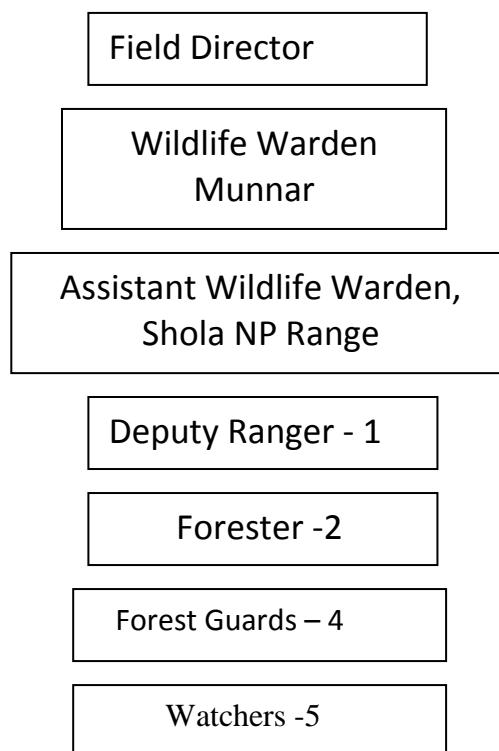


CHAPTER –10

ORGANISATION AND ADMINISTRATION

10.1 Structure

The organizational structure of the Park is as shown below



10.2. Responsibilities

The Kurinjimala Sanctuary will be headed by the Wildlife Warden who will have overall responsibility for the implementation of the Management Plan. The Wildlife Warden will develop a pocket field guide with schedule of operations for the implementation of Management Plan and supply it to Assistant Wildlife Warden and Section Foresters.

The Wildlife Warden will make arrangements to supply the below mentioned control forms (Annexure- 13) to the Assistant Wildlife Warden and Section Foresters and compile the information about the Sanctuary.

10.3 List of control forms

FORM WM - 1	Creation of new artificial waterholes
FORM WM - 2	Maintenance of waterholes : Natural
FORM WM - 3	Maintenance of waterholes : Artificial
FORM WM - 4	Restoration of habitat : weed control
FORM WM - 5	Restoration of habitat : Prescribed burning
FORM WM - 6	Restoration of habitat : Soil Conservation measures – initial operations and subsequent maintenance
FORM WM - 7	Restoration of habitat : Area under protection/closure
FORM WM - 8	Animals : Measuring trends in populations
FORM WM - 9	Animals : New records
FORM WM - 10	Animals : Mortality other than that attributable to an offence
FORM WM - 11	Animals : Mortality attributed to poaching or an act of vandalism
FORM WM - 12	Animals : Predation on domestic livestock by wild carnivores
FORM WM - 13	Animals : Killing of a human by wildlife or injury caused
FORM WM - 14	Animals : Wildlife damage to private or public property
FORM WM - 15	Plants : New records
FORM WM - 16	NWFP collection : Plants and other produce
FORM WM - 17	Grazing of domestic livestock
FORM WM - 18	Inter-agency programmes : Agencies and schemes (Government)
FORM WM - 19	Programmes of NGOs
FORM WM - 20	Construction*/maintenance* of infrastructure : Roads and Bridges (*existing/new)
FORM WM - 21	Construction*/maintenance* of infrastructure : buildings (*existing/new)
FORM WM - 22	Development*/maintenance* of infrastructure : communication (*existing/new)
FORM WM - 23	Development*/maintenance* of infrastructure : vehicles (*existing/new)
FORM WM - 24	Developing infrastructure : construction of boundaries Fences, CPTs, EPTs, exclosures, enclosures (*existing/new)
FORM WM - 25	Developing infrastructure : fire lines (*existing/new)
FORM WM - 26	Tourism
FORM WM - 27	Outbreak of fires
FORM WM - 28	Offence cases detected

- FORM WM - 29** Incentives and awards
- FORM WM - 30** Research projects under implementation through PA manpower with or without collaboration with other agencies
- FORM WM - 31** Survey and inventories
- FORM WM - 32** The Monitoring Programme
- FORM WM - 33** Ecodevelopment

The Wildlife Warden, Munnar will prepare Annual Plan of Operations and Schedule of Operations every year in the first week of April.

The Wildlife Warden shall not deviate from the Management Plan prescriptions without the prior permission in writing of the Chief Wildlife Warden.

10.4 Maintenance of Geo-referral data:

Wildlife Warden will maintain a register and record geo-references of the entire field based activities.