

Conservation of the Tropical Dry Evergreen Forest

Rapid Ecological Assessments of a Sample of Reserve Forests of the Coromandel coastal Belt



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Conservation of the Tropical Dry Evergreen Forest – Rapid Ecological Assessments of Reserve Forests of the Coromandel coastal Belt

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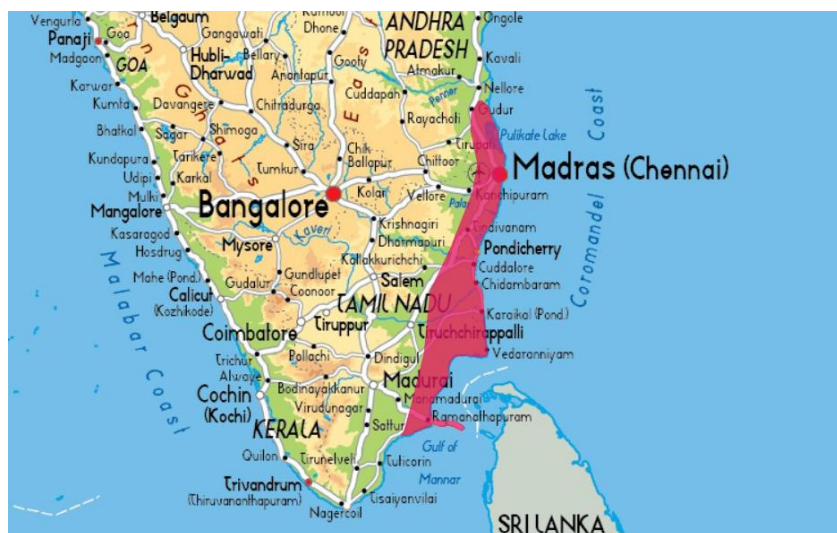
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Introduction

Within the coastal region of south-eastern peninsular India there is a vegetation type defined as Tropical Dry Evergreen Forest – TDEF (Champion and Seth 1968 [1]). It has a narrow range, approximately 500 km long running north to south, and with a width no wider than 50km, see *Map 1* below. This range experiences both of India's monsoon systems, South West in the summer and the North East in the winter. The annual rainfall for the zone varies between 1000 to 1500mm, with the majority experienced at the latter part of the year (Meher-Homji 1974 [2]). This zone is also affected by dew for up to 2 months after the North East monsoon, which all taken into consideration leads to this zone having a limited dry season. The predominant evergreen vegetation of this TDEF zone gives way to more deciduous flora as one moves inland out of the zone.

The TDEF, like most tropical forests, contains large amounts of species and biodiversity, it is estimated that up to 1000 different plant species make this forest type their home with over 300 of these being woody. The forest type has adapted to being in a cyclonic region, with a relatively low canopy of 8 to 10 metres with the occasional emergent tree. The canopy of evergreen trees with its evergreen shrub understory is rich with inter-linked lianas, and the forest floor is a rich layer of biomass that is effectively recycled by plant feeder roots in the top 1 cm of soil. The TDEF, like classical tropical forests, holds its nutrient wealth in the canopy, thus once cut the soil becomes impoverished and quickly leached by the region's intense monsoon rains.

Map 1 – The geographical extent of the TDEF

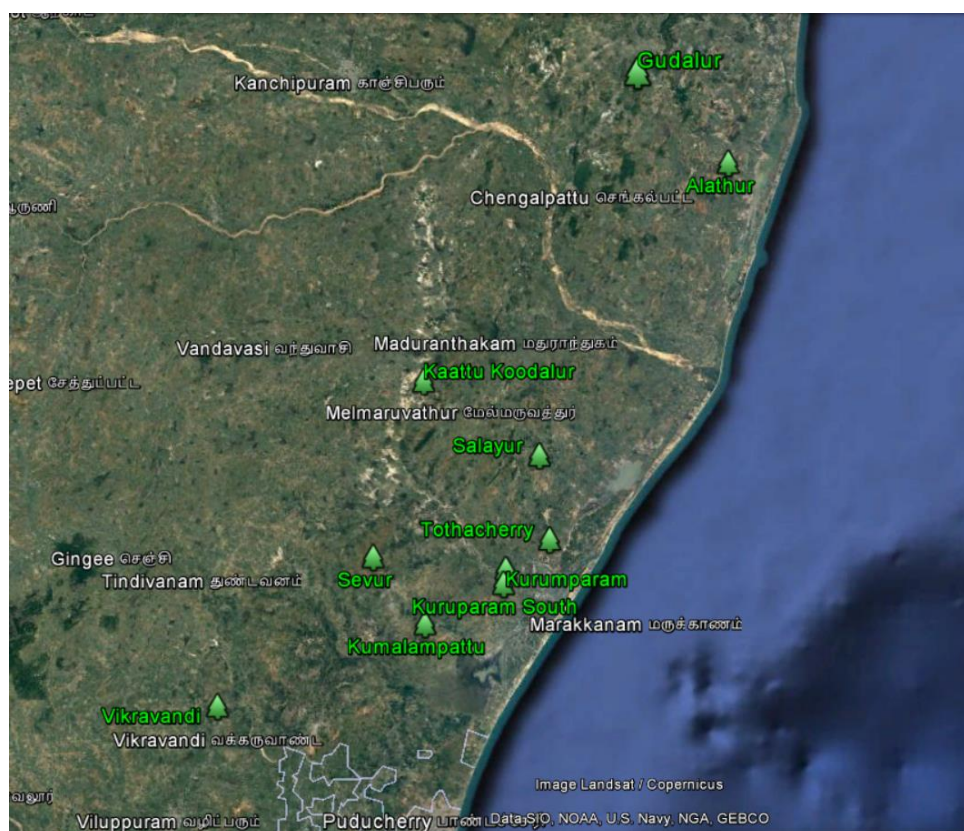


A forest type is not only the flora, the plants that are present within the ecosystem, but also the fauna, the mammals, birds, reptiles, and insects that survive and thrive in this habitat. In the past leopards and elephant herds would have roamed these regions, perhaps even tigers, but today the TDEF is home to smaller

mammals, the mongoose, porcupine, Indian civet cat, jungle cat, and many more including the fruit bat which is an important vector for spreading seeds of the forest. The TDEF is not only home to a large population of reptiles and a myriad of bird species that gain protection from the dense habitat the TDEF offers, but it also gives place for the insects, some of which are pollinators, to help the ecosystem thrive.

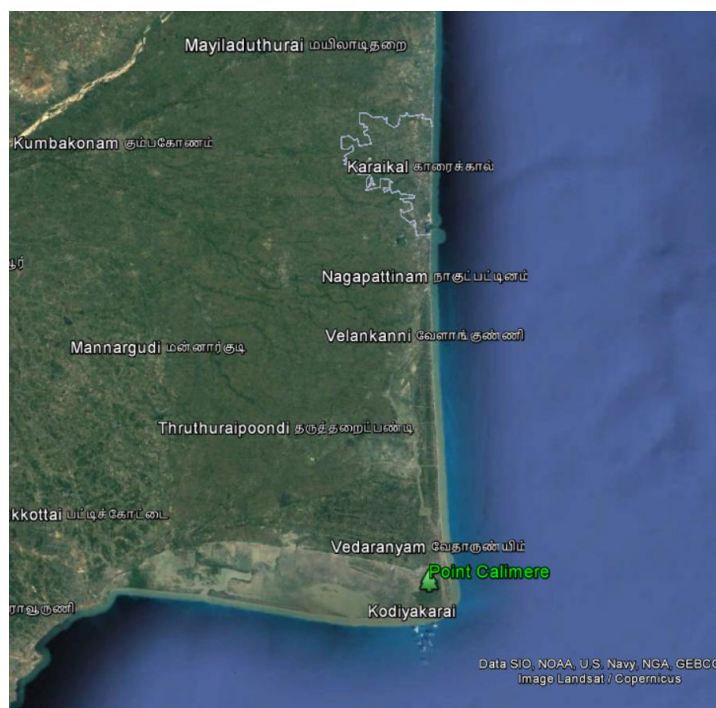
In 1992 it was estimated that only 5% of the TDEF zone was under forest cover (*Meher-Homji 1992 [3]*). In 2002 this estimate was revised to only 4% (*Wikramanayake et al 2002 [4]*), but in both estimations, it was understood that most of this forest cover was disturbed. As a result of extensive field studies carried out between 1999 and 2004 by the Auroville botanical team, a reasonable assessment was made, that from this 4% of forest, 5% could be assessed as a pristine remnant of the TDEF, with the other 95% to be highly disturbed and categorised as degraded scrub. Therefore, it would be fair to state that only 0.2% of this range now exists as a TDEF ecosystem, and consequently making it a very rare forest type in India, if not the rarest due to its anyway limited range. The circumstances which have left this forest system in a fragile state are many, but mainly the high concentration of human population in this coastal belt and the impact that it has on the environment. There are many other factors like the presence of an active port in Puducherry and in the mid 1800's it has also been documented that in an area close to Cuddalore, within the TDEF zone, one of India's largest steel mills was active and being fueled by wood and charcoal (*Raman A. 2017 [5]*).

During a larger TDEF research project implemented in the early 1990's, Reserve Forests (RF's) within the Chengalpattu, Cuddalore and Villupuram districts were visited and vegetation surveys conducted. As an initial step to understand the present ecological status of these RF's, and to create baseline information for any potential future conservation effort within these areas, it was decided to reassess a sample of RF's. Under the supervision of the Forest Department 11 reserve forests on the plains were assessed, see *Map 2 and 3* below for their geo-location.



Map 2 – Studied R.F.s in Chengalpattu, Cuddalore and Villupuram districts

Map 3 – Studied R.F. in
Nagapattinam district.



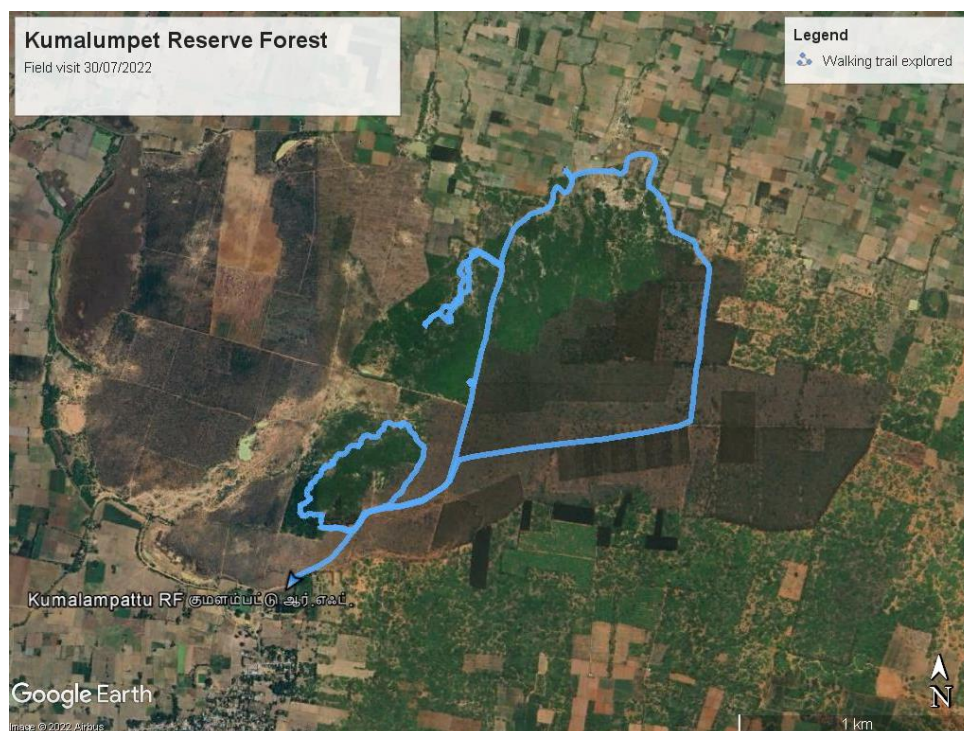
Methodology

It was chosen to follow a rapid assessment format, utilizing past data on site and species. Each site was physically visited by the Auroville Botanical Gardens team, and the following information collected:

- Description of the general ecology of the site
- Main canopy species assessment
- Understory cover/species assessment
- Main liana assessment
- Noteworthy species and regenerating evergreen species.
- Surrounding land use
- Cutting/lopping/browsing assessment
- Approximate canopy height and cover
- Presence of main evergreen species (as per previous species list supplied)
- Large trees of interest – Measurement, GPS, and photograph
- Key examples of the differing ecological zones of the area.

Note: The areas of the site that are designated in hectares are approximate. These figures were gained verbally either by the forest ranger or forest officer. As a future step these figures need to be clarified with land holding documents.

Kumulampet RF



Description of the general ecology of the site

Kumulampet RF is situated within the Vanur taluka of the Villupuram district. The approximate total area of the reserve forest is 93 hectares. Approximately half the site is being utilized as a Eucalyptus rotation crop, which has recently been clear cut and replanted. The rest of the site was scrub clumps of vegetation between 2 and 3 metres in height, being mainly a mix of thorny species and large evergreen shrubs, with intermittent denuded areas, (see figure 1 and 2 below). The highest diversity of plants was on the Southeastern side of the site. Amongst these clumps were occasional emergent trees which were at a height between 4 and 5 metres. It was estimated that the total vegetation cover was approximately 40%.



Figure 1 and 2 – Typical terrain of Kumulampet RF

Differing ecological zones present

Approximately half the site is Eucalyptus rotation crop and the half low scrub jungle clumps with denuded areas.

Canopy height assessment

The scrub clump areas could be approximated as being 2 to 3 metres in height with emergent trees 4 to 5 metres in height. Total vegetation cover was approximately 40%.

Main canopy species assessment

The scrub clumps were mainly *Memecylon umbellatum*, *Tarenna asiatica*, *Acacia chundra*, *Diospyros ferrea*, *Carissa spinarum*, *Benkara malabarica*. The emergent trees were *Abizia amara*, *Vitex altissima*, *Acacia chundra*, *Buchanania axillaris*, *Dalbergia lanceolaria*.

Understory species assessment

It was observed that the scrub clumps were generally a canopy and understory merged, as the large percentage of the canopy was made up of shrubs. Therefore, the species are as above in the canopy species assessment.

Main lianas assessment

The main lianas within scrub clumps were *Ventilago maderaspatana*, *Hugonia mystax*, *Derris ovalifolia*.

Noteworthy species

Chloroxylon swietenia, *Buchanania axillaris*, *Dolichandrone falcata*, *Pterocarpus marsupium*.

Main evergreen species present

Memecylon umbellatum, *Tarenna asiatica*, *Dodonaea viscosa*, *Atalantia monophylla*, *Psydrax dicoccos*.

Regenerating evergreen species

Memecylon umbellatum, *Tarenna asiatica*, *Atalantia monophylla*, *Psydrax dicoccos*.

Disturbance assessment - Cutting/lopping/browsing

The forest is in a disturbed state, with cattle grazing, cutting, and lopping being widespread. It was noticed that particularly the satin wood tree (*Chloroxylon swietenia*) was targeted for making wooden stakes.

Surrounding land use

Tapioca and ground nut plantations.

Tothacherry RF



Description of the general ecology of the site

Tothacherry RF is situated in the Chithamur block of Kanchipuram district. The site is very large with an approximate land holding of 182 hectares and highly degraded (*see figure 3 below*). The largest percentage of the site is barren exposed pebbly and sandy soil, with an estimated vegetation cover of only between 25 and 40%, and of maximum 3 metre canopy height. The presence of gullies and erosion are clear indicators of rainwater loss over periods of time (*see figure 4 below*). The species diversity is low, with the richer and denser areas only found around the water catchment areas (*see figure 5 below*).



Figure 3 – Large areas of degraded barren landscape



Figure 4 – Areas of terrain damage due to rainwater run-off



Figure 5 – A 3 metre specimen of *Buchanania axillaris*

Differing ecological zones present

The largest proportion of the site is barren soil with erosion and gullies, there is low lying scrub jungle which is denser near to water catchment areas. Also, there are areas of managed Eucalyptus plantation.

Canopy height assessment

Canopy approximately 3 metres high with the occasional emergent tree up to 4 metres.

Main canopy species assessment

No canopy as such, just emergent trees from the scrub areas; *Azadirachta indica*, *Buchanania axillaris*, *Manilkara hexandra*

Understory species assessment

Due to degraded nature of the area, there is clearly no defined canopy and understory, the species just merge at similar heights. The main shrub species present are *Carissa spinarum*, *Dodonaea viscosa*, *Memecylon umbellatum*, *Maytenus emarginata*.

Main lianas assessment

Ziziphus oenopia

Noteworthy species

Gardenia gummifera, *Antidesma* sp., *Buchanania axillaris*.

Main evergreen species present

Atalantia monophylla, *Capparis brevispina*, *Dodonaea viscosa*, *Drypetes sepiaria*, *Memecylon umbellatum*, *Manilkara hexandra*, *Buchanania axillaris*, *Diospyros ferrea*.

Regenerating evergreen species

Diospyros ferrea, *Memecylon umbellatum*

Disturbance assessment - Cutting/lopping/browsing

No cutting and lopping evident. Though no evidence of goat or cattle grazing, the presence of deer in the site would mean browsing is happening.

Surrounding land use

Main road, casuarina, Salt pans

Salayur RF



Description of the general ecology of the site

The Salayur RF is situated in Madurantakam block in Kanchipuram district. The total site covers approximately 100 hectares and is an intermittent scrub jungle of a canopy of 2 metres (*see figure 6 below*), with emergent trees of 4 to 6 metres (*see figure 7 below*). The canopy covers approximately 50% of the area with the barren land being exposed red soil and pebble outcrops. The northeast side of the forest has been planted with *Syzygium cumini* in between the vegetation clumps. There are water catchment areas present with denser and larger vegetation on the peripheries (*see figure 8 below*). The site is degraded with indicators of high human impact, and illegal soil mining (*see figure 9 below*). There was at present a good source of viable *Diospyros melanoxylon* and *Strychnos nux-vomica* for seed collection.



Figure 6 – General canopy height



Figure 7 – Typical emergent tree



Figure 8 – Water catchment with tank bund vegetation.



Figure 9 – Illegal soil mining

Differing ecological zones present

Half of the site is low lying scrub jungle patches, some in the NE side having *Syzygium cumini* plantation. The balance being barren expose soil, with some water catchments also being observed.

Canopy height assessment

The Scrub areas were 2 metres in height with emergent trees between 4 and 6 metres.

Main canopy species assessment

No canopy as such, just emergent trees from the scrub areas; *Syzygium cumini*, *Ziziphus xylopyrus*, *Albizia amara*, *Terminalia bellerica*.

Understory species assessment

The scrub was exposed and low and therefore could not be defined as an understory. It was made up mainly of *Memecylon umbellatum*, *Carissa spinarum*, *Catunaregam spinosa*, *Flacourtia indica*, *Ixora pavetta*, *Psydrax dicoccos*.

Main lianas assessment

Asparagus racemosus.

Noteworthy species

Diospyros melanoxylon, *Terminalia paniculata*, *Diospyros chloroxylon*, *Strychnos nux-vomica*

Main evergreen species present

Memecylon umbellatum, *Tarenna asiatica*, *Ixora pavetta*, *Drypetes sepiaria*, *Diospyros ferrea*, *Ixora pavetta*, *Psydrax dicoccos*, *Strychnos nux-vomica*

Regenerating evergreen species

Memecylon umbellatum, *Chionanthus zeylanica*, *Diospyros ferrea*, *Ixora pavetta*, *Psydrax dicoccos*

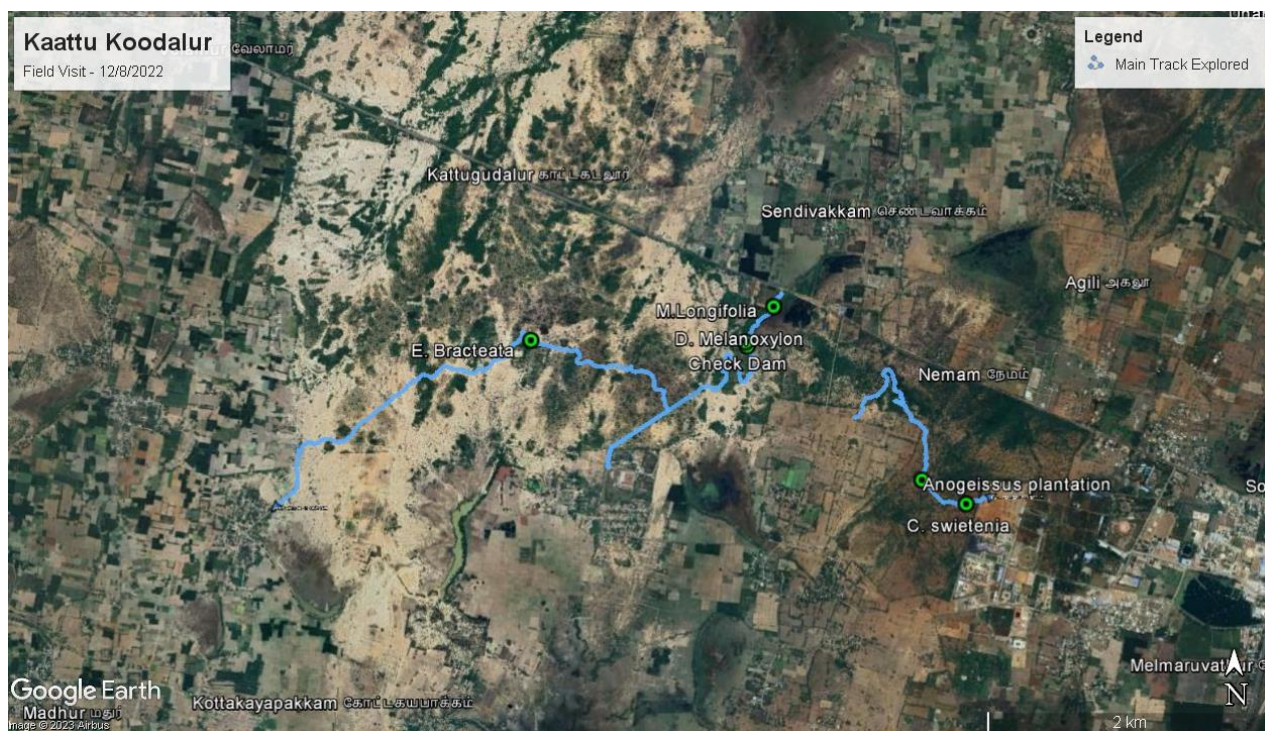
Disturbance assessment - Cutting/lopping/browsing

The site is highly disturbed, cutting and lopping evident, also garbage dumping and illegal soil mining observed.

Surrounding land use

Agriculture – Paddy, watermelon etc.

Kaattu Koodalur RF



Description of the general ecology of the site

The Kaattu Koodalur RF is situated in Chitamur block in Kanchipuram district. The total area of the site is approximately 942 hectares and it could be considered highly disturbed and degraded. The vegetation is sporadic scrub clumps with the occasional emergent tree out of the clump, with an approximate vegetation cover of less than 40%. There were large areas planted with Eucalyptus and Anogeissus. The canopy height could be seen as being approximately 3 to 4 meters and up to 6 metres in the area planted with Anogeissus. The remaining area is barren exposed grey clay. The denser vegetation can be found close to the water catchment area. There is evidence of rainwater erosion.



Figure 10 – Scrub jungle and exposed clay soil



Figure 11 – Seasonal water catchment



Figure 12 – Denser taller vegetation close to water catchment.

Differing ecological zones present

Mainly low-lying scrub clumps with exposed grey clay, some plantation area of Eucalyptus and Anogeissus. There were eroded watercourses and water catchments present.

Canopy height assessment

The scrub canopy was up to 3 metres with varying height of emergent trees between 4 and 6 metres.

Main canopy species assessment

No canopy as such, just emergent trees from the scrub areas; Anogeissus latifolia, Dolichandrone falcata, Manilkara hexandra, Syzygium cumini.

Understory species assessment

The scrub was exposed and low and therefore could not be defined as an understory. It was made up mainly of Benkara malabarica, Memecylon umbellatum, Carissa spinarum, Maytenus emarginata.

Main lianas assessment

Grewia bracteata, Derris scandens, Ventilago maderaspatana, Hugonia mystax.

Noteworthy species

Chlorophytum tuberosum, Anogeissus latifolia, Olax scandens, Pleurostylia opposita, Diospyros melanoxylon, Antidesma ghaesambilla, Hugonia mystax and Biophytum tuberosum.

Main evergreen species present

Memecylon umbellatum, Atalantia monophylla, Psydrax dicoccos, Manilkara hexandra, Dodonaea viscosa, Pleurostylia opposita, Hugonia mystax.

Regenerating evergreen species

Memecylon umbellatum, Atalantia monophylla, Gymnosporia senegalensis, Dodonaea viscosa.

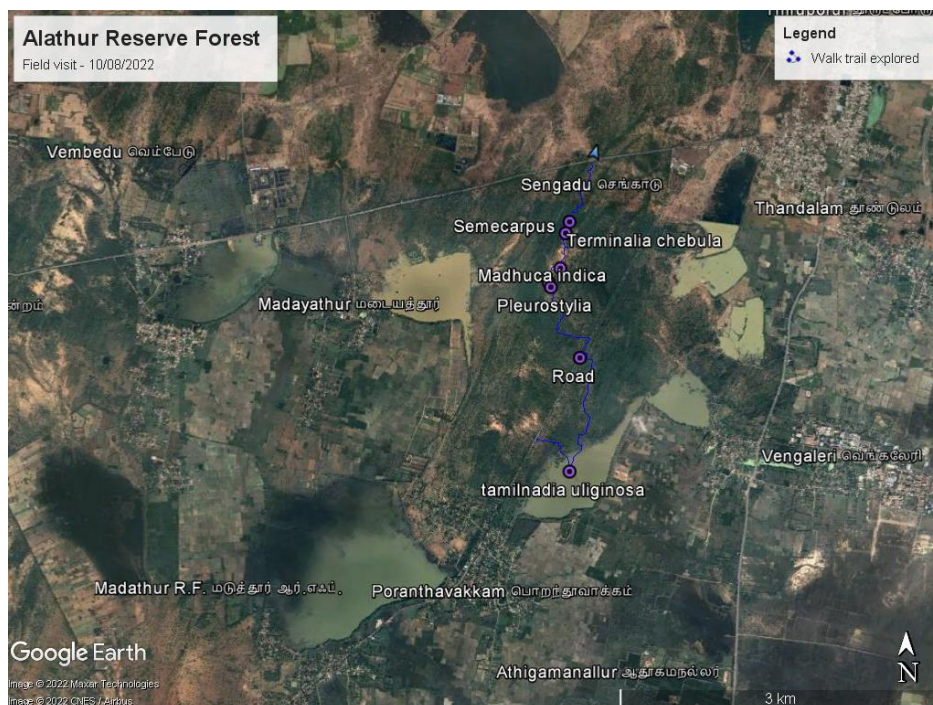
Disturbance assessment - Cutting/lopping/browsing

No major evidence of cutting or lopping.

Surrounding land use

Seasonal agriculture, wasteland, and road.

Alathur RF



Description of the general ecology of the site

Alathur RF is situated in the Chengalpattu taluka of Kancheepuram district. The site is very large with the approximate area covering 490 hectares. The site includes large water catchments, zones of scrub jungle (see *figure 13*) of between 3 to 4 metres height which is denser and richer in species along the road. Areas of pioneer exotic species (see *figure 14*) were also observed. Also, there are zones of planted economic trees, *Syzygium cumini*, *Acacia auriculiformis* and *Terminalia arjuna* and zones of scrub with emergent trees between 4 and 6 metres high along the watercourses. On the edge of the southern water catchment, specimens of a tree rarely observed in the TDEF zone, *Tamilnadia uliginosa* (see *figure 16*), was found. The site was also considered a good potential seed source for *Semecarpus anacardium* and *Terminalia chebula*. It was estimated that the total vegetation cover was approximately 60%.



Figure 13 - Scrub terrain



Figure 14 - Exotic pioneer area/barren



Figure 15 - Water course buffer



Figure 16 - *Tamilnadia uliginosa*

Differing ecological zones present

Scrub jungle clumps, economic forest areas, exotic pioneer areas, water catchments with buffer vegetation, barren land (see figure 15).

Canopy height assessment

Scrub jungle clumps 3 to 4 metres, economic area and water catchment buffers up to 6 metres. Total vegetation cover was approximately 60%.

Main canopy species assessment

The scrub areas; *Diospyros melanoxylon*, *Ziziphus xylopyrus*, *Butea monosperma*, *Cassia fistula*, *Albizia odoratissima*, *Memecylon umbellatum*, *Psydrax dicoccos*. The economic forestry areas; *Eucalyptus*, *Terminalia chebula*, *Pterocarpus marsupium*, *Anacardium occidentale*. Canopy/vegetation cover could be estimated as 60%.

Understory species assessment

Memecylon umbellatum, *Psydrax dicoccos*, *Carmona retusa*, *Catunaregam spinosa*, *Tarenna asiatica*.

Main lianas assessment

Rivea hypocrateriformis, *Ziziphus oenoplia*

Noteworthy species

Semecarpus anacardium, *Terminalia chebula*, *Diospyros melanoxylon*, *Tamilnadia uliginosa*.

Main evergreen species present

Atalantia monophylla, *Diospyros ferrea*, *Dodonaea viscosa*, *Memecylon umbellatum*, *Psydrax dicoccos*.

Regenerating evergreen species

Memecylon umbellatum, *Tarenna asiatica*, *Diospyros ferrea*, *Atalantia monophylla*, *Psydrax dicoccos*.

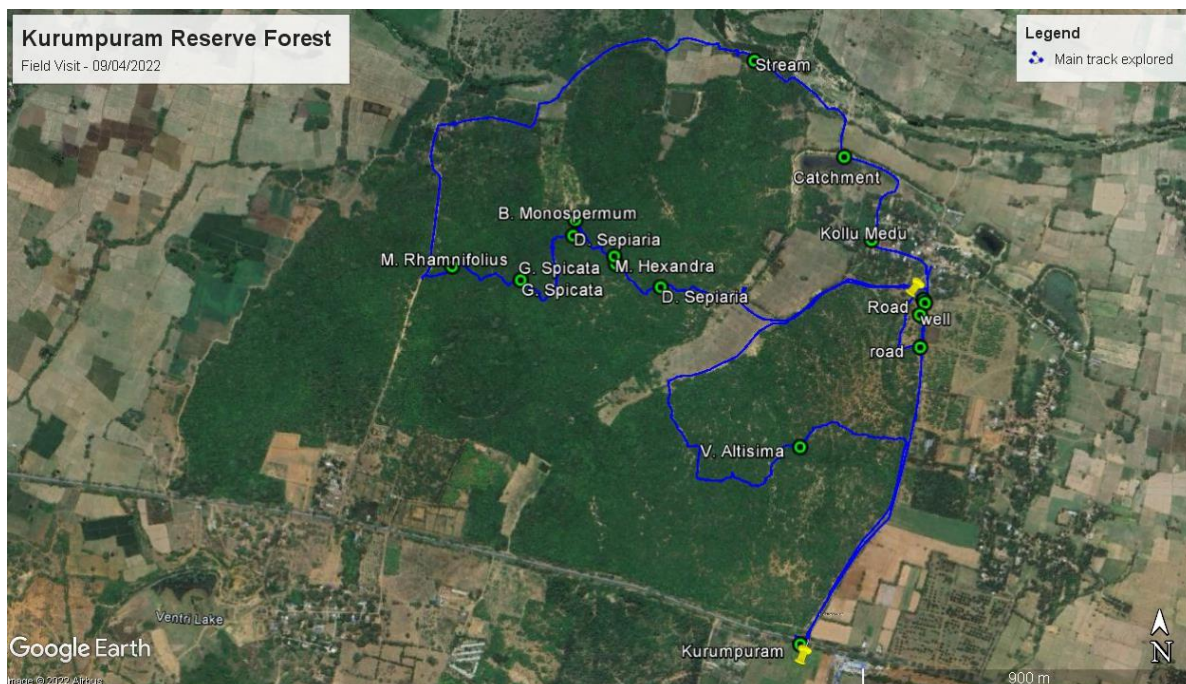
Disturbance assessment - Cutting/lopping/browsing

No cutting or lopping evident.

Surrounding land use

Road, habitation, wasteland.

Kurumpuram RF



Description of the general ecology of the site

Kurumpuram RF is situated in Tindivanam division of Villupuram District. The site is very large and covers approximately 220 hectares. The area could be considered a regrowth TDEF scrub jungle, which is well protected. The area has approximately 80% vegetation cover which has a general canopy of 2 to 4 metres (see *figure 17*). The scrub has intermittent barren land of varying soil types, some with exposed gravel soil and some rock outcrops (see *figures 18 & 19*). There are also occasional areas of 4 to 6 metre canopy, where emergent trees are prospering (see *figure 20*).



Figure 17 – low canopy scrub



Figure 18 – Varying soil types, barren sandy area.



Figure 19 – Varying soil types, barren gravel area with outcrops.



Figure 20 – Area where larger trees prosper.



Figure 21 – Regeneration of evergreen species under canopy.

Differing ecological zones present

Mainly a regrowth scrub jungle which has a general canopy of 2 to 4 metres, occasional scrub of 4 to 6 metres where emergent trees have prospered. Intermittent barren areas between the scrub of varying soil types.

Canopy height assessment

Mainly 2 to 4 metres, with occasional areas 4 to 6 metres. Total vegetation cover was approximately 80%.

Main canopy species assessment

Albizia amara, *Chloroxylon swietenia*, *Garcinia spicata*, *Syzygium cumini*.

Understory species assessment

Understory as well as the main components of low canopy scrub; *Psydrax dicoccos*, *Memecylon umbellatum*, *Chionanthus zeylanica*, *Carissa spinarum*.

Main lianas assessment

Ventilago maderaspatana, *Strychnos minor*, *Hugonia mystax*, *Cansjeera rheedii*.

Noteworthy species

Chionanthus zeylanica, *Erythroxylum monogynum*, *Suregada angustifolia*, *Walsura trifoliata*, *Diospyros melanoxylon*, *Diospyros ebenum*, *Garcinia spicata* and *Gyrocarpus americanus*.

Main evergreen species present

Chionanthus zeylanica, *Tarenna asiatica*, *Memecylon umbellatum*, *Psydrax dicoccos*, *Dodonaea viscosa*, *Suregada angustifolia*, *Walsura trifoliata*, *Diospyros ebenum*, *Strychnos minor*, *Hugonia mystax*, *Cansjeera rheedii*, *Drypetes sepiaria*, *Garcinia spicata*, *Diospyros ferrea*.

Regenerating evergreen species

Memecylon umbellatum, *Psydrax dicoccos*, *Diospyros ferrea*, *Tarenna asiatica*, *Dodonaea viscosa*.

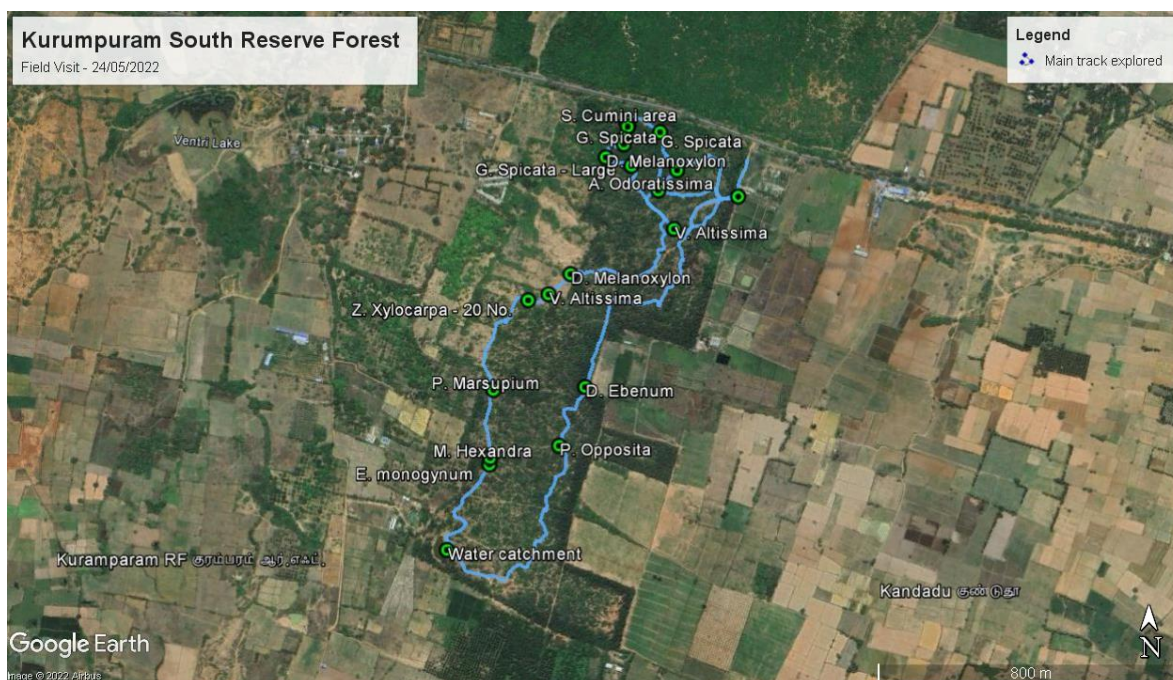
Disturbance assessment - Cutting/lopping/browsing

The forest is well protected with only evidence of cutting and lopping on some boundary areas.

Surrounding land use

Road, seasonal agriculture, *Eucalyptus*.

Kurumpuram South RF



Description of the general ecology of the site

Kurumpuram South RF is situated in Tindivanam division of Villupuram District, and is separated from Kurumpuram RF by a main road. The area of the forest is approximately 54 hectares. Most of the area is planted with Eucalyptus by the Forest Department, this plantation has a regrowth TDEF scrub jungle regenerating under it of varying heights and densities (see figure 22). The scrub jungle canopy height was observed as being approximately between 2 and 5 metres and covered approximately 60% of the site (see figure 23). There is a large water catchment pond on the SW corner of the site (see figure 24). Intermittent barren land with sandy soil was observed within the scrub jungle (see figure 25). In the northern area it was noted that small eroded ravines which become seasonal water courses with rich vegetation were present, with noteworthy large garcinia spicata specimens (see figure 26).



Figure 22 – Eucalyptus plantation with TDEF regrowth scrub below



Figure 23 – Dense TDEF scrub jungle



Figure 24 – Seasonal water catchment



Figure 25 – open barren land



Figure 26 – TDEF scrub adjacent to water course with *Garcinia spicata*.

Differing ecological zones present

Approximately one third of the site has planted Eucalyptus and 60% of the site contained regrowth TDEF scrub of varying heights. Also, a water catchment was present and intermittent barren areas. The northern area had small rain eroded ravines with richer denser TDEF regrowth scrub adjacent.

Canopy height assessment

The Eucalyptus trees reached approximately 8 metres and the TDEF regrowth canopy varied between 2 and 5 metres.

Main canopy species assessment

Albizia amara, *Chloroxylon swietenia*, *Azadirachta indica*, *Garcinia spicata*, *Ziziphus xylopyrus*, *Diospyros ebenum*, *Memecylon umbellatum*, *Ixora pavetta*.

Understory species assessment

Memecylon umbellatum, *Carissa spinarum*, *Carmona retusa*, *Ixora pavetta*.

Main lianas assessment

Derris ovalifolia, Reisanthia indica, Cissus vitigenia, Hugonia mystax

Noteworthy species

Garcinia spicata, Diospyros ebenum, Suregada angustifolia, Pterocarpus marsupium, Chloroxylon swietenia

Main evergreen species present

Garcinia spicata, Diospyros ebenum, Memecylon umbellatum, Ixora pavetta, Carissa spinarum, Carmona retusa, Dodonaea viscosa, Atalantia monophylla, Psydrax dicoccos, Drypetes sepiaria, Tricalysia sphaerocarpa, Suregada angustifolia, Chionanthus zeylanica, Drypetes sepiaria, Hugonia mystax.

Regenerating evergreen species

Ixora pavetta, Dodonaea viscosa, Psydrax dicoccos, Memecylon umbellatum, Garcinia spicata, Atalantia monophylla, Drypetes sepiaria, Tricalysia sphaerocarpa.

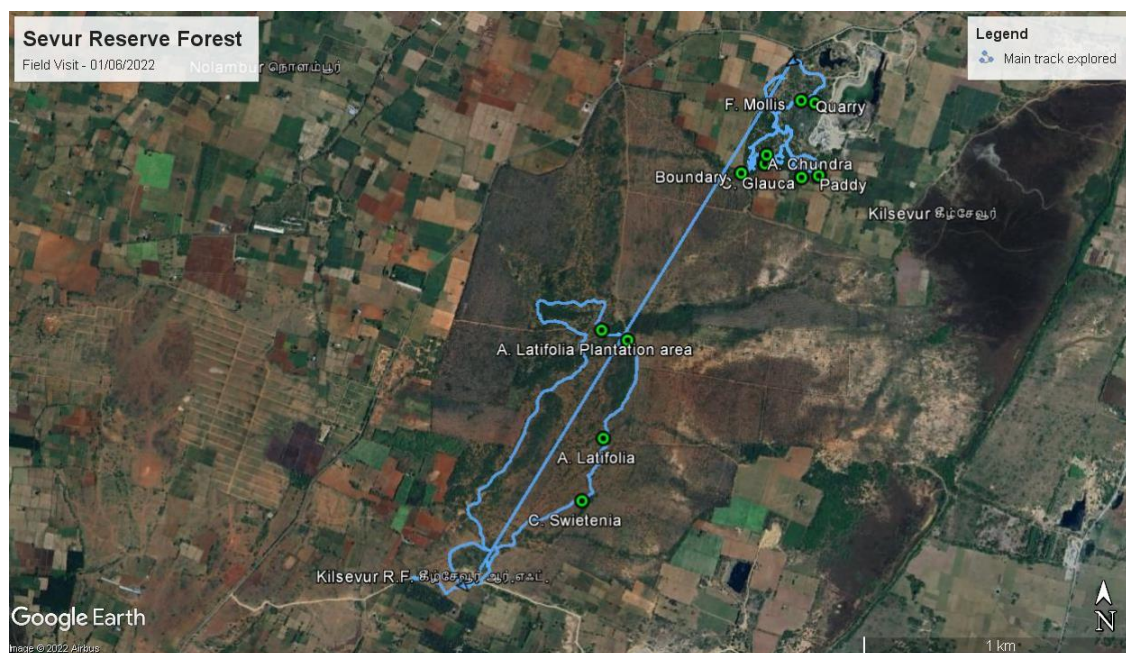
Disturbance assessment - Cutting/lopping/browsing

Evidence of cutting/lopping of the regrowth scrub.

Surrounding land use

Seasonal agriculture, main road.

Sevur RF



Description of the general ecology of the site

Sevur RF is situated in Tindivanam block of Viluppuram district, with the site being approximate 55 hectares. It could be categorised as a large intermittent degraded scrub jungle with few species present, with barren exposed land. It was observed that the vegetation covered less than 40% of the area with the barren land being exposed rocky yellow clay (see figure 27). The canopy of the scrub was estimated as being between 2 and 5 metres. It was clearly noticed that the land is used for goat grazing. It could be stated that the land was slightly undulated, with denser vegetation being found on the higher ground (see figure 28 & 29). On the Southeast side of the site the Forest Department had planted an area of *Anogeissus latifolia*, which has a canopy height of between 4 and 6 metres with an average DBH of 14cm (see figure 30). The southeastern side was disturbed by quarry activity.



Figure 27 – Low scrub jungle with exposed barren land.



Figure 28 – Denser vegetation on higher points.



Figure 29 – Rocky outcrops



Figure 30 – Anogeissus latifolia plantation area

Differing ecological zones present

Mainly a large intermittent degraded scrub jungle with barren rocky exposed land, with a vegetation cover of less than 40%. Some undulation on the site with denser vegetation on higher ground. Rock outcrops are also present. An area of planted *Anogeissus latifolia* is located on the Southeastern side.

Canopy height assessment

Scrub jungle between 2 and 5 metres, *Anogeissus latifolia* plantation area between 4 and 6 metres.

Main canopy species assessment

Acacia leucophloea, *Dolichandrone falcata*, *Manilkara hexandra*, *Diospyros ferrea*, *Lanea coromandelica*, *Anogeissus latifolia*, *Bauhinia racemosa*.

Understory species assessment

Carmona retusa, *Dodonaea viscosa*, *Psydrax dicoccos*, *Memecylon umbellatum*, *Atalantia monophylla*, *Diospyros ferrea*, *Tarenna asiatica*.

Main lianas assessment

Combretum albidum, *Derris ovalifolia*, *Grewia hirsuta*, *Ventilago maderaspatana*.

Noteworthy species

Anogeissus latifolia, *Olax scandens*, *Diospyros chloroxylon*, *Dolichandrone falcata*.

Main evergreen species present

Memecylon umbellatum, *Atalantia monophylla*, *Diospyros ferrea*, *Tarenna asiatica*, *Dodonaea viscosa*, *Psydrax dicoccos*, *Manilkara hexandra*.

Regenerating evergreen species

Atalantia monophylla, *Memecylon umbellatum*, *Psydrax dicoccos*, *Diospyros ferrea*.

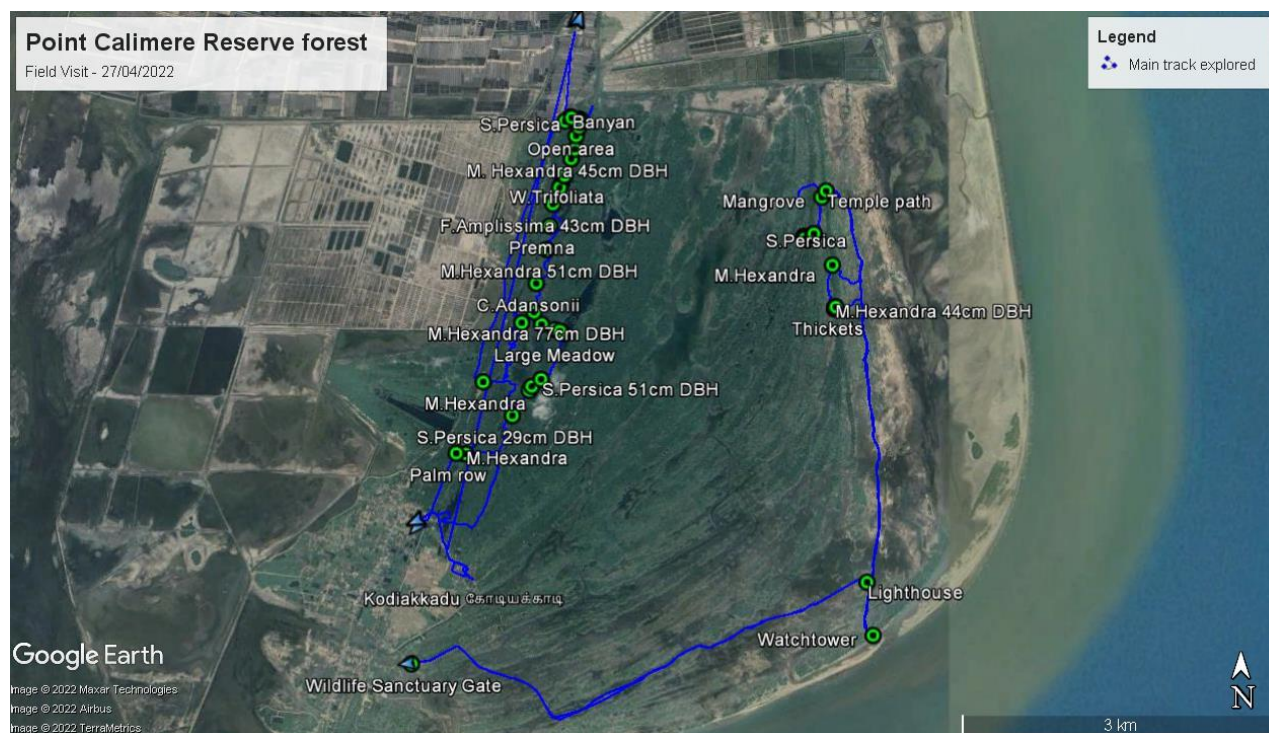
Disturbance assessment - Cutting/lopping/browsing

Highly disturbed, with cutting and lopping, with also goat grazing evident. It was also observed that the area is being used by hunters as wire snare traps were found.

Surrounding land use

Paddy and cotton plantation.

Point Calimere RF



Description of the general ecology of the site

Point Calimere RF, with the designation of wildlife and bird sanctuary, is a large 1729 hectare site in the Nagapattinam district. For this rapid assessment due to time restraints and the nature of the vegetation, i.e. presence of thorny species, the whole site could not be examined. The richer TDEF forest vegetation zone was found adjacent to the main access road running SSW on the western side of the site. The canopy height varied, between 4 and 8 metres on the initial buffer which was about 150 metres eastwards, thereafter it lowered to between 2 and 3 metres for approximately 850 metres eastwards (see figure 31). After this buffer the vegetation opened up to be clumps of TDEF vegetation around grasslands which would be seasonally flooded (see figure 32). As the grassland areas increased in size as you go further eastward to the coast, the TDEF clumps gave way to predominantly *Prosopis julifolia* clumps. As the site approached the coast, a sporadic sandy scrub was observed (see figure 33).

The overall vegetation canopy cover of the site could be approximated at 60%. It was noted that there was present some noteworthy specimens of *Manilkara hexandra* *Salvadora persica*, with one old *Manilkara* reaching 10 metres in height with a diameter at breast height (DBH) being 77cm (see figure 34). There was low frequency, sporadic mangrove species, *Aegiceras corniculatum* present (see figure 35).



Figure 31 – Expanse of low lying TDEF vegetation



Figure 32 – Seasonal grassland with TDEF on edges



Figure 33 – Sporadic scrub



Figure 34 – A heritage *Manilkara hexandra*



Figure 35 – Mangrove species present

Differing ecological zones present

Low lying 2 to 3 metre TDEF scrub, TDEF vegetation of between 4 to 8 metres, open grassland that is seasonally inundated with TDEF scrub clumps, open grassland that is seasonally inundated with thorny *Prosopis julifolia* clumps.

Canopy height assessment

The canopy varies between 2 and 8 metres with a vegetation cover of approximately 60%.

Main canopy species assessment

Manilkara hexandra, *Salvadora persica*, *Drypetes sepiaria*, *Sapindus emarginatus*, *Memecylon umbellatum*.

Understory species assessment

Catunaregam spinosa, *Senna auriculata*, *Eugenia bracteata*, *Glycosmis mauritiana*, *Ixora pavetta*, *Memecylon umbellatum*.

Main lianas assessment

Ziziphus oenoplia, *Olax scandens*, *Cansjeera rheedi*, *Hugonia mystax*

Noteworthy species

Salvadora persica, *Manilkara hexandra*, *Aegiceras corniculatum*, *Spinifex littoreus*

Main evergreen species present

Memecylon umbellatum, *Manilkara hexandra*, *Atalantia monophylla*, *Chionanthus zeylanica*, *Ixora pavetta*, *Pleurostyliya opposita*, *Psydrax dicoccos*, *Cansjeera rheedi*, *Hugonia mystax*, *Aegiceras corniculatum*, *Drypetes sepiaria*.

Regenerating evergreen species

Memecylon umbellatum, Manilkara hexandra, Atalantia monophylla, Chionanthus zeylanica, Ixora pavetta, Pleurostylia opposita, Psydrax dicoccos.

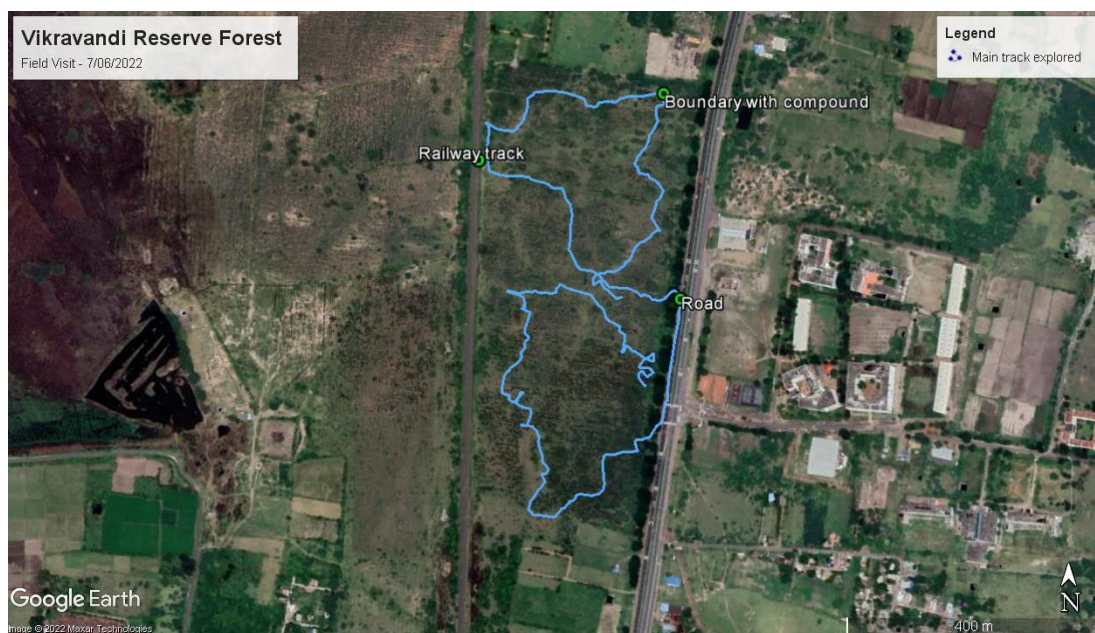
Disturbance assessment - Cutting/lopping/browsing

The area is well protected with no disturbance.

Surrounding land use

Habitation, salt pans and ocean.

Vikravandi RF



Description of the general ecology of the site

Vikravandi RF is a small site of 21 hectares in the Viluppuram district. In previous past studies of this site, it was designated as a highly degraded forest with a species count of 104. The main species being *Acacia chundra*, *Lanea coromandelica*, *Butea monosperma*, *Salvadora persica*, *Atalantia monophylla*. This visit highlighted that the site has been now been utilized as an income generating area, with the native species being clear cut and the site planted with *Eucalyptus* species.

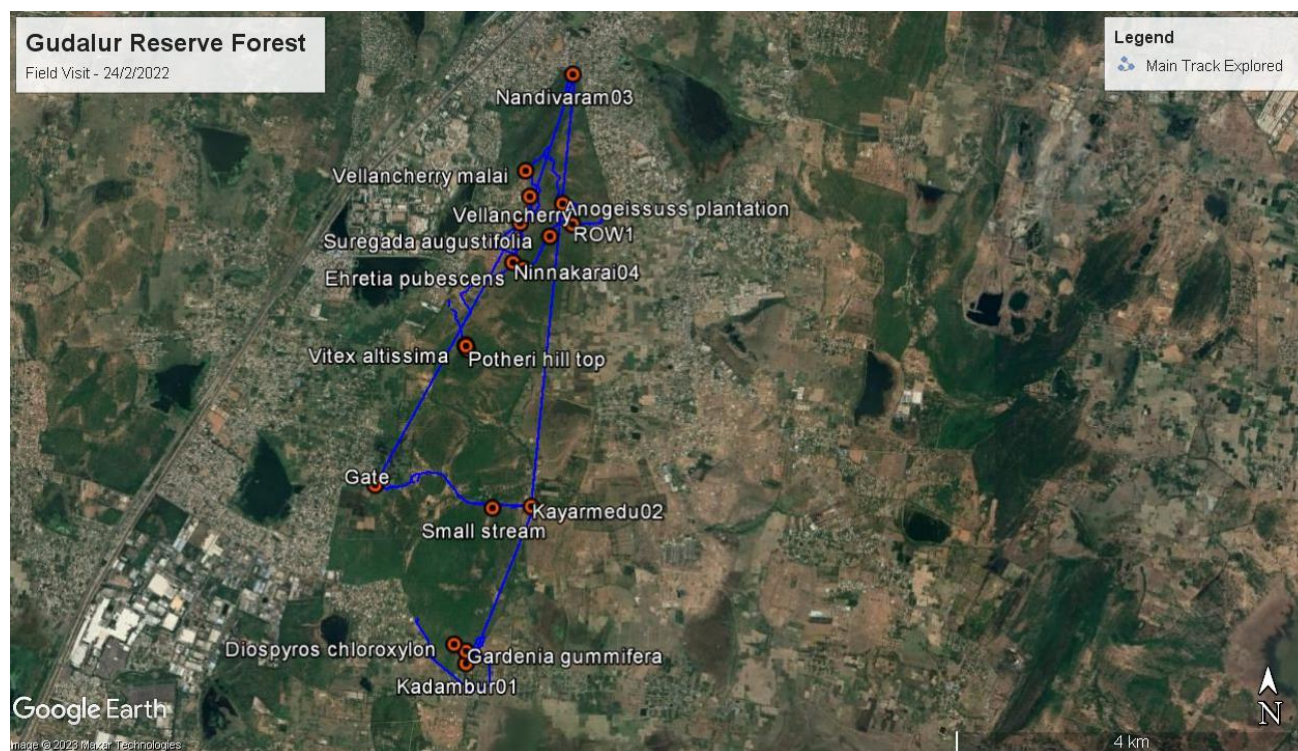


Figure 36 – Clear cut area



Figure 37– Eucalyptus cut for coppicing with TDEF regrowth.

Gudalur RF



Description of the general ecology of the site

Gudalur RF is a large site that is approximately 1104 hectares and is located near Kattankulathur village, and is part of the Thambaram Forest range in Chennai division. Within the site there are six small hillocks having slightly differing vegetation types than the low lying the terrains. There are 9 small villages on the periphery of the RF, Kadambur, Kayarmedu, Ninnakkarai, Potheri, Nandivaram, Vallancherry, Maraimalai nagar, Kudalur and Kuduvancherry. The soil type of the area is generally red soil, but yellow clay was also observed in some open barren areas. It could be estimated that 60% of the site had vegetation cover and was predominantly a 2 to 3 metre height TDEF scrub, certain areas had *Diospyros melanoxylon* and *Buchanania axillaris* emergent specimens of between 4 to metres. There was also *Anogeissus latifolia* and *Eucalyptus globulus* plantation areas that were 5 to 8 metres high. It was noted that the vegetation was denser on the hillocks and that *Memecylon umbellatum* is the main dominant species of the entire forest. Various right of way passages through the forest and manmade water catchments were observed.

It was noted that several TNEB power lines traversed the reserve forest. Furthermore, it was observed that only the fringes of the forest have been affected by the anthropogenic activity and cattle grazing.



Figure 38 – Low lying TDEF scrub with TNEB HT line crossing



Figure 39 – Low lying TDEF in forefront, Eucalyptus plantation in background



Figure 40 – Low lying TDEF in forefront, denser vegetation on hillock in background



Figure 41 – Right of way passage through TDEF scrub.



Figure 42 – Manmade water catchments



Figure 43 – Fringe of the site disturbed with cattle grazing

Differing ecological zones present

Predominately low lying 2 to 3 metres TDEF scrub, in some areas with the emergence of *Diospyros melanoxylon* and *Buchanania axillaris* of between 4 to 5 metres. Within the site there was 6 small hillocks with denser vegetation. There was present some plantation areas of *Eucalyptus*, *Anogeissus latifolia*, *Hardwickia binata*. Red soil can be found throughout the forest with manmade percolation ponds and few seasonal water catchments.

Canopy height assessment

The canopy is predominantly 2 to 3 metres with occasional emergent trees like *Ziziphus xylopyrus*, *Buchanania axillaris* and *Diospyros melanoxylon* approximately 4 to 5 metres. The planted areas, *Anogeissus latifolia* and *Eucalyptus globulus*, were 5 to 8 metres. It was estimated that the vegetation cover is approximately 60%.

Main canopy species assessment

No tree canopy as such, just emergent trees from the scrub areas; *Ziziphus xylopyrus*, *Buchanania axillaris*, *Diospyros melanoxylon*, *Grewia orbiculata*.

Understory species assessment

The scrub was exposed and low, and formed a shrub canopy and therefore could not be defined as an understory. It was made up mainly of *Memecylon umbellatum*, *Cautunaregam spinosa*, *Benkara malabarica*, *Maytenus emarginata*.

Main lianas assessment

Ventilago maderaspatana, *Hugonia mystax*, *Pterolobium hexapetalum*, *Secamone emetica*.

Noteworthy species

Buchanania axillaris, *Diospyros chloroxylon*, *Diospyros ebenum*, *Premna corymbosa*, *Vitex altissima*, *Suregada angustifolia*, *Hugonia mystax*, *Antidesma ghaesambilla*, *Ormocarpum sennoides*.

Main evergreen species present

Memecylon umbellatum, *Suregada angustifolia*, *Tarenna asiatica*, *Buchanania axillaris*, *Glycosmis mauritiana*, *Manilkara hexandra*, *Gardenia gummifera*, *Ixora pavetta*.

Regenerating evergreen species

Ixora pavetta, *Dodonaea angustifolia*, *Glycosmis mauritiana*, *Memecylon umbellatum*, *Suregada angustifolia*.

Disturbance assessment - Cutting/lopping/browsing

No major evidence of cutting or lopping, cattle grazing found in the fringes of the forest in some places.

Surrounding land use

The reserve forest is predominately surrounded by residential houses, schools and colleges, as well as cultivated farming lands like rice paddy, coconut, and mango. It was also observed that the site interfaced with a large lake and water catchments.

Summary

The below table summarizes the approximate areas, canopy cover, canopy height and height of emergent trees, for each reserve forest site visited:

Location	Approx. Area - hectares	Approx. Canopy Cover	Approx. Canopy Height	Approx. Height of Emergent Trees
Alathur RF	490	60%	3 to 4 metres	Up to 6 metres
Gudalur RF	1104	60%	2 to 3 metres	4 to 6 metres
Kaattu Koodalur RF	942	40%	Up to 3 metres	4 to 6 metres
Kumulampet RF	93	40%	2 to 3 metres	4 to 5 metres
Kurumpuram RF	220	80%	2 to 4 metres	4 to 6 metres
Kurumpuram South RF	54	60%	2 to 5 metres	up to 8 metres
Point Calimere RF	1792	60%	2 to 8 metres	up to 10 metres
Salayur RF	100	50%	2 metres	4 to 6 metres
Sevur RF	55	40%	2 to 5 metres	4 to 6 metres
Tothacherry RF	182	40%	3 metres	4 metres
Vikravandi RF	21	---	---	---

The below table summarizes the main evergreen species observed in each reserve forest site visited:

Location	Noteworthy Evergreen Species
Alathur RF	Memecylon umbellatum, Diospyros ferrea, Atalantia monophylla, Psydrax dicoccos.
Gudalur RF	Buchanania axillaris, Diospyros chloroxylon, Diospyros ebenum, Premna corymbosa, Vitex altissima, Suregada angustifolia, Hugonia mystax, Antidesma ghaesambilla, Ormocarpum sennoides
Kaattu Koodalur RF	Memecylon umbellatum, Atalantia monophylla, Psydrax dicoccos, Manilkara hexandra, Pleurostylia opposita, Hugonia mystax.
Kumulampet RF	Memecylon umbellatum, Buchanania axillaris, Atalantia monophylla, Psydrax dicoccos, Hugonia mystax.
Kurumpuram RF	Chionanthus zeylanica, Memecylon umbellatum, Psydrax dicoccos, Suregada angustifolia, Walsura trifoliata, Diospyros ebenum, Strychnos minor, Hugonia mystax, Cansjeera rheedi, Drypetes sepiaria, Garcinia spicata, Diospyros ferrea.
Kurumpuram South RF	Garcinia spicata, Diospyros ebenum, Memecylon umbellatum, Ixora pavetta, Atalantia monophylla, Psydrax dicoccos, Drypetes sepiaria, Tricalysia sphaerocarpa, Suregada angustifolia, Chionanthus zeylanica, Drypetes sepiaria, Hugonia mystax.
Point Calimere RF	Memecylon umbellatum, Manilkara hexandra, Atalantia monophylla, Chionanthus zeylanica, Ixora pavetta, Pleurostylia opposita, Psydrax dicoccos, Cansjeera rheedi, Hugonia mystax, Aegiceras corniculatum, Drypetes sepiaria.
Salayur RF	Memecylon umbellatum, Ixora pavetta, Drypetes sepiaria, Diospyros ferrea, Ixora pavetta, Psydrax dicoccos, Strychnos nux-vomica.
Sevur RF	Memecylon umbellatum, Atalantia monophylla, Diospyros ferrea, Tarenna asiatica, Psydrax dicoccos, Manilkara hexandra
Tothacherry RF	Atalantia monophylla, Capparis brevispina, Drypetes sepiaria, Memecylon umbellatum, Manilkara hexandra, Buchanania axillaris, Diospyros ferrea
Vikravandi RF	Not Applicable

The below table summarizes the observed ecological types for each reserve forest site visited:

Location	Approx. Area - hectares	Approx. Canopy Cover	Site Description
Alathur RF	490	60%	Low lying scrub jungle clumps, economic and exotic pioneer areas, water catchment, barren land
Gudalur RF	1104	60%	Low lying scrub jungle clumps with emergent trees, 6 denser smaller hills, economic plantations, water catchment, barren land.
Kaattu Koodalur RF	942	40%	Low lying scrub jungle clumps with exposed barren soil and eroded watercourses, sporadic water catchments, Eucalyptus and Anogiessus plantation areas.
Kumulampet RF	93	40%	50% Eucalyptus plantation - 50% low TDEF scrub with denuded areas
Kurumpuram RF	220	80%	80% low lying TDEF scrub regrowth with emergent trees with intermittent barren gravel soil.
Kurumpuram South RF	54	60%	60% low lying TDEF scrub regrowth with Eucalyptus plantation and intermittent barren land.
Point Calimere RF	1792	60%	Large area of TDEF scrub between 2 and 8 metres, seasonally inundated open grassland with thorny Prosopis clumps.
Salayur RF	100	50%	50% Low lying scrub jungle with partial Syzygium plantation - 50% barren exposed soil with sporadic seasonal water catchments.
Sevur RF	55	40%	An intermittent degraded scrub jungle with barren rocky exposed land, some planted Anogeissus latifolia is located on the South-eastern side.
Tothacherry RF	182	40%	Low TDEF scrub - barren areas exposed pebble/sandy soil showing gullies and erosion.
Vikravandi RF	21	---	Eucalyptus plantation

The below table summarizes the present status of each reserve forest site visited:

Location	Approx. Area - hectares	Approx. Canopy Cover	Status
Alathur RF	490	60%	The area is degraded but no evidence of cutting and lopping.
Gudalur RF	1104	60%	The area is degraded but no evidence of cutting and lopping, only cattle grazing on fringes.
Kaattu Koodalur RF	942	40%	The area is degraded but no evidence of cutting and lopping.
Kumulampet RF	93	40%	Degraded - cattle grazing/ cutting and lopping
Kurumpuram RF	220	80%	Moving away from being degraded which is well protected.
Kurumpuram South RF	54	60%	Degraded with evidence of cutting and lopping of regrowth scrub.
Point Calimere RF	1792	60%	Well protected with no disturbance.
Salayur RF	100	50%	Highly degraded with cutting lopping evident.
Sevur RF	55	40%	Highly disturbed, with cutting and lopping
Tothacherry RF	182	40%	Degraded - No cutting/lopping but signs of minor deer browsing
Vikravandi RF	21	---	No forest present

Conclusion

It can be concluded from the observations of the field visits that, apart from Point Calimere, the forests have all suffered past disturbance and do not represent a climax TDEF ecosystem that is represented in some sacred groves within the same geographical areas. Most of the forests could be categorized as disturbed and degraded TDEF low lying scrub jungle clumps with open areas. Having stated that, most sites still had evidence of regrowth of the important evergreen species. These species have survived the historical management practices, and have thrived in the less disturbed areas of the sites.

The 11 Reserve Forests studied represent approximately 5000 hectares, of which approximately 2800 hectares have vegetation cover. The remaining space of 2200 hectares, which represents 22 km², could be described as exposed land, some of which are seasonal grasslands and water catchment.

It could be concluded that if there was a direction to utilise these areas for ecological restoration and the adequate protection strategy was implemented, there is a huge potential. Though most sites are degraded and would initially require high input in compost, water and aftercare, the fact that all these sites are presently under the jurisdiction of the Forest Department, creates ease of protection and allows the continuation of good practice management to foster the reestablishment of the native forest of the area.

From experience of planting the native species in eco restoration condition on the Auroville plateau, a figure of 1250 seedlings per hectare, of a combination of tree and shrubs, were planted on open areas. This figure was lower in areas where pioneer species had previously been established. Therefore, taking into consideration the factors of the Reserve Forest, e.g., the water catchments, rocky outcrops and the difficulties of the thorny areas, a conservative figure of 600 tree/shrub combination per hectare could be applied. If this estimate was considered for the 2200 hectares of barren land it would mean that there is the potential to plant 1.32 Crore of native seedlings.

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Conserving the Tropical Dry Evergreen Forest