Restoration of the Tropical Dry Evergreen Forest of Peninsular India

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Abstract. The Tropical Dry Evergreen Forest (TDEF) of India is only found on the south eastern seaboard of the peninsular. It has a very limited range, and extends only 60 km inland. The TDEF occurs in an area of high population density and consequently it is the rarest type of forest ecosystem found in the subcontinent.

The establishment of the Auroville International Township in 1968 initiated a major work of eco-restoration which has turned a highly eroded lateritic plateau into a re-emerging ecosystem of the TDEF.

The work now spreads out beyond the boundaries of the international township and involves working with local people, especially women and children. Many lessons have been learnt and the work continues to reintegrate the forest in the social fabric of a rapidly changing rural environment.

INTRODUCTION

The vegetation of the coastal region of southeastern peninsular India has been defined as the Tropical Dry Evergreen Forest - TDEF (Champion and Seth 1968). It has a narrow range; some 500 km long (north to south) and at its broadest width is 50 km. Inland the makeup of the forest becomes more and more deciduous. This is probably due to the changing rainfall pattern and also the presence of dew in the coastal area for up to 2 months after the end of the winter monsoon. This area receives rain in both the summer and winter monsoons, in a tropical dissymmetric regime (Meher-Homji 1973), the annual rainfall being between 1000 – 1500mm, with the majority falling at the end of the year (Meher-Homji 1974).

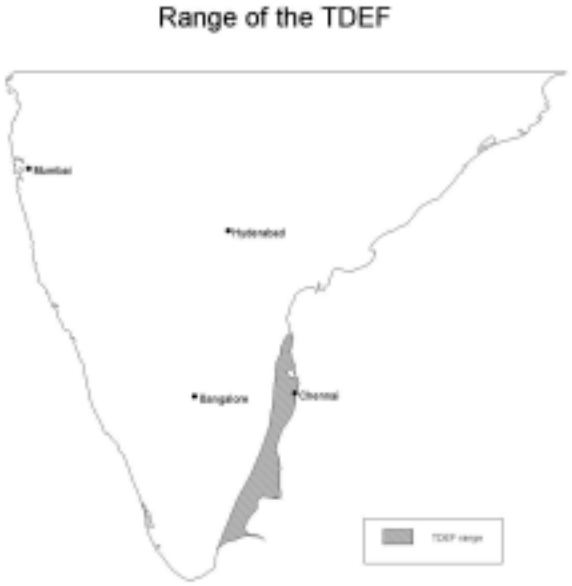
In 1992 it was estimated that the proportion of the natural range of the TDEF remaining under forest cover was 5% (Meher-Homji 1992). By 2002 this estimate was adjusted to 4% (Wikramanayake *et al*. 2002). In both cases it was recognised that the vast majority of this remaining forest was highly disturbed. From the results of field studies carried out by the author over the past ten years a reasonable estimate would be that 5 % of this remaining forest cover is pristine, the remaining 95 % is degraded scrub. Consequently the TDEF of South India is considered to be a rare, if not the rarest, type of forest ecosystem left in the subcontinent today. This is due to circumstances which include limited range size, an extremely high human population level over an extended period of time, and until recently, a lack of interest in its survival as a coherent ecotype. Today it is not as neglected as it was up until the late seventies, and there is even a growing interest in it as an entity, spread over a range of groups that include universities, NGO's and the Forest Department. The work that has been undertaken in the International Township of Auroville reflects this interest.

The TDEF is not a tall forest; the canopy rarely reaches higher than eight meters, with the occasional emergent tree reaching out above that height. The trees have to be able to withstand the cyclonic winds that once or twice in their lifetimes will roar in from the Bay of Bengal. The canopy is interlinked with lianas (woody vines) and the forest floor is a thick layer of leaf matter that is efficiently recycled by a dense mass of feeder roots in the top centimeter of the soil. It is a classical tropical forest with the nutrient wealth of the forest held in the canopy. This also means that once the forest is cut the impoverished soil is quickly leached of nutrients by the intense monsoonal rains.

In the past, the TDEF would have supported many of the smaller animals of Peninsular India, certainly Leopards (*Panthera tigris*), perhaps Tigers (*Panthera pardus*), and the Elephant (*Elephas maximus*) herds would have roamed within it on their way to seasonal grazing grounds in the wet months. Today it still supports animals such as the Porcupine (*Hystrix indica*), Mongoose (*Herpestes edwarsi*), Civet Cat (*Viverricula indica*) and possibly in some of the larger government reserve forest areas Pangolin (*Manis crassicaudata*) and Honey Badger (*Mellivora capensis*) still survive.

THE BEGINNINGS OF AUROVILLE

Once upon a time there was a dream, a dream of a place on the planet where people could live together in unity, a place of experimentation and development that would



Range map for the TDEF (all photos in this article courtesy of the author, unless otherwise indicated).

About the author: *Paul Blanchflower* has been involved in the restoration of the Tropical Dry Evergreen Forest since 1992. He is currently Co-Director of a European Commission funded project to develop a shared forest management plan for the ecotype, and he is Director of the newly established Auroville Botanical Gardens (www.auroville.org) Visit www.auroville-tdef.info for further information.

lead to humanity evolving and discovering the potential to transform the primitive and destructive in society.

This dream began to become reality in 1968 with the inauguration of the International Township of Auroville, 12 km north of the town of Pondicherry in the state of Tamil Nadu. In February of that year people gathered from all the nations of the world, under the umbrella of UNESCO and placed a sample of the soil from their country in an urn in the middle of a hot, dusty plateau that had been chosen as the center of the future city. It was quite an event, well attended by well-wishers from all over the planet and broadcast live on Indian National Radio. However when the crowds went home the hot dusty plateau remained, empty except for a few wandering goatherds, and during a few months of the year, some rain-fed subsistence agriculture in a rapidly degrading environment.

In the years that followed, the first settlers arrived. Often young, idealistic individuals who had been drawn to the project through the hope that the dream could be made into reality. They came to settle the land and in order to survive they needed to create a more comfortable habitat for themselves. It quite quickly became obvious that trees were essential to provide shade from the intense sun that beat down upon the eroded surface. A process began that would continue until the present day, and over time evolve to encompass not simply the planting of trees, but the study of the ecosystem and people's relationship with it. It would become one of the finest examples of ecosystem restoration present on the planet at the present moment. Although not completely successful it would also expand to tackle some of the most important biodiversity conservation questions of the current day, such as how to make the forest relevant to today's society and how to develop the capacity of local communities to manage their own community resources in a way that is beneficial locally and to the planetary system as a whole.

Top: Canyon erosion;
Bottom: The first tree nursery, circa 1973.

REGENERATING A DEGRADED LANDSCAPE

A red pre-lateratic soil is hard as iron in the long dry season, and subject to dust storms in the height of summer as the hot winds came blowing in from the west. In the monsoon months of October and November, it transformed into a soft and highly erodable substrate that would wash out into the Bay of Bengal through canyons up to 20 meters deep and 100 meters wide (see figure 2). It was a world of extremes, temperatures of over 40 °c and humidity of 90% during the summer, transforming into rainstorms that delivered up to 50% of the average annual precipitation of 1200mm within ten days during the North East Monsoon. It was into this environment that the early settlers were thrust. So they planted trees, any trees that they could lay their hands upon. Initially plants were brought from outside nurseries, but soon they established their own, collecting the seeds from any source that they could find: roadsides, parks, residual forests. The pressures on these newly planted trees were immense, not only due to the hostile physical conditions, but also the habituated use of the plateau by the grazing herds led to a conflict of interests. The young trees needed protection. This was provided by the planting of live fences and the employment of local people as watchmen for the forests.

The trees grew, but not all of them equally well. *Acacia auriculiformis* vastly outperformed the others. It was an exotic from northwestern Queensland, a wattle that came to be known in Auroville as the "Work tree". It thrived on the lateratic soils, its nitrogen fixing ability compensating for the poor nutrient stores in the almost non-existent topsoil. The Work tree not only survived and grew fast, it also provided good firewood and, in later years, valuable and useful timber.

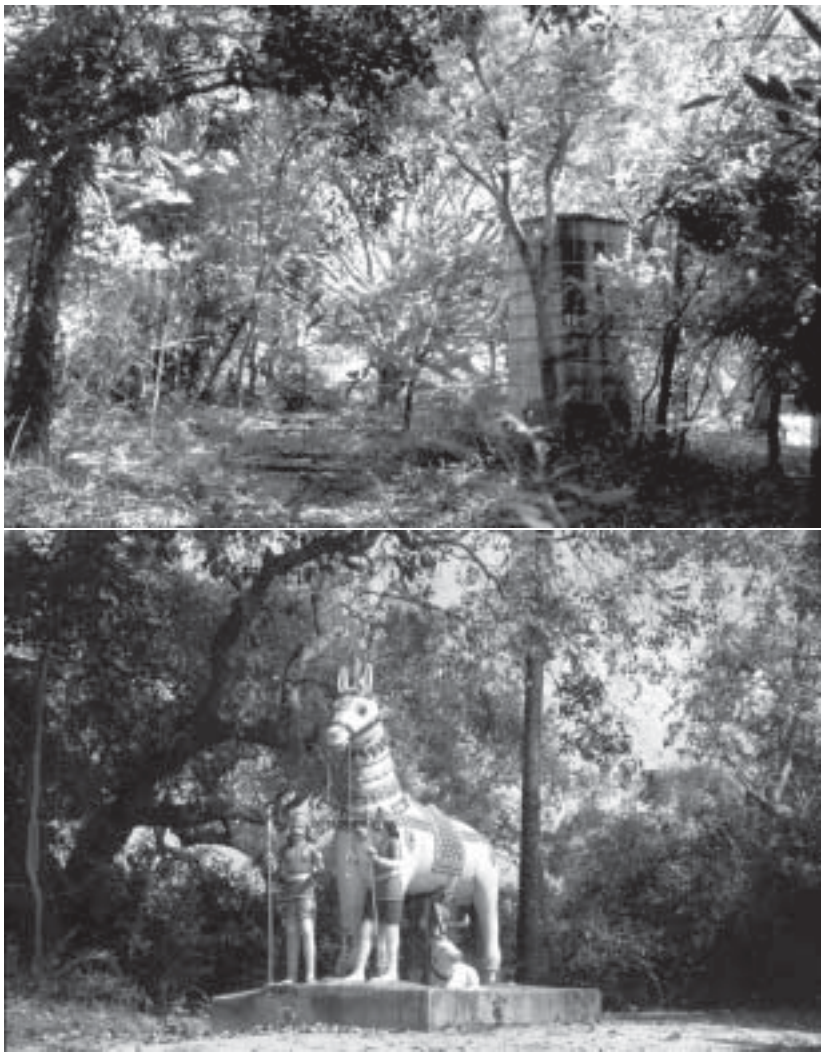
As the Auroville forests regenerated it was the birds that were the first to return and they continue to do so, in ever increasing numbers. As the diversity of flower and fruiting trees support an increasing variety of insects and other small prey animals, the bird list has reached over

100 species (see table of birds). Butterflies followed the birds with the establishment of specific food plants and current studies estimate over 200 species present. The mammal populations of generalist species such as Mongoose (*Herpestes edwarsi*), Pale Hedgehog (*Paraechinus coromandra*), Civet Cat (*Viverricula indica*), Indian Fox (*Vulpes bengalensis*) and the Jackal (*Canis aureus*) have also increased. Even some of the more specialized animals, such as the Porcupine (*Hystrix indica*), have found their way back to the forests in recent years. The reptile population has also increased with over 20 species of snakes recorded and other species such as the Monitor Lizard (*Varanus bengalensis)* increasing in numbers.

REFINING THE PROCESS: RESTORING THE TDEF

At the beginning of the 1980s, with over 1500 acres regenerated, the Auroville forests acquired a growing reputation. The greening of a desert was a story that many people were eager to hear. Various outreach programs were developed to try and take this technology out into the surrounding villages. Funds came both from within India and from without, to promote the planting of trees on farmer's lands, implementation of soil and water conservation measures, and also for the trial of various trees as possible species for reforestation programs. The Auroville community itself had grown to around 1500 people from over 35 different nations and of course not everybody was engaged in reforestation. Other areas needed attention such as schooling for the children, agriculture, investigation into alternative energy technologies, and even town planning. The enthusiasts however remained committed to the 'green work', as it had come to be known.

It had long been known that a remnant type of forest existed that was indigenous to the area. In fact in the early years many seed trips had been made to the local patches of remaining forest. Some of the species were already growing within the emerging forests. However a systematic and coordinated approach to studying this forest only really began at the beginning of the nineties, developed through funding assistance from an Indian organization called Foundation for the Revitalization of Local Health Traditions (FRLHT). They sponsored the establishment of *in situ* and *ex situ* medicinal plant reserves. Auroville was one of the first group of *ex situ* centers established by the FRLHT and this was the initiation of major research into the TDEF. Botanical surveys were carried out on a weekly basis in the local remnant forests. It was discovered that the government controlled Reserve Forests were examples of secondary growth vegetation, with the distribution of species skewed towards those that could re-grow or establish after disturbance. In the past they had been managed as woodlots and sold by auction to the highest bidder who would clear-cut them for fuel wood. The only true primary forest to remain was in sacred groves found around temples of the God Iygenar. These shrines, situated outside of villages, were surrounded by forests, for as the mythology goes the god enjoyed hunting at night and these sacred areas were for his recreation. The size of these groves varied from less than a hectare to at most five hectares, and more often than not with some disturbance present in at least a part of the area.



Top: The tree nursery 20 years later (from figure 3), showing the same water tank; **Bottom:** Temple grove with statue.

Each discovery of a new grove provided more data about the make up of the original forest type. Surveys were made in each site, recording the relative abundance of each species. Up until the present day over 75 sites have been located and a total of 1130 species of angiosperms recorded. Each remnant forest is an isolated biome within a sea of populated and cultivated land. Consequently the rules of island biogeography apply: high chance of local extinction and dangers of genetic contraction, especially within the dioecious genera such as *Diospyros*. Each plant was carefully studied, its identification at the Auroville Herbarium was checked with the French Institute in Pondicherry and with the living authority of south indian botany, Father K.M Matthew at the Rapinat Herbarium in Trichy. Information was collected on phenological characteristics and seeds collected and transported back

BIRD SPECIES OF THE TDEF (Ref. #'s from Salim 1996)

Ref	Family	Scientific name	Author	Common name
74	ACCIPITRIDAE	*Pernis ptilorhyncus*	Temminck	Honey Buzzard
77	ACCIPITRIDAE	*Accipiter badius*	Gmelin	Shikra
80	ACCIPITRIDAE	*Virgatus besra*	Temminck	Besra Sparrow-Hawk
108	ACCIPITRIDAE	*Spilornis cheela*	Latham	Crested Serpent Eagle
119	FALCONIDAE	*Falco tinnunculus*	Linnaeus	Kestrel
122	PHASIANIDAE	*Francolinus pondicerianus*	Gmelin	Grey Partridge
135	PHASIANIDAE	*Pavo cristatus*	Linnaeus	Common Peafowl
138	PHASIANIDAE	*Turnix suscitator*	Gmelin	Bustard Quail
163	CHARADRIIDAE	*Vanellus malabaricus*	Boddaert	Yellow-Wattled Lapwing
222	COLUMBIDAE	*Treron bicincta*	Jerdon	Orangebreasted Green Pigeon
233	COLUMBIDAE	*Streptopelia chinensis*	Scopoli	Spotted Dove
237	PSITTACIDAE	*Psittacula krameri*	Scopoli	Roseringed Parakeet
243	CUCULIDAE	*Clamator coromandus*	Linnaeus	Redwinged Crested Cuckoo
244	CUCULIDAE	*Clamator jacobinus*	Boddaert	Pied Crested Cuckoo
245	CUCULIDAE	*Cuculus varius*	Vahl	Common Hawk-Cuckoo
249	CUCULIDAE	*Cacomantis passerinus*	Vahl	Plaintive Cuckoo
251	CUCULIDAE	*Eudynamys scolopacea*	Linnaeus	Koel
255	CUCULIDAE	*Centropus sinensis*	Stephans	Coucal
257	STRIGIDAE	*Tyto alba*	Scopoli	Barn Owl
260	STRIGIDAE	*Otus bakkamoena*	Pennant	Collared Scops Owl
261	STRIGIDAE	*Bubo bubo*	Linnaeus	Indian Great Horned Owl
267	STRIGIDAE	*Athene brama*	Temminck	Spotted Owlet
274	CAPRIMULGIDAE	*Caprimulgus asiaticus*	Latham	Nightjar
278	APODIDAE	*Apus affinis*	J.E. Gray	House Swift
279	APODIDAE	*Cypsiurus parvus*	Lichtenstein	Palm Swift
284	ALCEDINIDAE	*Alcedo althis*	Linnaeus	Common Kingfisher
289	ALCEDINIDAE	*Halcyon smyrnensis*	Linnaeus	Whitebreasted Kingfisher
294	MEROPIDAE	*Merops phillippinus*	Linnaeus	Bluetailed Bee-eater
295	MEROPIDAE	*Merops orientalis*	Latham	Green Bee-eater
298	CORACIIDAE	*Coracias benghalensis*	Linnaeus	Indian Roller
300	UPUPIDAE	*Upupa epops*	Linnaeus	Hoopoe
314	CAPITONIDAE	*Megalaima haemacephala*	Muller	Crimsonbreasted Barbet
320	PICIDAE	*Dinopium benghalensis*	Linnaeus	Lesser Goldenbacked Woodpecker
329	PITTIDAE	*Pitta brachyura*	Linnaeus	Indian Pitta
332	ALAUDIDAE	*Mirafra assamica*	Horsfield	Bush Lark
342	HIRUNDINIDAE	*Hirundo rustica*	Linnaeus	Swallow
346	HIRUNDINIDAE	*Hirundo daurica*	Linnaeus	Redrumped Swallow
351	LANIIDAE	*Lanius cristatus*	Linnaeus	Brown Shrike
352	ORIOLIDAE	*Oriolus oriolus*	Linnaeus	Golden Oriole
356	DICRURIDAE	*Dicrurus adsimilis*	Bechstein	Black Drongo
357	DICRURIDAE	*Dicrurus leucophaeus*	Vieillot	Ashy Drongo
363	ARTAMIDAE	*Artamus fuscus*	Vieillot	Ashy Swallow-Shrike
366	STURNIDAE	*Sturnus pagodarum*	Gmelin	Brahminy Mynah
367	STURNIDAE	*Sturnus roseus*	Linnaeus	Rosy Pastor
370	STURNIDAE	*Acridotheres tristis*	Linnaeus	Common Mynah
377	CORVIDAE	*Dendrocitta vagabunda*	Latham	Tree Pie
380	CORVIDAE	*Corvus splendens*	Vieillot	House Crow
381	CORVIDAE	*Corvus macrorhynchos*	Wagler	Jungle Crow
385	CAMPEPHAGIDAE	*Tephrodornis pondicerianus*	Gmelin	Common Wood Shrike
387	CAMPEPHAGIDAE	*Coracina melanoptera*	Ruppell	Blackheaded Cuckoo-Shrike
391	CAMPEPHAGIDAE	*Pericrocotus cinnamomous*	Linnaeus	Small Minivet
393	IRENIDAE	*Aegithina tiphia*	Linnaeus	Common Iora
404	PYCNONOTIDAE	*Pycnonotus cafer*	Linnaeus	Redvented Bulbul
407	PYCNONOTIDAE	*Pycnonotus luteolus*	Lesson	Whitebrowed Bulbul
416	MUSCICAPIDAE	*Turdoides caudatus*	Dumont	Common Babbler
419	MUSCICAPIDAE	*Turdoides malcolmi*	Sykes	Large Grey Babbler
422	MUSCICAPIDAE	*Turdoides affinis*	Jerdon	Whiteheaded Babbler
434	MUSCICAPIDAE	*Muscicapa latirostris*	Raffles	Brown Flycatcher
435	MUSCICAPIDAE	*Muscicapa muttui*	Layard	Brownbreasted Flycatcher
443	MUSCICAPIDAE	*Muscicapa rubeculoides*	Vigors	Bluethroated Flycatcher
450	MUSCICAPIDAE	*Terpsiphone paradisi*	Linnaeus	Paradise Flycatcher
459	MUSCICAPIDAE	*Orthotomus sutorius*	Pennant	Tailorbird
474	MUSCICAPIDAE	*Erithacus brunneus*	Hodgson	Blue Chat
475	MUSCICAPIDAE	*Copsycus saularis*	Linnaeus	Magpie Robin
485	MUSCICAPIDAE	*Saxicoloides fulicata*	Linnaeus	Indian Robin
490	MUSCICAPIDAE	*Zootera citrina citrina*	Latham	Orangeheaded Ground Thrush
491	MUSCICAPIDAE	*Zootera citrina cyanotus*	Jardine & Selby	Whitethroated Ground Thrush
502	MOTACILLIDAE	*Motacilla indica*	Gmelin	Forest Wagtail
507	MOTACILLIDAE	*Motacilla maderaspatensis*	Gmelin	Large Pied Wagtail
509	DICAEIDAE	*Dicaeum erythrorhynchos*	Latham	Tickell's Flowerpecker
513	NECTARINIIDAE	*Nectarinia zeylonica*	Linnaeus	Purplerumped Sunbird
515	NECTARINIIDAE	*Nectarinia lotenia*	Linnaeus	Loten's Sunbird
516	NECTARINIIDAE	*Nectarinia asiatica*	Latham	Purple Sunbird
520	ZOSTEROPIDAE	*Zosterops palpebrosa*	Temminck	White-eye
523	PLOCEIDAE	*Ploceus phillippinus*	Linnaeus	Baya Weaverbird
530	PLOCEIDAE	*Lonchura striata*	Linnaeus	Whitebacked Munia
533	PLOCEIDAE	*Lonchura malacca*	Linnaeus	Blackheaded Munia
534	FRINGILLINAE	*Carpodacus erythrinus*	Pallas	Rosefinch

to the Auroville nurseries where germination techniques were established and seedlings raised for planting in the Auroville forests.

It was fortuitous timing. The Auroville forests were well established, but in many areas were becoming dominated by *A. auriculiformis* which not only grew well, but had a high fecundity rate and the seedlings were forming dense impenetrable patches in some areas. It was the right time for under planting, and the TDEF is a forest that is used to growing in the shade. The seedlings of some species actually demand it for the first few years. Here was a whole new job that the greenwork enthusiasts could throw their energy into and over the next ten years vast areas of Auroville's 1000 hectares of greenbelt were transformed into an emerging ecosystem of the TDEF. Over 230 species of woody plants, trees, shrubs, lianas, as well as forest floor dwelling bulbs and epiphytic orchids were propagated in the nurseries and transported out into the forests. Each year 30-50,000 seedlings are planted out into the forests. It continues to be a work of passion for many of the people, to provide a secure home to a forest that is beautiful in its pristine state.

PEOPLE AND THE FOREST

Forests never stand in isolation. They always exist in relationship with the species that inhabit them, including the local people.. It became immediately clear that it was impossible to become involved in the forest without becoming involved with the local people, particularly those who had living traditions associated with the species of the TDEF. The funding of FRLHT encouraged an approach that included the traditional health practitioners, and documenting the knowledge that was in danger of being lost as India transformed itself into a developing country with all of the inherent upheavals and change that are inevitably felt in the rural landscape. Around half of the 1000+ angiosperm species found within the range of the TDEF have a documented use, either as medicinal plants or in cultural activities. But as in many cases around the world, the traditions were no longer as valued as they were before, even though many of the remedies were known to be effective. The quick fix of pills or injections are instantly attractive, particularly when satellite TVs pour out images of foreign affluence in the palm fronded huts of the local villages.

However the wisdom and the traditional knowledge and techniques have survived and they are providing some of the clues that are essential to renegotiating the social contract between today's expectations and the services that the forest can actually provide.

EXTENDING THE WORK TO THE BIO-REGION

The eco-restoration of Auroville has consequently extended past the boundaries of the city area, and now continues within a defined bio-region. This extends 40 km north of the township and includes an important wetland site called Kaluveli and its watershed. For the past three years, with funding assistance from the European Commission, a program has been running to develop a shared forest management plan for the TDEF. Within the framework of this project, work is going on in local villages to develop community structures that could take responsibility for forest assets. The younger generations have been identified as a key to the forest's future and so the project is promoting environmental education in a local high school by building and staffing an environment center, as well as becoming involved in other curriculum activities and local institutions. Green centers have been opened in the small villages where local people have access to traditional doctors, and classes are held for eco-clubs that have been established in local primary schools and high schools. It is an integrated approach that acknowledges that for the forest to survive it has to be made relevant to local people's needs, and that local people have to become aware of the assets provided by a healthy, functioning forest ecosystem.

Top: The young TDEF;
Bottom: The ethno-medicinal forest of Pitchandikulam.

RARE AND THREATENED PLANT SPECIES OF THE TDEF

Family	Botanical Name	Author
ANACARDIACEAE	*Semecarpus anacardium*	Linnaeus
ANNONACEAE	*Polyalthia korinti*	(Dunal) Thw.
APOCYNACEAE	*Carissa salicina*	Lam.
APOCYNACEAE	*Vallaris solanacea*	(Roth.) Kuntze
ARACEAE	*Amorphophallus sylvaticus*	(Roxb.) Kunth.
ASCLEPIADACEAE	*Caralluma indica*	(Wight & Arn.) N.E. Br.
ASCLEPIADACEAE	*Caralluma pauciflora*	(Wight) N.E. Br.
ASCLEPIADACEAE	*Caralluma stalagmifera*	Fischer
ASCLEPIADACEAE	*Ceropegia bulbosa*	Roxb.
ASCLEPIADACEAE	*Ceropegia candelabrum*	Linnaeus var. biflora (L.) M.Y. Ansari
ASCLEPIADACEAE	*Ceropegia juncea*	Roxb.
ASCLEPIADACEAE	*Gymnema sylvestre*	(Retz) R.Br. ex Schultes
CAPPARACEAE	*Cadaba trifoliata*	(Roxb.) Wight & Arn.
CAPPARACEAE	*Capparis rotundifolia*	Rottler
CELASTRACEAE	*Salacia chinensis*	Linnaeus
CLUSIACEAE	*Garcinia spicata*	(Wight & Arn.) Hook.f.
EBENACEAE	*Diospyros chloroxylon*	Roxb.
EBENACEAE	*Diospyros ebenum*	J.Koen. ex Retz
EBENACEAE	*Diospyros melanoxylon*	Roxb.
EUPHORBIACEAE	*Dimorphocalyx glabellus*	Thw.
EUPHORBIACEAE	*Drypetes sepiara*	(Wight & Arn.) Pax & Haffm.
EUPHORBIACEAE	*Mallotus rhamnifolius*	Muell.-Arg.
EUPHORBIACEAE	*Suregada angustifolia*	(Baillon ex Muell.- Arg.) Airy Shaw
FABACEAE	*Derris ovalifolia*	(Wight & Arn.) Benth.
FABACEAE	*Ormocarpum cochinchinensis*	(Lour.) Merr.
FABACEAE	*Pterocarpus marsupium*	Roxb.
LOGANIACEAE	*Strychnos minor*	Dennst.
MELIACEAE	*Aglaia elaeagnoidea*	(A.Juss.) Benth.
MELIACEAE	*Walsura trifoliata*	(A.Juss.) Harms
ORCHIDACEAE	*Eulophia epidendraea*	(Koen.) Schlt.
ORCHIDACEAE	*Habenaria roxburghii*	(Pers.) R.B
ORCHIDACEAE	*Vanda spathulata*	Sprengel
ORCHIDACEAE	*Vanda tesselata*	(Roxb.) Hook. Ex Don
PASSIFLORACEAE	*Adenia wightiana*	(Wall. ex Wight & Arn.) Engl.
RUBIACEAE	*Tricalysia sphaerocarpa*	(Dalz.) Gamble
RUTACEAE	*Chloroxylon swietenia*	DC.
RUTACEAE	*Pamburus missionis*	(Wight) Swingle
SAPINDACEAE	*Lepisanthes tetraphylla*	(Vahl) Radlk.
SAPOTACEAE	*Manilkara hexandra*	(Roxb.) Dub.
STERCULIACEAE	*Pterospermum suberifolium*	Lam.
STERCULIACEAE	*Pterospermum xylocarpum*	(Gaertn.) Santapau & Wagh
VITACEAE	*Ampelocissus tomentosa*	(Heyne ex Roth) Planchon

REPTILE SPECIES OF THE TDEF

Family	*Scientific name*	Author	Common name
BOIDAE	*Eryx conicus*	Schneider	Common Sand Boa
BOIDAE	*Eryx johni*	Russell	Red Sand Boa
COLUBRIDAE	*Ahaetulla nasutus*	Lacepede	Vine Snake
COLUBRIDAE	*Amphiesma stolata*	Linnaeus	Striped Keelback
COLUBRIDAE	*Atretium schistosum*	Daudin	Olive Keelback Watersnake
COLUBRIDAE	*Boiga trigonata*	Schneider	Common Cat Snake
COLUBRIDAE	*Dendrelaphis tristis*	Daudin	Bronzeback Tree Snake
COLUBRIDAE	*Elaphe helena*	Daudin	Trinklet Snake
COLUBRIDAE	*Lycodon aulicus*	Linnaeus	Common Wolf Snake
COLUBRIDAE	*Lycodon striatus*	Shaw	Shaw's Wolf Snake
COLUBRIDAE	*Oligodon arnensis*	Shaw	Banded Kukri Snake
COLUBRIDAE	*Oligodon taeniolatous*	Jerdon	Russell's Kukri Snake
COLUBRIDAE	*Ptyas mucosus*	Linnaeus	Rat Snake
COLUBRIDAE	*Xenochropis piscator*	Schneider	Chequered Keelback
ELAIDAE	*Bungarus caeruleus*	Schneider	Common Krait
ELAPIDAE	*Naja naja*	Linnaeus	Indian Cobra
TYPHLOPHIDAE	*Typhlina bramina*	Daudin	Blind Snake
VIPERIDAE	*Echis carinatus*	Schneider	Saw Scaled Viper
VIPERIDAE	*Vipera russelli*	Shaw	Russell's Viper
AGAMIDAE	*Calotes calotes*	Linnaeus	Southern Green Calotes
AGAMIDAE	*Calotes rouxi*	Dum. & Bibr.	Forest Calotes
AGAMIDAE	*Calotes veriscolor*	Daudin	Common Garden Lizard
CHAMAELONIDAE	*Chamaeleon zeylanicus*	Laurenti	Indian Chameleon
GEKKONIDAE	*Hemidactylus frenatus*	Schlegel	Southern House Gecko
GEKKONIDAE	*Hemidactylus maculatus*	Dum. & Bibr.	Rock Gecko
SCINCIDAE	*Mabuya carinata*	Schneider	Common Skink
SCINCIDAE	*Riopa punctata*	Gmelin	Snake Skink
TESTUDINIDAE	*Geochelone elegans*	Schoepff	Starred Tortoise
VARANIDAE	*Varanus bengalensis*	Schneider	Common Indian Monitor

MAMMAL SPECIES OF THE TDEF

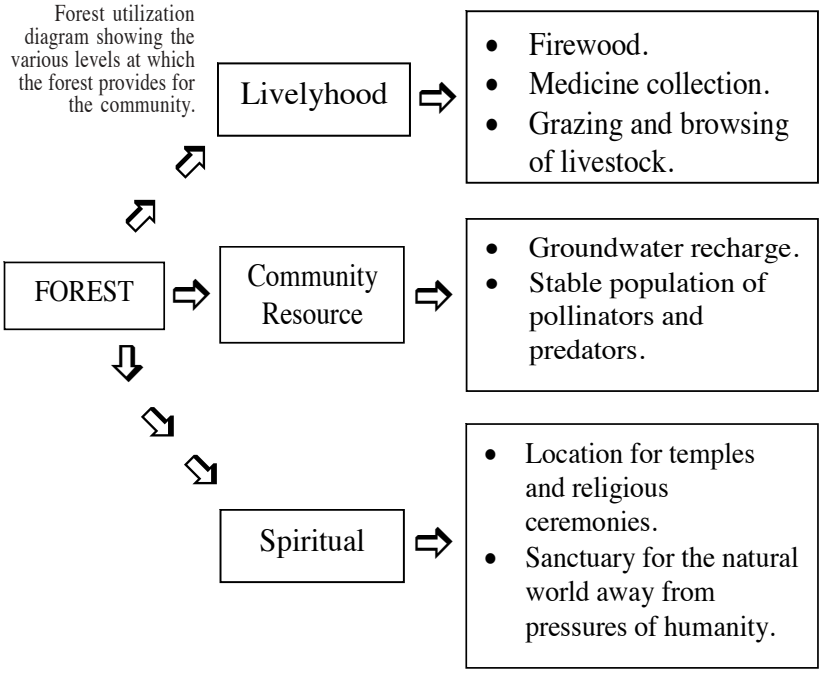
Family	Scientific name	Author	Common name
BOVIDAE	*Antilope cervicapra*	Linnaeus	Black Buck
CANIDAE	*Canis aureus*	Linnaeus	Jackal
CANIDAE	*Vulpes bengalensis*	Shaw	Indian Fox
CEROPITHECIDAE	*Macaca radiata*	Geoffroy	Bonnet Macaque
CEROPITHECIDAE	*Presbytis entellus*	Dufresne	Common Langur
CERVIDAE	*Axis axis*	Erxleben	Chital
CERVIDAE	*Muntiacus muntjak*	Zimmermann	Barking Deer
CHIROPTERA	*Cynopterus sphinx*	Vahl	Short-nosed Fruit Bat
CHIROPTERA	*Kerivoula picta*	Pallas	Painted Bat
CHIROPTERA	*Megaderma lyra*	Geoffroy	Indian False-vampire Bat
CHIROPTERA	*Pipistrellus coromandra*	Gray	Indian Pipistrelle
CHIROPTERA	*Pteropus giganteus*	Brunnich	Indian Flying Fox
ERINACEIDAE	*Paraechinus micropus*	Blyth	Pale Hedgehog
FELIDAE	*Felis chaus*	Guldenstaedt	Jungle Cat
HERPESTIDAE	*Herpestes edwarsi*	Geoffroy	Common Mongoose
HERPESTIDAE	*Herpestes smithi*	Gray	Ruddy Mongoose
LEPORIDAE	*Lepus nigricollis nigricollis*	F.Cuvier	Blacknaped Hare
LORISIDAE	*Loris tardigradus*	Linnaeus	Slender Loris
MURIDAE	*Bandicota bengalensis*	Gray & Hardwicke	Indian Mole Rat
MURIDAE	*Bandicota indica*	Bechstein	Bandicoot
MURIDAE	*Golunda ellioti*	Gray	Indian Bush Rat
MURIDAE	*Mus booduga*	Gray	Indian Field Mouse
MURIDAE	*Mus musculus*	Linnaeus	House Mouse
MURIDAE	*Rattus rattus*	Linnaeus	Common House Rat
MURIDAE	*Vandeleuria oleracea*	Bennett	Long-tailed Tree Mouse
MUSTELIDAE	*Mellivora capensis*	Schreber	Ratel
PHOLIDOTA	*Manis crassicaudata*	Gray	Pangolin
RODENTIA	*Hystrix indica*	Kerr	Indian Porcupine
SCUIRIDAE	*Funambulus palmarum*	Linnaeus	Three-striped Palm Squirrel
SCUIRIDAE	*Ratufa indica*	Erxelben	Indian Giant Squirrel
SCUIRIDAE	*Tatera indica*	Hardwicke	Indian Gerbil
SORICIDAE	*Suncus murinus*	Linnaeus	Grey Musk Shrew
SUIDAE	*Sus scrofa*	Linnaeus	Wild Boar
URSIDAE	*Melursus ursinus*	Shaw	Sloth Bear
VIVERRIDAE	*Paradoxurus hermaphroditus*	Pallas	Common Palm Civet (Toddy Cat)
VIVERRIDAE	*Viverra zibetha*	Linnaeus	Large India Civet

The story of eco-restoration does not end with the propagation of plants, nor does it end with the successful re-establishment of an ecosystem over a few square kms. It spreads in ever expanding circles, reaching out to local people, to government officials, searching for ways to open people's eyes to the benefits of the forest. Without the will of the people within each strata of society an entity under such pressure as the TDEF cannot survive.

POST-TSUNAMI UPDATE

Perhaps the most important stories from the tsunami tragedy are the less visible ones. There are stories of how Aurovilians who had not worked together for years dropped everything to collaborate in the relief effort and so recaptured something of the spontaneous joy and fraternity of the early years of Auroville; of how a new generation of tech and relief-savvy Aurovilians seamlessly assumed control of a vast and complex organization; of how some of the much-criticized youth of Kuilapalayam came forward to help with the clean-up in the coastal villages; of the young people who came all the way from the U.K. to offer their help as they had heard that Auroville was really making a difference. And perhaps this is the real story: that after all these years of developing expertise in fields like village development, water recycling and purification, computer systems and computer-generated technology, alternative building methods etc. Auroville could at last bring them all together and do something that really made a difference to the local villagers. At the same time, the professionalism of Auroville's relief and rehabilitation effort has enabled it to play a key role in assisting operations not only in the bioregion but in Tamil Nadu as a whole, forging important new relationships at the highest levels with the local and State governments as well as with international and national NGOs (information from the Auroville website: www.auroville-.org).

Nadukuppam School and Enviro-center.



Forest utilization diagram showing the various levels at which the forest provides for the community.

CONCLUSIONS

The challenges facing each forest type are different, but some experiences can be drawn out to highlight what needs to be achieved in each situation.

It is clear that this forest will not survive unless it pays tribute to the local people. Humanity does not allow anything to exist without a reason, particularly when other competing uses can be made of the land, even if it is only the occasional grazing of goats. Therefore we need to recognize and highlight the values that the forest can provide to society.

There are three levels at which the forest provides: personal livelihoods, communal assets and spiritual sustenance. It is only the primary level that actually costs the forest in terms of extraction, the latter two are passive actions that are recognizable only when it is brought to public attention. Thus in order to regenerate the forest it is essential to identify the present livelihoods that are extracting resources and modify them to maintain a sustainable extraction that allows the forest areas to regenerate. In the case of the TDEF it is only goat grazing and fuel wood collection that fall into this category. It is the role of the ecological restorer to mediate between the users and the forest and to identify and develop alternative livelihoods that are attractive enough to allow the users to make a change. If this is carried out in conjunction with education about the communal assets that will multiple if the forest is allowed to regenerate, such as ground water percolation, habitat for pest predators and crop pollinators, then it is possible that the necessary social fences can be established to protect the forest during its reestablishment.

Eco-restoration has two major requirements: technical knowledge, such as knowledge of species, propagation techniques, and planting strategies; and political knowledge; a need to work on the social level to create conditions within the population, both locally and nationally, which are conducive to the forest's re-emergence. To satisfy the first requirement is the simpler of the two; given enough time, enthusiasm, and dedicated workers the answers and knowledge can be gathered from the remnants of the forest. The political aspect is less straightforward. It exists in the world of local and national politics, where the weaknesses of personal greed and power are never far away. This work is not for the individual who only loves to be in nature, happy to find reasons to wander through the forest searching out flowers and seeds, observing the way evolution has adapted over the untold eons prior to our arrival. It is the work of the mover, the fixer, the talker. The first is restorative, the second exhausting. The first is the slow accumulation of verifiable knowledge, the second is seizing oportunities when they come and hoping that the ground will not shift or the political climate will not change on the whim of an election. But both are essential components of the struggle to create a planet rich in biodiversity.

The Auroville plateau today.

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