

# A Socio-Ecological Study of Sacred Groves and Memorial Parks: Cases from USA and India

Ishani Pruthi and William Burch Jr

**Abstract**—The concept of sacred and nature have long been interlinked. Various cultural aspects such as religion, faith, traditions bring people closer to nature and the natural environment. Memorial Parks and Sacred Groves are examples of two such cultural landscapes that exist today. The project mainly deals with the significance of such sites to the environment and the deep rooted significance it has to the people. These parks and groves play an important role in biodiversity conservation and environmental protection. There are many differences between the establishment of memorial parks and sacred groves, but the underlying significance is the same. Sentiments, emotions play an important role in landscape planning and management. Hence the people and communities living at these sites need to be involved in any planning activity or decisions. The conservation of the environment should appeal to the sentiments of the people; the need to be 'with nature' should be used in the setting up of memorial forests and in the preservation of sacred groves.

**Keywords**—Sacred groves, memorial forests, community based natural resource management.

## I. INTRODUCTION

CONSERVATION of natural resources has held utmost importance for mankind's survival and sustenance. The protection of nature for religious purposes is an ancient practice that has recently gained attention in conservation literature. History is replete with examples from Asia, Africa, Europe [1] where natural phenomenon have been termed as 'sacred' and worshipped. These are types of natural sites such as rivers, lakes, forests, gardens groves etc, that have been institutionalized by attachment of sacred values with intensions to make collective management easy and sustainable.

Sacred groves are community based monuments of biological diversity. They are landscapes that are protected on the basis of their religious and holy significance. Communities set aside sanctified areas of their forests and public land and established rules for their protection. The rules vary from grove to grove but most often prohibit the felling of trees and killing of animals. The belief being, the presiding deities administered punishment and death to the violators.

Sacred groves are recognized as a system that informally forces traditional communities to harvest natural resources in an ecologically sustainable way [2]. Most researchers [1] [3] believe that sacred groves not only preserve biological diversity but also cultural diversity. In India, Hinduism has

grown out of the merger of local traditions that have been intertwined with nature. [4] Deep religious reverence for nature, rather than resource scarcity is the basis for long standing commitment for preserving these forests. [5].

In the past few years, there has been an increase in the number of reports for degradation activities, affecting the institutional foundations for these sites all over India. This is due to several reasons. One of them is that the institutional identity of these traditional forests is fading with the advent of national forest policies. [6]

Factors causing degradation have been identified to be commercial agriculture, changing demographics and weak property rights [7]. The conservation of sacred groves hence faces several investigative management questions. The answers to which are required to identify the circumstances that lead to decline of groves as community based natural resource management institutions, the current threats, the change social institutions, the need for immediate action for sacred grove eco-restoration.

This research study describes the influence of human activity and perspective on two sacred groves in Ratnagiri district, Maharashtra.

The project is aims to bright light on the urgent need for conservation of sacred groves. It highlights the ecological importance of sacred groves and aims to analyse the social conditions that are essential for their long term conservation. It is an investigative effort to find out answers to some of the above mentioned questions, the changes in the people's perspectives and the social factors that are involved.

The study is an attempt to build a database on social preservation and to lay emphasis on the importance of groves as community based repositories of biological diversity, to explain the ecological and cultural services provided by the groves and to explain the socioeconomic aspects of their degradation. The article then aims to further analyze the socioeconomic drivers in the modern era that have weakened the traditional management systems.

The unique aspect of this project is that it is a continuation of a study conducted by *Lindsay Campbell and Erica Svendsen* in their publication *Land-markings: 12 Journeys through 9/11 Living Memorials*, 2006. (Publication: NRS-INF-1-06. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station) on the memorial groves and sacred forests that had been established after the 9/11 tragedy. The project aims to integrate the inherent significance of sacred landscapes and forests, with their impact on everyday lives across two

Ishani Pruthi is with the TERI University, N. Delhi INDIA (e-mail: ishani1402@gmail.com).

strikingly dissimilar cultures and examples.

## II. STUDY SITES

### A. The Western Ghats

Six states of India share the Western Ghats, namely Tamil Nadu, Kerala, Maharashtra, Karnataka, Goa and Gujarat. They are formed by the Malabar plains and a chain of mountains running North to South, stretching parallel to India's southwest coast about 30-50 kms inland from the Arabian Sea.

The unique climatic variations in the area make it one of the world's biodiversity hotspots and home to a variety of plants and animals with a high degree of endemism.

Less than 15% of the Ghats are protected in 20 national parks and 68 wildlife sanctuaries [8]. Their management status varies considerably as some protected areas include human habitation on forest resources. Hence only 20% of the original forest cover exists undisturbed.

The state of Maharashtra, India has about 4000 sacred groves recorded [9], the highest density being in western area.

The main grove sites are found in two southern coastal districts of Ratnagiri and Sindhudurga. The two grove sites chosen for this study were [Fig.1]:

- 1) *Vashi, Taluka- Sangameshwar, District- Ratnagiri*  
(Area: 33 acres)

Vashi is located in the heart of the Western Ghats, an international biodiversity hotspot. In the local language, the sacred grove is called 'Devarathi' or 'Devarai'. A local NGO – The Applied Environmental Research Foundation' has taken the village under its wing and has conducted various awareness programs.

- 2) *Kulye, Taluka- Sangameshwar, District- Ratnagiri*  
(Area 33 Acres)

It is located about 5 kms from Vashi. An unfinished government irrigation canal passes through the forest and the area around this canal is devoid of trees. It was dug up 20 years back but the work is still incomplete.

In the Ratnagiri district, sacred groves are located on plains, hill slopes and hilltops. They play an important role in soil and water conservation, reduction of erosion and provision of humus to the cultivated fields [9] [10].

It has been noted that thick vegetation cover of sacred groves reduces the flow of runoff water and holds several inches of rainfall in the soil. [4]. Also it is common to find ponds, lakes and springs in the forests. Sacred groves form sustainable forest parcels scattered over a small district. They provide a rich habitat for wildlife and are a depository for diverse flora and fauna.

## III. STUDY METHODOLOGY

The study techniques and research methods were derived from *Land-markings: 12 Journeys through 9/11 Living Memorials*. The authors have employed both qualitative and quantitative methods to collect the data. Hence the same methodology has been used for the current study. The aim was to understand the human interaction and opinions about the sacred groves and forests. For a comprehensive socio-ecological study, open ended individual and group interviews were taken as well as data was collected from the field. The following is a detailed explanation of the methods used.



Fig. 1 Map showing the Ratnagiri district

### A. Field Survey (Qualitative Method)

A field study was done at the two grove sites. The aim was to find out the ecologically degraded sites using certain parameters. The severity of use and human impact was also measured.

The data recorded included measurements for canopy openness, tree height and girth, path formation, presence of evergreen species, butterflies, climbers and invasive plants. Disturbance due to cattle and human activity was also noted. The measurements were made along randomly drawn line transects which were taken 15m from the edge to avoid edge effects.

The following is a description of the parameters chosen:

1. **Canopy Cover:** A closed canopy is generally an indicator of a well preserved forest. The forest canopy is the combination of all foliage, twigs, branches and their attending flora and fauna along with their environment. [11] A range finder was used to carry out the distance measurement and readings noted. The functions of a canopy include light absorption, intercepting rainfall and provision of habitat for wildlife and flora. It is involved in modification of forest interior environment by influencing values of average temperature, wind speed etc, depending on its openness.
2. **Tree Girth and Height:** The presence of mature trees is a sign of an ecologically stable system. As trees grow older, the fragile ecosystem becomes more stable. Measurement of the tree girth and height are way to find out the tree maturity and age, indicating degradation activities or tree felling. Line transects were taken and tree heights and girth was measured. Dominance of a particular species was also noted, if any.
3. **Leaf Litter Depth:** It is an important parameter for measuring the soil health and fertility. Leaf litter production,

decomposition and nutrient release patterns influence the soil productivity. It also keeps the soil moist. Human and animal intrusion reduced the leaf litter as well as wind movement. A ruler was used to measure the depth of leaf litter at each of the line transects.

4. Presence of Secondary Species: If a part of a forest is cut down, regeneration of the fast growing species takes place. Hence younger and less dominant fast growing secondary species dominate in such a scenario. The number and presence of such species is a good indicator to the ecosystem stability of the area.

5. Presence of evergreen trees: The area around the Western Ghats is mainly mixed evergreen deciduous. Hence presence of the evergreen species is an indicator of less disturbance activity and shows that the ecosystem is mature and stable.

6. Presence of invasive species: Invasive species are present when the native species are not able to establish dominance due to degradation factors. They dominate the area and use up most of the resources and nutrients. Presence of these indicates a poor ecosystem and degradation.

7. Disturbance due to cattle and human activity: This parameter includes a variety of activities and indicators. Number of paths, presence of cattle dung and presence of wood kept as firewood etc are all small signs of disturbances due to external factors. Presence of trash indicates soil pollution and hence more degradation and deterioration.

#### B. Village Survey (Qualitative Analysis)

A survey was conducted at the village level. The aim of the survey conducted was to investigate the increasing concerns about degradation of sacred groves. The villagers are the direct consumers of the forest products and worship the sacred and their perspectives would give direct answer to the research questions set out to be investigated. Open ended individual and group interviews were conducted in both the villages. The questions were designed as to gather information about their perception of the grove, its significance and impact on their lives, their intimate spiritual relationship and dependence, how they feel about the degradation and changes. In each village both male and female members were interviewed from various social backgrounds and age groups. The interviews were conducted in Marathi and the help of a translator was required. They were conducted at homes, temples and parks. School teachers and students were also interviewed to find out their perspectives.

The interviews were conducted during the festivals of Hanuman Jayanti and the villagers were not available. Hence the number of interviews taken was less than 20 per village.

### IV. OBSERVATIONS AND RESULTS

#### A. Vashi

##### 1) Field Survey Observations

The canopy openness was observed to be 70-80% in general. This was a result of the tall trees with spreading branches at the top. The leaf litter was 30cms in depth. The girth and tree height data is given in Annexure 1.

No invasive species were observed or signs of cattle

activity. There was not any trash in the area and one pathway, indicating low levels of human activity. Four different species of butterflies were observed, at the transect sites, indicating a sound ecologically preserved system. Many evergreen tree species were observed. Rare tree species *Saraca indica* was seen, indicating its disposition to host endemic species. The grove was enclosed by a wall of rocks put together by the villagers to keep out the cattle and intruders.

##### 2) Village Survey Observations

Seventeen people were interviewed from the age group of 12-70 years. The details are given in Annexure 2. All of the informants had been staying at the village since childhood and had grown up on local beliefs and values.

It was noted that the sacred site had immense significance to the people. The following perspectives were obtained:

##### a) Sacred Groves as holy sites.

The inhabitants of the village believed in the sanctity of the grove and deities. No one from the village was allowed to cut the trees or break branches from the sacred forest. If a tree had to be cut, it would be done in the presence of the priest, after a special ceremony asking the deity for permission to cut it.

The general belief amongst the people was that the deity would be angry with them if the tree was cut without permission.

##### b) Sacred Groves as a cultural identity

Several festivals such as Holi and Dussehra were celebrated in the sacred forest while worshipping the forest deities. Festivals and local village cultural celebrations were held in the ceremonial grounds at the grove site where the people would get together, few times in a year.

##### c) Sacred Groves for Collective Decision Making

At the time of important decisions regarding the village infrastructure and temple, the villagers would collect at the temple for a collective decision making process. At such ceremonies, prayers are offered to the forest deity and several rituals, traditions governed the outcome.

##### d) Sacred Groves and Biodiversity Conservation

Due to the efforts of local NGOs the villagers were aware of the immense potential of the grove to harbor rare species and be a repository for biodiversity. This came out very clearly during the interview with the school teachers. They said that the importance of sacred groves had been included in their environmental sciences curriculum and the children were being taught at school the importance of such sites and their impact on the environment. Most of the informants knew that cutting the trees would not only anger the deity but also led to loss of forest cover in the region.

One important observation was that after just five years of eco-restoration work, there had been an obvious increase in water levels, at the village well. This was clear evidence to the people that their hard work towards restoration of the grove was not in vain, and they should continue in their efforts.

##### e) Threats to Sacred Groves

Most of the informants said that the main threat to their grove was due to cattle intrusion and illegal felling of trees.

Hence they had built a stone wall around the grove, cutting it off from the rest of the area and blocking the path of the stray cattle. [Figure 2]

### B. Kulye

#### 1) Field Survey Observations

The sacred grove at Kulye was unique as an unfinished canal cut the forest into two [Figure 3]

The field survey was done separately at both the sections, Section 1 and Section 2.

##### a) Section 1

The canopy cover ranged from 60-70%. The leaf litter was almost absent from the forest floor. Many secondary species were observed and there was damage to the mature trees. Annexure 1 gives details of field study.

Chopped wood and logs were observed indicating human intrusion and illegal felling of trees. No butterflies were observed. Cattle dung was present at many places.

Invasive species *Lantana* were observed along the paths.

##### b) Section 2

The canopy cover was 70-80%. The leaf litter was 15cms. There were not signs of human activity although *Lantana* was present. Two butterfly species were observed in this section. *Antiaris toxicari* was observed, which is an endangered species.

#### 2) Village survey Observations

Fourteen people were interviewed between the agegroup of 25-70. Most of them had been in the village since childhood.

The main perspectives gathered from Kulye were similar to Vashi when it came to them being as sacred sites and cultural identities. But the enthusiasm was lacking amongst the people.

The elders of the village all agreed on the fact that the groves was degrading rapidly. They reported that this had not been the case 20 years back. One of the informants said that the grove site was on government revenue land and the villagers had allowed the construction of the canal after a collective decision making process in the village, where they had decided that increased water supply would benefit them all.

But the dam has still not been completed, hence the canal remained empty. Every year, trucks and rollers would come in to clear the path, which would lead to more tree cutting and felling.

Section 1 was located closer to the village and habitation. Hence, more degradation was observed in this section, due to frequent human activity in the area.

The informants lacked the enthusiasm while sharing their experiences about the grove. Many still believed in the sanctity of the forest but were not aware about the potential for biodiversity conservation. They believed that the main cause of degradation was due to cattle grazing and illegal felling of trees. They did not know about the benefits of eco-restoration activity as very few awareness programs had been targeted here. The transfer of knowledge to the next generation was mainly by the grandparents in the family. In school, the children were made aware about the importance of forests in the subject of environmental sciences.

It was noted that most of the residents of the village were

now settled in Mumbai or Pune, (urban areas in the state of Maharashtra) and it was told by the village elders that most of them believed more in the renovation of the temple than the grove itself. Thus many trees had been felled to make room for the renovation of the temple and its beautification.

A few people said that they did not believe in the sacred forest deity and refused to answer any further questions.

But in general, it was noted that most people were not pleased about the canal passing through the grove site as it was non functional and served no purpose. They agreed to the fact that there had been degradation after its construction.



Fig. 2(a) Wall around the Vashi Sacred Grove



Fig. 2(b) The Temple at the Vashi Sacred Grove



Fig. 3 The unfinished canal cutting through the Kulye Sacred Grove

## V. DISCUSSION

We have seen that groves are examples of community driven conservation. But it is also seen in the above cases that there is more importance given to the actual shrine and temple than the forest itself. This has led to a change in ideas over time, which has led to degradation of the forests.

From the results and observations, the reasons for degradation of sacred groves can be concluded to be:

1. The disappearance of traditional belief systems. Due to increased modernization and advent of technology, the traditional belief systems are dying out. They are considered mere superstition in many areas.
2. Sacred groves have been destroyed due to rapid urbanization and development interventions such as roads, railway tracks, dams including commercial forestry.
3. Encroachment has led to shrinkage of large forests. Due to the increase in population, the forest cover has reduced considerably and reduction in sacred grove cover.
4. Many groves suffer due to the transformation of the primitive forms of nature worship into formal temple worship. This is mainly due to rapid urbanization. As in the case of Kulye, many of the residents lived in cities and did not connect with the forest, as did the locals. The city dwellers wanted large celebrations involving the temple hence the significance of the forest was lost.
5. Invasion by exotic species or weeds is a serious threat. Due to encroachment of the sites, seeds and plants of invasive species can pollute the land, using up all the nutrients and resources, slowing down the process of regeneration.
6. Pressures increase on the groves due to increasing livestock and fuel wood collection. Most of the informants reported that cattle intrusion was the leading cause of degradation at the groves. Hence, there is an immediate need for proactive measures.

It is clear from the sites studied that there is a close association between the people and the groves. Fig. 4 gives a detailed analysis of the relationship.

Fig. 4 Relationship between Sacred groves and communities  
(Source Current Science, August 2004)

It is clear from the observations that at Vashi, where there were extensive awareness programs, the people were much more concerned about the sacred grove. Their sentiments and emotions had been revived. Twenty years ago, there had been a feeling of cutting off from the grove; the people had not been much concerned about the sacred grove and its significance. There had been illegal tree felling and cattle activity. Due to slow erosion of cultural norms due to increase in urbanization and modernization, there had been negligence towards the site. Now after revival of the emotions and sentiments amongst the people, an enthusiasm was observed, where the villagers were keen on protecting the grove and plant more trees. They built a wall around the grove to stop cattle grazing. This has led to conservation of various species in the forests. An important fact is that, there are no protected areas within this region. There are many endangered species found within the region namely *Saraca indica*, *Mappia foetida*, *Antiaris toxicaria*, Great Pied hornbill etc and these are protected only by the mechanisms of the sacred groves.

After the ecorestoration work started, six years ago, there have been several changes and their consequences at Vashi. The canopy cover has increased and the villagers have themselves noted that the water in the wells has increased. This is a clear indication of the revival of the ecosystem

services due to the involvement of the people and their increasing concern.

## VI. COMPARISON WITH MEMORIAL PARKS AND SACRED FORESTS IN US

### A. Memorial Parks

To memorialize the tragedy of September 11, many memorial sites have been established. These ranged from urban tree plantings to the restoration of old degraded patches of forests. In response to the tragic event, the families, schools, relatives and friends of victims, emerged with various memorial structures at neighbourhoods, schools etc.

According to the researchers Svenson and Campbell, the people need to experience nature to compensate for their losses. They need to move through and experience the joys of nature. This led to movements across the various cities to restore ecosystems, make use of natural landscapes. The Washington Congressional Cemetery Memorial grove doubles up as a cemetery and as Public Park. This secondary data used was supplemented by field trips to Washington Congressional Memorial Cemetery, Washington D.C., USA.

### B. Purpose of Creation of the Memorial

A cemetery is a logical place for the memorial site where people could visit their departed loved ones. There is a need for creation of a renewed awareness of the cemetery to bring more people onto the site.

### C. Reason for Site Selection

Congressional Cemetery was selected as the official Ward 6 grove by the steering committee. It is also noted for its proximity to the main Kingman island site, which will be accessible once the Anacostia Greenway is created. Within the cemetery, the grove is an alley originating at the John Phillip Sousa grave and continuing down the hill to the far edge of the cemetery near the Anacostia River.

Area covered : 3000 linear feet of a single alley

Number of Trees Planted and Species: 101-500, mainly Hornbeams and Chinese Elms

It was observed that tree planting was a habitual response for most of the residents and visitors to the cemetery.

### D. Memorial Forests

They exist in the various sizes ranging from small urban fragments to large wilderness areas. Many memorial sites are groves of trees which embody the forest in its social meaning and are meant for the people to connect with the natural system.

The following observations were reported related with people and their involvement with the memorial site.

1. There was a need to lose oneself in the larger system of nature. Hence many memorials are designed in such a way that visitors find themselves lost in the enormity of nature.

2. There is a need to connect to the system of nature amongst the urban dwellers. Hence many memorial sites have tracts of forest connecting to the city for the future generations to experience the bliss of nature in the memory of the victim.

3. There was less design involvement while creation of many memorial forests. The design was incorporated gradually in the forest system. Granite stones were placed on

the paths into the woods in the memory of the victims. Anonymous people often plant seedlings in the forest as a remembrance. It was noted, that the forests were used to convey that environmental restoration like human recovery were a lifelong pursuit. It held immense benefits for both humans and the forests.

The fundamentality in the establishment of the sacred groves in India is very different from that of the memorial sites. Sacred groves as discussed are based on deep religious sentiments and belief. People have grown up, learning from the various traditions and customs from their parents and their grandparents over many years. These customs are based on deep faith amongst the people and have been inculcated over a period of many years. The sacred groves studied only emphasized this fact. It is the people and their beliefs that keep the sacred grove as it was. Table I shows a comparison between the setting up of memorial parks and sacred groves.

Although the institutions and reasons for setting up of the memorial parks and sacred forests are completely different, there are similarities which cannot be overlooked. The underlying thoughts and sentiments attached to a particular 'space' have resulted in the conservation of that particular area. In the case of memorial forests, the people's sentiments are that strong that many commercial sites in busy urban areas have come up as memorials. In the case of sacred groves, the people's religious sentiments have preserved a small forest patch, despite degradation activities going on nearby. This indicates that emotions and sentiments play a very important role in landscape management, urban or rural. The feelings are not only limited to a particular country, state or place, it is a universal theme which affects decision making as well rational opinions and choices.

## VII. CONCLUSION

The study clearly indicates that sentiments play an

TABLE I  
COMPARISON BETWEEN SACRED GROVES AND MEMORIAL PARKS

Memorial Parks/Forests	Sacred Groves
Established to preserve the memory of person, place or event	Established for reasons of deep religious meaning
There is no worship of a God or deity	Worship of deities or God, related to religious sentiments
People respect nature, feel at one with the forests	People believe in the sanctity of the forest, don't cut trees so as not to anger the Gods
Belief is not based on tradition but on sentiments	Belief is based on tradition
Volunteers, people plant trees in urban areas suitable to the landscape	Rare and endangered species can be found at sacred groves. (indigenous species planted during eco-restoration work)
Financial backing by funding agencies, volunteer programs	Village based management system, NGO involvement for awareness programs

important role in landscape planning and these have to be kept in mind before any major decision in its alteration. The setting up of memorial parks is a step towards 'greening' the urban landscapes, but this requires motivation of the people and their contribution. The degradation of the sacred groves shows a lack of interest on the part of the people but it has been shown that awareness programs have been beneficial. Cross country learning can be incorporated in the agenda of many research

organizations and NGOs. The conservation of the environment should appeal to the sentiments of the people, the need to be 'with nature' should be exploited in the setting up of memorial forests and in the preservation of sacred groves.

It is evident that the current institutional arrangement needs to be reformed. Several policy changes would have to take place for management of sacred groves. There must not be any further loss of groves and areas. Also efforts need to be made by local organizations in partnership with state governments to revive the degraded forests along with enhancing the efficiency and equity of resource usage.

Biodiversity conservation is a function of rationality and awareness on part of the people involved. True environmental eco restoration can only be achieved if the public is involved and if it appeals to their emotions. Thus urban or rural planning requires proper monitoring and evaluation taking into consideration the various customs and traditions.

Several recommendations can be made at this point. Identification of sacred sites and conducting detailed inventories is very important as this would provide a database for future references. The awareness programs need to be targeted at women of the family and school children who would uphold the values and transfer it to the coming generations. There is an urgent need for a GIS based information system on natural sacred sites as well as memorial forests which contains inventories of species that are being conserved. If local groups are made responsible for the total management and enforcement of the groves, it would require immense financial backup.

Sacred groves can serve as an effective model for decentralized community based natural resource management, if they have the proper economic incentives and legal backing regarding the property right issues.

## APPENDICES

### APPENDIX I

Table showing transects taken at Vashi and Kulye and the tree girth and height range

Region	Transects	Girth Range (cms) Number of Trees					Height Range(m) Number of Trees		
		0-50	50-100	100-150	150-200	200-250	0-5	5-10	10-15
Vashi*	T1	2	1	1	0	0	2	2	0
	T2	1	2	1	1	1	1	4	0
	T3	1	2	1	1	0	0	4	1
	T4	0	1	2	0	0	0	0	3
Kulye**	T1	1	1	0	0	2	0	2	2
	T2	0	1	1	1	0	0	2	1
	T3	0	1	2	1	0	0	2	2
Kulye*** (Deg)	T1	0	3	1	0	0	0	4	0
	T2	0	3	0	0	0	0	3	0
	T3	1	3	0	0	0	0	4	2

\* In Vashi, ecorestoration work has been carried out. There are trees found in every girth range, and are evenly distributed and it is the same with the height.  
\*\*In this area of Kulye, less degradation had taken place. The sacred grove is divided into two by a government irrigation canal. This area is between the

road and the canal. The trees are almost evenly distributed according to the girth and height range. There were trees found in the 200-250cm girth range and height 10-15m. This shows that there are more mature trees found in this part of the grove. There were lesser trails and few creepers. The fact was confirmed by the villagers, that that particular area was not intruded upon as it was near the temple.

\*\*\* This area at Kulye, is a more degraded area, where there are more trees lying in the girth range of 50-100cms and height range of 5-10m. This shows that there are less mature trees in the area. The fact was justified by the villagers, who confirmed that the area was cut down for the construction of the canal. The secondary growth mainly consisted of creepers and undergrowth was poor. There were signs of cattle grazing in the area.

#### APPENDIX II

Table showing results of survey at Vashi

S. No	Name	Occupation	Believes in the Sanctity of Grove	Knowledge about importance biodiv conservation at grove sites	Comments
1.	Sharad Charkari	Farmer	Yes	Yes	Wall built to protect sacred grove site
2.	Ramakrishna Shirka	Farmer	Yes	Yes	Knowledge about sita ashok tree
3.	Shashikant Ghana	Farmer	Yes	Yes	Wall built to protect sacred grove site
4.	Govind Salvey	Farmer	Yes	Yes	Ecorestoration was important for the village and biodiversity
5.	Sharad Dhondur		Yes	Yes	-
6.	Narayan Dhondur	Farmer/Shopkeeper	Yes	Yes	-
7.	Mahendra Dattaram Pancha	Farmer/Shopkeeper	Yes	Yes	-
8.	Laksham Arjun Panche	Farmer/Shopkeeper	Yes	Yes	Wall built to protect sacred grove site
9.	Pramod Govarkar	Police officer	Yes	Yes	-
10.	Sadanand Babu Bole	-	Yes	Yes	-
11.	Ashok Sakharam Sutar	Farmer/Shopkeeper	Yes	Yes	Knowledge about pollination and importance of insect species
12.	Mahendra Salvey	Farmer	Yes	Yes	-
13.	Prashanta Ghorpade	Farmer	Yes	Yes	Wall built to protect sacred grove site
14.	Keshav Zarpaker	Farmer	Yes	Yes	-
15.	M. Shirka	Farmer	Yes	Yes	-
16.	Archana Shrikhende	Shopkeeper	Yes	Yes	-
17.	Rupali	Student	Yes	Yes	-

#### APPENDIX III

Table showing results of survey at Kulye

S. No	Name	Occupation	Believes in the Sanctity of Grove	Knowledge about importance biodiv conservation at grove sites	Comments
1.	Megha Mangeshkadam	Farmer	Yes	Yes	Disliked the irrigation canal cutting through grove
2.	Sakshi Salvey	Farmer	Yes	Yes	Disliked the irrigation canal cutting through grove
3.	Govind Rajaram Gokhle	Farmer	Yes	Yes	Disliked the irrigation canal cutting through grove
4.	Shavanti Govind	Farmer	Yes	No	Believed overgrazing by cattle was a cause of degradation
5.	Raviraj Kale	Shopkeeper	Yes	Yes	Overgrazing should be avoided.
6.	Shantaram Sajna Pade	Shopkeeper	Yes	No	-
7.	Jayasingh Thukaram	-	Yes	No	-
8.	Banderam Kansare	Farmer	Yes	No	-
9.	Govind Lotankar	Farmer	Yes	No	Disliked the irrigation canal cutting through grove
10.	Leena Maluskar	Shopkeeper	Yes	Yes	-
11.	R. Bhujabal	Farmer	Yes	No	Believed that migration to cities was a cause of lack of interest in grove
12.	A. Koranne	Farmer	Yes	No	-
13.	Jaya Devi	-	No	No	-
14.	Kranti	-	No	No	-

#### ACKNOWLEDGMENT

The Authors thank Erika Svenson and Lindsay Campbell for sharing their study and the Applied Environment Research Foundation without which the field visits would not have been possible.

#### REFERENCES

- [1] Beyond Belief: Linking faiths and protected areas to support biodiversity conservation WWF Report 2005
- [2] Gadgil, M., 1985. Social restraints on resource utilization: The Indian experience. Culture and Conservation: The Human Dimension in Environmental Planning. Croom Helm, Dublin.
- [3] Pandey, D.N., 1998. Ethnobotany: Local Knowledge for Sustainable Forestry and Livelihood Security. Asia Forest Network & Himanshu, Berkeley, New Delhi and Udaipur.
- [4] Chandran, S., Gadgil, M., 1998. Sacred groves and sacred trees of Uttara Kannada. Lifestyle and Ecology. Indira Gandhi National Centre for the Arts and D.K. Printworld, Pvt. Ltd., New Delhi.

- [5] Ramakrishnan P .S. Conserving the sacred for biodiversity: the conception framework, Proceedings of KFRI Workshop. 1997.
- [6] Chandrakanth, M.G., Romm, J., 1991. Sacred forests, secular forest policies and people's actions. *Natural Resources Journal*, 31(4): 741–756.
- [7] Chandrakanth, M.G., Bhat, M.G, & Accavva M.S 2004. Socio-economic changes and sacred groves in south India: Protecting a community based resource management institution. *Natural Resources Forum* 28 (2): 102-111
- [8] Singh, N. A Study of Human Impact on Sacred Groves in India. Thesis at the Center for International Studies f Ohio University, 2006
- [9] Godbole, A 1998. Role of sacred groves in biodiversity conservation with local people's participation: A case study from Ratnagiri district, Maharashtra. *Conserving the sacred: For biodiversity management* (pp 233-246). New Hampshire: Science Publishers.
- [10] Nagaraj, M.G. 1998, *Kembatti Holeyara Samskrithi*, Karnataka Sahithya Academy, Bangalore, India.
- [11] NM Nadkarni, GG Parker, HB Rinker, DM Jarzen - *Forest Canopies*, 2004 - Academic Press.