PROPOSAL

OECM & COMMUNITY RESERVE DECLARATION OF COMMUNITY MANAGED SACRED GROVE IN BARSANA, MATHURA DISTRICT, UTTAR PRADESH

Acknowledgement

This preliminary study was of vital importance in understanding this ecologically and culturally important site. This has helped us understand the history, biodiversity and socio-cultural belief systems that impact the grove. It could not have been possible without the support of the management of Mataji Gaushala, Barsana and Maan Mandir Management, Barsana who offeredtheir complete cooperation in assisting us in collecting the data required. I would also like to thank Padmavati Dwivedi and Mohit Saini, our project partners from the Vanamali Project forall their support on ground and technical inputs which made the work possible. A special thanksto Debadityo Sinha from Vidhi Center for Policy and Research for his advice towards the proposal development. I would like to extend our gratitude to Dr. Upamanyu Hore from Amity Institute of Forestry and Wildlife for providing us with valuable insights on study designand survey methodology. I would like to thank Rubina Rajan, Program Officer at Sacred EarthTrust for undertaking the field work for the biodiversity and community surveys along with me. Finally, we would like to acknowledge the warm hospitality and support offered by the people of Barsana and Maanpur who welcomed us and also took part in our community survey.

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Executive Summary

India is one of the 17 mega diverse countries in the world, with over 47,000 species of flora and 1,00,000 species of fauna. The country's economy and the livelihoods of millions of people are dependent on the conservation and sustainable use of these biological resources. India is committed towards achieving global priorities and national targets that aim to expand and effectively conserve areas of significance to biodiversity, such as the National Biodiversity Target 6, Aichi Biodiversity Target 11, and Target 3 of the Post-2020 Global Biodiversity Framework. Besides state-driven conservation in the form of legally designated protected areas, people's strong belief in protecting trees, animals, their habitats and associated religious and cultural traditions have prompted the adoption of conservation models led by communities and traditional institutions.

The sacred geography of the Indian subcontinent includes a network of pilgrimage sites where direct and intimate encounters with nature occur for millions of devotees and other visitors. The physical and spiritual engagement with the cultural landscape reflects traditional practices of nature veneration that can be the foundation for developing a faith-based environmental ethic. Today, environmental pollution, haphazard urbanization, and the depletion of natural resources are major problems in the Indian landscape, including many renowned sacred natural sites.

The sacred landscape of Braj in Northern India provides a suitable and appropriate case study of nature veneration evident in a rich corpus of place myths. The rituals and related enactments linked to those myths are part of a traditional belief system tied to environmental values and suggest sound strategies for landscape reclamation. Although Braj shares many features with other pilgrimage sites across India, the region is unique in its religious-cultural ethos centered on pastoralism and includes a large number of sacred sites located on the Yamuna riverbanks, Aravalli Hills, and other riverfronts and water bodies. While nature and culture once coexisted in harmonious balance in this landscape, insensitive development and the continually increasing number of pilgrims today exceed the sites' carrying capacities. The environmental degradation caused by disappearing wetlands, neglected water bodies and denuded forest cover is leading to a physical, mental, and spiritual disengagement with the cultural landscape and loss of place-based collective memories.

The indigenous model of conservation has often been attributed to a spiritual respect for, and a practical understanding of, the natural world (e.g., Vecsey 1980; Martinez 1996; Berkes 1999). Evidence offered in support of this characterization includes culturally expressed conservation ethics, animistic religious beliefs conceptualizing other species as social beings, and the relatively higher richness of biodiversity found within sacred forests (Duming 1992; Gadgil et al 1993; Callicott 1994; Alcorn 1996; Bodley 1996; Bernbaum 2006).

Social taboos are good examples of informal institutions (North 1994) that are based on cultural norms independent of government for either promulgation or enforcement (Posner and

Rasmusen 1999; Singh 2006). These have very often been neglected in conservation designs in biodiversity-rich developing countries (Alcorn 1995; Robbins 1998), where park protection remains the only major approach for protecting biodiversity (Gadgil et al. 1998; McNeely 2003). However, because most of the world's biodiversity exists outside of protected areas (Murphree 1994), informal institutions—such as sacred forests—may play an active role in nature conservation.

In November 2018, Parties to the CBD adopted at the 14th Conference of the Parties a definition of an **"other effective area-based conservation measure" (OECM)** as well as guiding principles, common characteristics and criteria for identification of OECMs (CBD/ COP/DEC/14/8). Decision 14/8 defines an OECM as: A geographically defined area other than a Protected Area, which is governed and managed in ways that achieve positive and sustained long-term outcomes for the in-situ conservation of biodiversity with associated ecosystem functions and services and where applicable, cultural, spiritual, socio–economic, and other locally relevant values.

While protected areas must have a primary conservation objective, this is not necessary for OECMs. OECMs may be managed for many different objectives but they must deliver effective conservation. They may be managed with conservation as a primary or secondary objective or long-term conservation may simply be the ancillary result of management activities.

On the other hand, in India, community reserves are the first instances of private land being accorded protection under the Indian legislature. Amendments to the Wildlife protection act in 2003, provided a mechanism for recognition and legal backing to the community-initiated efforts in wildlife protection. It provides a flexible system to achieve wildlife conservation without compromising community needs.

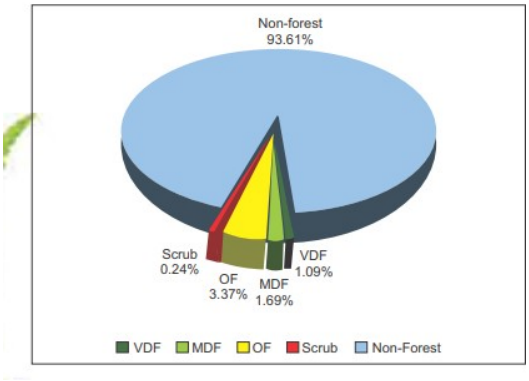
The Sacred groves in and around Barsana, Mathura District, Uttar Pradesh are specifically suited for this objective.

Study Area

Uttar Pradesh (UP) is one of India's largest states. It shows high floral diversity across its diverse areas, ranging from agricultural to highly urbanized, yet it has not received due attention in this respect, except for some reports from Lucknow (Chaturvedi & Sharma 1973, Chaturvedi 1976, Chauhan & Trivedi 2011, Chauhan et al. 2013) and Unnao (Chauhan & Singh 2010).

As per the Champion & Seth Classification of Forest Types (1968), the forests in Uttar Pradesh belong to five Forest Type Groups, which are further divided into 28 Forest Types. Major part of the State is agrarian. Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Oct 2017 to Jan 2018, the Forest Cover in the State is 14,805.65 sq km which is 6.15 % of the State's geographical area. In terms of forest canopy density classes, the State has 2,616.43 sq km under Very Dense Forest (VDF), 4,080.04 sq km under Moderately Dense Forest (MDF) and 8,109.18 sq km under Open Forest (OF). (*India state of forests report 2019*)

FIGURE 11.28.1 Forest Cover of Uttar Pradesh



Mathura district in western U.P has a Geographical area of 3,340 sq kms with 54.04 sq Kms of open forests and only 4 sq km under dense forests. The forests are tropical dry scrub forests/ tropical dry deciduous forests primarily with species like Dhau (*Anogeissus latifolia***)**, Kadamb (*Mitragyna parvifolia*), Palash (*Butea monosperma*), Doodhi (Euphorbia hirta), Ronhj (*Vachellia leucophloea)*, Baheda (*Terminalia bellirica*) among others. In all it represents only 1.71 percent of the state's forest cover. With the increasing human and livestock population of the state, the demand of economically important species is increasing fast. This has caused rapid decrease in the local population size of many species. Likewise, over exploitation of species and degradation of habitats have led to the loss of indigenous biodiversity elements of the State. Conversely, many exotic species such as *Lantana camara, Parthenium hystrophorus, Argemone mexicana* and many other species have invaded the degraded lands and some pristine habitats of the State. The State, therefore, requires an immediate action to overcome this loss

and to conserve and maintain biodiversity for the present and posterity. (Uttar-Pradesh-BSAP-September-2002)

BARSANA

Barsana is a historical town in the Braj region in the Mathura District. Formerly called Brahmasaran, Barsana holds historical importance as the birthplace of Goddess Radha and is a vital place of faith for billions of people from different parts of the world. Barsana is believed to be the home of the Hindu goddess Radha, the consort of Krishna and a "leela sthal. It comes under the Braj region.

Comprising predominantly tropical dry scrub forests/ tropical dry deciduous forests historically

(in sq km)

District	Geographical Area (GA)	2019 Assessment				% of GA	Change wrt 2017 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Mahoba	3,144	0.00	21.00	149.00	170.00	5.41	0.00	62.00
Mahrajganj	2,952	259.00	101.00	69.07	429.07	14.53	0.07	0.34
Mainpuri	2,760	0.00	1.00	12.64	13.64	0.49	-0.36	0.00
Mathura	3,340	0.00	4.00	53.04	57.04	1.71	-2.96	3.52
Mau	1,713	0.00	0.00	11.00	11.00	0.64	0.00	0.00
Meerut	2,559	0.00	34.00	34.41	68.41	2.67	0.41	0.00

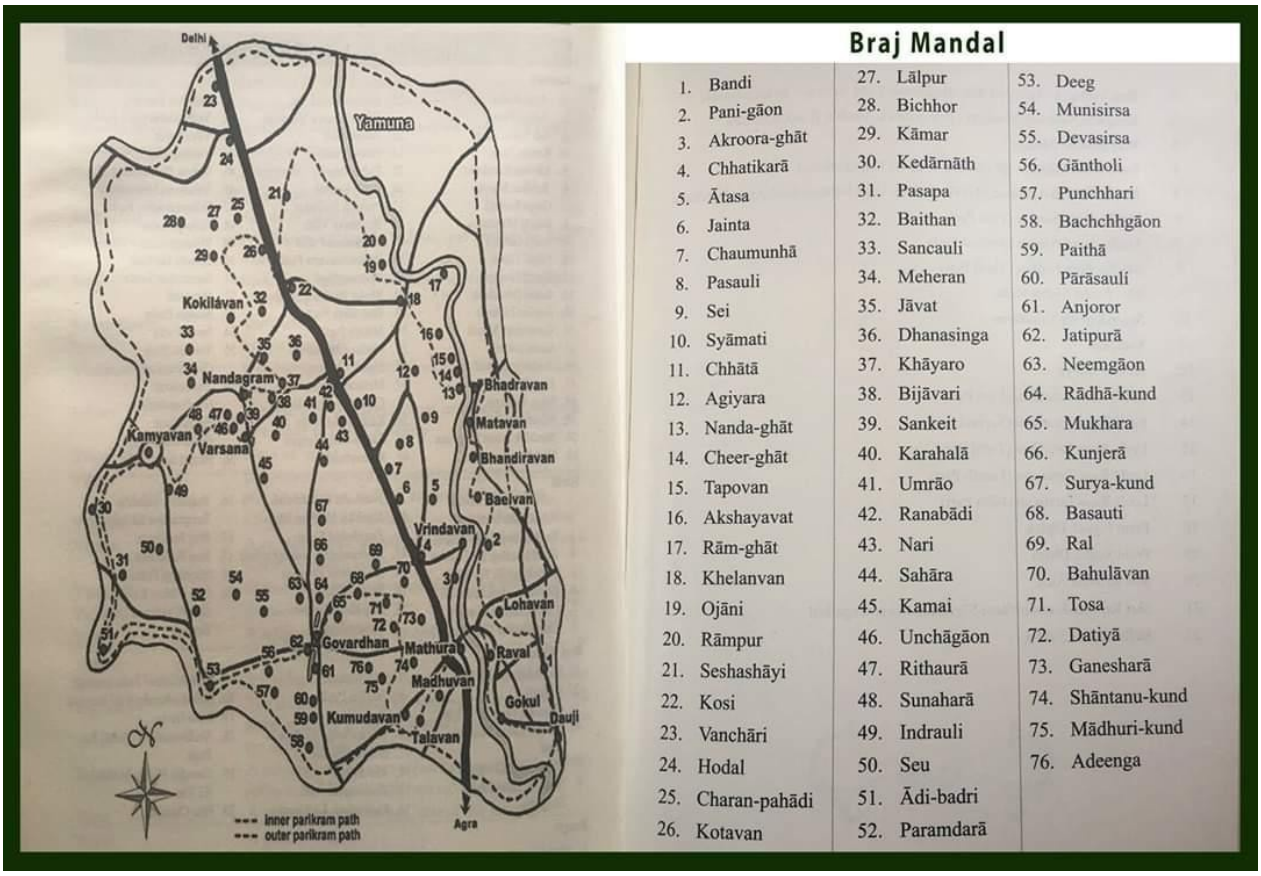
with species like Dhau (*Anogeissus latifolia***)**, Kadamb (*Mitragyna parvifolia*), Palash (*Butea monosperma*), Doodhi (Euphorbia hirta), Ronhj (*Vachellia leucophloea)*, Baheda (*Terminalia bellirica*) among others. Peafowl (*Pavo cristatus*) were once abundant in this region but have rapidly declined due to predation by Rhesus Macaques (*Macaca mulatta*). Blue bulls (*Boselaphus tragocamelus*), Indian hare *(Lepus nigricollis*) and spotted deer (*Axis axis*) were also found in the region. The area is also home to thousands of Rose-ringed parakeets (Psittacula krameri). No biodiversity assessment studies for the area exist till date.

ROLE OF SACRED GROVES IN THE PILGRIMAGE IN BRAJ

The sacred landscape of Braj is associated with the gods Krishna and Radha and covers 35 square miles at the juncture of three northern states-Uttar Pradesh, Rajasthan, and Haryana-in India. The Yamuna River flows on its eastern edge and to the west are outlying spurs of the Aravalli Hills. Amidst the cultivated fields of wheat, millet, and sugarcane survive the natural landscape of forests, groves, and historically the myths and legends. The ancient city of Mathura is the largest urban settlement; an additional 600 hamlets and several small towns including Vrindavan, Nandgaon, and Barsana make up the rest of the landscape. Braj comprises over 137 sacred groves mentioned in the mythology and folklore built around Lord

Krishna's life and times (Brajfoundation.org)

Since the beginning of the 16th century at least, if not earlier, Mathurā stands out as a great centre of Vashnavite pilgrimage, endowed with innumerable temples and religious establishments belonging to all the living Vaisnava sects. From the point of view of medieval and modern Hinduism, however, it is not so much the city of Mathurā as the whole area, the Braj-bhumi itself, that stands out as the holy land of Krishnaism.The sacred land of Braj is constantly crowded with pilgrims. The Vraja Mandala Parikrama is conducted during the holy month of Karttik(Oct-Nov) and takes exactly one month to complete. This famous parikrama is commonly called Ban-yātrā (vana-yātrā), since the various tirthas of Braj are mostly the vanas ('woods' or 'groves') hallowed by particular 'sports' (Irla) of Lord Krishna. The great authority for the *Braj-parikrama* or *Ban-yātrā* is considered to be the *Mathurāmāhātmyam*, a religious chronicle of Mathura found in the *Väräha Purana*." The text says that the *Mathurā- mandala* is 20 yojanas in extent.



Braj Mandal

1. Bandi	27. Lālpur	53. Deeg
2. Pani-gāon	28. Bichhor	54. Munisirsa
3. Akroora-ghāt	29. Kāmar	55. Devasirsa
4. Chhatikarā	30. Kedārnāth	56. Gāntholi
5. Ātasa	31. Pasapa	57. Punchhari
6. Jainta	32. Baithan	58. Bachchhgāon
7. Chaumunhā	33. Sancauli	59. Paithā
8. Pasauli	34. Meheran	60. Pārāsauli
9. Sei	35. Jāvat	61. Anjoror
10. Syāmati	36. Dhanasinga	62. Jatipurā
11. Chhātā	37. Khāyaro	63. Neemgāon
12. Agiyara	38. Bijāvari	64. Rādhā-kund
13. Nanda-ghāt	39. Sankeit	65. Mukhara
14. Cheer-ghāt	40. Karahalā	66. Kunjerā
15. Tapovan	41. Umrāo	67. Surya-kund
16. Akshayavat	42. Ranabādi	68. Basauti
17. Rām-ghāt	43. Nari	69. Ral
18. Khelanvan	44. Sahāra	70. Bahulāvan
19. Ojāni	45. Kamai	71. Tosa
20. Rāmpur	46. Unchāgāon	72. Datiyā
21. Seshashāyi	47. Rithaurā	73. Ganesharā
22. Kosi	48. Sunaharā	74. Shāntanu-kund
23. Vanchāri	49. Indrauli	75. Mādhuri-kund
24. Hodal	50. Seu	76. Adeenga
25. Charan-pahādi	51. Ādi-badri	
26. Kotavan	52. Paramdarā	

*Old Map of Braj 84 Kos. (*From the book *Braj Ki Sanskritik Yatra)*

Gahvar Van and Kadamb Khandi

Gahvar Van was historically a large forested patch located in Barsana and still exists to date though in more fragmented patches. The forest is said to be as old as 5000 years. The Kadamb Khandi is a part of Gahvar Van, though now fragmented due to agricultural settlements. It is significant from a religious perspective as it is the site of numerous Leelas performed by Hindu deities Radha and Krishna. The Leelas are said to be performed in forests, hills, ponds and by river sides. Radha Rani has lots of forests/vans in Braj.

The Gahvar Van is described in the text- Braj Bhakti Vilas written by Narayan Bhatt ji. It is among the 48 forests/vans of Braj. It is believed that Gahvar Van has special importance among these forests. Radha Rani is said to have created the Gahvar Van with her own hands. This is mentioned in the collection of verses titled "Vrishabhanupur Shatak". It consists of 100 Shlokas/Verses written in sanskrit. This book mentions Barsana many times and Gahvar van is glorified in the text. Shloka no.7 from the book mentions the Gahvar Van and can be translated as follows:

Verse: 7

Yatra Gahvarkam Naam Vanam Dvandvmnoharam

Nitykeli Vilasen Nirmitam Radhya Swayam

- Vrishbhanupur Shatak (7)

There is a forest in Barsana which is known as "Gahvar Vana", which is built by Shri Radha's own hands, which is the essence of '*Keli Vilas*' [playful amorous pastimes], hence this site is considered as "*Nitya Vihar*" site.

Shlok no. 9 of the Vrishbhanupur Shatak also describes the Gahvar Van.

9 Shloka from Vrishabhanupur Shatak mentions the beauty of Gahvar Van as follows: Holy Lotuses are blooming and bees are swarming. Koel starts singing,Peacocks are dancing and tree branches are creating music. The leaves, and flowers are like precious stones that act like spotlights for the dancers. The ground is also made of precious stones. Waterfall that flows acts

like a musical instrument. Three things happen, Singing/Gana, Playing an instrument/Bajana and Dancing/Nritya. It's so beautiful.

Shlok 10
Talks about the pure divine love of Radha and Krishna, the leelas which took place in the Gahvar Van.

Radha is said to have planted all the trees here and has taken care of them. No other forest in Braj claims to be created by Radha herself. That's why the Gahvar Van is more superior to the other forests.

Kadamb Khandi can be translated to "a cluster of Kadamb trees (*Mitragyna parvifolia*) is a part of the larger Gahvar Van. Folklore also suggests that wherever Krishna placed his feet, a Kadamb Tree sprouted. Kadamb Khandis can also be found elsewhere in the Braj Region. The Kadamb Khandi is significant as it is the site where the most special Radha-Krishna Leelas take place. Kadamb trees are believed to be very dear to Lord Krishna. The Kadamb Khandi is also home to a large number of Rose-ringed Parakeets. According to the mythology, these parakeets fly to Radha's Palace everyday. Radha used to feed them and take care of them. She also used to teach them. They would carry messages from Radha to Krishna and back. Hence Kadamb Khandi is said to be home to these divine Parakeets. The Kadamb Khandi also functioned as a meeting place for Radha and Krishna.

Kadamb Tree roots are used to treat bronchial issues, fever, muscular pain, poisonous bites, gynecological disorders. The bark is used for rheumatic pain. The leaves can be used to alleviate pain and swelling to treat ulcers. Leaf juice is also used to treat jaundice.

According to the Puranas, the Kadamb Khandi is mentioned in Radha Sudha Nidhi. The land is formally under the gram panchayat.

The world renowned Braj ki Holi is played here and other parts of Gahvar van. Also some special leelas such as *Matki Leela* and *Sanjhi Leela* are also performed here. During Radha Ashtami and Holi the Gahvar van is visited by a large number of people. Gahvar van and Kadamb khandi are also part of the yearly Braj Parikrama.

Biodiversity assessment

The area of the Kadamb Khandi which is approximately 2.19 acres will be divided into 10 x 10 m plots. To cover 10 % of the entire area, we will sample 10 randomly selected quadrats of 10 x 10m each. Within these plots we will conduct vegetation sampling and point counts to record the flora and fauna of the area. In the vegetation sampling we will note down all the tree and shrub species that occur within the plot and calculate the frequency and abundance of the species present. For the faunal species we will employ point counts to record birds, reptiles, butterflies and mammals that are present in the quadrat.

Qualitative survey

Qualitative surveys will be conducted using preset open-ended questions. These questions will be aimed at revealing opinions, experiences, narratives and accounts. We will use these surveys to understand and explore the history, belief system, taboos etc. of the villagers who use the Kadamb Khandi. It will enable us to gain in-depth information about people's underlying reasoning and motivation. The responses will later be coded for further analysis

Barsana Biodiversity assessment report

A biodiversity assessment study was conducted for the Barsana Kadamb Khandi (on 26/06/22, 9/07/22 and 06/08/2022). This area is approximately 2.19 acres in size. It is surrounded by agricultural fields on all sides. 10 plots of 10 x 10 meters were selected to cover 10% of the total area. Point counts were conducted in each plot using a binocular and camera. Alternatively a record has been made of all animals seen in the area during each visit. It is composed primarily of Krishna Kadamb (*Mitragyna parviflolia)* with some Neem (*Azadirachta indica*) along the boundary. The grove has a variety of shrubs and undergrowth in the form of grasses as well. The area has a hand pump towards one end and a water pumping station on the other end. A total of 23 bird species, 2 reptile species, 1 mammal species, 5 butterflies 4 tree species, 15 shrub species. The following are the results of the assessment conducted.

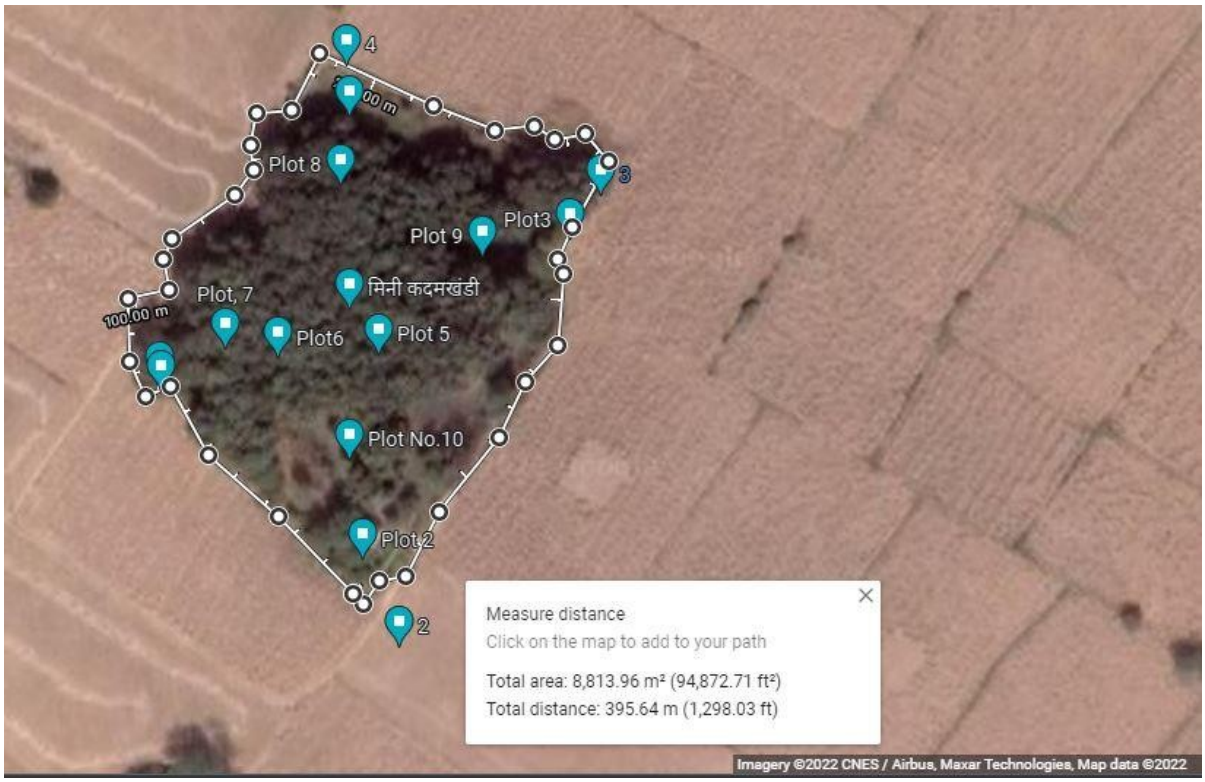


Image showing the field site and the plots surveyed

Avian Diversity

A total of 23 species were observed in 3 site visits. During the point counts we observed 15 species. Among others Jungle babblers, Red-vented Bulbuls, Rose-ringed Parakeet and Common Myna were the most abundant. The other species spotted include Rock Pigeon, Indian White-eye, Spotted Owlet, Indian Grey Hornbill, Coppersmith Barbet, Asian Koel, Yellow-throated sparrow, Spotted Owlet, Golden Oriole etc. Jacobin's Cuckoo was also seen in the Kadamb Khandi, which is migratory from Africa. This species is known to have high site fidelity which means that they come to the same location year after year. Therefore, this grove could be an important site for this species. The birds were seen using the canopies of the trees, nesting in tree hollows and also browsing in the leaf litter below the trees.

Table showing the number of species observed in each plot during the field survey

Plot No.	Scientific Name	Common Name	Number of individuals
1	*Psittacula krameri*	Rose-ringed Parakeet	5
2	*Pycnonotus cafer*	Red-vented Bulbul	4
	Merops orientalis	Green Beeater	1
	Spilopelia senegalensis	Laughing Dove	1
	Vanellus indicus	Red-wattled lapwing	Call
	Eudynamys scolopaceus	Asian Koel	2
	Cinnyris asiaticus	Purple Sunbird	2
	Zosterops palpebrosus	Indian White-eye	2
	Clamator jacobinus	Pied Cuckoo	1
3	*Ocyceros birostris*	Indian Grey Hornbill	1
	Eudynamys scolopaceus	Asian Koel	Call
	Pycnonotus cafer	Red-vented Bulbul	1
4	*Pycnonotus cafer*	Red-vented Bulbul	1
	Psittacula krameri	Rose-ringed Parakeet	4
	Acridotheres tristis	Common Myna	1
5	*Zosterops palpebrosus*	Indian White-eye	1
	Cinnyris asiaticus	Purple Sunbird	2
	Turdoides striata	Jungle Babbler	2
	Acridotheres tristis	Common Myna	2
6	*Acridotheres tristis*	Common Myna	3
	Vanellus indicus	Red-wattled lapwing	1

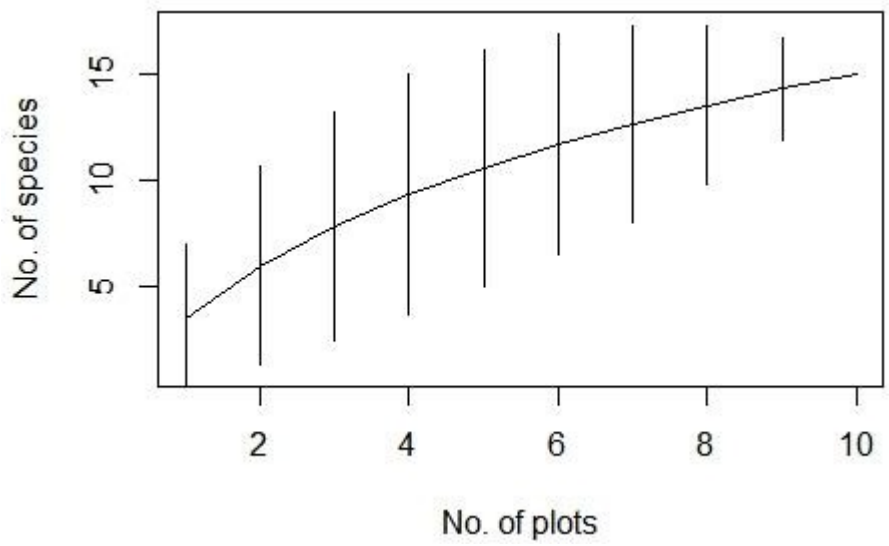
	Psittacula krameri	Rose-ringed Parakeet	2
	Turdoides striata	Jungle Babbler	1
7	*Acridotheres tristis*	Common Myna	4
	Turdoides striata	Jungle Babbler	2
	Hierococcyx sparverioides	Large Hawk-cuckoo	1
	Psittacula krameri	Rose-ringed Parakeet	4
	Coracias benghalensis	Indian Roller	1
8	*Psittacula krameri*	Rose-ringed Parakeet	1
	Acridotheres tristis	Common Myna	
	Columba livia	Rock Pigeon	
9	*Pycnonotus cafer*	Red-vented Bulbul	1
	Psittacula krameri	Rose-ringed Parakeet	1
10	*Turdoides striata*	Jungle Babbler	1
	Pycnonotus cafer	Red-vented Bulbul	1
	Coracias benghalensis	Indian Roller	1

Analysis using Rstudio software

Packages used: Vegan, ggplot2

Species Accumulation Curve
Accumulation method: exact
Call: specaccum(comm = species)

Sites 1.000000 2.00000 3.000000 4.000000 5.000000 6.000000 7.000000 8.000000 9.000000 10
Richness 3.500000 6.00000 7.866667 9.342857 10.579365 11.661905 12.633333 13.511111 14.300000 15
sd 1.746425 2.34519 2.672836 2.801711 2.773198 2.588851 2.294268 1.860782 1.187434 0



The above species accumulation curve plot shows that the line is plateauing indicating that we are very near the maximum sampling effort for this site. Therefore, the species recorded may be taken as a representation of almost all species found in the area.

specpool(species)

Species	chao	chao.se	jack1	jack1.se	jack2	boot	boot.se	n
All	15	20.5125	5.520307	21.3	4.058325	24.05556	17.87835	2.491826	10

The function “specpool” estimates the extrapolated species richness in a species pool, or the number of unobserved species. Function specpool is based on incidences in sample sites, and gives a single estimate for a collection of sample sites (matrix). Therefore, from the result we can say the extrapolated species richness of the grove ranges between 20 to 24 species.

Red-vented Bulbul

Jacobin’s Cuckoo

Rose-ringed Parakeet

Butterfly Diversity

A total of 5 species were observed during the 3 site visits. Among the species recorded were the Plain Tiger (*Danaus chrysippus*), Indian Pioneer (*Belenois aurota*), Yellow orange tip *(Ixias pyrene*) and two unidentified species. The most abundant were Plain tigers and Yellow orange Tip which were seen throughout the grove.

Plain Tiger Butterfly

Yellow Orange Tip Butterfly

Indian Pioneer Butterfly

Reptilian Diversity

On the 1st site visit, an Indian Rat snake (*Ptyas mucosa)* was spotted in the Kadamb Khandi and during the 2nd Site visit we recorded a juvenile Bengal Monitor Lizard (Varanus bengalensis) Spotting a juvenile indicates that this grove is an important site for breeding of the monitor lizard. The Monitor lizard was observed moving in the leaf litter and climbing the trunk of the Krishna Kadamb trees.

Juvenile Monitor Lizard

Mammalian Diversity

Among the mammals only squirrels were observed during the site visits. They were seen using both the trees and the ground for movement.

Tree Diversity

The study site is primarily composed of *Mitragyna parvifolia* and *Azadirachta indica* on the boundary. We also observed *Morus alba* and *Prosopis juliflora* in the area. The density of Kadamb trees is higher towards the middle of the area and less on the boundaries. A total of 77 trees were counted in 10 plots of 10 x 10 m belonging to 4 families. The canopy was dense and interlinked in some places whereas open in few spots. The trees were being used by a variety of birds, mammals and reptiles. Parakeets were observed using the tree hollows as well. A beehive was also observed in a Kadamb tree. Young trees of the following species were also spotted but not included in the tree count as the girth size was less than 10cms: Vilayati Babool/Keekar (Prosopis juliflora), Papdi (Holoptelea integrifolia), Neem (*Azadirachta indica)* and Semal (Bombax ceiba)

The graph showing trees recorded during the survey:

Plot No.	Scientific Name	Common Name	Number of individuals
1	*Mitragyna parvifolia*	Krishna Kadamb	1
	Azadirachta indica	Neem	2
2	*Azadirachta indica*	Neem	3
	Morus alba	Mulberry	2
	Prosopis juliflora	Vilayati Keekar	1
3	*Mitragyna parvifolia*	Krishna Kadamb	3
	Azadirachta indica	Neem	2
4	*Mitragyna parvifolia*	Krishna Kadamb	1
5	*Mitragyna parvifolia*	Krishna Kadamb	14
6	*Mitragyna parvifolia*	Krishna Kadamb	8
7	*Mitragyna parvifolia*	Krishna Kadamb	14
8	*Mitragyna parvifolia*	Krishna Kadamb	5
9	*Mitragyna parvifolia*	Krishna Kadamb	9
10	*Mitragyna parvifolia*	Krishna Kadamb	11
	Azadirachta indica	Neem	1

To understand the composition of trees in a particular area we use measures such as frequency, abundance and density etc. Frequency is defined as the number of sampling units in which the species occurred/Total number of sampling units studied. Abundance is defined as the total no. of individual of the species in all sampling units/ number of sampling units in which species occurred. Density Total no. of individuals of the species in all sampling units studied/Total no. of sampling units studied. The following graph shows the frequency, abundance and density for each of the tree species found at the Kadamb Khandi

Species	Frequency	Abundance	Density
Mitragyna parvifolia	0.8	85.71	0.8571428571
Azadirachta indica	0.4	10.38	0.1038961039
Morus alba	0.1	1.29	0.02597402597
Prosopis juliflora	0.1	1.29	0.01298701299
Total	1.4	98.67	1

Relative frequency = Frequency of a sp./Total frequency of all spp. X 100
Relative density = (Density of the species X 100)/ Total density of all species
Relative abundance = (Abundance of a sp. X 100)/ Total abundance of all sp.

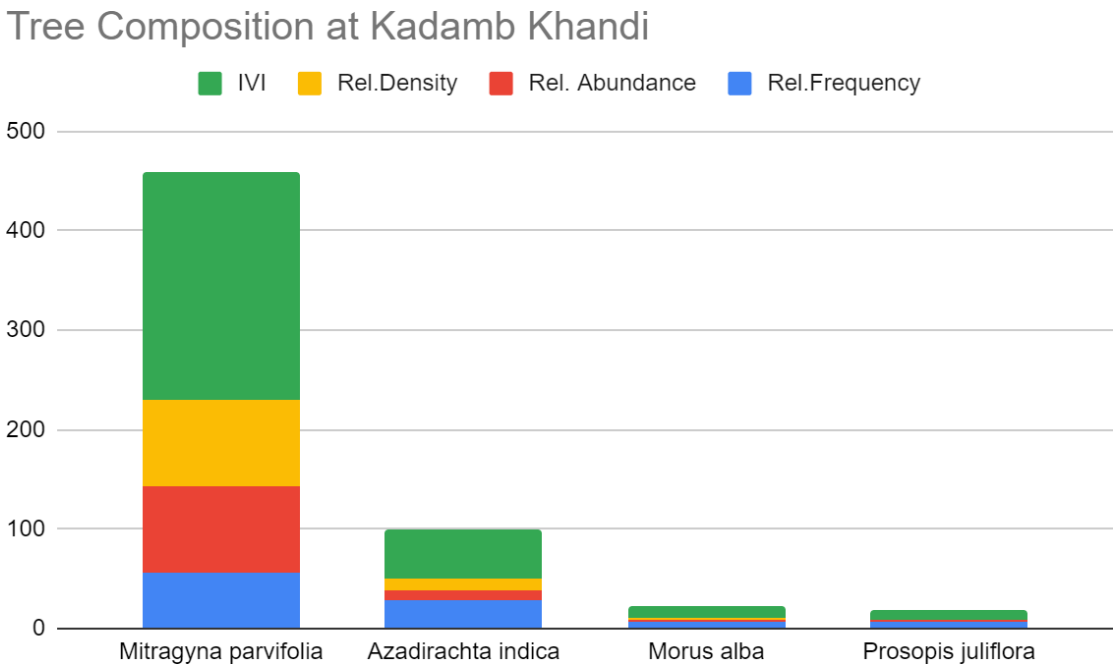
IVI (Importance Value Index)

IVI = Relative Frequency + Relative Density + Relative Abundance

- It gives an overall estimate of the influence or importance of a species in a community.
- IVI value ranges from 0 to 300 %.

The following table shows the relative frequency, relative abundance, relative density and importance value indices of the 4 tree species:

Species	Rel.Frequency	Rel. Abundance	Rel.Density	IVI
Mitragyna parvifolia	57.14285714	86.8653086	85.71428571	229.7224515
Azadirachta indica	28.57142857	10.51991487	10.38961039	49.48095383
Morus alba	7.142857143	1.307388264	2.597402597	11.047648
Prosopis juliflora	7.142857143	1.307388264	1.298701299	9.748946705



The above graph shows that **Mitragyna parvifolia** has the highest frequency, highest density and the highest abundance. With an IVI of 229.7224515, it is the most dominant species at the Kadamb Khandi, followed by *Azadirachta indica.*

Shrub Diversity

The Kadamb Khandi has over 15 shrub species spread across the area. Among the species found are *Achyranthes aspera*, Chitrak (*Plumbago zeylanica*), *Kirganelia reticulatus etc.* Owing to its astringent and anti-inflammatory properties *Achyranthes aspera, is* used in the treatment of cough, bronchitis, rheumatism, malaria, dysentery, asthma, hypertension and diabetes.Butterflies were observed nectaring on some of the shrubs. Small birds like Red-vented Bulbul were also observed perching on the shrubs. The shrubs along with the grasses make a dense ground cover for the grove. Future studies may be done to further explore the shrubs and grasses in detail.

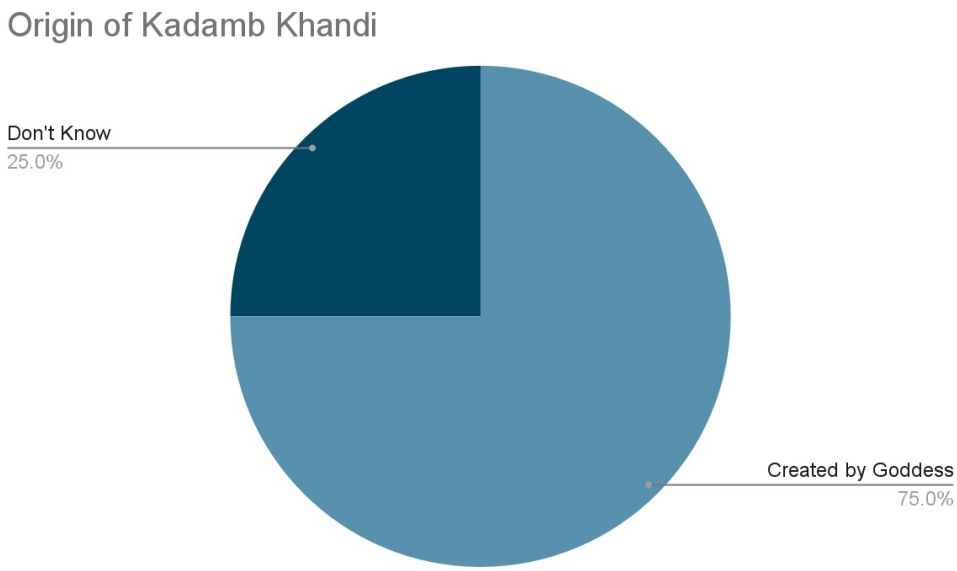
Achyranthes aspera

Chitrak (*Plumbago zeylanica*)

Kirganelia reticulatus

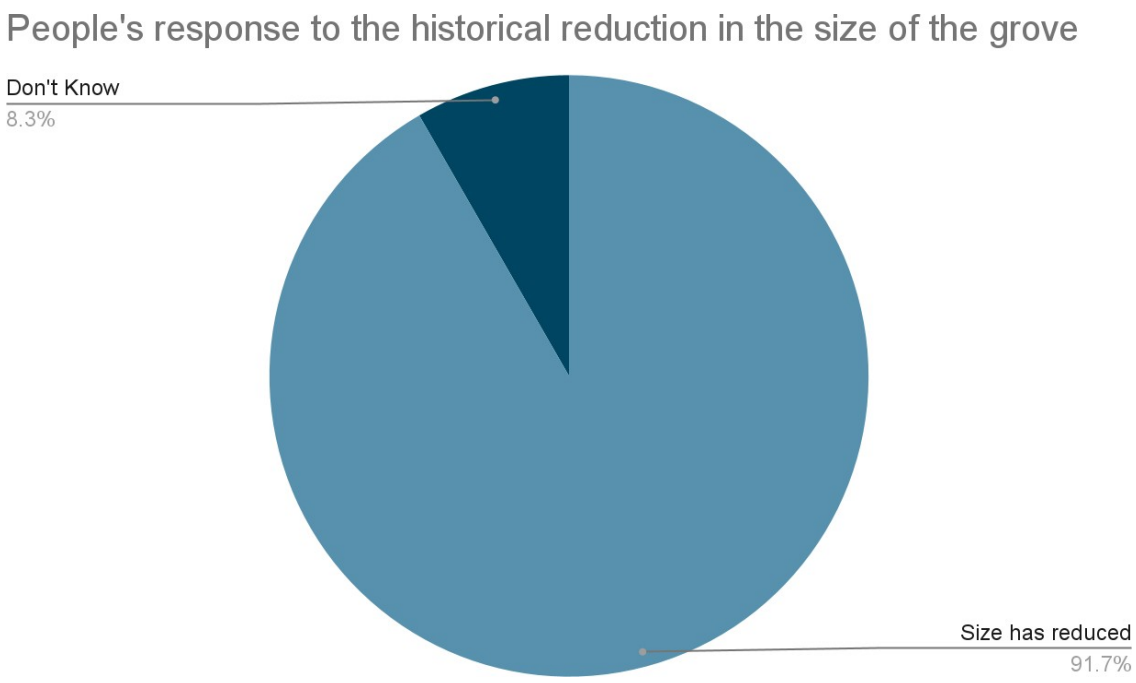
Community survey

Questionnaire based interviews were conducted to explore the community's understanding of the Kadamb Khandi (KK) and its history. Majority of the respondents were aware about the existence of the kadamb khandi. Majority of the respondents believed that Kadamb Khandi was planted by Radha a Hindu Deity whose birthplace is Barsana, Uttar Pradesh.



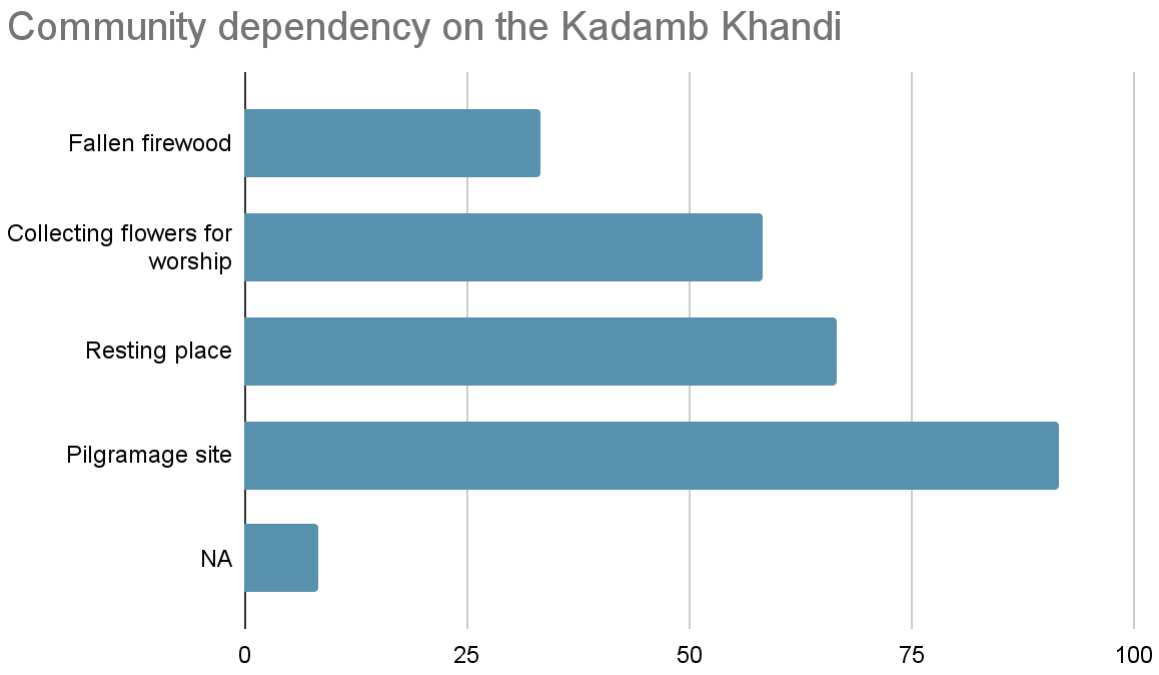
Pie-chart showing people's understanding on the origin of the Kadamb Khandi

The Kadamb Khandi is said to be a meeting site for Radha and Krishna. Kadamb trees hold a special relevance in Krishna mythology and are said to be his favored tree. The respondents relayed various stories connected with the Kadamb Khandi. One such story is as follows: The Kadamb Khandi is said to be a home to divine parakeets who were taken care of by Radha and would act as messengers between Radha and Krishna. To this day, numerous parakeets are seen flying out of the Kadamb Khandi during the early hours of daybreak. Some of our respondents weren't aware of such an origin story.



Pie-chart showing historical reduction in the size of the Kadamb Khandi

The Gahvar Van which was a bigger sacred forest within which the Kadamb Khandi exists has been mentioned in the Radhasudha Nidhi and Vrishbhanupur Shatak. 58% of our respondents stated that the Kadamb Khandi was bigger in size before whereas the rest claimed that it was more or less the same size since they have been seeing the grove since childhood (40-50 years approx.). One respondent claimed that the grove was 20-40 feet bigger on all sides before. When asked about the reasons for the reduction in Kadamb Khandi's size, respondents mentioned encroachment by farmers, cowherds and shepherds cutting branches to feed the goats and some also mentioned trees falling due to rains. They also mentioned that the boundary wall built a few years ago has been a positive step in safeguarding the grove.



Current taboos/restrictions associated with the grove is prohibition on cutting trees and encroachment. People have been known to collect fallen firewood from the grove for cooking at home or for *havans* and *bhandaras (*religious purposes). Lower branches of trees are often cut for feeding cattle. There are no restrictions based on caste, gender, religion etc. to enter the grove. Respondents also mentioned that they collect Kadamb flowers which are red in color and very fragrant. These flowers are often made into garlands and offered to Goddess Radha. Majority of people stated that they often come to the grove and find it very peaceful. It is also a resting site for people. Among the festivals that are celebrated within the Kadamb Khandi are Radhashtami and Rangeeli Holi. People also visit the Kadamb Khandi during the annual Braj Mandal Yatra and therefore this is also an important pilgrimage site.

Among the animals that people used to see before at the Kadamb Khandi are Chital Deer (*Axis axis*), Indian Peafowl *(Pavo cristatus*), Rhesus Macaques (Macaca mulatta), Golden Jackal (*Canius aureus*), Nilgai (*Boselaphus tragocamelus*), Porcupine (*Hystrix indica*), Indian Hare (*Lepus nigicollis*), Rose-ringed Parakeet (*Psittacula krameri*), snakes like spectacled cobra *(Naja naja*) Rat Snake (*Ptyas mucosa*) etc.

The Kadamb Khandi is an important feature of the Braj landscape and has a spiritual significance for the people. When asked why they wanted to save the KK, one of the respondents' answered - "It's a gift from God and that's why we have to protect it". During the survey we observed that since most people claimed that they do not have any major material

requirements from the Kadamb Khandi. Their primary reason to safeguard the grove was due to their spiritual connection with the place, which is very strong across all respondents. A majority of the respondents believed even though there is no current threat to the grove there is a need for legal protection of the grove to conserve it for the future. Recognition is also imperative to create awareness around the existence of this grove.

Threats to Gahvar Van and Kadamb Khandi

In most parts of India, Sacred grooves represent the climax vegetation, which is disappearing due to changes in faith, increasing anthropogenic pressure and modernization of society (Chandrakanth, 2004). Sacred groves are the best examples of a traditional way of in-situ conservation and averting an ecological crisis. Although the preservation of sacred groves is based on religious belief, they are important for germplasm conservation, which is otherwise under threat due to anthropogenic activities (Boojh and Ramakrishna, 1983).

Social transformation and urbanization have a large impact on the structure and health of forests and are responsible for their destruction. Developmental projects like agriculture, roads, unsustainable tourism projects etc. have reportedly destroyed many groves in the past. Due to social transformation, the rate of activities like grazing, encroachment, cutting and collection of fuel wood, fruits and leaves has been increasing and posing a threat to the conservation of biodiversity and ecosystem function in the future. The overexploitation of resources and grazing inside the grove areas has created a threat to various important species.

The estimated population of Maanpur (where the Kadamb Khandi is located) is approximately 1700-1800 with 137 households. Most of the forest has been rapidly decimated by sand mining, conversion of land for agriculture purposes, timber extraction and encroachments. Ramesh Baba Ji of Maan Mandir struggled for 46 years to save Gahvar van from being destroyed completely. The Kadamb Khandi was also being slowly encroached by the villagers. In order to protect the grove, a boundary wall was constructed around it recently. This initiative was also taken up by Ramesh Baba Ji.

People living around the Maanpur Kadamb Khandi primarily use it as a place to rest while grazing their cattle nearby. Villagers also collect flowers and fallen firewood from the grove which is then offered to Goddess Radha.

Currently firewood extraction, encroachment or any other detrimental activity is forbidden in the Kadamb khandi, however, it is very important to protect this sacred grove for the future as it is one of the last remaining patches of Kadamb grove and the revered Gahvar van.

The Kadamb Khandi is a symbol of belief systems centered around its natural elements. Currently the Barsana Kadamb khandi which spans around 2.19 acres has no legal provisions protecting the grove. Stop gap measures are in place like a boundary to wall to prevent encroachment and tree felling but without proper legal protection Barsana could stand to lose an important cultural site. Community surveys revealed that cultural beliefs are strong but

threats still exist due to the vested interests of people. It's essential that we use a combined approach of increasing awareness and providing legal protection to ensure that this unique grove is conserved for posterity.

Strategy for enhanced protection of the Sacred grove (Kadamb khandi at Maan Pur)

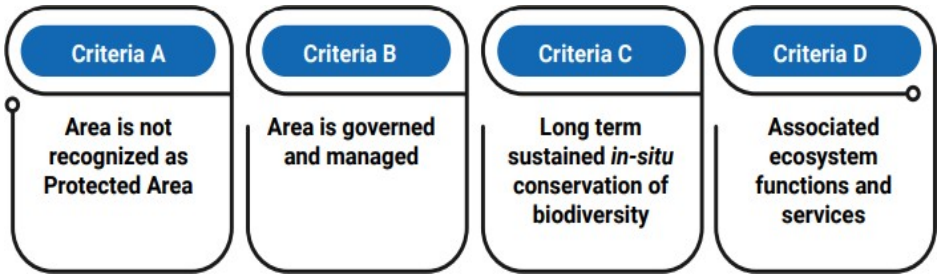
Recognition as an OECM

Recognition of OECMs offers a significant opportunity to recognise de facto effective long-term conservation that is taking place outside currently designated protected areas under a range of governance and management regimes, implemented by a diverse set of actors, including by indigenous peoples and local communities, the private sector and government agencies.

OECMs can contribute to ecologically representative and well-connected conservation systems, integrated within wider landscapes and seascapes, and in doing so, generate a range of positive conservation outcomes, such as: • Conserving important ecosystems, habitats and wildlife corridors; • Supporting the recovery of threatened species; • Maintaining ecosystem functions and securing ecosystem services; • Enhancing resilience against threats; and • Retaining and connecting remnants of fragmented ecosystems within developed landscapes.

OECMs include areas where the protection of key species and habitats and management of biodiversity may be achieved as part of cultural, spiritual socio-economic and other locally relevant values and practices. In such cases, it will be essential to ensure the recognition and protection of the linkages between biological and cultural diversity and associated governance and management practices that lead to positive biodiversity outcomes, such as customary sustainable uses of biodiversity (CBD Article 10(c)). Conversely, management for cultural, spiritual socio-economic or other locally relevant values within an OECM should not impact negatively on biodiversity conservation values.

Four General Criteria have been adopted from IUCN guidelines (IUCN-WCPA Task Force on OECMs, 2019), which will be applicable for the basic identification of potential OECMs in India. Once confirmed, the potential site will be assessed based on the specific criteria developed for each of the 14 categories.



Declaration as a Community reserves

A promising initiative in India, towards adopting a community-based conservation strategy into the PA system, are the Conservation Reserves and Community Reserves (MoEF 2010a). Conservation Reserves (IUCN Category VI) are biodiversity abundant.Community Reserves are protected area systems in India which integrate local communities as well as private organizations into protected area management. Community reserves (IUCN Category V) can be set up on biodiversity abundant, communal or private lands and are managed by the communities or entities in possession of the area. This allows for extraction of natural resources and represents an attempt at decentralizing the management of PAs by the inclusion of local communities and private organizations. This could potentially lead to a "win-win" situation where biodiversity conservation and local livelihood sustenance are integrated, leading to an improvement in conservation measures, especially in limited-access forests.

Under Section 36C in The Wild Life (Protection) Act, 1972

1[36C. Declaration and management of community reserve—

(1) The State Government may, where the community or an individual has volunteered to conserve wildlife and its habitat, declare any private or community land not comprised within a National Park, sanctuary or a conservation reserve, as a community reserve, for protecting fauna, flora and traditional or cultural conservation values and practices.

Expected outcomes

- Legal recognition and long term protection of the Kadamb khandi as a protected area
- Improvement in conservation measures through the integration of biodiversity conservation and local community based eco - spiritual traditions
- Retention and connection of remnants of fragmented ecosystems within the developed landscapes.
- Maintaining ecosystem functions and securing ecosystem services

NGO partnership

The team behind Vanamali Project, Sacred Earth Trust and Vidhi Center for legal policy bring together several decades of expertise in nature conservation as well as a deep commitment toward protection of sacred landscapes as potential areas for long term conservation. All on ground assessments, implementation and monitoring support will be provided by the team to ensure the legal processes are completed effectively.