

Perceptions and linkage of indigenous community in conservation of sacred natural sites in Assam, Northeast India

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Sacred natural sites are one of the most valuable ecosystems preserving the cultural integrity of different communities worldwide. Out of different sacred natural sites, sacred groves have acquired more importance due to spiritual theories and religious ethics. There are many sacred groves with diverse historical importance which are not yet been studied. The current study aimed to report the documentation and prominence established by the local community for the conservation of sacred groves in Assam during 2015 to 2017. Sacred groves were inventoried across the state, wherein sacred plants, people's perceptions, and anthropogenic disturbances were studied. Assam is a culturally rich state, and various ethnic communities conserved a total of 282 sacred groves covering an area of 672.48 ha, distributed within 23 AMSL to 955 AMSL. 83 tree species belonging to 68 genera and 38 families were listed, out of which 15 sacred trees were protected in the vicinity of the sacred groves. We observed a significant relationship between the cultural belief system and anthropogenic disturbances in the sacred groves, χ^2 (1, N= 768) =50.032, $p < 0.001$. The record on the degree of anthropogenic disturbances revealed 51% of wood collection from sacred groves, followed by browsing/grazing activities (38%) and fire frequency of 11%. The result of our study has widened the perception of the need to conserve the sacred groves not merely for aesthetic but also for community implications intended for ecological significance.

Keywords: Anthropogenic degradation, Disturbance, Management, Sacred groves, Traditional, Trees

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Sacred natural sites are areas protected by indigenous communities due to their spiritual and cultural significance. In different parts of the world, they have acquired significant prominence and are worshipped as divine being of nature. Since time immemorial, people have worshipped them in the form of "totemism." The rich and diverse system of sacred natural sites includes mountains, hills, forests, groves, rivers, lakes, lagoons, caves, islands and springs¹. Out of different sacred natural sites, sacred groves have acquired more priority because they are considered the first temples of worship and the last remnants of virgin forests in the world^{2,3}. The sacred groves are sanctified places covered with patches of wood with a belief of the deity's existence in that area. This connotation and linkage of the local community with the sacred groves have helped in the maintenance of ethnic and cultural diversity. In return, the sacred groves play a crucial role in the preservation of rare and endangered species⁴ and help in the proper

functioning of the ecological processes. The sacred groves were found to be deteriorated due to Sanskritization, lack of interest among the younger generation, poor management, change of climate, and different anthropogenic activities⁵⁻⁷, with such a rapid expansion and change in people's perception, the importance of sacred groves is being neglected, and there is a weakening in the cultural belief system. This might pose a significant threat to the existence of the present status of the sacred groves.

Sacred groves can be found in different parts of the world, especially in Asia and Africa⁸. In India, the rich customs of diverse communities protect many sacred groves of various sizes. They are available in different ecosystems comprising barren landscapes, grassland, hill slope, agricultural landscape, coastal plain, and deserts⁹. Though different forms of sacred groves exist in India, studies are confined to a certain region of the country. In Northeast India, several works have been reported on sacred groves from Meghalaya, Manipur, Sikkim, and Arunachal Pradesh, but studies are lacking in other states, including Assam.

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While a high importance is given to government-managed forests like reserve forests and protected forests, the concept of protecting sacred groves has been frequently underestimated. Different local communities have diverse ways of conservation principles and associated knowledge, which has directly contributed to the acquisition of cultural knowledge. The forest-dwelling tribes and non-tribes in Assam have traditions of maintaining the sacred groves^{6,10,11}. Increasing population density obviously puts an increasing pressure on the sacred groves, while most of them are surrounded only by a few trees to protect a deity as a custom. Concerning these factors, the present study is focused on understanding the profound connection between shared traditional knowledge and conservation practices of the local community and the extent of disturbance caused in the sacred groves.

Methodology

Study sites

Assam, a state in North-East India, lies between 89° 42' E to 96° 02' E longitude and 24° 82' N to 28° 22' N latitude covering an area of 78,438 km². The state encompasses three of the six physiographic divisions of India which includes the Northern Himalayas (Eastern Hills), the Northern Plains (Brahmaputra plain), and the Deccan Plateau (Karbi Anglong)¹². Currently, there are 35 districts in Assam inhabited by different religious groups. The state has got a mixed population of different ethnic groups. The ethnic origin of Assamese people varies from Mongoloids tribes to Indian stocks¹⁵ and most believe in Vaishnavism¹⁴. As per the 2011 census, the population was 30.57 million, with Hinduism constituting 61.47% of the total population. The state's economy is agriculture-based, of which 86% of the population lives in rural areas¹⁵. The forest of Assam has enormous variation in its edaphic typology characteristics and floral composition, ranging from a tropical evergreen at lower altitudes to pine and scrub forests at higher altitudes¹⁶. The temperature ranges from 8°C in winter to 32°C in summer. The edaphic characteristics of the state are alluvial, hill, submontane, and laterite¹⁷.

Survey design

Documentation and management of sacred groves

For documentation of sacred groves, a systematic field survey was carried out in different parts of Assam

from 2015 to 2017. GPS Garmin Oregon 550 was used to acquire the coordinates and to prepare a distribution map of the sacred groves using ArcGIS 10.6. The information on the area covered by the sacred groves was obtained from the caretakers. Based on religious, cultural, and other values practised by the indigenous communities, sacred groves were categorized as traditional, temple, and burial or cremation ground groves^{18,19}. A purposive sampling technique was conducted using a semi-structured questionnaire, and 384 individuals (local people, owner/caretakers, and village headmen) were communicated to share information on their cultural belief system and any disturbances activities in the sacred groves. Prior Information Consent (PIC) was obtained from the respondents in acquiring knowledge of sacred groves.

The information on the historical background of the sacred grove, rituals performed/celebrations, sacred plants, protected tree species, and deities worshipped was also obtained for the study. Plant species were identified based on their physiognomy. Specimens of the plants are collected for only those species for which identification was difficult in the field. The herbarium specimens for the collected species were prepared following Jain and Rao²⁰ and are housed in the Tezpur University Herbarium, Department of Environmental Science. Identification of the species were done consulting plant taxonomist and referring to the book "Flora of Assam"²¹. World Flora Online²² was followed for the scientific nomenclature of species. As some sacred groves do not have a demarcated boundary, the owner or caretaker was asked to give information with confidence on the area cover of the sacred groves.

Statistical analysis

Chi-square test of independence was performed to measure the relationship between the cultural belief system of the local community and anthropogenic disturbances in the sacred groves. The statistical analysis was carried out in SPSS 21.

To quantify the degree of anthropogenic disturbances in the sacred groves, the disturbances score was calculated based on human induced activities which include browsing/grazing, the severity of wood and non-timber forest products (NTFPs) collection, and fire frequency and intensity^{23,24}. Browsing/grazing was ranked as (1) no evidence of any cattle or browsing/grazing, (2) evidence of browsing/grazing, cattle seen in the sites, not daily, and (3) cattle seen daily in the sites. The wood and NTFPs collection were

ranked as (1) for no current evidence of wood and NTFPs collection, (2) sound for wood collection/felling heard and cut stumps found, and (3) sound for wood collection/felling heard daily and cut stumps during the study period. The fire was ranked as (1) no signs of recent fires, (2) evidence of only periodic small fires, not annually, and (3) evidence of large annual fires. The sum of all ranks for each site provided an overall ranking of anthropogenic disturbance within sacred groves. For categorizing the disturbance level (D) based on the anthropogenic pressure the sum of the maximum levels of disturbance factors D_{max} is used as a reference and compare to the observed value of disturbance level as D_{obs} using the formula:

$$D = D_{obs} / D_{max}$$

Results

Record of sacred groves

A total of 282 sacred groves were inventoried from Assam (Fig. 1). We recorded 271 sacred groves associated with temples, 3 with burial grounds, and 8 with traditional forests (Supplementary Table S1). Several ethnic communities like Assamese, Bodo, Chutia, Tiwa, Tai phakial (Buddhist), Karbi, Motok, Ahom, Sonowal Kachari, Missing, Meitie, and Tea tribe (Adivasi) were involved with the sacred groves. The groves associated with the temple have names like *Ashram*, *Devalaya*, *Dham*, *Doul*, *Mandir*, *Monastery* or *Buddha Vihar*, *Satra*, and *Than*. However, the groves associated with the burial grounds are known as *Maidam*, and traditional groves are named on the place

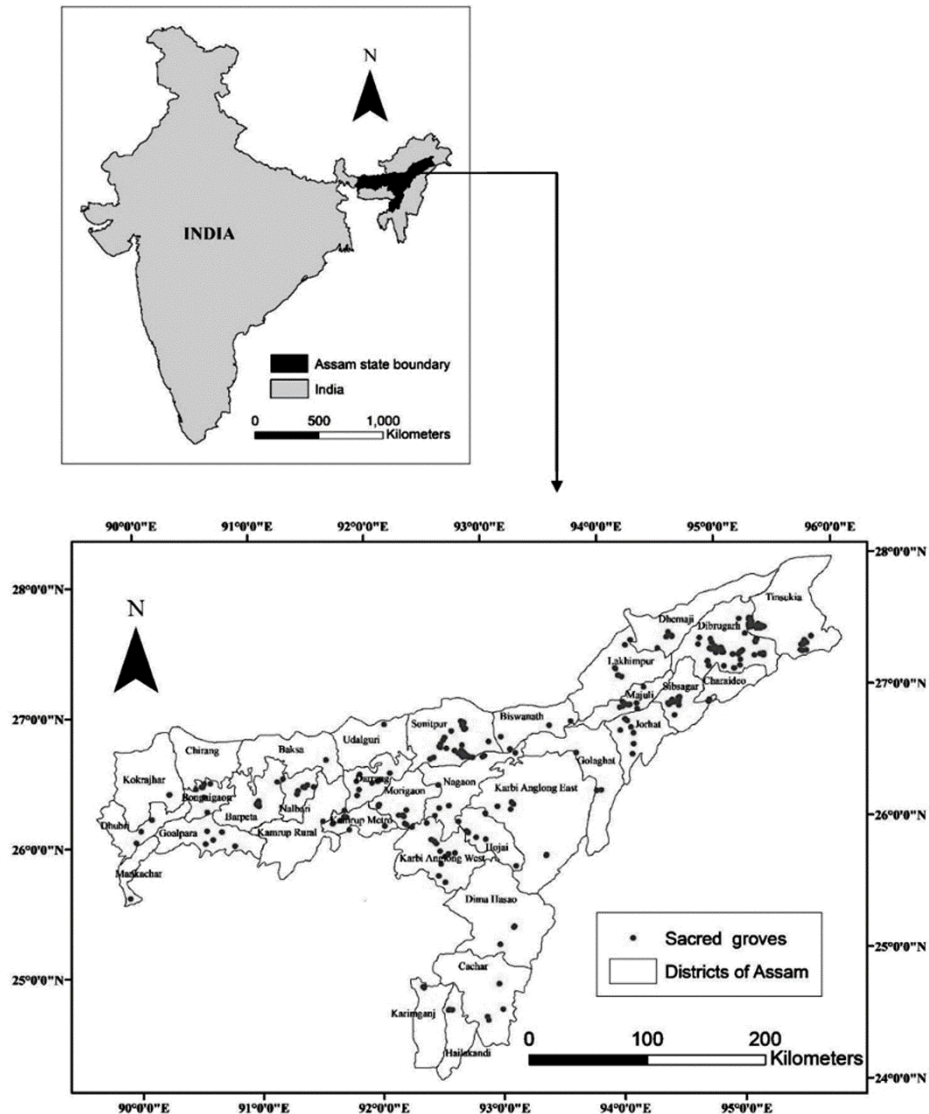


Fig. 1 — Map representing the sacred groves of Assam (generated using ArcGIS 10.6)

name where they are situated. The area of the recorded sacred groves ranged from 0.01 ha (temple groves) to 89 ha (traditional forests), covering a total area of 672.48 ha distributed within 23 AMSL to 955 AMSL. It was noted that the Ahom community is associated with burial grounds; however, the Karbi tribe protects traditional forests. The sacred groves having archaeological significance are protected and managed under 'The Ancient Monuments and Archaeological Sites and Remains Act, 1958', Govt. of India. The other groves are managed by the committee members, which the local people constitute. The tenure of work for the committee members is five years. The respective controlling authority mainly administers all the economic and socio-cultural activities performed in the sacred groves.

Religious and traditional beliefs

The survey showed that sacred groves are protected based on historical, religious, and cultural backgrounds. Each grove has its own legends associated with it and performs different rituals and celebrations as a part of customary tradition. There

are different deities linked with the sacred groves. Majority of people worship *Shiva* as a principal deity in the temple groves. The deity of traditional groves is known as *Sarpo*, whereas in burial grounds, deceased ancestors are worshipped. It was established that the sacred groves linked to temples have a tradition of offering animals. Devotees offered pigeons and goats to the deity of the sacred groves when their wish gets fulfilled or to overcome problems related to their prosperity. Temple authorities provide shelter and protect the animals offered by devotees within the premise of the sacred groves. In *Dakhinpath Satra*, deer (Fig. 2a) and rabbits (Fig. 2b) are domesticated and protected as *ex-situ* conservation. Eight holy ponds, locally known as *Pukhuri*, were recorded from eight sacred groves, where aquatic animals, mainly turtles, fishes, and ducks, are preserved. A sacred pond (Fig. 3a) in *Bichikri* grove is conserved by the local people (Karbi tribe). The walking catfish (*Clarias batrachus*) is abundant in the pond which is not harvested as a sacred species (Fig. 3b). During the



Fig. 2 — (a) Deer and (b) rabbits in Dakhinpath Satra



Fig. 3 — (a) Sacred pond in Bichikri sacred grove (b) *Clarius batrachus* in Bichikri sacred pond

study it was noted that few groves forest floors are covered by thick litter layers as there is less interference by the local community. There is a belief that if local people need to collect dead and fallen branches for domestic use, then they must seek prior permission from the forest deity through prayer. It was also noted that women are strictly prohibited from going inside the sacred groves during monthly menstruation, as there is a strong belief that it might defile her or the deities residing in the groves. Similarly, the deceased family members were not allowed to enter the sacred groves until the completion of purifying rituals. Similarly, the traditional groves also have strong beliefs and taboos that there should not be any misconduct inside the groves.

Plant species

A total of 83 tree species belonging to 68 genera in 37 families (Table 1) were recorded in the sacred groves. The family Fabaceae (12) recorded the highest number of species. Of the recorded species, 15 were sacred trees, worshipped as an incarnation of deities. *Aegle marmelos*, *Ficus benghalensis*,

Table 1 — Tree species recorded in sacred groves

Scientific Name & [Voucher number]	Family
<i>Actinodaphne obovata</i> (Nees) Blume	Lauraceae
<i>Aegle marmelos</i> (L.)Corrêa*	Rutaceae
<i>Albizia lebbek</i> (L.) Benth.* [362]	Fabaceae
<i>Albizia odoratissima</i> (L. f.) Benth.	Fabaceae
<i>Albizia procera</i> (Roxb.) Benth.[349]	Fabaceae
<i>Samanea saman</i> (Jacq.) Merr. [338]	Fabaceae
<i>Alstonia scholaris</i> (L.) R. Br.* [344]	Apocynaceae
<i>Archidendron bigeminum</i> (L.) I. C. Nielsen	Fabaceae
<i>Areca catechu</i> L.	Arecaceae
<i>Artocarpus chama</i> Buch.-Ham.* [367]	Moraceae
<i>Artocarpus heterophyllus</i> Lam.	Moraceae
<i>Artocarpus lacucha</i> Roxb. ex Buch.-Ham. [354]	Moraceae
<i>Averrhoa carambola</i> L. [343]	Oxalidaceae
<i>Azadirachta indica</i> A. Juss.	Meliaceae
<i>Baccaurea ramiflora</i> Lour.	Phyllanthaceae
<i>Bauhinia purpurea</i> L.	Fabaceae
<i>Bixa orellana</i> L. [351]	Bixaceae
<i>Bombax ceiba</i> L.	Malvaceae
<i>Borassus flabellifer</i> L.	Arecaceae
<i>Boswellia serrata</i> Roxb.	Burseraceae
<i>Butea monosperma</i> (Lam.) Kuntze	Fabaceae
<i>Carica papaya</i> L.	Caricaceae
<i>Cassia fistula</i> L.	Fabaceae
<i>Toona ciliata</i> M. Roem [365]	Meliaceae
<i>Cinnamomum tamala</i> (Buch.-Ham.) T. Nees & Eberm.	Lauraceae
<i>Citrus limon</i> (L.) Osbeck	Rutaceae
<i>Citrus maxima</i> (Burm.) Merr.	Rutaceae

<i>Cocos nucifera</i> L.	Arecaceae
<i>Cordia dichotoma</i> G. Forst.	Boraginaceae
<i>Dalbergia sissoo</i> Roxb. ex DC. [358]	Fabaceae
<i>Delonix regia</i> (Bojer ex Hook.) Raf	Fabaceae
<i>Dillenia indica</i> L.*	Dilleniaceae
<i>Diospyros malabarica</i> (Desr.) Kostel.*	Ebenaceae
<i>Dipterocarpus retusus</i> Blume	Dipterocarpaceae
<i>Dysoxylum excelsum</i> Blume	Meliaceae
<i>Elaeagnus caudata</i> Schltl. ex Momiy	Elaeagnaceae
<i>Elaeocarpus serratus</i> L.	Elaeocarpaceae
<i>Elaeocarpus floribundus</i> Blume [357]	Elaeocarpaceae
<i>Embelia ribes</i> Burm. f.	Primulaceae
<i>Ficus benghalensis</i> L.*	Moraceae
<i>Ficus simplicissima</i> Lour*	Moraceae
<i>Ficus racemosa</i> L.*	Moraceae
<i>Ficus religiosa</i> L.*	Moraceae
<i>Ficus virens</i> Aiton* [361]	Moraceae
<i>Flacourtia jangomas</i> (Lour.) Raeusch.	Salicaceae
<i>Garcinia lanceifolia</i> Roxb.	Clusiaceae
<i>Garcinia pedunculata</i> Roxb. ex Buch.-Ham.	Clusiaceae
<i>Garcinia xanthochymus</i> Hook. f.*	Clusiaceae
<i>Gmelina arborea</i> Roxb.	Lamiaceae
<i>Adina cordifolia</i> (Roxb.) Brandis	Rubiaceae
<i>Hevea brasiliensis</i> (Willd. ex A. Juss.) Müll. Arg.	Euphorbiaceae
<i>Lagerstroemia speciosa</i> Pers.* [342]	Lythraceae
<i>Lawsonia inermis</i> L.	Lythraceae
<i>Litchi chinensis</i> Sonn.	Sapindaceae
<i>Livistona jenkinsiana</i> Griff. [345]	Arecaceae
<i>Maclura pomifera</i> (Raf.) C. K. Schneid.	Moraceae
<i>Madhuca longifolia</i> (L.) J. F. Macbr.	Sapotaceae
<i>Mangifera indica</i> L.*	Anacardiaceae
<i>Mesua ferrea</i> L.	Calophyllaceae
<i>Mimusops elengi</i> L.*	Sapotaceae
<i>Moringa oleifera</i> Lam. [359]	Moringaceae
<i>Murraya koenigii</i> (L.) Spreng.	Rutaceae
<i>Neolamarckia cadamba</i> (Roxb.) Bosser [346]	Rubiaceae
<i>Oroxylum indicum</i> (L.) Kurz [368]	Bignoniaceae
<i>Phoenix dactylifera</i> L.	Arecaceae
<i>Phyllanthus acidus</i> (L.) Skeels	Phyllanthaceae
<i>Phyllanthus emblica</i> L.	Phyllanthaceae
<i>Plumeria rubra</i> L.	Apocynaceae
<i>Monoon longifolium</i> (Sonn.) B. Xue & R. M. K. Saunders [363]	Annonaceae
<i>Psidium guajava</i> L.	Myrtaceae
<i>Santalum album</i> L.	Santalaceae
<i>Saraca asoca</i> (Roxb.) Willd.	Fabaceae
<i>Schima wallichii</i> (DC.) Korth.	Theaceae
<i>Shorea robusta</i> C. F. Gaertn.	Dipterocarpaceae
<i>Spondias pinnata</i> (L. f.) Kurz [328]	Anacardiaceae
<i>Syzygium cumini</i> (L.) Skeels [350]	Myrtaceae
<i>Syzygium jambos</i> (L.) Alston [366]	Myrtaceae
<i>Tamarindus indica</i> L.	Fabaceae
<i>Tectona grandis</i> L. f.	Lamiaceae
<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn. [364]	Combretaceae
<i>Terminalia chebula</i> Retz.	Combretaceae
<i>Zanthoxylum armatum</i> DC. [353]	Rutaceae
<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae

* Sacred trees

Ficus religiosa, and *Mimusops elengi* are important sacred species.

Degree of disturbances

The study on the relationship between the cultural belief system and anthropogenic activities revealed a significant difference, $\chi^2(1, N= 768) =50.032$, $p<0.001$. The weakening of cultural values in sacred groves has increased anthropogenic pressures in sacred groves compared to the cultural belief systems (30.2%). Based on the degree of anthropogenic disturbance score, collection of wood was recorded in 51% of sacred groves, browsing/ grazing activities in 38% and fire frequency and intensity in 11% of sacred groves (Fig. 4). On disturbance level of anthropogenic activities, a total of 64 sacred groves were recorded in highest disturbance level and 82 recorded with moderate disturbance and 136 recorded as low disturbance. The temple authority mentioned that the woods or NTFPs collection is mainly used for cultural and religious practices. Similarly, occasional fire on the understory layer is carried out to eliminate invasive species. As most of the temple groves do not have well-fenced boundaries, it facilitates resource extraction by the local people to meet their subsistence requirements resulting in the gradual degradation of the groves. However, higher degradation in sacred groves was due to road and highway construction and expansion which encroached on considerable areas of the groves. Some groves are affected by natural disasters like floods accelerating to fragmentation of vegetation cover. It was also found that 196 sacred groves were renovated with bricks and constructed concrete wall fencing.

Discussion

The study of the sacred groves of Assam signified that the ethnic communities protect the sacred groves

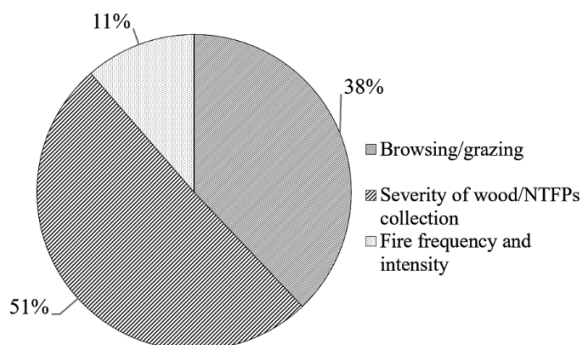


Fig. 4 — Anthropogenic disturbances in the sacred groves

due to their unique historical background and legends associated with them. Variation in the number and forms of sacred groves across the districts of the state depends on several factors. The most reasonable factors are the cultural belief system and the nature of vegetation composition in the grove. The present study has revealed that rich ethnic assortment had triggered the perpetuation and continuity of preserving sacred groves from generation to generation. However, it has also been found that the degree of conservation is eroding gradually due to various human induced activities. Maximum sacred groves were found to be associated with the temple groves. In prehistoric times, the pastoral tribes of Assam worshipped *Shiva* as a god of mountains²⁵. Therefore, in most temples, the main deity's incarnation is *Shiva*. The management of sacred groves of archaeological importance by the state government has contributed to protection and conservation. Mgumia and Oba²⁶ reported such management in Tanzania, where the State Forest Reserve manages the burial grounds. The contribution of local communities in the preservation of sacred groves was because of taboos and traditional beliefs. Likewise, the record of sacred trees is associated with mythological theories. Sacred groves are also protected by the local people because they are natural store house to rare plants²⁷.

The occurrence of 15 sacred trees in different groves signifies the importance of the groves and represents the socio-religious beliefs associated with the respective community. Similarly, the management of plant and animal species as an *ex-situ* conservation has helped to enrich the biodiversity of the area. The sacred plants were also reported in Ireland, where the sacred yew tree surrounded by churchyards is protected as a heraldic icon or symbol of life and death²⁸. These sacred plants are used in different religious practices and associated with the deities of the groves have helped in upholding the ecological balance²⁹.

Though the present study revealed that local communities make strong efforts to the conservation of sacred groves but on record various anthropogenic activities are disturbing the grove which is a serious concern. Despite the cultural and ecological significance, sacred groves are facing threats in recent times. In the present study, it was found that most of the sacred groves do not have proper fencing. Thus, it becomes porous for human intervention causing the degradation of natural resources. The highest score on

wood and NTFPs collection from the sacred groves accelerated threat to the habitats and species diversity which have directly influenced variability on the status of the sacred groves. The encroachment activities and resource extraction by the people who inhabited nearby the sacred groves were carried out to meet the subsistence requirements for their livelihood. In sacred groves of northern Togo, West Africa fires and woodcuttings are reported as the factors of degradation³⁰. Similarly, in *Sharngakavu* sacred grove in Kerala the demand for infrastructural facilities has resulted in the utilization of resources and the deterioration of numerous sacred groves³¹. Expansion of roadways, development of new roadways and renovation of the temple are some developmental activities, while erosion in people's attitude and religious beliefs, especially in the younger generation, towards the integral value of the groves are playing a significant role in the degradation of the sacred groves. The study carried out by Kandari *et al.*³² mentioned modernization, mechanization and globalization resulted in the alteration and weakening of both cultural and biological integrity. In sacred groves of Western Himalaya, the changing attitudes, erosion of traditional beliefs, and human impact collectively contributed to the degradation of sacred groves³³. The statistical analysis in the present study has also signified that loss in the socio-religious/cultural belief directly or indirectly influences anthropogenic activities resulting in degradation of the groves. Majority of the sacred groves are highly disturbed which was also confirmed by the respondent records. However, initiatives were in place to protect and conserve the remaining patches of the temple groves as formulated by the caretaker. Singh and Saxena³⁴ and Kushalappa and Bhagwat⁵ pointed out that the weakening of socio-cultural and religious values and developmental activities have influenced the degradation of sacred groves. Urbanization and modernization are also the main factors of forest degradation. Furthermore, Chandrakar *et al.*³⁵ observed that in the last century, the total area under the groves decreased substantially due to fragmentation and the ever-increasing human population under limited natural resources.

Conclusions

The present study has minimized the gap in understanding the preservation of sacred groves at the current time. We observed that *ex-situ* conservation and ethnic practices of local communities have contributed to the management of the sacred groves. It

has been confirmed that many sacred groves in the state were retained due to rich cultural diversity and aged-old traditional beliefs of communities. However, the record of gradually degrading sacred groves due to the loss or transformation of cultural belief systems and human activities is a threat towards the existence of sacred groves. The record of anthropogenic disturbances has caused pressure on the structure and composition of the sacred groves. Hence, there is an urgent need to be aware of the importance of biodiversity while acknowledging the indigenous knowledge of the community for the ecological sustainability of the sacred groves and preservation of cultural assets.

Supplementary Data

Supplementary data associated with this article is available in the electronic form at [https://nopr.niscpr.res.in/jinfo/ijtk/IJTK_23\(04\)\(2024\)316-323_SupplData.pdf](https://nopr.niscpr.res.in/jinfo/ijtk/IJTK_23(04)(2024)316-323_SupplData.pdf)

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Conflict of Interest

Authors declare that there is no conflict of interest in this article.

Author Contributions

AD- Funding for research, research design, methodology; SB- Survey, Data collection, Analysis of data. Both authors reviewed and edited the final manuscript.

References

- 1 Verschuuren B, Wild R, McNeely J A & Gonzalo O, Sacred natural sites conserving nature and culture, In: Sacred natural sites: Conserving nature and culture, edited by B Verschuuren, R Wild, J McNeely & Oviedo G, (Earthscan publishing for a sustainable future, London, Washington, DC), (2010) p. 1-13.
- 2 Manna S, Manna S, Ghora T K & Roy A, Sacred grove as remnant forest: A vegetation analysis, *Biodiversitas*, 18 (3) (2017) 899-908.
- 3 Garg A, Typology of sacred groves and their discrimination from sacred sites, *Curr Sci*, 104 (5) (2013) 596-599.
- 4 Patnaik S & Pandey A, Chattisgarh: Eco- cultural services of community commons, In: *Sacred groves of India: A*

- compendium*, edited by N Krishna & M Amirthalingam, (C.P.R Environmental Education Center, Chennai), (2014) p. 85-93.
- 5 Kushalappa C & Bhagwat S, Sacred groves: biodiversity, threats and conservation, In: *Forest genetic resources: Status, threats, and conservation strategies*, edited by R U Shaanker, K N Ganeshiah & K S Bawa, (Oxford & IBH Publishing Company), (2001) 317.
 - 6 Khan M L, Khumbongmayum A D & Tripathi R S, The sacred groves and their significance in conserving biodiversity an overview, *Int J Ecol Environ Sci*, 34 (3) (2008) 277-291.
 - 7 Ray R, Chandran M D S & Ramachandra T V, Sacred Grove: Nature conservation tradition of the ancient World, *Sahyadri e-news*, 32 (2001) 1-5.
 - 8 Dudley N, Bhagwat S, Higgins-Zogib L, Lassen B, Verschuuren B, *et al.*, Conservation of biodiversity in sacred natural sites in Asia and Africa: A review of the scientific literature, In: *Natural sites conserving nature and culture*, edited by B Verschuuren, R Wild, J McNeely & G Oviedo, (Sacred Earthscan, London/Washington, DC), (2010) p. 19-32.
 - 9 Prakasam R, Balakrishnan B & Sebastian S, Diversity and distribution of tropical dry forests: a case study from Pudukkottai District of Tamil Nadu, India-sacred groves, In: *Handbook of Research on the conservation and restoration of Tropical dry forests*, edited by R Prakasam, B Balakrishnan & S Sebastian, (IGI Global), (2020) p. 115-124.
 - 10 Malhotra K C, Gokhale Y, Chatterjee S & Srivastava S, Cultural and ecological dimensions of sacred groves in India, Indian National Science Academy, New Delhi & Indira Gandhi Rashtriya Manav Sangrahalaya, Bhopal, 2010.
 - 11 Medhi P & Borthakur S, Sacred groves and sacred plants of the Dimasas of North Cachar hills of Northeast India, *Afr J Plant Sci*, 7 (2) (2013) 67-77.
 - 12 Assam State Portal, Districts, (2nd December 2020). Available from <https://assam.gov.in/about-us/396> (Accessed on 31st December 2023)
 - 13 Raatan T, History religion and agriculture of northeast India, (Isha Books publication, Delhi), 2006.
 - 14 Borah R, Growth and development of the Satras in historical perspectives, (Bornali Borah Pathak Publication, Australia), 2012.
 - 15 Dhar S, Socio-economic and demographic status of Assam: A comparative analysis of Assam with India, *Int J Humanit Soc Sci Stud*, 1 (3) (2014) 108-117.
 - 16 Dikshit K R & Dikshit J K, Natural vegetation: Forests and grasslands of North-East India, In: *North-East India: Land, people and economy*, (Springer Netherlands, Dordrecht) (2014) p. 213-255.
 - 17 Deka P & Bhagabati A K, Geography, economic and regional, (New age international(p) limited, publishers, New Delhi), 2006.
 - 18 Pandey H, Sacred forests their ecology and diversity, (Regency publications, Delhi), 2010.
 - 19 Bisht T & Bhatt A B, Community- based biodiversity conservation in the Himalayas, In: *Sacred groves: A traditional way of conserving biodiversity in Gharwal Himalayas*, edited by Y Gokhale & A K Negi, (TERI Press, New Delhi), (2011) p. 61-71.
 - 20 Jain S K & Rao R R, A handbook of field and herbarium methods, (Today and Tomorrow Printers and Publishers, New Delhi), (1977) p. 157.
 - 21 Kanjilal U & Bor N, Flora of Assam, (Omsons Publications, New Delhi), 2005.
 - 22 The World Flora Online, available from <https://www.worldfloraonline.org/> (Accessed on 31st December 2023)
 - 23 Veblen T T, Kitzberger T & Lara A, Disturbance and forest dynamics along a transect from Andean Rain forest to Patagonian Shrubland, *J Veg Sci*, 3 (4) (1992) 507-520.
 - 24 Gillespie T W, Grijalva A & Farris C N, Diversity, composition, and structure of tropical dry forests in Central America, *Plant Ecol*, 147 (1) (2000) 37-47.
 - 25 Barman S, Neo- Vaisnavism and other religious cults of Assam: A study in conflict and comparison, In: *Religion and society in North East India*, edited by D Nath, (DVS publishers, Guwahati), (2011) p. 85-88.
 - 26 Mgumia F H & Oba G, Potential role of sacred groves in biodiversity conservation in Tanzania, *Environ Conserv*, 30 (3) (2003) 259-265.
 - 27 Bhatt N, Bhatt A B & Thaplyal V, Traditional wisdom of conserving biodiversity through sacred groves: Ethnobotanical treasure in Garhwal Himalayas, *Indian J Tradit Know*, 22 (3) (2023) 587-593.
 - 28 Delahunty J L, The ethnobotanical history and holocene extent of Yew (*Taxus baccata* L.) on the Irish landscape, *J Ethnobiol*, 27 (2) (2007) 204-217.
 - 29 Rodgers W A, The sacred groves of Meghalaya, *Man India*, 74 (1994) 339-348.
 - 30 Kossi A, Mazalo K P, Novinyo S K & Kouami K, Impacts of traditional practices on biodiversity and structural characteristics of sacred groves in northern Togo, West Africa, *Acta Oecol*, (110) 103680 (2021) 1-9.
 - 31 Jeevana K, Bonny B P & Gopakumar S. Climate change perspectives and conservation of sacred groves: Case of Sharngakavu, Kerala, *Indian J Tradit Know*, 22 (2) (2023) 433-443.
 - 32 Kandari L S, Bisht V K, Bhardwaj M & Thakur A K, Conservation and management of sacred groves, myths and beliefs of tribal communities: A case study from north-India, *Environ Syst Res*, 3 (16) (2014) 1-10.
 - 33 Singh S, Youssef M, Malik Z A & Bussmann R W, Sacred groves: Myths, beliefs, and biodiversity conservation—A case study from Western Himalaya, India, *Int J Ecol*, 2017 (2017) 1-12.
 - 34 Singh G S & Saxena K G, Sacred groves in the rural landscapes: A case study of Shekhala village in Rajasthan, In: *Conserving the sacred for biodiversity management*, edited by PS Ramakrishnan, KG Saxena & UM Chandra Shekera, (UNESCO and Oxford-IBH Publishing, New Delhi), (1998) p. 277-288.
 - 35 Chandrakar K, Verma D K, Sharma D & Yadav K C, A study on the role of sacred groves in conserving the genetic diversity of the rare, endangered and threatened species of flora & fauna of Chhattisgarh state (India), *Int J Sci Res publications*, 4 (1) (2014) 1-5.