

## ECOSYSTEM SERVICES FROM SACRED GROVES: AN OVERVIEW

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### Abstract

The cultural valuation of biodiversity has taken on renewed importance over the last two decades as ecosystem services frameworks have become widely adopted, with the most influential and well-known being presented in the Millennium Ecosystem Assessment. Sacred groves are a group of trees or a patch of vegetation protected by the local people through religious and cultural practices. Depending on its location and management status, sacred grove can provide all basic ecosystem services like, provisioning, regulating, supporting and cultural amenities. Sacred groves provide the inextricable link between present society to the past in terms of biodiversity, culture, religious and ethnic heritage.

**Keywords:** Sacred groves, ecosystem services, biodiversity, repositories, conservation

### Introduction

Identifying ecosystem's services' worth offers economists, ecologists, and conservation biologists a common parlance to discuss and debate the value of the natural world [1]. Nature's assets can provide life-sustaining benefits or ecosystem services, such as water purification, pest control, fisheries, and storm buffering [2]. The cultural valuation of biodiversity has taken on renewed importance over the last two decades as ecosystem services frameworks have become widely adopted, with the most influential and well-known being presented in the Millennium Ecosystem Assessment [3].

Ecosystems and the biological diversity contained within them provide a stream of goods and services, the continued delivery of which remains essential to our economic prosperity and other aspects of our welfare. In a broad sense, ecosystem services refer to the range of conditions and processes through which natural ecosystems, and the species that they contain, help sustain and fulfil human life [4]. The term "ecosystem services" also refers to aspects of humans' quality of life: whether spaces used for recreation or natural wonders have cultural and inspirational value. Recent research has suggested, for example, that a simple nature walk can improve cognitive thinking and emotional perspectives [5].

### Sacred groves

Sacred groves (forest) are a group of trees or a patch of vegetation protected by the local people through religious and cultural practices evolved to minimized destruction [6]. The institution of sacred groves is perhaps "as old as the civilization itself," born at a time when pristine religion was taking shape [7]. They include natural areas recognized as sacred by indigenous and traditional peoples as well as natural areas recognized by institutionalized religions or faiths as places for worship and remembrance" [8].

Sacred groves, protected over centuries are often located in regions rich in biodiversity [9]. Sacred groves (SGs) provide the inextricable link between present society to the past in terms of biodiversity, culture, religious and ethnic heritage [10]. Hughes and Subhash Chandran defined sacred groves as ‘segments of landscape containing trees and other forms of life and geographical features, that are delimited and protected by human societies believing that preserving such a patch of vegetation in a relatively undisturbed state is necessary for expressing one’s relation to the divine or to nature’ [11]. These sacred groves are the only remnants of natural vegetation as the surrounding landscape is transformed due to economic development. These areas by default form an unrecognized ‘shadow’ conservation network [12]. Sacred groves (sacred forests) constitutes an important type of such environment found on several continents too [9]. There exist some fascinating examples of forest patches harbouring native vegetation, which have been intertwined with various aspects of indigenous, cultural and religious practices along with the associated taboos [13].

It is now recognized in the conservation literature that understanding the cultural valuation of biodiversity requires interpretive as well as positivist social science theory and methods [14-16]. Understanding the biocultural relationships through which cultural values shape tropical forest diversity is now increasingly recognized as important for the conservation of both biodiversity and (tangible and intangible) cultural heritage [17]. In hopes of translating the science into actual policy decisions, government leaders from United Nations countries formed the Intergovernmental Platform on Biodiversity and Ecosystem Services in 2012 to help preserve the planet’s biodiversity and identify ecosystem services [18]. Sacred groves were part of most agrarian cultures in the world. Countries in South America, Africa, Australia and Europe had sacred groves [19-21].

Hence, these remain as isolated patches of climax vegetation in the midst of agricultural landscapes. Gadgil and Vartak [13] observed that in many parts of India, sacred groves represent surviving examples of climax vegetation and are disappearing under the influence of modernization. Pressures of growing urbanization and industrialization, the need for roads and housing and other infrastructure has eaten into the area of the groves [22]. Their role as biodiversity hotspots and providers of ecosystem services cannot be separated from the social context in which these objects exist and function.

### **Ecosystem Services provided by Sacred Groves**

Ecosystem Services are the processes by which the environment produces resources that we often take for granted such as clean water, timber, and habitat for fisheries, and pollination of native and agricultural plants. Regulatory functions such as carbon sequestration, nutrient retention, biodiversity, soil conservation, pollination and hydrological cycling can be beneficial not only to local communities but also at national and international levels [23]. Depending on its location and management status, sacred grove can provide all basic ecosystem services like, provisioning, regulating, supporting and cultural amenities which have not been properly explored yet. Although the importance of sacred groves in community life is usually felt through religious-cultural practices their utility in life-sustaining services cannot be overlooked. The groves are also sources of important ecosystem services for local communities, including provisioning (e.g. water, medicinal plants or ornamental resources) and regulating (e.g. pollination or water purification) services [24-26].

#### **1. Maintenance of ecological health:**

Sacred groves are of great ecological significance and have the potential to provide a variety of ecosystem services [27]. The sacred groves also help in maintaining the desirable health of ecosystem, reduce habitat destruction, conserve the viable population of pollinators and predators, serve as the potential source of propagules that are required for colonization of wastelands and fallows, conserve the indigenous flora and fauna and preserve the cultural and ethical practices developed through indigenous knowledge of generations [28-31]. A large and intact grove represents a healthy forest ecosystem that renders valuable ecological services like, soil, water and biodiversity conservation, nutrient cycling and temperature regulation. The variety of the services the groves may give, include, for example, water or medicinal provision, and religious, spiritual and aesthetic benefits.

## **2. Prevention of soil erosion and nutrient wash off**

The sacred groves provide a number of ecosystem services such as reduction in erosive force of water, conservation of soil, maintenance of hydrological cycle, availability of water of desired quality and natural dispersal of seeds of useful species [32, 33]. Studies in Meghalaya indicate that well preserved groves efficiently reduce the erosive power of runoff water thus preventing soil erosion and nutrient wash out [34].

## **3. Biodiversity repositories:**

Biodiversity-rich sacred groves are of immense ecological significance. Sacred groves serve as repositories of genetic diversity and are provided with comprehensive and rich ecological niche. These groves serve as stepping stones for dispersal through unsuitable habitat [35] and are known to retain viable populations of rare and endangered species [36]. Many Sacred groves constitute pristine vegetation, and are particularly rich in trees and associate groups of organisms, like epiphytes, amphibia, reptiles, birds, butterflies etc. [10]. Plant wealth and self conservation potential of sacred groves are impressive enough for them to be acknowledged as “mini biosphere reserves” [13]. It has already been seen that the traditional beliefs and taboos have played a vital role in maintaining these islands of biodiversity. Wherever the sacred groves existed, the indigenous traditional societies, which have a spiritual relationship with their physical environment, sustain them [10]. Results of a comparative study have also shown that sacred groves shelter high diversity of medicinal plants and have more vigorous regeneration of trees than formal forest reserves [37]. Therefore inventories are desirable to assess the diversity present in these groves.

## **4. Refuge for rare and endangered medicinal plants:**

They are also an important refuge for rare and endangered medicinal plants [38]. There is a need to record and document their knowledge of various medicinal plants, which are used for treating different ailments by local practitioners [39]. These groves are usually rich patches of undisturbed forest, serving as a natural habitat for endemic, rare, primitive and economically valuable organisms [40].

## **5. Sacred groves as a part of community life:**

The human societies are also culturally dependent on the ecosystems for spiritual purposes, aesthetic purposes, recreation, etc. Sacred groves are lifeline for the rural community in many ways either socio-religious, cultural or livelihood maintenance. Historically, attitudes and behaviour towards the environment and sustainable use of resources have been greatly

affected and determined by nature worship and spiritual values [41, 42]. Studies have pointed out their role in biodiversity conservation and ecological functions.

### **Ecological studies on sacred groves**

Ecological studies on groves can be categorized into two parts viz.

- 1) Where the sacred grove is treated as unit system irrespective of its surroundings and
- 2) Sacred grove as part of the landscape.

In both type of studies few ecosystem services have also been explored as a part of ongoing ecosystem dynamics within the grove system. Studies on sacred grove system are mostly concentrated towards inventory and documentation, biodiversity assessment especially angiosperms, anthropological and socio-religious issues. However, current resurgence of interest in the system promotes a fair number of ecological studies which in a way help us in understanding the ecological dynamics of the groves. Examples can be drawn from the works based on NTFP and medicinal plants and provisioning services [43, 44] maintenance of angiosperm diversity, preserving endemic members [45], nutrient cycling [34], soil microbial carbon [46].

### **Threats to sacred groves**

Sacred groves are patches of forests preserved for their spiritual and religious significance. The practice gained relevance with the spread of agriculture that caused large-scale deforestation affecting biodiversity and watersheds. Today, the pace of modernization has begun to interfere with the traditional social and religious systems that were up keeping the groves till date. The very sacred groves which are repositories of great biodiversity are faced with grave threats. The impact of modernization and education and growing disbelief in the traditional value systems among the local communities has impacted the preservation of the sacred groves. Increasing threats to biodiversity demand new conservation approaches emphasizing on the hidden values of conservation to the local communities and positive local attitude towards national and global conservation goals [47]. Conservation policies should incorporate intangible cultural heritage or symbolic cultural values into their conceptualization of local cultural valuation, along with better known tangible cultural heritage or utilitarian cultural values [48]. A matter of serious concern is the steady erosion of traditional and cultural values among the local communities, which in turn, has adversely affected the conservation and preservation of these groves.

Despite being recognized by the traditional communities and cultures for its valuable contribution to livelihood, groves are often subjected to negligence (especially the smaller ones) in terms of ecosystem services which require urgent attention from conservationists as well as decision makers. Traditional ways of resource management are becoming non functional due to direct conflict between ever increasing human population and limited natural resources [49]. Belief and taboos are the constructive tools for conserving the sacred groves, and erosion of belief and taboos has led to deterioration of groves [50, 31].

### **Conclusion**

The pan-Indian distribution of sacred groves is a subject of great interest to biologists, social scientists, anthropologists and policy makers because groves represent a variety of ecosystems, social and ethnic identities, management regimes, legal tenures, and cultural

traditions [51, 52]. Although groves are well explored by scholars for their biodiversity and socio-religious importance, their potential in ecosystem services are scantily studied. However, diminishing size and lack of proper recognition affect expected ecosystem services from sacred groves especially regulatory and supporting ones. A smaller grove can support local biota, may provide goods like Non Timber Forest Products (NTFP), medicinal plants, fuel-wood, etc. And also long lasting services for example ground water recharge, flood control, fire resistance require larger dimension and proper management of the grove system. More research is needed to assess the potential of the sacred grove for ecosystem services and their importance in livelihood maintenance.

## Reference

1. Daily G. and Matson P. A. 2008. Ecosystem services: From theory to implementation. *Proc Natl Acad Sci USA* 105(28):9455–9456.
2. West, Amy. 2015. Core Concept: Ecosystem services. *Proc Natl Acad Sci USA* 112(24): 7337–7338.
3. Millennium Ecosystem Assessment (MEA). 2005. Ecosystems and human well-being: synthesis. Island Press, Washington, D.C., USA.
4. Daily, G.C. 1997. “Introduction: What are Ecosystem Services?” in Daily, G.C., “Nature's Services: Societal Dependence on Natural Ecosystems”, Island Press, Washington, D.C.
5. Bratman GN, Hamilton JP, Daily G.C. 2012. The impacts of nature experience on human cognitive function and mental health. *Ann N Y Acad Sci* 1249(1):118–136.
6. Israel E, Vijai C, Narasimhan D. 1997. Sacred groves: Traditional ecological heritage. *International Journal of Ecology and Environmental Sciences*, 23: 463-470.
7. Skolmowski, H. 1991. “Sacred groves in history.” *Himalaya Man and Nature* XV: 5.
8. Oviedo G, Jeanrenaud S, Otegui M. 2005. Protecting Sacred Natural Sites of Indigenous and Traditional Peoples: An IUCN Perspective. Gland, Switzerland.
9. Bhagwat, S. A. and Rutte, C. 2006. Sacred groves: Potential for biodiversity management. *Frontiers in Ecology and the Environment*, 4: 519-524
10. Khan, M. L., Khumbongmayum, ashalata Devi and Tripathi, R. S. 2008. The Sacred Groves and Their Significance in Conserving Biodiversity: An Overview. *International Journal of Ecology and Environmental Sciences* 34 (3): 277-291.
11. Hughes, J D, and Chandran, M D S. 1998. Sacred groves around the earth: an overview, In: Ramakrishnan, PS, Saxena, KG and Chandrashekara, U M (eds.) *Conserving the Sacred for Bio-diversity Management*, Oxford and IBH Publishing Co., New Delhi, pp. 69-86.
12. Dudley N, Higgins-Zogib L, Mansourian S. 2009. The links between protected areas, faiths, and sacred natural sites. *Conserv Biol.* 23:568–577.
13. Gadgil, M. and Vartak, V.D. 1975. Sacred groves of India –A plea of the continuous conservation. *Journal of Bombay Natural History Society* 72(2): 313-320.
14. Adams, W. M. 2007. Editorial. *Oryx* 41(3):275-276.
15. Sandbrook, C., W. M. Adams, B. Büscher, and B. Vira. 2013. Social research and biodiversity conservation. *Conservation Biology* 27(6):1487-1490.
16. Moon, K. and D. Blackman. 2014. A guide to understanding social science research for natural scientists. *Conservation Biology* 28(5):1167-1177.
17. Gavin, M. C., J. McCarter, A. Mead, F. Berkes, J. R. Stepp, D. Peterson, and R. Tang. 2015. Defining biocultural approaches to conservation. *Trends in Ecology & Evolution* 30(3):140-145.
18. Ruckelshaus M, et al. 2013. Notes from the field: Lessons learned from using ecosystem service approaches to inform real world decisions. *Ecol Econ* 115:11–21.

19. Hughes, J.D. 1984. Sacred groves: The Gods, Forest protection, and sustained yield in the ancient world. In H.K. Steen (ed.). *History of Sustained-Yield Forestry: A Symposium*. pp 331–343. Forest History Society, Durham, NC.
20. Dorm-adzobou, C., O. Ampadu-agyei and P.G. Veit. 1991. Religious Beliefs and Environmental protection: The malshegu sacred grove in Northern Ghana. The ground up case study No. 4. Centre for International Development and Environment, World Recourse Institute, Nairobi and New York.
21. Molyneaux, B.L. 1995. *The sacred Earth*. Little, Brown and Company, New Delhi.
22. Amirthalingam, M. 2016. Sacred Groves of India: An Overview. *Int. J. Curr. Res. Biosci. Plant Biol.* 2016, 3 (4): 64-74.
23. Gokhale, Y. and Pala, N. A. 2011. Ecosystem Services in Sacred Natural Sites (SNSs) of Uttarakhand: A Preliminary Survey. *J Biodiversity*, 2(2): 107-115.
24. Harsha VH, Hebbar SS, Hegde GR, Shripathi V. 2002. Ethnomedical knowledge of plants used by Kunabi Tribe of Karnataka in India. *Fitoterapia*. 73(4):281–287.
25. Waghchaure CK, Tetali P, Gunale VR, Antia NH, Birdi TJ. 2006. Sacred groves of Parinche valley of Pune district of Maharashtra, India and their importance. *Anthropol Med.* 13(1):55–76.
26. Sukumaran S and Raj ADS. 2010. Medicinal plants of sacred groves in Kanyakumari district Southern Western Ghats. *Indian J. Traditional Knowl.* 9(2):294–299
27. Mourato S, and Smith, J. 2002. Can carbon trading reduce deforestation by slash-and burn farmers? Evidence from the Peruvian Amazon. In: D Pearce, C Pearce, C Palmer (Eds.): *Valuing the Environment in Developing Countries - Case Studies*. Cheltenham, UK: Edward Elgar Publishing Ltd., pp. 358-376
28. Godbole, A., Watve, A., Prabhu, S. and Sarnaik, J. 1998. Role of sacred grove in biodiversity conservation with local people's participation: A case study from Ratnagiri district, Maharashtra. Pages 233-246, In: Ramakrishnan, P.S., Saxena, K.G. and Chandrashekara, U.M. (Editors) *Conserving the Sacred for Biodiversity Management*. UNESCO and Oxford-IBH Publishing, New Delhi.
29. Godbole, A. and Sarnaik, J. 2004. *Tradition of Sacred Groves and Communities Contribution in Their Conservation*. Applied Environmental Research Foundation, Pune. 60 pages.
30. Tiwari, B.K., Barik, S.K. and Tripathi, R.S. 1998a. Sacred groves of Meghalaya. Pages 253-262, In: Ramakrishnan, P.S., Saxena, K.G. and Chandrashekara, U.M. (Editors) *Conserving the Sacred, for Biodiversity Management*. UNESCO and Oxford-IBH Publishing, New Delhi.
31. Tiwari, B.K., Barik, S.K. and Tripathi, R.S. 1998b. Biodiversity value, status and strategies for conservation of sacred groves of Meghalaya, India. *Ecosystem Health* 4(1): 20-32.
32. Ramakrishnan, P.S. and Ram, S.C. 1988. Vegetation, biomass and productivity of seral grasslands of Cherrapunji in north-east India. *Vegetatio* 84: 47-53.
33. Singh, G.S., Rao, K.S. and Saxena, K.G. 1998. Eco-cultural analysis of sacred species and ecosystems in Chhakinal watershed, Himachal Pradesh. Pages 301-314, In: Ramakrishnan, P.S., Saxena, K.G. and Chandrashekara, U.M. (Editors) *Conserving the Sacred for Biodiversity Management*. UNESCO and Oxford-IBH Publishing, New Delhi.
34. Khiewtam RS and Ramakrishnan PS. 1993. Litter and fine root dynamics of a relict sacred grove forest at Cherrapunji in north-eastern India. *For Ecol and Manag* 60: 327-344.
35. Lal JB, Singh GAK, Prajapati RC. 1990. Deforestation study in Kodagu district of Karnataka using Landsat MSS data. *Indian Forester*. 116:487–493.

36. Godbole, A. 1996. Role of tribals in preservation Sacred Forests. *Ethnobiology in Human Welfare*. Deep Publications, New Delhi. 345- 348.
37. Baraiah, K. T., Vasudewa, R., Bhagwat, S. A., & Kushadappa, C. G. 2003. Do Informal Managed Sacred Groves Have Higher Richness and Regeneration of Medicinal Plants than State—Managed Research Forests? *Current Science*, 84, 804-808.
38. Joshi, N.V., Gadgil, M., 1991. On the role of refugia in promoting prudent use of biological resources. *Theor. Popul. Biol.* 40, 211-229.
39. Maikhuri, R.K., Nautiyal, S., Rao, K.S. and Saxena, K.G. 1998. Role of medicinal plants in the traditional health care systems: A case study from Nanda Devi Biosphere Reserve. *Current Science* 75(2): 152-157.
40. Lyngwi, N. A., & Joshi, S. R. 2015. 'Traditional Sacred Groves', an Ethnic Strategy for Conservation of Microbial Diversity. *Indian Journal of Traditional Knowledge*, 14, 474-480.
41. Khumbongmayum, A. D., Khan M. L., Tripathi R. S. 2004. Sacred groves of Manipur - ideal centres for biodiversity conservation. *Conservation Science*, 87: 430-433.
42. Byers BA, Cunliffe R. Hudak AT 2001. Linking the conservation of culture and nature: A case study of sacred forests in Zimbabwe. *Journal of Human Ecology*, 29: 187-218.
43. Khumbongmayum, A. D., Khan M.L. and Tripathi R.S. 2005. Ethnomedicinal plants in the sacred groves of Manipur. *Indian J of Trad Knowl* 4: 21-32.
44. Ulman YN and Mokat DN. 2008. Sacred groves as a potential minor forest products reserve. *International J of For Usufract Manag* 9: 47-60.
45. Jamir SA and Pandey HN. 2003. Vascular plant diversity in the sacred groves of Jaintia Hills in northeast India. *Biodiv and Conserv* 12: 1497–1510.
46. Arunachalam A and Arunachalam K. 2000. Influence of gap size and soil properties on microbial biomass in a subtropical humid forest of north-east India. *Plant and soil* 223: 185 – 193.
47. Saxena, K.G., Rao, K.S. and Maikhuri, R.K. 1998. Religious and cultural perspective of biodiversity conservation in India: A review. Pages 153-161, In: Ramakrishnan, P.S., Saxena, K.G. and Chandrasekhar U.M. (Editors) *Conserving the Sacred for Biodiversity Management*. UNESCO and Oxford-IBH Publishing, New Delhi.
48. Fraser, J. A., M. Diabaté, W. Narmah, P. Beavogui, K. Guilavogui, H. De Foresta, and A. B. Junqueira. 2016. Cultural valuation and biodiversity conservation in the Upper Guinea forest, West Africa. *Ecology and Society* 21(3):36.
49. Sinha, B and Maikuri, R. R. 1998. Conservation through Socio- Cultural religious practices in Garhwal Himalaya .A case study of Haryali. Sacred site. APH Publication Corporation, New Delhi. 289- 299.
50. Vartak, V.D. and Gadgil. M. 1981. Studies on sacred groves along the Western Ghats from Maharashtra and Goa: Role of beliefs and folklores. In: Jain, S.K. (Editor) *Glimpses of Ethnobotany*. Oxford University Press, Bombay. Pp. 272-278.
51. Ray, Rajasri, Chandran, M. D. S. and Ramachandra, T.V. 2010. Ecosystem Services from Sacred Groves of Uttar Kannada- A Case Study. *Proceedings of Lake 2010: Wetlands, Biodiversity and Climate Change*, pp 1-8.
52. Ray, Rajasri, Chandran, M. D. S. and Ramachandra, T.V. 2014. Biodiversity and ecological assessments of Indian sacred groves. *Journal of Forestry Research*. 25 (1), pp 21-28.