International Journal of Environmental and Ecology Research
www.environmentaljournal.in
Online ISSN: 2664-7117
Received: 10-03-2026, Accepted: 10-04-2026, Published: 25-04-2026
Volume 8, Issue 2, 2026, Page No. 6-9

Sacred groves as reservoirs of biodiversity: An indigenous conservation model

Sahaya Mary[1*], Kavitha R S[2], Asha D R[1]
[1] Department of Botany, Teresian College, Mysuru, Karnataka, India
[2] Department of Zoology, Teresian College, Mysuru, Karnataka, India
Corresponding Author: Sahaya Mary

Abstract
Sacred groves are traditionally protected forest patches conserved by indigenous communities through cultural and religious practices, representing one of the oldest forms of biodiversity conservation. In Karnataka, these groves—locally known as Devarakadus, Kans, and Nagabanas—play a significant role in preserving ecological integrity within the biodiversity-rich landscapes of the Western Ghats. This review synthesizes existing literature on the biodiversity, ecological significance, and conservation value of sacred groves in Karnataka. The analysis highlights that sacred grove function as micro-reserves of biodiversity, harbouring endemic, rare, and medicinal plant species, while also supporting diverse faunal communities. These ecosystems contribute to essential ecosystem services, including soil conservation, water regulation, and microclimate stabilization. The review further emphasizes the critical role of indigenous knowledge systems and socio-religious practices in regulating resource use and ensuring long-term conservation. Despite their importance, sacred groves are increasingly threatened by urbanization, land-use changes, and the erosion of traditional belief systems. The study identifies key research gaps, including limited focus on faunal and microbial diversity, lack of long-term ecological monitoring, and insufficient integration of traditional knowledge with modern scientific approaches. The review underscores the need for interdisciplinary research and policy interventions that integrate indigenous conservation practices with contemporary ecological frameworks. Strengthening community participation and incorporating sacred groves into formal conservation strategies are essential for ensuring their sustainability. Sacred groves thus represent a valuable model for biodiversity conservation, offering important insights into sustainable environmental management in the face of growing ecological challenges

Keywords: Sacred groves, indigenous knowledge, biodiversity conservation, ethnobotany, ecosystem services, traditional ecological knowledge

Introduction

Sacred groves are forest fragments conserved by indigenous communities due to their religious and cultural significance. Found across various regions of the world, particularly in India, these groves represent one of the oldest forms of biodiversity conservation. They are often associated with deities, ancestral spirits, or traditional rituals, which restrict exploitation and ensure long-term ecological protection. Such culturally protected landscapes exemplify the profound interconnection between human societies and nature, where belief systems serve as powerful and effective mechanisms for environmental conservation. (Gadgil & Vartak, 1976; Ramakrishnan, 1996) [3, 5]. In recent years, sacred groves have gained increasing scientific attention for their role in preserving biodiversity, maintaining ecological balance, and supporting ecosystem services. Studies have shown that these groves act as reservoirs of endemic, rare, and medicinal plant species while also providing habitats for diverse faunal communities. Additionally, they contribute to essential ecosystem services such as soil conservation, water regulation, carbon sequestration, and microclimate stabilization (Bhagwat & Rutte, 2006) [1].

In Karnataka, sacred groves—locally known as Devarakadus, Kans, and Nagabanas—are integral to both cultural heritage and ecological sustainability. These groves are particularly prominent in the biodiversity-rich landscapes of the Western Ghats, where they serve as micro-reserves within fragmented ecosystems. Studies have shown that sacred groves in Karnataka support rich plant diversity and act as vital refuges for species that are no longer found in the surrounding degraded landscapes. (Chandran & Hughes, 2000; Kushalappa & Bhagwat, 2001) [2, 4]. However, despite their ecological and cultural importance, sacred groves are increasingly threatened by modernization, land-use changes, and the gradual erosion of traditional belief systems. The decline of traditional conservation practices has resulted in the deterioration, encroachment, and erosion of biodiversity in many sacred groves, especially those situated close to expanding urban areas and agricultural zones. (Kushalappa & Bhagwat, 2001) [4]. These challenges highlight the need for a comprehensive understanding of sacred groves within the framework of contemporary conservation science.

Against this backdrop, the present review aims to critically examine the ecological and cultural significance of sacred groves as indigenous conservation models, with a particular focus on Karnataka. It seeks to synthesize existing literature on biodiversity, analyse the role of indigenous knowledge systems in conservation, and identify key research gaps and future directions. By integrating traditional ecological knowledge with modern scientific approaches, this review underscores the potential of sacred groves as sustainable models for biodiversity conservation.

Synthesis of Literature on Sacred Groves and Biodiversity in Karnataka

1. Overview of Studies in Karnataka

Sacred groves in Karnataka constitute an important component of traditional ecological conservation systems, particularly within the biodiversity-rich landscapes of the Western Ghats. These groves, locally known as Devarakadus in Kodagu, Kans in Uttara Kannada, and

Nagabanas in coastal regions, are protected through long-standing socio-religious beliefs and customary practices. Over time, these culturally preserved forest patches have attracted considerable scientific attention due to their ecological significance and role in biodiversity conservation (Gadgil & Vartak, 1976; Ramakrishnan, 1996) [3, 5]. Early studies on sacred groves in India, including Karnataka, were largely descriptive and focused on documenting their cultural and traditional importance. For instance, Madhav Gadgil and V. D. Vartak (1976) [3] highlighted that sacred groves represent relic patches of original vegetation and function as repositories of biodiversity conserved through community protection. Their work emphasized that these groves serve as remnants of climax vegetation, thereby providing insights into pre-disturbance ecological conditions (Gadgil & Vartak, 1976) [3].

Subsequent research in Karnataka has increasingly focused on ecological and biodiversity assessments, particularly in the Western Ghats region. Studies conducted in Uttara Kannada demonstrated that sacred groves, locally referred to as kans, preserve evergreen forest patches and support a high diversity of plant species, including endemic and rare taxa (Chandran & Hughes, 2000) [2]. These groves act as micro-reserves within fragmented landscapes, maintaining ecological continuity and serving as refugia for species that are absent in surrounding degraded habitats (Chandran & Hughes, 2000) [2]. In Kodagu district, sacred groves known as Devarakadus have been extensively studied for their biodiversity value and traditional management systems. Research indicates that these groves harbour significant floristic diversity, including medicinally important plant species, and are protected through clan-based governance and strict cultural taboos (Kushalappa & Bhagwat, 2001) [4]. Such indigenous management practices effectively regulate resource use and contribute to long-term ecological stability (Kushalappa & Bhagwat, 2001) [4].

Although most studies in Karnataka have focused on plant diversity, there is growing recognition of the faunal and microbial components of sacred grove ecosystems. Available literature suggests that these groves provide important habitats for birds, insects, amphibians, and small mammals, thereby supporting overall ecosystem functioning (Ramakrishnan, 1996) [5]. In addition, recent research indicates that sacred groves maintain rich soil microbial diversity, which plays a crucial role in nutrient cycling and soil fertility, although systematic studies in this area remain limited (Ramakrishnan, 1996) [5]. A notable trend in the literature is the transition from descriptive ethnographic studies to more quantitative and analytical approaches. Contemporary research increasingly employs biodiversity indices, ecological assessments, and conservation frameworks to evaluate the significance of sacred groves (Chandran & Hughes, 2000) [2]. This shift reflects a broader recognition of sacred groves as not only cultural landscapes but also scientifically important ecological systems.

Despite the growing body of research, several gaps persist in the study of sacred groves in Karnataka. Most studies are geographically concentrated in regions such as Uttara Kannada and Kodagu, leaving other areas underexplored (Kushalappa & Bhagwat, 2001) [4]. Furthermore, there is a lack of long-term ecological monitoring and limited integration of indigenous knowledge with modern scientific methodologies (Ramakrishnan, 1996) [5]. Addressing these gaps is essential for enhancing the understanding and conservation of sacred groves as biodiversity reservoirs.

2. Regional Distribution and Ecological Context

2.1 Western Ghats Region of Karnataka

The sacred groves of the Western Ghats in Karnataka are among the most extensively studied due to their high biodiversity value. These groves harbour a wide range of endemic plant species and serve as important refugia for climax vegetation. Research indicates that sacred groves in this region retain fragments of original evergreen forests, helping to sustain ecological continuity in areas heavily affected by human activities. (Chandran & Hughes, 2000) [2]. In Uttara Kannada district, kans (sacred forests) have been documented to conserve relic evergreen species that are otherwise absent in surrounding degraded forests. These groves function as micro-reserves, protecting biodiversity through traditional community-based management systems and contributing to the conservation of species composition and ecosystem structure (Chandran & Hughes, 2000) [2].

2.2 Kodagu District

In Kodagu (Coorg), sacred groves known as Devarakadus are closely associated with local deities and clan-based protection systems. These groves support high floristic diversity, including medicinal plants and rare tree species, thereby contributing significantly to regional biodiversity conservation (Kushalappa & Bhagwat, 2001) [4]. The protection of these groves is strictly enforced through socio-religious taboos and customary laws, which limit human interference and promote ecological stability. Such indigenous conservation practices play a crucial role in maintaining the structural and functional integrity of these ecosystems (Kushalappa & Bhagwat, 2001) [4].

3. Biodiversity Across Different Biological Components

3.1 Floristic Diversity

Most studies conducted in Karnataka emphasize plant diversity within sacred groves, highlighting their importance as repositories of rich vegetation. These groves typically exhibit multi-layered vegetation structure, comprising trees, shrubs, climbers, and herbaceous species, which collectively contribute to high species richness and ecological complexity. The presence of endemic and threatened plant species further underscores their role as in-situ conservation sites, preserving relics of native vegetation that have disappeared from surrounding landscapes (Chandran & Hughes, 2000) [2]. Additionally, sacred groves in regions of the Western Ghats are known to support climax vegetation and serve as gene pools for several economically and medicinally important plant species (Ramakrishnan, 1996) [5]. Such floristic richness highlights their ecological significance in maintaining biodiversity at the regional level.

3.2 Faunal Diversity

Although relatively less documented compared to plant diversity, sacred groves in Karnataka also support a wide range of faunal species. These include birds, amphibians, reptiles, insects, and small mammals, many of which depend on undisturbed habitats for survival. The relatively pristine and protected nature of sacred groves creates unique ecological niches that are often absent in managed or disturbed ecosystems (Ramakrishnan, 1996) [5]. Studies suggest that these groves function as refuges for faunal diversity, contributing to ecosystem stability and supporting trophic interactions within the habitat. However, comprehensive and well-structured faunal assessments of

sacred groves in Karnataka are still scarce, highlighting the need for more focused research in this field. (Bhagwat & Rutte, 2006) [1].

3.3 Microbial and Soil Diversity

Recent studies have begun to explore microbial and soil diversity within sacred groves, revealing their importance in maintaining ecosystem functioning. Sacred groves are known to harbour rich soil microbial communities, including bacteria and fungi, which play a crucial role in nutrient cycling, organic matter decomposition, and soil fertility (Ramakrishnan, 1996) [5]. The undisturbed soil conditions and continuous litter deposition in these groves create favourable environments for microbial activity, thereby enhancing soil health and ecosystem productivity. However, systematic and region-specific studies on microbial diversity in Karnataka sacred groves are still scarce, representing a significant gap in current research (Bhagwat & Rutte, 2006) [1]. Addressing this gap could provide deeper insights into the functional ecology of sacred grove ecosystems.

4. Common Findings from Karnataka-Based Studies

A synthesis of literature from Karnataka reveals several consistent patterns regarding the ecological and cultural significance of sacred groves. These groves function as micro-reserves of biodiversity within increasingly fragmented landscapes, preserving patches of native vegetation that are otherwise lost due to anthropogenic pressures (Chandran & Hughes, 2000) [2]. They play a vital role in safeguarding endemic, rare, and medicinal plant species, functioning as important in situ conservation areas and reservoirs of genetic diversity (Gadgil & Vartak, 1976; Ramakrishnan, 1996) [3, 5]. Furthermore, indigenous protection systems, rooted in socio-religious beliefs and customary practices, effectively regulate resource use and prevent overexploitation, ensuring the long-term sustainability of these ecosystems (Kushalappa & Bhagwat, 2001) [4]. In addition to biodiversity conservation, sacred groves contribute significantly to ecosystem services such as water conservation, soil stability, and microclimate regulation, enhancing overall ecological resilience (Bhagwat & Rutte, 2006) [1]. Collectively, these findings strongly support the role of sacred groves as effective indigenous conservation models, demonstrating how traditional knowledge systems can complement modern conservation strategies (Ramakrishnan, 1996) [5].

5. Variations and Contradictions in Findings

Despite the general consensus on the ecological importance of sacred groves in Karnataka, several variations and contradictions have been reported across studies. Differences in biodiversity levels are often observed between groves, largely influenced by factors such as size, degree of protection, and intensity of human disturbance (Chandran & Hughes, 2000) [2]. Larger and well-protected groves tend to exhibit higher species richness and better structural integrity compared to smaller or partially degraded ones. Moreover, some studies provide evidence of ecological degradation in certain sacred groves, primarily attributed to the weakening of traditional belief systems and reduced adherence to customary practices (Kushalappa & Bhagwat, 2001) [4]. This decline in cultural protection has led to increased exploitation of resources and loss of biodiversity. In addition, sacred groves located near urban or agricultural areas are more susceptible to human interference, including encroachment, grazing, and resource extraction, further compromising their ecological stability (Kushalappa & Bhagwat, 2001) [4]. These variations highlight the significant influence of socio-economic changes on the ecological integrity of sacred groves. They also underscore the need for integrating traditional knowledge systems with modern conservation strategies to ensure the sustainable management of these ecologically and culturally valuable ecosystems (Ramakrishnan, 1996) [5].

6. Trends in Research in Karnataka

Research on sacred groves in Karnataka has evolved significantly over time, reflecting a shift in scientific focus and methodological approaches. Early studies were largely descriptive, emphasizing documentation of sacred groves and their cultural and religious significance, thereby highlighting their role in traditional conservation systems (Gadgil & Vartak, 1976) [3]. Over time, research has progressively moved towards more analytical and quantitative approaches, particularly in the biodiversity-rich regions of the Western Ghats. Recent studies increasingly focus on quantitative biodiversity assessments using ecological indices, detailed vegetation analysis, and species inventories to evaluate the conservation value of sacred groves (Chandran & Hughes, 2000) [2]. In addition, there is growing emphasis on understanding the ecological and conservation significance of these groves as micro-reserves that support endemic and threatened species (Ramakrishnan, 1996) [5]. Furthermore, contemporary research has begun to explore the role of sacred groves in climate resilience and sustainability, particularly in terms of carbon sequestration, microclimate regulation, and ecosystem stability (Bhagwat & Rutte, 2006) [1]. This transition from descriptive to quantitative and interdisciplinary research reflects an increasing recognition of sacred groves as critical components of regional conservation planning. It also highlights the importance of integrating traditional ecological knowledge with modern scientific frameworks to ensure the long-term sustainability of these ecosystems.

7. Research Gaps in Karnataka Context

Despite substantial research on sacred groves in Karnataka, several critical gaps remain that limit a comprehensive understanding of their ecological and conservation significance. Most studies have predominantly focused on floristic diversity, with relatively limited attention given to faunal and microbial components, thereby restricting insights into the full spectrum of biodiversity within these ecosystems (Ramakrishnan, 1996; Bhagwat & Rutte, 2006) [1, 5]. Additionally, there is a lack of long-term ecological monitoring, which is essential for assessing changes in species composition, ecosystem dynamics, and the impacts of environmental and anthropogenic pressures over time (Chandran & Hughes, 2000) [2]. Another significant gap is the insufficient integration of indigenous knowledge systems with modern scientific conservation strategies. While traditional practices have historically played a vital role in protecting sacred groves, their incorporation into formal conservation frameworks remains limited (Gadgil & Vartak, 1976) [3]. Furthermore, there is a growing need for the application of advanced tools such as Geographic Information Systems (GIS) and quantitative ecological methods to map, analyse, and monitor sacred grove ecosystems more effectively (Bhagwat & Rutte, 2006) [1]. Addressing these gaps is essential for strengthening

conservation efforts and ensuring the sustainable management of sacred groves in Karnataka. Integrating interdisciplinary approaches that combine ecological science, traditional knowledge, and modern technology can significantly enhance the conservation potential of these unique ecosystems.

Conclusion

Sacred groves stand as remarkable examples of how cultural traditions and ecological wisdom can work together to conserve biodiversity. In Karnataka, these protected forest patches continue to play a crucial role in safeguarding a wide range of plant and animal species, many of which are rare, endemic, or of medicinal importance. Acting as ecological sanctuaries amid highly fragmented landscapes, sacred groves play an important role in preserving environmental stability and supporting key ecosystem services, including soil retention, water regulation, and local climate moderation. What makes sacred groves particularly unique is the role of indigenous knowledge systems in their preservation. Community beliefs, rituals, and customary practices have historically acted as effective conservation tools, ensuring minimal disturbance and long-term sustainability. This form of conservation, rooted in cultural values rather than formal regulations, offers important insights into alternative and sustainable approaches to environmental management. However, the continued survival of sacred groves is increasingly uncertain. Rapid urbanization, changing land-use patterns, and the gradual decline of traditional belief systems have weakened the cultural mechanisms that once ensured their protection. As a result, many groves are facing degradation, fragmentation, and loss of biodiversity. These challenges highlight the urgent need to recognize sacred groves not only as cultural heritage sites but also as critical ecological assets deserving formal conservation attention.

Moving forward, a balanced approach that integrates traditional knowledge with modern scientific methods is essential. Strengthening community involvement, promoting awareness, and incorporating sacred groves into regional conservation planning can enhance their protection. At the same time, expanding research to include lesser-studied aspects such as faunal diversity, microbial ecology, and long-term ecosystem dynamics will provide a more comprehensive understanding of their ecological value. In essence, sacred groves offer a powerful model of harmonious coexistence between humans and nature. Preserving these ecosystems is not merely about conserving biodiversity, but also about sustaining cultural identity and ecological resilience. In an era of growing environmental challenges, sacred groves hold enduring relevance as living examples of sustainable conservation practices.

References

1. Bhagwat SA, Rutte C. Sacred groves: Potential for biodiversity management. Frontiers in Ecology and the Environment,2006:4(10):519–524. https://doi.org/10.1890/1540-9295(2006)4[519:SGPFBM]2.0.CO;2
2. Chandran MDS, Hughes JD. Sacred groves and conservation: The comparative history of traditional reserves in the Western Ghats of India. Environment and History,2000:6(2):169–186. https://doi.org/10.3197/0967340001 29342262
3. Gadgil M, Vartak VD. Sacred groves of India: A plea for continued conservation. Journal of the Bombay Natural History Society,1976:72:313–320.
4. Kushalappa CG, Bhagwat SA. Sacred groves: Biodiversity, threats and conservation. Current Science,2001:80(12):1655–1656.
5. Ramakrishnan PS. Conserving the sacred: From species to landscapes. Nature & Resources,1996:32(1):11–19.