Sacred groves: potential for biodiversity management

Journal Item

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Existing global protected area networks have two shortcomings: (1) they do not cover certain habitats, and (2) local people often resent their formal management. Here, we show that communities around the world traditionally protect natural sites that are dedicated to ancestral spirits or deities. Such sites cover a wide variety of habitats and are often located in biodiversity rich regions. Case studies on sacred groves show that these small forest patches play an important role in biodiversity conservation. Furthermore, natural sacred sites are maintained through traditional methods of community based conservation that do not require governmental involvement. Incorporating these sites into conservation networks could enhance the effectiveness of protected areas by covering a wider variety of habitats and by harnessing the support of local people. In this article, we discuss current threats to sacred groves that need to be addressed through management approaches. More research on the ecology and underlying socioeconomic mechanisms of natural sacred sites is required to fully reveal their potential for biodiversity conservation.

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Protected areas are thought to be the cornerstones of biodiversity conservation and the safest strongholds for wildlife (Bruner *et al.* 2001). Since the first national park was set up in Yellowstone, in 1872, some 104 791 protected areas have been established around the world, representing over 12% of the Earth's land surface (UNEP–WCMC 2005). However, only 6% of this formally protected land surface (World Conservation Union [IUCN] categories I–IV) lies within the areas recognized as biodiversity hotspots. The high rates of population growth and competing economic interests for available land (Cincotta *et al.* 2000) mean that the formal protected area network in many regions may never achieve the internationally agreed upon target of at least 10% coverage per region (SCBD 2004). Furthermore, it has been argued that such ad hoc targets may be insufficient to protect many species in the world's biodiversity rich regions (Rodrigues *et al.* 2004).

In a nutshell:

- Natural sacred sites exist in many countries all over the world
- Communities often share and manage natural sacred sites that are not under formal protection
- We propose that such habitats should be included in biodiversity management
- However, first, further research is needed to more fully understand their potential role in biodiversity conservation

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It has been recognized that the existing protected areas system has two major shortcomings. First, protected areas do not cover certain critical habitats and species because they are often located on land that has no other use. Mountainous regions with low human population densities are favored, while fertile agricultural valleys with high population densities are often excluded. For instance, although 23% of the Earth's tropical forests are protected, only 8% of cropland and natural vegetation mosaic habitats receive the same protection (Chape *et al.* 2005). As a consequence, the degree to which biodiversity is represented within the existing network of protected areas is unknown and may leave a considerable number of species unprotected (Rodrigues *et al.* 2004). Second, the management of protected areas is often ineffective in preventing human encroachment (Brandon *et al.* 1998). Of the 7322 protected areas in developing countries, where many people still rely on wild resources for food, animal fodder, and fuel, 30% are strictly protected, permitting no use of resources (Pretty 2003). The exclusion of local people is believed to be one of the reasons why protected areas are ineffective, despite the large sums of money and manpower invested in them (Brown 2003).

Here, we present evidence of nature conservation traditions from across the world and refer to specific examples from biodiversity rich countries where such traditions are upheld, even today. Natural sacred sites, protected by local traditions, are often situated within agricultural landscapes. They can play a valuable role in biodiversity conservation because of their long history and the local people's willingness to protect and conserve them. We argue that by incorporating natural sacred sites into the existing protected area networks, the effectiveness of these networks in achieving conservation objectives

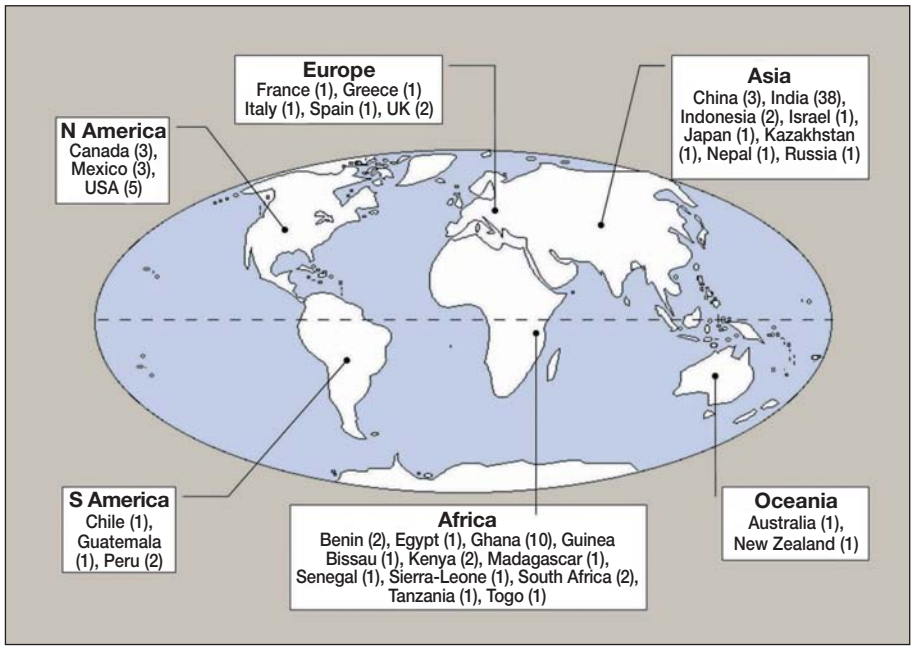

Figure 1. *Natural sacred sites are found on all continents except Antarctica. Our examples come from 33 different countries – three each from North and South America; five from Europe; 12 from Africa; eight from Asia; and two from Oceania. Numbers in parentheses indicate the total number of examples from that country. In addition to these examples, three others – two from Europe and one from the whole world – represented more than one country and are not shown. See WebOnly material for full citations to the literature surveyed.*

could be improved, by increasing the variety of protected habitats and by harnessing the support of local people. We also discuss management approaches for sacred groves that could help to mitigate the current threats to these tradition-linked areas.

Conserving sacred sites to protect biodiversity

We searched for peer-reviewed papers and conference proceedings on the ISI Web of Knowledge database (http://wok.mimas.ac.uk/) and found 98 references to natural sacred sites (WebTable 1). Such sites are found on every continent except Antarctica (Figure 1) and include a wide variety of habitats that we have classified into ten categories (Table 1).

One such tradition involves the protection of small patches of forest as sacred (Gadgil and Vartak 1975). Sacred groves (Figure 2) occur in various forms, including burial grounds (Mgumia and Oba 2003; Wadley and Colfer 2004) and sites of ancestral or deity worship (Ramakrishnan *et al.* 1998), and they exist in many different countries (WebTable 1). The local communities establish rules that vary from grove to grove; these often prohibit the felling of trees and the killing of animals, but do allow for the collection of firewood, fodder, and medicinal plants by local people (Hughes and Chandran 1998).

As a result of these restrictions, such sacred areas are preserved over many generations, and can become important reservoirs of biodiversity. For example, sacred groves in the Kodagu district of Karnataka state, India (Figure 2), have relict populations of certain threatened tree species (*Actinodaphne lawsonii*, *Hopea ponga*, *Madhuca neriifoli*, and *Syzygium zeylanicum*) that are not found in the formal protected areas (Bhagwat *et al.* 2005a). These groves also shelter a high diversity of macrofungi; 49 out of 163 species are unique to sacred groves (Brown *et al.* 2006). In the coastal regions of Karnataka state, numerous riparian groves of *Myristica fatua* and *Gymnacranthera canarica* trees have been reported (Chandran and Mesta 2001). This species, which belongs to the nutmeg family, is rarely found in official protected areas. In central Tanzania, Mgumia and Oba (2003) found a greater woody plant species richness in sacred groves than in a state-managed forest reserve.

The presence of sacred groves in cultivated landscapes can also provide habitat and corridors, allowing the movement of many different organisms (Decher 1997b; Wadley and Colfer 2004). In India, sacred groves exist in 19 out of 28 states, and it is estimated that there are between 100 000–150 000 throughout the country (Malhotra *et al.* 2001). Although the majority of these groves are less than 1 ha in size and cover only 0.01% of the total geographic area of the country, it is their number and spatial distribution that make them so valuable for biodiversity conservation (Bhagwat *et al.* 2005b). In the Kodagu district, Kalam (1996) reported at least 1214 sacred groves, one for every 300 ha of land. The cover of native shade trees in the neighboring coffee plantations also provides habitat corridors for many species in the cultivated landscape (Bhagwat *et al.* 2005b).

It is questionable whether any single sacred grove could have conservation value, in view of the small size of these fragmented forest patches (eg Hill and Curran 2001). However, as a network, the sacred groves in a region can preserve a sizeable portion of the local biodiversity in areas where it would not be feasible to maintain large tracts of protected forests and where protected reserves would be unlikely to receive local support. However, such a network would depend on there being a certain number of forest patches, each covering a minimum area (eg Tabarelli and Gascon 2005).

Although more research is needed on the role of sacred groves in landscape connectivity and on how these traditional sites can be integrated into existing conservation management practices, the existence of sacred groves has come under threat in many places (eg Chandrakanth *et al.* 2004). It is therefore important to develop management

approaches that encourage the conservation of these sites. Ironically, established conservation programs (eg protected area networks) do not recognize the value of traditional institutions, despite the existing evidence for their effectiveness in biodiversity conservation and pressure from researchers to include them in local and regional conservation planning (Colding and Folke 2001; Chan-drakanth *et al.* 2004).

Table 1. Natural sacred sites protect a wide variety of habitats in 33 countries (see WebOnly material for full citations to the reviewed literature)

Habitat protected	*Countries/regions represented*
Coastal	Australia, Guinea-Bissau, Japan, Togo
Cultivated	Indonesia, Mexico
Forest	Benin, China, Egypt, Ghana, India, Indonesia, Madagascar, Sierra Leone
Garden	New Zealand, USA, Europe
Lakes	Egypt, India, Kenya, South Africa
Mixed landscape	Canada, Guatemala, India, Mexico, Spain, UK, USA
Montane	Chile, China, France, Greece, India, Italy, Kazakhstan, Nepal, Peru, Russia, UK, USA, Europe, global
Riparian	Canada, India
Savanna	Ghana, South Africa, USA
Woodlots	Ghana, India, Israel, Senegal, Tanzania

Community values of sacred groves conservation

While it is difficult to determine the origins of the tradition of conserving sacred groves without historical evidence, it is thought that this dates back to pre-agrarian societies (Kosambi 1962). With the advent of agriculture, people may have set aside patches of natural habitats that were considered sacred, while surrounding forests were cleared for cultivation (Hughes and Chandran 1998). The subsequent increase in population may have compelled people to use these sites for day-to-day purposes, such as fuel and food collection. It would appear that the origin of the groves was not necessarily for utilitarian purposes, but utility may have emerged as a result of their presence in the landscape. This may have led, in turn, to the strengthening of a "social fence" in order to prevent unreasonable exploitation of the resources within these forest patches. This social fence now provides protection for a variety of species and habitats, as described in the examples below.

In the dry regions of central India, some perennial hill streams and riparian gallery forests receive protection as a result of religion-based traditions. In a village in the Koraput district (Orissa state), for example, there is a shrine hidden under stones within some bushes that grow among tall trees. While the surrounding land is barren, the trees in the vicinity of the shrine have remained untouched and protected because the shrine is considered sacred by the local community (Thusu and Jha 1969). Protection of trees for religious reasons is common in southern India. Near the town of Madurai (Tamilnadu state), groups of tall trees at four separate sites are considered sacred. These tree groves provide roosting sites for colonies of the Indian flying fox (*Pteropus giganteus*). It is believed that this bat, which elsewhere is hunted for its bodyfat (for use in alternative medicines), receives protection because the trees are worshipped by the local people (Marimuthu 1988).

The sprinkling of saffron water around a piece of land is a common practice in Udaipur district (Raja-sthan state) in northwestern India (Gandhi 1997). The attempts of the local forest department to conserve an area of forest at a site near Udaipur were largely unsuccessful because of persistent transgressions by local people. Frustrated, the forest officers decided to sprinkle saffron water around the site, in accordance with the local tradition. This was greeted with enthusiasm, and subsequently the local people began to respect the boundaries of the conservation area (Gandhi 1997).

Such social taboos exist in most cultures, so that informal practices rather than laws determine human behavior (Colding and Folke 2001). There are a number of examples where part or all of a terrestrial or aquatic landscape may never be subjected to resource use (for an extensive review see Colding and Folke [2001]). These restrictions may not be specifically designed for nature conservation; instead, the motivation is based on traditions, practices, and beliefs passed down through generations (Berkes *et al.* 2000). The rationale for sacred grove conservation is therefore very different from the rationale for setting aside formal protected areas. Furthermore, enforcement and sanctioning mechanisms are also different. Formal protection depends on legal frameworks and a large number of officers to enforce the laws, while informal nature conservation is mostly enforced by community members. The former system can be expensive, while the latter is carried out voluntarily and costs little or nothing (North 1990). The international conservation community has largely failed to recognize this approach.

The Integrated Conservation and Development Projects (ICDPs), a form of international aid specifically for conserving natural resources as well as improving quality of life in developing countries, are often criticized for their failures and for their attempts to achieve two very contrasting objectives (Brandon *et al.* 1998; Kramer *et al.* 1997; Oates 1999; Terborgh 1999). However, Brechin *et al.* (2002) argue that authoritarian protection practices overlook certain key aspects of social processes that could make conservation work more efficiently. The key aspects of non-authoritarian, social regulation of natural resources are acceptance among members of the

Figure 2. *Sacred grove dedicated to the god Aiyappa in Biligunda village, Kodagu, Western Ghats, India. Sacred groves are small patches of forest dedicated to ancestral or deity worship. These patches often have a long history of protection and shelter natural vegetation, including some very old trees.*

community, as well as fair enforcement of the agreed rules, strong organizational and institutional arrangements, and constructive dialogue. We agree with Brechin *et al.* (2002), and would further argue that informal conservation traditions also have a high degree of acceptance among local communities. If the merits of such traditions are recognized and legitimized within ICDPs, there is a strong possibility that ICDPs will work much better than they do at present.

■ Management of sacred groves

Although many sacred groves are still well preserved, many have been destroyed and others are now threatened by human encroachment. The "social fence" traditionally provided by the local conservation ethic is weakening in a number of places (eg Kalam 1996; Bonn 2000; Chandrakanth *et al.* 2004). The reasons why people no longer respect the integrity of these sites need to be taken into account in future management approaches.

Legal ownership

In many countries, local communities have lost their customary rights of forest management to the government. In India, many sacred groves were destroyed by commercial forestry operations, and local individuals also began to make use of these formerly community owned forests (eg Chandrakanth *et al.* 2004). Transferring the property rights of sacred groves back to local communities may help to prevent further infringements. The social customs and management traditions of local communities proved largely successful in the past and therefore have the potential to protect sacred groves in the future.

Social and economic changes

A successful return to the traditional local community management practices will only be possible if the communities can meet the challenges posed by the modern world and adapt to its social and economic changes. Some regions of the world are facing substantial population growth and increasing immigration; the resulting need for land puts some sacred groves under pressure (Kalam 1996). Furthermore, immigrants often retain their own cultures and customs, which might not include the values underlying the maintenance of sacred groves. These forest patches are also at risk from landowners who want to expand their cultivated land. For example, neighboring farmers in Kodagu district destroyed certain sacred groves while establishing coffee plantations and ginger fields, or when they sold native timber trees and replaced them with fast-growing exotic species (Kalam 1996; Bonn 2000). Governmental interference may be necessary in cases where powerful individuals ignore community interests.

Changes in spiritual and religious values

Sacred groves are assumed to have their origins in hunter–gatherer societies and thus in animistic beliefs. In some countries, conversion to other religions has resulted in the degradation of sacred groves. In ancient Europe (4th–5th century AD), for example, groves were destroyed with the arrival of Christianity (Matthews and Matthews 2002). In many places in India, local folk deities have been, and continue to be, replaced with Hindu deities (a process referred to as "Sanskritization"; Kalam 1996). This has resulted in the erection of temples in some previously sacred groves (Figure 3). Moreover, in many countries local traditions are being challenged by westernized urban cultures, so that the institution of sacred groves is losing its cultural importance for the younger generations of local people.

Recognizing the cultural and ecological values of sacred groves may help to revive or reinvent the tradition of preserving these sites. A greater understanding of the social networks that manage the groves will be necessary, including information on the type of community man-

agement structure and the primary groups involved in the management of such sites. Educational programs that explain the ecological importance of sacred groves, as well as their role in local traditions, could also play a crucial role. For example, in Kodagu district it has been possible to prevent further destruction of sacred groves through recognition of the existence of local, traditional customs, and by endorsing their sacred status (Kushalappa and Bhagwat 2001). We hope that future research will continue to focus on the social mechanisms that underpin the sacred grove tradition.

Figure 3. *Sacred grove dedicated to the goddess Chamundi in village Mythadi, Kodagu, Western Ghats, India. In many sacred groves in India, local folk deities continue to be replaced with Hindu deities, a process referred to as "Sanskritization" (Kalam 1996). This has resulted in the erection of temples in some previously sacred groves (notice the structure built from cement-concrete and the lack of old trees).*

Conclusions

While our proposal to incorporate natural sacred sites in global conservation initiatives is not entirely new, we seek to emphasize an alternative view of conservation that is not led by authoritarian practices. Such sites could play an important role in community based conservation of biodiversity and should therefore be included in conservation strategies. However, these traditional institutions are currently facing new threats that need to be recognized by scientists as well as practitioners. The nature and extent of these threats vary from nation to nation, and even regionally or by site. The integration of sacred groves and other sacred natural sites into the existing protected area networks must take into account the local ecology of the area, as well as the prevailing threats. As a result, it would be unwise to prescribe a single management approach. The ICDPs that are so often criticized for their failures may benefit from a greater sensitivity towards natural sacred sites and the communities that manage them. More research on the ecological values and the sociocultural mechanisms underlying sacred natural sites is needed to fully understand and realize their potential for biodiversity conservation in the future.

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