

# Demything “wilderness”: implications for protected area designation and management

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**Abstract** Protected areas are a cornerstone of many conservation approaches, and concepts of pristineness and wilderness are often considered central to protected area designation and management. However, these concepts are rarely explored through a historical lens that captures the philosophies and assumptions underlying protected area designation. In this paper, we aim to improve our understanding of protected area designation and management by reviewing the history of four main conservation approaches: (1) Wilderness conservation and the Yellowstone Model; (2) Wise use and the Game Reserve Model; (3) Wildlife and Biodiversity conservation; and (4) Ecosystem management. Through examination of the history of these Models, we discuss the values, rationale and assumptions behind each approach, and how these interface with protected area designation. In each case, we explore the extent of dependence on concepts of wilderness and pristineness. We also highlight the evolution of alternative criteria for designating protected areas, and ascertain how far these alternative values influence protected area designation and management.

**Keywords** Biodiversity · National Parks · Solomon Islands · Flux of Nature · Balance of Nature · Ecosystem management · Wise use · Pristine forests · Cultural landscapes

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## Introduction

Protected areas (PAs) are key components of most conservation strategies. The purpose of PAs is to separate valued species, ecosystems, landscapes or other natural or cultural features from factors that threaten them, and also to create an infrastructure which facilitates their use and appreciation, usually for recreational or scientific purposes (McNeely and Ness 1995). Not all PAs are wilderness i.e. without permanent or significant habitation and today, a range of conservation options are available, from strict preservation of wilderness areas to community-based management of natural resources. Yet the idea of wilderness preservation is frequently conflated with other conservation priorities like the preservation of biodiversity (Sarkar 1999) and attempting to understand the impetus and assumptions that are driving conservation initiatives might help in choosing the best strategy for different conservation problems and scenarios.

Here, we take a historical approach and trace the philosophical roots and assumptions of four influential conservation strategies. As today, preservation and utilization were major narratives in early conservation policy (Weddell 2002), and even in the early days of conservation, a philosophical tension can be discerned between the romantic idealism of the wilderness movement and more pragmatic concerns over the “wise use” of resources. Nevertheless, those who desired to set aside areas for the aesthetic and psychospiritual appreciation of nature, and those driven by a desire to privilege access to natural resources, found a common cause in lobbying for protected area designation. Later, wildlife and biodiversity conservation provided a (post-hoc) scientific and ethical rationalization of both wilderness and “wise use” approaches to protected area designation and management, again reaffirming the need and rationale for protected areas.

In recent decades, however, there have been conceptual and theoretical shifts in conservation ecology with the Flux of Nature gradually replacing the Balance of Nature as the ruling metaphor in conservation ecology (Barrett and Barrett 1997; Fiedler et al. 1997; Pickett et al. 1992). Furthermore, it is increasingly recognized that many biodiverse landscapes have been influenced by human management (Willis et al. 2004; Gillson and Willis 2004) and conservation strategies are evolving in response to this changing perception (Foster 2002).

Over the last few decades conservationists and social scientists have begun to grapple with the difficult issue of how to reconcile conservation and development. Debates have tended to become polarized along the community use versus parks/PAs division (Hutton et al. 2005). By developing a “conceptual typology” of conservation approaches, Adams et al. (2004) advanced the debate beyond these diametrically opposed viewpoints, suggesting that the rigorous definition of conservation objectives and priorities would help to elucidate when opportunities for combining conservation and development were feasible, and when conservation or development goals should be pursued independently (Adams et al. 2004). With this in mind, it is our goal here to disentangle some of the historical roots of different conservation movements, in order to separate those conservation goals which depend on wilderness preservation from those which are compatible with (and indeed may depend upon) some form of human use or management.

In the following sections, we discuss four influential strands in the history of PA designation and management, and then explore the extent to which PA designation

today still reflects the assumptions and culture of early conservation pioneers. In particular, we focus on the extent to which each conservation approach depends on concepts of wilderness and pristinity.

## Approaches to conservation of PAs

### Wilderness conservation and the Yellowstone model

During the late 19th and throughout the 20th Century, many conservation efforts were based on the idea of pristine wilderness. Wilderness was a dominant theme in the Romantic Movement in Europe, but it was the Wilderness Movement in the United States of America which created a model for conservation based on a wilderness ethic; it was in the USA that the first National Park, Yellowstone, was created, providing a model for conservation worldwide.

The Wilderness Movement in the USA originated in the late 19th century and was led by prominent figures such as John Muir and George Perkins Marsh, who advocated a wilderness ethic as an escape from the evils of modern civilization. (This sentiment was also echoed in the Nature Monuments movement in Europe—see Jepson and Whittaker 2002). Muir, Marsh and others emphasized the importance of pristine nature, and assumed that humans had a negative influence on landscape: “Where [man] plants his foot, the harmonies of nature are turned to discords” (George Perkins Marsh 1864, p. 36). The desire to protect wilderness stemmed from an aesthetic interest in preserving wild places for their intrinsic and spiritual value, and natural beauty.

With the powerful political support of Marsh, Muir and other individuals and organizations, Congress passed legislation creating Yellowstone as a National Park in 1872 (Dilsaver 1994; Schullery 1997; Diamant 2000; Jepson and Whittaker 2002). Wilderness, spectacular scenery and geological features provided the primary inspiration for this support (Pritchard 1999; Jacoby 2001), and the vision and management of Yellowstone and its tourists reflected the desire of the American public to enjoy a ‘natural’ or ‘wilderness’ area, unaffected by humans (Spence 1999; Fisher 2000; Johnson 2001).

Yet, at the time of its designation as a National Park, the landscape of Yellowstone already bore traces of the influences of various Native American tribes (Schullery 1997). From approximately 6,000 years ago, humans exerted many influences on the landscape, using fire to manipulate vegetation and the movement of animal populations (Schullery 1997; Jacoby 2001). In 1870, just two years before Yellowstone National Park was recognized in law, the Washburn exploring party encountered various abandoned Shoshone camps and used a number of well-established trails (Spence 1999). But perhaps because of the party’s commitment in promoting the idea of a park, it reported to Congress that the Yellowstone country was a wilderness that was ‘*never trodden by human footsteps*’ (Spence 1999, p. 43). Congress responded by including language in the park’s enabling Act that was later to facilitate removal of “*all persons trespassing upon the [park]*” (Dilsaver 1994). The Act creating Yellowstone made no reference to the Fort Laramie Treaty of 1851, which recognized native use of the resources within the Yellowstone area (Spence 1999).

Public support for the Wilderness Movement and the language of the enabling Act, facilitated by prior Federal legislation like the 1830 Indian Removal Act, allowed officials in the late 1870s to remove Native Americans from Yellowstone. By 1879, the Shoshones were relocated to a nearby reservation, a move that was in accordance with the underlying contemporary sentiments of tourists towards Native Americans (Spence 1999); park officials believed that the presence of Native Americans, who hunted ‘illegally’ in the park due to lack of food on reservations, scared away the tourists (Spence 1999; Fisher 2000). Yellowstone Superintendent Norris further ordered them to leave the Yellowstone landscape, stating that ‘Yellowstone is not Indian country, and no natives lived in the park’ (Norris 2001, p. 265). As Native American use and rights to the area decreased, many areas of formerly inhabited territory were reclassified as wilderness (Foner and Garraty 1991; Schullery 1997; Spence 1999; Fisher 2000; Jacoby 2001). Instead of preserving a pristine wilderness, then, advocates of American national parks sometimes created wilderness via policies that removed local people (Fisher 2000).

The Wilderness Movement and the Yellowstone model had, and continue to have, a major influence on protected area designation and management around the world. The Kruger National Park in South Africa, for example, founded in 1926, was idealized as the Yellowstone of the Transvaal (Dennis and Scholes 1995; WCPA 2005). The park was famous for its 147 species of wild mammals including the ‘Big 5’—lion, leopard, rhinoceros, buffalo and elephant (Stoddard 2005). Kruger also contained a ‘*representative sample of major natural regions*’ (IUCN 1994) of forests, savannahs, wetlands, shrub lands and rocky barren areas (WCPA 2005). It was the ideal place to be designated National Park status with its almost 2 million hectare land area which was ‘*large enough to contain one or more entire ecosystem not materially altered by current human occupation or exploitation*’ (IUCN 1994). Kruger was assured national park status in accordance with this latter clause through displacing the local Makuleke people from their land (Kahn 2003; Stoddard 2005).

Preservationist principles, which emphasized landscapes without people, were utilized by Bernard Grzimek, president of Frankfurt Zoological Society in the 1960s and 1970s to campaign for conservation in East Africa. Grzimek was dedicated to excluding the indigenous Maasai cattle herders from their lands in order to preserve populations of wild animals (Colchester 2003). ‘*A National Park*’ he argued ‘*must remain a primordial wilderness to be effective. No men, not even native ones, should live inside its borders*’ (Adams and McShane 1996). This attitude was enshrined in the 1968 Africa Convention on Nature and Natural Resources, which encouraged the designation of PAs where human activities aside from science and recreation were prohibited (see Box 1).

The emphasis on the appreciation and preservation of nature in protected areas continued and heightened until the 1990s, when opposition to “fortress conservation” gained momentum. By 2003, over 29,747 strictly PAs covered over 6.7 million square kilometres (Chape et al. 2003).

The rationale for Wilderness conservation is primarily aesthetic; humans benefit from wilderness by appreciating the beauty of the landscape, its geological and biological features, and enjoying psychospiritual and recreational benefits therefrom (Trudgill 2001). An economic dimension is also present, in that the tourist industry can create a powerful lobby in support of PA status (Ansson 1996). The establishment of PA status for Yellowstone, for example, might not have been possible without the tourism industry, and the desire of the American public to enjoy outdoor

**Box 1:** The 1968 Africa convention on nature and natural resources

*Conservation area* “means any protected natural resource area, whether it be a strict natural reserve, a national park, or a special reserve...”.

*Strict nature reserve* “means an area ... under State control ... throughout which any form of hunting or fishing ... [is] strictly forbidden ... where it shall be forbidden to reside, enter, traverse or camp...”.

*National park* “means an area ... under State control ... exclusively set aside for the propagation, protection, conservation and management of vegetation and wild animals ... in which the killing, hunting and capture of animals and the destruction or collection of plants are prohibited ... and [in which measures are taken] to enable the public to visit these parks.... [S]port fishing may be practiced with the authorization and under the control of the competent authority...”.

*Special reserve* “means other protected areas such as: ‘game reserve’ ... within which the hunting, killing or capture of fauna shall be prohibited ... where settlement and other human activities shall be controlled or prohibited; ‘partial reserve’ or ‘sanctuary’ ... an area set aside to protect characteristic wildlife.... ‘Soil’, ‘water’, or ‘forest’ reserve shall denote areas set aside to protect such resources”.

Source: Phillips (2003)

pursuits in an area which is uninhabited, apparently pristine and natural (Runte 1979; Ansson 1996; Sellars 1997; Schullery 1997; Spence 1999; Schelhas 2001; Diamant 2000). This co-occurrence of aesthetic and utilitarian benefits from Wilderness Preservation is underpinned by the belief that humans are separate from, and potentially damaging to, nature.

#### ‘Wise Use’ and the Game Reserve Model

Simultaneous to the growth of the Wilderness Movement in the US, was the advocacy for ‘wise use’ of natural resources. The idea of limiting or controlling access to natural resources has its origins in many ancient and medieval societies; sacred groves and taboos against the killing of certain animals, for example, were early forms of conservation. But in the 19th century, governments in America, Africa and Asia established legislation limiting access to forest products, game and grazing.

When Theodore Roosevelt took presidential office in 1901, he created the majority of the national forest system of the U.S.. Building on the Forest Reserve Act of 1891 and the 1897 Organic Act, 132 million acres of national forestlands were elevated to formal reserve status by the U.S. Forest Service (National Forest Protection Alliance 2005). According to the National Forest Protection Alliance (2005), ‘*The initial purpose behind the creation of forest reserves was to protect water sources for urban and agricultural uses, and the original Forest Reserve Act allowed no trees to be cut or sold*’. Following this, in 1897, Congress passed the Organic Act, containing a congressional rider that allowed for the selective harvesting of individual older trees (National Forest Protection Alliance 2005). The organic act encapsulated the principle of “Wise Use” and was to become the foundation for later conservation policy based on the management and use of natural resources.

Roosevelt appointed Gifford Pinchot as the Forest agency’s first chief (Coates 1993; Schullery 1997; Library of Congress 2002), and Pinchot pioneered the resource management approach to conservation. For Pinchot, ‘locking up’ resources in vast parks was as wasteful as leaving them to be destroyed by over-exploitation (Carr 2002). Pinchot also strongly felt that national parks should be managed as national forests, free of ‘*sentimental nonsense*’ (Carr 2002). This ultimately meant transferring

them from the Department of Interior to his agency. He predicted that exploitation of forest resources for private profit would fail unless scientific management of resources was in place, and he applied European-style forestry practices to the relatively unmanaged forests of the U.S. (Maughan and Nilson 1993; U.S. Forest Service 2004). His utilitarian philosophy of the ‘*greatest good for the greatest number*’ led Pinchot to promote the ‘wise use’ of natural resources around the world (Wallace 2003).

Roosevelt’s interest in “Wise Use” extended beyond forest products to game animals, in the U.S. as well as in Africa. During the late 19th and early 20th centuries the advent of the railways and European expansion in Africa, created many opportunities for hunting big game (Adams and McShane 1996; Jepson and Whittaker 2002). The development of the hunting culture, as well as the near extinction of some species, led to the development of restrictive game laws, aimed at ensuring the survival of favoured species (Schullery 1997; Lewis and Alpert 1997; Adams and McShane 1996). Alongside other ardent hunters like Edward North Buxton, founder of the Preservation of Fauna in the Empire (later to become the Fauna Preservation Society) Roosevelt was instrumental in persuading British and German colonial governments to establish game reserves, where hunting was prohibited or strictly controlled (Jepson and Whittaker 2002). The Fauna Preservation Society later commissioned reviews of the status of wildlife in East, Central and West African colonies and concluded that many species were heading for extinction and should thus be completely protected from hunting (e.g. Hingston 1931; Jepson and Whittaker 2002). Hingston (1931) argued especially for the protection of wildlife from indigenous hunters, maintaining that sport hunters killed selectively for trophies and thus had far less impact than indigenous hunters, who “want...as many animals as possible for the purpose either of meat or barter...[and] have then the power to cause serious depletion through the wholesale and indiscriminate methods employed” (Hingston 1931; Jepson and Whittaker 2002).

The “Wise Use” movement was driven by utilitarian concerns over the use of natural resources, and gained momentum and political force during a period of rapid colonial/capitalist expansion in the areas of hunting, mining and logging. Its focus was on privileging access to game, forest product and grazing, often for a ruling elite. Thus, despite the philosophical division that marked the origins of the Wilderness and Wise Use movements, the goals of these two contrasting approaches to conservation converged. Both movements perceived humans as potential threats to nature, and thus, aesthetic and economic concerns resulted in the same practical conservation outcome, that of establishing protected areas, free from human inhabitation and where consumptive uses of natural resources was forbidden or strictly controlled. During the 1990s, the term “Wise Use” has been adopted and mis-appropriated by right-wing anti-environmental lobbies in the U.S.A. who wish to protect the interests of timber and mining companies and have little relation to the philosophy of conservation as a wise use of natural resources (Echeverria and Eby 1995).

### Wildlife and biodiversity conservation

Over time, the conservation rationale for PA designation and management shifted from landscape, scenery and natural resources, to preservation of wildlife and biodiversity. This change in focus resulted from an interest in protecting animals for their own sakes, and for preserving species for science and for the potential and

actual benefits in terms of genetic resources and ecosystem services. Initially, wildlife conservation was deeply entwined with humane and ethical concerns for animals, though in recent decades the “Animal Rights Movement” has become somewhat separated from conservation, while scientific approaches to conservation have focused on concerns over biodiversity loss.

By the 1850s, humanitarian concerns for the welfare of the poor extended into demands for ethical treatment of animals (Western and Wright 1994). The Humane Movement developed in response to excessive hunting, cruel treatment of animals and the over-exploitation of animals and birds for their fur, feathers and tusks. (Other branches of the human movement were concerned with animal experiments and the meat industry, but these issues are less relevant to the development of protected area conservation so will not be explored here.) By 1869, John Stuart Mill responded to public sensibilities and advocated the preservation and ethical treatment of species for their own sake, independent of their utility for humans (Western and Wright 1994).

As well as overexploitation, then, animal welfare and an ethical/moral concern for the humane treatment of animals was a factor in the opposition of the slaughter of Yellowstone’s animals (Schullery 1997). With George Grinnell, editor of *Forest and Stream*, Roosevelt began to envision Yellowstone as a sanctuary and breeding ground for wildlife. Despite his own considerable hunting prowess, Roosevelt condemned excessive slaughter of animals, and envisaged the park’s wildlife as protected, thereby allowing an increase and distribution of the populations into surrounding areas (Jepson and Whittaker 2002; Johnston 2002). The dramatic decline in the numbers of plains bison prompted the Yellowstone Protection Act of 1894, which made poaching a federal offence (Pritchard 2002). Concerns over diminishing populations and the moral responsibility to protect animals thus converged with efforts to promote their wise use (described above).

Later in the 20th century, the ethical dimension of conservation shifted away from animal welfare and humane issues (which formed a separate Animal Rights lobby), to concern over extinction rates, and the moral imperative to mitigate an apparently anthropogenically driven “sixth extinction” (Brooks et al. 2002). This ethical strand, as well as the focus on species conservation, links the humane movement with to the more “scientific” strand of wildlife and biodiversity conservation.

According to Weddell (2002), wildlife at first was used to refer to game species; later it came to mean terrestrial vertebrates. In current usage, the term wildlife often denotes all forms of wild organisms, including animals, plants and microorganisms. “Wildlife” is now to some extent used interchangeably with ‘biodiversity’, a term that became common in the scientific literature from 1986, following a National Forum on Biodiversity held in Washington, D.C. It originated as shorthand for ‘biological diversity’ and is currently the scientists’ preferred term for wildlife and nature (Sarkar 1999). The term became very popular with the arrival of the 1992 Convention on Biological Diversity (CBD), which defined biodiversity as:

“The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems”<sup>1</sup>

<sup>1</sup> Definition as stated in the Convention on Biological Diversity (UNEP 2001).

The objectives of the CBD are “the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources” (Secretariat of the CBD 2001). Biodiversity conservation thus incorporates elements of the philosophy of the wise use movement, as well as a focus on conserving species and ecosystems for their intrinsic and scientific value.

Though preservation of wilderness and pristineness are not listed as objectives in the CBD, a conflation of biodiversity and wilderness and biodiversity conservation narratives has been observed (Sarkar 1999). It is frequently assumed that “‘*untouched*’ ecosystems as the best and richest repositories of the undiscovered species we must certainly try to protect” (Cronon 1996). One of the most influential conservation approaches in operation today, for example, that of Conservation International’s (CI) “biodiversity hotspots” combines species richness, endemism, and percentage of pristine habitat lost, thus combining concerns over pristinity and biodiversity as criteria for prioritization (Brooks et al. 2002; Myers et al. 2000). Furthermore, CI’s other main terrestrial conservation strategy specifically focuses on Wilderness areas (Conservation International 2006). Thus, approaches to biodiversity conservation, like the Wilderness Movement, reflect the underlying assumption that human activities are per se a danger to the survival of species. Thus, once again, in wildlife and biodiversity conservation we see convergence of conservation outcomes, in the form of strengthening and extending PAs, resulting from different underlying philosophical ideals.

### Ecosystem management

In recent decades, there have been conceptual and theoretical shifts in conservation ecology with ideas of variability, flux and resilience gradually refining older ideas of equilibrium and balance (Barrett and Barrett 1997; Fiedler et al. 1997; Gillson et al. 2003; Pickett et al. 1992). Furthermore, while habitat loss has continued apace, opposition to “fortress conservation” has become increasingly vocal, and the importance of biodiversity in managed or cultural landscapes has been recognized (Brockington 2002). Consequently, there has been a recognition of the complexity and interconnectedness of human and ecological systems (Callicott et al. in press). All of this has stimulated progress towards the critical evaluation of conservation systems, agencies and approaches (Callicott et al. in press; Gunderson and Holling 2001; Holling 2001) and has facilitated the development of ecosystem management as an alternative conservation approach (Grumbine 1994, 1997).

In contrast to earlier conservation approaches, ecosystem management is based on a paradigm of nature in flux, rather than balance, and a view of people within, rather than separate from, nature. This latter strand might be seen as a return to the “Land Ethic” proposed by Aldo Leopold (1949). Leopold emphasized the links between humans and nature, and advocated an approach to conservation which combined resource use with a sensitivity to landscape and a respect for ecological process. While some of Leopold’s ideas are resonant with a wilderness ethic, he did not share the view of human use of nature as antithetical to its survival. Equally, he was wary of the utilitarian view of nature, which tends to concentrate resource access in the hands of a few. Rather, he sought a reconnection of humans and nature and recognized the aesthetic and cultural importance of hunting and game animals.

These sentiments can be found in the elements of the ecosystem management that focus on the interface between human and ecological systems, and attempts to reintegrate human activities within ecosystem processes. In the ecosystem management approach, the role of people in ecosystems is explicitly addressed in two ways: (1) even relatively isolated systems are often influenced by humans, and have been for hundreds of years (Foster 2002; Head 2000; Heckenberger et al. 2003; Willis et al. 2004); (2) some communities have traditionally used and managed biodiverse areas, and as such may have contributed to the conservation of these areas (Fairhead and Leach 1996). A case study from the Solomon Islands (Box 2) illustrates the former point (Bayliss-Smith et al. 2003).

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**Box 2:** Culturally modified forests of New Georgia, Solomon Islands

With the exception of Papua New Guinea, the Solomon Islands have a greater diversity of animal species and higher level of endemism than any other Pacific island nation (see Hviding 2003), harbouring approximately 148 species of land and freshwater birds, over 60 of which are endemics (see WWF 2005).

The New Georgia Forest, comprised of several islands (New Georgia, Vella Lavella, Kolombangara, Gizo, Vangunu, Rendova and Tetepere) includes the largest salt water lagoon in the world: the Marovo Lagoon (see Wikipedia 2005). It is among the few places on earth ‘where large tracts of coastal rainforest cover remain’ (see Bayliss-Smith et al. 2003). This region is assumed to be pristine wilderness by numerous non-governmental organizations (NGOs) who are advocating for an IUCN status. However, the Marovo Lagoon area comprising the southern part of the New Georgia Group reveals some inherent contradictions. According to Bayliss-Smith et al. (2003):

‘On one hand, it (Marovo Lagoon area) has a history of agricultural intensification, inter-island contacts and sociopolitical transformations, yet on the other hand the lagoon’s catchments and its forested islands have in recent decades figured in international media as a prominent example of pristine tropical wilderness. As such Marovo has been proposed for permanent conservation and even as a possible UNESCO World Heritage Area’

Through combined evidence from oral history, aerial mapping, ethnography, archaeological and botanical fieldwork, Bayliss-Smith et al. (2003) revealed that the apparently pristine rainforest of New Georgia is only 150 years old. They have documented that in the main inland zones of Marovo (Gatokae, Vangunu, Kolombangara and New Georgia excluding Roviana) contained a disturbed forest with the dominant presence of *Campnosperma* sp. or *Terminalia brassii* at canopy level. Both *Campnosperma* sp. and *Terminalia brassii* are light demanding trees, which if in high frequency reflects a situation of relatively massive disturbance to the canopy (for discussion see Bayliss-Smith et al. 2003).

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The scientific origins of the Ecosystem Management approach to conservation is intertwined with the ‘flux of nature’ model and the “new ecology” of the 1980s and 1990s, which states that the natural world is variable and complex, and does not necessarily reach equilibrium (Pahl-Wostl 1995; Wu and Loucks 1995). A primary aim of ecosystem management is to protect ecosystem structure and function by adaptive management, as a means of maintaining both biodiversity and adaptive capacity (Grumbine 1994, 1997; Gunderson and Holling 2001). Conservation goals are based around maintaining spatial and temporal heterogeneity rather than specific population sizes or landscapes. Recently, for example, the Kruger National Park has shifted its focus from a ‘Wilderness Model’ to an ‘Heterogeneity Model’ (Rogers 2003). Rather than fixed vegetation assemblages or population abundances, ecosystem managers have developed conservation goals which reflect the variability and resilience of the ecosystem, while still respecting its intrinsic limits. “Thresholds of

Potential Concern” are the upper and lower limits along a continuum of environmental biological variables; conservation objectives relate to ranges of variability and management interventions are responsive to changing environmental and biological parameters (Biggs and Rogers 2003). Current fire management practice, for instance, involves adjusting the area burnt in response to rainfall and the area burnt through unintentional fires (van Wilgen et al. 2003), thereby linking management actions to external environmental and anthropogenic agents.

### **Wilderness and PA designation and management**

The four conservation philosophies described above combine elements of aesthetic, psychospiritual, economic, utilitarian, moral/ethical and scientific rationales for the designation of protected areas (see Table 1).

Despite their apparently separate philosophical roots and rationales, the four approaches to conservation described here show considerable overlap in both underlying ecological assumptions and in the implications for PA designation (and management). In all four approaches, PA designation is a key component of conservation strategy, and Wilderness is also a recurrent theme. By definition, most forms of human uses of natural resources are incompatible with Wilderness Preservation, but the wilderness ethic can also be discerned in all other conservation approaches. Over-exploitation of natural resources was the main driving force behind the “Wise Use” movement, and since over exploitation and habitat loss are two of the main causes of extinction, the necessity to protect nature from human intervention is also an assumption in wildlife and biodiversity conservation. Thus, the creation or preservation of “wilderness” areas, free from consumptive human use, are also central to “Wise Use” and wildlife/biodiversity conservation approaches.

Yet the negative relationship between biodiversity and human population density has recently been challenged by the finding that species richness in both North America and Australia is positively correlated with human population density (Luck et al. 2004). Furthermore, many areas of apparently pristine wilderness have been shown to bear the legacy of previous human occupation, or in some cases to actively depend on human management (Foster and Motzkin 2003; Motzkin and Foster 2002; Tipping et al. 1999). Thus, Sarkar (1999) has suggested that biodiversity conservation and wilderness conservation are distinct goals, which should be stated explicitly and pursued separately. In this way, opportunities for biodiversity conservation can be greatly expanded, because they do not necessarily depend on the creation or maintenance of wilderness areas. The cultural and psychospiritual need for wilderness can thus be focussed more specifically on wilderness areas, while other forms of PA can be designated to address concerns of biodiversity loss, sustainable natural resource management, or the need for minimal or strictly prescribed management to maintain ecological processes or ecosystem services (Cronon 1996; Adams et al. 2004). When concerns over wilderness preservation and the strict protection of endangered species are identified and dealt with explicitly, it is more likely that other conservation causes, not necessarily dependent on wilderness preservation, can be identified (Adams et al. 2004).

This graduated approach to PA designation and management, which describes a spectrum of human usage, is reflected in the development of the IUCN and its system of categorization of PAs (Table 2).

**Table 1** Four conservation models for designating PAs

	Main goals	Underlying rationale	Ecological assumptions	Justification for PAs
Wilderness preservation	The preservation of wilderness for recreation and science	Aesthetic/psycho-spiritual (economic value of tourism is secondary)	Nature is fragile and must be protected from humans (who can appreciate it in its pristine state, but are not necessarily a part of it)	PAs essential for the preservation/creation of wilderness qualities, and the protection of nature's harmony and balance
Wise use	The control of access to natural resource in order to ensure their sustainable use	Utilitarian/economic	Nature is a provider of resources, that needs management in order to protect it from overexploitation by humans (who are outside of nature)	PAs provide the means of controlling access to natural resources and maintaining the balance between regeneration and harvesting
Wildlife/biodiversity conservation	The protection of biological diversity	Ethical/moral intellectual/scientific (reductionist) utilitarian motives are secondary	The "sixth extinction" is anthropogenically driven and therefore humans have a moral duty to protect nature	PAs provide the means of protecting species from habitat loss and overexploitation
Ecosystem management	The maintenance of ecological processes across spatial and temporal scales	Psycho-spiritual intellectual/scientific (holistic) utilitarian needs are re-integrated with ecological processes	Resilience is finite and society must find ways of accommodating its psycho-spiritual, scientific and utilitarian objectives within ecological limits	PAs are part of an integrated approach to conservation, which includes varying degrees of protection and an emphasis on the reintegration of ecological and social systems

At its inception in 1948, the IUPN (which became the IUCN in 1956) adopted a preservationist stance that advocated the protection of pristine landscapes for scientific, aesthetic, recreational and educational purposes (Weeks and Mehta 2004). Despite the founders of IUCN being a diverse group of individuals that included big game hunters keen to preserve and replenish game stocks, the IUCN was strongly influenced by the Yellowstone Model and initially categorized protected areas in which human activities were strictly limited (Adams and McShane 1996; Wallace 2003). As pointed out in our introduction and explored in our historical review, it was just this convergence of conservation outcomes which allowed divergent conservation philosophies to unite in the cause of PA designation.

However, the IUCN soon recognized that strictly preservationist policies were not appropriate in all cases, because natural resources were important export commodities, and high proportions of the population of biodiverse countries were directly dependent on biodiversity for their livelihoods (Weeks and Mehta 2004). As underlying values for designating PAs were expanded and developed, IUCN sought to incorporate them within its categorization system, thereby signalling the organization's commitment to supporting post-colonial development in newly independent nations, and conveying the message that it did not privilege nature over people (Weeks and Mehta 2004).

According to IUCN (1994), a PA is defined as:

‘An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means’.

The six categories of IUCN reflect the degree of human disturbance or use (see Table 2) (McElwee 2001; Phillips 2002; Amend et al. 2003). If an area is strictly protected, consists of largely unmodified ecosystems, is free of human intervention, and has limited access mainly for research purposes, it qualifies for category I status.

**Table 2** Categories of protected areas and their criteria (modified from IUCN 1994)

Category	Type and description	Criteria
I (a)	<i>Strict nature reserve</i> : protected area managed mainly for science	Pristinity/wilderness, biodiversity, scenic
I (b)	<i>Wilderness area</i> : protected area managed mainly for wilderness protection	Pristinity/wilderness, biodiversity, scenic, tourism is allowed
II	<i>National park</i> : protected area managed mainly for ecosystem protection and recreation	Pristinity/wilderness, scenic, biodiversity, recreation
III	<i>Natural monument</i> : protected area managed mainly for conservation of specific natural features	Landscape, scenic, tourism
IV	<i>Habitat/species management area</i> : protected area managed mainly for conservation through management intervention	Biodiversity
V	<i>Protected landscape/seascape</i> : protected area managed mainly for landscape/seascape protection and recreation.	Tourism, biodiversity, landscape/seascape, scenic
VI	<i>Managed resource protected area</i> : protected area managed mainly for the sustainable use of natural ecosystems.	Biodiversity, presence of people allowed

PAs falling under category I are further subdivided into 1(a)—Strict Nature Reserve and 1(b)—Wilderness Area. Categories II–VI describe areas of increasing human use. Category II refers to most national parks, in which human occupancy may or may not be allowed, while category III describes areas ‘*containing one, or more, specific natural or natural/cultural features which are of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance*’. But it is in categories IV–VI, added in 1992, that IUCN describes varying degrees of habitat management, extractive use and residence patterns (McElwee 2001). Category IV refers to areas where active habitat management is considered necessary to protect species and habitats that are ‘*essential to the well being of nationally or locally-important flora or to resident or migratory fauna*’ (IUCN 1994).

Critically, IUCN (1994) explicitly recognizes that “the number assigned to a category does not reflect its importance: all categories are needed for conservation and sustainable development”. As such, IUCN (1994) “encourages countries to develop a system of protected areas that meets its own natural and cultural heritage objectives and then apply any or all the appropriate categories”. Countries that wish to apply the IUCN Categories should consider how suitable the specific category is to their needs as ‘each category fills a particular niche in management terms’ (IUCN 1994; Bishop et al. 2004).

Many conservationists are now in support of protecting cultural landscapes (Bridgewater et al. 1996; Phillips 2002; Turnpenny 2004). The idea of protecting cultural sites alongside nature was crystallized in a 1965 call for a ‘World Heritage Trust’ in the U.S. that would stimulate international cooperation to protect ‘the world’s superb natural and scenic areas and historic sites for the present and the future of the entire world citizenry’ (UNESCO-World Heritage Center 2005). These proposals for a ‘Convention Concerning Protection of World Cultural and Natural Heritage’ were presented and adopted by the 1972 United Nations conference on Human Environment in Stockholm (see Box 3). It was not until 1992, however, that this Convention became the first international legal instrument to acknowledge protection of cultural landscapes (Rossler 2000). Simultaneous to this was the inclusion of Categories V and VI into the IUCN PAs designations.

Another international instrument that sought to define and recognize cultural landscapes was UNESCO’s ‘Man and the Biosphere’ (MaB) Programme. This 1968 intergovernmental scientific programme aimed to establish a coordinated world network of protected areas, designated as ‘Biosphere Reserves (BR)’ (UNESCO-MaB 2005). In 1974 BR’s primary objectives were (1) to conserve for present and future use the diversity and integrity of biotic communities within natural ecosystems; (2) to provide areas for ecological and environmental research; and (3) to provide facilities for education and training (Rong Zhang 2004). Three new functions were adapted in 1995, namely conservation, logistical support for science and education, and sustainable development for local communities (Robertson-Vernhes 1997; Batise 2001; Rong Zhang 2004; UNESCO-MaB 2005). The MaB Programme integrates sites of cultural and biological importance to local inhabitants into the PAs system and thereby (in theory at least) establishes Biosphere Reserves as a ‘bottom-up’ administration. This provides a useful mechanism for creating and implementing a conservation-development strategy in areas with a high degree of connectivity between natural and social systems (Callicott et al. in press; Gunderson and Holling 2001; Holling 2001). In theory, community involvement and direction in BR planning can be increased by wide-ranging discussion, consensus building,

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**Box 3:** 1972 Convention concerning protection of world cultural and natural heritage natural and cultural properties

Cultural properties are defined in the Convention as:

- *Monuments:* architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science; or
- *Groups of buildings:* groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science; or
- *Sites:* works of man or the combined works of nature and of man, and areas including archaeological sites, which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological points of view.

Natural properties are defined in the convention as:

- Natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view; or
- Geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation; or
- Natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty.

*Source:* Department of Conservation, New Zealand (2005).

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experimentation and adaptive management (though see Rong Zhang 2004 for a critique). It thus, arguably, fills a different and complementary role to the “Top-Down” WHS system, which tends to focus on sites of touristic and international importance and can thus omit sites that are of great importance to local communities (Omland 1997).

## Conclusions

Prior to the 1980s PAs all over the world shared a high degrees of similarity in the ways they were designated and managed (McElwee 2001; Hutton et al. 2005). The common model for the creation of PAs was to find an area worthy of conservation and formally recognize this via national legislation and under various international conventions, then to make a boundary around this area to separate it from the wider landscape. Subsequent management was usually aimed towards restricting human utilization of the environment, often solely to scientific and recreational purposes, though sometimes for the purposes of natural resource management. The criteria for designation was usually based on wilderness, landscape, scenery and geological features, ‘charismatic megafauna’, endangered species or high species richness, uniqueness or (at least initially) utility (McElwee 2001; Phillips 2002, 2003; Weeks and Mehta 2004).

In recent decades, however, the “Flux of Nature” paradigm and the development of an ecosystem management approach to conservation, as well as debates over “Parks vs. People” has been reflected in the growing sophistication of PA designation and management. Formerly centred on the idea of wilderness, freedom from

human impact and stability, a range of models for conservation, both inside and outside of PAs, has now emerged. The most recent IUCN PA categories (V and VI, added in 1992), for example, indicates an increasing recognition of the value of cultural landscapes. This approach is complemented by the designation of World Heritage Sites and UNESCO's Man and Biosphere Programme, which aims to specifically protect culturally significant landscapes and artefacts and to preserve the interconnectedness of human and natural systems. Furthermore, the Convention on Biological Diversity, in its preamble, clearly recognizes the role of traditional lifestyles in contributing to conservation of biological diversity and sustainable use of its components (Secretariat of the CBD 2001).

The history of conservation approaches described here reveals how PA designation and management has become increasingly responsive to advances in ecological understanding and to changes in the understanding of the relationship between humans and nature and the re-integration of ecological and social systems. Though scientific and biological criteria were and are a driving force in biodiversity conservation, it is clear that they are only part of the rationale for conservation. Conservation goals were, and still are, built on the values, assumptions and priorities of conservationists, how they understood and interpreted the landscapes and ecosystems they sought to preserve and the way they perceived the relationship between humans and nature. A critical examination of assumptions, values and priorities of conservationists, as well as an examination of the historical links between ecological and social systems, will be central to developing conservation strategies that reconcile social, cultural and economic needs with conservation goals and the intrinsic limits of ecological systems.

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## References

- Adams JS, McShane TO (1996) *The myth of wild Africa: conservation without illusions*. University of California Press, California
- Adams WM, Aveling R, Brockington D, Dickson B, Elliott J, Hutton J, Roe D, Vira B, Wolmer W (2004) Biodiversity conservation and the eradication of poverty. *Science* 306:1146–1149
- Amend SGA, Oltremari J, Sanchez R, Valarezo V, Yerena E (2003) Management plans – concepts and proposals. *Paques Nacionales y Conservacion Ambiental* 11. Panama
- Ansson RJ Jr (1996) Our National Parks – overcrowded, underfunded and besieged with a myriad of vexing problems: how can we best fund our imperilled National Park System? *J Land Use Environ Law* 14(1):1–52
- Barrett NE, Barrett JP (1997) Reserve design and the new conservation theory. In Pickett STA, Ostfeld RS, Schachak M, Likens GE (eds) *The ecological basis of conservation: heterogeneity, ecosystems, and biodiversity*. Chapman & Hall, New York
- Batisse M (2001) World heritage and biosphere reserves: complementary instruments. *Parks* 11(1): 38–45
- Bayliss-Smith T, Hviding E, Whitmore T (2003) Rainforest composition and histories of human disturbance in Solomon Islands. *Ambio* 32:346–352
- Biggs HC, Rogers KH (2003) An adaptive system to link science, monitoring, and management in practice. In du Toit JT, Rogers KH, Biggs HC (eds) *The Kruger experience: ecology and management of savanna heterogeneity*. Island Press, Washington
- Bishop K, Dudley N, Phillips A, Stolton S (2004) *Speaking a common language: The uses and performance of the IUCN system of management categories for protected areas*. Cardiff University, IUCN – The World Conservation Union and UNEP – World Conservation Monitoring Centre

- Bridgewater P, Phillips A, Green M, Amos B (1996) Biosphere reserves and the IUCN system of protected area management categories. UNESCO, Paris, France
- Brockington D (2002) Fortress conservation. The preservation of the Mkomazi Game Reserve, Tanzania. James Currey, Oxford
- Brooks TM, Mittermeier RA, Mittermeier CG, Fonseca GABd, Rylands AB, Konstant WR, Flick P, Pilgrim J, Oldfield S, Magin G, Hilton-Taylor C (2002) Habitat loss and extinction in the hotspots of biodiversity. *Conserv Biol* 16:909–923
- Callicott JB, Rozzi R, Delgado L, Monticino M, Acevedo M, Harcombe P (in press) Biocomplexity and conservation of biodiversity hotspots: three case studies from the Americas. *Phil Trans R Soc London B*
- Carr E (2002) Park, forest and wilderness. *The George Wright Forum* 17(2):16–30
- Chape S, Blyth S, Fish L, Fox P, Spalding M (2003) 2003 United Nations list of protected areas. IUCN, Gland, Switzerland and Cambridge, UK and UNEP-WCMC, Cambridge, UK. ix + 44 pp
- Coates P (1993) In nature's defense: Americans and conservation. *British Association for American Studies* 26
- Colchester M (2003) Salvaging nature: indigenous peoples, protected areas and biodiversity conservation. World Rainforest Movement, Montevideo, Uruguay
- Conservation International (2006) Tropical wilderness areas. Available via <http://www.conservation.org/xp/CIWEB/regions/>
- Cronon W (1996) The trouble with wilderness; or, getting back to the wrong nature. In: Cronon W (ed) *Uncommon ground. Rethinking the human place in nature*. W.W. Norton, New York, pp 69–91
- Dennis NJ, Scholes B (1995) *The Kruger National Park: the wonders of an African Eden*. Struik Publishers (Pty) Ltd
- Department of Conservation, New Zealand (2005) World heritage. Available via <http://www.doc.govt.nz/Conservation/World-Heritage/index.asp>. Cited 2005
- Diamant R (2000) From management to stewardship: the making and remaking of the U.S. National Park system. Taking stock: changing ideas and visions for parks. *George Wright Forum* 17(2):31–45
- Dilsaver L (1994) *America's National Park system: the critical documents*. Rowman and Littlefield Publishers
- Echeverria J, Eby R (eds) (1995) *Let the people judge: wise use and the private property rights movement*. Island Press, Washington, D.C.
- Fairhead J, Leach M (1996) *Misreading the African landscape; society and ecology in a forest-savanna mosaic*. Cambridge University Press, Cambridge
- Fiedler PL, White PS, Leidy RA (1997) The paradigm shift in ecology and its implications for conservation. In: Pickett STA, Ostfeld RS, Shachak M, Likens GE (eds) *The ecological basis of conservation. Heterogeneity, ecosystems, and biodiversity*. Chapman and Hall, New York, pp 83–92
- Fisher C (2000) Review of Mark David Spence, *dispossessing the wilderness: Indian removal and the making of the national parks*. H-Net Review
- Foner E, Garraty JA (1991) *The reader's companion to American history*. Houghton Mifflin Company, Boston
- Foster DR (2002) Conservation issues and approaches for dynamic cultural landscapes. *J Biogeogr* 29:1533–1535
- Foster DR, Motzkin G (2003) Interpreting and conserving the openland habitats of coastal New England: insights from landscape history. *Forest Ecol Manage* 185:127–150
- Gillson L, Willis KJ (2004) As Earth's testimonies tell: wilderness conservation in a changing world. *Ecol Lett* 7:990–998
- Gillson L, Sheridan M, Brockington D (2003) Representing environments in flux: case studies from East Africa. *Area* 35:371–389
- Grumbine RE (1994) What is ecosystem management? *Conserv Biol* 8:27–38
- Grumbine RE (1997) Reflections on ecosystem management. *Conserv Biol* 11:41–47
- Gunderson LH, Holling CS (2001) *Panarchy: understanding transformations in human and natural systems*. Island Press, Washington
- Head L (2000) *Cultural landscapes and environmental change*. Arnold, London
- Heckenberger MJ, Kuikuro A, Kuikuro UT, Russell JC, Schmidt M, Fausto C, Franchetto B (2003) Amazonia 1492: pristine forest or cultural parkland? *Science* 301:1710–1714
- Hingston RWG (1931) Proposed British National Parks for Africa. *Geogr J* 77(5):401–422
- Holling CS (2001) Understanding the complexity of economic, ecological, and social systems. *Ecosystems* 4:390–405

- Hutton J, Adams WM, Murombedzi JC (2005) Back to the barriers? Changing narratives in biodiversity conservation. *Forum Dev Stud* 2:341–370
- Hviding E (2003) Contested rainforests, NGOs and projects of desire in Solomon Islands. UNESCO. Blackwell Publishing Ltd
- IUCN (1994) Guidelines for protected areas management categories. IUCN, Gland, Switzerland and Cambridge, UK
- Jacoby K (2001) Crimes against nature: squatters, poachers, thieves and the hidden history of American conservation. University of California Press
- Jepson P, Whittaker RJ (2002) Histories of protected areas: internationalisation of conservationist values and their adoption in the Netherlands Indies (Indonesia). *Environ Hist* 8:129–172
- Johnson BH (2001) The dark side of American environmentalism. *Rev Am Hist* 29:215–221
- Johnston J (2002) Preserving the beasts of waste and desolation: Theodore Roosevelt and predator control in Yellowstone National Park. *George Wright Forum* 15(4):19–26
- Kahn T (2003) Breaking down borders in Africa. Available at <http://www.scidev.net/Features/index.cfm?fuseaction=readfeatures&itemid=200&language=1>. Cited 2003
- Leopold A (1949) The sand county almanac. Oxford University Press, Inc., New York
- Lewis DM, Alpert P (1997) Trophy hunting and wildlife conservation in Zambia. *Conserv Biol* 11(1):59–68
- Library of Congress (2002) The evolution of the conservation movement, 1850–1920. Available at <http://www.memory.loc.gov/ammem/amrvhtml/conshome.html>. Cited 2002
- Luck GW, Ricketts TH, Daily GC, Imhoff M (2004) Alleviating spatial conflict between people and biodiversity. *Proc Natl Acad Sci* 101(1):182–186
- Marsh GP (1864) Man and nature. Harvard University Press, Cambridge, MA, 1965
- Maughan R, Nilson D (1993) What's old and what's new about the Wise Use Movement? Paper presented at the Western social science association convention 23 April 1993. Idaho State University Dept. of Political Science
- McElwee P (2001) Parks or people: exploring alternative explanations for protected areas development in Vietnam. Paper presented at conservation and sustainable development – comparative perspectives, Yale University, August 2001
- McNeely JA, Ness G (1995) People, parks and biodiversity: issues in population- environment dynamics. Paper given at the human population, biodiversity and protected areas: science and policy issues meeting held by the American Association for the Advancement of Science's Program on Population and Sustainable Development (PSD), April 1995
- Motzkin G, Foster DR (2002) Grasslands, heathlands and shrublands in coastal New England: historical interpretations and approaches to conservation. *J Biogeogr* 29:1569–1590
- Myers N et al (2000) Biodiversity hotspots for conservation priorities. *Nature* 403:853–858
- National Forest Protection Alliance (2005) Looking back at our National Forests. Available at <http://www.forestadvocate.org/century/usfs.html>. Cited 2005
- Norris F (2001) Managing subsistence activities in the national parks: general prohibitions vs. local sensitivities. In: Harmon D (ed) Crossing boundaries in park management: proceedings of the 11th conference on research and resource management in parks and on public lands. The George Wright Society, Hancock, MI
- Omland A (1997) World heritage – and the relationship between the global and the local. Department of Archaeology, University of Cambridge. Available at <http://www.folk.uio.no/atleom/master/contents.htm>. Cited 1997
- Pahl-Wostl C (1995) The dynamic nature of ecosystems: chaos and order entwined. John Wiley & Sons Ltd, New York
- Phillips A (2002) Management guidelines for IUCN category V protected areas—protected landscapes/seascapes. IUCN, Cambridge, U.K. and Gland, Switzerland
- Phillips A (2003) Turning ideas on their head: the new paradigm for protected areas. *The George Wright Forum* 20(2):8–32
- Pickett ST, Parker VT, Fiedler PL (1992) The new paradigm in ecology: implications for conservation biology above the species level. In Fiedler PL, Jain SK (eds) Conservation biology. Chapman and Hall, New York, pp 50–65
- Pritchard JA (1999) Preserving Yellowstone's natural conditions: science and the perception of nature. University of Nebraska Press, Lincoln, NE, 370 pp
- Pritchard JA (2002) The meaning of nature: wilderness, wildlife, and ecological values in the national parks. *The George Wright Forum* 19(2):46–56
- Robertson-Vernhes J (1997) Biosphere reserves: old and new. In: Protected areas in the 21st century: from islands to networks, 24–29 November 1997, IUCN, Albany, Australia

- Rogers KH (2003) Adopting a heterogeneity paradigm: implications for management of protected savannas. In du Toit JT, Rogers KH, Biggs HC (eds) *The Kruger experience: ecology and management of savanna heterogeneity*. Island Press, Washington
- Rong Zhang M (2004) A North American biosphere reserves network: background and prospects. Report prepared for Canadian Biosphere Reserves Association, December 2004
- Rossler M (2000) World heritage cultural landscapes. *The George Wright Forum* 17(1):27–28
- Runte A (1979) *National parks: the American experience*. University of Nebraska Press, Lincoln, NE
- Sarkar S (1999) Wilderness preservation and biodiversity conservation—keeping divergent goals distinct. *BioScience* 49(5):405–412
- Schelhas J (2001) The USA national parks in international perspective: have we learned the wrong lesson? *Environ Conserv* 28:300–304
- Schullery P (1997) *Searching for Yellowstone: ecology and wonder in the last wilderness*. Houghton Mifflin Company, New York
- Secretariat of the CBD (2001) Text of convention on biological diversity. Available via <http://www.biodiv.org/convention/articles.asp> Cited 2001
- Sellers RW (1997) *Preserving nature in national parks: a history*. Yale University Press, New Haven, CT
- Spence MD (1999) *Dispossessing the wilderness: Indian removal and the making of the national parks*. Oxford University Press, New York
- Stoddard E (2005) Land claims will not hurt South Africa's Kruger Park. Words and deeds. Available via KwaZulu-Natal Law Society. [http://www.lawlibrary.co.za/notice/wordsanddeeds/2005/2005\\_03\\_23.htm#press\\_land](http://www.lawlibrary.co.za/notice/wordsanddeeds/2005/2005_03_23.htm#press_land). Cited 2005
- Tipping R, Buchanan J, Davies A, Tisdall E (1999) Woodland biodiversity, palaeo-human ecology and some implications for conservation management. *J Biogeogr* 26:33–43
- Trudgill S (2001) Psychobiogeography: meanings of nature and motivations for a democratized conservation ethic. *J Biogeogr* 28:677–698
- Turnpenny M (2004) Cultural heritage, an ill-defined concept? A call for joined-up policy. *J Heritage Stud* 10(3):295–308
- UNEP (2001) Convention on biological diversity. Available at <http://www.biodiv.org/doc/publications/guide.asp>. Cited 2001
- UNESCO – World Heritage Center (2005) A brief history: linking the protection of cultural and natural heritage. Available at <http://www.whc.unesco.org/en/home/>. Cited 2005
- UNESCO (2005) Man and biosphere reserves. Available at <http://www.unesco.org/mab/wnbr.htm>. Cited 2005
- U.S. Environmental Protection Agency (2005) Endangered Species Act. Available at <http://www.epa.gov/region5/defs/html/esa.htm>. Cited 2005
- U.S. Forest Service (2004) Gifford Pinchot (1865–1946). Available at <http://www.lib.duke.edu/forest/Research/usfscoll/people/Pinchot/Pinchot.html>. Cited 2004
- van Wilgen BW, Trollope WSW, Biggs HC, Potgieter ALF, Brockett BH (2003) Fire as a driver of ecosystem variability. In: du Toit JT, Rogers KH, Biggs HC (eds), *The Kruger experience ecology and management of savanna heterogeneity*. Island Press, Washington, pp 149–170
- Wallace Z (2003) *The Wise Use Movement: environmental politics in the United States*. Spring 2003 Web essays. Bard's College. Available at: <http://www.inside.bard.edu/politicalstudies/student/PS260Spring03/wise-use.htm>
- WCPA (2005) World database on protected areas. Available via <http://www.sea.unep-wcmc.org/wdbpa/> Cited 2005
- Weddell BJ (2002) *Conserving living natural resources: in the context of a changing world*. Cambridge University Press, Cambridge
- Weeks P, Mehta S (2004) Managing people and landscapes: IUCN's protected area categories. *J Hum Ecol* 16(4):253–263
- Western D, Wright RM (1994) The background to community-based conservation. In: *Natural connections: perspectives in community-based conservation*. Island Press
- Wikipedia (2005) New Georgia Islands. Available at Wikipedia [http://www.en.wikipedia.org/wiki/New\\_Georgia\\_Islands](http://www.en.wikipedia.org/wiki/New_Georgia_Islands). Cited 2005
- Willis KJ, Gillson L, Brncic T (2004) How “virgin” is Virgin rainforest. *Science* 304:402–403
- Wu J, Loucks O (1995) From balance of nature to hierarchical patch dynamics: a paradigm shift in ecology. *Quart Rev Biol* 70:439–466
- WWF (2005) Ecoregions: Solomons-Vanuatu-Bismarck moist forests. Available at <http://www.panda.org/resources/programmes/global200/pages/regions/region016.htm>. Cited 2005