

Perceptions and attitudes of land managers in multi-tenure reserve networks and the implications for conservation

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Abstract

Multi-tenure reserve networks aim to connect areas managed for biodiversity conservation across public and private land and address the impacts of fragmentation on both biotic and social systems. The operation and function of Australian multi-tenure reserve networks as perceived by their land managers was investigated. Overall, the conservation of natural assets was the most frequently reported primary reason for involvement in a network. The perceived aims of the respective networks largely reflected the response identified for involvement and management. Over 88% of managers considered their involvement in multi-tenure reserve networks to be a positive or very positive experience. A lack of resources and time for management were considered major limitations of these networks. The majority (80%) of private land managers within networks were willing to be included in a national reserve system of conservation lands. As the Australian National Reserve System currently incorporates mostly public land, these findings have important and potentially positive implications for a greater role for protected private land.

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1. Introduction

Multi-tenure reserve networks aim to connect areas managed for biodiversity conservation across public and private land. Models of these networks include Biosphere Reserves (BR) and Conservation Management Networks (CMN). As networks in biodiversity conservation aim to address the impacts of fragmentation on both biotic and social systems, a more thorough understanding of social factors is required in order to create working relationships between people and nature (Briggs, 2002). This paper examines the social elements of multi-tenure reserve networks, particularly in relation to their management and operation. The physical and ecological attributes of multi-tenure reserve networks in Australia have been analysed by Fitzsimons (2004).

Biosphere Reserves are concerned primarily with integrating biodiversity conservation with ecologically sustain-

able development across a variety of land tenures and uses (UNESCO, 1995; Brunckhorst et al., 1997). The theoretical Biosphere Reserve model revolves around a 'core' protected area managed primarily for nature conservation, a 'buffer' zone where activities that impact on the biodiversity of the core are minimised, and a 'transition' zone, where the sustainable use of natural resources is encouraged (Batisse, 1993; Brunckhorst et al., 1997). The UNESCO 'Man and the Biosphere Program' coordinates the world network of Biosphere Reserves, which currently constitutes 482 Biosphere Reserves in 102 participating nations (UNESCO, 2005).

A Conservation Management Network is a network of properties with remnant vegetation managed for conservation, their managers and other interested parties. The CMN model essentially provides a coordinating or 'umbrella' body to help coordinate the protection and management of fragmented ecological communities across a range of tenures and with a variety of protection mechanisms (Binning and Young, 1997; Thiele and Prober, 1999, 2000). There are 7 CMNs operating in

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southeastern Australia at present (Fitzsimons and Wescott, 2005).

The increased focus on private land conservation in Australia has seen a number of studies exploring the attitudes of private, mainly rural, landholders towards the protection of remnant vegetation on their properties (e.g. Elix and Lambert, 1997; Denys Slee and Associates, 1998; Hamilton et al., 1999; Hodgkins et al., 1999; Kabii, 2001). The research presented in this paper focuses more specifically on landholders who have made a conscious effort to protect vegetation on their properties.

Few studies have dealt with landholders protecting vegetation under binding and non-binding agreements in Australia, despite their increasing number (although see Stephens, 2002; Stephens et al., 2002). Further, despite the number of public protected areas in Australia and staff within them, attitudinal studies of park managers are also limited. Thus it is not surprising that studies exploring attitudes and perceptions of managers within multi-tenure reserve networks worldwide are limited. Recent research into aspects of conflict, management and perceptions of Biosphere Reserves in India (Maikhuri et al., 2000a, b, 2001; Rao et al., 2003) and China (Xu et al., 2006) is an exception although this research has focussed on reserves with human inhabitants, a situation uncommon in Australia. Elsewhere, an analysis of the attitudes and knowledge of people living in the Greater Yellowstone Ecosystem in the USA has been undertaken by Reading et al. (1994). Within Australia, Todd (2000) has previously surveyed land managers with native grasslands on their properties in the Victorian Volcanic Plain, with the aim of assessing the suitability of a proposed Conservation Management Network model for addressing nature conservation objectives in that region.

The involvement of land managers and owners¹ is the process which elevates multi-tenure reserve networks from conceptual to functional networks. The inclusion of any property in a Biosphere Reserve or Conservation Management Network in Australia is on a voluntary basis. The successful operation of networks of people, often with varying objectives, relies heavily on issues of cooperation between parties, trust and adequate resources (Craig et al., 1995; Hodgkins, 1995; Moore, 1995; Wild et al., 1995; Briggs, 2002). Research has also indicated that establishing and maintaining networks or collaborative management agreements often relies on the energy and commitment of one or more individuals (e.g. Borrini-Feyerabend, 1999; Stoll-Kleemann and O'Riordan, 2002). More recently the collaborative planning and management of public protected areas by private interests has received increased attention (e.g. Endicott, 1993; Charters et al., 1996; Stolton and Dudley, 1999; Lane, 2001).

A key aspect of the successful management of multi-tenure networks as a whole (i.e. their capacity to meet their stated objectives) is clearly the actual land manager. In operating as part of a network, managers may face different expectations and challenges (e.g. legal constraints, time limitations) than might otherwise be experienced simply by managing their park or their property in isolation. One aspect of land managers' capacity is their understanding of the objectives of the networks and their perceptions of their specific role within the network.

As has previously been highlighted (Fitzsimons and Wescott, 2004), habitat protected outside of the public reserve system has received inadequate recognition when reporting for conservation audits such as the Australian National Reserve System. The Grassy Box Woodlands Conservation Management Network was originally established, in part, to act as a model for improving these inadequacies in reporting. However, the perceptions of managers, particularly those on private land, relating to their potential involvement in such a system has not previously been explored.

This paper investigates the operation and function of multi-tenure reserve networks as perceived by land managers. In order to achieve this aim, the following research questions were asked:

How do managers of components within multi-tenure reserve networks perceive:

- (1) The role of the network they are a part of?
- (2) Their own role within the network?
- (3) The functionality of the network?

2. Methods

2.1. Study area

Three case studies located in southeastern Australia were the focus of this research—the Bookmark Biosphere Reserve (BBR), Grassy Box Woodlands Conservation Management Network (GBWCMN) and Gippsland Plains Conservation Management Network (GPCMN) (Fig. 1). These networks were chosen on the basis that they were the most advanced in their development at the time of the research and that they enabled a comparison between attitudes and perceptions of land managers within different network structures and different Australian jurisdictions. The Bookmark Biosphere Reserve (now known as the Riverland Biosphere Reserve) is located in the Murray Mallee and Riverland areas of South Australia and includes large former pastoral properties and smaller privately owned properties along the Murray River. The Grassy Box Woodlands CMN incorporates a number of relatively small remnants of mainly grassy white box woodland vegetation, often on cemeteries and travelling stock routes, in the largely cleared inland slopes of New South Wales from north of the Victorian border to south

¹Land managers/owners in this context include park rangers, committees and trusts for public land, and farmers, non-government organisations and 'bush block' owners (landowners who have purchased land for the purpose of maintaining native vegetation) owners on private land.

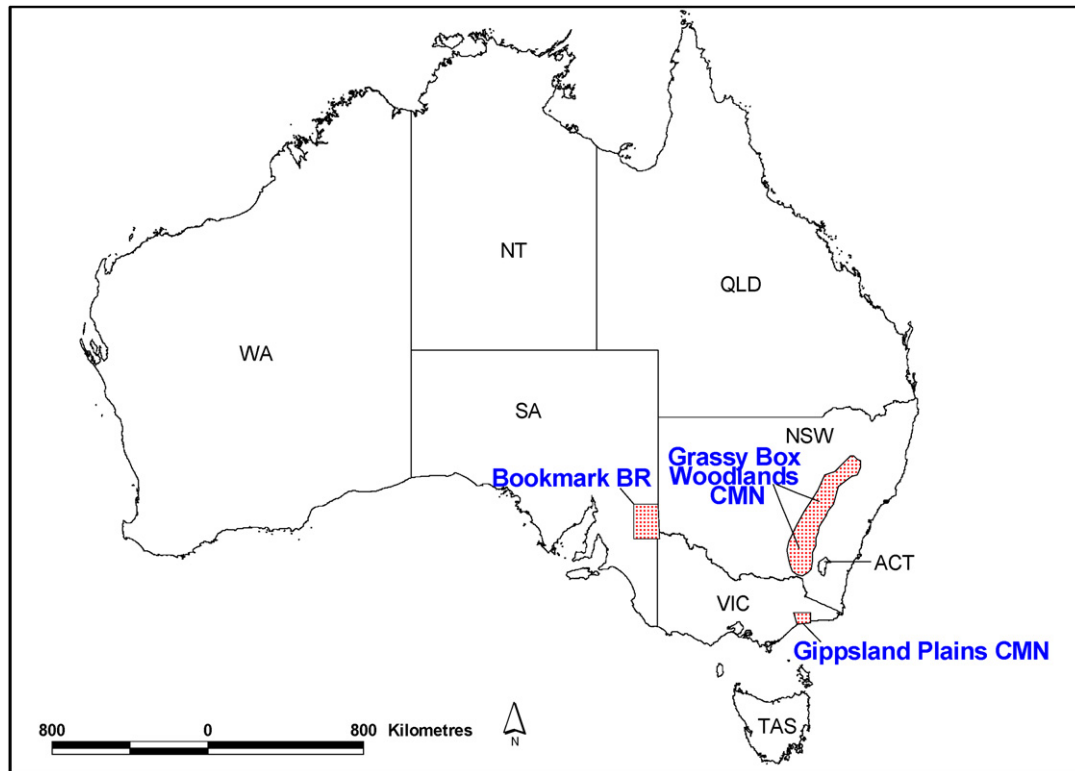


Fig. 1. Location of the Bookmark Biosphere Reserve, Grassy Box Woodlands CMN and Gippsland Plains CMN in Australia.

of the Queensland border. The Gippsland Plains CMN includes a number of public land nature conservation reserves, as well as private reserves owned by the Trust for Nature (a land trust), and private land owned by individuals under binding or non-binding agreements, protecting plains grassy woodlands, lowland forests and wetlands (see Fitzsimons and Wescott, 2005 for more details).

2.2. Data collection

A 6-page questionnaire² was sent to all 70 land managers involved in the three networks during November 2001. A covering letter explaining the research project, a consent form and a reply-paid envelope were included with each questionnaire. Reminder letters were sent to managers who had not replied after three weeks of the initial mailout. Follow-up phone calls were made to those who had not replied 3 weeks after the mailout of the reminder letter.

Questions were arranged into broad themes (e.g. 'limitations/improvements', 'awareness of other sites and correspondence with other managers') and comprised a mixture of open and closed questions. Questionnaires were given a unique identifier so follow up correspondence could be made with non-respondents.

We standardised the various tenure and protection types of network components by using the *Conservation Lands Classification* (CLC) (see Fitzsimons and Wescott, 2004) to

compare the relative contribution of various components to networks. The *Conservation Lands Classification* (CLC) was slightly modified to account for the likelihood that managers of public protected areas would be managing parks and reserves which fell into both IUCN Protected Area Categories I–IV and V–VI. These categories were thus merged to form the 'public protected area' category.

The majority of managers managed only one property but in some cases a manager was responsible for a number of sites within their network. This was particularly true for the government park management agencies in Victoria and South Australia which managed both a relatively large number of sites and total area within their networks. As most of these reserves are managed for similar purposes and as part of a broad operational resources budget it was considered unrealistic that these agencies complete a separate questionnaire for each individual reserve.

An overall response rate of 72.9% was obtained for the mail survey. The response rate for the three networks was similar, differing by only 6% from highest to lowest (Table 1). This response rate is considered relatively high for postal questionnaires (Babbie, 1990) and may reflect the landholder's or manager's intrinsic interest in the topic, considering that they have all voluntarily joined their respective networks.

2.3. Data analysis

Data collected from the questionnaire was entered into a statistical analysis package (SPSS Version 10.0). Calculation

²Copies of the questionnaire can be obtained from the senior author.

Table 1
Response rate for each network to the mail survey

Network	Total questionnaires sent	Useable surveys returned	Response rate (%)
BBR	30	21	70.0
GBWCMN	25	19	76.0
GPCMN	15	11	73.3
Total	70	51	72.9

of significant differences in responses between networks was ascertained using a χ^2 test, with Spearman's co-efficient used to ascertain significance at the 1% level. Some questions were of an 'open' nature and the responses were coded and grouped according to general themes. In some instances, managers provided more than one response to particular open questions. In these cases each broad response category was tested against all other categories put together in a series of $2 \times 2 \chi^2$ tests, to reduce problems associated with a lack of independence (Oppenheim, 1992).

3. Results and discussion

In order to ensure that responses were representative of the range of properties, managers were asked to specify which CLC category best described the property they managed. The highest response rate was from managers of 'privately owned properties managed by individuals for conservation but with no legally binding measures in place' (BBR 4; GPCMN 4; GBWCMN 5), followed by properties owned by private individuals that did have 'legally binding protective measures in place' (5:4:1). Responses from managers of public land not primarily reserved for nature conservation, both with and without formal conservation agreements in place were only received from the GBWCMN while the 'other' category, which effectively contained mostly properties managed for sustainable horticulture, only occurred in Bookmark. The spread of responses within the various CLC categories meant that statistical analysis was mostly restricted to differences in responses between networks.

3.1. Motivators for involvement in the network and perceived aims of the network

The aims and motivations for a manager's involvement in a multi-tenure reserve network and their perception of the aims of the network as a whole are likely to be important determinants of a network's 'workability' as both of these ultimately shape the 'expectations' of the managers.

Overall, 'conservation of natural assets' was the most frequently reported primary reason for involvement in a network, although it was the second most frequently listed

reason in the GBWCMN (Table 2a). Significant differences in responses between networks were recorded for 'associating with like-minded people' ($P = 0.016$) and 'supporting the idea of a network' ($P = 0.006$) (which was the most frequently listed GBWCMN response).

A number of managers listed multiple management aims (Table 2b) for their sites and consequently there are a greater number of aims than respondents. The conservation of native vegetation in general, and specific vegetation communities in particular, was the most cited primary management objective for sites across the three networks. While 'sustainable horticulture/agriculture' was the second most listed objective overall, significantly more BBR respondents listed this as a primary aim ($P = 0.038$).

The perceived aims of the respective networks largely reflected the response listed for involvement and management (Table 2c). Protection of natural areas was the most often listed perceived aim of the networks overall but differed significantly ($P = 0.038$) between networks. Conservation of specific areas was the most often listed response for Grassy Box Woodlands and Gippsland Plains networks while it was the second most often listed response for Bookmark. Similarly, reflecting the 'sustainable horticulture or agriculture' aim of many of the Bookmark managers, 'support and development of ecologically sustainable development' was the most often listed perceived aim of the network for managers in Bookmark.

A relatively even proportion of managers believed a primary aim of the networks was to 'provide an information source, educate land managers and involve the community' as well as 'developing a community of like-minded people and seeking partnerships'.

Overall, 26 respondents listed only one perceived primary objective of the network, compared to 20 who listed multiple objectives. Interestingly, four managers were unsure of the primary aim(s) of their network. The varying and sometimes narrow perceptions of the aims of the networks (e.g. 'information source', 'rehabilitation of degraded wetlands') may reflect a broader lack of public understanding of what cross-tenure conservation networks such as biosphere reserves actually means (Batisse, 1982; Kellert, 1986; de Salaberry and Reid, 1999).

3.2. Protected area classification and recognition within a national reserve system

Managers were asked whether they considered the property or reserve they owned or managed to be a 'protected area' based on the following (IUCN, 1994) definition of the term:

"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".

Managers were also asked whether they would like to be recognised as being part of a 'national reserve system' of

Table 2

(a) Primary reason for involvement in the network; (b) Primary management objectives for their sites; and c) Perceived aims of the network

(a)	BBR (n = 28)	GPCMN (n = 15)	GBWCMN (n = 22)	Total (n = 65)	χ^2	d.f.	P
Conservation of natural assets	11	6	6	23	0.959	2	0.619
Associate with like-minded people/information exchange	3	3	10	16	8.237	2	0.016
Request from, or introduction to, coordinating body or State conservation agency	1	3	3	7	3.028	2	0.220
Supported 'concept' of network/wider conservation effort	7	0	0	7	10.366	2	0.006
Miscellaneous	5	2	0	7	4.222	2	0.121
Means of obtaining funding	0	1	2	3	2.499	2	0.287
Give further credibility/recognition to the site	1	0	1	2	0.658	2	0.720
(b)	BBR (n = 30)	GPCMN (n = 13)	GBWCMN (n = 26)	Total (n = 69)	χ^2	d.f.	P
Conservation of natural vegetation/communities	9	8	14	31	4.987	2	0.083
Sustainable horticulture/agriculture	11	3	2	16	6.565	2	0.038
Endangered species breeding/restoration	3	2	4	9	0.433	2	0.805
Research/monitoring/education	2	0	4	6	2.859	2	0.239
Recreation	4	0	0	4	5.520	2	0.063
Miscellaneous	1	0	2	3	1.364	2	0.505
(c)	BBR (n = 36)	GPCMN (n = 16)	GBWCMN (n = 29)	Total (n = 81)	χ^2	d.f.	P
Protection of natural areas	6	7	11	24	6.531	2	0.038
Education of land managers/information source/involvement of community	6	3	6	15	0.235	2	0.889
Development of community of like-minded people/seek partnerships	4	3	6	13	1.378	2	0.502
Support and development of ESD	8	0	0	8	10.632	2	0.005
Restoration of ecosystem/ecological research	2	1	4	7	1.412	2	0.494
Direct reference to objectives of 'Man and Biosphere Program' or 'CMN'	4	0	0	4	5.033	2	0.081
Unsure	3	0	1	4	1.705	2	0.426
Coordinate working relationships for landscape management	1	2	0	3	5.463	2	0.065
Miscellaneous	2	0	1	3	0.867	2	0.648

n = number of responses.

land managed for conservation. The question was deliberately structured so as to imply a hypothetical national reserve system as opposed to the Australian National Reserve System currently in existence, as it was considered that this is likely to have a low profile amongst managers of private land and other public land.

At least two-thirds of the managers in the GPCMN and GBWCMN networks considered their properties to be protected areas based on the above definition, whereas the Bookmark response was divided (although this difference was not significant $\chi^2 = 6.801$, d.f. = 4, $P = 0.147$) (Table 3a). Almost 75% of respondents from all networks indicated that they would like to be recognised as part of a national reserve system ($\chi^2 = 2.141$, d.f. = 4, $P = 0.710$) (Table 3b). Interestingly, of those 38 respondents, only nine manage properties which would currently qualify to be admitted to the existing National Reserve System (the requirement being that they need to be a 'protected area') (Commonwealth of Australia, 1999).

Eleven managers believed their sites were not protected areas but were still willing to be recognised as part of a

national reserve system. Conversely, three managers who considered their sites to be protected areas did not want to be recognised as part of a national reserve system. What is more interesting is that sites managed by two of these managers are already considered part of the existing Australian National Reserve System (Fig. 2).

Prober et al. (2001) noted it was "interesting" that there had been no opposition to the word 'conservation' in the Grassy Box Woodlands Conservation Management Network's title. The willingness of respondents in this survey to be involved in a 'national reserve system' of land managed for conservation is equally of interest. This contrasts with research elsewhere which found that private landholders may see the creation of protected areas as an oppressive development bringing in foreign values and possibly depriving them of rights, wealth and culture (Borrini-Feyerabend, 1999; Stoll-Kleemann, 2001a, b; Hiedanpää, 2002; Wilshusen et al., 2002). Further, perceptions of protected areas as a source of weeds, vermin and fire are prevalent in many parts of rural Australia (Figgis, 1999; Worboys et al., 2001). The seemingly high interest in

Table 3

(a) Managers considering their sites to be protected areas and (b) managers willing to be recognised as part of a national reserve system of land managed for conservation

	BBR	GPCMN	GBWCMN	Total	%
<i>(a) Considered sites to be protected areas</i>					
Yes	9	7	12	28	57.1
No	8	3	6	17	34.7
Unsure	4	0	0	4	8.2
<i>(b) Willing to be part of national reserve system</i>					
Yes	14	9	15	38	74.5
No	6	2	4	12	23.5
Unsure	1	0	0	1	2.0

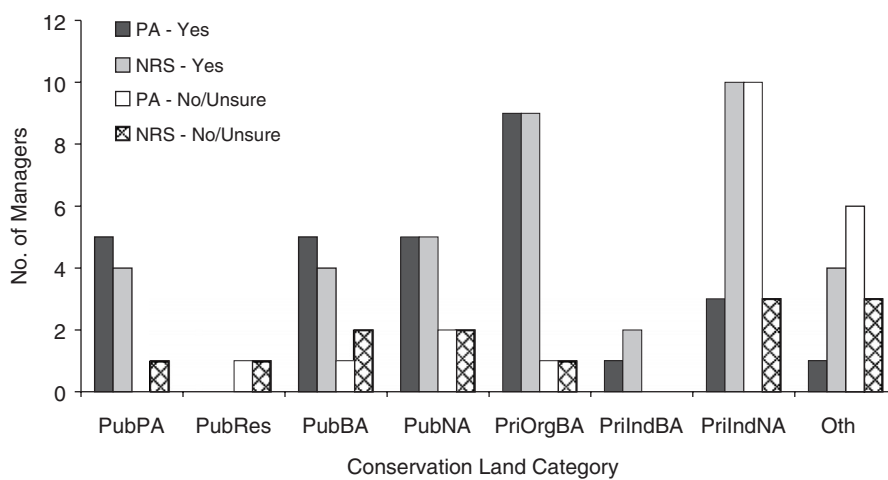


Fig. 2. Willingness by managers to be part of a national reserve system and consideration of their sites to be a ‘protected area’ by Conservation Land Classification. Abbreviations: PA (Protected Area), NRS (National Reserve System). Conservation Land Categories: PubPA = Public protected areas, PubRes = Public land reserve, PubBA = Crown lands–protective agreement, PubNA = Crown lands–no agreement, PriOrgBA = Private-organisation (binding agreement), PriIndBA = Private-Individual (binding agreement), PriIndNA = Private-individual (non-binding agreement), Oth = other.

involvement in a national reserve system may in part be due to the voluntary nature of the networks—that is, they may be more likely to attract landowners/managers with an existing interest in conservation.

However, one respondent not willing to be involved in a national reserve system cited “concern that figures contributing to (the National Reserve System) may justify clearing to continue” elsewhere in the region. Although this scenario is unlikely (i.e. clearing elsewhere as a result of recognition) it may lessen the emphasis on government’s meeting reservation targets on public land (e.g. through land purchase or upgrading public land).

Fitzsimons and Wescott (2001) highlighted the weaknesses of the current Australian National Reserve System in not adequately accounting for private land protected under legally binding agreements. Whilst not all land currently managed in these networks should necessarily be considered for entry into a national reserve system, networks do allow for accurate reporting of land managed for conservation under a variety of agreements on a variety of tenures. It is thus promising that close to three quarters (74.5%) of all respondents and, in particular, 80.8% of

private organisations or individuals managing their sites primarily for nature conservation, considered the possibility of including their site/s in such a system to be worthwhile.

3.3. Attitudes towards involvement in the network

The attitudes of managers towards their involvement within networks are likely to have an impact on the level of cooperation and possibly the long-term viability of these networks. Managers were asked whether they considered their involvement in the networks to be a very positive, positive, neutral/unsure, negative, or very negative experience. The majority of managers in each of the networks considered their involvement to be a positive experience and over 88% overall considered their involvement to be either positive or very positive (Table 4). There was no significant difference ($\chi^2 = 4.297$, d.f. = 6, $P = 0.637$) in responses between networks, however Bookmark was the only network where two managers indicated their involvement to be a negative experience. Both of these managers cited conflicts between the main groups involved in

Table 4
Attitudes to involvement in networks

	BBR (<i>n</i> = 21)	GPCMN (<i>n</i> = 11)	GBWCMN (<i>n</i> = 19)	Total (<i>n</i> = 51)
Very positive	7	3	4	14
Positive	11	7	13	31
Neutral/unsure	1	1	2	4
Negative	2	0	0	2
Very negative	0	0	0	0

coordination—the Bookmark Biosphere Trust and Australian Landscape Trust—to be a primary reason for this impression.

3.4. Awareness of other sites in the network and influence on management

Determining the extent to which multi-tenure reserve networks acted as human networks was measured by querying whether managers: (1) were aware of other sites in their network; (2) corresponded with other managers in their network; (3) had altered their management regimes as a result of the network; and (4) made management decisions based on other sites in their network.

A high proportion (83.3%) of managers overall were aware of other sites within their network, with no significant differences between networks ($\chi^2 = 0.594$, d.f. = 2, $P = 0.743$) (Fig. 3a).

Across the three networks, over half (55.3%) of the managers were in regular correspondence with other managers within their networks (Fig. 3b). However, there were significant differences between the three networks ($\chi^2 = 6.655$, d.f. = 2, $P = 0.036$), with Bookmark BR recording the highest rate of communication (75%) and GBWCMN the lowest (33%). It is likely that the geographic spread and level of property connectivity within networks would have a large bearing on the degree of communication between land managers (see Fitzsimons and Wescott, 2005).

Overall just less than half (48%) of managers indicated they had altered their management regimes as a result of participating in their network, although 61.9% of respondents from Bookmark suggested that they had ($\chi^2 = 4.815$, d.f. = 4, $P = 0.307$) (Fig. 3c). However, while those managers altering their management suggested they did so for biodiversity conservation or sustainability reasons, it cannot be assumed that management regimes on the sites where no change occurred were necessarily a negative for biodiversity. This is particularly true for native grassy ecosystems where any major and sudden changes to the past management regimes of sites with conservation value may have adverse consequences for their flora and fauna (Barlow, 1998). Overall, 54% of managers suggested that management decisions on their site were influenced by the actions of other sites within their network. Interestingly, while only 56% of GPCMN managers regularly corresponded with each other, 82% suggested that other sites in

the network influenced their management decisions (Fig. 3d). While this influence was notably higher than it was for Bookmark BR (52%) and the GBWCMN (39%) it was not significantly different ($\chi^2 = 7.791$, d.f. = 4, $P = 0.100$).

Considering that social norms and behaviours are difficult to shift (McKenzie-Mohr and Smith, 1999; Synapse Research and Consulting and Capital Ag Consulting, 2001), changing the social environment can be an important way of changing attitudes and behaviour (Lowe et al., 2003). However, attitudes are not considered a good predictor of behaviour (Hobbs and Saunders, 2000) and in some instances there is excessive emphasis on awareness raising activities in rural conservation programs, based on the assumption that this will lead to a change in attitudes and, in turn, behaviour (Curtis et al., 1998; Williams, 2000). Considering that more than half of managers were influenced by other managers and that almost half had altered management regimes suggests that multi-tenure reserve networks may well be an important structure for achieving behavioural change leading to improved management for biodiversity.

Communication to individuals rather than members of groups is seen as an important way to improve the effectiveness in conveying the conservation message (Stoll-Kleemann, 2001a; Briggs, 2002; Edwards and Traill, 2002). In effect, multi-tenure reserve networks have the potential to provide a forum to facilitate this as each landowner and property is considered an important part of a common goal.

3.5. Limitations and suggested improvements to the networks

Lack of sufficient finances and time for management were the most cited limitations to the Gippsland Plains and GBW networks and second most cited limitation for Bookmark (Table 5a). The current governance/coordination arrangements and a lack of cooperation and acceptance of some groups were considered a major limitation of Bookmark BR, an issue not cited at all in GBWCMN. Todd (2000) found that resources and perceptions of equality were the most critical factors in determining good landholder/government partnerships in the Victorian Volcanic Plain. The importance of perceptions of fairness, equality and procedural and social justice have been shown to be key drivers in a range of natural resource

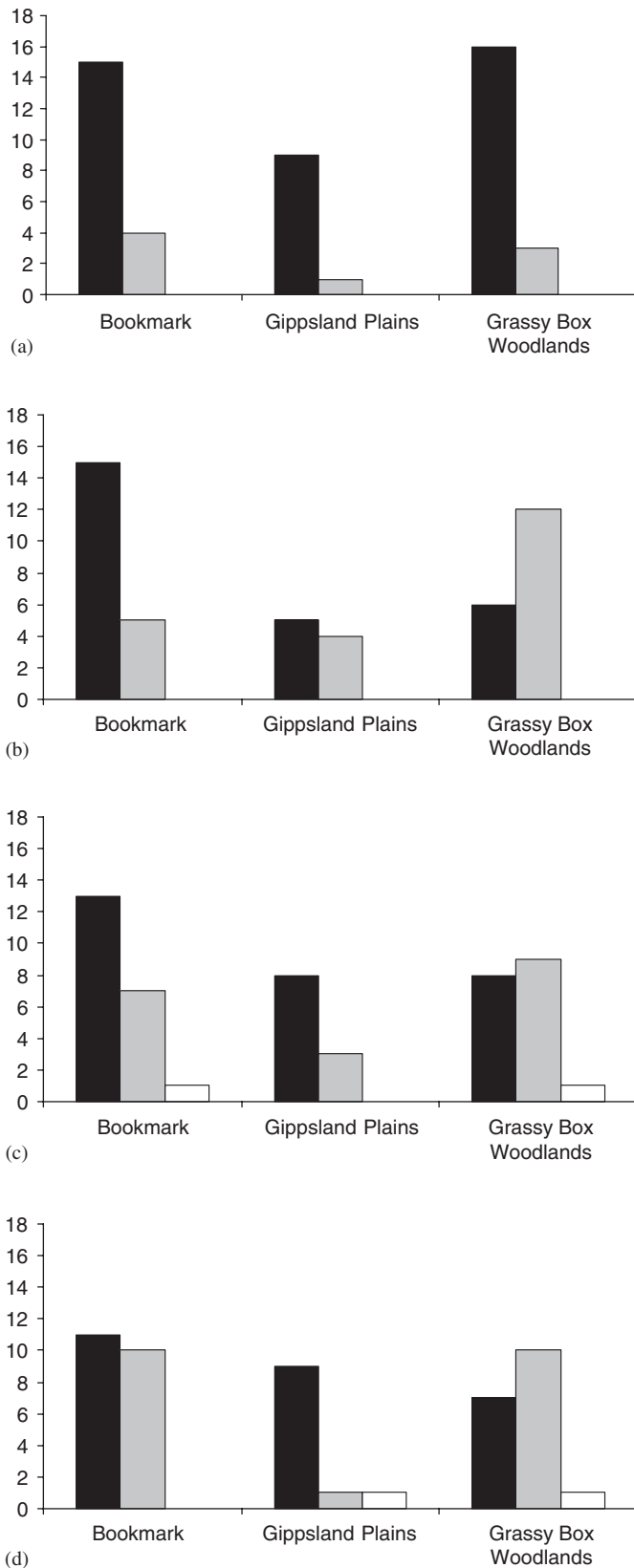


Fig. 3. Responses of managers to the following questions: (a) Were managers aware of other sites in the network? (b) Were managers in regular correspondence with other managers? (c) Did managers alter management regimes since becoming part of the network?, and (d) Did management actions on other sites influence management on their site?. Black bar = yes, grey bar = no, white bar = unsure.

management partnerships (e.g. Moore et al., 2001; Brechin et al., 2002; Theobald and Hobbs, 2002).

Tax concessions or direct financial assistance were considered two of the three most required areas of assistance for farmers in central western NSW (Hodgkins et al., 1999). Interestingly, Hodgkins et al. (1999) found that more information on trees and wildlife were required by these landholders, an improvement not elucidated by managers in the multi-tenure reserve networks. It may be that sufficient habitat management information is being provided within multi-tenure reserve networks or that the participants in such groups are more attuned and/or receptive to available information.

The suggested improvements to the network reflected the responses given to the perceived major limitations (Table 5b). ‘Increased funding/access to labour’ was the most often suggested improvement overall, and particularly from GBWCMN managers. Significant differences occurred for responses such as ‘improving coordinating authority arrangements/increased recognition of all components’ (where most suggestions came from Bookmark) and ‘education/publicity’ (where most responses came from Gippsland Plains managers) ($P = 0.005$ and 0.006 , respectively). These findings were broadly in line with a national survey of Australian covenantors, which identified “greater levels of financial assistance, including rate rebates” as the most suggested improvement to covenanting programs (Stephens, 2002, p. 14).

One of the perceived benefits of a site belonging to a network is that it gains a higher profile and is more likely to be successful in funding applications (Prober et al., 2001). Land managers were asked whether they had received any extra funding for management as a result of being in their respective network. Almost 40% of managers had received extra funding with seven managers identifying the Natural Heritage Trust³ as the source of funding and a further six specifically listing funding for the fencing of remnant vegetation. Despite some differences in the proportion of managers receiving funding between networks (BBR 52%, GPCMN 22%, GBWCMN 35%) there were no significant differences in responses between the networks ($\chi^2 = 2.671$, d.f. = 2, $P = 0.263$).

4. Implications of this study for conservation outcomes

This research has highlighted that different landholders and managers involved in multi-tenure reserve networks perceive the aims of their network in different ways. The *individual* motivation for joining the networks and the primary management aim of their property appear to have a strong influence on their perception of the aims of the

³The NHT is a AU\$2.5 billion environmental policy initiative. Funds are allocated by the national government to Australian States and Territories, generating matching funds or in-kind resources for investing in biodiversity conservation and sustainable natural resource management (see Crowley, 2001, for a detailed review of the program).

Table 5
(a) Perceived major limitations of the networks and (b) suggested improvements to networks

	BBR	GPCMN	GBWCMN	Total	χ^2	d.f.	P
<i>(a) Limitations of network</i>							
Lack of finance and time	7	4	9	20	0.023	2	0.988
Governance arrangements/ lack of cooperation and acceptance of some groups	8	2	0	10	11.351	2	0.003
Lack of field staff visitation/monitoring/advice	2	3	3	8	1.874	2	0.392
Too early/unsure	3	1	3	7	0.209	2	0.901
Location and distances between sites and managers	1	0	3	4	1.925	2	0.382
Public awareness/cynicism/ misconceptions	3	1	2	6	0.537	2	0.764
Miscellaneous	0	2	9	11	9.126	2	0.010
<i>(b) Suggested improvements</i>							
Increased funding/access to labour	3	3	7	13	3.567	2	0.168
Improving coordinating authority arrangements/ increased recognition of all components	8	2	0	10	10.705	2	0.005
More on-ground works/ research/trials/info exchange	3	1	5	9	2.956	2	0.228
Education/publicity	1	6	1	8	10.074	2	0.006
Too early to judge/unsure	2	1	2	5	0.236	2	0.889

network overall. While none of these perceptions would necessarily be considered contrary to the actual aims of the network, their often narrow focus has implications for its operation. Differences in perceived aims ultimately have the potential to cause uncertainty and even conflict, particularly if decisions are made in the name of the network but are contrary to a manager's expectations. More clearly defining and communicating these aims is likely to ensure confidence in the concept and role of the network. This may be a greater challenge for networks such as biosphere reserves, which aim to integrate a number of traditionally antagonistic/conflicting activities.

The correlation between the levels of communication and the geographic distances between components has important implications for planning effective sizes of networks. Many disputes over nature conservation issues are the result of social conditions and attitudes shaped by social networks (Stoll-Kleemann, 2001a). Multi-tenure reserve networks may thus play an important role in lessening animosity between public and private land managers by bringing them together for a common objective. However, if the network is too large and the properties too disparate, the need for communication amongst managers may be perceived as less important and/or less feasible. Thus the overall involvement of land managers may be lessened in these circumstances.

The high level of enthusiasm to be recognised within a national reserve system for land managed for conservation has important policy implications. This strengthens previous recommendations to incorporate private land managed for conservation under agreement within the traditional protected area estate for auditing and conservation planning purposes (Fitzsimons and Wescott, 2001).

The identification of insufficient resources (namely finances, time and labour) for management as a major deficiency within networks is unsurprising considering this

issue is consistently identified for the management of both public and private conservation lands in Australia and other parts of the world (e.g. Wescott, 1995; Langholz et al., 2000; Stephens, 2002). It is highly likely that this deficiency affects the ability of other landowners not currently part of a network. Beyond this, the varying limitations and suggested improvements identified between networks suggests that more local, network-specific issues are also occurring. Some of these limitations, such as the 'distance between sites', relate directly to the historical fragmentation of the landscape. However, almost all of the perceived major limitations and suggested improvements identified by managers relate to issues that can, to varying extents, be influenced by the networks coordinating body. The coordinating body itself was considered by some managers to be a major limitation of the network. Thus the coordinating body is likely to be a significant influence on the operation of the network.

5. Conclusions

Similarities in attitudes and perceptions of multi-tenure reserve networks by managers was evident in many instances. However, it is important to recognise different perceptions will form from the varying circumstances of each network; i.e. different ways the networks are run, the different mixes of tenures and properties involved, the differences in the biophysical nature of the landscapes and different social environments. This research has shown that managers within multi-tenure reserve networks face similar challenges to other managers of natural areas. However, multi-tenure reserve networks can to some extent lessen problems associated with the fragmentation of land ownership by linking managers of natural areas across tenures, thus improving information flow and, potentially, biodiversity conservation outcomes.

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References

- Babbie, E., 1990. *Survey Research Methods*, second ed. Wadsworth Publishing Company, Belmont, California.
- Barlow, T., 1998. *Grassy Guidelines: How to Manage Native Grasslands and Grassy Woodlands on your Property*. Trust for Nature (Victoria), Melbourne.
- Batisse, M., 1982. The Biosphere Reserve: a tool for environmental conservation and management. *Environmental Conservation* 9, 101–114.
- Batisse, M., 1993. The silver jubilee of the MAB and its revival. *Environmental Conservation* 20, 107–112.
- Borrini-Feyerabend, G., 1999. Collaborative management of protected areas. In: Stolton, S., Dudley, N. (Eds.), *Partnerships for Protection: New Strategies for Planning and Management of Protected Areas*. Earthscan Publications, London, pp. 215–223.
- Binning, C.E., Young, M.D., 1997. Motivating people: using management agreements to conserve remnant vegetation. Paper 1/97, National Research and Development Program on Rehabilitation, Management and Conservation of Remnant Vegetation Environment Australia, Canberra.
- Brechin, S.R., Wilshusen, P.R., Fortwangler, C.L., West, P.C., 2002. Beyond the square wheel: toward a more comprehensive understanding of biodiversity conservation as social and political process. *Society and Natural Resources* 15, 41–64.
- Briggs, S.V., 2002. Integrating people and nature for landscape conservation. In: Lunney, D., Dickman, C., Burgin, S. (Eds.), *A Clash of Paradigms: Community and Research-Based Conservation*. Royal Zoological Society of New South Wales, Mosman, pp. 64–73.
- Brunckhorst, D.J., Bridgewater, P., Parker, P., 1997. The UNESCO Biosphere Reserve Program comes of age: learning by doing; landscape models for sustainable conservation and resource use. In: Hale, P., Lamb, D. (Eds.), *Conservation Outside Nature Reserves*. Centre for Conservation Biology, University of Queensland, Brisbane, pp. 176–182.
- Charters, T., Gabriel, M., Prasser, S. (Eds.), 1996. *National Parks: Private Sector's Role*. University of Southern Queensland Press, Toowoomba.
- Commonwealth of Australia, 1999. *Australian Guidelines for Establishing the National Reserve System*. Environment Australia, Canberra.
- Craig, J.L., Saunders, D.A., Mattiske, E.M., 1995. Effective conservation requires people networked for action. In: Saunders, D.A., Craig, J.L., Mattiske, E.M. (Eds.), *Nature Conservation 4: The Role of Networks*. Surrey Beatty & Sons, Chipping Norton, pp. 653–660.
- Crowley, K., 2001. Effective environmental federalism? Australia's Natural Heritage Trust. *Journal of Environmental Policy & Planning* 3, 255–272.
- Curtis, A., Robertson, A., Race, D., 1998. Lessons from recent evaluations of natural resource management programs in Australia. *Australian Journal of Environmental Management* 5, 109–119.
- de Salaberry, N., Reid, D.G., 1999. Linking societal values with biosphere reserve imperatives: opportunities for awareness. In: *Parks and Protected Areas Research in Ontario. Proceedings of the Parks Research Forum of Ontario (PRFO) Annual General Meeting. University of Guelph, Ontario, 22–23 April 1999*, pp. 161–169.
- Denys Slee and Associates, 1998. *Remnant Native Vegetation—Perceptions and Policies: A review of legislation and incentive programs*. National Research and Development Program on Rehabilitation, Management and Conservation of Remnant Vegetation. Research Report 2/98. Environment Australia, Canberra.
- Edwards, R., Traill, B., 2002. Getting beyond field days: targeting extension to protect threatened ecosystems on private land. *Ecological Management & Restoration* 3, 229–231.
- Elix, J., Lambert, J., 1997. More Than Just the Odd Tree: Report on incentives and barriers to rural woodland conservation, using Grassy White Box Woodlands as a model. National Research and Development Program on Rehabilitation, Management and Conservation of Remnant Vegetation, Research Report 1/98. Environment Australia: Biodiversity Group, Canberra.
- Endicott, E. (Ed.), 1993. *Land Conservation Through Public/Private Partnerships*. Island Press, Washington, DC.
- Figgis, P., 1999. *Australia's National Parks and Protected Areas: Future Directions*. ACIUCN Occasional Paper no. 8. Australian Committee for IUCN Inc., Sydney.
- Fitzsimons, J., Wescott, G., 2001. The role and contribution of private land in Victoria to biodiversity conservation and the protected area system. *Australian Journal of Environmental Management* 8, 142–157.
- Fitzsimons, J.A., 2004. *The Contribution of Multi-tenure Reserve Networks to Biodiversity Conservation*. PhD Thesis. School of Ecology & Environment, Deakin University, Melbourne. Available: <http://tux.lib.deakin.edu.au/adt-VDU/public/adt-VDU20050817.103606/>
- Fitzsimons, J.A., Wescott, G., 2004. The classification of lands managed for conservation: existing and proposed frameworks, with particular reference to Australia. *Environmental Science & Policy* 7, 477–486.
- Fitzsimons, J.A., Wescott, G., 2005. History and attributes of selected Australian multi-tenure reserve networks. *Australian Geographer* 36, 75–93.
- Hamilton, S.D., Dettman, P.D., Curtis, A.L., 1999. Landholder Perceptions of Remnant Vegetation on Private Land in the Box-Ironbark Region of Northern Victoria. National Research and Development Program on Rehabilitation, Management and Conservation of Remnant Vegetation. Research Report 1/00. Environment Australia, Canberra.
- Hiedanpää, J., 2002. European-wide conservation versus local well-being: the reception of the Natura 2000 Reserve Network in Karvia, SW-Finland. *Landscape and Urban Planning* 61, 113–123.
- Hobbs, R., Saunders, D., 2000. Nature conservation in agricultural landscapes: real progress or moving deckchairs? In: Craig, J.L., Mitchell, N., Saunders, D.A. (Eds.), *Nature Conservation 5: Nature Conservation in Production Environments—Managing the Matrix*. Surrey Beatty & Sons, Chipping Norton, pp. 1–12.
- Hodgkins, D., 1995. Participation in action: networks for environmental repair in the Peel-Harvey Catchment of Western Australia. In: Saunders, D.A., Craig, J.L., Mattiske, E.M. (Eds.), *Nature Conservation 4: The Role of Networks*. Surrey Beatty & Sons, Chipping Norton, pp. 405–415.
- Hodgkins, D., Goldney, D., Watson, G., Tyson, G., 1999. The attitudes of landholders to a range of environmental issues, including the values of remnant bushland in the central western region of New South Wales. In: Hobbs, R.J., Yates, C.J. (Eds.), *Temperate Eucalypt Woodlands in Australia: Biology, Conservation, Management and Restoration*. Surrey Beatty & Sons, Chipping Norton, pp. 336–350.
- IUCN, 1994. *Guidelines for Protected Area Management Categories*. CNPPA with the assistance of WCMC. IUCN, Gland, Switzerland and Cambridge, UK.
- Kabii, T., 2001. Landholder's perceptions and attitudes to conservation covenants in WA and Victoria: a comparative overview. Paper presented to the National Forum—Taking Care of the Bush: Nature

- Conservation on Private Land Conference, 21–23 March 2001, Perth. Available: <http://www.ntwa.com.au/forum/paperTKabii.pdf>
- Kellert, S.R., 1986. Public understanding and appreciation of the biosphere reserve concept. *Environmental Conservation* 13, 101–105.
- Lane, M.B., 2001. Affirming new directions in planning theory: comanagement of protected areas. *Society and Natural Resources* 14, 657–671.
- Langholz, J.A., Lassoie, J.P., Lee, D., Chapman, D., 2000. Economic considerations of privately owned parks. *Ecological Economics* 33, 173–183.
- Lowe, K., Fitzsimons, J., Straker, A., Gleeson, T., 2003. Mechanisms for improved integration of biodiversity conservation in regional natural resource management planning within Australia—Literature Review. In: Synapse Research & Consulting & Associates (Ed.), *Pathways for Biodiversity Conservation. Report for Land & Water Australia* by Synapse Research & Consulting & Associates, Brisbane. Available: http://www.lwa.gov.au/downloads/final_reports/SYN5_lit_review.pdf
- Maikhuri, R.K., Nautiyal, S., Rao, K.S., Chandrasekhar, K., Gavali, R., Saxena, G., 2000a. Analysis and resolution of protected area—people conflicts in Nanda Devi Biosphere Reserve, India. *Environmental Conservation* 27, 43–53.
- Maikhuri, R.K., Rana, U., Rao, K.S., Nautiyal, S., Saxena, G., 2000b. Promoting ecotourism in the buffer zone areas of Nanda Devi Biosphere Reserve: an option to resolve people–policy conflict. *Journal of Sustainable Development and World Ecology* 7, 333–342.
- Maikhuri, R.K., Nautiyal, S., Rao, K.S., Saxena, K.G., 2001. Conservation policy–people conflicts: a case study from Nanda Devi Biosphere Reserve (a World Heritage Site), India. *Forest Policy and Economics* 2, 355–365.
- McKenzie-Mohr, D., Smith, W., 1999. *Fostering Sustainable Behaviour: An Introduction to Community-based Social Marketing*. New Society Publishers, Gabriola Island.
- Moore, S.A., 1995. The role of trust in social networks: formation, function and fragility. In: Saunders, D.A., Craig, J.L., Mattiske, E.M. (Eds.), *Nature Conservation 4: The Role of Networks*. Surrey Beatty & Sons, Chipping Norton, pp. 148–154.
- Moore, S.A., Jennings, S., Tacey, W.H., 2001. Achieving sustainable natural resource management outcomes on the ground: the key elements of stakeholder involvement. *Australian Journal of Environmental Management* 8, 91–98.
- Oppenheim, A.N., 1992. *Questionnaire Design, Interviewing and Attitude Measurement*, new ed. Pinter Publishers, New York.
- Prober, S.M., Thiele, K.R., Higginson, E., 2001. The Grassy Box Woodlands Conservation Management Network: picking up the pieces in fragmented woodlands. *Ecological Management & Restoration* 2, 179–188.
- Rao, K.S., Nautiyal, S., Maikhuri, R.K., Saxena, G., 2003. Local peoples' knowledge, aptitude and perceptions of planning and management issues in Nanda Devi Biosphere Reserve, India. *Environmental Management* 31, 168–181.
- Reading, R.P., Clark, T.W., Kellert, S.R., 1994. Attitudes and knowledge of people living in the Greater Yellowstone Ecosystem. *Society and Natural Resources* 7, 349–365.
- Stephens, S., 2002. National Survey of Landholder Views on Conservation Covenants. Report on findings. Bush for Wildlife, Canberra.
- Stephens, S., Lambert, J., Elix, J., Morrison, C., Kennedy, M., 2002. Conservation covenants: A national survey of landholders' views. *Ecological Management & Restoration* 3, 146–148.
- Stoll-Kleemann, S., 2001a. Barriers to nature conservation in Germany: A model explaining opposition to protected areas. *Journal of Environmental Psychology* 21, 369–385.
- Stoll-Kleemann, S., 2001b. Opposition to the designation of protected areas in Germany. *Journal of Environmental Planning and Management* 44, 109–128.
- Stoll-Kleemann, S., O'Riordan, T., 2002. From participation to partnership in biodiversity protection: experience from Germany and South Africa. *Society and Natural Resources* 15, 161–177.
- Stolton, S., Dudley, N. (Eds.), 1999. *Partnerships for Protection: New Strategies for Planning and Management of Protected Areas*. Earthscan Publications, London.
- Synapse Research and Consulting, Capital Ag Consulting, 2001. *Improving Natural Resource Management Behaviour at the Farm and Regional Levels*. Synapse Research and Consulting & Capital Ag Consulting, Brisbane.
- Theobald, D.M., Hobbs, N.T., 2002. A framework for evaluating land use planning alternatives: protecting biodiversity on private land. *Conservation Ecology* 6, (1): 5. Available: <http://www.consecol.org/vol6/iss1/art5>.
- Thiele, K.R., Prober, S.M., 1999. Reserve concepts and conceptual reserves: options for the protection of fragmented ecosystems. In: Hobbs, R.J., Yates, C.J. (Eds.), *Temperate Eucalypt Woodlands in Australia: Biology, Conservation, Restoration and Management*. Surrey Beatty & Sons, Chipping Norton, pp. 351–358.
- Thiele, K., Prober, S., 2000. Conservation management networks—a model for coordinated protection and management of remnant vegetation. In: Barlow, T., Thornburn, R. (Eds.), *Balancing Conservation and Production in Grassy Landscapes*. Proceedings of the Bushcare Grassy Landscapes Conference, Clare, South Australia, 19–21 August 1999. Environment Australia, Canberra, pp. 58–63.
- Todd, J.A., 2000. Developing a conservation management network—a pilot study. Report prepared for the Department of Natural Resources & Environment, Parks, Flora and Fauna Division, Melbourne.
- UNESCO, 1995. *Biosphere reserves: the Seville strategy and the statutory framework for the world network*. UNESCO, Paris.
- UNESCO, 2005. *World Network of Biosphere Reserves list—June 2005*. Available: <http://www.unesco.org/mab/doc/brlist.PDF> (Accessed February 2006)
- Wescott, G., 1995. Victoria's national park system: can the transition from quantity of parks to quality of management be successful? *Australian Journal of Environmental Management* 2, 210–223.
- Wild, R., Cunningham, A.B., Mutebi, J., 1995. People, parks and plant use: networks to enhance the conservation of montane forests in Uganda, East Africa. In: Saunders, D.A., Craig, J.L., Mattiske, E.M. (Eds.), *Nature Conservation 4: The Role of Networks*. Surrey Beatty & Sons, Chipping Norton, pp. 112–121.
- Wilshusen, P.R., Brechin, S.R., Fortwangler, C.L., West, P.C., 2002. Reinventing a square wheel: critique of a resurgent “protection paradigm” in international biodiversity conservation. *Society and Natural Resources* 15, 17–40.
- Williams, J., 2000. *Managing the Bush—research findings from the LWA National Remnant Vegetation R&D Program*. Research Report 4/00. Land and Water Australia, Canberra.
- Worboys, G., Lockwood, M., De Lacy, T., 2001. *Protected Area Management: Principles and Practice*. Oxford University Press, Melbourne.
- Xu, J., Chen, L., Lu, Y., Fu, B., 2006. Local people's perceptions as decision support for protected area management in Wolong Biosphere Reserve, China. *Journal of Environmental Management* 78, 362–372.