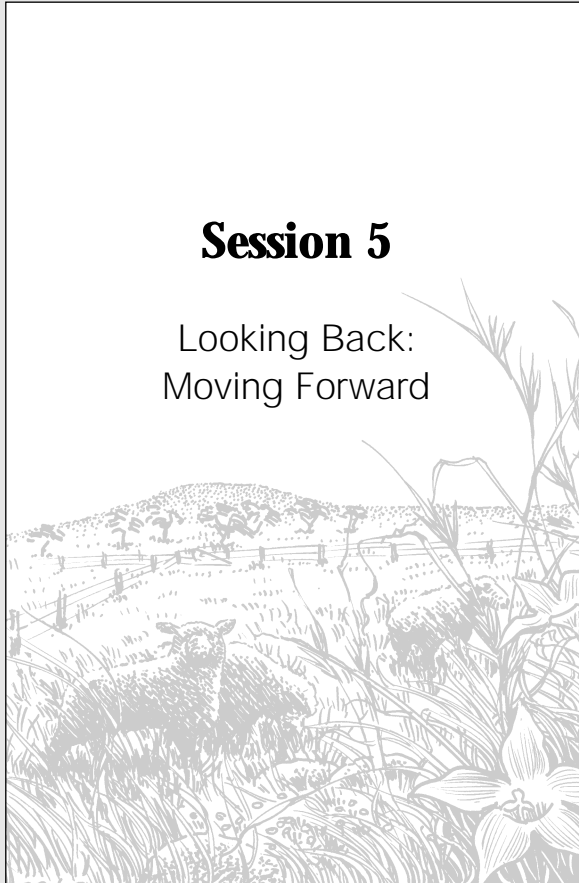


Session 5

Looking Back:
Moving Forward



Indigenous land management perspective on conservation and production

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Aboriginal people used grasslands as a source of food, primarily collecting seeds and utilising roots. The grasslands are also habitat for many native animals, which supplemented the seeds and roots as a food source. Aboriginal people burnt grasslands for several reasons, such as to open up 'country', cultural obligations, attracting grazing animals and promoting regrowth of grasses.

Aboriginal people are still utilising the grasslands. However, through the process of dispossession, Aboriginal people now have a somewhat different role and are managing 'country' differently. There is now a greater economic emphasis placed on the land whereas previously there was a balance between the cultural and economic spheres. In some regions land is now being returned to Aboriginal groups who are seeking to make a living from the land. In some circumstances the land is degraded and poor management practices of the past are clearly evident.

The future for Aboriginal people on the grasslands is held in knowledge and management. By passing knowledge on to the next generation, the combination of traditional knowledge and modern land management principles will give both Aboriginal and non-Aboriginal land managers tools to deal with problems in the future.

The Indigenous Land Corporation (ILC) has an important part to play in the future management of grasslands. The ILC's primary role is to acquire and manage land for Indigenous Australians. Some of the properties acquired by the ILC contain grasslands. Through this process and with cooperation between Aboriginal and non-Aboriginal land managers, the grasslands of Australia will be better managed.

*Keywords: Indigenous, land management,
Indigenous perspective*

Introduction

Australia is a unique country. We are blessed with some of the oldest rock formations, marsupials and monotremes, vegetation that is fire tolerant, and the oldest culture in the world. Indigenous people have lived in Australia for up to 60,000 years and the date may extend to 120,000 years (Roberts *et al.* 1994).

The time of arrival is always a point of discussion for many people. Indigenous people know how long they have been in Australia; it was from the beginning of time when Ancestors created the

landscape. Indigenous people have utilised the country they live in and found new and inventive ways to live with the land rather than against it.

According to Horton (1981) there are approximately 492 language groups in Australia and the Torres Strait. There are differences between people and there are differences between beliefs. There is, however, one overriding belief that is transported throughout Indigenous Australia, and that is—you must look after 'country'¹. 'If you don't look after 'country', country gets sick and if 'country' is sick people are sick' (Rose *et al.* 1996).

The Australian landscape is described as interactive, that is, it had to have continual human input for it to be functional and resource rich.

¹ The term 'country' in this context includes all of the landscape and the sea. This is the holistic view held by Aboriginal people which reflects the closeness of the Aboriginal people to the 'country'

Indigenous people utilised the land for food and subsistence, irrespective of whether the group was from the desert or the coast, the land and water was a constant source of food and had to be cared for.

Grasslands are one of the many land classifications that Indigenous people utilised. Grasslands are rich in biodiversity or in Indigenous terms 'good country'. There is a common belief that Indigenous people arrived from the North and stayed mainly on the coastal fringes where food, water and shelter were plentiful. It wasn't until later that Indigenous people moved to the inland regions of Australia. This movement coincided with the use of grinding stone tools to crush seeds into flour, which, when mixed with water, made a paste that was placed in a bed of coals and made into a damper-like substance.

The grasslands were habitat for many medium-sized marsupials and other smaller animals. The grasslands, like a lot of Australian vegetation, are accustomed to and tolerant of fire. Fire sometimes came naturally from lightning strike and was also often started by Indigenous people. The fire opened up country, made passage for people easier, assisted in the regeneration of plants, enabled animal movements to be easily traced and, in the months following the fire, new grasses grew and therefore it was easy to predict the movement of the animals that inhabited the grasslands. Another reason why fire was part of the landscape was because it was a necessity and a right as it was part of making country healthy.

Present

Today the grasslands of Australia are still utilised by Indigenous people. However, the use is somewhat different now in that there is a demand made on the country for economic return. In the past, economic return was in the form of food, water and shelter. There is still this demand on 'country', however, now there is another demand—money. Past land management consisted of cultural, social and economic use—a balancing act, which is difficult to achieve.

Before European people came to Australia, Indigenous land management worked within the limitations of the land. European land management is profit-driven and therefore demands a lot more of the land than Indigenous management.

The principal reason for this is that conditions in Australia are vastly different to conditions where the European land managers had come from. The major differences are soil nutrient levels, rainfall and climate. When money comes into the equation

some type of compromise or sacrifice has to be made, unfortunately at the expense of either cultural or social values. To make money the land suffers, which goes against all Indigenous Australians' belief systems.

Land that is given back to Indigenous people is usually marginal and isolated and, due to past management practices, 'country' is sick. Another issue of concern is that some of the areas given back to Indigenous people previously supported 3-7 people, but now must support up to 30 people. The repercussions of this are that stocking rates may be increased to compensate for the extra people. The 'country', being marginal and poor, cannot cope with this demand. The isolation or remoteness of some of the properties can result in additional problems such as poor health, poor housing and poor schooling.

For some Indigenous people, the grasslands were a route taken to another place and therefore they were not inhabited for long periods, unlike the situation today. Indigenous people are now living on the grasslands in permanent dwellings, communities and outstations. In tropical areas, the dwellings are inhabited seasonally, with a majority of people moving to towns in the wet seasons.

The grasslands were, and still are, a rich source of nourishment for Indigenous people. Quite often the same plants utilised by Indigenous people are now utilised to feed stock. When Indigenous people get land back and have to make a living from it, there is a factor encountered that was not experienced by non-Indigenous people. That factor is Indigenous 'culture'. Indigenous land management practices prior to European settlement were different to today. Land was burnt, 'country' was opened up and country was given time to regenerate. 'Open country is good country; closed country is rubbish country' (Bradley 1997). With practices of the past, 'country' could be rested. Now, most of the land needs to be used all of the time.

There is another issue of concern, and that is the loss of knowledge. With people not living on 'country' and travelling through 'country' less, the knowledge that was traditionally passed on is being lost. Knowledge is sometimes passed on as fragments and not as a whole picture, therefore this knowledge takes a lifetime to master. The danger is that parts of this knowledge will be lost and traditional Indigenous knowledge will be incomplete. As land needs to be looked after so does Indigenous knowledge.

Future

The future for grasslands is linked with knowledge. There are predominantly two types of knowledge systems held in land management: they are Traditional Indigenous knowledge and Western Scientific knowledge. The key to the future of grasslands in Australia is held within both of these knowledge systems.

Money-driven enterprises are changing to include social, cultural and environmental issues. There is a realisation that sustainable farming and management practices are the new way to manage land. There needs to be a combined effort from all parties involved in the management and use of grasslands, including Indigenous people, farmers, landholders, tourist operators, tourists, parks and wildlife agencies, conservation groups, scientists, and training and funding agencies. The onus is on the funding and training agencies, rather than on the Indigenous people, to include and inform Indigenous people of opportunities available to them. Sometimes agencies fail to acknowledge Indigenous landholders as stakeholders in their programs. One of the programs that is being implemented for use by Indigenous people is Property Management Planning.

For the process to be started, there really needs to be increased awareness of issues that face Indigenous people and non-Indigenous people alike. People need to be informed and advised of programs and resources that are available to them. Groups of people that use the grasslands need to be consulted. Recommendations need to be implemented and action taken—some of the best plans collect dust and are rarely implemented. There needs to be participation, both on the ground and at other levels. Agencies need to include and consult Indigenous people as stakeholders in the planning processes.

The Indigenous Land Corporation is part of the process of getting Indigenous people back to their 'country'. Whether the reason be economical, cultural, social or historical, these are insignificant if the system falls apart because of poor infrastructure and planning. Indigenous people need to be part of the process and included at management level, not just as landholders with an interest in the grasslands.

The combination of knowledge systems, inclusion of Indigenous people at management level, a voice, support from agencies, and implementation of management decisions are part of the process that will ensure the grasslands of Australia will be a viable commodity in terms of culture, economy, conservation and biodiversity.

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Community perceptions of grassy vegetation¹

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Management and protection of grassy vegetation is influenced by human beliefs, attitudes and values. Research into community perceptions is therefore an important tool for developing effective communication strategies in the interest of grassland protection. A recent project undertaken by the University of Melbourne investigated community perceptions of native vegetation in rural landscapes. Landholders and urban residents described their preferences for photographs of woodlands and grassland environments. The results indicate relatively high preference for grassy woodlands with eucalypt dominant canopy, but low regard for some other woodlands including those where the dominant canopy species is Buloke (*Allocasuarina luehmannii*). Treeless grassland also rated poorly. Low preference for these vegetation types can be attributed to a range of factors, including: poor understanding of the characteristics of healthy non-Eucalypt trees, false beliefs about the naturalness of treeless ecosystems, the cultural or symbolic importance of the gum tree, and inherited preferences for environments that appear productive and safe. This research suggests some new ideas for promoting the protection of grassy landscapes.

Keywords: preference, native vegetation, attitudes

Introduction

There is no doubt that protection of remnant vegetation depends on good understanding of the biophysical processes of these ecosystems and the surrounding landscape. What is increasingly apparent is that effective management also requires good understanding of the social and economic factors that influence management of native vegetation (Price & Tracy 1996). Landholders' knowledge and attitudes have a significant and direct impact on management of off-reserve vegetation. Urban attitudes toward native vegetation also count. The balance we find between production and conservation of grassy landscapes will depend partly on the values of Australia's large urban population. Of particular importance is their willingness to support, through both public and private financial systems, the establishment of reserves, incentive schemes and education programs that encourage conservation. Our knowledge of

community perceptions of Australia's biological resources therefore provides a powerful management tool. For this reason, Environment Australia and the Land and Water Resources Research and Development Corporation asked The University of Melbourne to examine how landholders and urban residents perceive native vegetation on private land.

Our attitudes toward native vegetation are shaped by numerous forces, some learnt, others innate. For example, Orians and Heerwagen (1992) have described some inherited responses that influence contemporary attitudes toward vegetation. Our landscape preferences, they argue, reflect an innate attraction to environments that appear safe and productive. They assume that evolutionary development of the brain occurred while humans lived as hunters and gatherers in the savannah environment of East Africa. The members of the species most likely to survive and reproduce were those who chose to settle in landscapes that provided for basic human needs such as shelter, food and water. In the African savannah, widely spaced trees indicate a source of shelter and

¹ The research described in this paper was undertaken in collaboration with John Cary, now with the Bureau of Rural Science, and Robert Edgar from The University of Melbourne.

suitability for hunting. Innate attraction to such landscapes provides an evolutionary advantage for hunters and gatherers; the processes of natural selection have ensured that such responses influence the attitudes of humans today. International research demonstrates landscape preferences that are consistent with this theory. Open landscapes with a smooth and easily traversed ground cover are highly preferred by most people (Kaplan & Kaplan 1989; Kaplan *et al.* 1989). While this approach provides encouraging news concerning human response to savannah-like grassy woodlands, one might expect that grasslands without trees would be considered unattractive.

Our perceptions of native vegetation are also influenced by social norms and expectations. Nassauer (1995) has examined people's responses to gardens with mowed and unmowed prairie grasses. She argues that both rural and urban communities expect well managed properties to be neat and tidy. Properties where native vegetation has been maintained in a relatively natural state (with scrubby understorey or long grass) may be considered uncared for and the owners judged to be poor stewards. For this reason, unmowed native grassland is likely to be viewed unfavourably during much of the year. Work by Lamb and Purcell (1990) contains a similarly discouraging message for those promoting the importance of protecting our native grasslands. They found that tall and dense vegetation was considered more natural than low, open vegetation. Cultural beliefs about naturalness shape our response to native grassland; landscapes with few trees are likely to be seen as somewhat unnatural and consequently to hold little aesthetic appeal.

Landscape preference theories provide insight to the types of native vegetation that may be preferred in agricultural landscapes. Photo-questionnaires are a useful method for examining perceptions of this kind and are a common approach to the study of environmental perception (Kaplan & Kaplan 1989). This approach often requires people to make simple preference judgements concerning photographic representations of various landscapes. By studying patterns of preference, one can identify the types of landscapes that people value and the criteria they use to assess these places. In the research described below, this technique has also provided a starting point for discussing beliefs and attitudes that influence land management.

Study 1: Perception of woodland vegetation

This investigation of landholder and urban attitudes towards woodland remnant vegetation was conducted in 1997 and 1998. The study involved over a thousand residents of south-eastern Australia, including 568 rural landholders and 664 residents of Melbourne. The landholders were drawn from three regions: Victoria's Wimmera, the Midlands of Tasmania, and upper south-east South Australia.

Participants completed a survey regarding their preferences for photographs of native vegetation. The photo-questionnaire included 36 black-white images of native vegetation, selected from the areas in which landholder respondents lived. The scenes were chosen in consultation with local botanical experts to represent a range of values related to dominant species, spatial configuration and degree

Table 1. Mean preferences for vegetation categories: Comparison of urban and rural respondents

Vegetation Category	Key descriptives	Mean Preference	
		Rural	Urban
Dense Eucalypt Woodland	natural undergrowth vegetation	3.30 ^a	3.26 ^a
Open Grazed Woodland	open grazed cleared	3.25 ^b	<u>3.38</u> ^{b***}
Buloke Woodland <i>A. luehmannii</i>	fire dense natural	2.84 ^c	2.80 ^c
Grassy Woodland	grass native open	<u>3.36</u> ^{ab}	3.34 ^a
Sheoke Woodland <i>A. verticillata</i>	rocks/rocky dead dry	2.96 ^d	2.84 ^{c***}

^{abcd} For columns, matching superscript letters indicates no significant difference between preference for these vegetation categories

^{***} For rows, asterisks indicate rural and urban preferences are significantly different for this vegetation category.

of human modification of landscape (through grazing or wood collection). Respondents rated their preference for the scenes using a five point scale, ranging from 'I like this very much' to 'I do not like this at all'.

These preference ratings were used in two ways. First, patterns of preference were identified from the responses of all respondents. Through this process, five categories of vegetation were identified, suggesting perceptual characteristics that people might consider when assessing native vegetation. Second, mean preferences were calculated for each of the five vegetation categories. Follow up interviews and surveys provided further insight to perceptions of native vegetation. Participants described liked and disliked aspects of photographs that were typical of the five vegetation classes.

The results of this study are described in detail in Williams *et al.* (1998). Table 1 presents a summary, showing urban and rural preferences for the five vegetation categories. Three aspects of this research are particularly important for our management of grassy landscapes. First, the study indicates a moderately high preference for grassy woodland where the tree canopy is dominated by eucalypts. For rural landholders, these were the most preferred vegetation type. Landholders associated these landscapes with concepts such as stock, grass, feed and shelter. Our research provides strong evidence that landholders' aesthetic response to vegetation is strongly associated with its perceived value for agricultural production (Cary *et al.* 1999a) and this is reflected in the way landholders described these scenes.

Urban responses to grassy woodlands were distinct from those of rural respondents. Although these images were also moderately preferred, urban residents highlighted different characteristics of grassy woodlands. In particular, urban people tended to see this vegetation as typically Australian and picturesque. A higher proportion of urban residents appeared concerned by the long grass in some images, mentioning the hazards of snakes and fire.

A second important aspect of this study is the moderately high preference among urban people for woodland where the grassy understorey has been destroyed. Urban residents' most preferred scenes were those where heavy grazing and other processes had cleared the understorey and left widely spaced trees. They described these places as park-like, pleasant for walking and picnics. Relatively few urban residents appeared conscious of the associated loss in biological diversity. It is important to note

that rural landholders viewed these landscapes much less favourably, were likely to describe these places as overgrazed, and to note the lack of understorey vegetation.

A final important aspect of this study is the finding that both rural and urban respondents express low preferences for Casuarina woodlands. This includes both the Buloke vegetation (woodlands dominated by *Allocasuarina luehmannii*, represented by sites in both South Australia and Victoria) and Sheoke woodlands (*Allocasuarina verticillata* woodlands found on rocky hill tops in the Midlands of Tasmania).

In examining responses to Buloke vegetation, the most obvious pattern to emerge from the interviews and surveys is a dislike of dense vegetation. A number of the most typical scenes in this category show relatively young, closely growing stands of Buloke. Urban and rural people described this vegetation as too dense for both agricultural and recreational functions. Density was not the only factor however, since respondents also expressed low regard for Buloke vegetation where trees were widely spaced and the understorey smooth and grassy. Respondents' comments also reveal quite a strong response to the form and foliage of the *Allocasuarina* trees. A number of landholders (23) described Buloke as scraggly, unhealthy, straggly, spindly, scruffy and providing no shade. One even referred to the 'dark satanic shapes' of the trees. Similarly, a number of respondents interpreted the dark bark of these trees as fire damaged. Low awareness of the species also appears an important factor in shaping perceptions of Buloke vegetation. Landholders expressing higher preference for Buloke were far more likely to name the trees as Buloke, Casuarina or Sheoke (Williams & Cary 1998). Poor understanding of some woodland species may contribute to misinterpretation of these plants as unhealthy.

In summary, the study found relatively high preference for grassy woodland with a eucalypt canopy, but low preference for grassy woodland with a Buloke or Sheoke canopy. The study also identifies a disconcerting preference among urban people for woodland vegetation where the understorey has been cleared. The findings overall are consistent with evolutionary theories of landscape preference, which predict higher preferences for landscapes that are relatively open and have a smooth understorey. The study also suggests some other factors that shape attitudes toward native vegetation. These include awareness of less familiar tree species, dislike of landscapes

where trees are perceived to be unhealthy, and low awareness of the visual cues of land degradation, particularly among urban people.

Study 2: Perception of grasslands

Human response to grassy landscapes, and especially to grassy landscapes with few trees, is a particularly fascinating issue for social science. This is because, almost without exception, the many theories predicting landscape preferences suggest that people will generally hold tree-less ecosystems in low regard. A second study provides insight to community perceptions of these landscapes. The study was designed primarily to identify whether landholders value native vegetation in landscapes that are obviously used for agricultural production. The study also investigated components of landscape preferences, including the perception of agricultural, aesthetic and ecological value in the landscape. It is very likely that landholders use multiple criteria to assess agricultural landscapes. By identifying some of the perceived values in the landscape, we are better able to understand landholders overall preferences for their own properties. Within this study we examined landholder response to both woodland and grassland vegetation in agricultural landscapes.

The landholders interviewed for this study were selected from respondents to the survey described in Study 1 above. A total of 131 landholders participated, selected from Victoria's Wimmera, the Midlands of Tasmania, and upper south-east South Australia.

Landholders examined 11 photographs of

agricultural landscapes. The photographic images were full-colour and each landscape was based on an identical single landform. Three aspects were systematically varied: amount of remnant vegetation (none, small or large areas), presence of fencing, and associated land use (crop or pasture). In addition, one scene showed a native grassland.

Landholders assessed these images in four ways, each time using a five-point scale. They responded to the following questions:

1. How much would you like this paddock on your property? (Overall preference)
2. How valuable is this paddock for protecting native plants and wildlife? (Perceived ecological value)
3. How valuable is this paddock for farming? (Perceived agricultural value)
4. How attractive is this paddock? (Perceived aesthetic value)

Table 2 summarises landholder perceptions of agricultural landscapes with no remnant vegetation, with small and larger areas of remnant bushland, and with a large area of native grassland. The results confirm predicted low preferences for treeless landscapes. Landholders expressed low preference for having native grassland on their own property, but considered native grassland to be preferable to landscapes with no remnant vegetation. Native grassland was also perceived to have relatively low agricultural and aesthetic value and only moderate ecological value.

Landholders considered the aesthetic value of grassland to be significantly lower than landscapes with large areas of trees. This finding is consistent

Table 2. Overall preference, perceived agricultural, ecological and aesthetic values of four landscape categories.

	No Remnant NativeVegetation (RMV)	Small area trees RNV	Large area trees RNV	Native grassland	
Preference for own property	2.015 ^a	2.958 ^b	4.027 ^c	2.585 ^d	Wilk's L(3,127) =.202, p=.000
Agricultural value	3.242 ^a	3.688 ^b	4.167 ^c	2.792 ^d	Wilk's L(3,127) =.381, p=.000
Ecological value	1.336 ^a	2.405 ^b	3.815 ^c	3.130 ^d	Wilk's L(3,128) =.087, p=.000
Aesthetic value	2.142 ^a	3.006 ^b	4.233 ^c	2.938 ^b	Wilk's L(3,127) =.177, p=.000

a,b,c,d For each row, non-matching superscript annotation indicates means are significantly different

with theories predicting low preference for native grassland on the basis of habitat requirements (Orians & Heerwagen 1992). Landholders also considered the aesthetic value of the grassland to be significantly greater than that of landscapes with only crop or pasture land cover. This finding is not entirely consistent with the work of Nassauer (1995) who predicted higher preference for neat and tended environments. The crop and pasture scenes provided strong signs of being tidy, managed environments yet landholders expressed higher preference for the relatively messy grassland environment.

A potentially important aspect of the study is the finding that native grassland was perceived to have only moderate ecological value. The ecological value of grassland was considered to be significantly less than that of landscapes with large areas of trees. In interpreting this finding, it should be noted that landscapes designated as having a 'large' area of bushland actually retained quite small remnants (around one sixth of the visible land). In contrast, the native grassland scene presented a very large area of remnant vegetation, albeit treeless vegetation. Current thinking in landscape ecology concerning management of remnant vegetation (Dramstad *et al.* 1996) would suggest that larger remnants are less open to invasion from exotic weeds and from clearing. Larger areas of remnant vegetation (including treeless plains) would be highly valuable from an ecological perspective. Landholder response to the grassland scene suggests they have little appreciation of the ecological value of tree-less ecosystems, and little appreciation of the relationship between remnant size and viability. This finding supports the work of Lamb and Purcell (1990) who found that most people perceived low vegetation to be less natural.

Discussion

In summary, this research suggests that community perceptions of grassy woodlands are quite positive where there is a eucalypt-dominated canopy. Perceptions of some other woodlands are less favourable, including those where the dominant canopy species is Buloke. The research also shows that native grasslands are generally not well regarded. There are many possible reasons for these perceptions. These include: poor understanding of the characteristics of healthy Casuarina trees, a belief that treeless landscapes are barren and unnatural, an Australian cultural preference for the symbolically important gum tree, and inherited preferences for environments that appear productive and safe.

These findings have some important implications for protecting and managing grassy landscapes, and also raise some critical issues for discussion. For example, one might question why Australian grassy woodlands are in such poor condition when community perception of grassy woodlands is apparently positive. It is important to note that while grassy woodlands were the most preferred vegetation type for landholders involved in this study, participants assessed only a small number of landscapes. The grassy woodlands presented in this study were only moderately preferred. Highly preferred landscapes, typified by managed parklands and scoring mean preferences above 3.8 on a 5-point scale (Kaplan & Kaplan 1989), may excite more protective management. Apparent inconsistency between perception and management outcomes may also reflect factors other than attitudes that influence human behaviour (Gardner & Stern 1996). While landholders value grassy woodlands, these ecosystems are principally valued for production purposes, particularly provision of shelter and feed. While in many situations landholders choose to retain these landscapes, other forces may intervene. One factor may be financial pressure to expand intensive enterprises. Another may be poor knowledge of how to manage grassy woodlands to ensure their long-term survival. Thus grazing pressure, use of fertilisers and other management practices may gradually erode the quality of these landscapes to a point where they are no longer viable. In the case of grassy woodlands, the community (or least the rural community) is likely to need little convincing of the value of these landscapes. Instead, community interventions should focus on the need for better management knowledge and practice, and for mechanisms which support less intensive management of these areas.

The situation for grasslands is quite different. Our research provides evidence that community perceptions of grasslands are quite different to their perceptions of woodlands. The long term protection of native grasslands is likely to require significant changes in community attitudes. In fact, one might wonder whether there is any hope of generating widespread community concern for treeless grasslands. Other research indicates attitudes can change. For example, research conducted in both Australia and New Zealand showed strong cultural differences in response to tussock inter-montane landscapes. New Zealand students expressed much higher preferences for these culturally significant landscapes (Cary & Williams 1999). A careful perusal of landscape perception research reinforces

the hope that thoughtful design and management of grasslands may bring about change in community attitudes (see for example, Kaplan *et al.* 1989; Cook & Cable 1995; Nassauer 1995).

A final question requiring consideration is the validity of drawing inferences from human responses to photographic representations of grassy landscapes. People often express doubt as to whether photographs provide an adequate substitute for real environments. A number of researchers have studied this problem in the past by comparing responses to actual places and photographic representations of these places. Overall, the research shows this is a valid method (e.g. Shuttleworth 1980; Stamps 1990). When individuals view photographs, information visible within the scene is not the only factor that influences their response. Photographs prompt memories of direct experience of similar places, as well as more abstract knowledge of the environment. This knowledge and past experience contributes to the rich information obtained through these processes.

With regard to the studies reported here, there is reason for cautious interpretation of the results on two counts. First, *Casuarina* foliage is difficult to capture in a photograph and this may have contributed to negative perceptions of this vegetation. There is a possibility that the black-white photography used in Study 1 may have resulted in less valid assessments of this particular vegetation type. Second, the use of a single grassland image in Study 2 was an unfortunate (although in this case necessary) restriction. The appearance of native grasslands varies radically with season and management regime. The grassland image utilised showed a large area of long grass with no visible forbs, and the results of this study may well have been different were the grass shorter and a range of wildflowers visible. Further research is being planned to resolve these uncertainties.

Implications for protection of grassy landscapes

The implications of this research for protection of native vegetation are dealt with extensively in Cary *et al.* (1999b). Four elements are particularly important to our discussion of balancing conservation and production in grassy landscapes:

1. There is a clear argument for interventions that target particular species and ecosystems in the interest of native vegetation retention. This study indicates the need for special approaches with regard to grasslands and *Casuarina* grassy woodlands. Educational

approaches should raise awareness of these less familiar landscapes and challenge common misconceptions regarding these vegetation types.

2. There continues to be a strong need to provide an educational focus on the understorey or ground layer of plant communities, and this is as true for grasslands as for grassy woodlands. This approach is particularly important within urban communities, where there appears to be relatively little awareness of the importance of understorey plants. A related issue is the need to draw attention to the importance of young saplings in woodland environments. Few respondents noted the lack of regeneration in woodland environments or identified the link between regeneration of trees and remnant health.
3. As suggested earlier, the protection of grassy woodlands is perhaps most clearly dependent on management expertise and mechanisms to allow less intensive land uses. Landholders clearly appreciate the utilitarian value of these landscapes, but may have insufficient knowledge and capacity to manage these environments sustainably.
4. A final implication of the research is the potential for using designed landscapes to promote community concern for grassy landscapes. Strategies might include:
 - creating feelings of safety and coherence using built features, mowed paths and edges, and judicious planting of trees;
 - planting (unnaturally) high ratios of flowering plants to promote the feeling that a landscape is productive and attractive;
 - providing visual cues of 'good management' including high quality fences and signs; and
 - providing interpretative material regarding unusual plants and ecosystems.

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Rediscovering the past and making a future

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Historical journal case studies are used to give an appreciation of the early pastoral settlement management impacts on the ecology of the New South Wales Riverina. The degree of disturbance and fragmentation of various grassy woodland ecosystems are outlined.

The perception of the current landscape status as being 'natural' as opposed to an artefact of management is discussed. This perception, the natural productivity and relative resilience of the productive system, (combined with current rural economic trends) tend to mask the continued decline and fragmentation of the Riverina Plain mosaic ecosystem.

The role of awareness and understanding through extension as part of the delivery of financial incentives is seen as a core element to overcome this impediment. The process continuum of awareness, working with the willing, identification of issues, and delivery of incentives to reach nature conservation and production objectives is outlined.

Keywords: history, degradation, rehabilitation

It has been said that one definition of insanity is to do the same thing over and over and expect to get a different result each time.

If that is the case, then perhaps it is a sign of lunacy to not look back and understand and reflect on what actions have led us to a situation where large areas of the Australian agricultural landscape no longer function effectively. This lack of function is evident in ecological, hydrological and socio-economic terms. The sad truth is that we as a society, and agriculture as a collective industry, are effectively still doing the same thing—just with greater efficiency and effectiveness (without really looking back at what we've already done).

Because much of the degradation has been gradual, or were historical events beyond current living memory, much of the appreciation of change is lost. Each generation is numbed into a false sense of security that 'It's always been like that' or that 'It's not getting much worse' or, more frighteningly, 'What problem?'

One of the great difficulties in building an individual or community vision for a diverse, ecologically functional and agriculturally productive future is a failure to recognise how natural systems

functioned and the degree of divergence from natural that presently exists.

Historical case studies of ecological changes are important because they:

- provide an historical benchmark for what existed at that site or region;
- offer examples of a known location and the degrees of change that have occurred at known locations (they are accessible, visible local sites);
- are dynamic and demonstrate the ongoing impact of management;
- demonstrate variations in the direction and level of change in response to management; and
- provide local understanding, learning and empowerment to act.

Historical case studies are not just an academic fascination or a romantic preoccupation with the past. They provide for:

- acceptance of past practises and understanding of their impacts;
- understanding of the pre-agricultural landscape and rates of change;
- understanding of the past and current issues, driving processes, repercussions and impediments;

- establishing the presence, condition and significance of remnants as skeletons to build upon; and
- a plan to attempt a systems reconstruction based on local landscape knowledge.

There exists a lot of individual and insightful historical references relating to vegetation status and changes from across the Riverina of southern NSW. I would like to use some excerpts from R.G.Kiddle's summary of 'Steam Plains' station journals, that were published in the Pastoral Review in 1931, to demonstrate the value of this sort of information. This reference is the most complete that I am aware of in terms of time coverage, vegetation detail, management practices and impacts relating to vegetation cover and composition changes.

Steam Plains is an oblong block about 15 miles long by five miles wide, and consisted of open plain lands intersected by pine ridges and belts of timber, a wide, very shallow creek and various shallow lignum swamps, which in very wet seasons fill and overflow and form other shallow creeks. The pine ridges, or sandhills as they were called, were covered with a forest of Murray pines of all ages from seedlings to mature trees, interspersed with various kinds of acacias and similar trees, such as needlewood, wild irishman, hophbush, deadly nightshade, sandalwood and willows (cuba), and below these were numerous kinds of the smaller blue and salt bushes. In this condition the sandhills were not good as feeding grounds for sheep, as the grass was not as sweet nor as plentiful as in the open country. Also they were a great harbour for noxious animals, dogs and marsupials etc.

On the edge of the pine ridges and extending out onto the plains, in some cases perhaps only two or three hundred yards, and in others two to three miles, were timbered areas generally of a hard red soil, carrying grasses which were very sweet and quick growing after a dry period, and timbered with large quantities of edible trees, mostly boree (myall), cuba (willow), quandong and wilga etc. Beyond these timbered areas and sometimes amongst them were swamps timbered with box (eucalyptus) and gum trees, and the balance of the country was open plain interspersed with swamps and depressions, the biggest of which grow large quantities of lignum, growing in many cases 10ft. high. Such lignum swamps produced very little useful fodder. The wide shallow creek, generally dry, crossing the property was also heavily timbered with box, and it and similar box swamps produced very little grass. Towards the southern end of the run

there occurred one large and two small swamps filled with a heavy growth of cane grass.

The open plain country, which when dry is either crumbly red or grey clay, and the open boree hard red country, were generally bush country with annual and perennial grasses growing around and between the bushes. These bushes consisted mostly of Old man saltbush, and considerable areas of bluebush and smaller saltbushes and cottonbush. At this time, taking a line from Narrandera to Corowa, which would run about 70 miles east of Steam Plains, the country all to the east of that line was forest country. Today, so much timber has been killed that, generally speaking, that forest line is now one hundred miles further to the east.

About 1850 fencing was started in the district and Steam Plains was fenced about then. This enabled more stock to be carried, but as a result the bush was more severely eaten during dry periods, and the less there was the more it was punished, so that by 1874 the bulk of the saltbush had been eaten out and killed and only certain areas of the cottonbush remained. The exception to this is that about 400 acres close to the homestead was preserved and still retains its original cover of Old Man saltbush and bluebush etc.

However, large numbers of sheep were successfully carried, for although the bush was gone the country was not eaten out, and responded to rains quickly; also thousands of edible trees were continually dropping edible leaves and branches. Large sums of money were spent in killing the box trees in the creek and swamps, and the sandhills were cleared of much useless scrub (needlewood, hopwood, wild irishman), and the pine trees were pollarded to a height of 8ft. These operations meant a largely increased growth of grass in the timbered areas. Further, the water supplies were improved and the lignum was cut and killed in the swamps. This period of improvement lasted approximately till 1897.

Rabbits were first known on Steam Plains in 1880, and in 1882, 29 scalps were paid for at 2s. 6d each; in the same year 884 kangaroos and 136 emus were paid for at 1s each. In 1890 the property was rabbit netted on the boundaries, and continual but ineffective methods of destroying the pest were adopted, and the whole district became very badly infested, it being nothing unusual to poison from ten to twelve thousand at one waterhole. The result was that during any dry period both the rabbits and sheep were underfed and the country was being eaten out. It was not fully realised what damage the

rabbits were doing, but many of the edible trees were ringbarked and killed, and practically all bush and perennial grasses were killed.

In 1897 autumn was very dry, and over 13,000 lambing ewes were fairly successfully fed on branches of boree and cuba trees until June, when the season broke. The years of 1898 and 1899 were dry, and the country became very bare and started to drift. During 1900-1901 the rabbit burrows were all dug out and all rabbits destroyed, since when there have been practically none on the property.

Unfortunately, before the country could recover, the 1902-1903 drought started, and during that summer the whole country was in effect a moving sand-drift, with most netting fences and yards covered with sand. Blinding sandstorms occurred frequently, and many of the excavated dams were practically filled with drift.

As mentioned previously, in 1887 13,000 sheep were satisfactorily fed on the leaves and branches of boree and cuba trees. In places these trees were so thick that in mustering sheep it was not possible to see more than 300 yards, but generally the boree country was more open than that. About this time it was first definitely noted that the tent caterpillar (very hairy and living in woven bags during the day time) was attacking the boree trees and killing them by eating all the leaves. This caterpillar has continued its destruction, and 90 percent of the boree trees are now dead. A bushfire swept the property in 1918, burning many of the dead borees, and today it is practically clear country, where once it was possible to see only 300 yards. Though there is an abundance of young boree trees growing, which would soon reforest the country if protected from sheep, such precautions would only result in fostering them for the benefit of the caterpillar.

Today the sandhills are clear of all useless scrub and the pines have been considerably thinned out, and the two principal sandhills have been fenced in paddocks by themselves. The result is that during the growing season they produce a heavy crop of herbage, mostly crowfoot and barley and corkscrew grasses. Which can then be eaten, and the more suitable country reserved to a limited extent for summer use. The trees in the box swamps and creek have nearly all been killed, and most of the dead timber has disappeared. This part is now the heaviest carrying country on the property, the growth generally being a mixture of trefoil and barley grass. The boree country is now mostly very open and forms the main areas of the perennial

grasses, such as whitetop and corkscrew, together with local herbage. The lignum swamps carry a good solo of herbages – mostly trefoil, barley, blue and small crowfoot.

The open plains, where it has been possible to treat them generously, are now well covered with cottonbush to an extent of about 12,000 acres, and are growing the usual herbage and grasses, while in several areas large quantities of wild oats grow in good seasons to a height of 3ft. and to an extent of several hundreds of acres. The cane grass swamps have been burnt at times and are now producing more feed than in the past.

There are several very important points that can be gained from this reference. The first is that high levels of structural and species diversity (presumably including wildlife) existed during early settlement. There obviously existed a complex vegetation mosaic related to various Riverina soil types. There was also a high degree of perenniality, a range of age classes, and a high stored biomass relative to the rainfall and in contrast to the present vegetation cover.

The Riverina landscape was flat and easily settled. There was an apparently abundant supply of vegetation used for structural and fodder purposes. There also appeared to be an abundance of land to settle and 'improve'.

While many of these management 'improvements' were deliberate, some of the consequences were not. The outcomes that we now see as degradation were not a conscious decision to reach this end point, but the result of multiple impacts of small changes and subsequent responses. The action of fencing and set grazing was not (in most cases) intended to eliminate saltbush. And the belated recognition of the impact of total grazing pressure of sheep and rabbits on changes to the vegetation structure had a similar consequence.

The results of this management (deliberate or not) was to convert a perennial grassland/shrubland/woodland mosaic into a perennial grassland/shrubland (at best) or at worst an annual grassland with some perennial components. The resultant higher annual grass biomass effectively made the system more vulnerable to catastrophic wild fires, which in turn depleted the woodland component under set stocking.

This loss of perenniality has to a large degree impacted on both the ecological/hydrological stability and the production capability of this system under an erratic climate. Early set stocking management was effectively mining biomass without allowing any opportunity for replenishment of the system.

The grazing system is now subject to seasonal fluctuations in effective rainfall to a much larger degree than previously. Primary production is now concentrated on winter/spring biomass peaks related to rainfall and is not as effective in utilising summer storm events or intermittent rainfall. Therefore, the production fluctuations are further exacerbated making effective grazing utilisation problematic and prone to autumn feed gaps.

I won't go any further into the ecological and hydrological consequences of this level of vegetation disturbance and fragmentation. Suffice to say that they are significant and ongoing and the subject of an entire paper itself.

The loss of perennials and the ongoing decline in productive (and ecological) potential, and lower wool returns, have tempted many Riverina landholders to recently pursue intensification of production through annual cropping and pasture irrigation. The options are basically dryland grain crops, irrigated (deep bore) pasture, or rice. The former two are probably marginal and risky economic options, the latter showing tempting short-term profits. While not rejecting the development of appropriate scale irrigation, the danger is that it becomes uniform across the landscape. The irony is that it is still driving the system in the direction that we have done for 150 years—that is, losing perennials and resilience, increasing vulnerability and lowering replacability (sustainability). Technology can maintain unstable systems, but at a cost. It also can often lead to non-irrigated areas being more intensively utilised because of the higher stock concentrations, leading to overgrazing and further loss of perennials.

While it may not yet be insanity, it is certainly approaching lunacy, to keep on doing what we have done in the past and not learn from our mistakes. We need, I believe, to have an individual and collective planned approach to structuring the landscapes of the future to integrate production and conservation objectives. We need to be sending the right messages as a community in the way of incentives and disincentives. Herein lies our current dilemma.

Ron Greentree, large-scale NSW wheat producer has been quoted in *The Bulletin* (13.7.99) as saying 'We have decided as a global community to sacrifice the environment to produce food and fibre for the standard of living we have chosen'. It would appear that somewhere along the line, Ron is picking up mixed messages, or that he just has selective hearing (or thinking).

While the current agricultural system does often maximise economic goals at the expense of the environment and social objectives, there are none-too-subtle cracks appearing. The objective of improving the extent and quality of native vegetation across the agricultural landscape is a stated aim of the government and an increasing desire of segments of the rural community. In the Riverina, Greening Australia (NSW) is trying to deliver a package of extension and incentives to help these people.

The first core elements of these programs are:

1. *Awareness, extension and understanding* – historical case study sites like Steam Plains and surrounding properties make excellent learning sites;
2. *Identification of issues and impediments and needs* – again local demonstration management sites are essential to show what is possible and what works, and able to demonstrate changes over time;
3. *Work with the willing* – work with those with a desire, empathy and capacity to actively manage their remaining vegetation;
4. *Provide appropriate incentives and support* – Greening Australia offers \$1200 towards fencing costs, access to other appropriate support programs, up to \$250/ha for site management, direct seeding and/or plant stock, technical support and advice and follow up.

The most important thing is not what native vegetation has been left within or at the edges of the agricultural landscape, but what is done with what is left. Active management, not passive neglect, is the key to the future of our natural systems. Appropriate management of seemingly highly degraded sites can result in significant conservation outcomes at a local level. In many cases there is no quantifiable negative production impacts because the areas of high conservation potential often coincide with the areas of the lowest production potential. In the Riverina, prior stream beds and associated sand dunes (as on Steam Plains) are the areas of most diversity, but subject to the most degradation under continuous grazing. Delineation of these areas with fencing to control grazing and appropriate weed control has the most potential to encourage regeneration. Many of the species listed in the Steam Plains reference will freely regenerate either from current fresh seed, soil seed stores or vegetative root suckering.

White Cypress Pine (*Callitris glaucophylla*) shows the greatest sensitivity to grazing, and therefore will benefit greatly from grazing control.

The harder red duplex soils adjoining prior streams can also respond positively to management. Total grazing exclusion may not be necessary though significant rest under rotational grazing will improve the density of perennial components (grass, shrubs and trees). Recovery of perennial native grasses is relatively quick (although the diverse herb layer may be largely lost in highly degraded areas for a long, if not indefinite, time).

The Boree (*Acacia pendula*)/Cooba (*Acacia salicina*) woodland component can regenerate from soil seed stores. This has been recorded even when there have been no living adult trees on the site for more than sixty years (pers. obs.). Stock exclusion is desirable during suitable germination conditions and the first few years of growth. The majority of young trees can reach maturity through an appropriate rotational grazing system that removes stock when grazing pressure is transferred to browse. The grazing regime can significantly influence the perennial structure of this system and the ratio between grassy and woody vegetation.

The development of a significant and diverse shrub component in the Acacia woodlands is entirely dependent on its starting condition and surrounding seed sources. Because of the early elimination of most of the saltbush species and their short-lived seed, only a few species (e.g. Thorny Saltbush *Rhagodia spinescens*) will readily volunteer into protected areas, provided there is a nearby seed source. However, this is where the greatest opportunity exists for direct seeding at least some elements of the shrub component back into former shrubland/woodland sites.

Re-establishing species like Oldman Saltbush (*Atriplex nummularia*) across the landscape has the twofold benefit (under appropriate management) of improving the landscape biodiversity values while at the same time improving the perenniality, and therefore sustainability for grazing. An added benefit can be the ability to defer grazing (because of the extra grazing provided by the saltbush) of

other areas, allowing longer rest periods and even grazing exclusion of sensitive areas. Regeneration under appropriate management can occur once a seed source has been established.

Such a program can, in conjunction with other management changes, break the cycle of set stocking and continued degradation. This can then lead to a process of regenerating landscapes of increasing resilience, productivity and sustainability. Significantly, the change in management may, in many cases, only occur with the delivery of appropriate extension and demonstrations, access to incentives, technical advice, seed and machinery resources.

Mr Stanley, Government Veterinary Surgeon, wrote in 'The Pastoral Times' (Deniliquin) on May 15, 1886 – '*Cotton and saltbush were indigenous and required no cultivation in the old times, but it may be that having exhausted them here there may be some difficulty in again encouraging them to take to their old pastures; but as a matter of fact if we go into cultivation it would be better for us to grow cotton and saltbush than lucerne or hay... We have no doubt that plenty of roots and seeds are available on the back portions of the colony where the effects of excess feeding off are not so apparent as they are here, and that were small nurseries created here, it is likely that in a few years we would again have such valuable plants thriving vigorously on the local pastures. Is the experiment worth a trial?*'

Let's just hope that in another hundred years we are not repeating mistakes and have moved on to rewarding regenerative production systems based on sound ecological, social and economic goals.

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A guide to best practice conservation of temperate native grasslands

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Effective conservation of the temperate native grassland communities in south-eastern Australia has proved difficult. Despite growing awareness of the important conservation values of native grasslands, slow progress has been made in securing permanent protection for remnants or even halting their decline. This 'problem' of grassy ecosystem conservation has prompted the development of some inspirational projects and new approaches to conservation that are of relevance to many agricultural landscapes.

This paper, based on a report commissioned by World Wide Fund for Nature, outlines the most successful methods developed for grassland conservation and develops a practical vision of the nature of landscape-scale temperate grassland conservation and the means for its realisation.

Recommendations for future action are based on the observations and experience of native grassland programs throughout south-eastern Australia. It is proposed that grassland conservation should concentrate on the protection of those sites of highest conservation priority for the community, species or region concerned. Specific targeted extension coupled with a range of protection mechanisms and appropriate incentives are the most significant elements in achieving long-term protection for these high priority sites.

Even where there is a clear recognition of the values of native grasslands by landholders and land managers, native grasslands on private and public land will continue to be lost or degraded unless action is taken to ensure their long-term security.

Keywords: best practice, projects, conservation

Introduction

'... a cataclysm has reduced landscapes of colourful, unique species-rich grasslands to a few small, scattered refugia, making these grasslands the most endangered natural ecosystems in Australia.'
(McDougall & Kirkpatrick 1994).

In the temperate lowland regions of south-eastern Australia, the natural grassy ecosystems have either been eliminated or reduced to small remnants. Temperate native grassland communities are regarded as requiring urgent conservation action in all regions in which they occur.

The decline in area and quality of native grasslands continues. Indeed, it is probable that the current rate of loss is the highest for several decades.

The main threats and impediments to conservation of the remaining native grasslands include:

- conversion to crops and introduced pasture;
- overgrazing by introduced stock;
- poor management of remnants;
- urban expansion; and
- invasion by exotic plants.

Threatening processes operate on both public and private land and are exacerbated by the common failure of landowners and government agencies to recognise native grasslands as native vegetation of conservation value.

The 'problem' of grassy ecosystem conservation has prompted the development of new thinking and new approaches that are of significance for nature conservation throughout agricultural landscapes in Australia.

This paper is based on a project conducted by World Wide Fund for Nature (Australia) (WWF) (Ross 1999a). The project aimed to develop a practical vision of the nature of landscape-scale temperate grassland conservation and the means for its realisation, based on the experience of the many projects and programs of the past decade.

Conservation in productive landscapes

A dramatic shift in agriculture is occurring across the fertile plains of south-eastern Australia, from low-intensity grazing to more intensive use of land. With the support and encouragement of governments and industry groups, tens of thousands of hectares of new crops and pastures are being established in regions that contain the last remnants of the original native grasslands.

Although regulations are in place to limit or control clearing of native vegetation, land development continues to reduce options for biodiversity conservation in these regions.

It is apparent that many landholders still do not recognise the link between sustainable agricultural production and retention of threatened remnant vegetation. As a result, even where there are positive attitudes to remnant vegetation, those attitudes may not translate into action (Elix & Lambert 1997).

It appears certain that the existing threats to native grassland communities will continue and are likely to intensify. Even in those regions where there is currently little clearing in natural grassland landscapes, there is a constant and continuing threat of new technology, new crops, new weeds and changed market conditions. Pressures on the viability of farms will inevitably translate into pressures on native vegetation.

The area of high-quality native grassland remaining is a very small percentage of the total agricultural area. In the face of such uncertainty we must use legislative and planning mechanisms to secure these areas for conservation now.

Grassland conservation programs

A decade of programs directed at addressing threats and achieving long-term conservation for species and communities has generated considerable interest in the conservation of native grassland communities throughout south-eastern Australia. Specifically these programs have:

- increased awareness;
- placed specific grassland extension and planning officers in most regions;
- provided biological surveys;
- protected a number of significant sites as conservation reserves;
- developed management agreements for sites on public and private land;
- identified benefits of native grassland for sustainable land management;
- increased knowledge of appropriate conservation management;
- included grassland communities and species in threatened species legislation;
- incorporated grassland conservation into regional planning processes; and
- placed the conservation of native grasslands on the conservation agenda.

In many respects, the effectiveness of these projects and programs has been unquestionable and there are numerous projects that have made substantial contributions to the conservation of native grasslands (Ross 1999a). However, most of these projects have aimed to increase community involvement and increase knowledge of the distribution and composition of native grassland remnants. With the notable exception of acquisition of areas for conservation reserves, few projects have been successful in achieving long-term protection for native grassland remnants or have adopted specific strategies to this end.

Conservation objectives for temperate native grasslands

At present, all native grassland communities are considered to be 'Critically Endangered' or 'Endangered' across their range (adopting the taxon ratings of IUCN 1994). The massive depletion in area and fundamental changes in environment and management that have occurred since 1770 means that, even without further loss, these communities will always be threatened. The goal of grassland conservation should reflect this reality.

Goal

Improve the status of native grassland communities to Conservation Dependent through permanent or long-term protection and management across their range.

Immediate objectives for native grassland communities

- increased area of high priority native grassland permanently protected in conservation reserves;
- increased area of high priority native grassland on private land protected by covenants and long-term management agreements;
- increased area of high priority native grassland on public land protected by long-term management agreements;
- improved conservation management across all land tenures;
- increased community involvement in the management of native grasslands;
- increased knowledge of the distribution and composition of remnants;
- recognition of native grassland conservation in regional landuse planning and conservation strategies.

Best practice conservation of temperate native grasslands

A systematic and comprehensive conservation program for temperate native grasslands will include five main elements:

- knowledge gathering and processing;
- priority setting;
- strategic planning;
- the means for conservation; and
- stewardship and management.

Few programs adequately address all these elements and it would appear that, without this comprehensive approach, on-ground outcomes could be limited or short-lived.

Knowledge

Surveys of temperate native grasslands should identify and define sites, communities, species and features worthy of conservation on all land tenures. They should either assign a level of conservation priority to these features or provide a framework for making such assessments. Surveys should also be predictive of what may occur on unsurveyed sites, through analysis of flora and fauna with regard to environment and management (see Lunt 1995).

The most influential surveys for temperate grasslands have been:

- 'landmark' surveys that provide inspiration for broadscale action (e.g. McDougall & Kirkpatrick 1994);

- bioregional or sub-regional surveys across all land tenures (e.g. Diez & Foreman 1997; Sharp & Shorthouse 1996); and
- targeted surveys for particular features or programs (e.g. Maher & Baker-Gabb 1993; Barlow 1996).

Surveys will be most successful in leading to conservation outcomes if linked to extension programs and incorporated into conservation strategies. The Trust for Nature (Victoria) has consistently linked surveys of private land with regional programs, to good effect. Similarly, the instigation of WWF projects in the Monaro and South Australian Mid-North followed extensive surveys of those regions.

The current knowledge of the distribution and composition of remnant native grasslands in all regions is sufficient to undertake specific actions to protect high priority sites. Full inventories of sites or site characteristics are not a prerequisite for conservation action.

Priorities

All remnants of native grassland are of value. However there is unlikely to be sufficient capacity in any region to protect all known native grassland sites through active means. Therefore, conservation programs should concentrate on the protection of those sites of highest priority for conservation of the community, species or region concerned (e.g. Prober & Thiele 1998).

Conservation priorities should be determined for sites based on the contribution they make to achieving immediate objectives and the overall conservation goal. The concept of 'irreplaceability' provides a useful basis for the design of reserve systems and the determination of conservation priorities (Pressey *et al.* 1995). Areas should be identified for establishment as public land protected areas in all regions, along with core areas or clusters of priority sites on both public and private land for complementary management.

A number of approaches are possible for assessing priority, including the use of focal species (Lambeck 1999), umbrella species (NSW NPWS *in prep*), iterative ranking according to threatened flora (Kirkpatrick 1983; McDougall & Kirkpatrick 1994), and the presence of particular features or communities (Owen 1997).

The Department of Natural Resources and Environment in Victoria is developing Guidelines for assigning priority to native grassland sites (see Muir 1996).

Strategy

Lambeck (1999) provides an excellent summary of the two broad approaches to nature conservation in production landscapes. 'General Enhancement' attempts to maximise the number of indigenous species retained or to minimise the number lost, within constraints imposed by other land use objectives. 'Strategic Enhancement' aims to retain identified components of the biota. It is strategic because it requires specification of landscape elements and the management regimes needed to meet a particular objective. Such approaches have quantifiable targets against which we can judge the effectiveness of our actions.

Grassland conservation demands the adoption of a strategic approach through concentrating on achieving protection for priority sites. These sites will become 'icons' for native grassland conservation that can be used to promote conservation management and act as a catalyst for grassland conservation in the broader landscape.

Strategies should always include specific outcomes with measurable indicators of success and performance targets to assess how projects meet immediate objectives. Performance measures should include the total area protected, number of management agreements completed, areas fenced, populations of significant species protected, managers of high priority sites met with, and so forth.

Strategies should also recognise that building relationships, trust and capacity within the community all take time.

Recovery plans developed for lowland grasslands in the ACT (ACT Government 1997) and being developed for the Plains-wanderer (*Pedionomus torquatus*) (NSW NPWS *in prep*) provide model approaches for written conservation strategies.

Means

Two outcomes are necessary for permanent protection of remnants:

- a change in the land status, tenure or property rights of the land through reservation, purchase, covenants, or other permanent management agreements; and
- effective management of the land in perpetuity.

The means of achieving these conservation outcomes is through active involvement of people through targeted extension and education, mechanisms to achieve the change in land status

or property rights, and incentives to undertake and maintain conservation management.

People

Well-delivered extension programs are fundamental to the success of all elements of grassland conservation: from collecting and disseminating knowledge to promoting the acquisition of reserves. However, extension programs must be directed towards achieving tangible outcomes if they are to be successful.

There are a number of excellent extension programs for native grasslands in south-eastern Australia. The majority are operated by Non-Government Organisations such as WWF, Greening Australia and Trust for Nature (Victoria). In areas where these extension programs are operating, knowledge of grassland conservation is low and there are few government extension officers.

Extension programs should aim to generate long-term protection for high priority sites on both public and private land. All extension programs should have access to suitable incentives for maintaining or adopting conservation management. Grassland extension programs should run for a minimum of three years, although longer periods will often be needed to secure long-term conservation and to ensure that knowledge is transferred to the community.

Extension is a specialist task requiring an understanding of community dynamics and personality types. There is some value in using local people as extension officers, but much will depend upon the skills of those people and their standing in the local community. Trust, local knowledge and continuity of advice should be maintained by ensuring that the same extension officer is employed throughout the duration of the program.

Greening Australia has developed a program called 'Learning from Farmers' whereby conservation-minded farmers encourage other landholders to adopt similar practices. Similarly, the Grassy White Box Woodland project of Community Solutions has recently employed four local landholders as Action Liaison Officers.

A number of themes can be drawn from the experiences of grassland extension projects to date:

- Only talk to landholders or managers in the grassland concerned. '*If they can see the native grassland once, they can't NOT SEE IT in the future*'.

- Use ‘cold calling’ to target owners with significant remnants.
- Always ask people what they know about the site first, how they manage it and why they value it.
- Use maps of the original and current distribution of native vegetation to demonstrate the significance of remnants.
- Develop messages that are appropriate for native grasslands and native pastures.
- Farmers may have limited knowledge about native flora, but conservationists often know less about farming.
- Build capacity within communities by ‘training the trainers’. Use other groups such as Landcare and Field Naturalists to educate the community.
- There is a lack of trust between ‘the conservationists’, ‘the government’ and ‘the farmers’.
- When sites are destroyed, use this in a positive way to encourage protection of other remnants.
- Actions speak louder than words: the educational value of on-ground projects should not be underestimated.
- Promote the diversity and naturalness of treeless grasslands.
- Be clear and honest about what you are trying to achieve, what you would like landholders to do and how you can help them.
- Most landholders require practical advice on identification and management of remnants.
- Non government extension officers will usually be more successful for private land conservation.

Mechanisms

Even where there is a clear recognition of the values of native grasslands, sites will continue to be lost unless mechanisms are available to ensure their long-term security. A range of protection mechanisms including reservation, acquisition, covenants, easements and other land management agreements is required, backed by incentives to encourage voluntary partnerships to protect biodiversity on and off reserves.

Regional plans are one approach to meeting broad vegetation management objectives. However, they must include suitable criteria for biodiversity conservation if they are to be effective. Acceptable levels of agricultural development should be set in each region with requirements for biodiversity conservation and sustainable land use underpinning those decisions.

Regulations to prevent clearing of native grasslands are an essential ‘safety net’ in all regions. However, regulations on their own will not bring about or maintain the long-term management necessary to protect biodiversity. A ‘duty of care’ approach will also be inadequate by itself, as many significant areas will require specific actions that go beyond this duty.

The development of management agreements including covenants and easements that secure long-term conservation for significant areas are crucial for grasslands conservation in all regions. Many landholders will, with some encouragement and assistance, readily set aside areas for conservation of native grasslands, especially on relatively unproductive parts of their properties. However, considerable extension effort and innovative incentive schemes may be required to secure agreements over relatively large or potentially productive areas.

The perceived unsuitability of some existing protection mechanisms may suggest the need to develop new approaches. The use of easements in Australia has not been explored to any great extent, yet overseas experience would suggest that they are an ideal mechanism for grassland conservation. Generally speaking, conservation easements are used to ‘purchase’ development rights over land to retain certain features. Most easements are voluntary and can be for a fixed term or can operate in perpetuity.

The number of privately owned native grassland areas that are a high priority for protection is sufficiently small that individual sites can be targeted for conservation in each region. [Crosthwaite (1997a) estimated that around three hundred to five hundred properties in south-eastern Australia support native grassland with high conservation values.]

Long-term management agreements should also be used to pursue conservation objectives on public land. A notable example of such agreements is the Memorandum of Understanding between the Department of Defence, Environment Australia and Environment ACT for the protection of threatened species and communities on Defence land in the ACT. Incentives, similar to those used on private land (such as fencing, management advice and surveys), may also be used to obtain long-term management agreements for public land such as cemeteries and Travelling Stock Reserves.

Most bioregions that support temperate native grasslands have relatively low reservation levels and,

with few exceptions, high levels of bias within the existing reserve system (Thackway & Creswell 1995). There is a degree of urgency in improving the reservation status of grassland communities as land clearing continues to reduce options for biodiversity conservation.

In the past three years a number of highly significant grassland areas have been added to the National Reserve System. Together they represent the most important advance in native grassland conservation in south-eastern Australia. Despite the capital cost, there is little doubt that acquisition for conservation (whether by governments or private organisations) of large, relatively intact areas is the most effective means of ensuring long-term protection for native grassland communities.

As an example, the purchase of a property of some 1,280 ha supporting native grassland and grassy woodland communities at Terrick Terrick in northern Victoria, and its protection within the National Park system, has substantially improved the reservation status (and the conservation outlook) for a number of grassland conservation values (Lunt *et al.* 1999; Robertson 1999). These include:

- the largest area of Northern Plains Grassland in Victoria;
- the largest population of Plains-wanderers in Victoria;
- the largest known population of the Hooded Scaly-foot in Victoria;
- the only Victorian populations of Annual Buttons and Pepper Grass;
- possibly the largest Victorian populations of three other threatened flora species; and
- populations of a large number of flora and fauna species previously unrepresented within National Parks in Victoria.

Acquisition provides a level of certainty for grassland conservation that allows for long-term management planning and research. Just as importantly, it provides a presence for native grassland conservation in 'mainstream' conservation planning and public recognition of the importance of protecting these communities.

Purchase is not always an option, however. Cost and the vagaries of the open market can be limiting factors. More importantly, some owners simply have no interest in selling because of the site's value to their farming system, the potential loss of future opportunity, or a fear of what may happen to

the land in government ownership (Gilfedder & Kirkpatrick 1995).

To facilitate the purchase of high priority sites for conservation, the necessary approvals and funding should be obtained on an in-principle basis—either for specific sites or for a class of sites so that conservation objectives are not frustrated by inability to act within the short timeframes of the open market. Non-government and statutory organisations have an important role to play in that they can act quickly and decisively to secure important grassland areas that become available for purchase and can negotiate openly with landholders.

Significant gains in reservation status can also be achieved by reviewing the status and management of public land areas: implementing mechanisms for long-term or permanent protection of high priority sites on public land should be a major component of grassland programs.

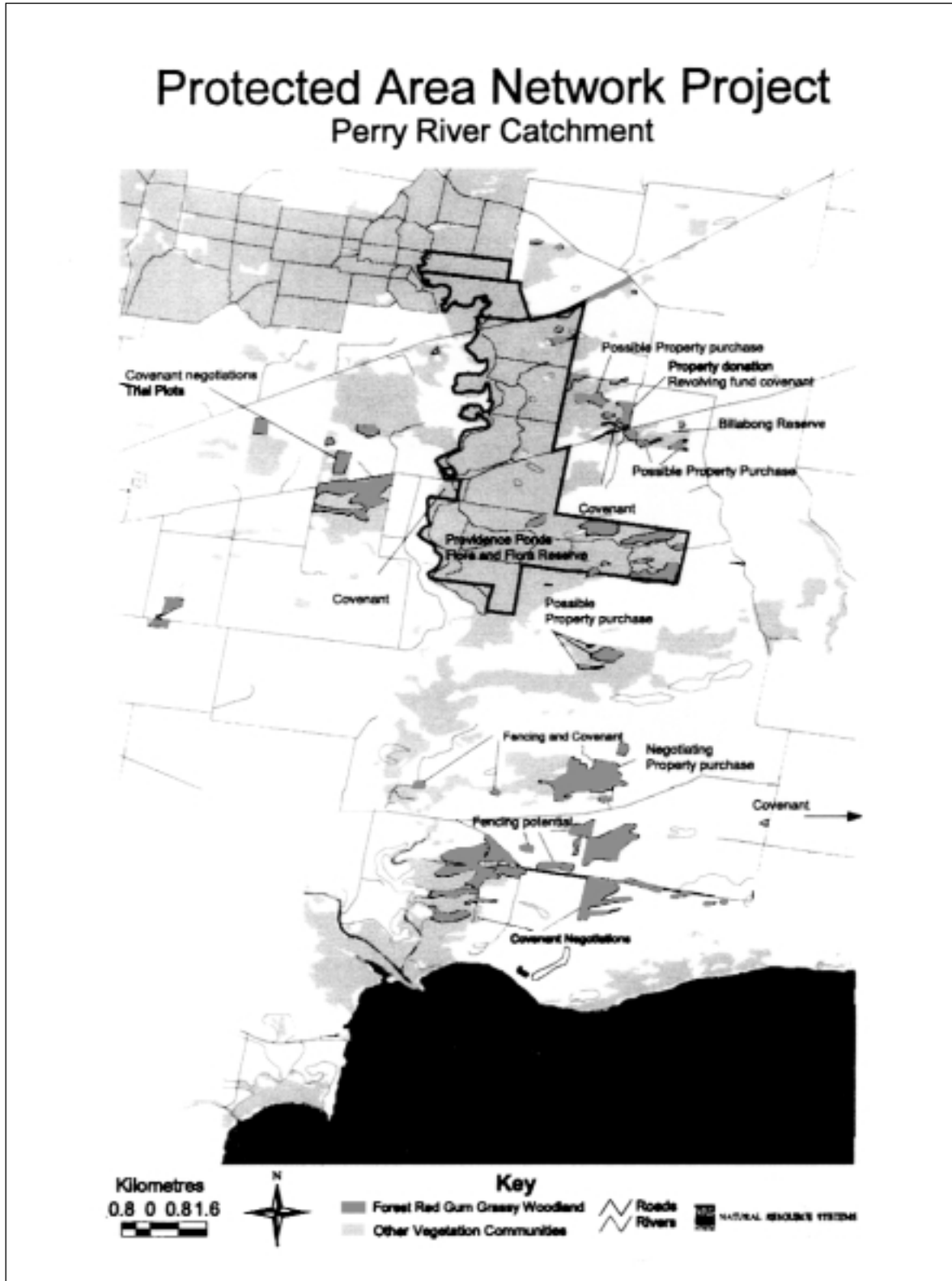
Protected Area Networks

Addressing biodiversity protection in highly fragmented landscapes requires the development of a network of public reserves and private land managed in sympathy—a 'protected area network' (Prober & Thiele, this volume). Protected Area Networks (or 'conservation management networks') provide an effective answer to the problem of developing adequate reserve systems for highly fragmented communities (see Todd 1998; Ross 1999b).

A conservation reserve system that incorporates private management is likely to be more easily achieved and politically acceptable than an approach based on public acquisition alone (Howard & Young 1995). Whether a site is protected as public or private land will depend on a range of factors, including current land status, land values, threats, desired management, availability of incentives, willingness of landowners to negotiate, and many more. The Perry River Protected Area Network, being developed by the Trust for Nature in Gippsland, includes existing reserves, purchases, covenants, revolving fund acquisitions and fencing agreements (Fig. 1).

All protected areas should have site-specific management plans and agreements and overall management should be coordinated across the Protected Area Network by a single organisation (Binning & Young 1997).

Figure 1. Perry River Protected Area Network. A range of mechanisms is being used to secure conservation management for individual sites within this network of protected areas.



Incentives

While there will be agricultural benefits in retaining native grassland, absolute management for nature conservation will almost always require some sacrifice in production or loss of future opportunities for individual landholders. These costs must be recognised if effective partnerships are to be developed. Failure to do so, especially by overstating or generalising the benefits of retaining native grasslands, risks alienating farmers and farm advisers.

The economics of grassland conservation on farms is such that more than education is needed to change behaviour. A major program of incentives will be required if the *status quo* is to be maintained, if not improved. Options for targeting incentives are discussed by Crosthwaite (1997a; 1997b; this volume). For properties that have native grasslands of high conservation significance, a targeted approach based on the circumstances of the whole farm is desirable. Incentives should be linked to structural change to achieve long-term farm viability and secure protection for native grassland.

Incentives aimed at the conservation site can also be successful where threats to the site are relatively low and the cost of conservation is manageable. In Gippsland, the offer by Trust for Nature (Victoria) of surveys and ongoing management advice coupled with fencing incentives and rate rebates has been effective in securing long-term protection for relatively low cost.

Elix and Lambert (1997) recommend the development of a 'toolkit' for private landholders that includes:

- practical information and advice on the significance and management of remnants;
- provision of incentives for integrated management that includes a strong conservation component;
- provision of fencing subsidies contingent on entering into management agreements; and
- development of a 'stewardship' scheme.

Stewardship

The type, frequency and consistency of management, or lack of it, has a profound influence on the composition of grassland flora and fauna. Perhaps more than any other ecosystem type, the long-term conservation of native grassland communities and their constituent species are dependent on the maintenance of regular, high quality, strategic management.

Nowhere is the application of effective management more important than on newly acquired reserves. Sites that are reserved for conservation should be promoted as models for the protection and sustainable management of native grasslands.

The adoption of a conservative approach based on existing management regimes and involving local landholder input are important steps in gaining the confidence and support of local communities.

Protection through management agreements or by reservation will not in itself ensure conservation. At present, grassland communities in all regions are undergoing a loss of diversity on private and public land due to poor or insufficient management. Areas protected under management agreements will still require a degree of management advice and assistance as well as regular inspection. Effective management agreements must both achieve and retain strong landholder commitment by developing a partnership with the landholder. This involves a genuine commitment from government (or other contracting organisations) to provide ongoing advice and resources.

Grassland management should focus on outcomes—achieving specified objectives by the best means possible. Lunt and Morgan (1998) have recommended the adoption of adaptive management principles for all native grasslands managed for conservation. They emphasise that learning from management outcomes should be a specific objective of conservation management and that management should be structured in such a way that assessment is possible. They argue that it will prove to be far more cost-efficient and effective to integrate research issues with management, rather than to maintain the two as separate activities.

Best practice models

The Grasslands Stewards/Advisers Program of Trust for Nature (Victoria) provides the most complete model of how a grassland conservation program can operate. The program is based on the philosophy that long-term conservation on private land requires a change in property rights and effective management in perpetuity.

The key elements are:

- identify significant remnants through surveys, existing databases and personal contacts;
- establish one-to-one relationships with the owners/managers of those remnants;

- seek permanent change to tenure through covenants, purchases or other mechanisms;
- maintain the same extension workers for the period of the program;
- maintain extension programs for a minimum of three years;
- use non-government organisations rather than government agencies to build relationships with private landowners;
- use incentives to encourage and reward conservation;
- develop networks of protected areas on public and private land; and
- develop a stewardship fund to provide on-going support and advice for managers of protected areas.

Conclusion

The relationships, trust and capacity in local and regional communities that are required for long-term conservation of native grasslands take time to build. Grassland programs must therefore be supported until these elements are in place.

It is clear from case studies that such long-term programs will be most effective where they are both comprehensive and strategic. Within these programs, effective extension projects that utilize a range of mechanisms for permanent or long-term protection of priority sites will be fundamental to success. And success, once achieved, should always be celebrated.

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