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COSTS AND BENEFITS OF INTEGRATING CONSERVATION WITH PRODUCTION IN SOUTH AUSTRALIAN RANGELANDS

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ABSTRACT

Results from studies of the effects of grazing on native biota in rangelands have indicated a general relationship relating changes in species composition to grazing intensity based on distance from sources of drinking water. This relationship leads to concern about the persistence of the most grazing-sensitive species unless some areas are maintained for the needs of those species. Using current principles for the design of conservation networks, we have examined scenarios for the integration of pastoral land use with off-reserve conservation networks at regional scales in an arid region of S.A. Costs that might be associated with an integrated conservation network include: capital costs of fencing and bore management, and opportunity costs of not being able to graze areas set aside specifically for the conservation of sensitive species. These costs are explored and compared with existing institutional costs of conservation, and with potential opportunities growing in world markets. A conservation management network on pastoral lands covering an area of 60,000 kms^2 might cost $35-60K per year in foregone opportunity costs. This amount is not substantially different to existing inputs through NHT/Landcare processes, and a lot less than costs of managing a similar area in the reserve estate. Apart from costs, benefits of this approach include a proactive conservation image for the pastoral industry, opportunities for "green" product marketing, and security of conservation objectives through formalised voluntary agreements. Social and economic impediments to this approach are also outlined.

INTRODUCTION

The traditional model of conservation is one of national parks and reserves. Each one of these tends to be large in area, and relatively isolated in the landscape because it is surrounded by land used for other things. In the past, national parks and reserves were often chosen because they were scenically attractive (e.g., Uluṟu) or were areas that were otherwise unusable for production (e.g., wetlands). In recent times, however, reserves are also being chosen as areas to represent particular ecosystems and the species that they support, and managed for those biological values. While national parks and reserves remain key areas for a conservation network, it is unlikely that a dedicated reserve network will ever represent the range of ecosystems across the 70% of Australia which is rangeland.

The effectiveness of this traditional conservation model for conservation in the arid zone has also been questioned on the basis that the environment is highly variable in space and time ((1)), and that management costs for a fully representative network of reserves would be prohibitively high. There is now also data to suggest that many rangeland species are rare and patchy in distribution (especially plants and invertebrates) and may not be present inside reserved areas.

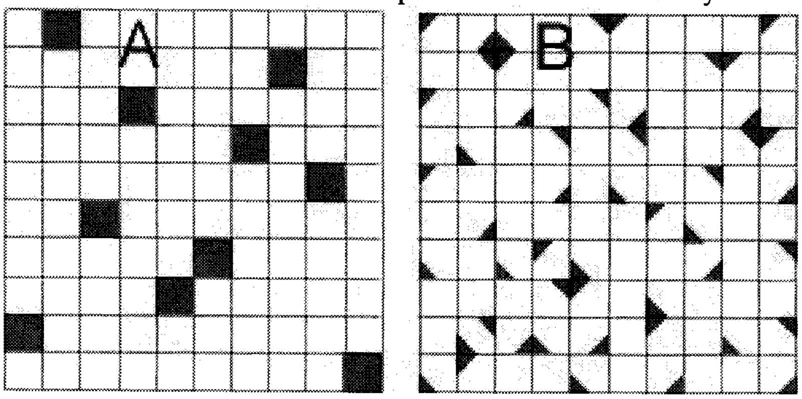
Work over the last 10 years has also shown that some species are very sensitive to grazing ((2)). These species may have declined in pastoral landscapes because of the consistent grazing pressures. As more water points are installed, and more areas are opened up to sustained grazing pressure, decreaser species may become locally extinct. At a regional-scale, the population of a decreaser species may become so low and fragmented that total extinction is possible. While the majority of species are compatible with normal pastoralism, the more sensitive decreaser species may require lightly or ungrazed areas to be set aside for their persistence. This hypothesis is derived from many studies but needs to be tested at a regional scale.

These considerations lead us to hypothesise that an effective model for conservation in rangelands would be to have a network of sites, at quite close spacing, across the pastoral matrix to fill-in the landscape between national parks and reserve areas. We outline the biological, social and economic reasons why we think this model would be a beneficial way to approach conservation in rangelands, and compare the model with a traditional reserve scenario.

METHODS

The comparative planning study was conducted on 60,000 km^2 of sheep-grazed rangeland in northern South Australia in which there are approximately 1050 paddocks larger than 10 km^2 (and many other paddocks smaller than 10 km^2). We used six landsystem groups as surrogates of biodiversity information (e.g., (4)). Surveys of plants and animals at 32 sites provided confirmatory evidence that a small but significant proportion of species were moderately to severely depressed in population size by grazing (Landsberg et al. *in prep*).

Figure 1. Diagrammatic representation of scenarios compared in this paper: A - "Reserve". B - "Network". Both achieve 10% representation of each landsystem class in a lightly grazed state.



We explore two scenarios in which 10% of the area of each landsystem class across a region is notionally allocated to be lightly grazed so that populations of decreaser species are supported. The scenarios are: (1) a "reserve" model and (2) a "network" model (Fig. 1). In the "reserve" model, paddocks were chosen using complementarity principles ((3)) until 10% of each landsystem was achieved. In the "network" model, existing water-remote corners of paddocks were chosen, also using complementarity principles, to achieve the 10% target. The area of each landsystem in each paddock was calculated and paddocks were selected using the TARGET software (Walker and Faith).

Notionally, paddocks identified in the "reserve" scenario would be removed from the grazing range of stock to attain their ungrazed status (Fig 1A), under the assumption that release from grazing would cause an increase in the population size of decreaser species in these paddocks. This has obvious direct costs in reducing the total area of a property which is stocked and ensuring that waters are fully closed down. Ongoing costs include maintenance of fences with adjoining paddocks still in use (assuming that fences hold out grazing animals such as kangaroos and goats where they are numerous), pest and weed management and grazing opportunity costs.

The paddocks identified in the "network" scenario would be left as they were and contribute to the maintenance of populations of decreaser species by virtue of their existing lightly-grazed areas in water-remote corners. Water-remote areas were designated as those greater than 6 kms from water and we could achieve the 10% area target for most landsystems with this restriction.

Our surveys in this region indicate that some decreaser species could persist well under light grazing (e.g., *Atriplex vesicaria*) whereas others are very sensitive to grazing and are only found in ungrazed areas (e.g., *Vittidinia sp.*). Hence, we calculate costs of fencing and not fencing the water-remote corners. Ongoing costs include the maintenance of fencing, and the opportunity costs of not subsequently establishing a new water point in the area.

RESULTS

Of 1270 paddocks in the study region (> 10km2), 32 paddocks giving an even spread of sites and 10% representation of each landsystem were selected for the "reserve" scenario, and 262 paddocks were selected for the network scenario.

Economic analyses of the scenarios are summarised in Table 1. Fencing costs for the "reserve" paddocks is for re-fencing the perimeter to keep out grazing animals (ie with goat and kangaroo proof fence). Fencing for the "network" scenario is for all corners (N=262), only for the corners of paddocks that have areas > 9 kms from water (N=44), and for not fencing any corners.

Capital and ongoing cost of the reserve scenario is dramatically high compared to the network scenario. Ongoing costs are higher for reserve areas than for network areas.

Table 1. Summary of the simulated once-off costs and on-going annual cash surpluses (constant 2000 $AUD) for different conservation scenarios (Fig. 1) for the Kingoonya Region, S.A. See text for explanation of costs. For simplicity, we do not include depreciation.

		"Reserve"	**"Network"**
Capital costs	All corners & paddocks fenced	$8,047 K	$4,484 K
	Only areas > 9km from water fenced (N=111)	-	$2,629 K
	without fences	$5,140 K	-
On-going costs	All corners & paddocks fenced	$919 K	$799 K
	Only areas > 9km from water fenced (N=111)	$919 K	$614 K
	without fences	$919 K	$351 K

DISCUSSION

Biological aspects

We believe that a network of sites across the pastoral matrix is needed to supplement reserves because of high rates of species turnover, rarity and patchiness of species distributions. A network of sites spreads the risk, for small localised populations, of the entire population being killed by disasters such as wildfire or drought, and potentially achieves the representation of decreaser species in areas suitable for their persistence. This model for conservation is based on our observations and interpretation of results from surveys of species responses to grazing on gradients away from water points.

There are some vegetation types where the impacts of grazing on biodiversity seem to be much less than others. If this proves to be the case, not fencing corners of paddocks may be a favourable approach with minimal establishment and opportunity costs to industry and society. Where it is impossible to be confident that even very low levels of grazing are compatible with the retention of decreaser species (such as in the SA study area), then the "reserve" scenario or "network" scenario with fenced corners are likely to be preferred on the grounds of greater certainty of long term persistence of these species.

Social aspects

The "network" scenario has a number of socially-beneficial features compared with the reserve scenario. First, it directly involves managers as custodians of land that is part of the conservation network. In this way it formally recognises the role already voluntarily and willingly undertaken by many people to preserve areas in a lightly grazed state. The engagement of leases managers as voluntary custodians of these areas is more likely to result in sympathetic management and instill duty of care. For an industry that has (an undeserved) poor image for land management, improved image in society is of great benefit. The role of custodian, coupled with good sustainable pastoral management on the remainder of the property can begin to send images and credentials of responsible land management to the broader Australian society.

A planning exercise that identifies water-remote areas that contribute to a regional total representation of each landsystem provides security of management actions to both the lessee and to society. It is extremely rare that a particular corner of a paddock is not substitutable by another area. Thus, a network of sites can be selected in many different ways. Once negotiated to the satisfaction of lessees in the region, areas not identified can be developed in the knowledge that conservation planning is already in place.

Markets

Since the signing of international agreements for the management of the natural environment to prevent the loss of species, world interest is focussing on 'environmentally-friendly' production. That is, production systems that can prove no decline or loss of species as a result of activities are likely to be more widely accepted by markets. Rangeland products have great potential to take advantage of this market trend by moving toward the ability to demonstrate these credentials. Most species already coexist with grazing. Existing pest control, and some proactive measures to ensure areas are retained for decreaser species will prove the industries preparedness to meet the market challenge. While the market trends are developing, implementation of a regional plan and monitoring of decreaser species on areas set-aside will determine whether or not the conservation plans are succeeding.

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