



# Hope on the range

A new recipe for resolving land-use conflict in the rangelands challenges the view that conservation and pastoralism don't mix. **Bryony Bennett** outlines the 'stewardship' proposal developed by CSIRO scientists.





**F**OR 100 years, the pastoral industry has had a stranglehold on the rangelands. In its heyday, pastoralism invoked images of swarthy men on stocky ponies driving cattle to market through a harsh, yet seemingly timeless, land.

We always knew that, despite the floods, droughts and stampedes along the way, provided that the herd reached the saleyards on time, things would be okay. Those prime beasts would top the market and the pastoralist would triumph over the latest impending disaster... at least until next year.

But now the image of pastoralism is tarnished. Today the rangelands bear a legacy of degradation and species loss resulting from policies and management that failed to control grazing and feral animals. Soils have been washed and blown away, and palatable vegetation is declining.

Losses to the pastoral industry caused by land degradation have been estimated at 50-80% of animal production, or 30-40% of economic productivity. The resource base of the pastoral industry has, literally, eroded.

Viewed against this spiral of falling returns and fertility, the prospect of achieving ecological and economic sustainability in the rangelands looks grim. But a group of arid-zone specialists from CSIRO's Division of Wildlife and Ecology believes that, where there is the social and political will to achieve sustainable land-use in the rangelands, they can provide the way.

The scientists are Dr Steve Morton, a wildlife ecologist; Dr Mark Stafford Smith, an ecologist and modeller; Dr Margaret Friedel, a botanist and range scientist; Dr Graham Griffin, a plant ecologist; and Dr Geoff Pickup, a geomorphologist who uses remote sensing. They all have worked for more than 10 years at Alice Springs, between them notching up more than 70 years of research into Australia's rangelands.

They believe the rangelands are a quintessential part of the national identity in the minds of most urban Australians. With the power of this cultural perspective behind them, they have pooled their knowledge of the arid zone to forge a recipe for its sustainable use. Their approach is outlined in a paper titled 'The Stewardship of Arid Australia: Ecology and Landscape Management', prepared for the *Journal of Environmental Management*.

Australia's arid zone is of global significance, the paper says. Of all the world's deserts, it has the smallest and least dense human population, and has been used for grazing for a relatively short time. If Australia can't manage its arid lands sustainably, desertification in other parts of the globe, where pressures are more intense, appears inevitable. In this sense, the eyes of the world are on Australia's arid-land managers.

### Why not ban grazing?

If pastoralism causes such serious degradation in the arid zone, why don't we just stop doing it?

The answer to this question is threefold:

- Whatever the future uses of the arid zone, the problems of feral animals, weeds, soil erosion and fire will still exist. Land managers will have to be present on the country to deal with them.
- The people who live on the land have some right to occupation through their long association with it.
- Conservation initiatives have to be paid for. This funding depends partly on the wealth of rangelands' industries. These include pastoralism and, increasingly, tourism and the Aboriginal economy.

The recipe for change put forward by Morton and his colleagues hinges on

breaking the cycle of degradation perpetuated by attempts to lift production through unsustainable stocking rates. They say the answer lies in allocating priority areas for conservation management, and integrating national parks with off-reserve protection.

Part of the responsibility for conservation work would rest with existing managers of marginal land who would help to manage feral animals, weeds, fire and local reserves. In return they would receive a 'stewardship salary' from the government enabling them to ease the grazing pressure on their own land.

### Is biodiversity sustainable too?

In addition to land degradation, arid Australia has suffered extinctions and contractions of range among its native biota since European settlement. More than half of Australia's endangered mammals, more than a third of its threatened bird species and about one tenth of its threatened plant species occur in the semi-arid and arid lands.

The threats to biological diversity are primarily feral herbivores and domestic stock which eat out critical habitat and prevent native species from using their drought refuges. Introduced foxes and cats then put pressure on relict populations. There is concern that the ecological changes brought about by



This healthy river floodplain is an example of the areas of inland Australia where small rich pockets (here the floodplain) are embedded in a sea of infertility (the spinifex sand plains that surround these small central Australian hills). Rich pockets such as these are easily damaged as stock, feral animals and tourists all focus on the same areas. Good conservation planning must recognise the inevitable nature of these land-use conflicts and seek to resolve them.



European settlement will continue to cause losses of biodiversity.

Ecologically-sustainable land management is defined in the 'stewardship of arid Australia' paper as the management of a region (rather than of individual farms or enterprises) to allow the maintenance of all its ecological functions, thereby ensuring the persistence of its biodiversity.

Achieving sustainability in the rangelands relies on maintaining ecological function in resource-rich areas. The question is, how can conflict over resource-rich areas be resolved to allow both regional conservation of biodiversity and use of the land for other purposes, such as pastoralism, Aboriginal use or tourism?

National parks have been created throughout inland Australia, but these have rarely been selected objectively to maximise the representation of different ecosystem types and, therefore, of biodiversity. Also they have failed to focus on the ecological processes which permit organisms to move between island reserves.

Morton and his colleagues say that from now on, selection of national parks must be based on a systematic, quantitative analysis of ecosystem and landscape pattern. Second, it may be impossible in some areas to reserve sufficient parks in the future to create a network representative of all systems. The capricious climate of arid Australia, which swings from heavy rain to drought, means that even a representative network of parks might not provide permanent habitats for some plant and animal species. A management approach to cope with this must be based on a better understanding of ecological functioning.

## Ecosystem function

Land management for production and conservation involves identifying areas likely to be the focus of conflict. A way of trading off these potential uses is then needed. The key elements of ecosystem function in the rangelands show where these conflicts are most severe.

Three basic types of landscape, characterised by different levels of moisture supply and nutrient availability, exist in the arid zone. One consists of relatively rich soils, such as those of the Mitchell grasslands, and the chenopod shrub lands, and the second (more common) type is dominated by poor soils, such as the spinifex grasslands. In the third type, patches of productive country, resulting from the



Damaged and healthy landscapes. The challenge is to change the first into the second, to the common benefit of conservation, the industry and society at large.

concentration and redistribution of water and nutrients, are scattered throughout the resource-poor expanse.

Plants and animals that prefer the richer habitats, and have diversified through evolutionary time with them, are forced in many regions to occupy small areas of the landscape. Their dependence on these patches is strong during drought. Unfortunately, introduced herbivores prefer these patches too.

This competition has caused the decline and extinctions of native species, reductions in palatable native plants and the decline of some birds. These areas are significant for conservation management. It seems likely that biodiversity will continue to decline in the arid zone unless conflict over the use of resource-rich country can be resolved.

## An ideal world

The land-allocation procedure developed by the scientists begins with assumptions about how land management might be approached in an ideal world.

- The land would be used for profit, but in such a way that the local economic productivity and the regional biological diversity of the landscape would remain in perpetuity.

- To meet this aim, society would implement systematic land-use planning to identify areas where particular occupations could be compatible with the long-term maintenance of the land and its organisms.

- The government would analyse potential land uses to determine their compatibility with the overall goal, and after this allocation process it would define management agreements with potential land users to permit economic development.

Morton and his colleagues suggest that an understanding of the ecological

Figure 1: Key rangeland statistics, 1991-92

	Amount in pastoral zone	% share of Australian total
<b>Pastoralism</b>		
Total area farmed	338 million ha	76
Cattle numbers	6.1 million	31
Number of cattle sold	1.4 million	18
Value of cattle sold	\$527 million	17
Sheep numbers	19.5 million	14
Number of sheep sold	3.4 million	7
Value of sheep sold	\$22 million	4
Wt. of wool produced	87 000 tonnes	14
Value of wool sold	\$274 million	12
<b>Tourism</b>		
Number of visitors	5.6 million	8
Value	\$3 billion	8
<b>Mining</b>		
Value	\$10 billion	38



functioning described above would lead the government to allocate land to several different tiers of land use, and to devise a management system based on different degrees of government involvement. It would recognise that the risks of damage differ between the different functional types of landscape.

The land-use categories they have developed are excised management units (EMUs), restricted use units (RUUs), national parks, and sustainable use and living areas (SULAs).

The biggest challenges for land allocation are in regions of poor soils with substantial resource-rich patches, since these patches attract grazing activity and potential management error. Examples of such country are flood plains coursing through infertile, sandy desert, or fertile clay plains situated among acacia shrub lands growing on infertile red earths. These patches cannot be managed in isolation from surrounding infertile country, since it is the latter through which recolonising organisms must pass after drought, and small isolated patches could easily be swamped by changes on neighbouring land.

Having identified the land-use categories, the next step is to efficiently achieve the level of protection appropriate to ecologically sustainable land management. It is not realistic to fence off every fertile patch, so some scheme for setting priorities is needed.

### Allocating land

The scientists' solution is to develop a hierarchical system of land allocation based on the following principles.

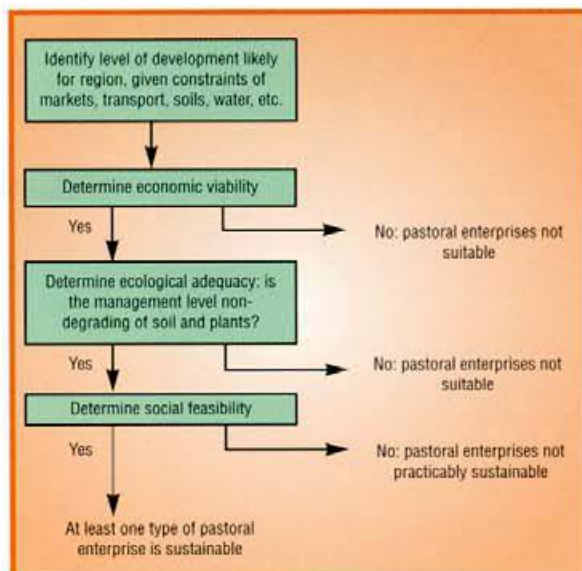
- Identify areas where there are many resource-rich patches, and reserve some purely for conservation.
- Identify important patches in the remaining country and protect them fully, but, because they are smaller and therefore likely to act as reservoirs of biodiversity in isolation from the surrounding country, ensure their management is integrated with surrounding land uses.
- Allow other land uses across the remaining country, but identify areas which need special actions at critical times.
- Constrain land management elsewhere to be sustainable in conjunction with the goals of whatever industry is proposed.

**National parks:** National parks are the core of a reserve system and must be large enough (perhaps at least 30 000 hectares) to conserve biota. A network

of parks is necessary to ensure that representative systems are retained, and that major aggregations of resource-rich country are protected. In some places other land uses may be compatible, whether by incorporating Aboriginal land use into management, or by accepting tourism.

**Excised management units (EMUs):** Small, but regionally-significant patches can be reserved as the next layer in the network, the excised management unit. They could be fenced off and the surrounding land managed to minimise the impact of other land uses. Their conservation value depends on the effective management of fire and of domestic stock, and of feral animals in surrounding areas. EMUs would be selected on size, location relative to national parks and the presence of unusual features.

**Restricted use units (RUUs):** Special management will be required in some remaining restricted-use units to help



A procedure for assessing the sustainability of any type of pastoral enterprise in a region.

meet the goal of ecologically sustainable land management. The RUUs could be used for purposes such as pastoralism or tourism, but managed appropriately at critical times. For example, some temporary swamps support important breeding assemblages of waterbirds. They need to be protected when nesting,

## Quest for a sustainable future

Australia's federal and state governments – through their Agriculture and Resource Management and Environment Conservation Councils – are facilitating the development of a National Strategy for Rangeland Management.

A Working Group representing community and industry groups has been consulting widely around the country to identify the concerns of individuals and organisations about the future of our rangelands.

Management of the rangelands is a matter of importance for all Australians, the group has stated. Concerns over land degradation, loss of biodiversity, declining terms of trade for some industries (in particular pastoralists), and the social pressure brought about by such changes must be addressed and a sustainable future planned.

The group has circulated an Issues Paper, carried out consultative meetings in some 40 locations in the rangelands and capital cities, and is now developing a draft strategy for further comment. Additionally, the pastoral industry, Aboriginal interests and non-government conservation groups have been assisted with funding to obtain further input from their constituencies.

The consultative process is probably the most geographically extensive and time intensive ever carried out in Australia. It is likely to recognise the regional differences through the rangelands, and hopefully will establish a process whereby the planning described in this article could be integrated with other approaches on a regional basis.



An outline of how different parts of arid Australia might be managed in an ideal world where an understanding of ecological functioning precedes decisions about land uses. Ecologically sustainable land management on a regional basis would be achieved through creating a structured system of reserves to protect patches of productive country. The remainder of the land would be available for sustainable use driven by regional productivity.

but could be used for pastoral production or Aboriginal hunting at other times.

**Sustainable use and living areas (SULAs):** People could occupy the remainder of the land as they wish, subject to general provisions for sustainable use and to some management for feral animals and fire. These sustainable use and living areas could be used for grazing, tourism, Aboriginal purposes, mining or new activities.

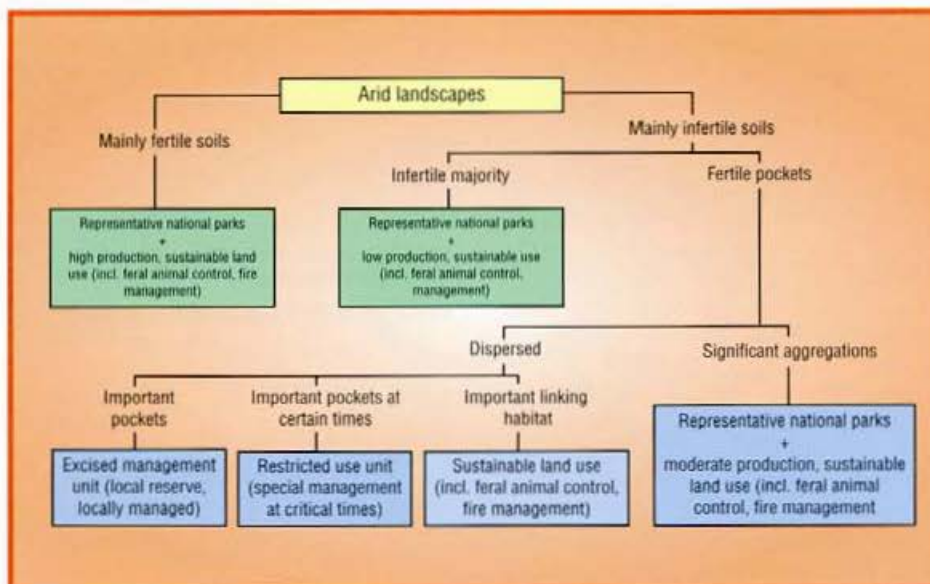
### Getting back to reality

Implementing this plan of land allocation would be straightforward if the rangelands were not yet in use. But an array of land uses has already been established. Transforming the land allocation proposals into reality therefore requires realistic methods for defining management priorities; how today's management system might evolve; and what economic, political and cultural constraints exist.

The move from defining national parks, EMUs and RUUs in principle, to defining them in practice, exposes gaps in our knowledge that urgently need research. There is a need to understand the responses of the biota to the landscape patterns caused by moisture and nutrient distribution, as well as to rainfall, drought and grazing. All research needs to be carried out in cooperation with land managers.

With the existing scientific knowledge of the rangelands, however, it is possible to outline a basic procedure which could be readily applied.

Before the land can be allocated, a natural major region of the arid zone must be mapped in two ways. First, the landscape must be classified into the three categories mentioned above. At the regional scale, the distribution and patchiness of areas maintaining unusually elevated degrees of greenness over years of fluctuating rainfall can be mapped from multi-temporal satellite data. Second, the occurrence of ecosystem types needs to be mapped



## Finding common ground

Developing and promoting the 'stewardship ethos' for Australia's semi-arid rangelands is one of many goals encompassed by CSIRO's National Rangelands Program. Specific research underpinning this contribution to rangelands planning includes studying ways of balancing pastoralism and biodiversity conservation, and developing practical tools for drought management.

Scientists from the Division of Wildlife and Ecology believe that, despite competition from introduced predators such as foxes and cats, and herbivores such as rabbits, sheep, goats and cattle, it is possible for native plants and animals to co-exist with pastoralism in the rangelands.

To help achieve this vision, Dr Jill Landsberg, Dr Craig James and Dr Stephen Morton have embarked on a five-year project to investigate the impact of grazing on biodiversity, the factors affecting population fluctuations of selected rangelands species, and the potential for co-existence of grazing and biodiversity management.

The scientists will complete biodiversity surveys along a large number of grazing gradients (grazing intensity decreases with distance from permanent water) and in grazing trials. Test models for achieving regional conservation of biota, based on networks of reserves integrated with sustainable managed pastoral lands, will then be developed.

In another project called DroughtPlan, CSIRO scientists have joined with livestock producers, the Queensland Department of Primary Industries and other government agencies to develop drought management tools for producers, and methods for applying them.

DroughtPlan is working in rangeland regions right across Australia, as well as several temperate areas. Graziers and pastoralists have identified issues where better information would improve decision-making about drought management. These include climate prediction and understanding risk; supplementary feeding and stock marketing in drought; the influence of drought policy; how stocking rates affect reproduction and mortality rates in dry and good years; and the effects of drought management on pasture sustainability. Information packages, training activities and computer programs are being developed to meet these needs.



independently of patterns of productivity. An iterative process of land allocation, containing the following key elements, could then begin.

**1. National parks:** Allocate land to potential national parks. The primary criterion would be the land's ability to represent an ecosystem type or vegetation formation poorly covered by the present reserve network. The second criterion would be the density of patches of productive country, because a major fault of the current reserve network is its failure to encompass large productive areas. The potential parks would be ranked for their importance to the development of a representative national network, and for their management efficiency.

**2. Conservation ranking:** The remaining productive country would be ranked in order of conservation value. The primary criterion would be the contribution that the area of land would make to the representativeness of the reserve network. The secondary criterion would be the degree to which the value was incompatible with other uses such as grazing, tourism or mining.

If judged irreplaceable in terms of conservation value, the area would be a potential EMU. Other important areas would be RUUs. The result would be four ranked, but overlapping lists of potential parks, EMUs, RUUs and SULAs.

**3. Adding up the costs:** The costs of managing each element would be estimated by adding up the investment in fencing, salaries and running costs, as well as the compensation for present lease-holders and the cost of foregone production. The value that new reserves might bring through tourism could be subtracted from direct costs.

Although difficult to estimate, the ecological and non-use values of each reserve to the community should also be assessed. The total cost of implementing the network could then be estimated.

**4. Cutting the costs:** The first attempt at identifying an array of potential reserves would no doubt prove expensive. Three procedures would reduce costs and optimise the spatial distribution of the reserve network.

- Local managers of SULAs could be reimbursed for conducting conservation work on nearby EMUs and RUUs, instead of paying distant park rangers.
- Areas of land could be switched from one category to another, trading off ecological function for economic necessity.

- Finally, the spatial arrangement of potential reserves would be inspected to ensure that the best possible network of reserves was created.

To integrate production and conservation, land stewards could receive support from society. This support could take the form of stewardship salaries to manage EMUs or RUUs, which the current land use could not really afford. Also, existing subsidies for managing feral animals and fire or for undertaking rehabilitation work would be reinterpreted as part of such stewardship salaries.

These arrangements would not necessarily involve complete removal of productive enterprises from marginal pastoral country. Such enterprises might remain, but degradation minimised because the economic imperative to make a profit regardless of the state of the land would be removed. Finally, the people who frequently know the country best would remain on it and be able to apply their knowledge to stewardship.

As with any debate on land allocation, a fair resolution process would be needed on behalf of all the people involved.

## Politics and culture

The primary cultural issue concerns the attitudes of pastoralists and Aboriginal people who will play a major role in any change to concepts of stewardship and to land tenure. Many of these people know much about the land, and some have effectively developed their own concepts of stewardship independently of scientists and administrators.

Even if the attitudes of present land managers are altered, many changes will be necessary in legislative arrangements. In the Australian arid zone, different land enterprises are frequently handled under different legislation and different government departments, with little or no coordination.

For example, there are no mechanisms for paying pastoralists for conservation work. In addition, there is a lack of agreed national goals about land use across arid Australia, although these are being developed with efforts towards a National Strategy for Rangelands Management (see story page 23). A national perspective is also imperative because many of the present types of subsidies delivered to the arid lands, such as tax incentives, are organised at that level.

Morton and his colleagues say that as long as management is partitioned off

Division of Wildlife and Ecology



One of the authors of the 'stewardship' paper, Dr Stephen Morton, handles a member of arid Australia's extraordinarily rich lizard fauna.

into categories such as land for pastoralism, mining or Aboriginal use without emphasis on the common concept of stewardship, then ecological sustainability will be difficult to achieve.

They say the concept of stewardship in the pastoral and Aboriginal communities is more of a broadening of priorities than a complete change in direction. For example, the Landcare movement has already had a considerable impact on rural attitudes. Political and cultural change will be needed to institute the stewardship ethos advanced here, but the task is not insurmountable.

## More about the rangelands

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