



What is the true cost of on-farm conservation, and who will pay? **Wendy Pyper** reports.

# Cattle and conservation can

**N**ative biodiversity conservation and beef production may seem unlikely allies. But until recently, few studies on whether the two could co-exist had been conducted. In a project just completed, CSIRO Sustainable Ecosystems economist, Neil MacLeod, and his colleagues in the Grazed Landscapes Management Team, considered the costs and barriers involved in implementing conservation strategies with livestock production on Queensland's grassy eucalypt grazing lands.

'We looked at the on-farm impacts of adopting best practice conservation management in Queensland to optimise biodiversity on rural landscapes,' MacLeod says.

'The grassy eucalypt woodlands are under-represented in formal conservation reserves because they're among the richest grazing lands in the country, and they're some of the oldest settled. But they're also ecologically diverse, and maintaining that biodiversity is a high priority.'

The first questions typically asked of any strategy to conserve resources are: how will changing management practices affect production, and what are the economic implications of such change?

MacLeod's study sought real-world answers to these questions.

## Down on the farm

Four beef cattle properties were selected for the study, at Crows Nest, west of Brisbane, and further north at Mundubbera. Two properties were small, intensive farms of about 900 hectares, and two were larger farms of 1700 ha and 10 000 ha.

The properties were chosen to represent the diversity of enterprises in the region, in terms of their vegetation structure and commercial activity. All four contained 'variegated landscapes', that is, 60–90% of the original native vegetation remained. This definition is important as it influences landscape management.

'Treating them as "fragmented" landscapes and seeking to only protect a few of

their component species is likely to eventually lead to their degradation,' MacLeod explains.

MacLeod and his colleagues assessed the ecological health of each property under their present management systems, through vegetation and ground surveys, air photo interpretation and landowner consultations. Using geographic information systems, the ecological information was turned into spatial maps showing the distribution of different land uses and ecological elements.

## Principles and thresholds

The maps were then compared to a set of ecological principles for the sustainable management of grazed woodlands. These principles promote improved ecological function through the management of pastures, soils, trees, watercourses, wildlife and habitat.

'The principles were developed through a partnership between our project team and 11 scientific specialists with expertise





Main picture: Cows graze on alluvial flats surrounded by blue gums at 'Nukinenda', one of four Queensland properties studied.  
Left: Zebu cattle on speargrass pasture in narrow-leaved ironbark country.

Tara Martin, CSIRO Sustainable Ecosyst

## e a costly mix

in different aspects of landscape management, such as soils, hydrology, wildlife, tree grazing ecology, and farm forestry,' MacLeod says.

Some of the management principles contain threshold values for minimum levels of native vegetation. For example, 'there should be a minimum of 30% woodland or forest cover on properties'; 'woodland patches should be a minimum of 5–10 ha'; and, 'at least 10% of the property managed for wildlife values'.

'Thresholds are naturally contentious, but we've included them to show that as tree or grass cover gets below a certain threshold, some key ecological processes change for the worse,' MacLeod says.

'Woodland bird populations decline or tree dieback increases, for example.'

The health assessment revealed that the soils and pastures on each property were in good condition. The most significant issue for the four properties, however, was the state of their treescapes and the health of riparian vegetation.

While many paddocks had significant tree populations with a reasonable diversity of species, there were also many paddocks with non-viable tree populations. In all cases, MacLeod says the riparian zones had been extensively cleared (which is common practice), and continued access by livestock had significantly modified the bankside timber and soil structure.

'Most of the properties had more than the minimum threshold of trees, but they weren't necessarily in the right spots to be ecologically sustainable over time, or to sustain regional wildlife populations,' MacLeod says.

'Riparian zones are the real battlegrounds, however, because they are generally the most productive parts of the landscape. They were often the first areas cleared for pastoral settlement and remain targets for pasture development. But they're also critical for retaining local wildlife populations and ensuring adequate water quality.'

Landholders could implement a number of management strategies to address this imbalance. These include limiting areas of intensive development, reducing stocking rates to minimise bare soil, retaining, regenerating and planting trees, particularly in recharge and riparian areas, and excluding cattle from watercourses by fencing. But how much would these strategies cost?

### Conservation costs

To find out, MacLeod used an economic model to estimate differences in profitability between the present management systems and alternative conservation measures. The analysis was based on changes in grazing access, timber densities and stock carried, and the capital costs of the restoration options (fencing off watercourses, tree planting, dams and troughs).

If the conservation measures were adopted, the model projected a decline in net profit across the four properties of





Tara Martin, CSIRO Sustainable Ecosystems

Without significant public support, the prospect of farmers adopting management principles that protect native animals, such as this bearded dragon, are slim.

between 29 and 77%. This was mostly due to the reduction in forage available to cattle as timber densities increased and access to riparian areas was restricted. The capital costs for infrastructure and trees ranged between \$90 000 and \$1.4 million.

'This fairly poor finding is not entirely surprising' MacLeod says. 'The scale of change required to meet serious conservation objectives was always going to be a large one.'

As well as these economic losses, the grazing team identified other barriers to the adoption of the ecological principles they had identified. During paddock meetings, landholders and their neighbours pointed to the lack of available labour and skills to plant trees and build infrastructure as important barriers.

'Most farms are operated by one person or a small family team, so the amount of effort to plant and manage thousands of trees is very high,' MacLeod says.

'Farmers also like to trial new things before they adopt them. But augmenting a large treescape or "buffering" (planting trees and shrubs) a whole creek can't be tested on a small scale.'

Farmers argue that replanted and fenced riparian zones would become weed, pest and fire hazards. The first fire would take the trees and the \$2000 a kilometre fence with it. And treeing riparian areas is contentious, particularly in headwater areas, because stock grazing around shallow-rooted trees encourages bare soil and increased erosion.

Furthermore, MacLeod says not all farmers accept that the level of dysfunction in the landscape is as great as ecologists claim it is. The long time scales in which any positive results from alternative management *might* accrue is a disincentive, and there is no real evidence that money will fix a supposedly damaged system.

'The outcomes from the landholders' point of view are fairly adverse, and they feel that any benefits from their management actions and capital outlays will go to others,' MacLeod says.

'The general conclusion from this project is that there are limited prospects for wide-scale private adoption of the conservation principles in the absence of significant public support. It's now a question of to what extent the landholder should bear the public cost of conservation, and vice versa.'

### Seasoning unpalatable solutions

For MacLeod, a 'product' of the land himself, this outcome is frustrating, considering the apparent urgency of the situation. But his realistic streak and a determination to find alternative solutions temper his frustration.

'Australia has a long history of pastoralism and landscape modification, so it would be unrealistic to turn it around quickly. We just have to be more creative in trying to break down barriers and solve some of the problems,' he says.

He ponders whether a 'Volkswagen' alternative to the 'Rolls Royce' conservation effort could be found.

'Australian farmers are notorious for finding their way around tricky problems with a bit of native ingenuity. We need to tap into that innovation if we are serious about fixing the problems this study suggests are out there,' MacLeod says.

He adds that alternative income sources such as agroforestry, or intensifying production on particular parts of the land, are being considered. More wide ranging issues are also being canvassed in the public arena, such as reforming markets and institutions to reward private landholders' efforts to provide environmental services for the wider community.

With the continued support of Land and Water Australia, MacLeod has launched a new project that will attempt to resolve some of the economic and other issues raised by the landholders. The project will consider the validity of the ecological principles in different vegetation communities, and at larger scales across 20–30 subcatchments (each 500 ha) at Emu Creek.

'Does every landholder have to apply the principles, or can we operate at a different scale and get the same or better result?' MacLeod asks. 'Can we get people to operate in groups, on a landcare-type basis, and target parts of the catchment that would be priority areas? We might be able to get some economies of scale on the effort or the outcomes.'

Using economic modelling, the Grazed Landscapes Management Team will try to define costs for particular management activities, and how those costs might be distributed among a group of landholders. The team will also try and confirm that following the principles really does improve ecosystem function.

'We are going back into the catchments to look for evidence that the landscape is

**Abstract:** A CSIRO project looked at the impacts, at farm level, of adopting best practice conservation management in Queensland, to optimise biodiversity on grassy eucalypt woodlands, which are ecologically diverse yet under-represented in conservation reserves. Modelling of differences in profitability between the present management systems and alternative conservation measures projected a decline in net profit of 29–77% if conservation measures were adopted. The project concluded there were limited prospects for wide-scale private adoption of the conservation principles in the absence of significant public support. A new project will attempt to resolve some of the economic and other issues.

**Keywords:** woodlands, grassy eucalypt woodlands, grazing, biodiversity conservation, cattle, sustainable management, land management.

or isn't configured the way our principles suggest,' MacLeod says.

'We'll look for output indicators – water quality, tree health, or wildlife populations – to see if subcatchments that appear to be consistent with the principles are giving a good outcome, if there's no difference, or if there's an in-between response.'

The project will seek to maintain landholder interest by working with the Emu Creek Catchment Landcare Group. As with the previous project, landholders are being engaged and consulted.

'Farmers are happy to discuss contentious issues, once their point of view is respected,' MacLeod says.

'Their knowledge and stewardship of their land is a critical component of any recipe for success. In the previous project there were many exchanges of views and ideas, and I think it helped both sides understand each other and the nature of the barriers to adopting the principles.'

At the end of the day, MacLeod says the search for sustainable land use in Australia is a journey rather than a destination: 'we have already started walking in the grassy woodlands at least'.

*This is an edited version of an article that first appeared in Thinking Bush, published by Land and Water Australia.*

#### More about the ecological principles

McIntyre S McIvor JG and MacLeod N (2000) Principles for sustainable grazing in eucalypt woodlands: Landscape-scale indicators and the search for thresholds. Chapter 13, *Management for Sustainable Ecosystems*. P Hale A Petrie D Moloney and P Sattler (Eds.). Centre for Conservation Biology, The University of Queensland, Brisbane.

McIntyre S McIvor JGM and Heard KM (2002) *Managing and Conserving Grassy Woodlands*. CSIRO Publishing, Melbourne.



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Neil MacLeod and his colleagues are investigating conservation incentives, such as the reform of markets and institutions, to reward private landholders' efforts to provide environmental services for the wider community.

## A practical guide to conservation farming

WIDESPREAD changes to the grassy eucalypt woodlands of south-eastern Australia, mainly for agricultural production, highlight the need for landholders to consider conservation goals in their daily decisions about property management.

A new book from CSIRO Publishing, *Managing and Conserving Grassy Woodlands*, offers practical guidance to help them do just that.

The book draws together the findings of a major project in which a multidisciplinary team of CSIRO scientists worked for more than six years to address the issue of ecological sustainability in grazing lands.

It features a set of principles covering property planning, and the conservation of native vegetation, soils, pastures, wildlife and watercourses. Each is addressed in a separate chapter that outlines the scientific understanding behind the principle and discusses issues relating to its practical application.

A chapter on wildlife and core conservation areas is based on the principle that all properties require core conservation areas for species that are sensitive to agricultural land uses. It describes the ecosystem services that a diversity of organisms can

provide, such as pest control, pollination and the maintenance of soil health.

The chapter also offers advice on selecting core conservation areas, and the critical elements they should contain – mature trees, hollows, fallen timber, vegetation, ground litter, and understorey and waterside vegetation – and how to preserve them. For example, a variety of grazing regimes can help maintain areas of large grass tussocks, leaf litter and fallen branches that protect bird species, and mammals such as the rufous bettong and long-nosed potoroo.

A minimum woodland cover of 30% is advocated in the book's chapter on trees. This is supported with an explanation of the positive effect of trees on production systems, and discussions of natural regeneration, minimum patch sizes, tree locations and population structures.

A chapter on barriers and opportunities for adoption explores issues relating to the uptake of new agricultural practices by Australian farmers. It includes feedback from landholders who have had the opportunity to discuss the principles.

The final chapter offers an example of how a simple landscape of one land type might look if the principles were applied.

The 250 page hard-cover book is extensively referenced and clear diagrams are used to illustrate many of the concepts outlined in the text. It has been edited by CSIRO's Sue McIntyre, John McIvor and Katina Heard.

*Managing and Conserving Grassy Woodlands* is available for \$59.95 from CSIRO Publishing, freecall 1800 645 051, email: [publishing.sales@csiro.au](mailto:publishing.sales@csiro.au).

