

Steve Davidson

discovers unexpected diversity amid the rural grasslands of south-east Queensland.



# Surprise pastures

Australia's grassy woodlands are a conservation priority as they have been widely used for grazing and cropping and are poorly represented in national parks and other reserves.

Commercially grazed pastures traditionally have been overlooked in conservation strategies, but in the past decade, reports have emerged of significant native vegetation surviving in pastures, including rare species.

Dr Sue McIntyre, Tara Martin and Katina Best, of CSIRO Sustainable Ecosystems, have investigated this new outlook on pastures in a study of ground flora associated with major land uses and

habitat types at three beef-production properties in south-east Queensland.

Their study found that a wealth of plant species were maintained in native pastures, due in part to selective grazing pressures. It has also yielded advice for graziers on how to maintain productive agricultural ecosystems amid the grassy eucalypt (mostly ironbark) woodland and forest.

## Grazing surprises

The scientists sampled five main habitat types – crops, sown pastures, native pastures, riverbanks and roadsides – and related their species diversity to various combinations and intensities of land use. These included grazing, soil disturbance, enrichment and tree density.

Native unfertilised pastures and undisturbed roadsides had the highest native species richness, while crops and sown pastures had the lowest. Riverside zones and areas grazed by livestock tended to have the high densities of exotic species.

Somewhat surprisingly, crops (including sub-habitats such as contour banks) and sown pastures had 30–50% of the native species richness found in the most diverse native pasture and roadside habitats. This is more than might be expected, following such profound habitat disturbance.

'It will come as a surprise to some that many grassland species are able to persist in these habitats, given the century-long

history of beef production,' the researchers say. 'In pastures, it partly reflects the fact that grazing is a complex disturbance.'

'Some grassland plants are sensitive to grazing, but we now realise that livestock grazing can sometimes also maintain species richness by controlling dominant species, which then allows other herbs and grasses to prosper.'

Grazing disadvantages certain species, but others are advantaged by either heavy, moderate, or any grazing regime.

'We also think it is significant that enrichment of the sites with water or fertiliser was more deleterious to species diversity than the more visible human influences of cattle grazing,' Martin says.

'Australia's flora has evolved on soils of low fertility and, unlike weedy introduced plants, they don't really appreciate extra nutrients. Also, cultivation is often combined with fertiliser use and few native plants thrive under these conditions.'

## World-class diversity?

These native pastures and roadsides of south-east Queensland appear to have a wealth of plant species.

The scientists say they are at least as rich as grassland communities in the temperate woodlands of Victoria's national and state parks, previously described as among the richest known terrestrial vegetation. And they are some 50% richer in herbaceous



Tara Martin

This heavily grazed pasture supports a diversity of native plants because it has not been fertilised or cultivated. Forty-five species were recorded in the marked plot.



Tara Martin

Part of the survey area showing a variegated landscape, still dominated by native vegetation (grassland and woodland) and modified by tree clearing, cultivation and grazing.



Sue McIntyre



Sue McIntyre

plant species than temperate grassy woodlands previously studied in the cooler, New England region of New South Wales.

Possible reasons for the difference include the limited extent of fertilisation and cultivation in the Queensland study area, and the different impacts of cattle (predominant grazers in the tropics) to sheep (in the temperate study).

Also, the Queensland study region is near the boundary of tropical and temperate environments and may be inherently richer in species due to the overlapping ranges of some flora.

'The century-long co-existence of such exceptional plant diversity with an economically viable land use is a wonderfully positive story for conservation in grassy subtropical woodlands,' McIntyre and her colleagues say.

The properties studied were chosen as typical commercial enterprises, but the scientists say the results don't imply that intense grazing should be practised across the entire landscape.

Heavily grazed paddocks that look like lawns may support some plant biodiversity, but they do not provide suitable habitat for fauna, including invertebrates, that require tall grass tussocks. A good strategy is to employ a range of grazing intensities over the landscape, including areas from which livestock are excluded.

Top: Grazing lawns support a range of small-statured native and exotic plants, but do not provide much bulk of forage for wildlife.

Above: *Thesium australe* is one of three rare and vulnerable plants found to be moderately abundant in native pasture

Other investigations are needed to establish the generality of the diversity patterns that the CSIRO researchers have found in this study. The scientists caution that species richness is but one indicator of ecosystem health and conservation status.

They suggest the best approach is to seek an appropriate mix of land use intensities across the landscape to provide a balance between animal production and ecosystem function, to achieve all the benefits that flow from healthy grassy woodlands.

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### More about variegated landscapes

McIntyre S and Hobbs R (1999) A framework for conceptualising human effects on landscapes and its relevance to management and research models. *Conservation Biology*, 13:1282–1292.

## Variegated landscapes

DR SUE McINTYRE and Dr Richard Hobbs of CSIRO Sustainable Ecosystems have published a framework for considering the effects of human activities on landscapes.

McIntyre and Hobbs suggest that the practice of classifying landscape into 'habitat' and 'non-habitat' is simplistic and has its limitations.

They propose a scheme that places intact, variegated, fragmented and relict landscape states on a continuum, depending on the degree of habitat destruction.

On a second level, the scheme considers the patterns of habitat modification that are imposed on the remaining habitats, as in the grassy woodland study reported here (see main story).

Variegated landscapes are widespread in many parts of eastern Australia where domestic livestock graze on native pastures in eucalypt woodlands. The Queensland study area is a good example of this.

Habitat destruction in variegated landscapes is limited, with 60–90% of the original habitat remaining, compared with 10–60% in (more degraded) fragmented landscapes such as the Western Australian wheatbelt.

Variegated landscapes contain a mosaic of original habitats, modified to various degrees, but not destroyed. Scattered or irregular stands of trees can blur the boundaries between them.

The researchers say conservation management in altered landscapes involves stopping and, if possible, reversing the processes of destruction and modification. Because habitat restoration is so difficult, a first priority will always be to nurture the least modified habitat.

In variegated landscapes, maintaining the relatively healthy habitat matrix is important in order to halt trends towards fragmentation. It is best not to wait until landscapes become fragmented – with islands of unmodified habitat surrounded by hostile land uses – before conservation action is taken.