Slow change on the range

A long-term grazing experiment at Lake Mere in NSW has demonstrated the important functional role of perennial grasses.

Inset: A bettong mound at Lake Mere. Excavation work by bettongs and malleefowl create fertile mini-ecosystems that provide habitat for other species.

At what stocking rate do sheep cause degradation in rangelands? It's a question that can't be answered in a hurry because climatic variation can mask many of the effects of grazing in the short term. But the answer is fundamental to sustainable land management.

For this reason, CSIRO Wildlife and Ecology decided in 1986 to set up a long-term grazing experiment in semi-arid mulga woodlands near Lake Mere Station in north-western New South Wales. To determine the impact of grazing on the landscape, 12 fenced plots were subjected to differing levels of grazing by sheep and kangaroos.

David Freudenberger, who maintains the experiment, says its value has been enhanced through collaboration between scientists including David Tongway, Richard Greene, Jim Noble, Ken Hodgkinson, John Ludwig and Allan Wilson. This has enabled the integration of different research findings. A key discovery has been the important role played by perennial grasses.

'Perennial grasses are critical for maintaining landscape function, particularly the capture of scarce rainfall and retention of soil nutrients,' Freudenberger says. 'They're also critical for maintaining a feed supply during dry seasons. Production in overstocked plots crashed in dry years due to the loss of perennial grasses.'

He says that a three to five-year study would not have detected this critical interaction between rainfall and stocking rate. The insight led to the development of what is called tactical grazing, which recognises the need to reduce stocking rates during El Niño-inspired dry periods.

Having met its original objective after some 10 years, the Lake Mere study has entered a new and less intensive phase involving the removal of stock from half of the plots. 'We're now looking at issues of landscape resilience,' Freudenberger says.

Woody weeds

In related research, Jim Noble set out to address another perennial issue in rangelands management: the proliferation of native shrubs that have been favoured by changes to the natural fire regime. Fires are much less common in the rangelands these days because sheep, feral goats, rabbits and kangaroos consume what otherwise would become fuel during dry periods. With nothing to keep them in check, shrubs have proliferated to an extent where they affect the viability of many grazing operations.

CSIRO research into woody weed management in rangelands has persisted since about 1960. Noble says the variable nature of the climate in the rangelands makes long-term studies essential. 'Ecosystem processes may be dependent on particular climatic sequences, which might in turn interact infrequently with other disturbances such as fire,' he says. 'So I don't see any alternative to long-term experiments if we are serious about understanding how these plant and animal communities develop over time.'

Much of the woody weed research now centres near the Lake Mere study. Noble is studying the production of herbage in destocked plots in which shrub density has been reduced by varying amounts. Hopefully, he says, this research will help to assess the effectiveness of management options. He believes that maintaining these plots indefinitely will be worth the low level of resources required. 'I think the longer they stand the more valuable they become,' he says. 'The soils change, everything changes, and so we end up ultimately with a collection of time capsules.'

'CDK' research

Noble also has other interests in the rangelands. He calls it his CDK research – 'Chief Doesn't Know'. It arose from his fascination with the ring-like diggings of the malleefowl and the crescent shaped excavations of the burrowing bettongs. The latter species became extinct on the Australian mainland earlier this century, and the mallee fowl is now rare or absent from large tracts of the rangelands. Noble says the burrowing bettong may once have helped to thin woody weeds by browsing shrubs regenerating after fire, while the earthmoving work conducted by both the malleefowl and the bettong might also have played a key ecological role.

'It's a great example of the way many soil biota interact with other landscape processes,' he says. 'Take the malleefowl, for instance. By disturbing the soil, they create mini-ecosystems, fertile little catchments that encourage the growth of forage and provide habitat for other species.'

It's only after a lifetime spent studying ecological processes in the rangelands that Noble has started to guess at the potential role of such species. 'You only start to make these serendipitous connections when you've been working in the area long enough to really get a handle on the complexity,' he says.

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