Native Vegetation

Project title: TRC1	**Incorporating biodiversity monitoring into rangeland condition assessment**
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Host Organisation:	Tropical Savanna Management CRC, Darwin, NT
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Project Summary

Methods for monitoring the condition of Australian rangelands, from the perspective of pastoral use, are well established. These include plot-based measurements of pasture composition, shrub density, perennial grass frequency or soil-surface condition, as well as the use of satellite imagery to assess changes in ground cover. However, there are no comprehensive biodiversity monitoring programs in the rangelands, partly because the task of monitoring all aspects of biodiversity seems impossibly daunting. There is a developing demand to extend rangeland monitoring programs to include the assessment of the status of biodiversity. The challenge is to develop effective **indicators** for biodiversity that can be readily measured.

This project will explore the extent to which widely used measures of rangeland condition can also serve as surrogates for biodiversity status. Where currently used indicators prove inadequate, new indicators may need to be developed for use in monitoring critical or sensitive components of biodiversity. During the project, biodiversity attributes and measures of land condition will be sampled at sites ranging in condition, in three representative rangeland regions of northern Australia. The project will develop and validate mechanisms for biodiversity monitoring within rangelands, an important tool for improving adaptive management and ecological sustainable use of the rangelands.

Project Objectives

The objectives of the project are:

- to establish the value of widely-used measures of landscape health or pasture condition as surrogates for trends in biodiversity in northern rangelands, and determine which measures are most predictive for which components of biodiversity;
- to provide a framework and methodology for monitoring biodiversity in the northern rangelands, so that consideration of biodiversity condition can be incorporated into assessments of landscape health and ecological sustainability (at enterprise and regional scales);
- to establish which components of biodiversity, particularly at a species and functional group level, are most susceptible to deterioration in landscape condition; and
- to provide management decision support systems for the retention of biodiversity in Australia's northern rangelands.

Approach & Methods

The project will be undertaken in three major rangeland regions in northern Australia – one in each of Queensland, Northern Territory and Western Australia – representing a mix of rangeland types, land use intensities and land condition. Sample sites will be selected from three major land types within each region, according to the importance for pastoral use and biodiversity value, and including 'poor', 'good' and 'intermediate' levels of land condition. Where practical, existing pastoral monitoring sites, where

land condition has been assessed using remote sensing, will be chosen for biodiversity sampling.

At each site, plants, vertebrates and some invertebrate groups will be systematically sampled. Land 'condition' will be assessed at each site using comparable methodology to that of existing plot-based pastoral monitoring schemes, including Landscape Function Analysis. For each site, a set of 'condition' variables will also be derived based on the value and temporal stability of reflectance indices from remote-sensed data. Additional variables will be derived to describe the context of the sites in relation to spatial patterns of landscape condition.

Analyses will examine differences in species composition between sites of different condition and identify species, guilds or functional groups most susceptible to deterioration in landscape condition. Modelling will be used to examine the strength with which each variable describing land condition and landscape function is a predictor for biodiversity (including measures of species richness and abundance at various functional or taxonomic levels) and the presence or abundance of individual plant and animal species.

Benefits

Government agencies, pastoral producers and other land users in the rangelands now recognize the need for effective biodiversity monitoring programs. The importance of biodiversity monitoring was identified in the *National Principles and Guidelines for Rangeland Management* and was one focus of the *National Land and Water Resources Audit*.

There has been a substantial decline in some elements of biodiversity in Australia's rangelands. Biodiversity monitoring programs are required that will help us recognize where change is occurring, what species, habitats or ecosystem processes are involved, and whether changes in management have been successful in halting or reversing declines.

The project will contribute to the development of methods for monitoring biodiversity in Australia's northern rangelands. In particular, it will assess the adequacy of existing pastoral monitoring programs for monitoring biodiversity and identify where more detailed direct measures of the components of biodiversity are required. The project will also contribute to management decision support systems for the retention of biodiversity in northern rangelands, which may be used in property and regional planning. Ultimately, this will lead to improved rangeland management at enterprise, regional and State scales, which incorporates the maintenance of biodiversity values. In future, adequate systems for biodiversity monitoring may be a necessary component of demonstrating the environmental credentials of land managers.

What is biodiversity monitoring?

Monitoring is the assessment of change in something by repeated measurements over time. Pastoral monitoring programs have been established for a number of years in most States – including WARMS in WA; Qgraze and Grasscheck in Qld; and the Tier 1 & Tier 2 schemes in the NT. Pastoral monitoring may be as simple as the use of fixed points for photography, or involve detailed measurements of vegetation structure and composition. Monitoring of land condition over large areas can now be achieved by the use of satellite imagery. Changes in vegetation cover over time can be inferred, with adequate ground-truthing, from variation in the satellite data.

Biodiversity encompasses the variety of living organisms and ecosystems, including genes, species, habitats and ecological communities, as well as the ecological processes that link them. Biodiversity monitoring, at its most simple, may consist of counting the number of species occurring at a site. At a more complex, but more useful level, biodiversity monitoring would consider: the relative abundance of each species; the distribution and structure of habitats or ecosystems; and ecological processes such as gene flow, water & nutrient cycling and disturbance.

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