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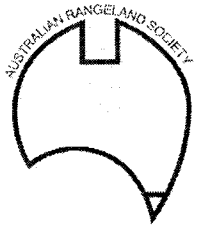

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RANGELAND MONITORING IN NORTHERN SOUTH AUSTRALIA USING A GRAZING GRADIENT METHOD

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In South Australia, the Pastoral Land Management and Conservation Act (1989) requires the condition of pastoral leases to be monitored, to prevent degradation and loss of indigenous plant and animal life. In addition to these requirements there is a need for reporting nationally on the condition of Australia's rangelands (National Land and Water Resources Audit, 2001). The difficulty of assessing rangeland condition in the cattle grazing regions of northern South Australia has led to a trial of remote sensing methods (Bastin *et al.*, 1998). The grazing gradient method (Pickup *et al.*, 1994) allows grazing effects on vegetation to be separated from those due to rainfall and local landscape variability by examining patterns of cover change with increasing distance from water. Vegetation cover tends to increase with distance from watering points as grazing intensity decreases, producing a grazing gradient. Where this cover gradient persists after large rainfalls, it indicates a degree of land degradation.

Grazing gradient analyses were conducted for the regional assessment and reporting of landscape function (cover) for an area of 50,000 km^2, in northern South Australia (see Figure 1). The project area consisted of 12 pastoral properties, used for extensive grazing by domestic cattle. A time series of Landsat TM images were analysed to compare average cover levels at increasing distance from water in October 1988 (dry conditions), July 1989 (after a large rainfall event) and April 1997 (following another large rainfall event).

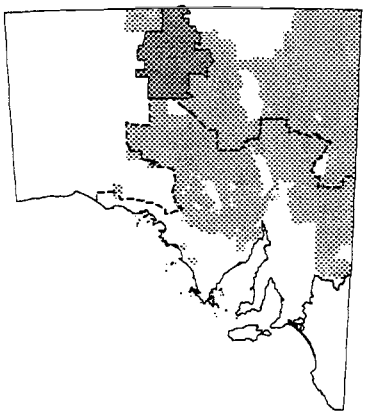
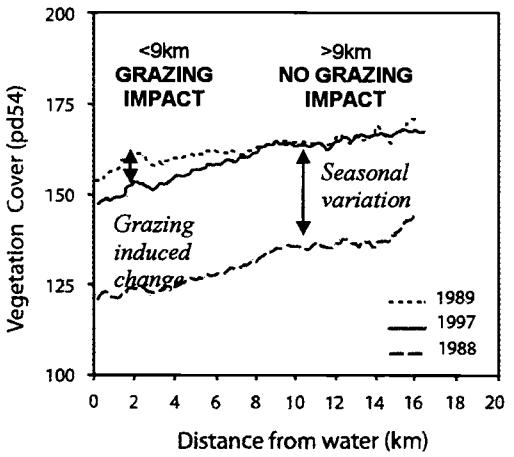


Figure 1: Location of project area in South Australia (dark grey) in relation to pastoral leasehold area (light grey). Areas grazed by cattle are mostly north of the dog fence (dashed line).

Grazing gradient plots, summarising vegetation cover changes with distance from water were produced for the major land systems as well as the major landscape types within each land system. A detailed description of the methods of this study is provided in Brook *et al.* (2001). The land systems analysed represented 70% of the project area, or 30,000 km^2. The remaining area was not suited for application of the grazing gradient as the landscape was too heterogeneous. Application may have been improved through improved landscape stratification however it was preferred to exclude these areas from the analyses, as they are not used extensively for grazing. Plots were then interpreted to determine the condition of landscape types.



The grazing gradient plot to the left (Figure 2) displays the results for the Alberga land system. The ability to separate grazing effects from those due to rainfall variability is clearly shown. The significant feature is the different cover responses in the wet-dates (1997 and 1989) between 0-9km and beyond 9km from water. Between 0-9km, the different cover response to rainfall is due to grazing effects. Beyond 9km, i.e. beyond the influence of grazing, cover response is similar for both wet-dates; the difference between the wet and the dry-dates reflects seasonal change in vegetation cover.

Figure 2: Example of a gradient plot for the Alberga land system.

The grazing gradient method proved an effective tool for describing present rangeland condition. Major benefits are that it is objective, quantitative and repeatable. Importantly, it allows grazing effects to be separated from seasonal change in vegetation cover, and it provides a benchmark from which future changes may be measured. There is considerable potential to integrate ground-based monitoring to better understand the actual changes occurring to the soil and vegetation. The establishment of monitoring sites to quantify the change in landscape function (Ludwig, *et al.* 1997) would enhance our ability to interpret change detected by remote sensing methods. The next stage of this work is to re-run the grazing gradient analysis for selected land systems at a property and paddock scale. Ground-based monitoring sites will be established to quantify the change on the ground, assisting interpretation of results gained from the remote sensing approach. This work is planned for early 2003.

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