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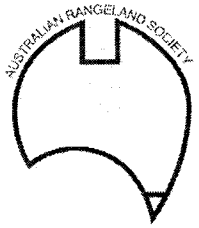

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LANDSCAPE FUNCTION ANALYSIS AS AN INDICATOR OF GRAZING PRESSURE

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ABSTRACT

The landscape organisation and soil surface condition assessment criteria of the Landscape Function Analysis methodology were used to assess the effects of three cattle grazing pressures on sub-tropical pastures of the Aristida/Bothriochloa native pasture community supporting poplar box (Eucalyptus populnea) woodlands in the Maranoa. Three 50m transects, located in upper, middle and lower slope positions in 12 paddocks were recorded after seven years of continuous grazing by Brahman cross steers. There were cleared and treed treatments. The lengths of runon patches and runoff zones were measured and the soil surface condition criteria were converted to indices of patch area, stability, infiltration and nutrient cycling. The Landscape Function Analysis was a sensitive indicator of grazing pressure. The length of runon patches and the four indices were all ranked from highest to lowest in the order low, medium and high grazing pressure.

INTRODUCTION

The Landscape Function Analysis method (LFA) (Tongway and Hindley 1995) describes (a) landscape organisation of runon (accumulation) patches and runoff (resource loss) zones, and (b) soil surface condition, using qualitative and quantitative criteria. An analysis program summarises the zone criteria into indices of 4 attributes: runon patch area, surface stability (resistance to accelerated erosion), nutrient cycling (the way plant litter and roots decompose and become available for use by other plants), and infiltration (the rate the soil absorbs water). These relative figures can be used to compare site differences at one point in time. The LFA method was used to compare the effects of three grazing pressures on the landscape in a grazing trial in a poplar box woodland in the Maranoa.

Materials and Methods

Surface conditions in 12 treatment paddocks of a cattle grazing trial at "Glentulloch", Injune (148^0 25.133'E, 25^0 45.359' S; MAR 625 mm) (Silcock *et al.* 2000) were compared using the LFA landscape organisation and soil condition assessment criteria. The experiment is located in undulating (slopes to 4%) poplar box (*Eucalyptus populnea*) woodland of the *Aristida/Bothriochloa* native pasture community of Queensland. The treatments are: 3 grazing pressures, adjusted annually to pasture utilisation rates of 25%, 50% and 75% of end of summer growth, and 2 tree competition rates, either cleared or live trees at an average $5m^2$ per hectare basal area. Paddock sizes are 4 to 18ha and there are 2 replications.

Three line transects each of 50m running down the slope were located in upper, middle and lower slope positions within each paddock. Each transect was divided into zones describing different types of runon patches and runoff areas. Examples included combinations of four grass densities by four litter amounts. At 3 locations within each runon patch and runoff zone, soil surface conditions were described and measured using the 11 criteria with 4 sub-criteria of the LFA method. The LFA analysis program calculated the indices of patch area, surface stability, infiltration and nutrient cycling for each transect. These indices and runon patch length were used to compare the effects of the three grazing pressures after 7 years of steer grazing. Recording was in February 2002, during a dry summer.

Results and Discussion

The soil cover of the cleared paddocks was from the pasture plants only, predominantly grasses, while fallen tree leaves contributed 63% to the cover in the treed treatments. This tree leaf component made up most of the litter in the runon patches of treed treatments.

The effects of three grazing pressures on indices of patch area, surface stability, infiltration and nutrient cycling are shown in Figure 1. The trends were consistent with the low grazing pressure

having the best soil surface condition by the four measures. The length of runon patches/50m of transect was 27m, 13m and 10m for the low, medium and high grazing pressures respectively.

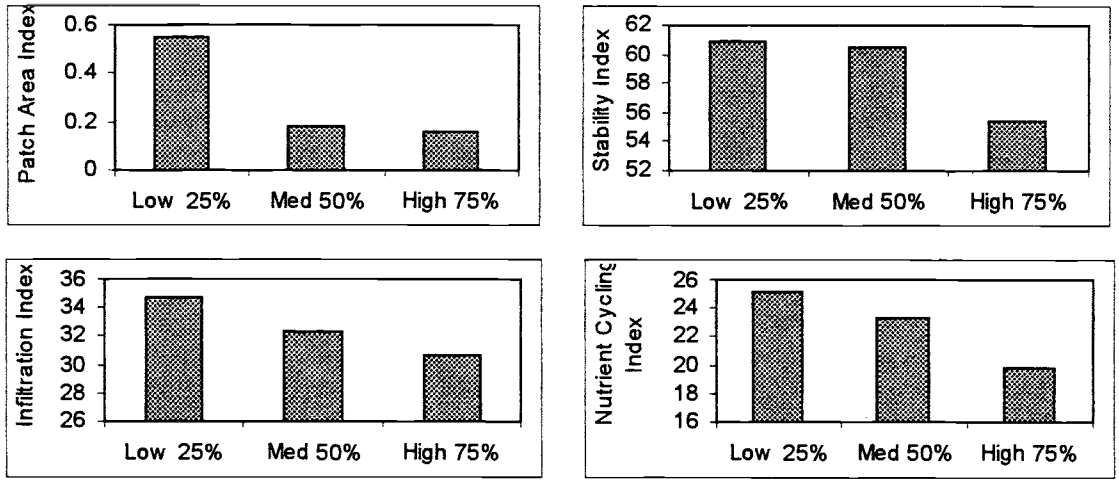

Figure 1. Soil surface condition indices of patch area, stability, infiltration and nutrient cycling at low, medium and high grazing pressure.

The low grazing pressure had the highest runon patch area index, while there was little difference between the medium and high grazing pressure treatments. The stability index shows a decline only with high grazing pressure. The infiltration and nutrient cycling indices also indicate declining surface condition as grazing pressure increases.

Alternative methods of assessing grazing pressure effects on cattle performance, by measuring liveweight and condition scoring, and on pasture condition, by measuring composition, yield and cover, may be complimented by this LFA method of soil surface condition assessment. Some criteria of LFA are more sensitive to change by grazing impacts than the conventional species composition changes in this community. There were 173 pasture species recorded at this site.

LFA is an additional tool to complement cattle and pasture condition indicators for evaluating land management. The patch measurements are a sensitive indicator of soil surface changes induced by grazing.

ACKNOWLEDGEMENTS

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