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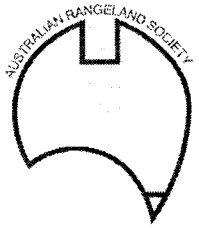

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MANAGING MITCHELL GRASS PASTURES – GRAZING PATTERNS IN SMALL PADDOCKS

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INTRODUCTION

Geographic Information Systems (GIS) offer tools for examining grazing patterns in greater detail than previously. While general patterns such as patch grazing are documented in Mitchell grasslands (eg Orr 1980), our understanding of the detailed temporal and spatial processes involved are limited. On this basis, a detailed study of grazing patterns was conducted within an existing grazing trial to investigate the utility of applying a GIS approach to improving our understanding of these patterns in small paddocks. This paper presents an interim spatial analysis of pasture yield and grazing utilisation conducted in association with a study to determine plant species diversity (Orr and Phelps 2003).

METHODS

A grazing study incorporating six levels of utilisation was established at "Toorak", in the north-western Mitchell grasslands of Queensland in 1984. Sheep numbers are changed annually at the end of the summer so that anticipated proportions of 0, 10, 20, 30, 50 and 80% of the total forage available will be consumed over the ensuing year. Grazing continues in 2002.

Detailed grazing patterns were documented in September 2001 on a 60 X 60 m grid basis. The grid was first constructed in ArcView 3.2 GIS software, using the "graticules and measured grids" extension and overlain on an existing site digital map constructed from GPS waypoint data and LandSat TM satellite imagery. The centre of each grid cell was physically located during field sampling within the grazing trial through a combination of physical maps and Garmin II Plus GPS units set to UTM coordinates and the WGS84 datum.

In September 2001, we collected soil cores on this 60 m GIS grid to determine plant species diversity from the seed bank. At the same time we estimated total pasture yield, Astrebla spp. tussock density and utilisation, the occurrence of other major species and the presence of soil disturbance. A null hypothesis (H0: paddocks are grazed evenly within a set utilisation level) was tested against visually observed patterns in spatial data using the ArcView Spatial Analyst extension. Data was entered against the latitude and longitude of each central grid point. Total yield and utilisation surfaces were then interpolated using Spatial Analyst's "Surface" menu, using a nearest neighbours analysis (4 neighbours, power of 2, IDW method, no barriers).

RESULTS

Distribution of total pasture yields and utilisation levels was uneven within each grazed paddock (Figure 1a, b). The proportion of low (10 to 500 kg/ha) yields and high utilisation levels (60 to 100%) was greatest under high utilisation rates (50, 80%). The proportion of high yields (2000 to 3000 kg/ha) and low utilisation levels (0 to 30%) was greatest at low utilisation rates (10, 20, 30%). Whilst utilisation rate was even within the exclosure (0% utilisation) yield varied between 500 to 2000 kg/ha.

DISCUSSION

The null hypothesis of even grazing throughout each paddock was rejected. The patterns of total pasture yield and utilisation distribution demonstrate patchiness of grazing even at low set utilisation rates (10 and 20%). Yield tended to be lowest, and utilisation rates highest, along the bore-drain of each paddock. Patches of high utilisation have formed in areas extending out from the bore-drain, but also in south-east, north-east and north-west corners of paddocks. These patterns are similar to observations made in commercial scale paddocks within the Mitchell grasslands (eg Orr 1980) but

demonstrates the ability to conduct accurate recordings on a fine scale, and the ability to present spatial data in a visually powerful manner. Areas of high utilisation and low yields at 20% and 30% utilisation indicate the need for further detailed studies to follow patterns of change temporally at similar spatial scales to the one presented in this paper.

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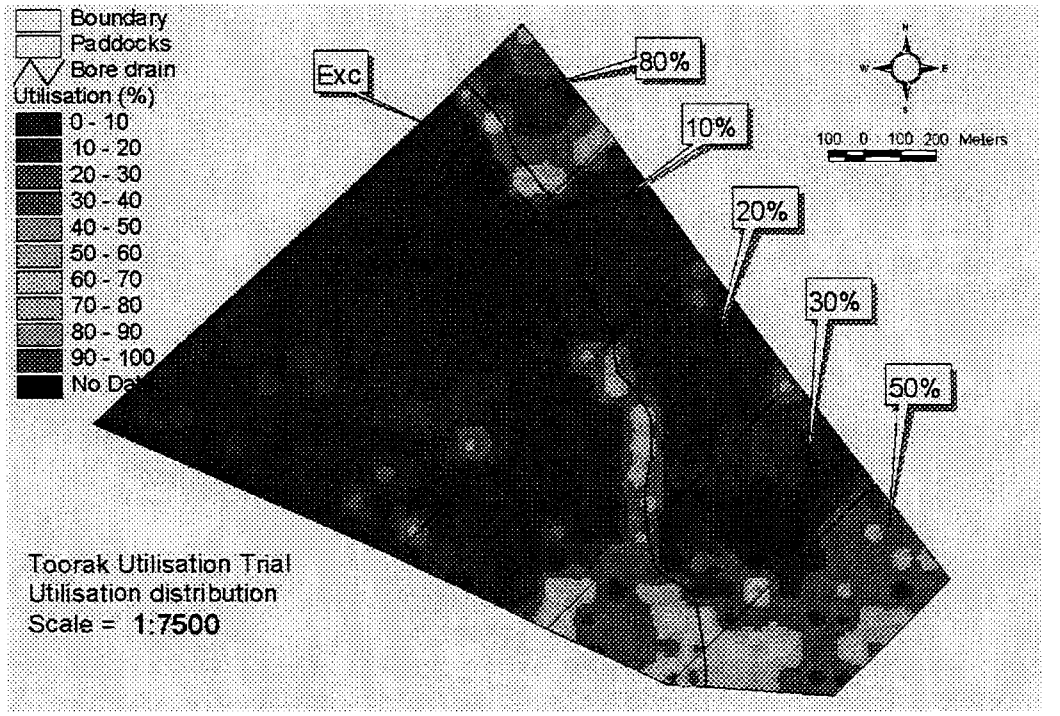
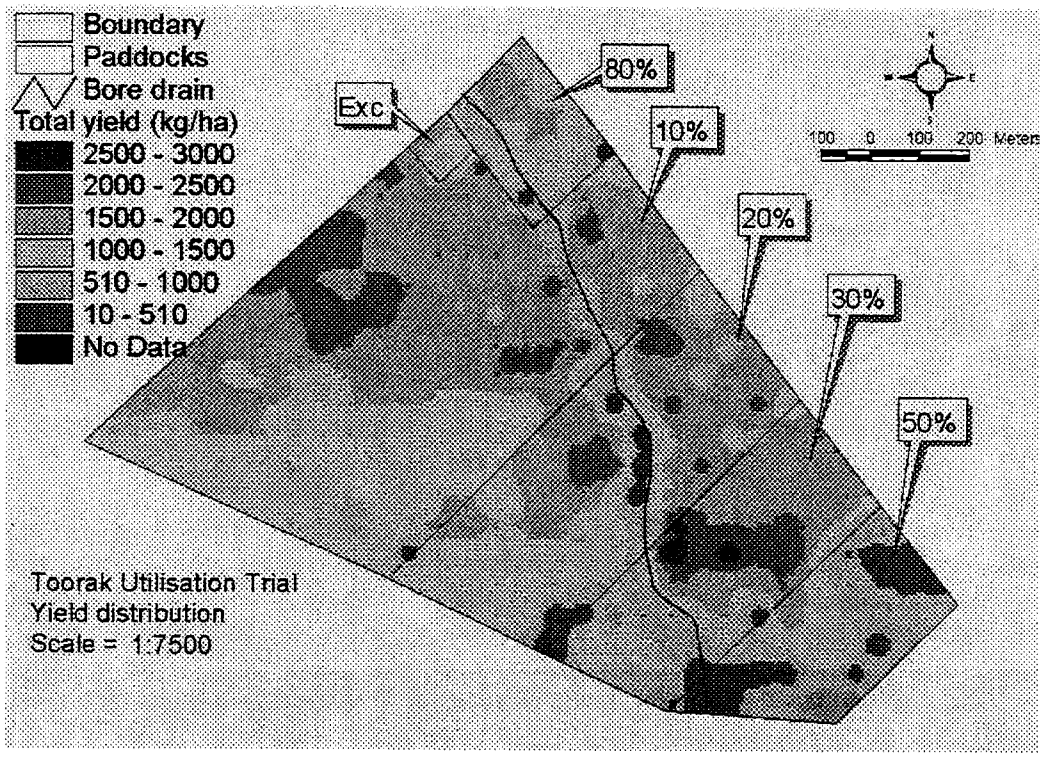
Figure 1. Spatial distribution of a) utilisation level and b) total pasture yield (kg/ha) within paddocks grazed continuously at 0 (Exc), 10, 20, 30, 50 or 80% utilisation for 17 years.




Boundary
Paddocks
Bore drain
Total yield (kg/ha)
2500 - 3000
2000 - 2500
1500 - 2000
1000 - 1500
510 - 1000
10 - 510
No Data
Exc
80%
10%
20%
30%
50%
100 0 100 200 Meters
Toorak Utilisation Trial
Yield distribution
Scale = 1:7500