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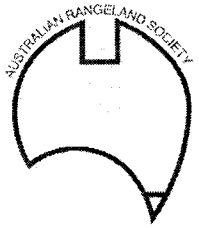

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RANGELAND SUCCESSION, MONITORING AND MANAGEMENT - A CLIMATIC VIEWPOINT

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ABSTRACT

The quantitative climax and its successional (equilibrium) dynamics is questioned for rangelands driven by unpredictable climatic events. An alternative model is that of state and transition (driven by non-equilibrium dynamics). Published estimates of climatic conditions likely to result in non-equilibrium conditions applied to the Queensland rangeland area suggests three zones - one in which equilibrium dynamics is likely to apply, one in which non-equilibrium dynamics is likely to apply, and one which appears to swap from equilibrium to non-equilibrium dynamics under the influence of El Nino conditions. Rangeland management based on expectations of succession (i.e. equilibrium conditions) may lead to disappointment in the latter two areas. Rangeland monitoring systems based on expectations of succession will also likely lead to results that are difficult to interpret.

INTRODUCTION

Neo-Clementsian succession has been the soul of rangeland thinking (Mentis 1985), and it features in rangeland management texts, in condition and trend monitoring and in grazing management strategies. It assumes that rangeland management needs to move towards a stable biotic or climatic climax. Grazing is considered one of the major factors in disturbance. However there is increasing evidence that neo-Clementsian succession does not drive more arid areas (Mentis 1985). Westoby *et al.* (1989) propose a 'state and transition' model for non-equilibrium rangelands. Others question assumptions of equilibrium in rangeland condition and trend assessment (e.g. Friedel 1991). Stability in succession is the tendency of an ecosystem to return to equilibrium after disturbance. Resilience is the system's ability to retain its organizational structure after disturbance (Common and Perrings 1992). However a resilient system is not necessarily stable. Management aimed at sustained animal production from semi-arid savannas may reduce their resilience. As well as grazing, climate can influence community dynamics. McKeon *et al.* (1990) discuss the importance of the Southern Oscillation Index (SOI) on the ecology of Australian savanna communities. This paper looks at its likely effect on successional dynamics.

THE SOI AND LIKELY NON-EQUILIBRIUM ZONES IN QUEENSLAND

Coppock (1993) considers that non-equilibrium arid systems operate where rainfall is less than 400 mm predominantly in one season. An approximate equivalent of this for Queensland is given by Clewett *et al.* (1991). Figure 1 shows the location of the 400 mm summer (November-April) isohyet under conditions of: (a) SOI in spring of above +5; and (b) SOI in spring below -5. This splits Queensland into three regions - one where equilibrium dynamics may be expected (Zone 1); one where non-equilibrium dynamics should be expected (Zone 3); and one which may swap under the influence of the SOI (Zone 2). These divisions appear to flow into NSW and the NT and thus potentially to other rangeland states in Australia.

IMPLICATIONS FOR RANGE MANAGEMENT AND MONITORING IN QUEENSLAND

Coincident with Landcare there is an upsurge in interest in management and monitoring of rangelands in Queensland. For various reasons, systems for both seem to lean towards simplifications. Application of grazing management based on expectation of successional processes in Zones 2 and 3 appears likely to produce disappointing results. Interpretation of monitoring results in these zones needs to consider climatic events as well as management. Users of both should remember that in these areas resilience may well be more important than stability.

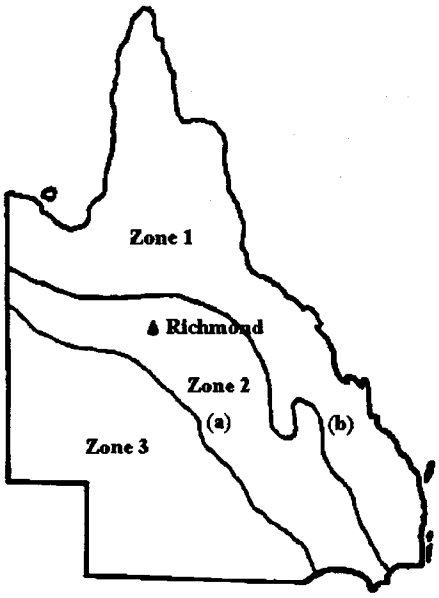

Figure 1. Isohyets of 400 mm mean summer rainfall (November - April) across Queensland for years when the mean value of SOI in spring was (a) more than +5 and (b) less than -5 (Redrawn from Clewett *et al.* 1991).

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