Grazing management and environmental determinants of the diversity and composition of ground-storey vegetation on the Northern Tablelands, NSW

Volume I - THESIS

Jodie Reseigh

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ABSTRACT

Agricultural management influences the species richness and composition of ground-storey vegetation in Australia and elsewhere. This thesis investigates the influence of grazing management and environmental determinants on the diversity of native ground-storey vegetation on the Northern Tablelands of New South Wales. The predominant land use is livestock grazing in a variegated landscape in which pastures dominated by native ground-storey species are more extensive than sown pastures dominated by exotic ground-storey species. Vascular plants were floristically surveyed in 6 x 5 m plots at 373 sites within a 60 km radius of Armidale from January to April in 2001 and 2002. Sampling was concentrated in commercially grazed paddocks (81%), remnant vegetation managed for conservation on private land (7%), and public land grazed intermittently or not at all (12%). Management history and environmental variables were recorded at each site. Confounding of management influences was addressed by stratified sampling in relation to grazing, cultivation, fertiliser management and lithology. Over the period of the study, some 321 species and sub-species of vascular plants were recorded, 70% of them native taxa.

Seasonal fluctuations in native, exotic and total species richness were determined, with maxima recorded in late spring to autumn, thereby identifying this period as the optimal time for sampling the diversity of native ground-storey vegetation on the Northern Tablelands.

Native and exotic ground-storey species richness were highly influenced by agricultural management. Native ground-storey species richness was highest at ungrazed and episodically grazed areas in comparison with planned rest and continuously grazed areas. Sites with a planned rest grazing regime (i.e. grazing followed by regular planned rests, similar to rotational or cell grazing) generally had lower native species richness than sites in continuously grazed regimes, although the relationship was influenced by lithology and management history. Exotic ground-storey species richness was lowest at grazed sites with planned rest and continuous grazing on basalt and granite soils compared with ungrazed sites. High fertiliser use was associated with lower native ground-storey species richness, compared with no fertiliser or low fertiliser application. In contrast, exotic ground-storey species richness increased as the intensity of fertiliser application increased. The influence of cultivation on native ground-storey species richness was not easily discerned on basalt

parent material however, there was a clearer pattern on granite with lower native ground-storey species richness associated with more recent cultivation. Evenness of ground-storey vegetation (as measured by cover) was not significantly affected by any environmental or management variables measured.

Ground-storey composition was highly influenced by environmental variables such as climate and soil nutrients, accounting for 61% of the explained variance, and by a large number of agricultural management variables, including fertiliser, grazing and cultivation, accounting for 39% of the explained variance. A suite of native species including grasses, herbs and shrubs were found to be sensitive to commercial grazing, and the responses of particular native and exotic species to planned rest and continuous grazing were established. Positive responses by common native grasses to increased fertility were confirmed, and information about the direction of response of many native herbs was gained.

Information from this study was used to develop a state and transition model for native ground-storey species. Transitions were based upon changes due to agricultural management (grazing, fertiliser application and cultivation). The assemblages of ground-storey species associated with particular agricultural management practices were used to define states for each lithology. The identity and species richness of native ground-storey vegetation in commercially grazed areas, public reserves, and on-farm remnants were determined. The data are useful for determining the importance of these areas in the conservation and management of ground-storey vegetation on the Northern Tablelands. While production areas are floristically less diverse than public reserves and on-farm remnants, they provide an extensive matrix of predominantly native vegetation, which is vital for the long-term conservation of the regional biota.

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