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**REFERENCE AREAS FOR RANGELAND MANAGEMENT,
HOW SHOULD WE USE THEM?**

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ABSTRACT

This paper describes work in progress to examine how best to set up and use reference areas, particularly in the framework of the South Australian Pastoral Land Management and Conservation Act (1989). The preliminary examination of data from the South Australian rangeland exclosures reveals difficulties with using the long-term exclosures as benchmarks for rangeland assessment. The problems include: statistical validity, impact of other herbivores and vegetation dynamics. Thus other alternatives to exclosures as reference areas will be explored.

INTRODUCTION

The use of "reference areas" in the form of fenced stock exclosures has long been regarded as a key component of rangelands monitoring procedures. Indeed the South Australian Pastoral Land Management and Conservation Act (1989) makes specific provision (Section 44) for reference areas to be established throughout the State's 40 million hectares of pastoral lease lands.

Many fenced exclosures already exist in the pastoral lands, about 25 having been erected by various governmental and university agencies in last 20 years alone, leaving aside the older exclosures.

Studies of these exclosures (being undertaken by A. Valamanesh as a Ph.D. project and supervised by M. Andrew and R. Lange) show that their usefulness cannot automatically be taken for granted. There are various problems that qualify their usefulness, and these must be taken into account before any new installations are attempted.

SIZE AND REPLICATION

One of the important technical shortcomings of the existing exclosures is that they are too small (50m x 50m) to include the natural compositional variations in the vegetation that occur within the paddock. Also their lack of replication adds to the difficulties in distinguishing the effects of grazing from natural variations in vegetation composition. Even if the size of exclosures could be large enough to cover the spatial variations within a paddock and could be sampled satisfactorily, there is still the problem that neighbouring paddocks will be different. That is, the results from an exclosure may not extrapolate very far.

Obviously, the number of exclosures needed to satisfy sampling theory will greatly exceed the number that can be afforded in practice.

Accordingly, arguments about implications of the observable effects of limited exclosures, will have to be persuasive without appeal to much replication. A single exclosure still is persuasive, if it alone contains vegetation in an otherwise denuded landscape, for example.

Size and replication difficulties thus become less important as the management deficiencies become more and more overt.

FERAL AND INDIGENOUS HERBIVORES

The design-complications of exclosures depend greatly upon locality, where the effects of feral and indigenous herbivores have to be distinguished. Some existing exclosures (e.g. on Todmorden Station in the State's far north) lack

rabbit-netted areas on the argument that rabbits are never a problem there. This sort of economy is liable to the criticism that actual problems could be obscured by predefinition that they do not exist! On the other hand, expensive resources cannot be deployed on the off-chance that a negligible influence might inexplicably increase in the near future.

Similarly, what might appear at first sight to be self-evidently correct, can prove wrong in practice. An example from the existing exclosures is the extent to which kangaroos actually spend more time per unit area inside typical stock proof exclosures, than outside them (Andrew and Lange 1986).

VEGETATION DYNAMICS

The foregoing problems aside, there is still the issue that the contrast between vegetation inside a fixed exclosure, versus vegetation outside, is not liable to one consistent sort of interpretation.

For example, the contrast observed after the first year of exclosure might be reasonably attributable to stocking differences. The observed contrast in subsequent years, however, is not a contrast between situations of equivalent starting condition (the condition within the exclosure started with one year's prior protection, the condition without the exclosure did not, and so on). This effect increases with time, forcing the time-scale of interpretation into ever coarser units.

Where management-related observations are required to relate year-by-year events, a system of shifting or rolling exclosures will be required.

EXCLOSURES AS REFERENCE AREAS ?

A more fundamental question is whether exclosures are the best, or only, kind of reference areas. Are the pieces of rangeland long-protected from domestic stock the best benchmark for assessing the condition of rangelands? Alternatives to fenced reference areas will be explored in this project.

While the focus is been on South Australian exclosures, the principles being examined are universal. Thus we would be pleased to make contact with any one with experiences, observation or case studies relevant to this project.

REFERENCE

Andrew, M.H. and Lange, R.T. 1986. The spatial distribution of sympatric populations of kangaroos and sheep: Examples of dissociation between these species.