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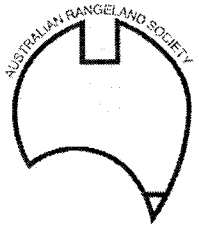

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IS THE VEGETATION OF THE WESTERN AUSTRALIAN SOUTHERN SHRUBLANDS CHANGING OVER TIME?

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ABSTRACT

Analysis of the WARMS monitoring data has been carried out to determine trends in vegetation condition across the Western Australian southern shrublands. Results suggest that a small number of monitoring sites (7.0%) have changed over time, with both improvements and declines in the vegetation being noted. Although a majority of these changes appear to be related to changes in seasonal conditions, management factors are likely to be important influences at some sites. Direct gradient analysis will be used to explore these relationships.

INTRODUCTION

Information concerning the long-term trends in the condition of the rangeland is keenly sought by land managers, extension officers and administrators. A regional analysis of the WARMS (Western Australian Rangeland Monitoring System) data from the southern shrublands of WA has recently been undertaken to provide some information on changes in rangeland vegetation over time. The aims of this study were to classify the monitoring sites into groups with relatively similar vegetation; to determine if the vegetation within each group is changing over time; and to assess whether these changes are desirable or undesirable according to present or intended land uses.

METHODS

The study used data from over 900 WARMS shrubland monitoring sites visited from 1983 to 1995. The data set included nearly 450 sites which had been measured twice and 23 sites which had been measured three or more times. Sites had generally been measured at 5 year intervals, although intervals of between two and eleven years were noted. Before an analysis of change was carried out, indirect multivariate analyses (classification and ordination) were used to classify sites into relatively homogeneous vegetation types. Vegetation changes were assessed from density measurements only.

Two types of vegetation change were examined. Firstly, sites which changed vegetation type over time were noted. Such changes generally represented a large change in the dominant species at a site. Secondly, data from each vegetation type were analysed to assess within-vegetation type change. Vectors of trend across the ordination space of each vegetation type were derived for revisited sites in a similar manner to that described by Foran *et al.* (1986) and Friedel (1991). A combination of DCA and PCA ordination allowed detection of both major shifts in species composition and large changes in the density of individual species at each monitoring site. Cut-off levels for change were set at a 5% change in species composition per year (i.e. 25% change over a 5 year monitoring period) for DCA analyses, and change in site score greater than 5% of the axis length per year for PCA analyses.

RESULTS

Vegetation change was detected at only a small number of monitoring sites over the monitoring period. Three out of the total of 468 classified sites changed sufficiently to place them in a different vegetation type on subsequent visits. Two of these changes represented an improvement at the site for pastoral land use (increases in Gascoyne bluebush *Maireana polypterygia* and cotton bush *Ptilotus obovatus* were noted) and the other a decline (a decrease in Gascoyne bluebush was noted).

An additional 30 sites (6.4%) showed change although they were still classified within the same vegetation type. Twelve (2.6%) of the sites improved, 14 sites (3.0%) declined and 4 sites (0.8%)

showed change which was neither an improvement nor a decline (Table 1). Saltbush (*A. vesicaria* and *A. bunburyana*) communities showed the highest proportion of sites changing, while bluebush communities (*M. polypterygia, M. sedifolia and M. pyramidata*) appeared to change little.

Table 1. Vegetation changes detected at shrubland WARMS monitoring sites. The vegetation types referred to above have been aggregated into vegetation complexes for simplicity.

Vegetation complex	Total sites	Sites not changing	Sites improving	Neutral change	Sites declining
Saltbush	105	94	6	1	4
Bluebush	62	61	-	-	1
Saltbush/Bluebush	55	49	3	1	2
Cottonbush ± Mulga	153	146	2	-	5
Gascoyne Mulla Mulla	63	59	1	1	2
Species Poor	24	23	-	1	-

DISCUSSION

The results presented here give a 'snapshot' indication of rangeland vegetation trend in a number of shrubland communities. Few sites have been seen to change; this may be expected as data are only available for a short period (5-10 years) and rangeland communities usually respond slowly over time except during episodic events (Wilson 1994).

There has been no general directional trend detected at monitoring sites to date, with a comparable number of site improvements and declines. At a majority of sites it appears likely that the change is due to seasonal conditions, with declines noted in poor rainfall years and improvements in high rainfall years. Other sites, however, have shown change against this trend. These sites may be influenced by factors that can be managed, such as grazing intensity or fire (Foran *et al.* 1986), or by unpredictable natural events such as hailstorms.

An extended period of monitoring, encompassing a range of seasonal conditions, is required before long-term trends and thresholds (Friedel 1991) within these shrubland ecosystems can be determined. Direct gradient analysis, incorporating climate, stocking rates and landscape processes, will help to explain whether vegetation changes are linked to seasonal conditions or management practices.

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