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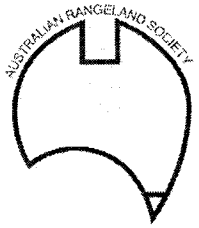

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RESULTS FROM RANGELAND MONITORING ACROSS THE SOUTHERN RANGELANDS OF WESTERN AUSTRALIA

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ABSTRACT

For the first time, a region wide assessment of change across the southern shrublands of Western Australia is reported, using information from the Western Australian Rangeland Monitoring System (WARMS).

Shrub and tree density, canopy area and species richness increased on the majority of sites. The results were similar when considered at a species level, with most shrub and tree species showing an increase in density, total canopy area and the number of sites on which they were found. Recruitment of new individuals to the population was commonplace on virtually all sites and for virtually all species.

This generally good news should be tempered by the understanding that acute degradation processes may still be occurring, especially within and surrounding drainage lines, which are away from where the WARMS sites are typically located.

Grazing was implicated in the decline in density on some sites, particularly those which had experienced below average seasonal conditions. On these sites, decreaser species were particularly affected.

INTRODUCTION

WARMS provides an indication of change in pastoral rangelands at a broad scale using a set of representative point-based sites on which attributes of soil surface and perennial vegetation dynamics are recorded (Watson and Novelly 2004). WARMS is based on the belief that perennial vegetation is a good indicator of rangeland health or condition.

In Western Australia, rangeland monitoring, has been underway, in one form or another, since the 1970s. However, this is the first time we have been able to report region-wide, from (almost) all sites in the southern shrublands, stretching from north-west cape through to the Nullarbor. Vegetation data are presented for 964 of 996 shrubland sites.

METHODS

At the regional scale, WARMS sites were stratified on vegetation type. The number of sites allocated to each vegetation type was based on the areal extent of that vegetation type, its fragility and its productivity for pastoral purposes. Fragile, productive areas (such as chenopod shrublands) were assigned proportionally more sites than robust, unproductive areas (such as *Acacia* sandplain shrublands). At the local scale, sites were typically located within grazing distance of water and were designed to reflect both the range of vegetation states and the most common state in that area.

Recruitment, mortality and canopy size change of all shrubs and trees was assessed on 964 sites on 320 leases. Almost all sites were first assessed between December 1993 and November 1999 and re-assessed between July 1999 and November 2005. The average interval between assessments was 5 years and 2 months. Analysis was based on comparing a particular attribute at first assessment (date 1) with the same attribute at reassessment (date 2). For results given by species, the data was first filtered to ensure sufficient numbers of individuals (at least 20) or populations (at least 5) were available to make meaningful comparisons.

Causal factors were inferred after categorising the seasonal conditions experienced between assessments. Grazing is likely to be a causal factor where a decline is observed despite good seasons, sites decline while other sites in the region do not, or where decreaser species decline but other less palatable species (increasers) do not. For much of the region, seasonal conditions were very good from the mid 1990s to early 2000, followed by a sequence of dry years.

RESULTS

By site

The density of shrubs increased on almost 70% of sites (Figure 1a) by an average of 26%. On only 2.5% of sites did the density decline to less than half. Canopy size (a surrogate of cover) increased on 78% of sites (Figure 1c) by an average of 38%. On only 1.6% of sites did the shrub cover decline to less than half. Species richness (of shrubs and trees) remained the same or increased on 80% of sites (Figure 1e). Recruitment of new individuals, regardless of species, was found on 99% of sites.

By species

The total number of individuals increased for 133 of 154 species (Figure 1b). There were two species in which the population declined by more than half, neither of which were species known to decrease due to grazing. The average canopy area per plant increased for 70% of species (Figure 1d). For some species, such as *Acacia papyrocarpa* and *A. sclerosperma*, the decline in average canopy size was due to the large number of (small) recruits entering the population. Most species (81%) were found on the same number of sites or more sites at date 2 compared with date 1 (Figure 1f). There was at least one recruit recorded for 98% of species. Recall that these species results were filtered to only include those species where there were sufficient numbers (at least 20 at either first or second assessment) in order to provide meaningful population level results.

Season vs. grazing

Seasonal conditions had an impact on shrub and tree dynamics (Table 1). Under above average seasonal conditions, 76% of sites showed increased density of 5% or more. Under average and below average seasonal conditions only 45% and 34% respectively showed the same increase. Under above average seasonal conditions the increased density was similar for decreaser, intermediate and increaser species, suggesting no grazing impact. However, for those sites which experienced average or below average seasonal conditions, decreaser species declined more than intermediate or increaser species. This suggests that grazing had an adverse impact on these sites, over and above the impact of seasonal conditions.

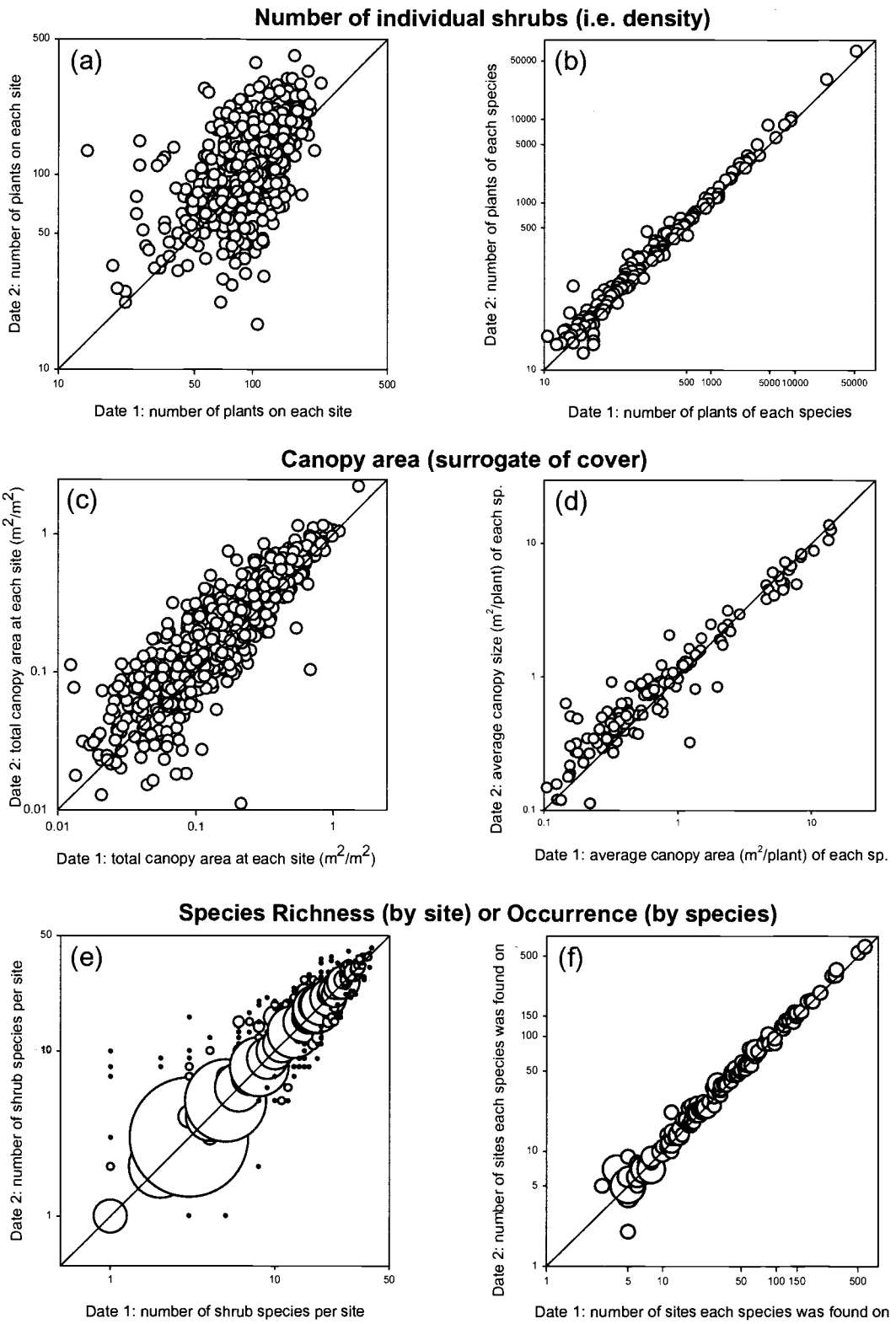

Figure 1: Summary of changes by site (left hand side) and by species (right hand side). The diagonal lines represent no change between date 1 and date 2. Bubble plots are used in (e) and (f) because more than one data point had the same x-y coordinate. Several outliers have been removed to allow the majority of the data to be presented on appropriate scales

Table 1: Change in shrub and tree density from one assessment to the next. Percentage of sites in each seasonal quality category showing decline, no change or increase

Seasonal Quality	Species group	Decline. Density < 95%	No change. Density between 95% and 105%	Increase. Density >=105%	Number of sites
Above average	All	11	13	76	453
	Decreaser	13	12	75	402
	Intermediate	17	16	68	393
	Increaser	10	17	73	256
Average	All	31	24	45	395
	Decreaser	34	23	43	316
	Intermediate	27	30	43	311
	Increaser	14	35	51	191
Below average	All	47	18	34	116
	Decreaser	54	12	34	82
	Intermediate	47	22	31	81
	Increaser	25	33	42	57

DISCUSSION

The species composition and abundance of shrubs and trees is used in the arid shrublands of Western Australia to reflect range health or condition. In general, an increase in this woody vegetation is regarded as favourable, although some species are regarded as woody weeds. Shrub and tree density, canopy area, richness and occurrence increased on the majority of sites and for the majority of species. Recruitment was commonplace.

These generally favourable results from WARMS across the southern shrublands need to be understood within the context of site location. WARMS sites are located on the largest grazed areas of the required vegetation type within each paddock. These tend to be relatively intact areas away from drainage lines. Acute degradation may still be occurring elsewhere, especially in the form of catchment canalisation and desiccation (Pringle *et al.* in press). The apparent contradiction can best be understood in terms of models that consider change from the site to catchment scale (Coleman 2005).

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