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THE IMPACT OF RECENT DRY SEASONS ON SHRUB AND TREE DYNAMICS: RESULTS FROM THE WESTERN AUSTRALIAN RANGELAND MONITORING SYSTEM (WARMS)

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ABSTRACT

The numbers and canopy size of shrubs and trees increased on the majority of Western Australian Rangeland Monitoring System (WARMS) sites in the arid and semi-arid shrublands of Western Australia over the last decade. Recruitment of new individuals was commonplace. Recruits were observed on almost all sites and for the majority of species. About 40% of the sites were reassessed within an area declared for Exceptional Circumstances. While there were some negative impacts from the combination of pastoralism and dry seasons, they were not catastrophic, as has been previously observed following severe drought.

INTRODUCTION

The premise behind WARMS is that changes in the condition of the rangelands can be indicated by changes in the health of the perennial vegetation and that WARMS sites provide a stratified sample of the rangelands grazed by domestic stock. In general, an increase in shrub numbers and canopy size is seen as an improvement, although this will depend on the values placed on particular species.

A prolonged dry period across much of the southern rangelands of Western Australia began in 2000 and continued through 2001, 2002 and 2003. The dry period resulted in much of the region being declared for Exceptional Circumstances. History shows that severe droughts have result in extensive degradation (McKeon *et al.* 2004). This paper summarises changes observed on WARMS sites over the last decade, including during the prolonged dry period, in order to determine to what extent degradation had occurred.

METHODS

Between July 1999 and October 2003, 711 WARMS sites were reassessed on 240 leases (i.e. about 74% of leases in the southern rangelands of WA). These sites were installed between December 1993 and June 1999. The average time between installation and reassessment was five years. On each site, the dynamics (i.e. recruitment and survivorship) of the shrub and tree populations were tracked using direct census. That is, the final number of plants was derived from the initial number, plus recruitment, minus deaths. Additionally, canopy dimensions (i.e. width and height) of all individuals were assessed. A general description of WARMS is given in Watson and Novelly (2004). The data set comprised about 104,000 individual plants and about 200 species.

The data were summarised for each site by comparing (1) shrub and tree numbers at reassessment, with numbers at installation; and (2) canopy size, taken as the sum of the canopy width and height, between installation and reassessment. Note that the maximum estimated canopy height was 205 cm.

To investigate the impact of the dry seasons, the sites were divided into three groups based on the date of reassessment and whether or not the lease was within the area submitted to the Commonwealth Government for Exceptional Circumstances. Of the 711 sites, 410 were either outside the EC declared (ECD) area, or were assessed before 1/8/01, i.e. before the impact of the dry seasons (Group1). Group 2 consisted of 151 sites that were in the ECD area and were reassessed between 1/8/01 and 1/8/02, i.e. in the early part of the dry period. Group 3 consisted of 150 sites in the ECD area and reassessed

between 1/8/02 and 11/10/03, i.e. further into the dry period. Note that while sites in Groups 2 and 3 were reassessed during the dry period, they were all installed prior to July 1999, in years when rainfall was higher.

RESULTS AND CONCLUSIONS

The dry seasons had a negative impact on shrub and tree populations. However, the impact was not large, certainly not catastrophic, except on a few isolated sites. While such a result can generally be viewed as "good news", it may also be that the full impact of the extended dry period had not expressed itself by the time the sites were reassessed, even though Group 3 sites had experienced three or four consecutive dry winters.

For those sites either outside the EC area, or which were reassessed before the impact of the dry period (Group 1), shrub and tree populations remained the same or increased on 87% of sites by an average of 54% (Table 1). Both statistics were less for sites in the ECD area during the dry period (Groups 2 and 3). For Group 3, around half the sites (46%) showed increased or identical populations and half decreased. The average change in numbers was close to zero (-1%). The pattern for canopy size was similar with a negative impact in the ECD area during the dry period.

Table 1: Summary of changes found on 711 WARMS sites. Group 1; Either not ECD or ECD but reassessed before 1/8/01 (410 sites). Group 2; ECD and reassessed between 1/8/01 and 1/8/02 (151 sites). Group 3; ECD and reassessed between 1/8/02 and 11/10/03 (150 sites). For the "Average change (%)", (i.e. rows two and four) 0% equals no change and 54% equals an increase of 54% from baseline.

	Group 1	Group 2	Group 3
Percent of sites with same or increased shrub and tree numbers	87%	66%	46%
Average change (%) in shrub and tree numbers by site	54%	10%	-1%
Percent of sites with same or increased total canopy size	98%	89%	53%
Average change (%) in total canopy size by site	38%	16%	3%

Across all sites, recruitment of new shrubs was commonplace, with at least some new individuals being recorded on 99% of sites, irrespective of whether ECD or sampled in the dry period. Recruits found on sites that were assessed well into the dry period (Group 3) almost certainly germinated during earlier wetter periods. Recruitment was observed for 80% of all species recorded and 100% of species with an initial population of at least 20.

These results suggest that pastoral activities during a very dry period did not have region-wide severe impacts on shrub and tree populations, at least on WARMS sites within those areas reassessed. However, we note that pastoral lease inspections within the region have identified some leases where unacceptable impacts have occurred over the same period. We also note that should the dry period continue through 2004, the scale of negative impact will almost certainly increase.

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