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Rangeland monitoring in the Kimberley region of Western Australia—changes in perennial grass frequency

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Introduction The Western Australian Rangeland Monitoring System (WARMS) is used by the state government of Western Australia to help determine the impact of cattle grazing on rangelands in the pastoral region. These rangelands are leasehold, owned by the Crown, and the government has a responsibility to ensure they are managed well.

Materials and methods WARMS consists of a set of permanent ground sites on which aspects of perennial vegetation dynamics and soil surface condition are assessed (Watson *et al.*, 2007). Here we present data on perennial grass frequency from the subset of 280 sites (from a total of 383) that were assessed in the Kimberley region in each of the four assessment epochs. Epochs are sequential three year periods during which the sites were assessed. Epoch 1 (E1) was 1994-1995-1996; E2 was 1997-1998-1999; E3 was 2000-2001-2002 and E4 was 2003-2004-2005. Paired t-tests were used to examine if the average perennial grass frequency changed from epoch to epoch. The number of sites in which perennial grass frequency remained stable or increased was also calculated. Rainfall data and lease level statistics of cattle numbers were obtained from unpublished government databases.

Results and discussion The average perennial grass frequency on the 280 sites was 77% in E1. It increased between E1 and E2 ($p < 0.01$) and between E2 and E3 ($p < 0.01$) but not between E3 and E4 (Table 1). Increased or stable frequencies were found on about 75% of sites between E1 and E2 and over the subsequent period. Rainfall was typically above average from the mid 1990s to early 2000s, followed by a relatively drier period. Cattle numbers increased from the mid 1990s until early 2000s and have not declined since.

Table 1 Comparisons of change in perennial grass frequency (%) between epochs—Kimberley WARMS sites.

Epoch comparison	Average change in frequency between epochs	p-value	Number of sites with stable or increased frequency
E2 vs E1	+ 5.4	$p < 0.01$	210
E3 vs E2	+ 4.2	$p < 0.01$	212
E4 vs E3	- 1.0	$p = 0.20$	167

Conclusions On its own, the increase and then stability in perennial grass frequency under commercial cattle grazing is a favourable result. However, seasonal conditions (i.e. high rainfall) were clearly beneficial for the establishment of perennial grasses for much of this time and we would expect frequency to increase. From the early 2000s seasonal conditions became drier but cattle numbers did not decline. This may be reflected in the plateau seen in perennial grass frequency between E3 and E4, raising concerns that cattle numbers have not been adjusted in line with drier seasonal conditions and may be adversely affecting the rangelands. The fifth epoch (E5) assessment will be finished by the end of 2008 and this will show the changes in perennial grass frequency since E4, which should confirm if cattle numbers are too high. The results from this will be presented to land administrators within the government of Western Australia.

Reference

Watson, I. W., Novelly, P. E., Thomas, P. W. E., (2007). Monitoring changes in pastoral rangelands—the Western Australian Rangeland Monitoring System (WARMS). *The Rangeland Journal* 29, 191-205.