An operational monitoring program in the grasslands region of western Australian rangeland

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Introduction The Western Australian Rangeland Monitoring System (WARMS) monitors and reports on the pastoral rangelands of Western Australia. WARMS is a system of permanent sites for reporting at broad scales, such as by biogeographical region or local government area.

Materials and methods The Kimberley and the Pilbara regions in Western Australia have extensive grasslands used for pastoralism i.e. commercial livestock production. To allocate the WARMS sites, the 220 published land systems (109 in the Kimberley and 111 in the Pilbara) were stratified into 12 major vegetation groups. The more productive vegetation types for pastoral use were allocated more sites, hence tussock grasslands (e.g. species of *Astrebla*, *Chrysopogon*, *Eragrostis* and *Cenchrus*) received a higher density of sites than spinifex communities (*Triodia spp*, *Chrysopogon spp* and *Eraichne ssp*).

Table 1 *Summary of Kimberley and Pilbara regions.*

Region	No. of sites	No. of stations	Station area (M ha)	No. of Cattle (head)	Annual rainfall (mm)	Tussock grasslands		Spinifex communities	
						Total area No. of sites	Average area per site (ha)	Total area No. of sites	Average area per site (ha)
Kimberley	385	85	21.4	600,000	500-1100	4.8 M ha 259 sites	18,700	8.2 M ha 126 sites	65,100
Pilbara	248	58	13.7	450,000	300-400	2.3 M ha 144 sites	16,400	6.4 M ha 104 sites	60,700

At each assessment, the frequency of perennial plants by species is recorded on 100 quadrats over a 0.13ha site. Estimates of crown cover by species of shrubs and trees over 1metre are made. Details of site selection and assessment can be found in Western Australian Rangeland Monitoring System for Grasslands: field manual" Craig, Thomas and Watson (2008). Landscape function is also assessed, following Tongway and Hindley (1995).

Discussion WARMS commenced in 1994. Grassland sites are assessed on a three year cycle, thus by the end of 2008 the fifth cycle of assessments will have been completed in the Kimberley. Analysis and reporting is by prescribed vegetation group within each biogeographic region or other appropriate regionalisation. Reporting is to State and Federal Government and the general pastoral community, rather than to individual pastoral enterprises. (See associated paper by Watson, Thomas, Novelly and Craig in these proceedings). Data for grassland sites are stored in Oracle and MS Access relational databases, with links to a medium resolution digital photo for each observation. Currently, for the 633 grass sites, there is a total of 2450 observations, with many sites having 5 observations.

In designing and implementing a regional monitoring program, there is a need to consider the long term institutional commitment of the organisation undertaking the monitoring. There will always be a need to balance the number of sites needed for meaningful reporting and the availability of resources required for their monitoring. Each year about 130 sites are assessed in the Kimberley and 85 in the Pilbara. Not every site will be able to be assessed in any given year. In the Kimberley, about 4% of grass sites cannot be assessed because of recent fire and up to 3% of sites are abandoned due to changes in fence lines and tracks. In the Pilbara burnt or abandoned sites are rare. Ancillary datasets such as, interpolated rainfall and NOAA NDVI, and measures of stocking pressure are used to help tease out likely causal factors.

Conclusions WARMS is an established operating monitoring system of long term, objective data over expanses of the Western Australian rangelands. The system is designed for reporting on similar vegetation types at broad scales, rather than at the scale of the individual enterprise.

References

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