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KIMBERLEY GRASSLANDS: CHANGE, DRIVERS AND ATTRIBUTION

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INTRODUCTION

The Western Australian Rangeland Monitoring System (WARMS) provides change information on pastoral rangelands at broad scales, through a set of representative, point-based sites (Watson and Novelly, 2004). Sites are allocated to vegetation groups (Table 1) based on an index of pastoral productivity, fragility and areal extent. There are 381 grassland sites in the Kimberley, reassessed on a three-year cycle. Ancillary data are collected concerning use of the paddock within which the site is located, as well as nearest rainfall data, evidence of fire and so on.

The Department of Agriculture, Western Australia developed WARMS as part of its process for measuring and reporting on the extent to which rangeland targets are being achieved, with achievement considered some measure of pastoral management. But, performance assessment should be derived from the logic of the relations between causation and the influences that connect actions to ultimate effects. While change may be identified, the more difficult question is one of determining what is driving that change. Attribution is important for providing feedback to management, and separating managerial drivers from natural, uncontrolled drivers such as rainfall is difficult. This paper considers such attribution.

CHANGE

Since 1994, 286 WARMS sites have been assessed on three occasions, with perennial grass frequency generally increasing, albeit from a strong base (Table 1). Note that no distinction is made in this paper as to grass species, and hence pastoral, ecological or other value.

Table 1. Vegetation group and average frequency of perennial grasses (i.e. number of quadrats containing perennial grasses out of 100 quadrats) for all sites in the Kimberley with three assessments.

Vegetation Group	Number of sites	1994 or 1995 or 1996	1997 or 1998 or 1999	2000 or 2001 or 2002
Black Soil	100	74	81	86
Curly Spinifex	52	79	82	85
Coastal Vegetation	10	86	88	81
Frontage Grass	12	68	85	87
Limestone Grass	19	31	36	44
Northern Ribbongrass	17	97	96	98
Southern Ribbongrass	54	78	88	92
Soft Spinifex	22	89	89	91
Total	286			

Site selection is based on encompassing the range of condition states within the local area. However, variation in frequency at the first sampling amongst vegetation groups should not be taken to indicate variation in the initial condition. Rather, as the same quadrat size is used on most sites to prevent confusion, this difference reflects the characteristics of each of the vegetation groups.

DRIVERS OF CHANGE

Undoubtedly, individual paddock management varied across sites within vegetation groups. However, individual site data are aggregated for analysis, and such aggregated data should reflect the drivers at the regional or vegetation community level, rather than paddock or property. Several factors apart from the grazing pressure of domestic stock have, theoretically, affected change over the previous decade. So, what are these regional, or community wide, drivers, and to what extent can attribution of their effects be defined?

Grazing pressure

While heterogeneous across the region and pasture groups, data suggest average cattle stocking rates in the Kimberley in the early 1990s were only around 50% of those ten years previously. Rates remained relatively constant through to the late 1990s, increasing again somewhat in the last few years. Allied to this was a steady decline in grazing from feral animals, particularly feral donkeys. Donkeys had been eradicated from more than 230,000 sq km by late 2003, up from virtually nothing 12 years previously. For a similar control effort, donkey numbers destroyed per annum fell by almost 50% over this period.

Rainfall

Rainfall was low in the late 1980s and early 1990s, especially in the central Kimberley (Halls Creek and Fitzroy Crossing). Halls Creek average rainfall from 1986/87 to 1989/90 was only 368 mm (average 548 mm), with 699 mm in 1990/91 but only 241 mm in 1991/92. In contrast, from 1992/93 to 2000/01, rainfall averaged 726 mm annually, with 1005 mm recorded in 1999/2000. A similar cycle was recorded in other centres, suggesting change from a 'dry' to a 'wet' cycle prior to the decade during which monitoring occurred.

"Coastal Vegetation" change was negative in the latter part of the monitoring cycle. This vegetation is concentrated on the Broome coast where, starting from the 1998/99 wet season, heavy falls associated with cyclones inundated pastures for several months. At one lease, falls in one month exceeded annual rainfall on two occasions between December 1998 and March 2000, with the total rain during this period being 1957 mm (annual mean is 352 mm). The neighbouring lease also recorded rainfall above the annual mean in two separate months, while the total for the period was 2473 mm, with an annual mean of 407 mm.

Fire frequency and intensity

Fires are a significant component of Kimberley grasslands, and like grazing pressure, impact is heterogeneous across the landscape. While only available from 1993, data show fire frequency was low in 1993, then much higher, although variable, subsequently. However, data available on the impact of fire on perennial grass frequency (particularly the interaction of fire and grazing) are limited, thus restricting attribution of this driver.

CONCLUSION

The improvement in perennial grass frequency seen on WARMS sites is encouraging. However, several drivers have potentially contributed to this improvement. The degree to which any one driver is responsible is difficult to determine, as is the impact of possible interaction between drivers. This restricts the conclusions that can be drawn. To enhance the value of WARMS, further research in the area of attribution determination is warranted.

REFERENCES

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