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MEASURED CHANGE IN THE RANGELANDS OF WESTERN NSW: 1989-2003

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INTRODUCTION

The Rangeland Assessment Program (RAP) is an operational site-based monitoring system measuring vegetation change in western New South Wales (Green *et al.* 2001). The initial design of the program focused on identifying trends in land condition to stimulate landholder interest and provide objective data at the state policy level. Increasingly there is a demand for data to support the monitoring of "catchment level" natural resource management outcomes and to ground-truth regional modelling.

For the past 14 years, annual assessments have been undertaken at up to 340 monitoring sites throughout the western rangelands of NSW. The temporal scale of this monitoring is the most intense in Australia. The program therefore possesses a comprehensive dataset on plant and soil surface responses to seasonal effects and pastoral management. Selected statistical analysis of the data has been completed (Eldridge and Coen 2003), but this paper reports on general trends evident at broad spatial scales.

REGIONAL TRENDS

Fourteen years is a short timeframe for recognising real change in rangeland pastures. Regional trends in the data therefore highlight the well-known seasonality of pasture response in the semi-arid zone. While exceptionally dry or wet years define a broad context for pasture growth, individual species respond to more specific events. However, beyond seasonal impacts, plant diversity, frequency, biomass, soil surface cover and chenopod density datasets provide robust evidence of long-term site dynamics. In the following, these are considered in the context of the whole of western NSW.

Pasture diversity

Pasture diversity, measured by the average number of individual plant species recorded at each site, appears to be relatively stable across the region. Different responses are evident between specific range-types or biogeographic regions. High variability and peaks of diversity are evident in the Cobar Peneplain and Mulga Lands Bioregions. In comparison, the belah (*Casuarina pauper*)-rosewood (*Alectryon oleifolius*) communities of the Murray-Darling Depression Bioregion exhibit low but more consistent diversity. As would be expected, diversity has been greatest following years of exceptional rainfall. We suspect that this is especially so when they follow dry seasons. Across the region, about 80% of pasture species are of native origin. The "non-natives" include weeds as well as pastorally productive plants such as barley grass (*Hordeum leporinum*) and medics (*Medicago spp*).

Pasture composition

Regional trends in individual pasture species frequency and biomass closely follow seasonal rainfall totals and the timing of the growing season. Speargrass *(Austrostipa spp*), the dominant grass in the region, grows best on autumn or winter rainfalls and produced big flushes in 1989-90, 1992-93 and 2000-01. Many perennial grass species such as curly windmill grass (*Enteropogon acicularis*) maintain a relatively low presence in pastures at any one time. However, collectively their productivity remains relatively consistent year to year in contrast to the "boom or bust" cycles of many annual plants and speargrass. Number nine wiregrass *(Aristida jerichoensis*), which tends to be summer growing, did best in 1995 when rains were predominantly in January, as well as in 2000-01. Curly Mitchell grass (*Astrebla lappacea*) showed increasing biomass throughout the 1990s, although declining in 1998 with mainly winter rainfall.

In southern parts of the western NSW rangelands, medics and crowfoot (*Erodium spp*) are generally considered the most important non-grass pastoral plants. However, the data confirm that their growth is quite seasonal, resulting in significant variation in the yields recorded at monitoring sites. This was evident in the years 1993-97, when the palatable native, grey copperburr (*Sclerolaena diacantha*) produced greater biomass.

Soil surface cover

The amount of vegetation cover and cryptogam on the soil surface is a good indicator of seasonal response, grazing pressure and consequent land stability. As sites are measured during autumn in predominantly winter rainfall areas and in spring where summer rain dominates, the data represent the "worst case scenario" in terms of groundcover. Over the last decade, cryptogam cover has been relatively stable. However, vegetation cover has responded to the better rainfall years but declined slightly overall. There appears to be a slight trend towards more bare ground over the period, whilst erosion levels show a slight downward trend.

Chenopod density

Edible chenopod shrubs play a big part in maintaining soil stability and pastoral productivity over a significant area of western NSW. Bladder saltbush (*Atriplex vesicaria*) is the most important of these shrubs. During the early part of the last decade, this saltbush was badly affected by caterpillar attack, dieback and drought. Fortunately, bush density made a good recovery with better rainfall during 1999-2000, but then rapidly declined again with the onset of the current drought. Other chenopod species, such as old man saltbush *(Atriplex nummularia)* and pearl bluebush *(Maireana sedifolia)*, have demonstrated relatively stable numbers over the period. Black bluebush *(Maireana pyramidata)* showed substantial recruitment of younger plants after 1996, only to be thinned by the drought since 2001. The recruitment coincided with the introduction of rabbit calicivirus.

ARE THE NSW RANGELANDS CHANGING?

Over the 14-year timeframe of monitoring, significant ecological change is not readily evident in the broad regional context of the western rangelands of NSW. At this scale, annual change is mainly driven by season and the actual circumstances of each growing period have more influence than annual rainfall totals. Seasonal variation tends to disguise real ecological trends due to land use or other factors. As many ecological changes in semi-arid rangelands occur very slowly, even 12-14 years of annual monitoring provides a limited view of long term trends.

Rangelands are complex. The changes described here simplify dominant trends averaged across many different sites. Each site has specific circumstances. However, site-specific data demonstrate our ability to report on issues such as saltbush dieback and responses to rabbit ripping (Green *et al.* 2001).

Site-based monitoring has both advantages and limitations in defining change in the spatial context of rangelands. We consider that RAP ground-based data used in conjunction with emerging remote sensing technologies will provide the most objective reporting on the health of the rangelands of western New South Wales. Proposed extensions to the RAP program therefore include case study investigations of remote sensing for spatial extrapolation of the point samples to broader areas of western NSW. Remotely sensed images are available for a similar time period as that of the RAP data, allowing direct comparison between the two datasets.

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