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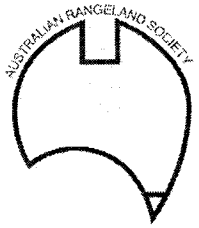

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CHANGE IN THE DARLING RIVERINE PLAINS BIOREGION: 1992-2002

R. Grant

NSW Department of Natural Resources, PO Box 77, Condobolin, NSW, 2877
Email russell.grant@dnr.nsw.gov.au

ABSTRACT

Recently a pilot project tested the capacity of agencies to report nationally on rangeland change through the Australian Collaborative Rangeland Information System (ACRIS). The NSW component of the pilot focused on change in the rangeland portion of the Darling Riverine Plains bioregion for the period 1992-2002. Key trends affecting parts of the bioregion are the decline of the wool industry, a shift to cereal cropping and a decline in floodplain function. Regional-scale natural resource monitoring datasets show that pastoral productivity, plant biodiversity, landscape function and groundcover are quite responsive to seasonal conditions, but longer-term trends appear stable.

INTRODUCTION

The Australian Collaborative Rangeland Information System (ACRIS) is coordinating the reporting of rangeland change across State and Territory jurisdictions (see ACRIS: http://www.deh.gov.au/land/management/rangelands/acris/index.html). To establish the feasibility of a national report on change, ACRIS recently coordinated a pilot project to test the capacity of natural resource management datasets to address key policy areas. The rangeland portion of the Darling Riverine Plains bioregion was selected as the NSW case study area over the chosen reporting period of 1992-2002. Information from this and four other case studies were then synthesised into a national report, presenting, to the extent possible, a consistent assessment of change across five geographically distinct rangeland regions for the decade (Bastin et al. 2005).

Five broad policy questions underpinned the pilot reporting framework, addressing key regional-scale natural resource management issues:

- Sustainable management: What was the change in critical stock forage productivity?
- Biodiversity: What was the change in native species?
- Landscape function: What was the change in landscape function?
- Ground and canopy cover: What was the change in cover?
- Socio-economic factors: What was the capacity for change in the region?

This paper summarises trends identified to answer these questions within the Darling Riverine Plains bioregion.

THE DARLING RIVERINE PLAINS CASE STUDY AREA

The rangelands of the Darling Riverine Plains bioregion (see Figure 1) are amongst the most pastorally productive in NSW. Land-use change, socio-economic adjustment resulting from the decline of traditional enterprises and floodplain deterioration through reduced flooding frequency add complexity to natural resource management issues within the bioregion.

The bioregion consists of extensive Quaternary alluvial plains associated with the Darling River and its tributaries. Low-gradient alluvial fans forming broad clay plains comprise the northern parts, while to the south-west, the alluvium exists as the floodplain of the Darling

River confined by higher landscapes. This floodplain is a "panhandle" of the bioregion, crossing areas of both summer and winter-dominant growing seasons along a gradient decreasing rainfall. To reduce the complexity of reporting, the "panhandle" was excluded from the case study.

Recent vegetation mapping is available for the study area (Northern Floodplains Regional Planning Committee, 2005). The dominant vegetation associations include open woodland communities dominated by coolabah (*Eucalyptus coolabah*) and black box (*E. largiflorens*), grasslands based on curly Mitchell grass (*Astrebla lappacea*), low shrublands of lignum (*Muehlenbeckia florulenta*) or canegrass (*Eragrostis australasica*) and chenopod shrublands of mainly bladder saltbush (*Atriplex vesicaria*).

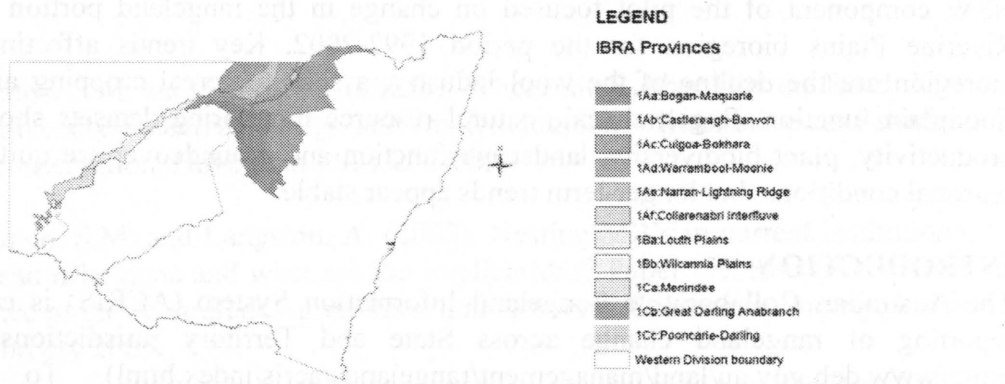

Figure 1: Map of the Darling Riverine Plains bioregion within New South Wales
The eastern margin of the rangelands approximates the Western Division boundary as marked

Implicitly, the reporting of change requires repeat measurements. While various snapshot studies reporting the status of natural resources of western NSW were produced over the period 1992-2002, few datasets encompass repeat measurements. The case study therefore relied heavily on monitoring data from the NSW Department of Natural Resources (DNR) Rangeland Assessment Program (RAP) but also the DNR Resource Assessment and Monitoring System (RAMS) and the NSW National Parks Kangaroo Management Plan aerial survey database. For all five case studies, ACRIS accessed national datasets covering demographic change (Australian Bureau of Statistics, ABS), modelled seasonal pasture growth and cover (AussieGRASS), seasonal quality based on vegetation greenness and forest cover change (Environmental Resources Information Network, ERIN).

REGIONAL TRENDS

Regional-scale trend information provides a broad overview of change. When based on aggregated site-scale data, local environmental and land management factors are muted and higher level factors such as seasonality or regional land use change have most influence. Over the reporting period, seasonal conditions across the Darling Riverine Plains included average seasons for 1992-94, above-average seasons from 1995 till 2000 and below average seasons for 2001-02. This seasonal backdrop was the primary influence on natural resource change over the reporting period, with drought suppressing many indicators leading into 2002.

The segregation of seasonal effects from land management influences is often a challenge for site-based rangeland monitoring systems. The ACRIS pilot projects used an approach to identify management influences based on a matrix comparing the direction of change of a parameter at the site level within the context of the direction of seasonal change. Management influences were inferred where site-based change was counter to the expected response in the context of the direction of seasonal change (Bastin et al. 2005).

An overview of significant regional trends identified within the ACRIS reporting framework follows. Further detail is accessible at:
http://www.deh.gov.au/land/management/rangelands/acris/publications-products.html

Sustainable Management
The RAP database was the primary source of relevant datasets for this theme, providing data on trends in perennial bush density, the frequency of palatable perennial grasses and pasture species biomass.

Historical records suggest that the Darling Riverine Plains bioregion once supported an abundance of palatable perennial grasses that were subsequently depleted by grazing (Beadle, 1948). While the present abundance of pastorally-valuable species such as curly Mitchell grass (*Astrebla lappaceae*) is relatively low, RAP monitoring over the 1992-2002 period suggests that pastoral productivity is stable in a decadal timeframe although highly responsive to year-to-year seasonal conditions. The density of pastorally-important chenopod shrub populations was also dynamic in the short term, although remaining relatively consistent over a decadal timeframe.

Biodiversity
Change in rangeland biodiversity is difficult to quantify and explicit monitoring systems have yet to evolve. Consequently, the pilot project relied on surrogate data to address this theme. The available datasets included the extent of cropping (RAMS database), species diversity of pastures and chenopod shrubs (RAP) and kangaroo census (NSW National Parks Kangaroo Management Plan aerial survey database).

The most obvious influence on biodiversity has been a widespread change of land use from extensive grazing to cereal cropping, driven by economic and social considerations. Between 1992 and 2003, the area of cropping within the study area increased by approximately 97,600 hectares to an estimated 183,400 hectares (RAMS database).

On land used for extensive grazing, average pasture diversity ranged from 23 to 42 species per site, with a stable long-term trend. Above average seasonal rainfall appeared to be the source of most year-to-year variability. Shrub diversity in chenopod communities also remained constant, although this is expected in a decadal timeframe. Commercially harvested kangaroo populations appear to be responsive to seasonal change but otherwise stable.

Landscape Function
Formal landscape function data has yet to be collected systematically within the bioregion, so surrogate information was used to discern broad regional trends. A compound index based on the frequency of perennial plants and groundcover was used on the premise that these two factors significantly influenced the ability of the local landscape to retain resources and support plant growth. This index suggested a gradual improvement in landscape function from 1992 until the onset of drought in 2001, largely driven by seasonal opportunity rather than management influence.

Change in flooding regime is a regional scale landscape function issue operating over a decadal timeframe within the bioregion. Analysis of annual flow data shows a declining trend in the extent of episodic flooding across the floodplains of the Culgoa, Bokhara and Narran Rivers. Between 1988 and 2004, the relative share of individual flooding events with peaks of around 60,000 ML/day at St George, Queensland, reaching NSW has declined from an

average of over 50% in 1997 to only 20% in a 2004 event. Satellite image analysis indicates that the extent of flooding has declined by 88% (140,000 hectares) in comparing similar events in 1988 and 2004. This reduction in flooding frequency and extent places riverine and floodplain ecosystems at risk of decline, with associated negative impacts on pastoral productivity on areas reliant on periodic inundation.

Ground and Canopy Cover

Both groundcover and canopy cover are important parameters of rangeland health. Groundcover was considered on the basis of both AussieGRASS modelling and RAP site data. There was general trend to increased groundcover from 1992 until the onset of drought in 2001. This change was accord with the overall direction of seasonal change as the dominant influence. Canopy cover change data from RAP sites was also considered. Canopy cover is highly variable across the bioregion and often very low. Of 15 sites considered, canopy cover increased on the majority between 1991 and 2002.

Socio-economic Factors

The social and financial circumstances of landholders define their capacity for management of natural resources. Information accessed to address this component of the project included demographic trend data (ABS, 2004), the status of diversification (various sources), trends in land value (DNR), trends in stock numbers (RAP, various) and available data from a range of projects addressing change in natural resource management. Key changes affecting the bioregion include the declining profitability of wool-growing with a flow-on fall in stock numbers, diversification into cropping as the most attractive alternative enterprise option and an increasing age profile of land managers. Several of these influences imply a declining capacity to embrace changes in natural resource management.

CONCLUSION

A decade is a short period when considering ecological and socio-economic change in rangelands. The period 1992-2002 presented one "cycle" of seasonal conditions within the Darling Riverine Plains bioregion, finishing with a long drought and the yet unanswered question of subsequent recovery. Many regional-scale parameters are strongly influenced by season, but appear to have a longer-term stable trend.

The project highlighted a lack of temporal data for biodiversity and landscape function in reporting on change in NSW rangelands. Despite this limitation, the case study provided encouragement on the capacity to report in a NSW rangeland-wide context as a component of ACRIS reporting at the national level.

REFERENCES

ABS (2004). A Regional Profile– Selected Regions within Australia's Rangelands 2004. Report compiled for the National Land and Water Resources Audit by the Australian Bureau of Statistics. Commonwealth of Australia, Canberra.

Bastin, G. and members of the ACRIS Management Committee (2005). Australian Collaborative Rangeland Information System: Reporting Change in the Rangelands, National synthesis of reports from pilot regions. CSIRO Alice Springs. 156 pp. (available at http://deh.gov.au/land/management/rangelands/acris/publications-products.html)

Beadle N C W. (1948) The Vegetation and Pastures of Western NSW with Special Reference to Soil Erosion. Dept of Conservation of NSW.

DIPNR. (2004) River flow and floodplain inundation impacts of current water resource development in the lower Condamine-Balonne. DIPNR Far West Region.

Northern Floodplains Regional Planning Committee. (2005) Vegetation communities of the Northern Floodplains, Western NSW. Books 1-3.