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# A CLIMATE OF CHANGE: INFORMED BY THE AUSTRALIAN COLLABORATIVE RANGELAND INFORMATION SYSTEM

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## INTRODUCTION

'Change' is a continuing theme from previous rangelands conferences: e.g. it was a key element at Renmark in 2006 (Foran 2006). So in today's world where climate change is accepted (if not fully understood) and where management of Australia's water resources impacts both the rural community and suburbia, what does 'a climate of change' mean and what is its relevance to the rangelands? We provide a partial answer to the first question. That change is relevant to the rangelands is undeniable.

The rangelands cover ~80% of Australia, are home to approximately 600,000 people and experience extreme climate variability. Pastoralism has altered many environments with eight degradation episodes recorded since federation (McKeon *et al.* 2004). The arid zone has a dismal record for mammal extinctions and in the absence of comprehensive monitoring data, the best assessment is that biodiversity continues to decline in the wider rangelands (Bastin *et al.* 2008). Real prices for meat and wool are still declining. Demographic trends are that rangeland managers continue to age and young people are leaving most regions (Hanslip and Kelson 2007), a trend common with rural Australia.

Some of the above statements have a solid basis, e.g. the social demographics from census data. Others are more general and are little more than informed opinion or best guess. In a climate of change, the decisions required to better manage the rangelands ought to be based on fact derived from the best available data; if it's not measured, then it's difficult to manage. This paper provides headline statements and brief interpretations of recent change based on data available to the Australian Collaborative Rangeland Information System (ACRIS).

## ACRIS

ACRIS is a partnership between agencies of the Australian Government and rangeland states (including the NT) that are responsible for natural resource management (NRM) and biodiversity conservation. The state agencies contribute interpreted monitoring data that are collated across jurisdictions and synthesised with higher-order analysis (i.e. meta-analysis) by a Management Unit to periodically report change in the rangelands. Funding for the Management Unit and some ACRIS activity is provided by the Australian Government and administered by the Desert Knowledge Cooperative Research Centre. State and NT partners have also made substantial investments through their monitoring programs and other rangeland NRM activities.

## Purpose and scale of ACRIS reporting

The state, NT and Australian government partners in ACRIS are responsible for balancing the economic and social needs of the whole Australian community with the maintenance of productive land resources and the conservation of biodiversity. These responsibilities are manifested and implemented through legislation, through national and international strategies and through a range of programs and delivery mechanisms, such as *Caring for Our Country* and the preceding *Natural Heritage Trust*. Both levels of government have periodic reporting requirements (e.g. State of Environment) and the Australian Government has international reporting obligations (e.g. the United Nations Convention to Combat Desertification). Importantly, policies and programs, including assistance measures, directly relevant to the rangelands ought to be periodically reviewed for their effectiveness in delivery. All require data for proper reporting and evaluation.

ACRIS reporting and specifically, *Rangelands 2008 – Taking the Pulse*, is directed at assisting state, national and international levels of reporting by synthesising results across jurisdictions, but retaining regional resolution where appropriate. Most results lack the spatial resolution required to directly

assist regional NRM groups in reporting change in their resource condition targets, but our regional results should provide valuable context for assisting these groups in interpreting more local data.

### **Understanding Change**

There are four components to interpreting and understanding change: (i) from what starting point has change occurred? (i.e. baseline condition or state), (ii) the direction of change (trend), (iii) whether the change is desirable (value judgement) and (iv) what caused the change (attribution). The ACRIS Management Committee has focussed on reporting the magnitude and direction of change (see results in Bastin *et al.* 2008). While this provides valuable information, it can at times be misleading, e.g. 'no change' in long-term forage supply (called critical stock forage) superficially is a positive indication of sustainable grazing management. However, it is a less desirable result for sites in a degraded state.

Improved rangeland management requires that we identify those changes which are undesirable for the majority of purposes. Often this is a value-laden judgement. Ludwig *et al.* (1997) caution strongly that greater clarity is obtained if the process of detecting change is separated from judgements about the value of such change. A single change can be judged differently by various end-users. Examples include (i) an increase in unpalatable perennial grasses that increase landscape function but reduce grazing value; (ii) the spread of buffel grass (*Pennisetum ciliare*, syn. *Cenchrus ciliaris*) or additional waterpoints may improve pastoral productivity but decrease biodiversity; and (iii) feral goats increase total grazing pressure and add to damage caused by other grazing animals but when mustered and sold, can contribute significantly to station income.

Rainfall is the principal driver of vegetation change in the rangelands. Thus in interpreting change, we need to separate its effect on measured attributes of the vegetation from wildfire, grazing management and other possible causes of change. ACRIS has implemented a 'seasonal quality' matrix for filtering seasonal effects on change (Bastin *et al.* 2008). We demonstrate towards the end of this paper how a variant of this matrix may assist in formulating management and policy responses to detected change.

### **Change in the rangelands**

Headline statements of change in biophysical and socio-economic themes between 1992 and 2005 are summarised in Table 1. Particular caveats apply to the various results and the reader should refer to the complete report (Bastin *et al.* 2008) for a more comprehensive account of change.

### **TURNING DATA INTO INFORMATION**

How should land administrators, program managers and policy advisers act when presented with the types of results in Table 1? The usual answer of "it depends" probably applies. As a guide though, an adapted form of the ACRIS seasonal quality matrix (Table 2) may help guide regional responses to changes in landscape function and sustainable management. With more data, this framework may assist in answering a realistic question such as: is the recent growth of the northern beef industry sustainable in terms of natural resource management?

Using data available to the ACRIS, we can report that large parts of northern Australia experienced very good seasonal conditions through most of the 1992-2005 period. This coincided with generally strong demand for live-shipper cattle into south east Asia. Widespread pastoral intensification has resulted with herd improvement, higher stocking rates, infrastructure development and significant increases in land values. While this intensification has improved stock and land management, and has undoubtedly led to more effective fire management, there is a risk that financial exposure may challenge the ability of some land owners to respond in a timely manner should the run of good seasons end. The high land prices are also a challenge for those seeking to achieve biodiversity conservation outcomes. The most pastorally productive regions – those where land values have risen the highest – are often the most poorly represented within the conservation estate.

**Table 1. Summarised change in biophysical and socio-economic themes between 1992 and 2005.**

Theme	Change
Climate variability	Seasonal quality between the early 1990s and 2005 was generally above-average in the north and north-west, variable in much of central Australia, initially above average in most of the WA and SA shrublands followed by drier-than-average conditions, and below average followed by drought conditions in the eastern grasslands and mulga lands.
Landscape function	The majority of pastoral monitoring sites in 26 bioregions in WA, SA, NSW & NT suggest an increase or stability in landscape function given the trends in seasonal quality and known stocking densities from 1992-2005. Baseline condition is unknown and a 'no change' (stable) result may not be favourable for sites in degraded landscapes. Reported change is for the local area of monitoring sites, not the whole of each bioregion. Five bioregions in Queensland showed seasonally adjusted stability or increase in landscape function from road-traverse data. Six bioregions had decreased landscape function.
Sustainable management	Critical stock forage remained stable or improved at the majority of sites in 28 bioregions with suitable data for reporting, despite periods of low seasonal quality and variable stocking density. Stability may be an unfavourable result for sites located in degraded landscapes.
Total grazing pressure (TGP)	<i>Livestock</i> : densities consistently declined in some south-eastern bioregions (e.g. Riverina) and consistently increased in some northern bioregions (e.g. Pilbara). Elsewhere, stocking density broadly tracked seasonal quality. However there is evidence from some pastorally important bioregions that recent stocking density has remained high as seasonal quality has deteriorated. <i>Kangaroos</i> : are a significant component of TGP in the southern and eastern rangelands, where they contribute 20 to 40% of livestock grazing pressure. There is considerable year-to-year variation in their contribution to TGP relative to livestock. <i>Feral herbivores</i> : contribute significantly to TGP in parts of the rangelands; distributions are known reasonably well but reliable data on regional densities are generally lacking.
Fire regime	Across northern Australia, up to 40% of some tropical savanna bioregions burn each year. Altered fire regimes are having significant impacts on components of the native flora and fauna.
Biodiversity	Substantial declines in rangeland biodiversity have occurred historically and there is no reason to believe that these have ceased given current land uses and the time lags in the biological responses. This assumption is backed by documented declines in the detection rates of some bird species in the rangelands by the Birds Australia volunteer network. The Collaborative Australian Protected Areas Database (1997-2004) documents significant changes in management intent for some areas, most notably in the Great Victoria Desert and Central Ranges bioregions where Indigenous communities have agreed to manage very large areas for biodiversity conservation. There has been a significant reduction in the extent of woody cover due to broad-scale clearing in a limited number of bioregions on the eastern margin of the rangelands (Qld and NSW). Case studies show that loss and fragmentation of habitats has affected several rangeland species. In many pastorally productive regions, increased numbers of water points have reduced the area remote from water. Water-remote areas may make a de facto contribution to biodiversity conservation, as lower TGP in these areas may provide refugia for biodiversity.
Socio-economics	Land values have increased in the order of 150-300% for many pastorally important bioregions over part or all of the reporting period, notwithstanding problems in comparing values derived by differing ways in each jurisdiction. In most regions, these increases were far more than could be accounted for by increases in productivity (turn-off of meat and/or fibre).

## A FUTURE FOR ACRIS

Change in the rangelands is ongoing and will likely accelerate under climate change scenarios. *Rangelands 2008 – Taking the Pulse* has demonstrated our capacity to report on several components of change and this is very dependent on jurisdictional monitoring programs. These must be maintained as there is no substitute for longitudinal data in identifying change. What we don't measure we can't manage: e.g. the paucity of data with which to identify trends in biodiversity severely compromises our ability to develop, implement and refine effective conservation strategies at the national, jurisdictional and regional levels.

An ongoing dialogue is required between policy makers and program managers (including those charged with delivering monitoring programs) to ensure there is clear articulation of the issues to be addressed and of the information needed to guide decision makers.

**Table 2. The ACRIS framework for interpreting regional trends in landscape function and stock forage relative to recent seasonal quality.**

Seasonal quality	Trend in landscape function or critical stock forage most of the region showing:		
	Decline	No change	Increase
Above Average	Management has suppressed the expected response <i>Further investigation required</i>	Management has not delivered the expected response <i>Further investigation required</i>	Management has delivered a response consistent with expectations
Average	Management has not delivered the expected response <i>Further investigation required</i>	Management has delivered a response consistent with expectations	Management has delivered a better than expected response <i>Investigate, acknowledge and promote management actions</i>
Below Average	Management has delivered a response consistent with expectations	Management has limited the impact of below-average seasons <i>Investigate, acknowledge and promote management actions</i>	Management has had a significantly beneficial impact on the outcome <i>Investigate, acknowledge and promote management actions</i>

(Text in normal font describes the seasonally interpreted change and *italics* presents the recommended action. Grey shaded cells show an adverse result with the intensity of grey emphasising the urgency of action. Conversely, grey shaded text highlights beneficial outcomes, darker grey showing the most positive result.)

An inability to document real trends across important socio-economic issues is one of the major limitations. Several proxy indicators of the capacity of land managers to change management practices were tested but few delivered meaningful information (Hanslip and Kelson 2007). There is a continuing need to develop effective socio-economic indicators, at the very least to ensure that government assistance programs are appropriately targeted, managed and improved.

The relevance of ACRIS to other stakeholders, such as regional NRM groups, industry organisations, the non-government conservation sector and Indigenous land managers, Indigenous people now have a recognised interest in managing 37% of the rangelands. Increased understanding of the specific information needs of all these users and how their needs can be met will increase the relevance and use of ACRIS, particularly as a repository of interpreted information.

The future wealth of inland Australia is largely dependent on its natural and cultural heritage values. To avoid compromising these values, actions by land administrators, and natural resource policy and program managers must be informed by the best available data, such as that provided by ACRIS.

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