



**Australian Government**  
**National Land & Water Resources Audit**

**Extract from Rangelands 2008 — Taking the Pulse**  
**Executive summary**

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Assistant Secretary  
Biodiversity Conservation Branch  
Department of the Environment, Water, Heritage  
and the Arts  
GPO Box 787  
Canberra ACT 2601  
Australia

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ISBN 978 0 642 37146 1

ISBN 978 0 642 37147 8 (CD-ROM of the report)

ISBN 978 0 642 37148 5 (PDF)

Product number: PN21387

**Suggested citation**

Bastin G and the ACRIS Management Committee, Rangelands 2008 — Taking the Pulse, published on behalf of the ACRIS Management Committee by the National Land & Water Resources Audit, Canberra.

**Acknowledgments**

Rangelands 2008 — Taking the Pulse is the work of many people who have provided data and information that has been incorporated into this report. It has been possible due to significant in-kind contributions from the State and Territory governments and funding from the Australian Government through the Natural Heritage Trust. Particular thanks are due to staff of the Desert Knowledge Cooperative Research Centre, including Melissa Schliebs, Ange Vincent and Craig James.

**Cover photograph**

West MacDonnell Ranges (photo Department of the Environment, Water, Heritage and the Arts)

Principal author: Gary Bastin, CSIRO and Desert Knowledge CRC

Technical editor: Dr John Ludwig

Editors: Biotext Pty Ltd

Design: Design ONE

Printed in Australia by Lamb Print

Printed with vegetable-based inks on stock that comprises 80% recycled fibre from postconsumer waste and 20% totally chlorine-free pulp, sourced from sustainable forests.

August 2008

# Executive summary

## Major findings

This report, *Rangelands 2008 — Taking the Pulse*, is the first time that disparate datasets have been brought together at a national and regional scale to report change in Australia's rangelands. The rangelands cover some 81% of Australia and are popularly known as 'the outback'.

- Rainfall variability is one of the major drivers of change in the rangelands. Managing short-term (seasonal and yearly) variability within the context of longer-term climate change is a key challenge to ensuring sustained production and biodiversity conservation.
- Much of our current understanding of change in the rangelands derives from pastoral monitoring programs that report specifically on pastoral land management.
- Landscape function — a measure of the landscape's capacity to capture and retain rainfall and nutrients — increased or remained stable between 1992 and 2005 at a majority of pastoral monitoring sites.
- Historically, rangeland biodiversity has substantially declined, and there is no reason to believe that the decline has been arrested. Our ability to report change in biodiversity continues to be limited by inadequate data.
- Up to 40% of some tropical savanna bioregions burn each year. A national system for reporting the extent and frequency of fire is now in place.
- Eleven plant species have the capacity to permanently alter ecosystems across Australia's rangelands.
- Land values increased appreciably between 1992 and 2005 across most of the grazed rangelands — far more than could be accounted for by increases in real productivity.
- The Australian Collaborative Rangeland Information System (ACRIS) provides an excellent baseline for ongoing tracking of natural resource management in the rangelands.

The rangelands — popularly known as ‘the outback’ — cover 81% of Australia’s land area (Figure 1). Revenue generated through mining (more than \$12 billion annually), tourism (more than \$2 billion annually) and agriculture (\$2.4 billion in 2001) contributes significantly to Australia’s economy. The rangelands are relatively intact ecosystems and contain important components of Australia’s biodiversity. Additionally, they are home to many Indigenous people and have important cultural value for most Australians.

**Figure 1 Extent of the rangelands and major population centres in Australia**



Source: NLWRA, 2007

There are many natural resource management challenges in the rangelands. Historical declines in biodiversity may be continuing under current land management practices. Dry years are normal, making it difficult to distinguish the effects of inappropriate grazing practices from the effects of drought. Other pressures include inappropriate fire regimes, weeds, grazing by kangaroos and feral animals, and water extractions and diversions.

Governments' task is to balance economic and social needs with the maintenance of productive land resources and the conservation of biodiversity. Regional investment priorities, national, state and Northern Territory (NT) legislation, and international conventions and strategies all guide the use and management of different parts of the rangelands. The effectiveness of these various policies and investment strategies can only be judged by access to information such as ACRIS is providing.

Policies, programs, and on-ground management of natural resources should all be based on the best available data. ACRIS — a partnership between government organisations responsible for rangeland management — is a coordinating mechanism for collating and synthesising information. This report is the first time that disparate datasets (from 1992 to 2005) have been brought together to present integrated results at a national and regional scale for policymakers and managers.

### Rangeland environments

The rangelands encompass tropical woodlands and savannas in the far north; vast treeless grassy plains (downs country) across the mid-north; hummock grasslands (spinifex), mulga woodlands and shrublands through the mid-latitudes; and saltbush and bluebush shrublands that fringe the agricultural areas and Great Australian Bight in the south. Across this gradient, seasonal rainfall changes from summer-dominant (monsoonal) in the north to winter-dominant in the south. Soils are characteristically infertile. Great climate variability and the dominating influence of short growing seasons distinctly characterise rangeland environments.

Interpreting the data

The Natural Resource Management Ministerial Council tasked the ACRIS Management Committee with exploring Australia’s capacity to identify, explain and forecast the impacts of environmental, economic and social change in the rangelands. The committee’s report, synthesised from jurisdictional pastoral monitoring data and other national sources, presents findings for a number of information types grouped by theme (Table 1).

In reporting on change in the rangelands, data have generally been aggregated to regions or subregions from the Interim Biogeographic

Regionalisation for Australia (IBRA). A bioregion is a large, geographically distinct area of land and/or water that has assemblages of ecosystems forming recognisable patterns within the landscape. In addition, some socioeconomic data, such as that of the Australian Bureau of Statistics, are aggregated into statistical local areas (SLAs).

Several aspects of data availability and suitability were identified that, if improved, should lead to more comprehensive and confident reporting in future (see ‘Issues in reporting’ box).

Table 1 Information types, grouped by theme, used by ACRIS to report change in the Australian rangelands between 1992 and 2005

| Theme                  | Information type                                                                                                                                                                                                                                                                                     |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Climate variability    | ■ seasonal quality as context for interpreting change                                                                                                                                                                                                                                                |
| Landscape function     | ■ landscape function (the capacity of landscapes to capture and retain rainwater and soilborne nutrients for plant growth)                                                                                                                                                                           |
| Sustainable management | ■ critical stock forage<br>■ pastoral plant species richness<br>■ distance from stock water<br>■ invasive weeds                                                                                                                                                                                      |
| Total grazing pressure | ■ domestic stocking density<br>■ kangaroo density<br>■ feral animals                                                                                                                                                                                                                                 |
| Fire and dust          | ■ fire regime<br>■ atmospheric dust (Dust Storm Index)                                                                                                                                                                                                                                               |
| Water resources        | ■ information sources for water availability and sustainability                                                                                                                                                                                                                                      |
| Biodiversity           | ■ protected areas<br>■ number and status of threatened species/communities<br>■ habitat loss by clearing<br>■ effects of stock waterpoints on biota<br>■ fauna and flora records/surveys<br>■ ‘transformer’ weeds<br>■ condition of wetlands<br>■ habitat condition<br>■ bird population composition |
| Socioeconomic          | ■ socioeconomic profiles<br>■ value of non-pastoral products in the rangelands<br>■ land use and pastoral land values                                                                                                                                                                                |

## Key issues and findings

### Climate variability and management influences

'*Seasonal quality*' describes the relative value of recent rainfall for vegetation growth and is used to help distinguish the impacts of climate variability from those of grazing management and fire. The term is italicised throughout this report to emphasise its use for indicating the effects of recent climate.

#### → Findings

*Seasonal quality* between the early 1990s and 2005 was generally above average in the north and northwest, variable in much of central Australia, initially above average in most of the Western Australia (WA) and South Australia (SA) shrublands followed by drier-than-average conditions, and below average followed by drought conditions in the eastern grasslands and mulga lands.

#### → Management implications

Pastoralists and other land managers are likely to face increased rainfall intensity and cyclone incidence across the north, and decreased rainfall and changing seasonal patterns across southern and southeastern regions. Increased atmospheric carbon dioxide may enhance photosynthesis, partly offsetting the expected reduction in plant growth in areas of decreased rainfall.

### Landscape function and grazing pressure

'Landscape function' — a measure of the landscape's capacity to capture rainfall and nutrients — provides an assessment of landscape condition and resilience, including cover of perennial plants.

'Critical stock forage', which can be reported using a subset of the data used for landscape function, comprises perennial forage species known to decrease with excessive grazing (typically, palatable perennial grasses in the north and centre, and palatable chenopod shrubs in the south).

Grazing by livestock (cattle and sheep), feral herbivores (goats, donkeys, horses, camels) and kangaroos affects landscape function and critical stock forage, particularly when total grazing pressure remains high in years of lower *seasonal quality*.

#### → Findings

Results are based on monitoring programs that provide information about pastoral land management, not ecological sustainability.

Data from the majority of monitoring sites in 26 bioregions in WA, SA, New South Wales (NSW) and the NT suggest an increase or stability in landscape function, given the trends in *seasonal quality* and known stocking densities from 1992 to 2005. Baseline condition is unknown and a 'no change' (stable) result may not be favourable for sites in degraded landscapes (ie increased landscape function is a more desirable outcome in such cases). Reported change applies to the local area of monitoring sites, not the whole of each bioregion.

In Queensland, five bioregions showed seasonally adjusted stability or increase in landscape function from road-traverse data. Six bioregions had decreased landscape function.

Critical stock forage has 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. As for landscape function, baseline condition is unknown and stability may be an unfavourable result for sites in degraded landscapes.

In some pastorally important bioregions, recent stocking density has remained high as *seasonal quality* has deteriorated.

Kangaroos contribute between 20% and 40% of the livestock grazing pressure in the southern and eastern rangelands. There is considerable year-to-year variation in the contribution of kangaroos to total grazing pressure relative to livestock. Feral herbivores also contribute significantly to total grazing pressure in some areas. Their distributions across the rangelands are known reasonably well, but reliable data on regional densities are generally lacking.

#### → Management implications

Without adequate knowledge of baseline condition and more extensive monitoring data, it is difficult to assess the impact of recent grazing management practices. While there is a view that management practices are benign, that assessment could be

overoptimistic, particularly where 'no change' has occurred at sites in poor condition.

In some northern bioregions (eg the Pilbara), the buoyant live-shipper market into Southeast Asia has resulted in a considerable increase in cattle numbers during generally good seasons. In other areas, intensification through lease subdivision, development of grazing infrastructure and improved fire management have accompanied this expansion in cattle numbers (notably in the Sturt Plateau bioregion).

Future improvement (where possible) in landscape function and critical stock forage requires that pastoralists continue to make timely adjustments to total grazing pressure in line with variable *seasonal quality*. This imperative is increased with higher stocking densities under intensified production. The continued timely delivery of information to pastoralists and land management agencies about trends in landscape function and critical stock forage should assist appropriate future land management practices.

## Biodiversity

Biodiversity is the variability among living organisms from all sources, and includes diversity within species and between species and diversity of ecosystems. Land clearing, wildfire and grazing have affected biodiversity in parts of the rangelands, but our ability to report change in biodiversity is limited due to inadequate data.

### → Findings

Historically, there have been substantial declines in rangeland biodiversity, and there is no reason to believe that they have ceased, given current land uses and time lags in 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) (CAPAD) documents significant changes in management intent for some areas, most notably in the Great Victoria Desert and Central Ranges bioregions of central Australia where Indigenous communities have agreed to manage very large areas of their land for biodiversity conservation.

The extent of woody cover has significantly decreased due to broadscale clearing in a limited number of bioregions on the eastern margin of the rangelands (Queensland and NSW). Case studies show that loss and fragmentation of habitats have affected several rangeland species.

In many pastorally productive regions, increased numbers of waterpoints have reduced the area of land remote from water. In some instances, water-remote areas can make a de facto contribution to biodiversity conservation, as lower total grazing pressures in those areas may provide refugia for biodiversity.

### → Management implications

*The New Atlas of Australian Birds* (Barrett et al 2003) provided valuable insights into change for approximately 60 bird species, but there were limitations in the more remote parts of the rangelands due to scarce data and high seasonal variability.

CAPAD allowed reporting of change in the extent of Indigenous protected areas, private protected areas and the National Reserve System. However, absence of data on the effectiveness of management (for instance, in weed and feral animal control) prevents quantification of improvements in biodiversity outcomes. A key challenge is to establish the capacity to manage those areas effectively for biodiversity conservation.

The most pastorally productive bioregions remain the most poorly represented within the National Reserve System.

Areas remote from water in pastoral country can contribute to biodiversity conservation, but their value diminishes where they occur as isolated patches and where weeds, feral animals and fire are inappropriately managed.

## Fire regimes

High fire frequency and intensity, and large-scale fires, can damage rangelands, as can the absence of fire where it was once part of the ecosystem. A national system for reporting the extent and frequency of fire is in place and can now track changes in fire regimes.

### → Findings

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.

### → Management implications

In areas such as the Sturt Plateau bioregion, communities are working with government to manage fire for improved production and conservation outcomes. Elsewhere, there are programs to re-establish Indigenous burning practices (eg the West Arnhem Land Fire Abatement Project).

In the semiarid eucalypt and acacia woodlands in the eastern rangelands and in the northern tropical savannas, reduced fire frequency affects the management of woody thickening, a significant issue for the pastoral industry in some regions.

## Weeds

Weeds affect both production values and biodiversity conservation. Eleven plant species have been identified as 'transformer weeds' that permanently alter ecosystems and habitats. The transformer weeds include rubber vine, prickly acacia and four exotic grasses.

### → Findings

Despite an improved ability to map the distribution and abundance of some significant weeds, such data are absent or inadequate for many others.

### → Management implications

Inadequate data on changes in the distribution and abundance of important weed species make it difficult to quantify those species' effects on production and biodiversity conservation at a bioregion scale.

Some transformer weeds, such as buffel grass, can also provide an important economic resource to the pastoral industry. Addressing the lack of agreed protocols for the use of such species, and minimising their impacts on biodiversity values, remain significant challenges.

## Land values

Socioeconomic data for the rangelands are difficult to extract from national statistical datasets, but changes in pastoral land values (which may reflect relative profitability, asset-to-income ratios and ability to service debt) have been reported. There are problems in comparing values derived by differing means in each jurisdiction, but these indicators reveal important long-term trends in the social and economic viability of pastoral land.

### → Findings

Land values have increased in the order of 150%–300% for many bioregions over part or all of the reporting period.

### → Management implications

Generally, increases in land values were far more than could be accounted for by increases in productivity (turn-off of meat and/or fibre). Increasing cattle prices during parts of the 1992–2005 period may have contributed to increased financial productivity over and above any gains in agricultural productivity, but this was not the case for the wool industry.

For established rangeland pastoral enterprises, the increase represents a substantial boost in asset wealth. However, those who have recently bought rangeland properties may be under greater pressure to maintain a return on equity, and hence to overstock.

## The value of regional comparisons

Summaries for individual bioregions, and in some cases for broader regions where particular unifying themes are apparent, provide important insights, particularly in relation to varying management strategies and practices.

An example is the northern beef industry, for which recent good seasons have coincided with the rapidly developing demand for live cattle in easily accessible Asian markets and thereby dramatically improved economic prospects. This has resulted in significant

enterprise intensification, including subdivision of leases, infrastructure development (additional waterpoints, fences and yards), and herd build-up, particularly in the Sturt Plateau and Pilbara bioregions. The economic opportunities provided by these developments have encouraged better herd and land management, including regional fire control programs. However, those successes may be threatened by a return to poorer seasonal conditions in the future; how management responds by adjusting stock numbers will test the sustainability of the industry.

### Issues in reporting

In compiling *Rangelands 2008 — Taking the Pulse*, several issues related to data availability and suitability were identified.

- Existing jurisdictional monitoring systems cannot provide all the information required for comprehensive national reporting.
- Integrated programs for more effectively monitoring biodiversity and landscape function are required.
- The focus has been on reporting change, with less attention paid to quantifying baseline condition.
- Because site-based data collection is rarely statistically robust, it is not valid to infer that site data represent the whole of any region; improved reporting of some parameters will come from linking ground-based data collection with appropriate remote sensing.

## Emerging information users

Given significant shifts in management responsibilities in the rangelands, Indigenous landowners, natural resource management (NRM) groups and the non-government environment sector are all potential clients for future information products from ACRIS.

## Indigenous land managers

Indigenous people now have primary responsibility for managing 27% of the rangelands. ACRIS has a role in assisting that management, but there may be value in exploring specific additional Indigenous needs that ACRIS could satisfy. The scale of information needs for Indigenous organisations and commercial pastoralists is largely congruent at property to subregional scale, usually at a finer scale than ACRIS currently delivers.

## Regional natural resource management groups

As regional NRM groups are responsible for implementing NRM programs to improve land management and biodiversity conservation, ACRIS can potentially help by providing contextual data at appropriate scales. For example, ACRIS data on recent *seasonal quality* and fire history (in northern Australia) and seasonally interpreted changes in landscape function and critical stock forage are useful for regional NRM planning. In return, data collected by NRM groups could assist ACRIS in reporting change at the regional scale. For example, property managers in the Northern Gulf Resource Management Group (north Queensland) are using global positioning system (GPS) units to record the locations of infrastructure, land types, weed infestations and pasture condition classes — information of value to ACRIS.

## Non-government environment sector

The non-government environment sector acquired 25 rangeland properties (approximately 18 000 km<sup>2</sup>) for biodiversity conservation in the 10 years to 2007. The Australian Wildlife Conservancy and Bush Heritage Australia are required to report to investors on the effectiveness of their management in meeting conservation objectives, and ACRIS may be able to assist by providing regional context. Sharing of data from non-government sources would also assist ACRIS with regional reporting of change, as demonstrated by the information on rangelands avifauna from volunteer members of Birds Australia. There is considerable potential for such 'citizen science' to contribute to the capacity of ACRIS to document environmental change.

### ACRIS — maximising future value

This first attempt at bringing together disparate environmental, economic and social data to report changes in the rangelands has demonstrated that ACRIS can identify significant and emerging trends.

This success is largely due to the availability of long-term, consistent information sets, such as those provided through pastoral monitoring. Those datasets have allowed reporting on change in the environmental parameters being directly measured. When they are integrated with other datasets, such as kangaroo density and fire frequency, more robust interpretations of changes in resource condition and in biodiversity are enabled.

The existing monitoring programs are national assets for policy and program purposes. Their value would be even greater if they were expanded to sample the landscape comprehensively and if gaps such as biodiversity monitoring could be addressed.

As well as providing comprehensive reporting, ACRIS is a valuable forum for collaboration between agencies and across jurisdictional boundaries. The challenge now is to consolidate the lessons, skills and mechanisms developed through the production of this report into a permanent, dynamic information system. The goal of ACRIS is to enhance its ability to meet the information needs of those involved in the sustainable use, conservation and management of Australia's unique rangelands at bioregional to national scales.

### Future monitoring requirements

Australia's rangelands are characterised by huge climatic variability and by a rich mix of diverse people, land uses and land management practices. The strength of *Rangelands 2008 – Taking the Pulse* lies in the report's documentation of changes over a relatively long period (1992–2005) and its identification of the major drivers of change and the extent of their contribution to those changes.

Although reporting at a national scale is useful for national policies and programs, reporting at a bioregional scale is equally useful in allowing cross-regional comparisons. As there is no 'one size fits all' response appropriate for managing the rangelands, given their size and variability, the ability of ACRIS to produce data and information at appropriate scales is a challenge for the future.

In some regions, stocking densities appear to be out of step with declining *seasonal quality*. There are also areas where total grazing pressure has increased due to kangaroos and feral herbivores, particularly goats. The ability of ACRIS to track trends in landscape function and critical stock forage for these 'at risk' regions would help us to assess whether risks are increasing or decreasing over time. The decreased extent of destructive late dry-season fires in some northern bioregions suggests that fire management is improving, although a longer period of monitoring is required for confirmation.

ACRIS provides an excellent baseline for ongoing tracking of NRM in the rangelands.