Australian Government

National Land & Water Resources Audit

Extract from Rangelands 2008 — Taking the Pulse
1. Introduction

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Disclaimer

This report was prepared by the ACRIS Management Unit and the ACRIS Management Committee. The views it contains are not necessarily those of the Australian Government or of state or territory governments. The Commonwealth does not accept responsibility in respect of any information or advice given in relation to or as a consequence of anything contained herein.

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

1 Introduction

Rangelands 2008 — Taking the Pulse has been compiled by the Management Committee of the Australian Collaborative Rangelands Information System (ACRIS-MC). The report is based on data that describe change in the Australian rangelands' natural resources. Most of the available data cover the period from 1992 to 2005.

The report's title derives from the dynamic but sometimes fragile nature of the rangelands, and the need to monitor the way this large part of Australia responds to human impacts. As medical staff take our pulse as a measure of our health, so we take the 'pulse' of the rangelands to determine how they are changing through time. The analogy is strengthened by viewing satellite images of vegetation growth over a 10–20 year period. The sequential images appear as a beating heart, as vegetation greens (grows) each summer in the monsoonal north, most winters in the south and irregularly in the arid interior.

Effective decision-making requires an understanding of those changes. This report aims to document change in resource condition in the rangelands by bringing together data (the quantities or numbers that represent change) and information (how we interpret those numbers) to test, for the first time, their capacity to present a national picture. The source of data and information is ACRIS.

Australia's rangelands

The rangelands are those areas where the rainfall is too low or unreliable and the soils too poor to support regular cropping. This definition covers about 81% of Australia and includes diverse savannas, woodlands, shrublands, grasslands and wetlands (Figures 1.1 and 1.2). For ACRIS reporting purposes, the rangelands are the vast areas of arid and semiarid Australia, including the monsoonal north (Figure 1.3). Areas of native pastures in temperate southern Australia, such as those in the higher ranges of New South Wales (NSW), the Australian Capital Territory, Victoria and Tasmania, are excluded from ACRIS reporting.

Figure 1.1 Mitchell grassland, central Australia

Photo: NT Department of Natural Resources, Environment and the Arts

Figure 1.2 Desert sand dune

Photo: Robert Ashdown

Extensive grazing on native pastures occurs across most of Australia's rangelands. Other uses include defence force training, activities managed or controlled by Indigenous people, national parks, mining, tourism and biodiversity conservation. A significant area of the rangelands used for extensive commercial grazing is state- or territory-owned public or Crown land, although there are significant areas of freehold in Queensland and NSW. Rangelands owned by the Crown are mostly leased for extensive grazing; however, the Crown reserves the right to change land use if economic and societal values change markedly.

A defining characteristic of the rangelands is variability. Several major droughts and wet periods have occurred since the beginning of Australian pastoralism. Rainfall varies greatly from year to year, season to season and place to place.

This variability means that assessing change is particularly difficult: change can be slow to emerge and hard to detect, or it can occur so rapidly that institutional systems may be insufficiently prepared. Major changes to resource condition can be caused by the grazing pressure of domestic stock, kangaroos, and a wide variety of feral animals, including rabbits, goats, camels, horses and donkeys. Total grazing pressure from these animals is strongly influenced by the location of waterpoints in the landscape. Grazing near waterpoints can accelerate soil erosion and alter vegetation composition and structure, with ephemeral species typically replacing palatable perennial grasses and shrubs.

Fire is also a major driver of change in Australia's rangelands, but the size and incidence of fires are now markedly different from those before European settlement. Changed fire regimes can have both short- and long-term effects, with the latter including thickening of the perennial woody vegetation in woodlands, savannas and grasslands due to fire suppression. Woody thickening can affect both pastoral production and conservation values.

Similarly, exotic weed invasions pose a major threat to the ecology of Australia's rangelands, with significant costs from lost production and for weed control. Dingoes, foxes and feral cats are predators having major effects on native animal populations.

Figure 1.3 Extent of the rangelands

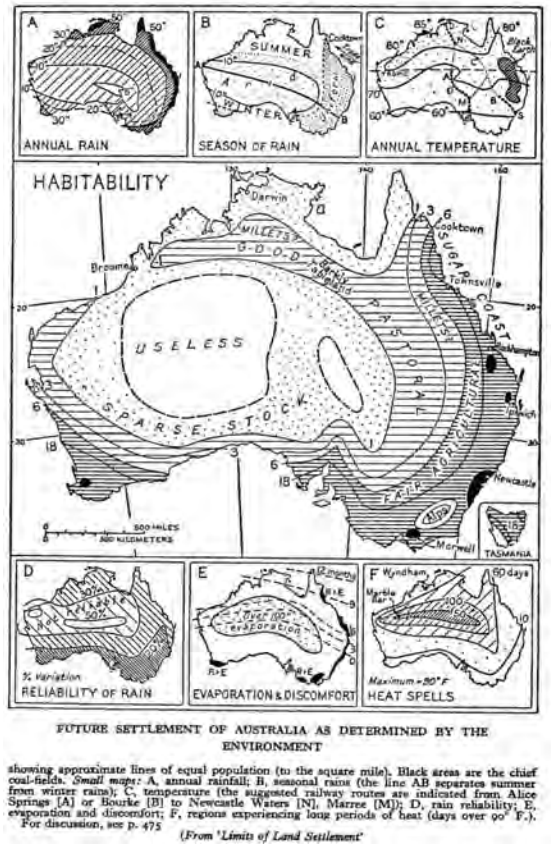
Source: NLWRA, 2007

Rangeland values

The rangelands provide substantial benefits to Australia, for example production of agricultural commodities, mineral extraction, the use of natural resources such as water for a range of purposes, and cultural values fundamental to Indigenous Australians. All these values are increasingly being recognised by the wider community. Historically, that was not the case — parts of the rangelands were considered useless (Figure 1.4).

The value of rangeland resources to society changes over time and varies between individuals and communities. For example, a particular plant species may be regarded as a pest from the perspective of biodiversity conservation, but may be seen as highly useful for economic production.

Figure 1.4 1947 map of Australia showing areas of rangeland considered useless



FUTURE SETTLEMENT OF AUSTRALIA AS DETERMINED BY THE ENVIRONMENT

showing approximate lines of equal population (to the square mile). Black areas are the chief coal-fields. *Small maps:* A, annual rainfall; B, seasonal rains (the line AB separates summer from winter rains); C, temperature (the suggested railway routes are indicated from Alice Springs [A] or Bourke [B] to Newcastle Waters [N], Marree [M]); D, rain reliability; E, evaporation and discomfort; F, regions experiencing long periods of heat (days over 90° F.). For discussion, see p. 475

(*From 'Limits of Land Settlement'*

Source: Griffith Taylor (1947). Map accessible at http://www.austehc.unimelb.edu.au/fam/0003_image.html# (accessed 3 July 2007).

Biodiversity

Australia's rangelands comprise a great variety of habitats (Figure 1.5), which support a rich diversity of species and biotic communities. The rangelands have some of Australia's most intact ecosystems, and many are still relatively unmodified. However, some of those ecosystems are extremely vulnerable, particularly to grazing pressures, inappropriate fire management practices and exotic invasive species.

Figure 1.5 Mt Ilbillee, Everard Ranges, SA

Photo: Peter Canty, SA Department for Environment and Heritage

Australia's rangelands comprise a great variety of habitats. This example is of Mt Ilbillee in the Everard Ranges, far north South Australia (SA).

Economic

Much of Australia's mineral wealth, worth approximately $12 billion each year, is derived from the rangelands (Figure 1.6).[1] In addition, grazing of sheep and cattle ($1.8 billion in 2001) and other non-pastoral agriculture ($627 million in 2001; Chudleigh and Simpson 2004) are substantial sources of income. The rangelands present opportunities for 'clean and green' food and fibre, and for harvesting wild animal and plant products. Tourism in the rangelands generates a yearly revenue estimated to exceed $2 billion (NLWRA 2001a).

[1] http://www.rangelands-australia.com.au/frameSet5_CurrentIssues.html (accessed 3 July 2007)

Figure 1.6 Mine shafts at Coober Pedy, SA

Photo: Allan Fox and the Department of the Environment, Water, Heritage and the Arts

Social and cultural heritage

Approximately 600 000 people live in the rangelands, including populations in centres such as Darwin, Alice Springs and Mount Isa (ABS 2001). The landscapes and cultural heritage of inland Australia have an intrinsic social value for all Australians. The rangelands provide a sense of place and identity for many Indigenous Australians.

Water resources

The rangelands rely on surface water in the large catchments or drainage basins (eg Lake Eyre Basin) together with artesian water sources such as the Great Artesian Basin (one of the world's largest underground potable water sources) and other subartesian aquifers. The rangelands also have major river systems, such as the Gascoyne River in Western Australia (WA), the Victoria River in the NT, the Burdekin River in Queensland, and the rivers of the Lake Eyre Basin (Figure 1.7) and parts of the Murray-Darling Basin in southeastern Australia. The episodic and ephemeral nature of such a vital resource makes water a key force defining land use and management.

Figure 1.7 Flooding rains, Windorah, western Queensland

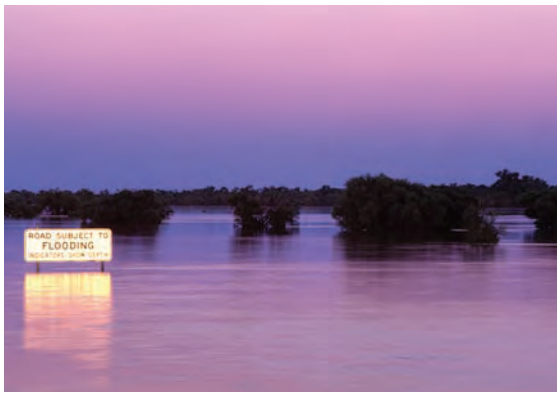


Photo: Robert Ashdown

Carbon sequestration

Rangelands contribute to Australia's carbon account through the carbon in their soils and woody vegetation. Although carbon storage per unit of area is low, the extent of the rangelands means there is a significant total carbon store. Managing those carbon stores in relation to fire and vegetation clearing and thickening will present challenges in the future.

Information requirements

Baseline and trend information on change in environmental, social and economic indicators is essential to inform natural resource management (NRM) policy development and decision making, particularly when considering trade-offs between competing values. This information is required at a range of scales, from national to local.

Australian and state or territory governments

At the national, state and territory levels of government, information is required to support legislative and policy initiatives, for example to:

- underpin assessments of the status and trends in condition of a jurisdiction's resources at scales that allow broad priorities to be set and outcomes to be evaluated against those priorities
- evaluate regional plans in the context of partnership initiatives (eg the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality) to ensure that the plans are robust and address priority issues in the region
- examine options for changed land use
- track progress in initiatives, their impacts and effectiveness in fostering change to meet objectives and targets
- monitor compliance with legislation
- meet regional, national and international reporting obligations (for example, the Australian Government is required to report to the United Nations Convention to Combat Desertification).

Regional organisations

Regional communities and organisations require data and information about the condition of their natural resources to:

- underpin community participation in preparing, implementing and evaluating NRM and property management plans
- improve awareness of landscape processes
- provide an understanding of the geographic distribution of key issues and their implications across a region
- track improvements in the condition of the environment and progress towards meeting targets and agreed outcomes in regional plans
- assess the effectiveness of land management strategies (including simulation models that explore the environmental impact of different management actions).

Local communities

Local communities require an improved understanding of their natural resources and the processes driving change to:

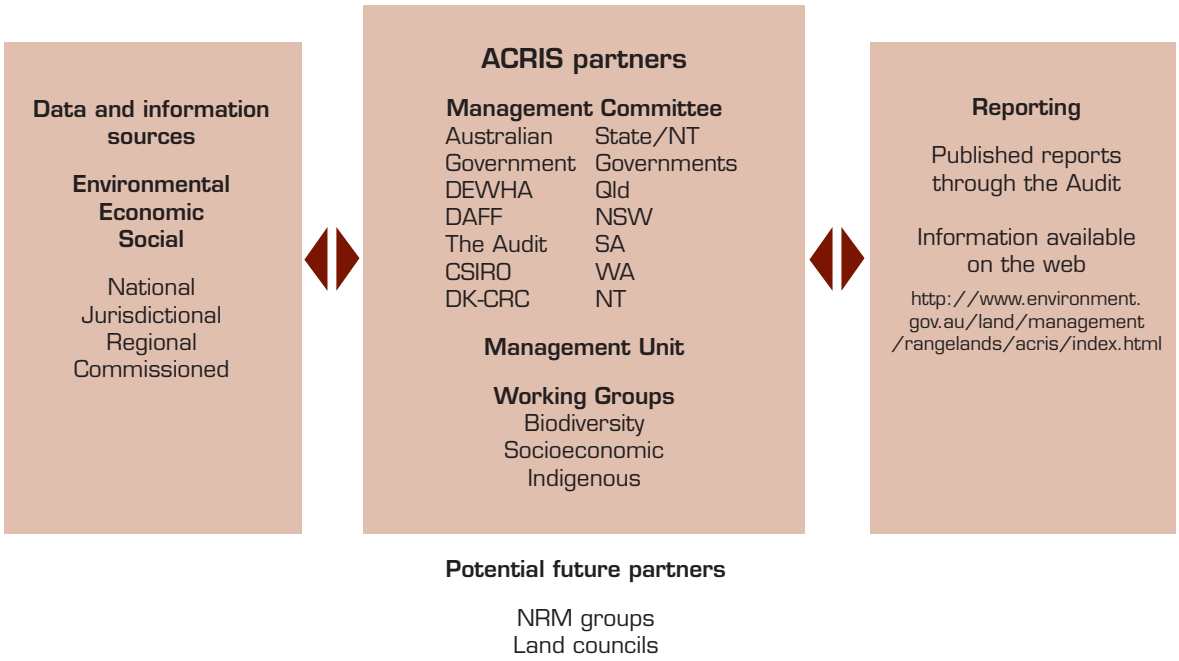
- develop improved NRM systems
- better quantify biophysical processes
- create improved landscape-management tools.

Australian Collaborative Rangeland Information System

ACRIS is a partnership between Australian Government organisations and those agencies in WA, SA, the NT, Queensland and New South Wales responsible for resource management and biodiversity conservation. The role of the state/territory agencies is to collect and interpret rangeland data and make them available to ACRIS. ACRIS also draws on data available from Australian Government sources, such as the Australian Bureau of Statistics. ACRIS facilitates data collation and documentation for reporting on regional and national changes in the rangelands.

Figure 1.8 ACRIS — a partnership between Australian, state and territory government agencies dealing with rangelands issues

The Australian Collaborative Rangelands Information System (ACRIS)



CSIRO = Commonwealth Scientific and Industrial Research Organisation; DAFF = Department of Agriculture, Fisheries and Forestry; DEWHA = Department of the Environment, Water, Heritage and the Arts; DK-CRC = Desert Knowledge Cooperative Research Centre; The Audit = National Land & Water Resources Audit

Themes are used as the framework for presenting data and information types in this report:

- climate variability
- landscape function
- sustainable management
- total grazing pressure
- fire regimes and dust generation
- water use and management
- biodiversity
- socioeconomic change.

ACRIS relies on state/territory agency partners to regularly update this information.

Ongoing challenges for ACRIS are to:

- foster long-term institutional commitments to rangeland monitoring
- promote monitoring activities that provide national and regional trend information and fill important gaps in data
- provide consistent information across all rangeland regions at appropriate scales
- maintain national databases and the capacity to interpret information against the background of long-term climatic variations and emerging policy and management issues.

ACRIS management

The ACRIS Management Committee (ACRIS-MC) oversees ACRIS (Figure 1.8), and includes representatives of the rangeland states and the Northern Territory, and the Australian Government (Department of the Environment, Water, Heritage and the Arts; Department of Agriculture, Fisheries and Forestry; National Land & Water Resources Audit; and Commonwealth Scientific and Industrial Research Organisation). The ACRIS-MC has convened working groups to assist in reporting on specific areas, such as biodiversity and socioeconomics.

As well as providing a forum for identifying and evaluating effective procedures for monitoring biodiversity, the Biodiversity Working Group has assisted in collating and interpreting available data reporting status and trend in biodiversity for this report. The primary role of the Socioeconomic Working Group is to facilitate the ongoing collection, collation, integration and management of socioeconomic information needed for NRM decision making in the rangelands. An informal Indigenous working group has helped ACRIS engage with groups providing NRM assistance to Indigenous communities.

Implementation and operation of ACRIS is coordinated through the ACRIS Management Unit (ACRIS-MU) located within the Desert Knowledge Cooperative Research Centre in Alice Springs. The role of the ACRIS-MU includes:

- collating various key regional and jurisdictional data
- conducting meta-analysis as appropriate
- interpreting results with respect to climate and other drivers of change
- reporting national syntheses of data.

The ACRIS-MU fulfils an important function in distributing suitably collated and analysed data to individual jurisdictions to assist interpretation of their data.

Building on the 2001 Rangelands report

Rangelands — Tracking Changes (NLWRA 2001a) provided an assessment of the information needed to report on change in the condition of the nation's rangelands. In 2005, the Natural Resource Policies and Programs Committee, an advisory committee to the NRM Standing Committee, agreed on the themes for a national report on change in the rangelands. The themes are climate variability, landscape function, sustainable management, total grazing pressure, biodiversity, management of water resources, and socioeconomics. *Rangelands 2008 — Taking the Pulse* builds on the identification of those needs and provides data and information for each of the identified themes (Table 1.1).

Rangelands 2008 — Taking the Pulse reports *change*, as distinct from *state*, in the Australian rangelands for the period from 1992 to 2005. It builds on *Rangelands — Tracking Changes*, with several new information types reported here (Table 1.1). For example, a number of maps in the earlier report documented the status of some indicators of rangeland condition, but few illustrated changes in condition.

This report is based on mostly unpublished data providing coverage from a regional to a national scale. This national synthesis is not, as is often the case, based on consensus of 'expert opinion' or literature reviews, which often have limited spatial or temporal relevance to the entire rangelands.

The information in *Rangelands 2008 — Taking the Pulse* provides the basis for the ongoing improvement of monitoring and reporting systems for Australia's rangelands.

Table 1.1 Information types reported in *Rangelands 2008 — Taking the Pulse*, compared with those in *Rangelands — Tracking Changes*

Reporting in *Rangelands 2008 — Taking the Pulse*	Reporting in *Rangelands — Tracking Changes*[a]
Theme: climate variability ■ *seasonal quality* as context for interpreting change	Impacts on biophysical resources ■ climate variability ■ predicting pasture availability ■ seasonal characteristics and influence on vegetation
Theme: landscape function ■ change in landscape function	Changes in biophysical resources ■ changes in landscape function
Theme: sustainable management ■ change in critical stock forage ■ change in pastoral plant species richness ■ distance from stock water ■ invasive weeds	Changes in biophysical resources ■ introduced plants and animals
Theme: total grazing pressure ■ change in domestic stocking density ■ change in kangaroo density ■ feral animals	Changes in biophysical resources ■ total grazing density ■ introduced plants and animals
Theme: fire and dust ■ change in fire regime ■ change in atmospheric dust (Dust Storm Index)	Changes in biophysical resources ■ fire
Theme: water resources ■ information sources for water availability and sustainability	Changes in biophysical resources ■ water availability and sustainability
Theme: biodiversity ■ change in protected areas ■ change in number and status of threatened species/ communities ■ habitat loss by clearing ■ stock waterpoint effects on biota ■ fauna records and surveys ■ flora records and surveys ■ transformer weeds ■ wetlands: condition and change ■ habitat condition derived from remotely sensed groundcover ■ bird population composition	Changes in biophysical resources ■ changes in biological diversity ■ native vegetation clearing ■ supporting information (photo records)
Theme: socioeconomics ■ socioeconomic profiles ■ value of non-pastoral products in the rangelands ■ change in land use ■ change in pastoral land values	Socioeconomic information ■ land use and tenure ■ individual (land manager) attributes ■ business attributes ■ community attributes
Institutional responses ■ regional activity ■ Natural Heritage Trust investment	Institutional responses ■ institutional activity

a NLWRA (2001a)

Key questions

Rangelands 2008 — Taking the Pulse seeks to inform important policy and management-practice questions for the rangelands:

- Where are the ecologically significant regions?
- Where are the most economically productive areas?
- How do grazing systems affect the ecological health of rangeland environments and native biodiversity?
- Where are there strong or emerging tensions between pastoral production and the desire to conserve native flora and fauna?
- How do invasive species and fire impact on pastoral production and native flora and fauna?
- What are the constraints and opportunities for further development of grazing and agriculture?
- Where do grazing and agriculture face structural adjustment pressure?
- What are the demographic, social and economic trends in rural communities, and how do those trends affect the communities' capacity to achieve and manage structural adjustment?
- How can information on natural resources be managed to meet the requirements of Indigenous land managers and regional NRM groups?
- What are the impacts of climate variability and long-term climate change on productive capacities and conservation challenges?

Structure of the report

This report begins by addressing the defining characteristics and values of Australia's rangelands, and then presents information to assess change in rangeland characteristics and values. Results, and their integration across themes, comprise the major part of the report.

Chapter 1 Introduction

An overview of Australia's rangelands and ACRIS's role in assessing changes in resources

Chapter 2 Assessing change

Concepts and approaches in monitoring and assessing changes in rangelands

Chapter 3 Change in the rangelands

National results for each of the reported ACRIS themes

Chapter 4 Focus bioregions

Regional case studies highlighting specific issues in selected rangeland bioregions

Chapter 5 Emerging information needs

Emerging information needs and new stakeholders

Chapter 6 ACRIS — data into information

Integration and information management — using the system

Appendix Jurisdictional reporting

An update (since 2000) from each ACRIS partner on its ongoing rangelands information activities (see NLWRA 2001a for detail on jurisdictional monitoring programs)