Australian Government
Department of Sustainability, Environment,
Water, Population and Communities

The Australian Collaborative Rangelands Information System (ACRIS): Reporting Change in the Rangelands

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RANGELANDS: THE HEART OF AUSTRALIA

More than 75% of Australia is defined as rangelands. This area includes a diverse group of relatively undisturbed ecosystems such as tropical savannas, woodlands, shrublands and grasslands. Rangelands extend across low rainfall areas and variable climates, including arid, semi-arid, and some seasonally high rainfall areas. Extensive grazing on native pastures occurs across the rangelands while broadscale cropping and cultivation generally do not take place.

Australia's rangelands are home to many communities, including around 150,000 Indigenous people, and have a strong emotional or cultural attachment for most Australians.

Rangelands are important in terms of:

- **biodiversity** – representing the largest group of the nation's ecosystems remaining in a relatively natural condition
- **income** – much of Australia's mineral wealth is derived from the rangelands – cattle, sheep and wool production, and tourism also generate income
- **social and cultural heritage** – through their connection to country, Aboriginal people have deep emotional attachment to land while for non-indigenous Australians, the rangeland landscape is an intrinsic element of the social heritage of urban and rural folk alike
- **groundwater sources and major river systems** – large artesian and sub-artesian water sources and iconic river systems sustain a diverse range of ecosystems and support production
- **clean and green food and fibre production** – mainly through the absence of chemical additives and from the harvest of wild animal and plant products
- **carbon storage** – contributes to meeting Australia's international obligations for climate change and greenhouse gas emissions.

Value of rangelands to business and conservation

- mining: the major revenue source (greater than $10bn a year) but difficult to accurately quantify its value to the rangeland economy)
- tourism: approximately $6.1bn a year
- grazing: occupies approximately 55 per cent of the rangelands
- conservation: approximately 16 per cent of the rangelands are formally managed for conservation
- countless heritage sites
- home to many iconic plants such as mulga and spinifex and animals including the feral camel and bilby.

THE ROLE AND VALUE OF ACRIS

The Australian Collaborative Rangelands Information System (ACRIS), established in 2002, is a partnership between the Australian Government, CSIRO, Ninti One Ltd and those government agencies in Western Australia (WA), South Australia (SA), the Northern Territory (NT), Queensland (Qld) and New South Wales (NSW), responsible for natural resource management (NRM) and biodiversity conservation.

It collates and synthesises monitoring data describing change in the rangelands. This information assists the Australian Government, state agencies and rangeland NRM groups in meeting reporting obligations, planning investments to facilitate change and evaluating the effectiveness of their investments. ACRIS reporting is a useful education resource and a source of up-to-date data for researchers and the wider community with an interest in the environmental health of the rangelands.

ACRIS combines environmental, social and economic data contributed by its partners and other sources (for example the Bureau of Meteorology and the Australian Bureau of Statistics) to provide a more complete understanding of change in the rangelands, irrespective of state and territory borders.

Photo 1: 1993

Photo 2: 2011

Vegetation change between 1993 and 2011 at a grazed pastoral monitoring site in the Broken Hill Complex bioregion of South Australia.

The 2011 photo illustrates the loss of shrubs from 1993, likely due to drought conditions, at the same time grasses responding to good rains.

ACRIS has developed techniques for separating seasonal variation as a driver of change to determine the effects of grazing management on land condition.

Role in Australia

At the national level, ACRIS' interpreted data provide useful context at regional to national scales for evaluating the success of programs such as *Caring for our Country* and the *Biodiversity Fund* to improve the health of the rangelands. As a simple example, maintaining acceptable levels of ground cover minimises atmospheric dust emanating from the rangelands that can adversely affect human health and economic productivity in coastal and urban areas.

State and territory governments benefit from the ACRIS partnership by:

- seeing their monitoring investment, skills and data contribute to rangelands-wide analyses and syntheses beyond jurisdictional borders - experience has shown that this integrated outcome is more useful for planning and evaluation than the common alternative: an often poorly connected set of individual reports
- having improved access to the intellectual property of collaborating agencies - this can facilitate development of additional shared intellectual property such as the recent progress in objectively determining management-related change in remotely-sensed ground cover across large areas
- greater consistency in monitoring programs as partners appreciate the benefit of more uniform and systematic methods.

ACRIS data has been used in national State of the Environment Reports in 2006 and 2011 and is considered to be an essential information source for future reports.

ACRIS reporting provides useful context for NRM groups' assessments of outcomes from regional investments to address land management issues. Examples include: a standardised approach to ranking seasonal quality; regional indices of components of total grazing pressure; and recent fire histories. All can be important drivers of environmental change additional to investments targeted at changing land management practices and it is essential to understand such effects when evaluating the success of practice-change investments.

The Rangeland NRM Alliance, a partnership between 13 NRM agencies operating in the rangelands, has used ACRIS information to increase government and public awareness of the rangelands.

"The Rangeland NRM Alliance appreciates the support and involvement of ACRIS in its activities to promote and generate greater collaboration in natural resource management for the rangelands of Australia. ACRIS provides the Alliance with an excellent link to the best/only national collated information available on the state of Australia's rangeland environment."
Kate Forrest, Coordinator for the Rangeland NRM Alliance

Our international role

ACRIS reporting provides relevant information to show Australia's progress in meeting its international obligations, particularly the United Nations Convention to Combat Desertification (UNCCD) and the Convention on Biological Diversity (CBD). ACRIS offers a model for increased scientific rigour in assessing and monitoring desertification under the UNCCD. The publication, *Rangelands 2008 – Taking the pulse*, demonstrated the ability of ACRIS to assemble often patchy and disparate datasets, conduct higher-order analyses and synthesise resulting information into an integrated assessment of recent change in Australia's rangelands. Recognising the success of ACRIS' collaborative approach, there has been international interest from member countries within regional groupings of the UNCCD in adopting collaborative reporting approaches similar to the ACRIS model.

The ACRIS partnership approach to the collection and synthesis of data provides experiential lessons that can be adopted by other organisations. These include: initial activity must be focussed, facilitated and may require funding to support engagement; initial efforts must provide results that benefit partners so they continue with the collaboration; it takes time for partners to see the value in the process; and trust builds as results accrue and the process continues.

Dynamic and threatened systems

Rangeland environments respond to considerable climate variability which is a major driver of change in natural resources like soil, water and vegetation.

While rangeland ecosystems remain largely intact, past land use practices have a lasting effect and there is a continuing threat of the environment being further degraded, for example from:

- poor grazing management of domestic stock
- feral and native herbivores damaging and grazing vegetation
- inappropriate fire regimes
- weeds and other invasive species such as cane toads
- introduced predators such as cats and foxes.

Much of the rangelands has multiple values, both monetary and non-monetary. For example, sustainable grazing of native pastures can maintain biodiversity, enhance aesthetically-pleasing landscapes that have ecotourism appeal and provide opportunities for carbon sequestration.

Maintaining and improving the ecosystem services that underpin these multi-functional values is now an important part of natural resource management. Ecosystem services provided by the rangelands include:

- **provisioning services** – producing products such as forage for livestock and bush foods for Indigenous communities
- **regulating services** – services that benefit other areas – for example, clean air above major coastal cities as a result of maintaining rangeland ground cover to reduce dust storms
- **cultural services** – the strong cultural and emotional attachment that Aboriginal people have to country and continued cultural practices contribute to better health. Non-indigenous Australians experience iconic outback landscapes like Uluru and Kakadu National Park as part of a sense of identity
- **supporting services** – the underlying ecosystem processes that allow provisioning, regulating and cultural services to be provided - examples include net primary production, habitat for biodiversity, soil formation and nutrient cycling.

What and How ACRIS reports

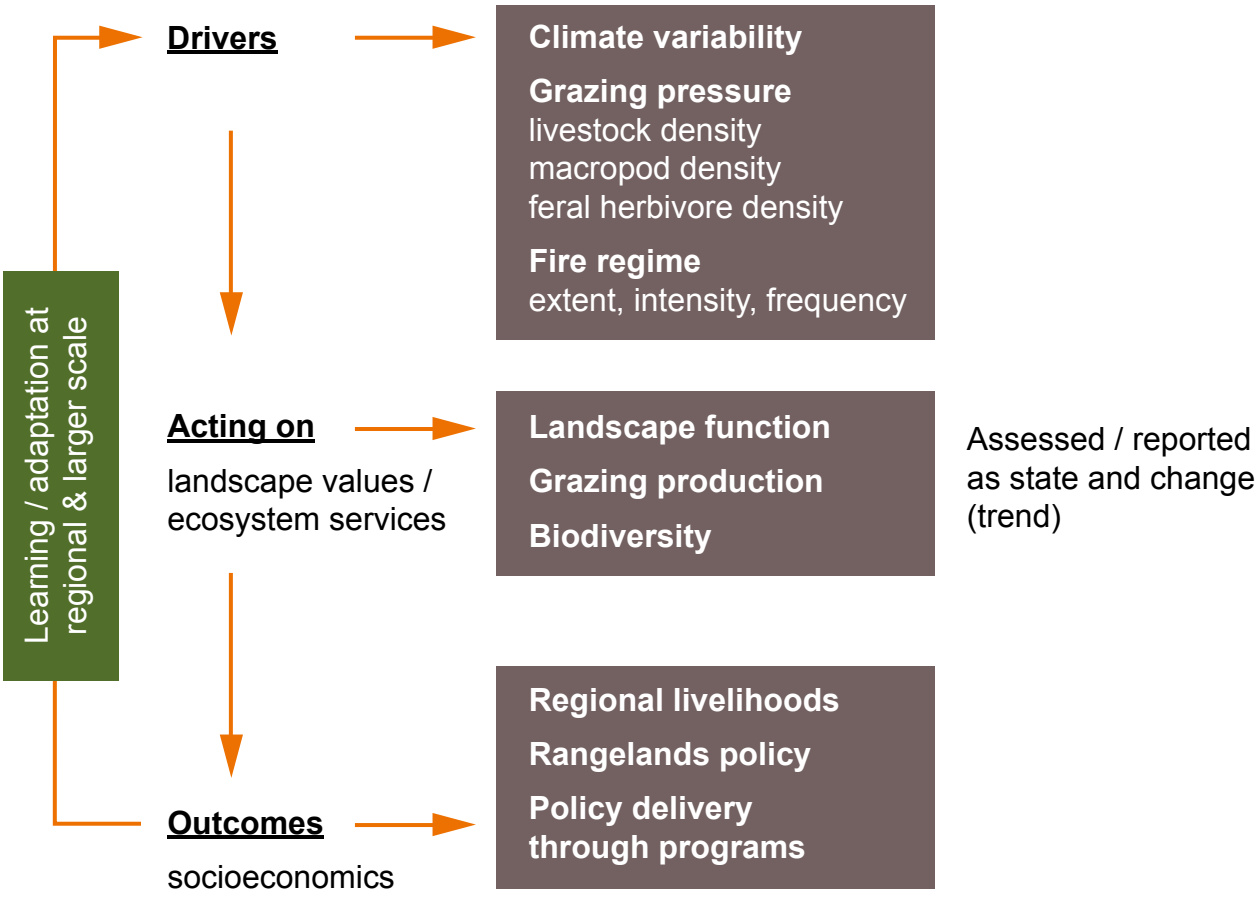
The Australian Government, rangeland states and the Northern Territory, and NRM groups conduct environmental monitoring for specific purposes, such as reporting on the management of pastoral leases. Collated data from these monitoring systems can provide information about ecosystem health.

ACRIS reports by bioregion: large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features and plant and animal communities.

We use a simple framework for measuring and reporting rangeland changes. The framework (represented on page 9) includes three broad elements:

- key drivers of change
- effects on landscape values and ecosystem services
- resulting effects on, and feedbacks from, socio-economic outcomes

ACRIS reporting is structured around a simple framework that relates key drivers of change to effects on landscape values or ecosystem services. These effects, in turn, flow through to socio-economic outcomes. These outcomes feed back on the drivers, ideally through appropriate learning and adaptive management.



The pulse of the rangelands

Rangelands 2008 – Taking the pulse, was a definitive report published in 2008. It brought together a range of disparate datasets to report change in Australia's rangelands between 1992 and 2005.

More recent updates to this diverse information include:

- pastoral land condition based on two indicators (landscape function and critical stock forage)
- seasonal conditions as context for better understanding management effects on the rangelands
- levels of grazing pressure from livestock (sheep and cattle), kangaroos and feral goats
- fire history
- atmospheric dust as an indicator of wind erosion rates and
- change in protected area (areas reserved for conservation).

Rangelands 2008 – Taking the pulse and more recent information updates are available from: **www.environment.gov.au/land/rangelands/acris/index.html.**

EXPANDING THE CAPACITY OF ACRIS

ACRIS fulfils an important role in collating and synthesising the best available data on changes in Australia's rangelands. As the demands for, and capability of, scientific assessment change, ACRIS is responding by developing new methods in two critical areas: biodiversity monitoring and making the most of satellite technology.

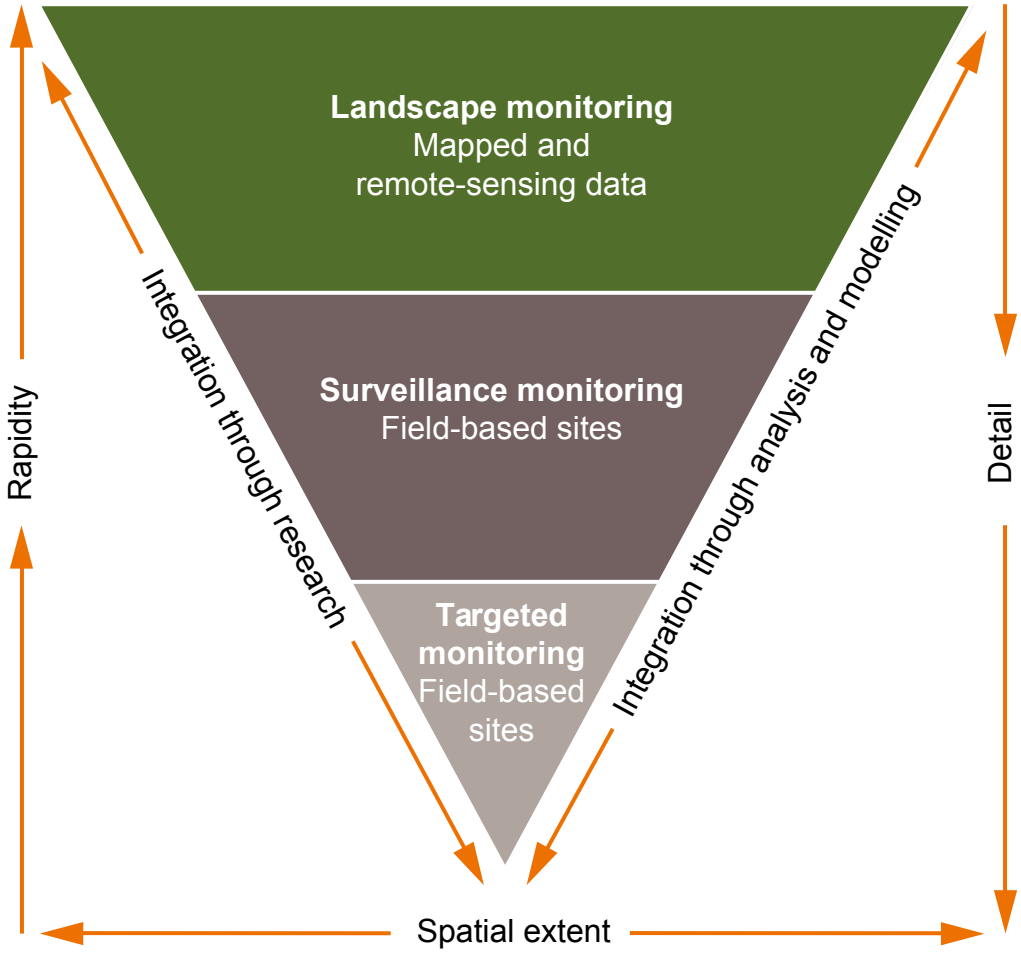
ACRIS partners have also collaborated with the Terrestrial Ecosystem Research Network (TERN) in sampling methods used by the AusPlots Rangelands facility.

Monitoring biodiversity

Tracking changes in biodiversity in the rangelands (the diversity of plants and animals) has been difficult due to a lack of reliable data. As the rangelands are mostly remote, extensive and highly variable, judgements about change are often made using indicators or surrogates of biodiversity. In addition, large areas are not surveyed and have no data.

ACRIS is now trialling a new framework that should allow systematic monitoring of the status and trend of rangeland biodiversity at bioregional scale. This framework is built on methods that help identify where and how intensively to sample within bioregions to detect trends in biodiversity attributable to the main drivers of change (grazing pressure, fire etc).

The trial involves most rangeland jurisdictions and will be completed in 2014. Experience from the trial will better inform ACRIS as to the level of resourcing required to implement systematic and continuing monitoring of biodiversity in the rangelands. An important goal of all partners is to demonstrate collaboration by participating in using common sampling protocols to the extent possible. Where methods need to differ, there is acceptance by all partners that the protocols used were the most appropriate for that situation.



Systematic monitoring of rangeland biodiversity requires a hierarchical framework of three components operating at different scales: targeted monitoring, surveillance monitoring and landscape-scale monitoring.

Making the most of satellite data

In the past, the science has not been available to ACRIS to fully utilise the potential of remotely sensed data. In particular, ACRIS has not had the ability to objectively separate management-related changes in ground cover from those due to rainfall variability.

Now, through collaboration between ACRIS members and the Queensland Government, we are developing methods to separate seasonal (climate) effects on ground cover from those due to grazing management.

Satellite imagery from the Landsat Thematic Mapper sensor is being analysed with a dynamic reference cover method at sub-IBRA scale across approximately 700,000 km^2 of Queensland's rangelands.

Further testing is underway and ACRIS is exploring how the method can be extended to western NSW where similar remote sensing-based monitoring of ground cover occurs.

IBRA (Interim Biogeographic Regionalisation for Australia) is a national and regional planning framework that classifies Australia's landscapes into 89 regions.

Establishing a biodiversity monitoring site, Simpson Strezlecki Dunefields bioregion, south-eastern NT.

Field data collected through the Wambiana grazing trial (south of Charters Towers) was essential to validate results obtained from applying the Dynamic Reference Cover Method to remotely sensed data.

ACRIS: A NATIONAL APPROACH TO RANGELAND ASSESSMENT

Governments agree that science is an important input to evidence-based policy.

Land managers using, protecting and restoring land need to know that what they are doing is making a difference.

Investors in land management programs, including government, need to know that they are spending money in the right areas to achieve better land management outcomes.

ACRIS contributes to these important activities through providing accurate, timely and relevant data and information. The ACRIS community is also actively addressing major information gaps so that it can continue to improve its understanding of change in the rangelands for the betterment of Australia.

ACRIS, providing relevant data to better inform policy and regional-scale management of the rangelands.

FURTHER INFORMATION

To facilitate rangelands assessment, ACRIS collects, analyses and reports a multitude of information, too detailed for inclusion in this publication. Visit the ACRIS website at **www.environment.gov.au/land/rangelands/acris/index.html** to view recent information updates and *Rangelands 2008 – Taking the pulse*.

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More detail on some of the science underpinning ACRIS is available in the following papers:

Bastin, G.N., Stafford Smith, D.M., Watson, I.W. and Fisher, A. (2009). The Australian Collaborative Rangelands Information System: preparing for a climate of change. *The Rangeland Journal* **31**, 111–125. doi: 10.1071/RJ08072

Bastin, G., Scarth, P., Chewings, V., Sparrow, A., Denham, R., Schmidt, M., O'Reagain, P., Shepherd, R. and Abbott, B. (2012). Separating grazing and rainfall effects at regional scale using remote sensing imagery: A dynamic reference-cover method. *Remote Sensing of Environment* **121**, 443–457. doi: 10.1016/j.rse.2012.02.021

Eyre, Teresa J., Fisher, Alaric, Hunt, Leigh P. and Kutt, Alex S. (2011). Measure it to better manage it: a biodiversity monitoring framework for the Australian rangelands. *Rangeland Journal* **33**, 239–253. doi: 10.1071/RJ10071 CSIRO

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FRONT COVER IMAGE
Kimberly Ranges, WA – Nick Rains

PAGE 3
Spinifex country – Graeme Chapman

PAGE 4
Rangeland boundary – Map produced by the ACRIS Management Unit
Top: Rangeland Grasses – Dragi Markovic
Bottom: Mt Ilbillee – Peter Canty, SA Department for Environment, Water and Natural Resources

PAGE 5
Grazed pastoral monitoring site, Broken Hill Complex, South Australia
– Craig Baulderstone, SA Dept. of Environment, Water and Natural Resources

PAGE 8
Kimberley Rangelands – Dragi Markovic

PAGE 10
Top: Grazing, Northern Queensland Rangelands – Andy Heaney
Bottom: Flinders Ranges National Park – John Baker

PAGE 12
Top: Biodiversity monitoring site – Simon Ward, NT Department of Land Resources Management
Bottom: Wambiana cattle – Peter O'Reagain, Department of Agriculture, Fisheries and Forestry, Qld

PAGE 13
Coral Beebe on her family's property, Ucharonidge, NT – Newspix / James Croucher

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