

Determination of Data and Information Requirements for Best Management Practice in Australia's Rangelands

Final Report

RDP9

**Undertaken by Rural Directions Pty Ltd on behalf of the
National Land and Water Resources Audit**

August 2004

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Executive Summary

The National Land and Water Resources Audit were contracted by the Australian Department of Agriculture, Forestry and Fisheries to provide an analysis of the data and information needs underpinning sustainable grazing land uses in the Australian Rangelands.

The purpose of this project was to prepare an analytical report on current recommended management practices, their relevance and the extent of their use across rangelands regions (bioregions). Rural Directions Pty Ltd, a South Australian based rural management consulting company, were contracted by the National Land and Water Resource Audit to undertake this project.

A. Terms of Reference

Project Aims

The project aimed to:

- ▶ Identify existing management practices that are considered to maintain sustainable land uses
- ▶ Identify the information requirements for land managers to undertake these practices.

Project Objectives

The stated project objectives were to:

- ▶ Compile a list of best management or recommended practice for major land uses in the rangelands.
- ▶ Assess national and regional data and information needs underpinning these management practices. This will include an assessment of information gaps.
- ▶ Identify land uses and management strategies for which best practice systems still need to be developed or completed.

B. Best Management Practice

Best management practices are those management practices that are recommended or aspired to by industry, that allow a manager to achieve production and income targets and manage identified risks (environmental, financial and production). An industry accepted best management practice represents the code of practice for that particular industry.

For this project, best management practices are those practices that are considered to maintain sustainable land use in the rangelands.

C. The Australian Rangelands

Rangelands are generally defined as “areas whose main use is for extensive livestock grazing on a native pasture base; area too dry for sowing crops or pastures”.

More than three quarters of Australia consists of rangeland country. This represents a large range of ecosystem types including:

- ▶ Low rainfall and variable climate, arid and semi arid grasslands, shrublands and woodlands in Western Australia, South Australia and New South Wales
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- ▶ Slopes and plains of northern New South Wales
- ▶ High rainfall tropical savanna woodlands of southern Queensland and the Northern Territory.

A relatively small number of people occupy the rangelands and make decisions that either directly or indirectly influence natural resource management across the area. (Rangelands – Tracking Changes, 2001)

The rangelands are ecologically important because they:

- ▶ Provide habitat for rare, threatened and endangered endemic species
- ▶ Include 1,800 plants and 605 vertebrate animals
- ▶ Contain five World Heritage sites (Rangelands Australia, 2004).

Approximately 6,000 pastoral enterprises occupy 58% of the rangelands land area. These enterprises make significant contributions to the economy but are under increasing market, environmental and economic pressure as they need to contend with issues of product quality, sustainability, tourism, biodiversity, carbon storage and water resources relating to livestock production (Rangelands Australia, 2004).

The rangelands have special management needs including:

- ▶ Management systems to cater for a large diversity in country, people and seasons.
- ▶ Monitoring systems to provide information on positive and negative changes over time.
- ▶ Changing management to more sustainable practices to assist in reducing impact on biodiversity and maintain healthy production systems
- ▶ Support to assist in maintaining a capable and viable population in rural and remote communities.

D. Scope of Project

In addition to grazing, the project considered those land uses which are considered to operate on a large scale and have the potential to have a significant impact on the condition of the rangelands. Consequently the project focused on:

- ▶ Sheep and cattle grazing that occupy 58% of the rangelands
- ▶ Aboriginal management that occupies 18% of the rangelands
- ▶ National parks that represents a significant and increasing proportion of rangelands land area
- ▶ Broad acre cropping that poses a significant resource degradation risk due to the marginal nature of cropping in the area.

E. Definition of BioRegions

The “Interim Biogeographic Regionalisation of Australia” was developed to provide a framework to describe the dominant landscape scale attributes of climate, lithology, geology, landforms and vegetation of interacting similar ecosystems (Rangelands – Tracking Changes, 2001). Under this system, the rangelands are divided into fifty-three bioregions.

F. Project Methodology

In attempting to identify documented best management practices, best practice gaps and information required to undertake best management practice across the rangelands, the project methodology included a literature search and a qualitative survey of representative people in the rangelands.

The literature search identified 56 written documents, 11 best management practice courses and 17 best management practices.

The qualitative survey used a semi-structured process to interview 46 people from across the rangelands including administrators, researchers, extension officers and producers.

G. Key Findings

G.1 Best Management Practice

There are a large number of documents available for best management practice systems and the various elements of best management practice systems. Information was identified for domestic grazing animals (sheep, cattle, goats, exotic sheep), broad acre cropping, national parks, indigenous lands and fire management.

Best management practice documents are often more highly valued by agencies than by rangelands managers, especially where they represent a milestone for a project or a formal requirement to provide best management practice guidelines for a particular industry. These formal documents are also a useful reference point for research or extension staff, particularly those new to an area or an industry, as they provide a good overview of industry issues and best practice recommendations.

Best management practice documents are useful to describe a range of industry practices within a production system. However, the best management practice should only be considered after an assessment of the appropriateness of current systems and processes has been made.

Survey Themes

1. Many rangelands managers use an active-adaptive management process, and large, formal documents may be of little value to them. An active-adaptive approach sees managers constantly accessing specific information from appropriate sources (people, website, technical bulletins and newsletters) to fine tune their management decisions over time.
 2. Matching stocking rate to feed conditions on a seasonal basis is a significant issue for rangeland producers. Mismatching livestock numbers to feed, results in over or under utilisation of feed and financial penalties to producers. This is also one of the most significant issues for impact on natural resource health.
 3. Best management practice needs to encompass production, economic and natural resource management issues. In the past, some documents have concentrated only on a production focus. Best management practice should incorporate aspects of drought and financial risk management.
 4. Best management practices can be incorporated into an Environmental Management System (EMS). However, an EMS may have little impact on
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broader management practices and resource impacts of the enterprise if the EMS criteria are not broad enough.

5. Best management practice is a continuum, with extension messages and landholder practice changing over time as new research is conducted and new issues emerge.
6. A lack of structural flexibility and change can limit the uptake of best management practice. Inflexible legislation relating to land use, stocking rate or property management can prevent positive practice change from occurring.
7. Determining “who pays” for biodiversity monitoring on pastoral and multiple use land needs to be resolved.
8. In developing the rangelands in new areas of Australia, it is important that the mistakes of the past are avoided and that good biodiversity and productivity are maintained.
9. Best management practice relating to grazing production is more or less linked to efficient use of water in the system by maintaining responsive species in the system, spreading water over country and managing to maintain the health of highly responsive parts of the property.
10. Fire is a tool for restoring the balance between perennial grasses and shrubs in the system.

G.2 Best Management Practice Gaps

1. There is very little, if any documented best management practice for Queensland grazing systems. Future lease renewals may have a requirement for a code of practice or best management practice.
2. In States with strong contrasts in land systems and plant communities, best management practice needs to be tailored for the different communities.
3. Best management practice needs to be developed for land that is in flux as it moves from a pastoral grazing property to a conservation park or into indigenous held land.
4. Best management practice documents developed for National Parks are a valuable resource and should be made available to people managing private parks and conservation areas and indigenous owned and managed areas.
5. Whilst indigenous held land often fits within the scope of formal pastoral monitoring systems, there does not appear to be any best management practice documents aimed at indigenous land managers.

G.3 Information Needs

Information to inform best management practice decision making needs to be available to researchers, extension workers, consultants and land managers. The challenge in making this information available, is to tailor the resolution, frequency and cost to the needs of different users.

Packaging information so that it is more accessible and relevant to pastoral users is required. Tailoring entry points for web sites, information links, and information types to suit the needs of on-ground users, will help to improve uptake and application of information in best practice systems.

The following groupings were used for grouping the information requirements of best management practice systems:

- ▶ **Managing seasons:**
 - ▶ **Forecasting**
Climate and rainfall information is used to assist in risk management for cropping and grazing businesses. Climate risk management is as much about capturing the extra profit associated with above average years as it is in eliminating or minimising the losses associated with below average years.
 - ▶ **Assessing the impact of rainfall**
Information on the response of pastures and vegetation to seasonal rainfall allows pastoralists to make operational and tactical grazing management decisions in response to feed of offer
 - ▶ **Understanding natural resource systems:**
 - ▶ **Land systems**
All States have maps developed for land systems. However, some of these are amalgamations of maps and there are inconsistencies in scale of detail or descriptions on boundary areas. These maps are important in providing an understanding of geology and plant communities across a property and across regions.
 - ▶ **Plant identification**
A sound knowledge of plant species in the system and the relative nutrient value of different plants, leads to a better understanding of system health and the benefits of maintaining productive systems.
 - ▶ **Biodiversity**
Effective biodiversity monitoring needs to consider the impact of grazing systems and other land uses on all species in the ecosystem and monitor change at regular intervals.
 - ▶ **Land condition**
Maintaining and enhancing the quantity and quality of perennial vegetation should be a primary goal of management. Relating land systems to land condition data obtained through satellite imagery and ground truthing, provides an important picture on the current state of the natural resource system.
 - ▶ **Monitoring the system**
Developing a range of production, financial and natural resource benchmarks is essential for monitoring the performance of the business, enterprises and the operating system. These will assist pastoralists and croppers to better understand annual enterprise and business performance and resource condition, interpret performance and to monitor progress towards business goals.
 - ▶ **Grazing management:**
 - ▶ **Stocking rate**
Stocking rate needs to be matched to the stocking capacity or feed on offer. Well planned fencing and watering points contributes to effective grazing and livestock productivity. Managing stocking rate within and between seasons to capture opportunities and optimise productivity and profitability, without degrading the system, is an ongoing challenge for management.
 - ▶ **Total grazing pressure**
The management of total grazing pressure is important to pastoral businesses, national parks and indigenous businesses to maintain a healthy land condition.
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► **Fire management**

Improved fire management is being achieved through active extension programs, a number of high quality websites, seasonal updates and printed best management practice guidelines. Fire management information is important for grazing, cropping, national parks and indigenous lands.

G.4 Monitoring Systems

Monitoring of land condition is currently undertaken by State and Territory agencies who have responsibility for the administration of pastoral land. The focus of this monitoring is to ensure that pastoral land is being well managed over time and to impose management requirements on areas of land that have suffered from poor management or seasonal or other events (fire, insect, vermin).

Changes in management practice require effective, affordable monitoring systems to inform landholders of the subtle and gross changes in the system. This allows the landholders to make the required changes to optimise the performance of the system. A comprehensive monitoring system should provide information on production, natural resources, finances and social outcomes of the changes in practice. Despite the reluctance of landholders to undertake monitoring, this should be a key component of best management practice.

Survey Themes

1. Monitoring systems designed for producers need to be simple, affordable, effective and repeatable over time. If the landholder understands the method and how the information can be used in management, then monitoring is likely to occur.
2. When changes are made to management systems to improve performance, monitoring needs to be put in place to measure how successfully this is achieved.
3. The application of a consistent process for biodiversity monitoring will assist in obtaining a clear picture when compiling “State of the Nation” biodiversity reports.
4. If landholders understand the relationship between good land condition and productivity, then they will see a benefit in land condition monitoring.
5. The differences in monitoring systems between the different States and the Northern Territory, makes it difficult to compile cohesive Australia-wide reports.

G.5 Best Management Practice Information Gaps

This section provides a summary of the broad information gaps that were determined from the literature search and survey.

Managing Seasons

1. Predictive rainfall tools need to be continually improved to assist in land use planning. Current tools have limitations which will be overcome through continued research and development.

Understanding Natural Resource Systems

1. There is a need for the collection of sensible and appropriate biodiversity information (vegetation, reptiles, insects, mammals) for all States so as to better
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interpret the state of the different systems. Work conducted at the expert technical workshop on biodiversity monitoring in the rangelands (Smyth et al, 2003) will contribute to the development of a useable system.

2. Natural resource maps and land systems maps need to be at a useful scale (1:50,000 and 1:100,000). Older maps are often at a coarse scale that limits their use for land condition monitoring and interpretation of aerial or satellite imagery.
3. There are issues with some of the land systems maps available for States. Due to inconsistencies in earlier mapping and interpretation, a number of States are finding it necessary to either re-survey or reinterpret original survey data. Some areas of States do not have existing land systems maps.
4. Remote sensing provides relatively cheap and repeatable information but there is low confidence in the accuracy/interpretation of the data (resolution of image, effect of overstorey) without significant ground truthing. Better linkages between remote sensing and ground based monitoring information will allow accurate reporting on land condition change over large areas.
5. Information held by National Parks on flora and fauna is generally not very accessible to landholders. Increasing access to this information will provide some useful biodiversity and plant identification information to landholders.
6. There is still the need for plant identification workshops and materials to assist pastoralists to identify plants beyond the common feed and weed types. It is also important for monitoring changes in systems that indicator plants for system health can be identified.
7. Local data provides important baseline information for understanding the system and identifying changes that have occurred. It is likely that there is still a significant amount of unpublished data housed in "filing cabinets". Identifying and accessing this data is difficult, especially when staff have moved onto other positions.

Monitoring the System

1. All States and the Northern Territory have rangeland monitoring and condition assessment programs. These programs provide good historic data for changes in rangeland condition when grazed by domestic livestock. However, the information is generally perceived to be for a regulatory purpose. It is not suited to the needs of pastoralists, especially due to the long time between monitoring events.
2. Information specific to properties gained through simple monitoring systems is required for grazing decision making.
3. Information is needed to assist in managing land in flux. Significant areas of Australia are moving from a pastoral grazing to a conservation land use. Base line biodiversity and land management information (weeds, ferals, land condition) need to be determined prior to establishing management and monitoring plans.
4. There needs to be a better understanding of the most significant positive and negative drivers in systems. Land systems are dynamic, responding to the combined effects of season, livestock management, impact of ferals and weeds and fire and it is difficult to determine how each impacts on the system.

Grazing Management

1. As land managers, agency staff and others explore new land management systems, they will require information on the comparative benefits of these systems in
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relation to historic systems. More information is required on the relative merits of cell grazing systems.

2. Animal condition (fat score) is a lag indicator for feed on offer, and managing stocking rate by animal condition will result in regular under or over grazing. Monitoring land condition and feed on offer is the only real way of ensuring that the number of stock grazing is in balance with the capacity of the system at that time.

Fire Management

1. There are a number of projects and information products specifically designed to provide information to landholders and these have significantly improved the management of fires in Northern Australia.
 2. Current bans on burning (and clearing) in Queensland limit the ability to implement best management practice for woody weeds. Assuming that this ban remains, new information will be required for alternative approaches for managing woody weeds and scrub thickening
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Rangelands Best Management Practice - Publication Details

Title	Author	Organisation	ISBN	Date	Comments
Native Pastures in Queensland: Their Resources and Their Management	WH Burrow, JC Scanlan and MT Rutherford	Dept of Primary Industries, QLD		1988	Information Series Q187023
Fire management of rangelands in the Kimberley low-rainfall zone: A review	AB Craig	The Rangeland Journal 21(1) 39-70		1999	
Fire studies in mallee (eucalyptus spp) communities of western NSW: grass fuel dynamics and associated weather patterns	Noble, JC; Vines RG	The Rangeland Journal 15(2), 270 - 297		1993	
Graziers Guide to Rangetypes		Dept of Land, Water and Conservation, NSW		0	Landholder guide for recognising indicator species for rangeland condition
Plants of Western NSW	Geoff Cunningham; Bill Mulham; Peter Milthorpe		0409 306878	0	Excellent reference on plant types but has become quite expensive
Best Practice Survey: Natural Resource Management and Australian Wool Growers		Land and Water Australia		2003	Info on the level of NRM activity undertaken by landholders, not a list of best mgt practice
Biodiversity Monitoring in the Rangelands: A way forward	Anita Smyth, Craig James, Grant Whiteman	CSIRO Sustainable Ecosystems	0 9581014 1 8	2003	Report from an expert technical workshop. Includes a CD-ROM
Reducing Sediment and Nutrient Export from Grazed Land in the Burdekin Catchment for Sustainable Beef Production		Meat and Livestock Australia		2001	Reference LPI 165
Managing Tropical Woodlands to Control Exotic Woody Weeds		Meat and Livestock Australia		1999	Refrence LPI 163
Managing Grazing in Northern Australia and in the Semi Arid Woodlands	Ian Partridge	Meat and Livestock Australia		2000	Reference LPI 162
Grazing for Profit		Resource Consulting Services		0	Workshop program facilitated by an RCS consultant
Holistic Management	Allan Savory with Jody Butterfield	Island Press	1 55963 487 1	1999	
Marla Oodnadatta District Plan		PIRSA		1996	Reviewed in 2003
Evaluation of Alternative Enterprises for the Pastoral Rangelands of SA: New Meat Sheep Breeds	Albert Singh	PIRSA Rural Solutions		2001	Broad assessment of economics and production requirements
The effect of perennial grasses, stocking rate and rainfall on sheep production in a semi-arid woodland of Eastern Australia	D Freudenberger; A Wilson; R Palmer	The Rangeland Journal, 21 (2) 199 - 219		1999	
Mulga, Merinos and Managers. A handbook of recommended pastoral management practices		North-Eastern Goldfields and Kalgoorlie Land Conservation Districts		1993	
Grazier Guide Series	Various	Soil Conservation Service of NSW		1988	Series for Belah-Bluebush, Bimble Box-Pine, Mallee, Mulga, Saltbush-Bluebush Downs, Saltbush Plains
Managing Mulga Grasslands: A Grazier's Guide	I. Partridge	Dept of Primary Industries, QLD		1996	Information Series Q196072
Managing Mitchell Grass: A Grazier's Guide	I. Partridge	Dept of Primary Industries, QLD		1996	Information Series Q196009
Rangeland Management In Western Australia		Dept of Agriculture, WA		1992	Miscellaneous Publication 8/92
Grazing Management: Technology for Sustaining Rangeland Ecosystems	RK Hietschmid and JR Walker	Rangeland Journal 18 (2)		1996	13-Aug-04

Murray Mallee District Plan		PIRSA		1996	Under review
Eastern Districts District Plan		PIRSA		2003	Under review - Draft developed
North East Pastoral District Plan		PIRSA		1996	
Gawler Ranges District Plan		PIRSA		1996	In review
Northern Flinders Ranges District Plan		PIRSA		1997	In review and draft developed
Kingoonya District Plan		PIRSA		1996	
Glovebox Guide to Plants of the NSW Rangelands		NSW Agriculture		1999	Landlinks Press
Marree District Plan		PIRSA		1997	Document currently being
Responsible, sustainable beef production: Issues facing today's beef producer	Belinda Walker	NSW Agriculture		2003	www.agric.nsw.gov.au
Pastoralism in tropical rangelands: Seizing the opportunity to change	A Ash; DM Stafford Smith	The Rangeland Journal, 25 (2) 113 - 127		2003	
Rangeland management in Western New South Wales	I Simpson (ed)	NSW Agriculture		1992	
Survey of Bestprac Groups for the Pastoral Sub Program of "Land, Water and Wool	D Heinjus; J Squires	Rural Directions Pty Ltd		2003	Report of activities undertaken by 33 Bestprac groups
Best Practice in Park Management	Various	Dept of Environment and Heritage		1996	15 documents on aspects of management - www.deh.gov.au/parks/best-practice
Property Management Planning	Primary Industries SA	Primary Insutries SA	0 7308 4290 8	1997	Extension resource manual.
Property Management Planning - Rangelands	Primary Industries, SA	Primary Insutries SA		1998	Extension Resource Manual
National Rangelands Monitoring Program	Ian Watson	Ag WA		2000	Extract from Rangelands Management Newsletter. July - Page 6
Field Guide to the Plants of Outback South Australia	Frank Kutsche and Brendan Lay	Government of South Australia	0 7590 1052 8	2003	
Plants of the Kimberley Region of Western Australia	RJ Petheram and B Kok	University of WA		2004	
The Rangelands: A synthesis of three reports on sustainable natural resource management		Centre of Internation Economics		2000	
Ecological Sustainability for Pastoral Management	Dr Hugh Pringle and Dr Ken Tinley	Department of Agriculture - WA		0	This article is extracted from the WA Journal of Agriculture.
Conservation and the maintenance of biodiversity in the rangelands	J.C.Z Woinkarski; A Fisher	The Rangeland Journal, 25 (2) 157 - 171		2003	
Relationships between sheep production, stocking rate and rainfall on commercial sheep properties in Western NSW	DA Roshier; I Barchia	The Rangeland Journal, 15(1), 79 - 93		1993	
Natural Resource Management Practices for Pastoral Zone Wool Producers	URS Australia Pty Ltd	LWA		2003	
Sustainable Land Management for Beef Production in the Lake Dunn - Lake Galilee area	Based on Producer Experience	Meat Research Corporation		1994	
Beef Property Management in the Kunwarara area	Based on Producer Experience	Meat Research Corporation		1992	
Property Management in the Quilpie Area of south-west Queensland	Quilpie Bestprac Group	Queensland Department of Primary Industries	0727-6273	1997	

Property Management for the Members of the Plains Country North of Booligal Bestprac Group Best Management Practice Fire Management Guidelines for Kimberley Pastoral Properties	Plains Country North of Booligal Bestprac Group Department for Planning and Infrastructure	NSW Agriculture Government of Western Australia		2000 2001	web site - http://www.dpi.wa.gov.au/pastoral/policies/bestmgtppracticefire.pdf
Managing riparian lands in the cotton industry	Lovett, S., Price, P. & Lovett, J.	Cotton Research and Development Corporation	1 876354 88 7	2003	
Best Management Practice: The Grazing of Sheep in the Pastoral Areas of Western Australia	Department for Planning and Infrastructure	Government of Western Australia		2001	web site - http://www.dpi.wa.gov.au/pastoral/policies/bestmgtppracticesheep.pdf
Best Management Practice: The Grazing of Cattle in the Northern Pastoral Areas of Western Australia	Department for Planning and Infrastructure	Government of Western Australia		2001	web site - http://www.dpi.wa.gov.au/pastoral/policies/bestmgtppracticecattl.pdf
Sustainable Natural Resource Management in the Rangelands	Centre for International Economics	Centre for International Economics		1997	
National Principles and Guidelines for Rangeland Management	ANZECC, ARMCANZ	ANZECC, ARMCANZ	0 642 546266	1999	
The Glove Box Guide to Tactical Grazing Management	T Campbell, R Hacker	Nsw Dept of Agriculture	0 7347 11956	2000	
Rangelands Tracking Changes	National Land and Water Resources Audit	National Land and Water Resources Audit	0 642 371148	2001	
The Lower Murray Darling Rangeland Management Action Plan	Lower Murray Darling RMAP	NSW Dept of Land & Water Conservation		1999	www.rangelandmap.org.au

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Stuart	Mitchell	(07) 4625 6198	Bollon	QLD	Cashvale
Leonard	Nutt	(08) 8648 4714	Hawker	SA	Edeowie Station

Rural Directions Pty Ltd

First Name	Last Name	Telephone	Location	State	Comments
David	Heinjus	(08) 8842 1103	Clare	SA	National Bestprac Coordinator

Wentworth/Dareton MAP

First Name	Last Name	Telephone	Location	State	Comments
Sheree	Bradford	(03) 5027 2416	Wentworth	NSW	