Department of
Agriculture and **Food**

GOVERNMENT OF
WESTERN AUSTRALIA

Report card **on sustainable natural resource use in the rangelands**

Status and trend in the pastoral rangelands
of Western Australia

Supporting your success

Section 3
3.1 Rangeland vegetation condition

ISBN 978-0-9923083-2-2 (hardcopy)

ISBN 978-0-9923083-3-9 (digital copy)

Cover: Cattle grazing on rangeland pasture in the Pilbara

Recommended reference

Department of Agriculture and Food, Western Australia 2017, *Report card on sustainable natural resource use in the rangelands: status and trend in the pastoral rangelands of Western Australia*, Department of Agriculture and Food, Western Australia, Perth.

Disclaimer

The Chief Executive Officer of the Department of Agriculture and Food and the State of Western Australia accept no liability whatsoever by reason of negligence or otherwise arising from the use or release of this information or any part of it.

Copies of this document are available in alternative formats upon request.

3 Baron-Hay Court, South Perth WA 6151
Telephone: +61 (0)8 9368 3333
Email: enquiries@agric.wa.gov.au
Website: agric.wa.gov.au

Shortened forms

Short form	Long form
ARLI	Annual Return of Livestock and Improvements
CC	carrying capacity
Commissioner	Commissioner of Soil and Land Conservation
CU	cattle unit (see Glossary)
DSE	dry sheep equivalent (see Glossary)
ha	hectare; 100ha = 1km^2
ha/CU	hectares per cattle unit
km^2	square kilometres; 1km^2 = 100ha
LCD, LCDC	land conservation district, land conservation district committee (see Glossary)
MODIS	Moderate Resolution Imaging Spectroradiometer
NAFI	North Australian Fire Information (firenorth.org.au)
Potential CC	Potential Carrying Capacity (see Glossary)
Present CC	Present Carrying Capacity (see Glossary)
RVCI	Rangeland Vegetation Condition Index
t/ha/y	tonnes per hectare per year
UCL	unallocated Crown land
WARMS	Western Australian Rangeland Monitoring System (see Glossary)

Section 3 Natural resource themes

3.1 Rangeland vegetation condition

Key messages

Status and trend

- In the Northern Rangelands, rangeland vegetation condition at the aggregate LCD scale was mostly good or fair, with 57% good, 29% fair and 14% poor (Figure 3.1.1 and Table 3.1.1).
- There was considerable variability between and within LCDs, and between vegetation types on individual stations in the Northern Rangelands.
- In the Northern Rangelands, WARMS monitoring sites indicate a stable trend since the last station inspections (2002–09), except in the Ashburton and De Grey LCDs where the trend was declining.
- In the Southern Rangelands, rangeland vegetation condition at the aggregate LCD scale was mostly fair or good, with 36% good, 39% fair and 25% poor (Figure 3.1.2 and Table 3.1.2).
- There is considerable variability between and within LCDs and stations, and between vegetation types on individual stations in the Southern Rangelands. Many LCDs had less than 30% of the rangeland vegetation in good condition, and vegetation condition in the Upper Gascoyne LCD was poor at more than 50% of traverse points.
- In the Southern Rangelands, WARMS monitoring sites indicate a stable trend since the last station inspections (2002–09).

Management implications

- Vegetation in fair or poor condition needs to be carefully managed to cope with seasonal variation.
- Susceptible land units, particularly in the Southern Rangelands, require rehabilitation and/or improved grazing management to allow regeneration of desirable perennials.
- Optimal placement of watering points and paddock boundary fencing can reduce loss of vegetation condition and improve vegetation use.

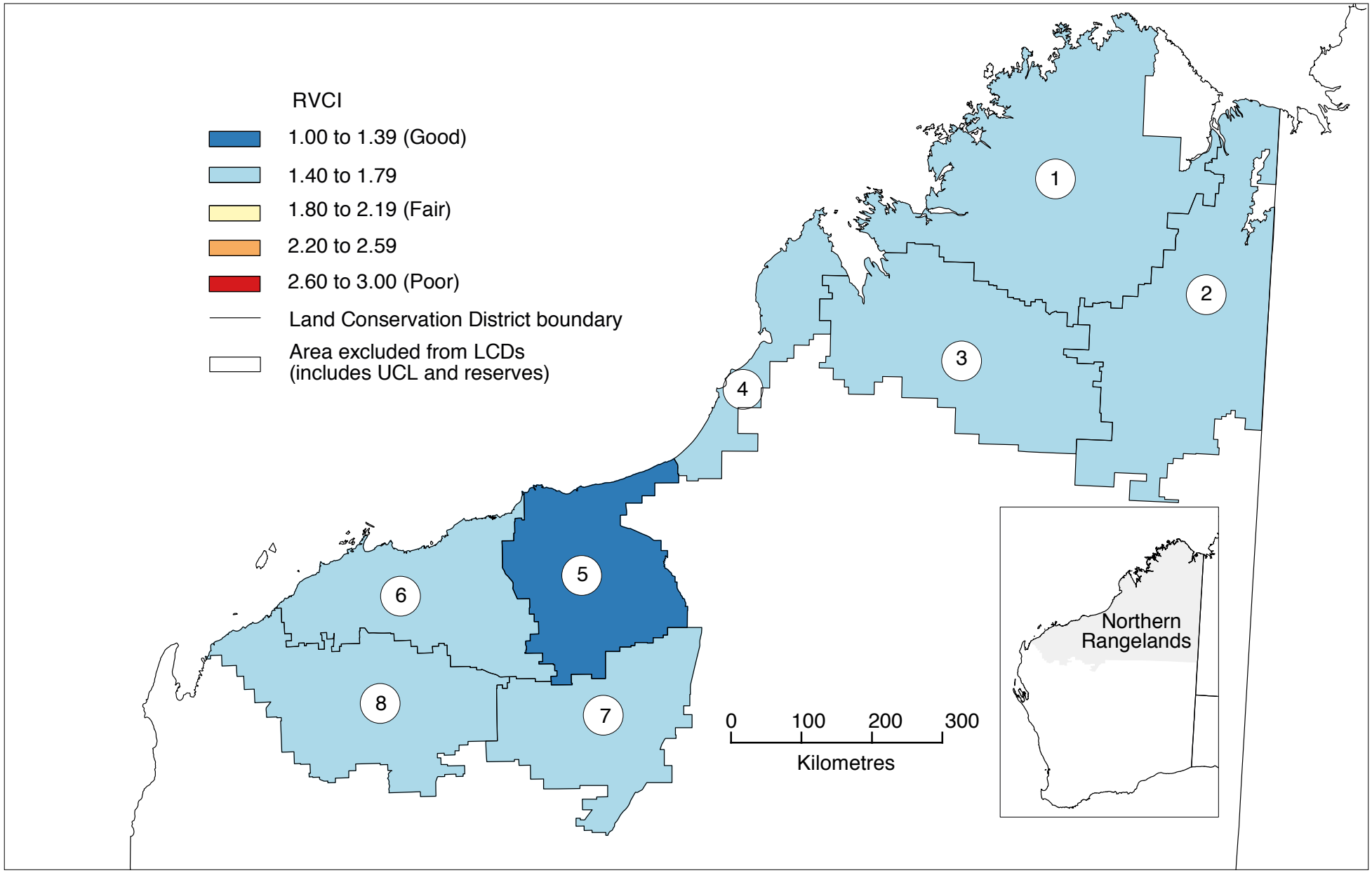

Figure 3.1.1 Rangeland Vegetation Condition Index at the most recent assessment in the Northern Rangelands, 2001–09

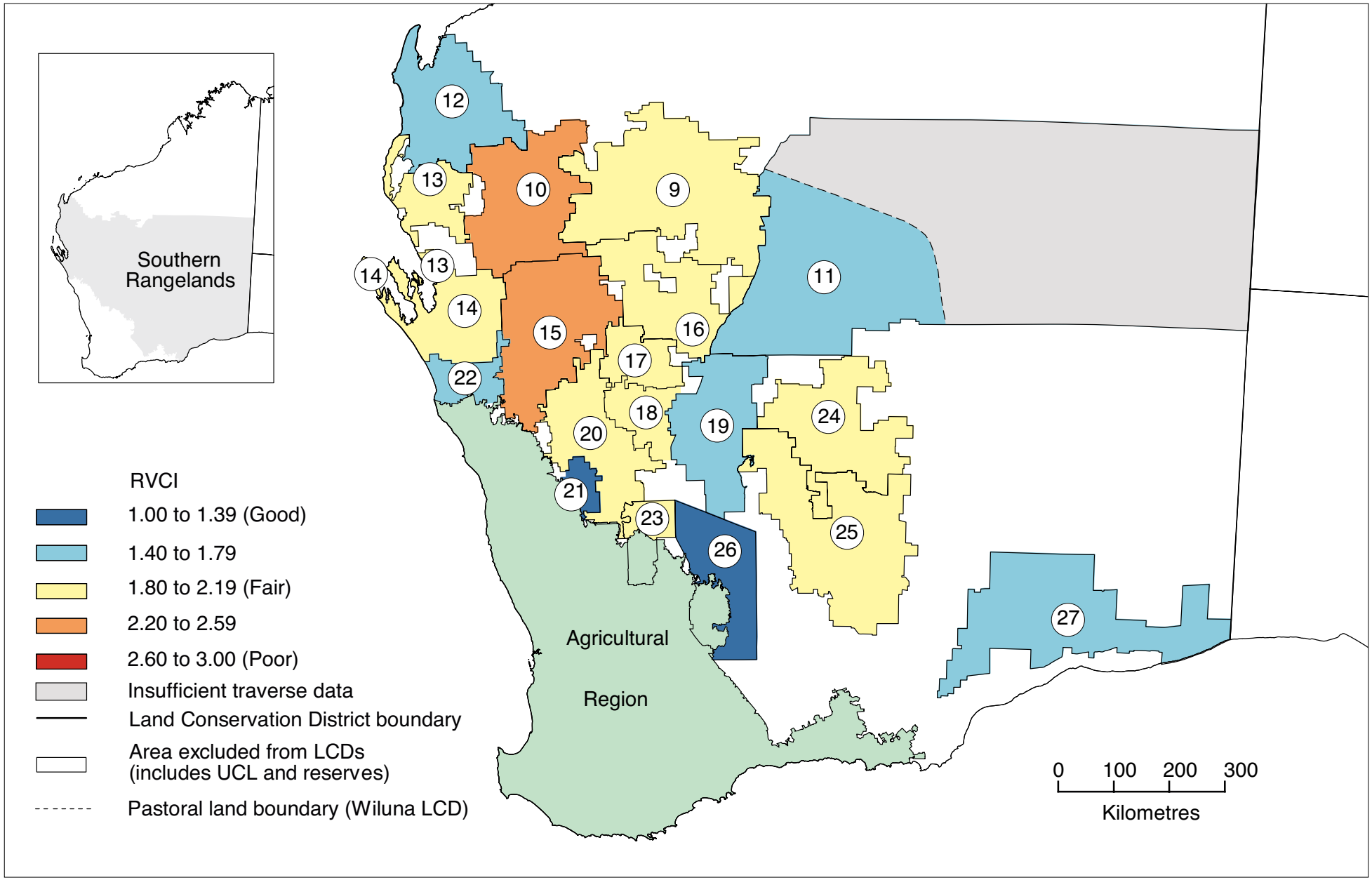

Figure 3.1.2 Rangeland Vegetation Condition Index at the most recent assessment in the Southern Rangelands, 2001–09

Table 3.1.1 Status and trend in rangeland vegetation condition at the most recent WARMS assessment in the Northern Rangelands

LCD	Number of stations	Number of vegetation condition ratings in LCD	Vegetation condition classes (%)	Rangeland Vegetation Condition Index	Trend
			0 50 100		
1 North Kimberley	13	1291		1.5	▪ *
2 Halls Creek – East Kimberley	35	6111		1.7	▪ †
3 Derby – West Kimberley	32	4591		1.6	▪ †
4 Broome	9	926		1.4	▪ *
5 De Grey	15	2552		1.2	↙ †
6 Roebourne – Port Hedland	18	2829		1.4	▪ †
7 East Pilbara	13	2459		1.7	▪ †
8 Ashburton	16	2684		1.6	↙ *

* Trend was based on the period from the last station inspection to Assessment 8 (2015).

† Trend was based on the condition assessment of the WARMS site between the corresponding year of the last station inspection and Assessment 7 (2012–14).

Note: For WARMS assessment periods, refer to Table 3.2.1.

Condition class

- Good
- Fair
- Poor

Recent trend

- ↗ Improved
- ▪ Stable
- ↙ Declined

Table 3.1.2 Status and trend in rangeland vegetation condition at the most recent WARMS assessment in the Southern Rangelands

LCD	Number of stations	Number of vegetation condition ratings in LCD	Vegetation condition classes (%)	Rangeland Vegetation Condition Index	Trend
			0 50 100		
9 Gascoyne – Ashburton Headwaters	15	3933		2.1	▪
10 Upper Gascoyne	18	3013		2.4	▪
11 Wiluna	15	3268		1.6	▪
12 Lyndon	20	3653		1.7	▪
13 Gascoyne–Wooramel	16	2658		1.9	n/a
14 Shark Bay	12	1513		1.9	n/a
15 Murchison	26	5017		2.2	▪
16 Meekatharra	19	3880		2.1	▪
17 Cue	8	1436		2.1	▪
18 Mount Magnet	16	2011		1.9	▪
19 Sandstone	12	2312		1.7	▪
20 Yalgoo	18	3008		2.0	▪

Table 3.1.2 continued

LCD	Number of stations	Number of vegetation condition ratings in LCD	Vegetation condition classes (%)	Rangeland Vegetation Condition Index	Trend
			0 50 100		
21 Perenjori	2	98		1.2	n/a
22 Binnu	4	405		1.5	n/a
23 Mount Marshall	2	332		1.9	n/a
24 North-eastern Goldfields	29	6629		1.9	▪
25 Kalgoorlie	21	4143		1.8	▪
26 Yigarn	6	473		1.3	n/a
27 Nullarbor – Eyre Highway	20	6290		1.4	▪

n/a No assessment rating was recorded in Assessment 3 (2005–10).

Note: Trend was based on the condition assessment of the WARMS site between the corresponding year of the last station inspection and Assessment 4 (2010–15). For WARMS assessment periods, refer to Table 3.2.1.

Condition class

- Good
- Fair
- Poor

Recent trend

- ↗ Improved
- ▪ Stable
- ↙ Declined

Overview

In this report, rangeland vegetation condition relates to livestock grazing (pastoralism) values.

Rangeland vegetation condition (good, fair or poor; see Glossary) is an assessment of the health of the vegetation in relation to a reference or benchmark site — an area perceived to be in a state of good health — within a given set of environmental and managerial factors (Friedel et al. 2000). Rangeland vegetation condition is measured using a defined set of indicators of vegetation for production.

The presence and persistence of palatable perennial grasses and shrubs is the major indicator of rangeland vegetation condition for pastoralism. Palatable (to livestock), productive perennial plants (grasses or shrubs) are essential for sustainable pastoralism. These plants provide drought forage in variable rainfall climates, protect the soil surface, play an important role in nutrient cycling and maintaining soil health (for example soil organic matter), and in some areas, provide fuel for burning to help control woody weeds.

Rangeland vegetation condition declines:

- when desirable plants (generally palatable, perennial species) are replaced by less desirable ones (often, but not necessarily, annual species)
- when there is a loss of vegetation cover leading to an increase in bare ground
- when water flow patterns are altered by soil erosion, thereby reducing water availability for vegetation growth.

Perennial plants provide a degree of production and soil stability for pastoral production systems across variable seasons and years. Annual and short-lived perennial plants provide less soil stability because they drop their leaves and decrease in numbers or disappear in dry conditions.

Stocking rate and livestock productivity can be high on vegetation in poor condition in average or above-average rainfall seasons because the substantial amount of forage produced by annuals and short-lived perennials can mask the underlying impact of prolonged overgrazing on desirable perennials.

However, in below-average rainfall seasons, annuals produce very little forage and perennials are significantly reduced or absent. In these seasons, rangeland in poor condition has more bare ground and less capacity to productively use rainfall, has limited grazing potential and livestock production capacity, and has lost drought resilience.

Rehabilitating and improving rangeland vegetation condition generally requires sequences of above-average rainfall years coupled with low grazing pressure to allow desirable plant populations to recover. In areas where there has been considerable soil loss and substantial vegetation change, irreversible change may have occurred and grazing productivity may have declined permanently.

Assessment method

DAFWA assesses rangeland vegetation condition by comparing the current vegetation to that which would be expected to occur in the natural undisturbed state. Rangeland vegetation condition at the pastoral station scale was assessed using a standard methodology about every six years from 1997 until 2009, and intermittently prior to 1997. These assessments are held in confidential reports. Each station assessment consisted of traverses through the major land systems (see Glossary). At every kilometre along each traverse, rangeland vegetation condition was recorded. The status of the soil surface (cover and erosion) relative to a pristine area of the same pasture type was also recorded.

Example of rangeland condition states for ribbon grass Alluvial Plain pasture in the Kimberley

Good condition: high density and even spacing of perennial ribbon grass, only a small number of undesirable grasses, good soil cover provided by perennial grasses

Fair condition: density of desirable grass is reduced, increased number of undesirable grasses, increased number of bare soil patches

Poor condition: density of desirable grass is sparse, large areas of bare soil

The measures used to report on vegetation condition are:

1. percentages of good, fair and poor vegetation condition (aggregate from points on the traverses on each station)
2. Rangeland Vegetation Condition Index, a weighted figure based on the percentages in point 1.

The Rangeland Vegetation Condition Index (RVCI) derived from these assessments and the trend in RVCI is used to assess the change in rangeland vegetation condition over time.

The RVCI ranges from 1.0 to 3.0, with:

1.0 = good condition

2.0 = fair condition

3.0 = poor condition.

It is calculated as:

RVCI = Sum ((% good vegetation condition traverse points/100 x 1) + (% fair vegetation condition traverse points/100 x 2) + (% poor vegetation condition traverse points/100 x 3))

For example, in an LCD with 20% of traverse points in good vegetation condition, 50% in fair vegetation condition and 30% in poor vegetation condition, the RVCI is calculated as:

RVCI = Sum ((0.20 x 1) + (0.50 x 2) + (0.30 x 3)) = 2.1

If the RVCI is 1.0, the whole LCD is in good rangeland vegetation condition; if the RVCI is 3.0, the whole LCD is in poor rangeland vegetation condition.

Note that LCDs with different proportions of rangeland vegetation condition can have the same RVCI. For example, an LCD with 50% of the vegetation in good condition and 50% in poor condition has

the same RVCI (2.0) as an LCD with 100% in fair condition. Caution is needed when comparing the RVCI of LCDs with different land systems.

Figures 3.1.1 and 3.1.2 are based on DAFWA's most recent assessments (ending in 2009). The RVCI values for each LCD are based on all traverse points for each LCD (regardless of the station they occur on), rather than the average of individual stations within an LCD. Note that the most recent assessment for some stations was from 2001 and 2002 (Tables 1.3 and 1.4).

Status and trend

Northern Rangelands

At the LCD scale, rangeland vegetation in the Northern Rangelands was mostly in good or fair condition. At the aggregate LCD scale, vegetation condition was 57% good, 29% fair and 14% poor (Figure 3.1.1 and Table 3.1.1).

Vegetation in the Broome, De Grey and Roebourne – Port Hedland LCDs was generally in good condition and the vegetation in the rest of the LCDs was in good to fair condition (Table 3.1.1). Spinifex-dominated hummock grasses dominate a large proportion of the Pilbara rangelands (Van Vreeswyk et al. 2004). This grass species composition makes these rangeland types particularly resilient to grazing and is often in good to fair condition.

Considerable variation in vegetation condition exists within LCDs and within individual stations. Vegetation types within land systems vary in resilience to grazing and palatability to livestock, resulting in patch grazing — where continual grazing in certain areas contributes to localised overgrazing — while other areas are lightly grazed or, in some cases, rank and unused. The palatable vegetation types or preferred areas (often in drainage areas or valley floors) generally record a higher percentage of poor condition ratings than less-palatable vegetation types, such as hard spinifex hill pastures. Therefore, between stations within LCDs, there is a wide range of RVCI values. Several stations have more than 40% of the traverse points in poor condition while, some stations have 80–90% of traverse points in good condition.

In the Kimberley, pasture types dominated by hummock grasses appear more resistant to grazing than tussock (bunch grass) types. In the Ord River Catchment, only 4% of the assessments of hummock pasture types are in poor vegetation condition, compared to 37% of tussock pasture types. Hummock grasses, particularly spinifex (*Triodia* spp.), have greater resilience to grazing, lower palatability to livestock and are often in locations less attractive to livestock.

Tussock grass-dominated pastures, for instance ribbon grass pasture dominated by the highly palatable grass, *Chrysopogon fallax*, have limited resistance to heavy and prolonged grazing. Ribbon grass is highly favoured by cattle and native herbivores early in the growing season and so it is particularly susceptible to a decline in rangeland vegetation condition.

Southern Rangelands

At the LCD scale, rangeland vegetation in the Southern Rangelands was mostly in good or fair condition. At the aggregate LCD scale, vegetation condition was 36% good, 39% fair and 25% poor (Figure 3.1.2 and Table 3.1.2).

The LCD RVCIs in the Southern Rangelands indicate a more variable rangeland vegetation condition than in the Northern Rangelands, with several LCDs having aggregated RVCI values above 2.0 (Table 3.1.2). This variability is, in part, associated with different land uses and lease ownership (Figure 1.8). The Goldfields and Nullarbor have low RVCI values (good condition), with numerous stations having more than 70% of traverse points in good condition. Other areas, particularly in the summer rainfall region, have relatively high RVCI values, indicating a low proportion of traverse points in good condition on many stations. For example, only 2 of the 33 stations in the Gascoyne – Ashburton Headwaters and Upper Gascoyne LCDs recorded more than 50% of traverse points in good condition.

As in the Northern Rangelands, there is considerable variation within LCDs and between land systems and vegetation types within individual stations. While the vegetation in the Goldfields and Nullarbor was generally in good condition, several stations recorded less than 10% of traverse points in good condition. In the Gascoyne River Catchment, when aggregated into land type, the alluvial plains with halophytic shrublands — including the Sable (55% of traverse points in good condition) and Delta (24% in good condition) land systems — recorded the highest percentage of traverse points in good condition.

In contrast, the stony plains with acacia shrublands and halophytic shrublands land type were in the poorest condition, with 68% of traverse points in poor condition (Waddell et al. 2012). This land type includes the Nadarra (73% of traverse points in poor condition), Bryah (71%), Durlacher (70%), Mantle and Yinnietharra (61%) and Kurubuka (53%) land systems. The differences between land systems and their vegetation types are largely a result of differences in the inherent resilience to grazing of the species within the vegetation types, palatability to livestock and the topographic location.

Discussion and implications

Rangeland vegetation condition varies widely across the WA pastoral rangelands. While some LCDs, particularly in the Northern Rangelands, have good RVCI values, other areas in the Southern Rangelands are dominated by poorer RVCI values.

Variation in rangeland vegetation condition at the land system scale is exacerbated by the difficulties of managing grazing pressure across pastoral areas that include several land systems. Selective grazing of the more palatable vegetation types in some land systems and seasonal factors are the primary influences on the variability of rangeland vegetation condition.

Sources of information

Friedel, MH, Laycock, WA & Bastin, GN 2000, 'Assessing rangeland condition and trend', in I T'Mannetje and RM Jones (eds), *Field and Laboratory Methods for Grassland and Animal Production Research*, Commonwealth Agricultural Bureau, Oxford, pp. 227–62.

Van Vreeswyk, AME, Payne, AL, Leighton, KA & Hennig, P 2004, 'An inventory and condition survey of the Pilbara region, Western Australia', *Technical bulletin 92,* Department of Agriculture Western Australia, Perth.

Waddell, PA, Thomas, PWE & Findlater, PA 2012, 'A report on the Gascoyne River Catchment following the 2010/11 flood events', *Resource management technical report 382*, Department of Agriculture and Food, Western Australia, Perth.

Westoby, M, Walker, B & Noy-Meir, I 1989, 'Opportunistic management for rangelands not at equilibrium', *Journal of Range Management,* vol. 42, pp. 266–74.