GOVERNMENT OF WESTERN AUSTRALIA

Department of **Agriculture** and **Food**

Annual Pastoral Land Condition Report 2008/2009

A report prepared for the
Pastoral Lands Board of Western Australia
on behalf of the
Commissioner of Soil and Land Conservation

December 2009

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SUMMARY

This report to the Pastoral Lands Board of Western Australia presents information for the 2008/2009 financial year. The report also satisfies the Commissioner of Soil and Land Conservation's obligation to provide the Pastoral Lands Board with a report on the current condition of land under pastoral leases in the State.

The report provides background information on pastoral leases, seasonal conditions and pastoral land condition, using information from the Bureau of Meteorology, the Western Australian Rangeland Monitoring System (WARMS) and the pastoral lease inspection program of the Department of Agriculture & Food Western Australia (DAFWA).

Pastoral leases cover 87.4 million hectares or 35% of the State. In a continuing trend, the number of pastoral leases has again declined. The Northern Rangelands remain predominantly cattle, focussed on the live export market, and market conditions remained buoyant. The Southern Rangelands have seen a continuing trend over the past twenty years of an expansion of the cattle industry at the expense of the sheep industry.

Much of the north received average to above average summer rainfall (with record falls being recorded in the Kimberley region), but the season ended early, and in contrast much of the winter rainfall has been average or below average. Conditions in the Pilbara were average to below average overall, while conditions in the Southern Rangelands varied among Land Conservation Districts (LCDs).

The 2008/2009 analysis of the Western Australian Rangeland Monitoring System showed that perennial grass frequencies in the Kimberley increased over the latest sampling period, although frequencies are reaching a plateau. Conversely, perennial grass frequencies declined in the Pilbara region, and in the Southern Rangelands, although data were variable, there was an overall general decline in recorded shrub density. Reported stock densities continued to rise (in general terms) in both Kimberley and Pilbara LCDs (despite a preponderance of only 'average' or 'below average' seasonal conditions being recorded in the latter), while trends in reported stock densities in the Southern Rangelands varied among LCDs.

A total of 116 reports were prepared for the Pastoral Lands Board by DAFWA during 2008/2009. Of the 60 stations inspected for Rangeland Condition Assessments, 37 (62%) had one or more identified land management issues. Of the stations where range condition trend could be assessed, 17 (28%) of stations had a positive trend in range condition, 14 (23%) had no significant change and 22 (37%) had declined in range condition. An assessment could not be made on a further 7 stations (12%). There appears to be a steady increase in the number of leases indicating a negative trend, particularly in the Southern Rangelands, although this appears dominated by 'moderate' negative changes.

1 Introduction

Western Australia's rangelands cover 87% of the state's landmass and include all but the south west of the State. Pastoral leases, used for grazing of livestock on native vegetation, cover 35% (874,000 km^2) of the rangelands, with Unallocated Crown Lands (UCL) and lands vested for conservation and Indigenous purposes making up the balance.

The rangelands region is comprised of a diverse range of climates from the semi arid tropics in the north through to the arid south. Topography includes coastal plains, dunes, rocky ranges, and arid deserts. Annual rainfall varies from 1,400 mm in the north Kimberley to less than 200 mm in the southern, more arid areas. This diversity has led to the demand for diversification of use for the rangelands that are not based on traditional pastoralism.

There are currently 459 registered pastoral stations (made up of 510 pastoral leases) in Western Australia; there are 159 stations in the Northern Rangelands (Kimberley and Pilbara), 291 stations in the Southern Rangelands, and nine stations in the South West Land Division. The total number of stations continues to decline as it has for the past decade. Ten years ago (1998-99) there were 507 stations listed in Western Australia.

The average size of a pastoral station is 185,000 hectares, with the largest being over 500,000 hectares. Pastoral production is estimated at around $240 million, comprising $180 million in cattle sales, $34 million in wool production, $14 million in sheep sales and $12 million in goat sales.

The Kimberley, Pilbara and northern Gascoyne are predominately cattle producing areas, focused on live export out of the northern ports of Port Hedland, Broome, and Wyndham and to a lesser extent Darwin. Store cattle are also produced in the southern Pilbara and Gascoyne areas for finishing in agricultural areas. Demand for cattle in the live export market has been strong, and this, allied with the good seasonal conditions, has been generally favourable for the industry.

Wool production remains the major enterprise in the southern Gascoyne, Murchison and Goldfields areas. However, the contribution of Southern Rangelands sheep production continues to decline, and is currently less than 3% of the total value of the State's sheep production. Over the past 20 years there has been a gradual expansion of the cattle industry (at the expense of the sheep industry) south through the Upper Gascoyne and Murchison areas. The move to cattle has come about for a range of reasons, both associated with perceived difficulties with small stock enterprises (producers consider that cattle are more resistant to wild dog predation, require reduced infrastructure and lower labour inputs than sheep), as well as perceived superior financial returns from cattle production. Poor returns from sheep have diminished the capacity for pastoralists to invest in necessary infrastructure maintenance over a considerable period of time (> 20 years). The condition of small stock infrastructure has currently deteriorated to the point that many pastoral leases in the Southern Rangelands have inadequate infrastructure to support a Merino sheep enterprise. However there is an increasing focus on meat production from sheep in the Southern Rangelands, from both Merino and meat sheep breeds, and from goats.

In comparison to the productivity of pastures in the northern rangelands (essentially grasslands), productivity of the perennial component of the vegetation communities (predominantly shrublands) in the Southern Rangelands is low. As a result of this low productivity and the unreliable seasons, the perennial vegetation in the Shrublands is more susceptible to degradation through overgrazing than the northern grasslands.

Pastoralists and other land mangers continue to work with relevant agencies to explore new opportunities for diversified activities in the rangelands. These include investigation into the potential to utilise underground water resources to support the trialling of agricultural crops such as fodder crops, food crops or biofuel feed stocks.

This report provides information on seasonal conditions, the information provided by the Western Australian Rangeland Monitoring System (WARMS), and information from the scheduled Rangeland Condition Assessment (RCA) reports carried out by the Department of Agriculture and Food Western Australia (DAFWA) staff. The report refers to the districts of East and West Kimberly, Pilbara, Gascoyne-Murchison, Meekatharra and Goldfields-Nullarbor (Figure1).

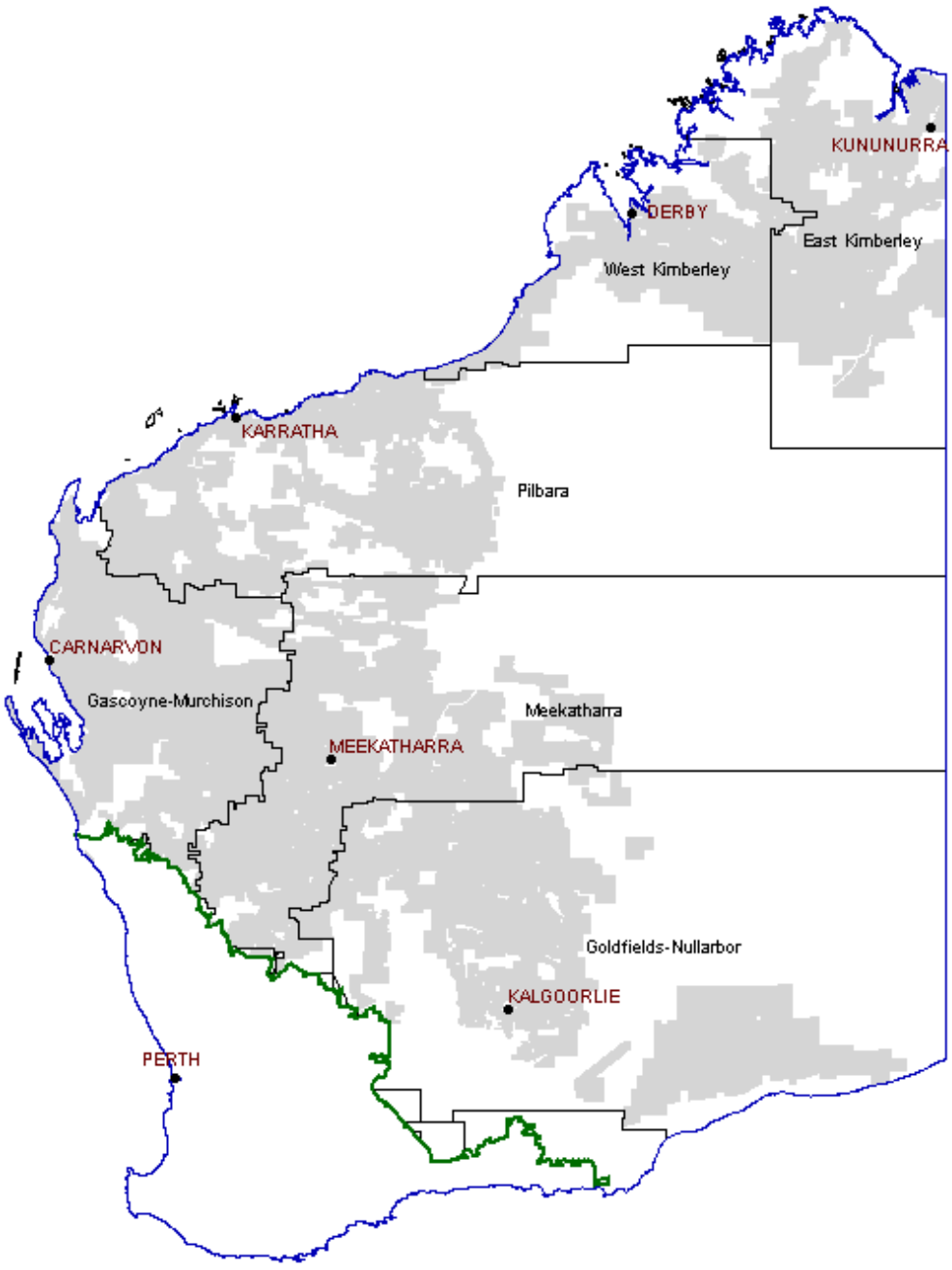

Figure 1. Western Australia Pastoral Districts

2 Seasonal Conditions

2.1 Northern Rangelands

Above to very much above average summer rainfall was recorded in late 2008 and early 2009 in much of the Kimberley and southwest Pilbara, with some areas receiving their wettest November on record. The wetter than normal summer was mainly due to an active monsoon season in the north. Tropical cyclone *Billy* in mid-December, and *Dominic* in late January as well as several tropical lows in February produced widespread heavy rainfall and flooding along their paths mainly in the Kimberley, west Pilbara, and inland Gascoyne. Several sites, mainly in Kimberley, recorded their highest total summer rainfall on record. However, across the Kimberley the season ended early, with little rainfall recorded after mid-February. Autumn was dry, and parts of the Kimberley and Interior received below average winter rainfall.

2.2 Southern Rangelands

Above to very much above average summer rainfall was recorded in much of the inland Gascoyne, Southeast Coastal and neighboring areas. However, the Gascoyne down to the Southwest Land Division (SWLD), received below to very much below average autumn rainfall. Many locations in the SWLD registered their driest autumn on record. Winter 2009 saw near average rainfall across large parts of Western Australia. The western Gascoyne, Great Southern and Southeast Coastal received below average winter rainfall, whilst pockets in the Goldfields, Eucla and the South Coastal registered above average winter rainfall.

Whilst year to date NOAA - NDVI imagery (October 2009) indicates that some areas in the rangelands may have had a 'reasonable season' in 2009, there are still some areas (brown, blue and black in Figure 2) which have not had a 'reasonable season' for a number of years. However as shown in Figure 3, some areas which may have had a 'reasonable season' in 2009 (green in Figure 2) may still have had only a few reasonable seasons in the last 6 years. This is important, as there are cumulative negative effects on the rangelands from successive below average seasons, and these need to be accounted for.

2.3 Seasonal Outlook

The outlook for summer (December 2009 – February 2010) rainfall shows no significant tendency towards either a drier or wetter summer season across Western Australia. The pattern of seasonal rainfall across Western Australia is a result of higher than average temperatures in both the Pacific and Indian Oceans. The contribution of the warm Pacific (El Niño) biases the climate towards below average rainfall over western parts of the State, while the warm Indian Ocean counteracts this by promoting a tendency towards above average falls in largely the same areas.

The chances of exceeding the median rainfall for December to February over Western Australia are between 45 and 55%, meaning that above average rainfall is about as equally likely as below average rainfall over this period. The outlook is related to how consistently the Pacific and Indian Oceans affect Australian rainfall. During summer, history shows this effect to be moderately consistent across much of Western Australia, grading to weakly consistent in the southeast and far east.

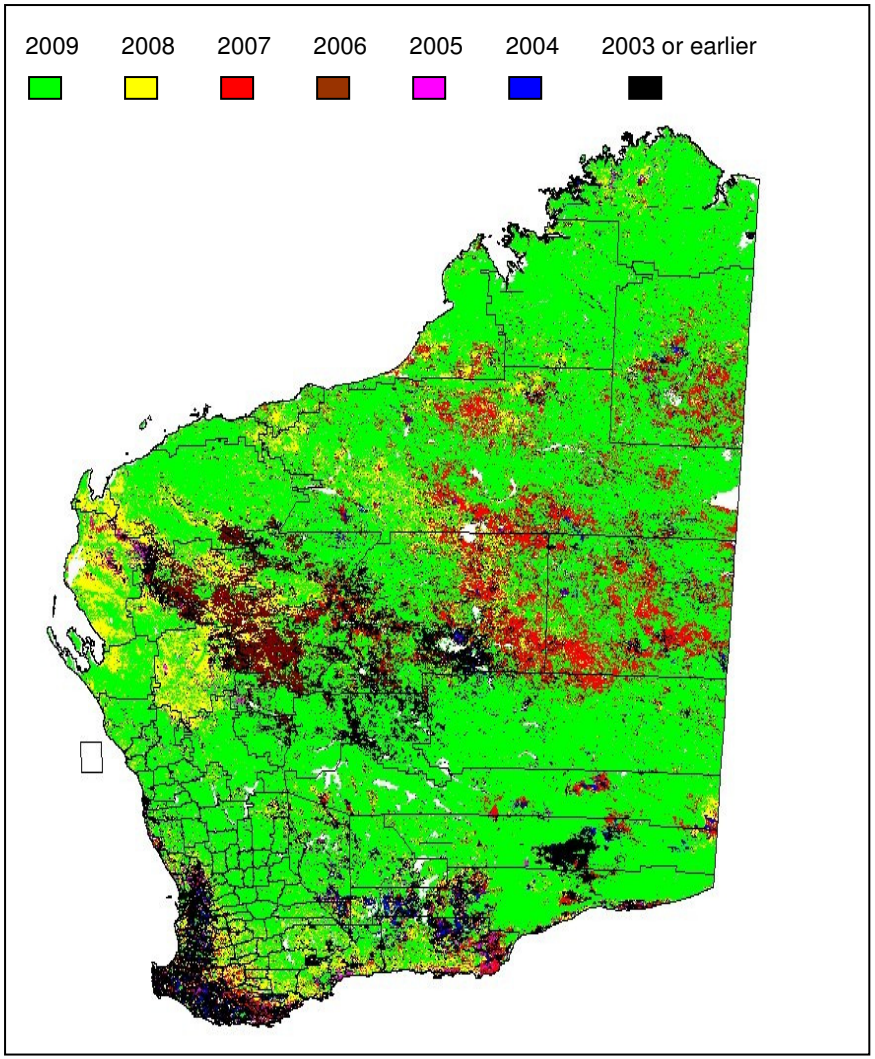

Figure 2. Year of last reasonable season (as determined by NOAA NDVI)

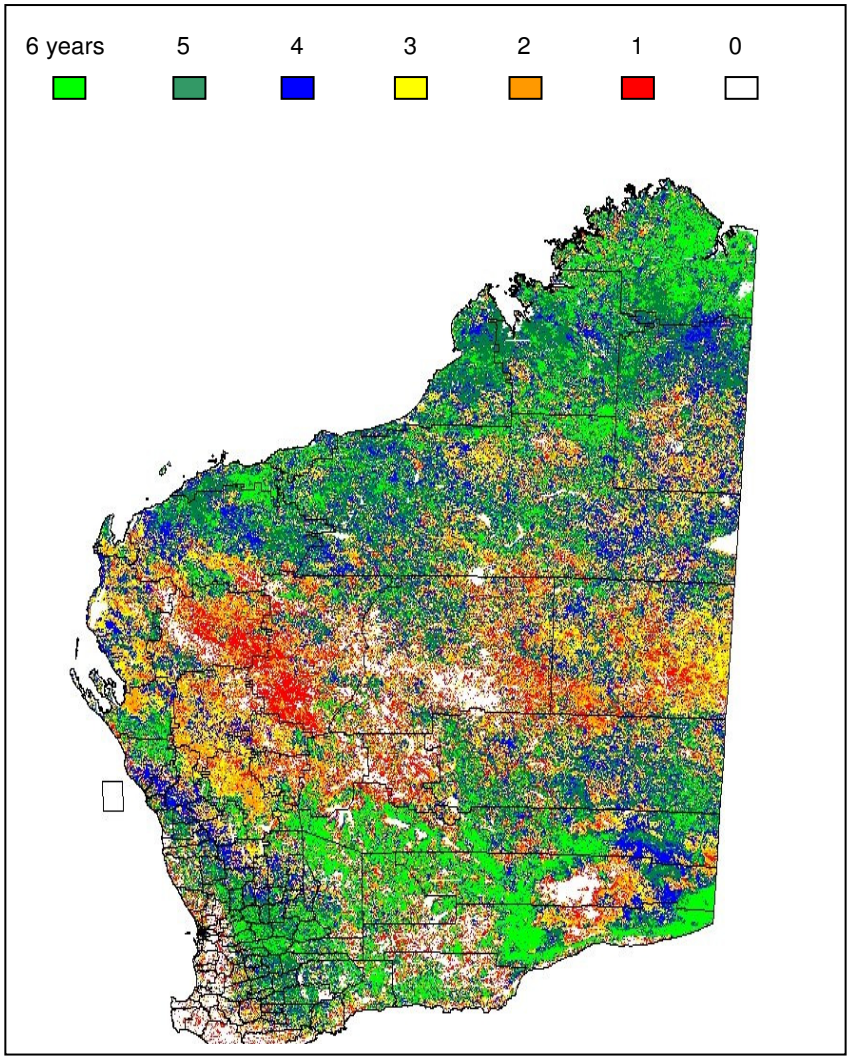

Figure 3. Number of reasonable seasons over the last six years (as determined by NOAA NDVI)

3 Condition of the Pastoral Resource Base

3.1 The Western Australian Rangeland Monitoring System

3.1.1 Introduction

The Western Australian Rangeland Monitoring System (WARMS) provides information on the trend in the pastoral rangelands at a regional scale. It does this through a representative network of point-based sites on which attributes of the soil surface and the vegetation are recorded. The system was developed on the understanding that perennial vegetation is a good indicator of rangeland health or condition. Site installation began in 1993, with the final sites installed in 1999. There are two types of sites. Grassland sites are recorded in the Kimberley, Pilbara and north-west Gascoyne, while in the southern Pilbara through to the Nullarbor shrubland sites are recorded.

There are currently 1,622 WARMS sites, with 633 grassland sites and the remainder shrubland sites. Grassland sites are reassessed on a 3-year cycle; shrubland sites are re-assessed on a 5-year cycle. In any given year about 410 sites are reassessed. The fifth assessment of the Kimberley (grassland) sites was completed in 2008. One full cycle (i.e. two assessments) has been completed for the shrubland sites, with approximately 90% of these sites now assessed three times.

WARMS is designed to report at the regional or district scale rather than on individual pastoral leases. Data in this report are presented at the Land Conservation District (LCD) scale. The number of sites on an individual pastoral lease is insufficient to provide a comprehensive assessment of the whole lease, nor is the location of individual sites necessarily appropriate to assess station or paddock scale trend. WARMS data and photographs are stored in the WARMS database. This database also contains information on about 4,000 old WARMS and Pastoralist Monitoring Sites and 80 benchmark sites.

In 2008/09 reassessments of sites in the Kimberley were carried out by staff based in the Kununurra and Derby district offices. A DAFWA staff member based in Northam and a private contractor carried out the reassessment of Pilbara and southern region sites.

3.1.2 Seasonal quality

Seasonal condition is estimated for each reassessment period (epoch) at each WARMS site. ‘Seasonal quality’ describes the relative value of recent climate (principally rainfall) with respect to biological functioning. ‘Biological functioning’ broadly means vegetation growth as a basic resource for both livestock (forage) and fauna (food and shelter) and for soil protection. A single ‘seasonal quality’ is calculated for each WARMS site, designed to summarise rainfall amounts and timing (winter or summer) over the approximate period between either site installation and re-assessment (i.e. Date 1 and Date 2), or, subsequently, between further re-assessments. There are two periods defined, a summer period (October to March) and a winter period (April to September). The three seasonal quality categories defined are ‘below average’, ‘average’ and ‘above average’, based on terciles (a division of the rainfall data into three equal groups). Seasonal qualities are calculated using rainfall data obtained from the gridded SILO rainfall surfaces.

3.1.3 Kimberley grasslands

3.1.3.1 Seasonal quality

Seasonal quality was assessed for the Kimberley region for each of the epochs (an 'epoch' is a 3 year sampling cycle, the first being 1994 to 1996, the last 2006 to 2008) since current WARMS data have been collected (Table 1). In general, seasonal quality has been above average in the Kimberley over the past 15 years, with the majority of WARMS sites classified as 'above average' (Table 1), and with no sites assessed as experiencing a 'below average' epoch during this period.

Table 1. Percentage of WARMS sites assessed as receiving above average, average or below average seasonal conditions, Kimberley LCDs

LCD	Seasonal quality	Cycle 1 (E1 to E2)	Cycle 2 (E2 to E3)	Cycle 3 (E3 to E4)	Cycle 4 (E4 to E5)
Broome	Above average	78%	100%	76%	41%
Broome	Average	22%	0%	24%	59%
Derby West Kimberley	Above average	97%	100%	25%	92%
Derby West Kimberley	Average	3%	0%	75%	8%
Halls Creek East Kimberley	Above average	68%	100%	75%	78%
Halls Creek East Kimberley	Average	32%	0%	25%	22%
North Kimberley	Above average	74%	100%	74%	82%
North Kimberley	Average	26%	0%	26%	18%

3.1.3.2 WARMS site data

On a regional basis, recorded perennial grass frequency increased in all LCDs in the Kimberley over the previous sampling period, although the increase was more variable in both the Broome and the North Kimberley LCDs (Figure 4). Perennial grass frequencies appear to have plateaued during the most recent epochs. This result is positive, but it should be remembered that WARMS reports on a regional or pasture type basis, not the basis of individual leases. Data from other sources (particularly the Pastoral Lease Assessment activities discussed later) do indicate that some individual leases have gone against this trend.

Given the above average seasonal conditions in many areas (Table 1), this result was not unexpected, with the excellent run of seasons providing favourable conditions for grass establishment and persistence. However, data show that perennial grass frequencies have stabilized (albeit at a relatively high level), implying that further increase (at least under current stocking levels) is unlikely.

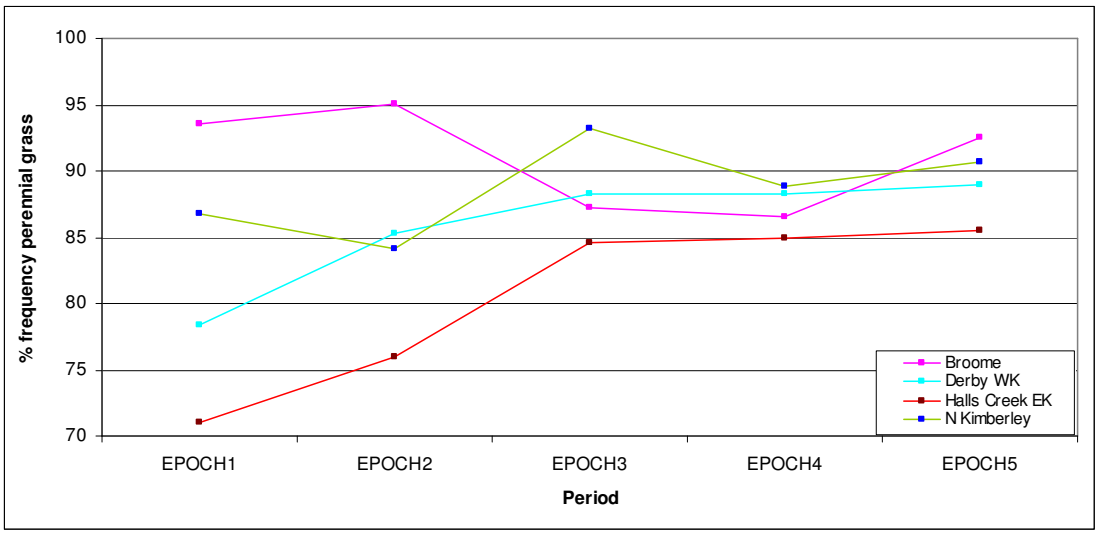

Figure 4. Mean perennial grass frequencies, Kimberley LCDs, Epoch 1 to Epoch 5

3.1.3.3 Reported stock numbers

Although variable, stock densities (cattle units per sq km) rose in the Kimberley over the past 15 years (Figure 5), with the exception of the Halls Creek East Kimberley LCD. Relative densities between LCDs reflect both the different potentials (in terms of carrying capacity) of the LCDs and their degree of infrastructure development. In particular, densities doubled in both the Derby West Kimberley and North Kimberley LCDs. As with WARMS data, these are regional figures, with considerable heterogeneity among leases within the Kimberley region and within LCDs. Moreover, several intensive "post-sale musters" have identified stock numbers on specific stations well in excess of those reported. This should also be kept in mind when interpreting these data.

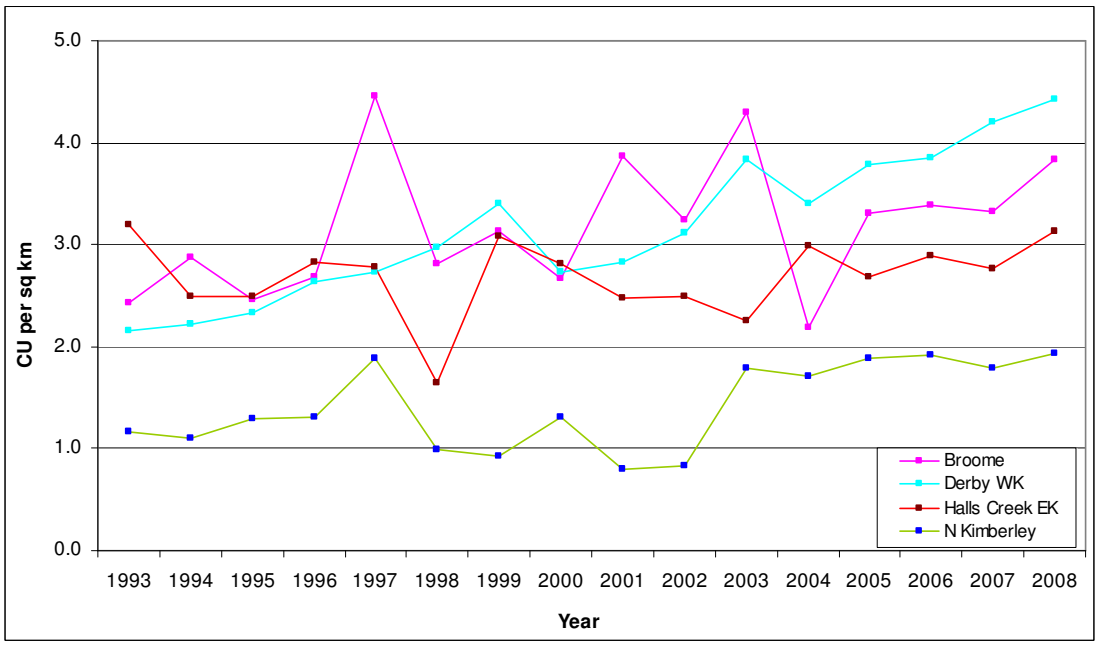

Figure 5. Mean reported stock densities (CU per sq km), Kimberley LCDs, 1993 to 2008

3.1.3.4 Discussion

Favourable seasonal conditions have been recorded in the Kimberley region over the previous fifteen years. The vegetation groups represented by WARMS sites are generally improving and this improvement has been recorded at each assessment since the sites were installed in 1995. It suggests that the grazing pressure has not been so high as to over-ride the impact of the generally good seasonal conditions at a time of increases in reported stock densities. This further suggests that the impact of grazing pressure pushing frequency of perennial grasses down has been roughly equivalent to the impact of rainfall pushing frequency up. There were no LCD specific or vegetation type specific trends obvious in the recorded data.

However, given the current plateau in grass frequencies recorded, it would appear that there is a risk that maintenance of the current stock densities would be unsustainable if seasonal conditions were to return to more 'average' levels for several successive years. This would become particularly apparent on the less resilient pasture types (generally tussock grasses on red soils) with the more resilient pasture types (tussock grasses on black soils – in particular the Mitchell grasses) able to support higher stock numbers for more extended periods. Moreover, as mentioned above, stock numbers are reported on a regional or district basis with considerable variation among leases within a given LCD. These differences are related to factors such as lease ownership and use (e.g. Indigenous-held leases are generally stocked at levels significantly below the LCD average, although individual paddocks may be stocked at or beyond potential levels) and the degree of infrastructure development. Heterogeneous grazing patterns (related to both cattle preference for specific pasture types and spatial grazing based on water-source distribution) remain a problem in the extensively managed Kimberley environment.

3.1.4. Pilbara and Gascoyne grasslands

3.1.4.1 Seasonal quality

Seasonal conditions in the Pilbara and Gascoyne grasslands were variable across LCDs (Table 2), with the most favourable conditions being recorded in the 1990s, and a greater prevalence of 'average' or 'below average' years being recorded since 2000. Data suggest that the East Pilbara has received good seasons over the last six years, while Ashburton, Lyndon and Roebourne LCDs received a preponderance of below average conditions.

3.1.4.2 WARMS site data

Perennial grass frequencies at WARMS grassland sites in the Pilbara and Gascoyne generally declined during Epochs 4 and 5, although in both the Lyndon and Roebourne LCDs recorded frequencies of perennial grasses have increased from Epoch 4 to Epoch 5 (Figure 6).

Table 2. Percentage of WARMS sites assessed as receiving above average, average or below average seasonal conditions, Pilbara and Gascoyne LCDs

LCD	Seasonal quality	Cycle 1 (E1 to E2)	Cycle 2 (E2 to E3)	Cycle 3 (E3 to E4)	Cycle 4 (E4 to E5)
Ashburton	Above average	59%	14%	na	12%
Ashburton	Average	41%	86%	na	26%
Ashburton	Below average	0%	0%	na	62%
DeGrey	Above average	na	100%	11%	80%
DeGrey	Average	na	0%	44%	20%
DeGrey	Below average	na	0%	44%	0%
East Pilbara	Above average	na	na	70%	100%
East Pilbara	Average	na	na	30%	0%
East Pilbara	Below average	na	na	0%	0%
Lyndon	Above average	81%	12%	0%	4%
Lyndon	Average	19%	88%	0%	61%
Lyndon	Below average	0%	0%	100%	35%
Roebourne	Above average	na	100%	20%	18%
Roebourne	Average	na	0%	17%	48%
Roebourne	Below average	na	0%	63%	34%

na implies no WARMS sites assessed in the LCD during that epoch)

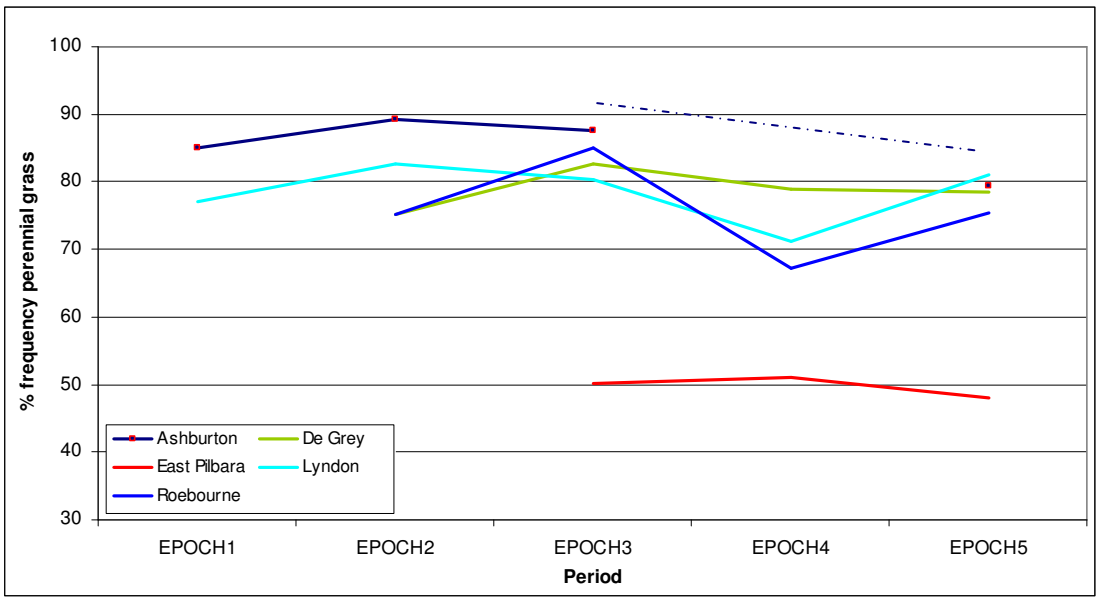

Figure 6. Mean perennial grass frequencies, south of Kimberley LCDs, Epoch 1 to Epoch 5

3.1.4.3 Reported stock numbers

Reported cattle numbers in the grasslands in the Pilbara and Gascoyne have increased over the period 1993 to 2008 (Figure 7), more than doubling in the East Pilbara and DeGrey LCDs. Comments made above (S 3.1.3.4) concerning the stock number differences within LCDs in the Kimberley region are equally valid for the Pilbara and Gascoyne LCDs. Additionally, the time span illustrated in Figure 7 also tracks a substantial shift from sheep to cattle in the Pilbara over the previous 20 years.

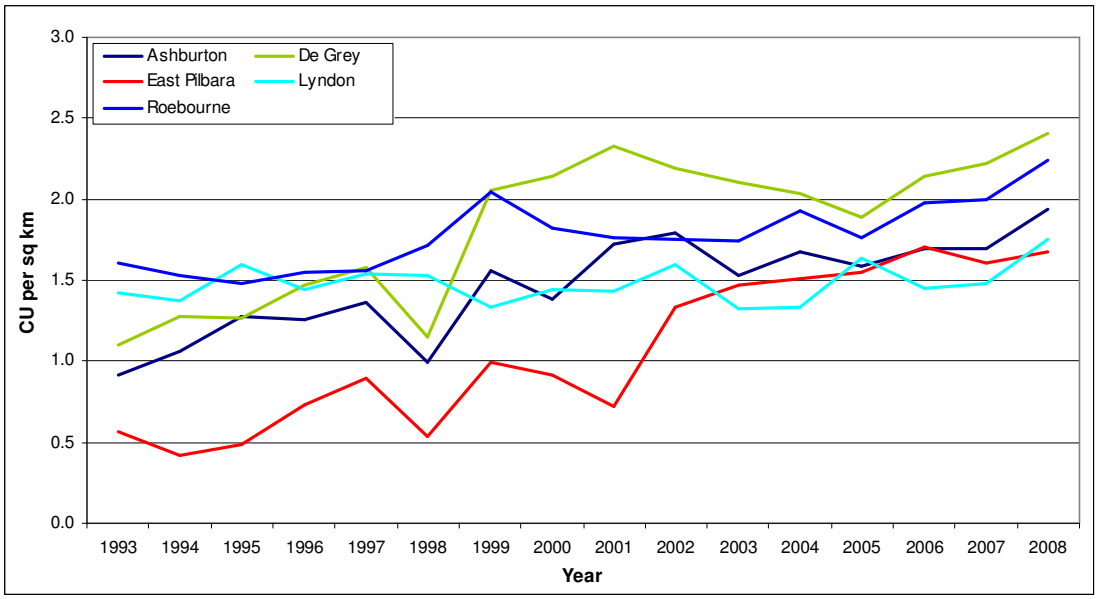

Figure 7. Mean reported stock densities (cu per sq km) south of Kimberley LCDs, 1993 to 2008

3.1.4.4 Discussion

The increase in reported stock density in the Pilbara and Gascoyne has not been accompanied by good seasonal conditions. In the period from Epoch 4 to Epoch 5, 62% of the sites in the Ashburton LCD were assessed as receiving a 'below average' season. However, stock densities continued to rise during this period (Figure 7), and the frequency of perennial grasses declined slightly to 79% in Epoch 5 (Figure 6). The sites assessed as 'below average' season have a mean perennial grass frequency of 74%, and the sites assessed as 'above average' season are at 96% perennial grass frequency. In the East Pilbara LCD the seasons between Epochs 4 and 5 are rated 'above average', yet the grass frequency trend is marginally down, with stock numbers trending up. This clearly suggests that stock numbers are reducing the capacity of the rangeland to respond to the more favourable seasons.

Both these situations suggest that the increase in stock numbers in this region is non-sustainable, while in the East Pilbara LCD, a return to 'average' seasons or perhaps 'below average' seasons could cause significant problems if stock numbers are not rapidly reduced in response. The trend in reported stock numbers should be monitored on both a station and LCD basis, while the lag time between a period of excessive grazing pressure and the consequences being recorded at a WARMS site is relevant here.

3.1.5 Recent trends in WARMS data and reported stock numbers, Northern Rangelands

The percentage changes in desirable perennial grass frequency within each LCD in the Northern Rangelands (Kimberley and Pilbara) and the relative stocking levels over the previous 3 years (Epoch 4 to Epoch 5) are illustrated in Figure 8. Changes in recorded grass frequencies from WARMS sites are represented horizontally, either increasing (to the right of the figure) or decreasing (to the left) compared with Cycle 4. Reported animal numbers relative to the assessed present carrying capacity of leases within each LCD are represented vertically. LCDs with average reported stock numbers above the average present carrying capacity are in the upper half, and those with average stock numbers below the average present carrying capacity in the lower half of the figure. Ideally, the place to be is on the right hand side of Figure 8.

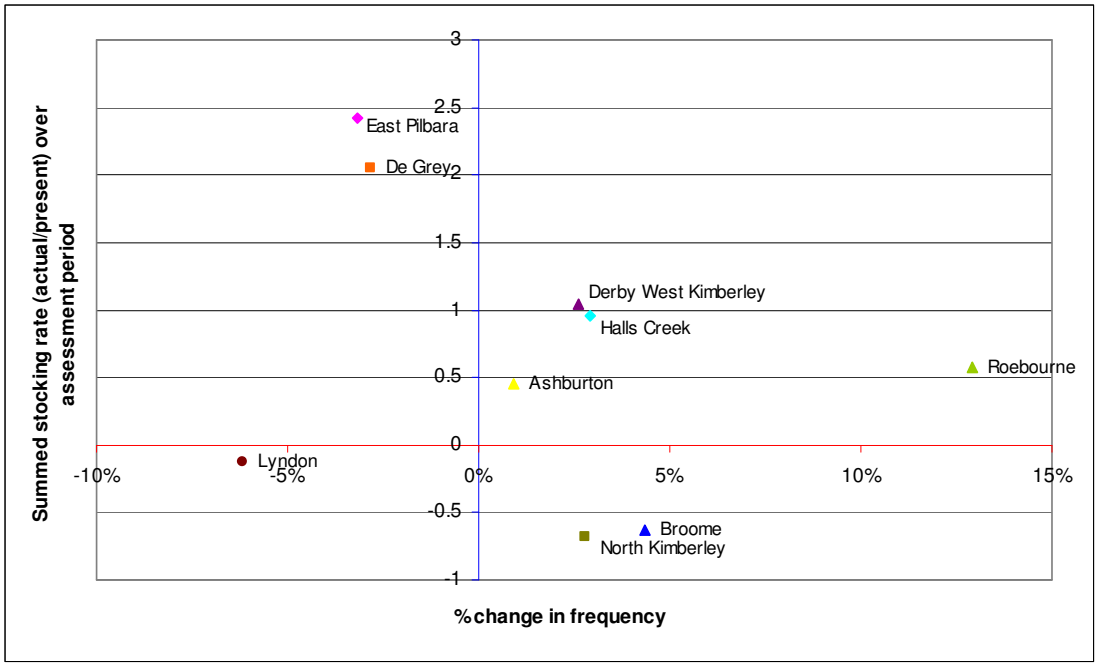

Figure 8. Changes in recorded frequency of desirable perennial grasses in relation to grazing pressure, Northern Rangelands LCDs

In considering the information provided in Figure 8, the antecedent status of grass frequency should be considered (Table 3). For example, while Figure 8 would suggest that desirable grass frequency in the Roebourne LCD had improved substantially over the previous three years (despite a slightly above capacity stock level across the district and 34% of WARMS sites in the district having a seasonal quality rated as 'below average' and only 18% 'above average'), Table 3 indicates that this increase is on the back of the previous three year period in which the frequency of desirable perennial grasses in the Roebourne LCD declined by 27%. Therefore, the increase in Cycle 4 was from a low base, with the recovery in Cycle 4 significantly less than the decline in Cycle 3. Conversely, positive changes during Cycle 4 in the Kimberley LCDs all surpassed the declines recorded during Cycle 3.

Although declines in the recorded perennial grass frequency in the East Pilbara LCD are only approximately 3%, the frequency of perennial grasses has declined despite 100% of the WARMS sites being rated as having 'above average' seasonal conditions. This is a worrying situation for two reasons. Firstly, reported stock densities are well in excess of assessed present carrying capacity, indicating substantial reductions in numbers will be required if a succession of below average (or even average) seasons are recorded. Secondly, it is during periods of favourable seasonal conditions that recruitment and establishment of desirable

perennial grasses is most likely. The decline in the frequency of desirables in the East Pilbara LCD during a time of 'above average' seasonal quality at all sites suggests that this recruitment may have been negligible during this time, and so will not bode well for future years. A similar situation exists with the DeGrey LCD (Figure 8 and Table 2).

Table 3 Change in frequency of desirable perennial grasses by cycles, Northern Rangelands

LCD	Cycle 1 (E1 to E2)	Cycle 2 (E2 to E3)	Cycle 3 (E3 to E4)	Cycle 4 (E4 to E5)
Ashburton	6.4%	-6.2%		0.9%
DeGrey		7.3%	-2.7%	-2.8%
East Pilbara			0.3%	-3.2%
Lyndon		16.9%	-4.4%	-6.2%
Roebourne		4.3%	-27.1%	12.9%
Broome	3.2%	-11.9%	-3.6%	4.3%
Derby West Kimberley	8.8%	7.1%	-0.6%	2.6%
Halls Creek East Kimberley	0.8%	11.0%	-2.4%	2.9%
North Kimberley	1.5%	2.9%	-2.7%	2.8%

3.1.6 Shrublands

3.1.6.1 Seasonal quality

Seasonal conditions between assessment periods varied across the Shrublands over the period 1999 to 2008 (Table 4). Some LCDs (such as Murchison) experienced an equal proportion of 'above average', 'average' and 'below average' seasons, while others (such as Shark Bay) recorded predominantly 'below average' seasons. The Binnu LCD has only 2 WARMS sites, and therefore the seasonal condition rating at these sites does not necessarily reflect the entire LCD.

3.1.6.2 WARMS site data

WARMS Shrubland sites are assessed every 5 years. Current data reflect Epoch 2 (1999 to June 2006) and Epoch 3 (May 2005 to current).

Recorded change in the shrub density on WARMS sites in the Shrublands was, given the geographical range of the area, quite variable. In general, shrub densities declined in the Gascoyne Ashburton Headwaters, Murchison, Lyndon, Meekatharra, Shark Bay and Upper Gascoyne LCDs, and were stable or increased slightly in the other LCDs. Overall, fewer shrubs were recorded at Date 2 than Date 1, so suggesting that overall conditions declined in the Shrublands (Figure 9).

Preliminary analysis of the shrub data from the second cycle for the shrublands indicates that there has been an 8% average fall in shrub numbers in Cycle 2. However, this was affected by seasonal conditions.

- Sites that were rated as 'below average' seasonal quality in Cycle 2 have the largest average fall of 15% in shrub numbers.
- Sites rated as 'average' seasonal quality in Cycle 2 had an average fall of 6% in shrub numbers.
- There was a 3% average fall in plant numbers recorded on sites that were rated as 'above average' seasonal quality in Cycle 2.

Table 4. Assessed seasonal quality of WARMS site, Shrublands region, 1999 to 2008

LCD	% above average	% average	% below average
Binnu	0%	0%	100%
Cue	50%	44%	6%
Gascoyne-Ashburton Headwaters	32%	39%	29%
Gascoyne-Wooramel	6%	31%	63%
Kalgoorlie	12%	46%	42%
Lyndon	0%	40%	60%
Meekatharra	11%	81%	8%
Mt Magnet	3%	71%	26%
Murchison	30%	33%	37%
NE Goldfields	22%	74%	4%
Nullarbor-Eyre Highway	13%	31%	56%
Sandstone	2%	87%	11%
Shark Bay	0%	12%	88%
Upper Gascoyne	2%	37%	61%
Wiluna	73%	27%	0%
Yalgoo	8%	65%	27%
Yilgarn	0%	100%	0%

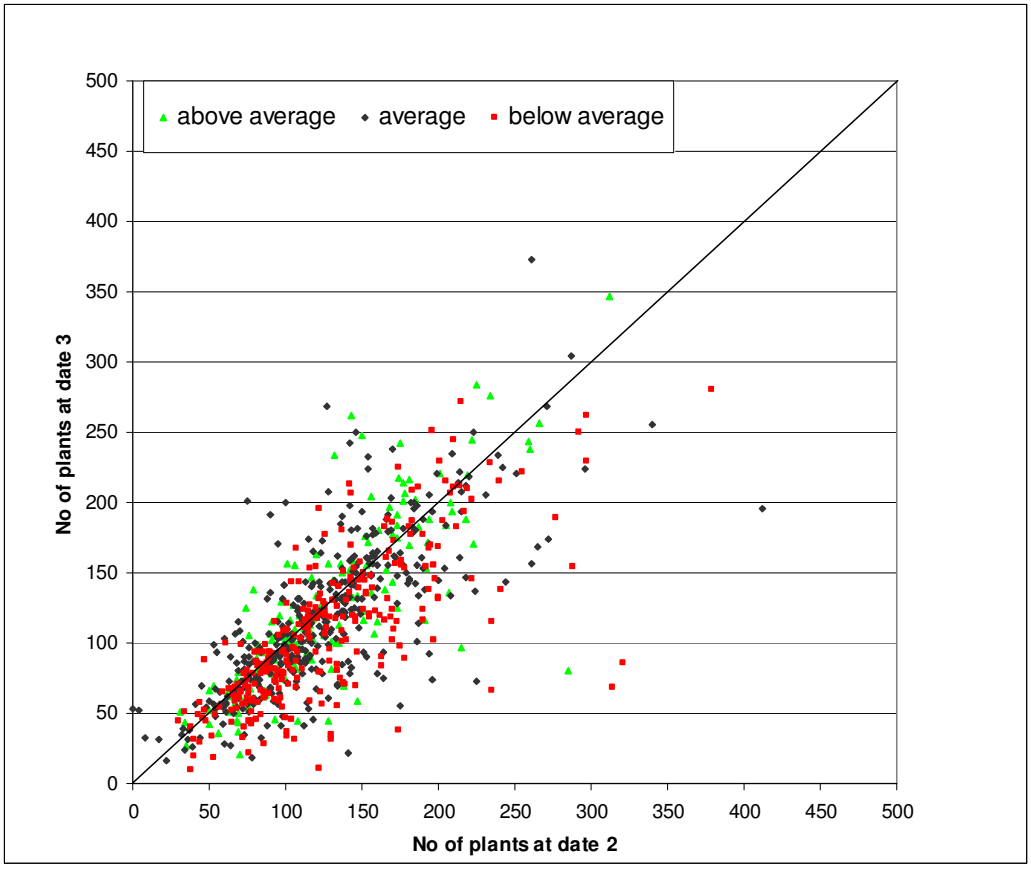

Figure 9 Shrub density and seasonal quality on WARMS Shrubland sites as recorded in Date 2 and Date 3

3.1.6.3 Reported stock numbers

The trends in the reported stock numbers (ha/dse) varied across the Shrublands region over the reporting period. Of the sixteen LCDs in the region (excluding Binnu), stock numbers in 2008 compared with 1998 had declined in five LCDs and increased in four LCDs (Table 5). However, over the period there was considerable variation, both declines and increases being recorded in all LCDs. Again, previous comments relating to variations in reported stock numbers within LCDs should be remembered.

Table 5. Reported stock densities (ha/dse) by LCD, Shrublands region, 1998 to 2008

LCD	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08
Binnu	17.3	13.4	36.2	34.1	53.9	40.6	44.7	54.2	45.1	15.1	60.7
Cue	29.3	19.5	30.1	23.6	28.0	29.9	46.0	41.6	33.6	26.5	31.9
Gascoyne-Wooramel	13.1	9.7	9.4	10.6	13.6	16.8	14.3	11.6	11.3	11.0	10.1
Gascoyne-Ashburton Headwaters	22.0	18.0	21.5	20.9	20.1	19.1	20.7	23.9	24.1	19.6	17.9
Kalgoorlie	40.6	28.8	36.9	37.9	27.0	34.0	37.5	37.2	45.2	53.4	46.5
Lyndon	9.3	10.7	9.9	10.0	8.9	10.8	10.7	8.7	9.9	9.7	8.1
Meekatharra	21.4	19.1	28.1	32.7	32.6	30.8	29.1	29.0	26.8	26.8	25.0
Mount Magnet	20.8	15.7	18.9	16.8	18.8	24.1	25.0	22.1	18.3	22.0	22.9
Murchison	16.5	17.2	16.4	21.3	23.5	32.2	40.6	33.4	26.4	29.0	22.2
North Eastern Goldfields	46.1	35.8	48.2	46.8	47.7	46.2	48.6	46.2	55.0	42.2	36.8
Nullarbor-Eyre Highway	37.5	22.3	25.5	28.5	24.5	23.5	22.7	25.0	32.9	27.8	32.0
Sandstone	52.5	32.7	52.8	51.6	84.7	77.5	64.0	99.2	85.0	74.1	64.2
Shark Bay	18.2	16.1	16.8	17.3	17.3	18.2	20.2	17.0	18.4	21.7	18.5
Upper Gascoyne	9.9	10.9	15.4	18.4	17.5	23.0	19.4	16.5	15.3	12.9	12.5
Wiluna	33.4	26.0	30.5	27.2	31.0	17.5	19.2	22.4	21.7	20.0	17.5
Yalgoo	18.2	16.4	18.9	21.0	23.4	33.0	39.1	37.4	30.9	25.6	28.8
Yilgarn	89.2	67.7	154.8	46.8	44.1	46.9	51.6	111.9	118.7	104.0	52.5

3.1.6.4 *Recent trends in WARMS data and reported stock numbers, Southern Rangelands*

The percentage changes in shrub numbers within each LCD in the Shrublands and the relative stocking levels over the previous five years are illustrated in Figure 10. As with data provided for the Northern Rangelands (Figure 8), changes in recorded shrub numbers from WARMS sites are represented horizontally, either increasing (to the right of the figure) or decreasing (to the left) over the assessment period. Reported animal numbers relative to the assessed present carrying capacity of leases within each LCD are represented vertically. LCDs with average stock numbers above the average present carrying capacity are in the upper half of the figure, and those with average stock numbers below the average present carrying capacity in the lower half. Ideally, the place to be is on the right hand side (Wiluna, NE Goldfields, Mt Magnet, Sandstone, Cue and Yalgoo). The results indicate that for some LCDs, the grazing pressure in times of below average seasons and in some cases average seasons is not sustainable, with average declines in plant numbers of 44% being recorded in some areas. To account for the effects of flood and fire, sites affected in this way were removed from the analysis to assess their impact on average figures. The effect on plant population change was not great once these sites were removed.

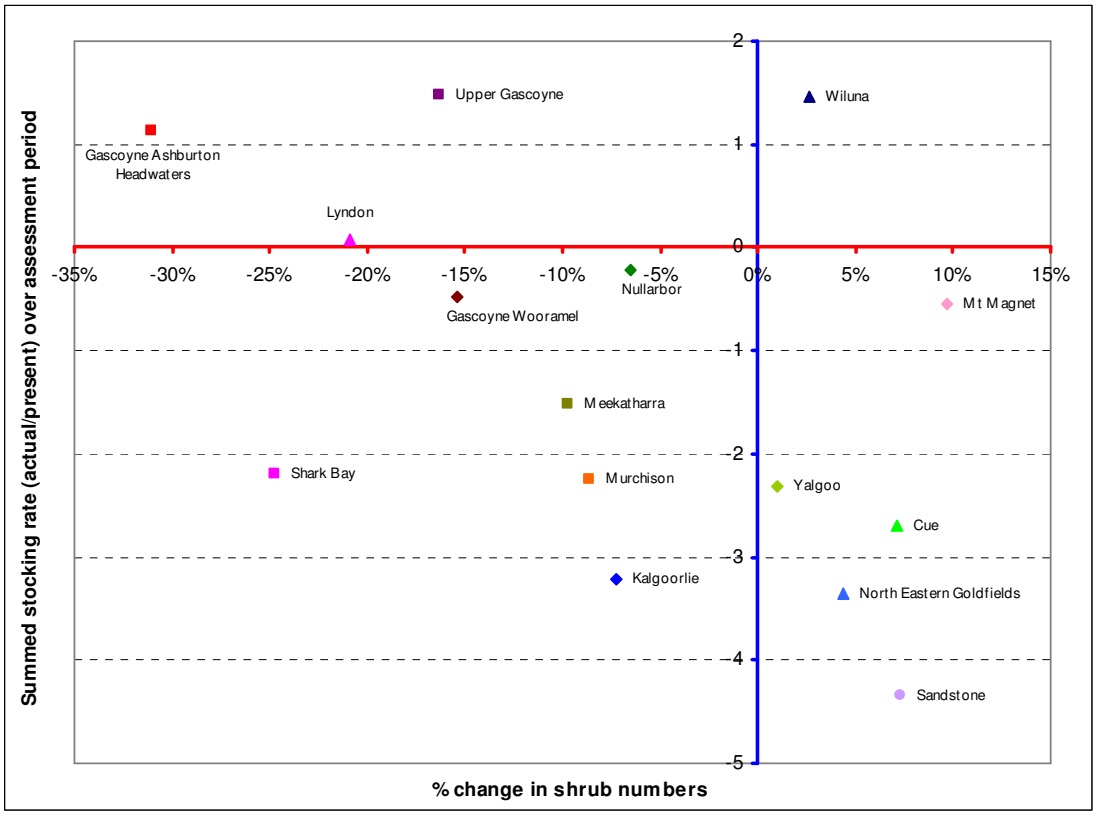

Figure 10. Changes in recorded shrub populations in relation to grazing pressure, Southern Rangelands LCDs

3.1.6.5. Discussion

Overall for the period from Epoch 2 to Epoch 3 there has been a decline in recorded shrub numbers in the Shrublands, with a 3% decline in numbers even at sites that had recorded 'above average' seasonal conditions. This suggests that season alone was not the only factor but that excessive grazing pressure also contributed to the decline.

It would be anticipated that in above average seasons shrub numbers would increase. However, in six LCDs where seasonal conditions were rated as 'above average', numbers have declined. This suggests that stock densities are potentially too high to allow the favourable seasonal conditions to encourage shrub germination and establishment. As an example, in the Gascoyne Ashburton Headwaters LCD, which recorded 'above average' and 'average' seasons, substantial falls in shrub numbers were recorded. Although the 'above average' years have lower decline than those sites in 'below average' seasons, a 16% decline in sites with 'above average' seasonal conditions should be noted.

Conversely, for the period from Epoch 2 to Epoch 3, WARMS sites assessed in the Wiluna LCD had either 'above average' or 'average' seasonal conditions, and although the stocking rate for the period 1999 to 2006 (when the sites were assessed) has increased, the density of shrubs basically remained stable.

In particular, there has been substantial decline in recorded shrub populations in the Gascoyne-Ashburton Headwaters, Gascoyne-Wooramel, Lyndon, Shark Bay and Upper Gascoyne LCDs. Smaller declines were recorded in the Murchison LCD. In some cases below average seasonal conditions were not reflected in reduced stock numbers and desirable shrub numbers have declined.

The matching of stocking rate to seasonal quality is the key factor influencing changes to plant populations (excluding natural events like floods or fire). LCDs such as Mt Magnet and North Eastern Goldfields have increased shrub numbers, even under 'average' and 'below average' seasonal conditions because of their seasonally appropriate stocking rates. However, the results indicate that for many LCDs the current grazing pressure in times of below average seasons and in some cases average seasons is too high.

3.2 Pastoral Lease Assessment

3.2.1 Pastoral lease reporting

The Department of Agriculture and Food, Western Australia (DAFWA) provides advice on Western Australia's pastoral leases to the Pastoral Lands Board (PLB) under a Memorandum of Understanding. A total of 116 reports for a range of purposes (Table 6) were prepared for the PLB by DAFWA in 2008/09. Table 6 provides a summary of these reports on a district basis. Of the total number of reports, 60 constituted scheduled or sale Rangeland Condition Assessments (RCAs) that provide a baseline assessment of lease level range condition.

Table 6. Summary of reports to the Pastoral Lands Board in 2008/09

District Office	RCAs	Sale RCAs	Sale letters	Follow-up reports	Other
Derby	9	-	-	4	5
Kununurra	8	-	4	6	-
Karratha	6	-	1	1	2
Carnarvon	13	10	7	7	6
Kalgoorlie	13	1	2	3	6
Total	**49**	**11**	**14**	**23**	**19**

'Follow up reports' are those reports prepared following a station inspection to assess compliance with those conditions placed on a pastoral lease by the PLB. 'Other' reports include comments on: management plans (5); permit applications (3); agistment applications (3); destocking applications (2); proposals to amalgamate Unallocated Crown Land into pastoral leases (2); reviews of carrying capacity (2); sublease proposals (1); and subdivision applications (1).

3.2.2 Land management issues

Of the 60 stations on which an RCA was conducted during 2008/09, land management and / or infrastructure issues were identified on 37 stations (62%). In comparison, in 2004/05 62% of stations inspected had identified land management issues, in 2005/06 79% had identified issues, in 2006/07 77% had identified issues and in 2007/08 69% had identified issues.

On a district basis identified issues were recorded on a higher proportion of stations inspected in the Southern Rangelands (68%) compared with the proportion of stations identified with issues in the Northern Rangelands (52%), although the proportion of leases on which issues were identified was substantially higher in the Kununurra district compared with the other two district offices in the Northern Rangelands region (Table 7).

A range of land management and infrastructure issues were identified on individual stations (Table 8). More than one issue may have been identified on an individual station.

Table 7. Issues identified in Rangeland Condition Assessments in 2008/09

District office	Number of stations inspected	Number of stations with issues identified	Number of stations with no issues
Derby	9	4 (44%)	5 (56%)
Kununurra	8	6 (75%)	2 (25%)
Karratha	6	2 (33%)	4 (67%)
Northern Rangelands	**23**	**12 (52%)**	**11 (48%)**
Carnarvon	23	18 (78%)	5 (22%)
Kalgoorlie	14	7 (50%)	7 (50%)
Southern Rangelands	**37**	**25 (68%)**	**12 (32%)**
State total	**60**	**37 (62%)**	**23 (38%)**

Table 8. Types of issues identified in Rangeland Condition Assessments in 2008/09 (note that several issues could be noted on the one station)

Issue	Northern Region	Southern Region
Animal management	-	1
Areas of severe degradation and erosion	-	6
Requirement to destock an area	2	-
Requirement to destock paddocks	4	2
Requirement to review stocking rate	5	10
Historical degradation	1	1
Unmanaged grazers (horse/donkey/camel/kangaroo)	-	2
Unsatisfactory infrastructure	-	1
Photo monitoring sites recommended	2	-
Rangeland degradation	7	18
Soil erosion	1	6
Unmanaged goats	-	2
Vegetation decline due to overstocking	1	4
Vegetation decline near water point	3	5
TOTAL	**26**	**58**

3.2.3 Lease category

DAFWA categorises pastoral stations to introduce an appropriate follow up regime where land management issues have been identified, and as a tool to assist in prioritising the inspection schedule to ensure effective use of resources.

The station categories are:

1 *Low concern* – The station has no known land management issues. A baseline inspection of the whole property will be undertaken on a six yearly cycle.

2 *Minor concern* – The station has minor land management issues. In addition to the whole property baseline inspection every six year, areas of concern will be inspected on a three yearly cycle.

3 *Moderate concern* – The station has moderate land management issues. In addition to the whole property baseline inspection every six year, areas of concern will be inspected on a two yearly cycle.

4 *High concern* – The station has significant land management issues. In addition to the whole property baseline inspection every six year, areas of concern will be inspected on an annual cycle.

Of the 450 stations in the pastoral zone of Western Australia, 79% are classified as Category 1 or Category 2 in 2008/09 (Table 9). Only 2% are classed as Category 4.

Table 9. Number of stations within each category and change in 2008/09

District Office	No. of stations	Category 1		Category 2		Category 3		Category 4	
		No.	Change	No.	Change	No.	Change	No.	Change
Derby	56	28	+1	24	-	4	-1	0	-
Kununurra	39	16	-1	13	-3	10	+4	0	-
Karratha	64	33	-	25	-	6	-	0	-
Carnarvon	154	35	-5	78	+3	40	+2	1	-
Kalgoorlie	137	52	-2	51	-	27	+2	7	-
State	**450**	**164 36%**		**191 43%**		**87 19%**		**8 2%**	

3.2.4 Range condition trend

The dominant purpose of range condition surveys is to assess the current status of the range condition on the lease, interpret the data, and assess whether the lease condition is satisfactory and compliant with the requirements of the *Land Administration Act 1997*. If the range condition on the lease as a whole or in one or more paddocks is unacceptable, the survey attempts to define causality and recommend management changes to lead to range condition improvement. Additionally, assessments of range condition during inspections can be compared to previous assessments made either during rangeland resource surveys or on previous lease inspections to provide an indication of range condition trend over the intervening period. This is not possible in all cases. Some leases have not previously been covered by rangeland surveys, and in some cases a direct comparison can not be made because the assessment route of the latest survey differs significantly from previous surveys, or because the methodology used for assessments has changed (some surveys date back to 1969/1970) and results can not be directly compared.

Of the 60 stations inspected in 2008/09, 17 stations improved in range condition, 14 had no significant change, 22 declined in range condition, and an assessment of range condition trend could not be made on 7 stations (Table 10). Table 11 provides a comparison with previous years.

When split between the Northern and Southern Rangelands regions, the 2008/09 figures indicate that in the Northern Rangelands 43% improved in range condition, 34% indicated no significant change and 23% declined in range condition. In the Southern Rangelands, of the stations that could be assessed for range condition trend, 23% improved in range condition, 20% indicated no significant change and 57% declined in range condition.

Table 10. Estimated trends in range condition from Rangeland Condition Assessments conducted in 2008/09

Office	Improved	No significant change	Declined	Unable to assess	Total RCAs
Derby	4	5	-	-	9
Kununurra	4	2	2	-	8
Karratha	2	1	3	-	6
Carnarvon	4	4	14	1	23
Kalgoorlie	3	2	3	6*	14
Total	**17**	**14**	**22**	**7**	**60**

*This number is high because stations on the Nullarbor have not been previously assessed.

Table 11. Trends in range condition from Rangeland Condition Assessments conducted between 2004/05 and 2008/09

Year	% improved	% no significant change	% declined	No. of RCAs
2004/2005	37	38	25	68
2005/2006	54	31	15	68
2006/2007	52	32	16	50
2007/2008	44	28	28	57
2008/2009	32	26	42	53

An alternative approach to assess trend at the lease level is to assess changes in the Range Condition Index (RCI) which is derived from the traverse assessments and summarises pastoral lease performance for range condition.

RCI scores can range from 1 to 3, with:

1 = good condition,

2 = fair condition,

3 = poor condition.

The RCI is calculated as –

SUM ((%good X 1) + (%fair X 2) + (%poor X 3))

For example, on a lease with 20% of traverse points rated as 'good' pasture condition, 50% rated as 'fair' pasture condition and 30% rated as 'poor' pasture condition the RCI would be:

RCI = SUM ((0.20 x 1) + (0.50 x 2) + (0.30 x 3)) = 2.1

The RCI can be used to assess change in range condition of a group of stations over time.

The average RCI of stations inspected in 2008/09 was 1.85.

Using the RCI from the most recent assessment suggests 122 stations are rated as being on average in good condition, 182 stations rated as on average in good to fair range condition, 110 stations rated as on average in fair to poor range condition and 19 stations rated as on average in poor range condition (Figure 11).

Figure 12 shows changes in the RCI between rangeland surveys and the most recent

inspection. Assessment shows 128 stations had a positive change in overall range condition with 21 stations indicating a large positive change, 38 stations indicating a moderate positive change and 69 stations indicating a small positive change. However, 80 stations had a negative change in overall range condition with 3 stations indicating a large negative change, 34 stations indicating a moderate negative change and 43 stations indicating a small negative change. Finally, 110 stations indicated no significant change in overall range condition. Comparison of RCI values at survey (1972 to 2007) and subsequent inspection for all pastoral stations indicates a marginal improvement in the RCI from 1.83 to 1.78.

It is noteworthy that the proportion of stations on which traverse data are suggesting a downward trend has increased from 15% of RCAs in 2005/06 to 42% of RCAs in 2008/09. These numbers are strongly influenced by the information recorded in the Southern Rangelands and are in line with the conclusions being drawn from the WARMS data. However, these are mainly moderate changes in the RCI of 0.25 to 0.5 RCI units (Figure 12).

4. Conclusions

The current (2008/2009) status of the pastoral rangelands of Western Australia is variable. The data from the WARMS program suggest that, at the regional or district level the situation in the Kimberley region remains positive (albeit with a continuation of 'average' to 'above average' seasons supporting a steady increase in reported stock numbers). However, the situation in the Pilbara is far less optimistic. The recorded frequency of perennial grasses has declined over the previous three years, while reported cattle numbers continue to rise and the favourable seasons of the 1990s have been replaced with a greater proportion of 'average' or 'below average' years. In the Southern Rangelands conditions as defined from the data recorded at WARMS sites are variable across LCDs. However, in general terms there has been an 8% decline in recorded shrub numbers in the Southern Rangelands, while even WARMS sites at which seasonal quality was rated at 'above average', a measurable fall in shrub numbers has been recorded.

The trend in range condition at the lease level presents a similar picture. There appears to be a steady increase in the number of leases indicating a negative trend, particularly in the Southern Rangelands, although this appears dominated by 'moderate' negative changes rather than more serious declines in range condition.

Data at both the lease level and the district level are suggesting that there may be a disconnect between current reported stock numbers and the capacity of the rangelands in many instances, leading to excessive grazing pressure. Adjusting stocking rates in response to varying seasonal conditions is the main management option available to producers in Western Australia's rangelands. Commonly, lessees rely on local knowledge to make these decisions, and some appear to have expectations biased by the recent short term favourable seasonal conditions, particularly in the north. Moreover, the grazing capacity of rangeland is not confined to sheep and cattle. Kangaroos, feral goats, camels, donkeys, rabbits, and insects such as termites and locusts generally graze the same forage as sheep and cattle, though the relative densities of these species varies across the landscape and over time. The contribution to total grazing pressure and degradation from these animals is difficult to assess, but must be included in any setting of carrying capacities.

Although there are difficulties in determining the extent to which observed declines in recorded shrubs and grasses are the result of year to year variation (reversible), or a long-term rundown in resource condition (due to the difficulty in separating the effects of management from year to year seasonal variation), the recorded declines in desirable species in the Pilbara and Southern Rangelands are indicating rangelands under stress. Of particular importance is the lag between a pressure on the rangeland and its measured response. That negative changes have been recorded in these rangelands is an indicator

that significant stress has been imposed on the rangelands and that this stress has been of sufficient duration for its impact to be evident in recorded plant numbers. In addition, it should be remembered that animal productivity is not always a good indicator of range condition, as animal production can be maintained for some time after pasture deterioration has begun. While good condition rangeland has a better yearlong supply of palatable and nutritious forage than does rangeland in poor and fair condition, stock can compensate as range condition declines by increasing the utilization on the more desirable plant species, increasing grazing pressure on such species to levels that are not sustainable. Therefore, using animal performance as the sole criterion of range status is dangerous, and the implications of the recorded decline in plant numbers must be seen clearly as evidence of a significant period of grazing pressure in excess of that warranted by the recorded seasonal conditions.

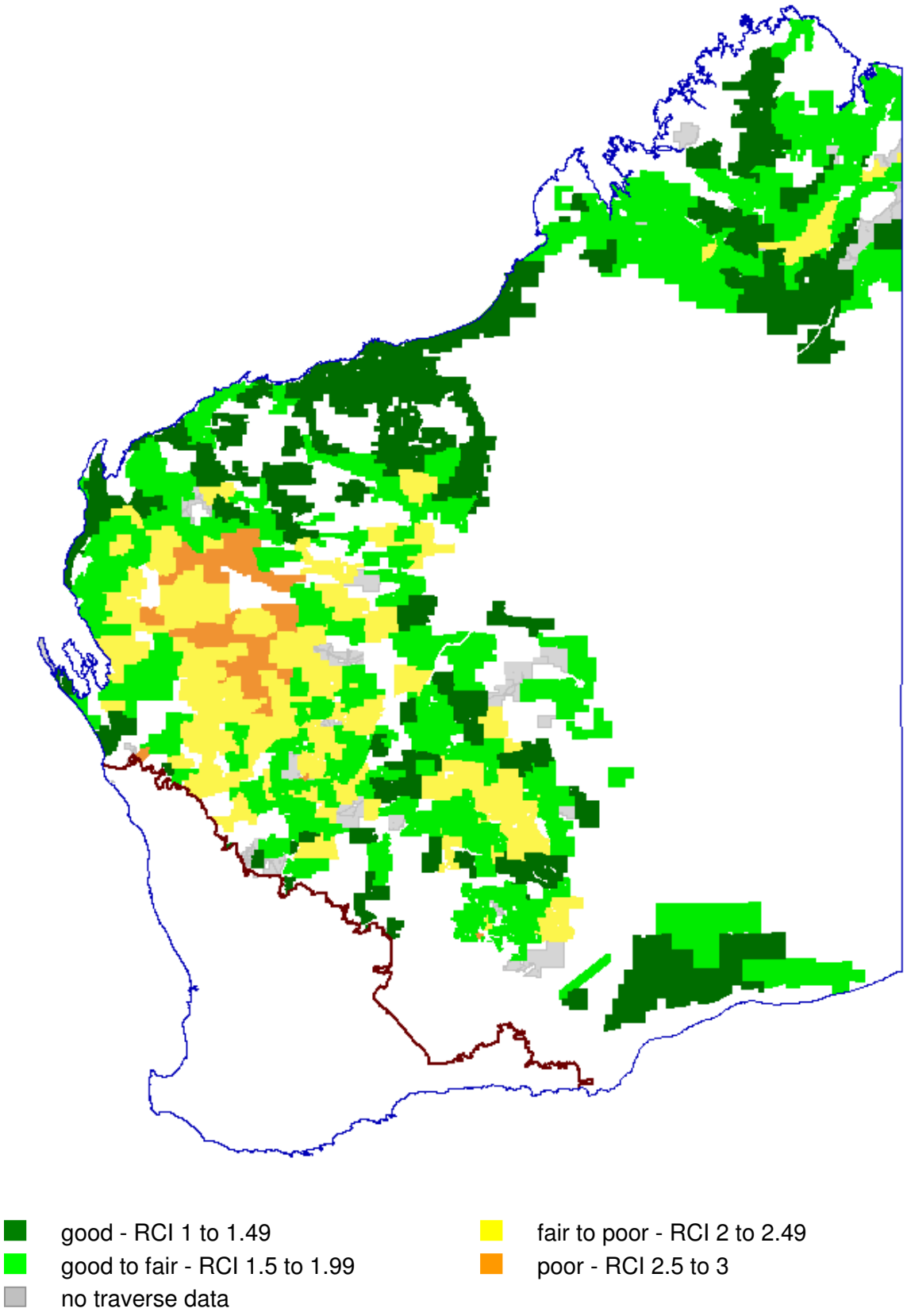

Figure 11. Range Condition Index (RCI) at last inspection (inspection can be between 1999 and 2009)

(nb. Nullarbor station values are derived from 2007 survey)

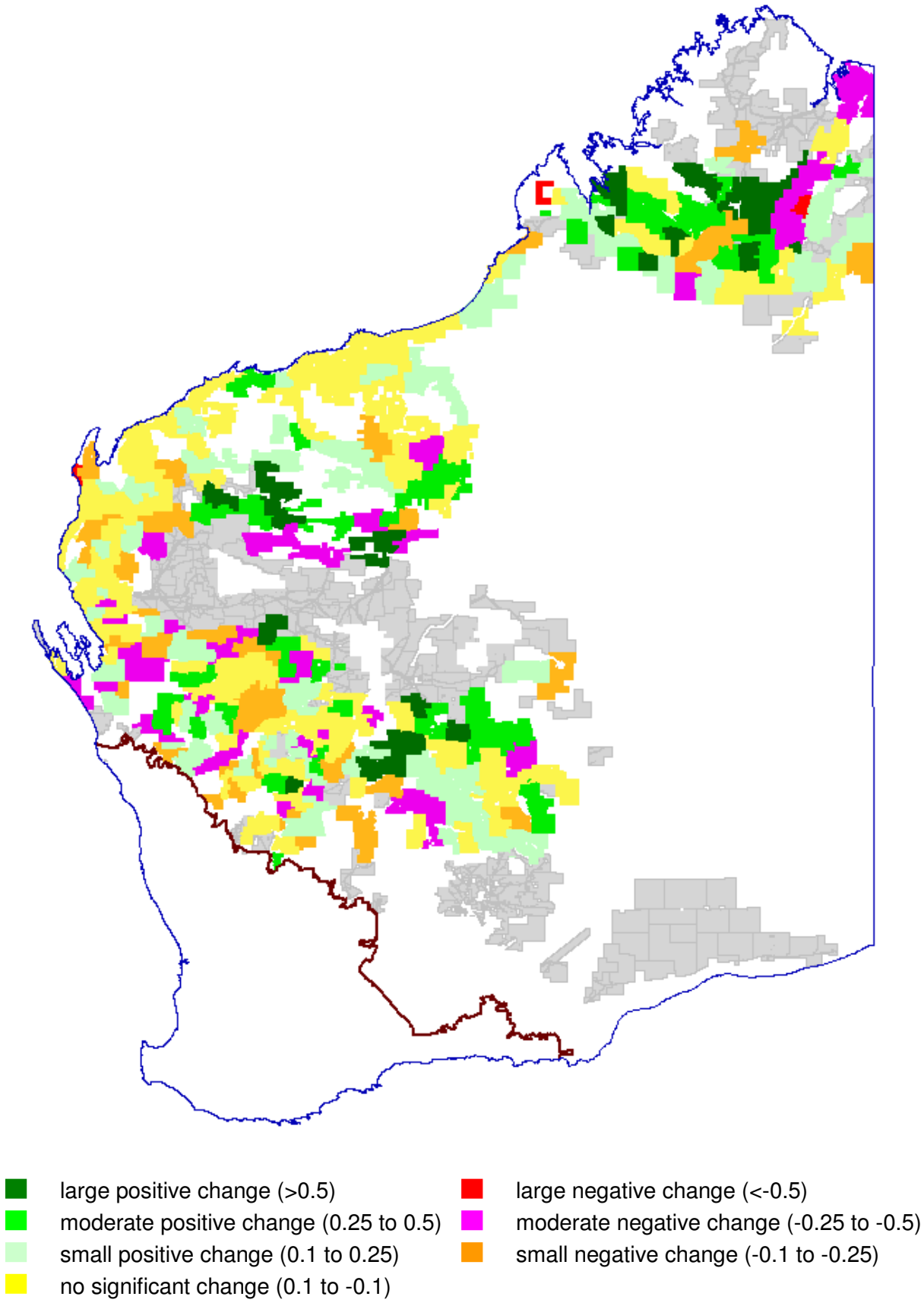

Figure 12. Changes in Range Condition Index between survey (1972 to 2007) and inspection (1999 to 2009)