

**REPORT TO THE COMMISSIONER OF SOIL CONSERVATION ON THE  
CONDITION OF THE PASTORAL RESOURCE BASE  
NOVEMBER 2010**

**1. Introduction**

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

**2. Data Sources and Information Provided**

This report provides information on seasonal conditions, and information provided by the Western Australian Rangeland Monitoring System (WARMS) and the Pastoral Lands Board's (PLB) Annual Returns database.

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. Site installation began in 1993, with the final sites installed in 1999. There are 1,622 sites, with 633 grassland sites and the remainder shrubland sites. Grassland sites are reassessed on a 3-year cycle; shrubland sites are reassessed on a 5-year cycle. The fifth assessment of the Kimberley (grassland) sites (Epoch 5) was completed in 2008. One full cycle (i.e. two assessments) has been completed for the shrubland sites, with nearly all of these sites now assessed three times. WARMS data are reported on a district or other regional level, not lease-level scale. In this report, data are provided at the Land Conservation District (LCD) level.

Seasonal condition is estimated for each reassessment period (epoch) at each 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.

All pastoral lessees in Western Australia submit an Annual Return to the PLB, providing, among other information, the numbers of stock held on the lease, defined by specific categories. This information is made available to the Department of Agriculture & Food Western Australia (DAFWA) for analysis and interpretation.

This report should be read in conjunction with the report provided in July 2009.

### **3. Seasonal Quality**

In general, seasonal quality has been above average in the Kimberley over the past 16 years, with the majority of WARMS sites classified as “above average” with no sites assessed experiencing a “below average” epoch during this period.

Seasonal conditions in the Pilbara grasslands have been variable, with the most favourable conditions being recorded in the 1990s, and a greater prevalence of “average” or “below average” years being recorded since 2000. The East Pilbara LCD has received good seasons over the last 6 years, while Ashburton, Lyndon and Roebourne LCDs received a preponderance of below average conditions.

Seasonal conditions have also varied across the Shrublands over the period 1999 to 2009. Some LCDs (such as Murchison) have experienced an equal proportion of “above average”, “average” and “below average” seasons, while others (such as Shark Bay) have recorded predominantly “below average seasons”. The Binu LCD has only two WARMS sites, and therefore the seasonal condition rating at these sites does not necessarily reflect the entire LCD.

Table 1 shows seasonal quality for Land Conservation Districts within APB regions. Seasonal quality for 2009 was mostly average in the Kimberley, below average in the Pilbara and Carnarvon regions and average to above average in parts of the Meekatharra and Kalgoorlie regions.

### **4. WARMS Site Data**

Perennial grass frequency generally increased in all Kimberley LCDs from Epochs 1 to 5, although the increase was more variable in both the Broome (BRM) and the North Kimberley (NTK) LCDs (Figure 1). Perennial grass frequencies at Pilbara WARMS grassland sites generally declined during Epochs 4 and 5, although in both the Lyndon and Roebourne LCDs data suggested that frequencies have increased from Epoch 4 to Epoch 5 (Figure 2).

In the Kimberley and Pilbara regions, limited WARMS data are available as yet for Epoch 6 (2009 to 2011). In the Kimberley, only the Broome LCD (95% of sites assessed) and the North Kimberley LCD (93% of sites assessed) have a sufficient proportion of sites assessed in 2009 to provide an indication of range trend during Epoch 6 (Figure 1). Mean perennial grass frequencies recorded were 90.1% (Broome LCD) and 92.4% (North Kimberley LCD). In the Pilbara, only the Ashburton LCD has sufficient sites re-assessed (100%) to provide an indication of Epoch 6 trend. In the Ashburton LCD, perennial grass frequencies recorded in 2009 averaged 78.1% (Figure 2).

Because of the five year cycle for WARMS in the Shrublands (compared with the three year cycle in grasslands) there are insufficient “new” data available such that an updated assessment of range trend at the LCD level could be made with confidence. Current data reflect Epoch 2 (1999 to June 2006) and Epoch 3 (May 2005 to current). Data reported previously suggested change in shrub density on WARMS sites in the Shrublands was quite spatially 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. The proportional decrease in shrub densities was greater than the proportional increase, suggesting that overall conditions declined in the Shrublands (Figure 3). Unfortunately, more recent data are currently insufficient from any one LCD to determine if this trend is continuing.

Table 1.. **2009 Seasonal quality of Land Conservation Districts by APB region.**

Land Conservation District	Above average (%)	Average (%)	Below average (%)
<b>Kimberley</b>	<b>14%</b>	<b>56%</b>	<b>30%</b>
Broome (30 – 85) [334 – 518]	34%	59%	7%
Derby West Kimberley (11 – 54) [392 – 571]	15%	50%	35%
Halls Creek – East Kimberley (9 – 44) [427 – 586]	5%	77%	18%
North Kimberley (18 – 64) [647 – 846]	14%	29%	57%
<b>Pilbara</b>	<b>7%</b>	<b>17%</b>	<b>76%</b>
Ashburton (57 – 120) [102 -200]	0%	4%	96%
De Grey (34 – 97) [152 – 287]	26%	35%	39%
East Pilbara (39 – 93) [112 – 218]	0%	35%	65%
Roebourne - Port Hedland (43 – 108) [129 – 253]	0%	4%	96%
<b>Southern rangelands</b>			
<b>Carnarvon</b>	<b>1%</b>	<b>2%</b>	<b>97%</b>
Binnu	0%	0%	100%
Gascoyne - Wooramel	0%	0%	100%
Lyndon	0%	0%	100%
Murchison	3%	3%	94%
Shark Bay	0%	9%	91%
Upper Gascoyne	0%	0%	100%
<b>Meekatharra</b>	<b>19%</b>	<b>29%</b>	<b>52%</b>
Cue	44%	56%	0%
Gascoyne Ashburton Headwaters	0%	0%	100%
Meekatharra	0%	24%	76%
Mount Magnet	14%	86%	0%
Yalgoo	63%	33%	4%
<b>Kalgoorlie</b>	<b>32%</b>	<b>43%</b>	<b>25%</b>
Kalgoorlie	53%	47%	0%
North Eastern Goldfields	27%	63%	10%
Nullarbor - Eyre Highway	40%	28%	32%
Sandstone	38%	58%	4%
Wiluna	0%	30%	70%
Yilgarn	50%	17%	33%

Figures in (brackets) are winter tercile ranges and summer terciles in [brackets].

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

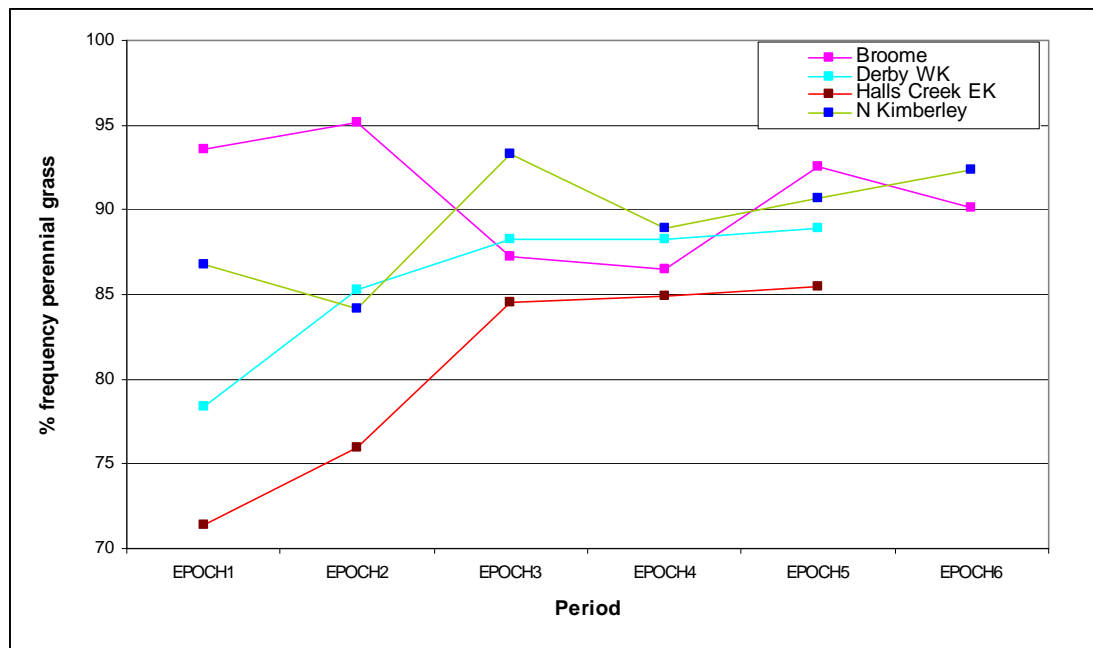


Figure 2. Mean perennial grass frequencies, Pilbara LCDs, Epoch 1 to Epoch 6.

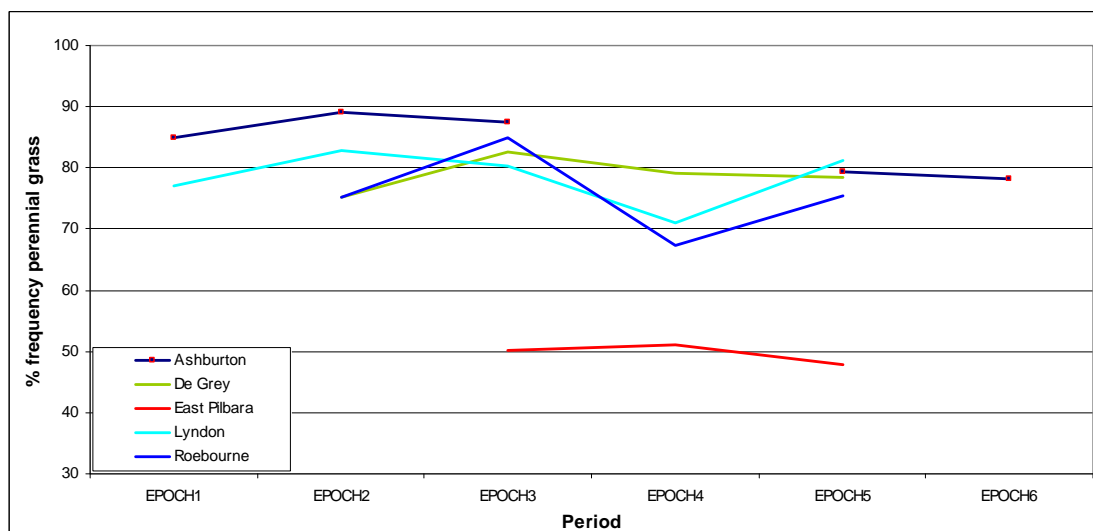
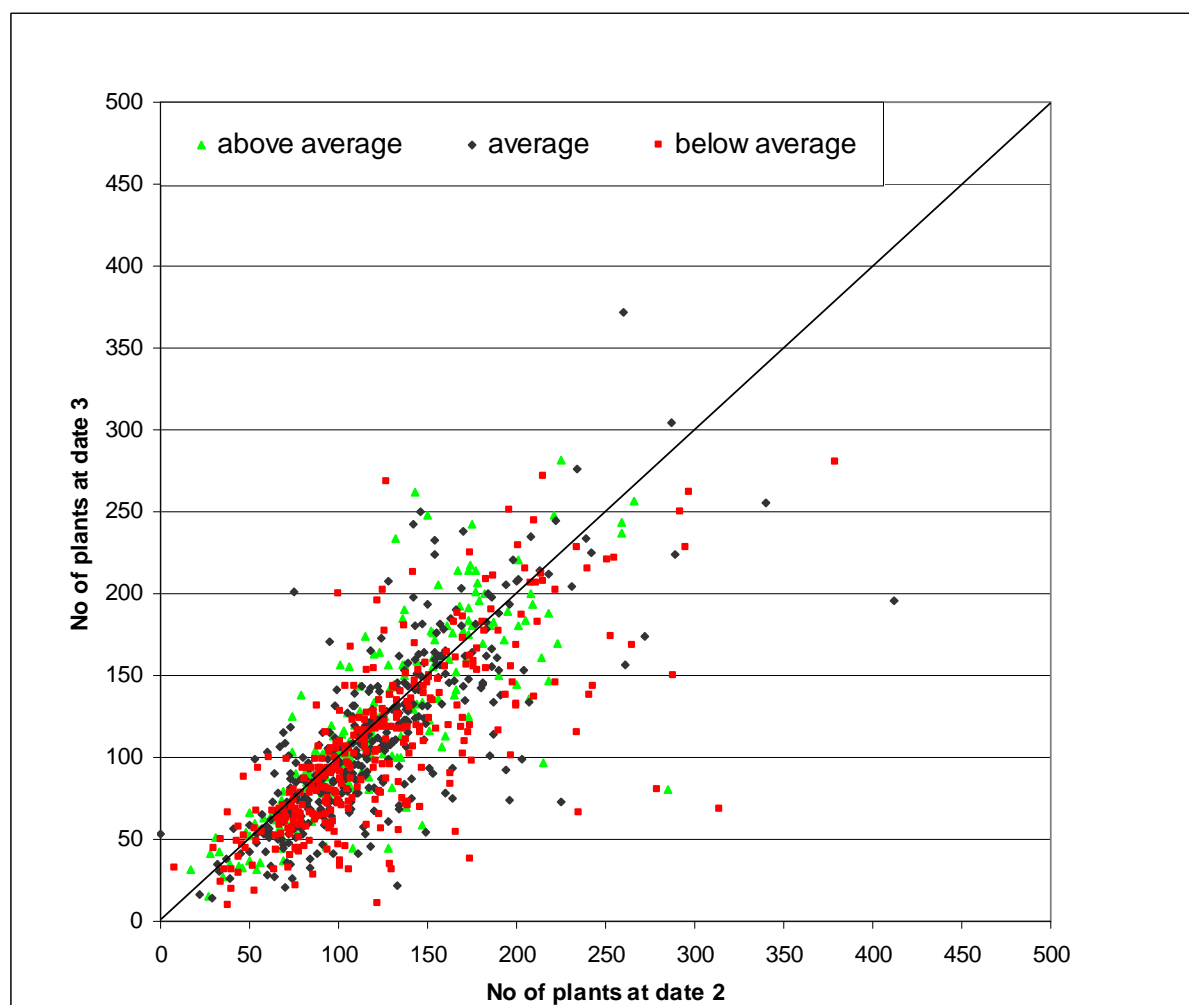


Figure 3. *Shrub density on Shrubland WARMS sites as recorded in Epoch 2 and Epoch 3 (as at June 2010).*



## 5. Stock Densities

Relative stock densities between LCDs reflect both the different potentials (in terms of carrying capacity) of the LCDs and their degree of development. Reported stock numbers (from the Annual Return provided for each pastoral lease) show that, although variable, stock densities (cattle units/sq km) have risen in the Kimberley over the past 15 years, with the exception of the Halls Creek East Kimberley LCD (Figure 4). Reported 2009 figures indicate a decline from 2008 figures for Halls Creek and Derby West Kimberley LCDs, and a stable situation in other LCDs. As a point of contrast to current stocking levels, estimated present carrying capacities (in cu/sq km) for the region are Broome LCD 4.1, Derby West Kimberley LCD 3.1, Halls Creek LCD 2.5 and North Kimberley LCD 2.2. It should be noted that stock densities vary significantly between leases, with some leases virtually destocked. Lease carrying capacities per unit area also vary widely. Therefore, comparisons between estimated carrying capacity and reported stock numbers should be treated with caution.

Reported cattle numbers in the Pilbara increased from 1993 to 2009 (Figure 5), more than doubling in the East Pilbara and De Grey LCDs. The change from 2008

to 2009 has been variable across LCDs, with declines recorded in Roeburne and East Pilbara LCDs and increases in the De Grey and Ashburton LCDs. The estimated present carrying capacities (in cu/sq km) for the region are Ashburton LCD 1.5, De Grey LCD 1.6, East Pilbara LCD 1.0, Roeburne LCD 1.7 and Lyndon LCD 1.5.

Figure 4. Mean reported stock densities (cu/sq km), Kimberley LCDs, 1993 to 2009

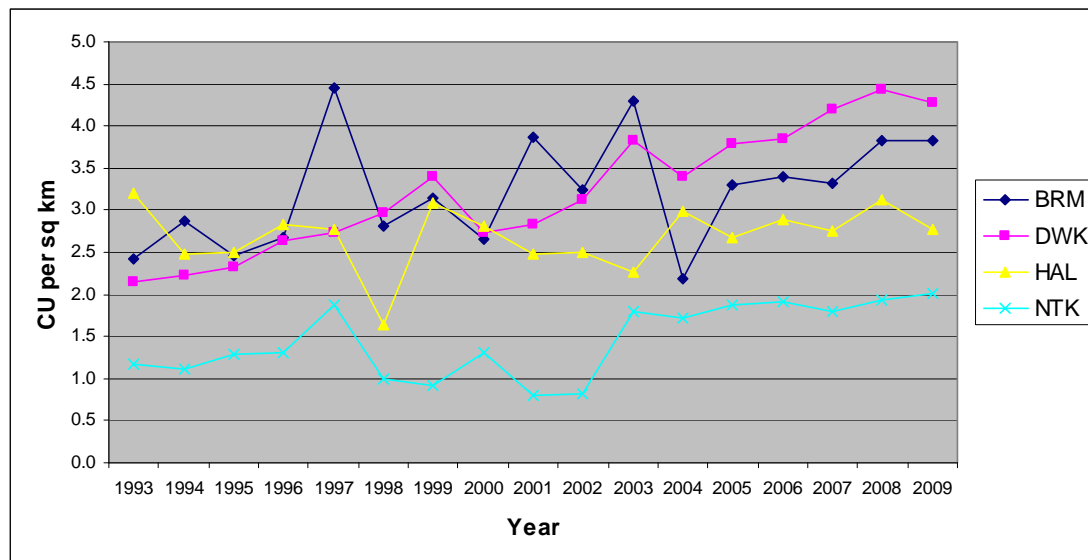
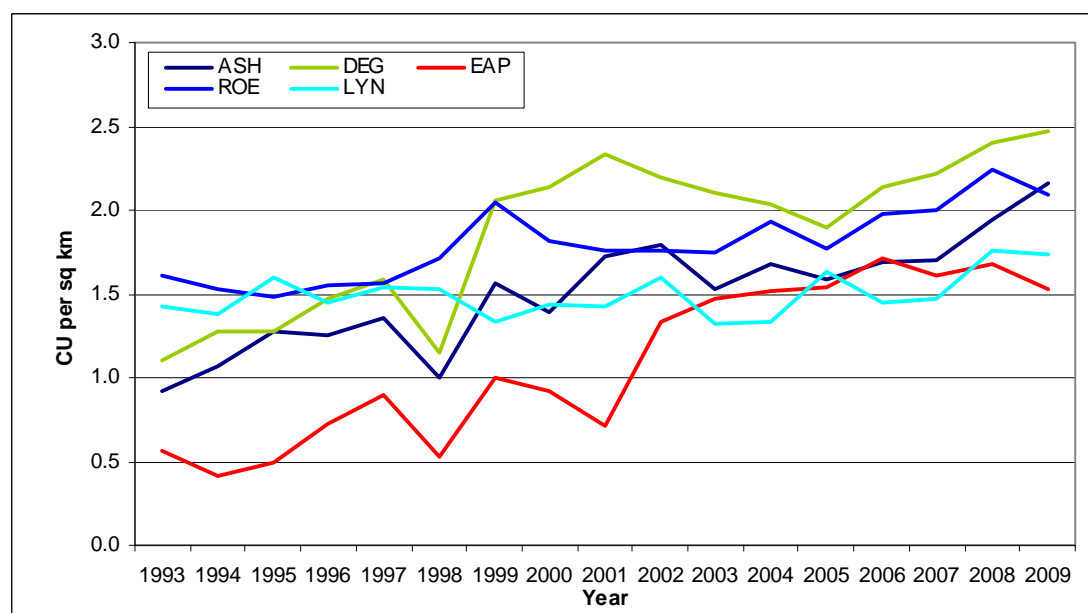


Figure 5. Mean stock densities (cu/sq km) Pilbara LCDs, 1993 to 2009.



Reported stock numbers (ha/dse) varied across the Shrublands region over the past ten years (Table 2). Of the 16 LCDs (excluding Binnu), stock numbers in

2009 compared with 2000 had declined in eight LCDs and increased in eight. However, over the period there was considerable variation, both declines and increases being recorded in all LCDs.

*Table 2. Reported stock densities (ha/dse) by LCD, Shrublands region, 2000 to 2009.*

LCD NAME	Average Present cc	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Binnu	25.2	36.2	34.1	53.9	40.6	44.7	54.2	45.1	15.1	60.7	52.7
Cue	18.7	30.1	23.6	28.0	29.9	46.0	41.6	33.6	26.5	31.9	35.8
Gascoyne - Wooramel	11.4	9.4	10.6	13.6	16.8	14.3	11.6	11.3	11.0	10.1	9.0
Gascoyne Ashburton Headwaters	20.8	21.5	20.9	20.1	19.1	20.7	23.9	24.1	19.6	17.9	16.1
Kalgoorlie	20.3	36.9	37.9	27.0	34.0	37.5	37.2	45.2	53.4	46.5	52.4
Lyndon	9.5	9.9	10.0	8.9	10.8	10.7	8.7	9.9	9.7	8.1	8.2
Meekatharra	22.2	28.1	32.7	32.6	30.8	29.1	29.0	26.8	26.8	25.0	24.7
Mount Magnet	17.1	18.9	16.8	18.8	24.1	25.0	22.1	18.3	22.0	22.9	24.4
Murchison	18.1	16.4	21.3	23.5	32.2	40.6	33.4	26.4	29.0	22.2	24.6
North Eastern Goldfields	23.1	48.2	46.8	47.7	46.2	48.6	46.2	55.0	42.2	36.8	44.4
Nullarbor - Eyre Highway	24.2	25.5	28.5	24.5	23.5	22.7	25.0	32.9	27.8	32.0	32.8
Sandstone	19.2	52.8	51.6	84.7	77.5	64.0	99.2	85.0	74.1	64.2	58.5
Shark Bay	12.8	16.8	17.3	17.3	18.2	20.2	17.0	18.4	21.7	18.5	14.1
Upper Gascoyne	19.2	15.4	18.4	17.5	23.0	19.4	16.5	15.3	12.9	12.5	10.9
Wiluna	23.6	30.5	27.2	31.0	17.5	19.2	22.4	21.7	20.0	17.5	18.4
Yalgoo	18.1	18.9	21.0	23.4	33.0	39.1	37.4	30.9	25.6	28.8	28.0
Yilgarn	16.8	154.8	46.8	44.1	46.9	51.6	111.9	118.7	104.0	52.5	109.7

\* CC is carrying capacity. Present carrying capacity has been averaged for stations within each LCD. Note not all stations have a calculated present carrying capacity.

## Discussion

Given the favourable seasonal conditions and the generally stable stock numbers, the trend in the frequency of perennial grasses and the relatively stable range condition trend in the Kimberley region were not unexpected. The range trend in Kimberley grasslands continues to be stable. Conditions have encouraged an increase in the recorded frequency of perennial grasses at a time of increases in reported stock densities. Data do suggest that cattle numbers are above the present carrying capacity in the Derby West Kimberley LCD. However, the present carrying capacity assumes average seasonal conditions, while actual seasonal conditions have been most favourable for many years. Consequently, this is not seen to be a problem. However, if seasonal conditions were to decline, current stock numbers would require an immediate and substantial response from lessees.

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) do indicate that some individual leases have gone against this trend.

In the Pilbara, the increase in reported stock density has not always 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 (see previous report). However, stock densities continued to rise during this period (Figure 5), and the frequency of perennial grasses declined slightly to 79% in Epoch 5 and to 78% in Epoch 6 (Figure 2). The sites assessed as having a “below average” season have a mean perennial grass frequency of 74%, and the sites assessed as having an “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 suggests that stock numbers are reducing the capacity of the rangeland to respond to the more favourable seasons.

Both these factors suggest that the increase in stock numbers in the Pilbara is unlikely to be 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.

As expected, as seasonal conditions declined in the Shrublands, the decline in recorded shrub densities was more pronounced. On average, shrub densities declined by 3% at those sites where seasonal quality was assessed as “above average”, by 8% at those sites where seasonal quality was assessed as “average” and by 14% at those sites where seasonal quality was assessed as “below average” (Figure 3).

Overall for the period from Epoch 2 to Epoch 3 there has been an 8% decline in plant numbers in the Shrublands. The largest decline (15%) was in the sites that had “below average” seasonal conditions. There was still a 3% decline in plant numbers in sites that had “above average” seasonal conditions, suggesting that season alone was not the only factor.

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

For the Shrubland LCDs with below average seasonal conditions in 2009 (Table 1), Sandstone and the North Eastern Goldfields have a low stocking rate (Table 3), and stock impact is likely to be low. Stocking rates in Wiluna LCD remain high despite a decline in seasonal quality (see 2009 report and Table 1). For the 57% of sites identified as below average seasonal quality (predominantly the western area), stocking rates have remained around 24 ha per dse. If seasonal conditions remain below average, detrimental impacts on the range condition are likely.