Australian Government

National Land & Water Resources Audit

Extract from Rangelands 2008 — Taking the Pulse
4. Focus Bioregions - Darling Riverine Plains bioregion (NSW and QLD)

Disclaimer

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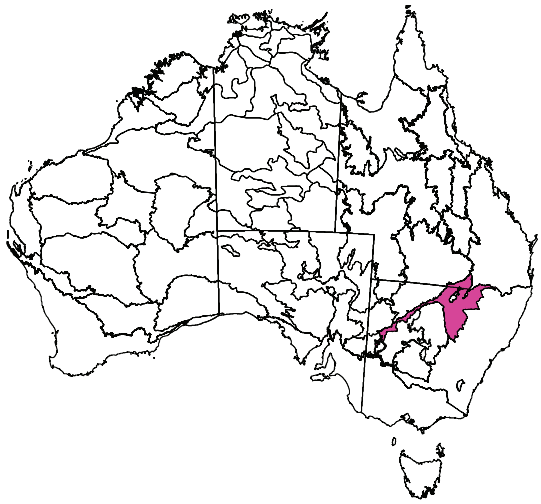
Figure 4.1 Darling Riverine Plains bioregion in the NSW and Queensland rangelands



Note: Area = 103 329 km^2

Darling Riverine Plains bioregion (NSW and Queensland)

The Darling Riverine Plains bioregion includes the Darling River and its tributaries in NSW and Queensland (Figure 4.1). Ninety per cent of the area of this rangeland bioregion (93 316 km^2) is in NSW; the remaining 10 013 km^2 is in Queensland. Most results reported here relate specifically to NSW, but some also include the Queensland portion.

This bioregion includes the extensive alluvial plains of the network of rivers and creeks that flow into the Darling River, together with its floodplains (Figure 4.2). Vegetation includes river red gum, blackbox and coolibah woodlands with inliers of poplar box, belah, redbox and ironbark woodlands on higher parts of the landscape. Major tenure is leasehold in the Western Division and freehold in the Central Division of NSW. Sheep and cattle grazing is the main land use; other land uses include dryland cropping, irrigated cotton, horticulture and, at Lightning Ridge, black opal mining. Major population centres are Wilcannia, Bourke, Brewarrina and Nyngan.

Regional issues

- Upstream diversion of river flows for irrigation is reducing the size, frequency and effectiveness of downstream flooding. This has reduced pastoral productivity and altered the floodplain ecosystem, particularly that of riparian corridors and wetlands.
- The merino wool industry has been in decline for most of the reporting period. That decline initiated a trend into cereal cropping in the eastern margins of the rangelands, peaking in the late 1990s before the implementation of native vegetation legislation. Cropping has focused on certain soil types, especially those of grasslands. Properties with the capacity to crop have greater options to maintain financial viability.

Figure 4.2 Characteristic landscapes of the NSW Darling Riverine Plains bioregion

Woodland of eucalypts and acacias

Photo: NSW Department of Environment and Climate Change

Coolibah

Photo: NSW Department of Environment and Climate Change

Myall

Photo: NSW Department of Environment and Climate Change

Darling River near Louth

Photo: Arthur Mostead

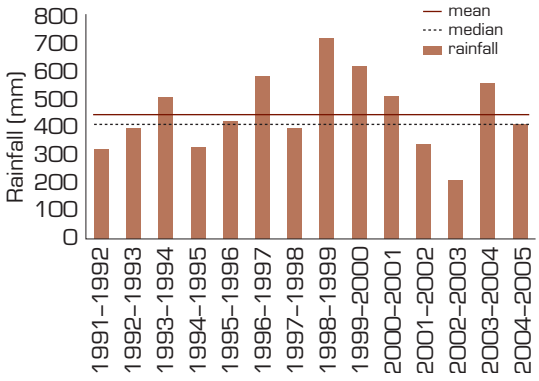
- A large loss of social infrastructure (eg families, Landcare network, social groups) was evident during the late 1990s and early 2000s, particularly in areas without cropping. Very few young people are now returning to properties.
- Thickening of black box (*Eucalyptus largiflorens*) and coolibah (*E. coolabah*) affects pastoral management in areas where flooding has initiated dense regeneration.
- Perennial grasses appear to have declined across the bioregion in the longer term. The main species, curly Mitchell grass (*Astrebla lappacea*), appears to have remained stable over the 1992–2005 reporting period.
- The bioregion generally has low numbers of feral goats, but feral pigs are associated with the watercourse areas. Rabbits generally have a low impact.

Further information relevant to recent change in the bioregion is available in Grant (2006).

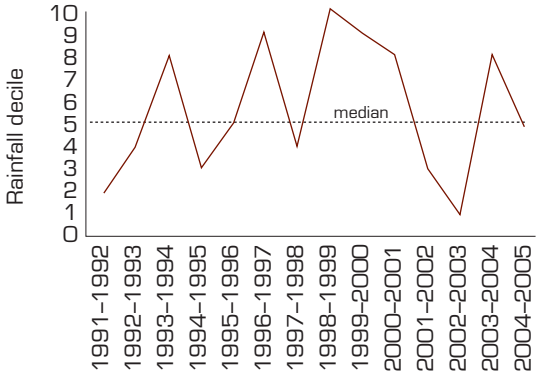
Seasonal quality — 1992–2005

Rainfall was quite variable through the 1992–2005 period and fluctuated both above and below the long-term (1890–2005) median (Figure 4.3, top left and centre). However, the 1992–2005 period as a whole was among the wetter 14-year periods since

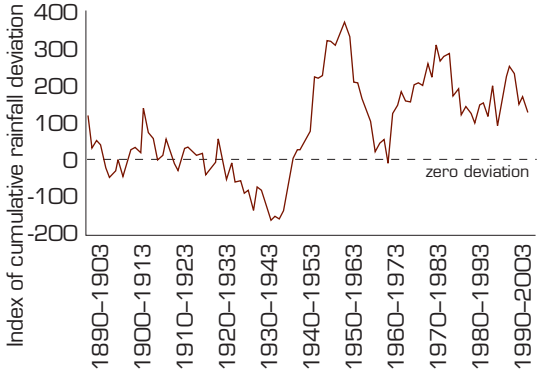
Figure 4.3 Indicators of *seasonal quality* for the entire Darling Riverine Plains bioregion



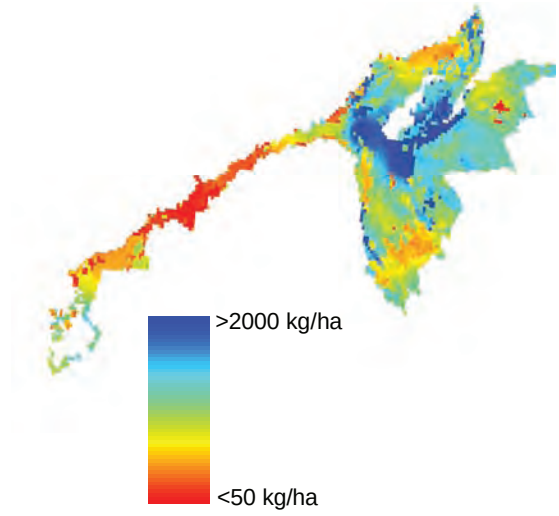
Annual rainfall, long-term (1890–2005) mean and median



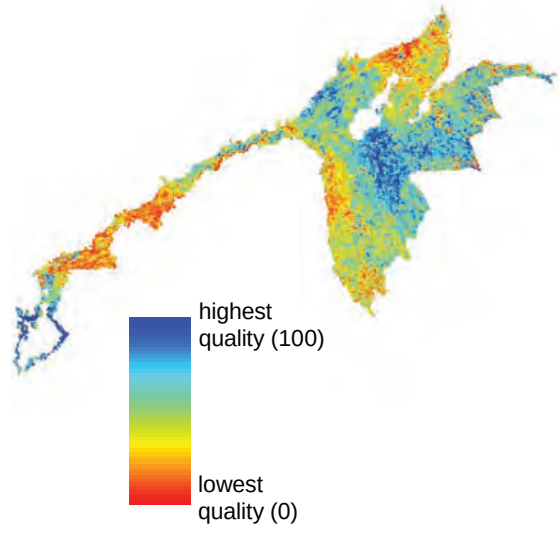
Annual rainfall as deciles of the long-term (1890–2005) rainfall record



Cumulative percentage deviations of annual rainfall from the long-term (1890–2005) median for all 14-year periods between 1890–1903 and 1992–2005



Aussie-GRASS simulated total standing dry matter — 1995



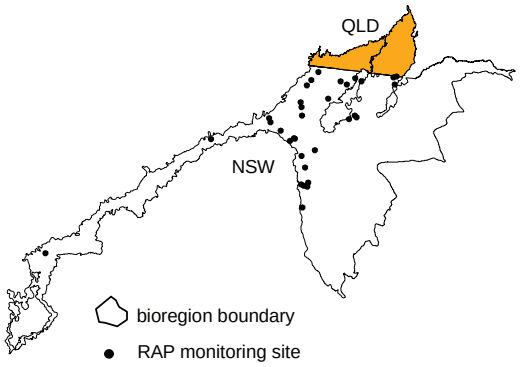
NDVI-based image of 'season quality' for 1995. Each pixel has a relative value according to the greeness of vegetation (ie photosynthetic activity)

Left: Rainfall

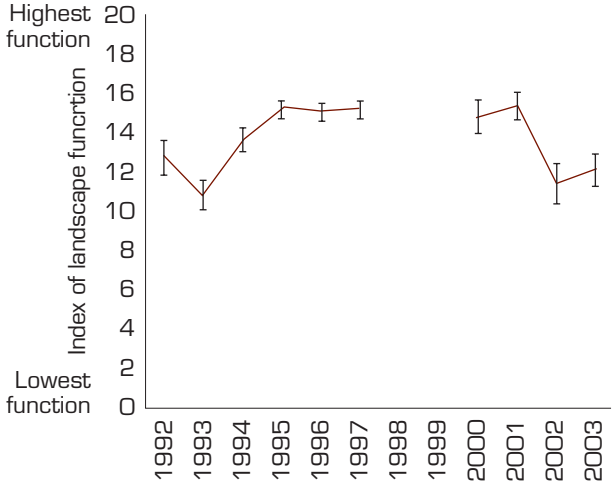
Right: Simulated pasture biomass and vegetation greenness (NDVI)

Note: Indicators are based on spatially averaged annual rainfall (April–March) between 1991–92 and 2004–05. For cumulative percentage deviations, periods below the dashed zero line indicate 14-year sequences with generally less rainfall (poorer *seasonal quality*) and periods above the line indicate sequences of increased rainfall (better *seasonal quality*). All data are for the combined NSW and Queensland components of the bioregion.

Figure 4.4 RAP monitoring sites, Darling Riverine Plains bioregion, and reported changes in an index of landscape function



Locations of RAP monitoring sites



Change in an index of landscape function based on the frequency and cover of perennial grasses. Bars show the standard error of the mean for each year. Data not available for 1998 and 1999.

1890. Figure 4.3 (bottom left) demonstrates apparent longer-term change in the pattern of annual rainfall. The first 30 years of available records show that rainfall fluctuated about the line of 'zero percentage cumulative deviation'. The 1920s to 1940s was a much drier period, and in terms of cumulative rainfall deficiency over successive 14-year periods, was much drier than conditions experienced recently. The past 50 years have been generally above average, and exceptional in the 1950s and 1970s. For the 1992–2005 reporting period, there was marked year-to-year variation, indicating highly variable *seasonal quality*. 2002–03 was a very dry year, while the period 1998–99 to 2000–01 was a wetter period. As in most bioregions, *seasonal quality* varied spatially across the Darling Riverine Plains in some years (shown in Figure 4.3, right, for 1995). This assessment of variability is based on simulated pasture biomass produced by AussieGRASS and 'season quality' derived from the Normalised Difference Vegetation Index (NDVI[36]).

Change in landscape function

Change in landscape function is reported from 31 Range Assessment Program (RAP) sites in the NSW part of the Darling Riverine Plains bioregion (Figure 4.4). Each site was assessed at least eight times between 1992 and 2003. An index of landscape function was calculated from the frequency and cover of perennial grasses at each site. Most of the change was probably seasonal, with index values responding to the presence of summer-growing perennial grasses, particularly curly Mitchell grass.

Across all seasonal conditions, 89% of site-time assessments had stable or increased landscape function. Taking account of seasonal conditions prior to each site reassessment, 2% of site-time assessments showed a decline in landscape function (beyond a change threshold) when *seasonal quality* was above average, and 23% of site-time assessments showed an increase when *seasonal quality* was below average (Table 4.1).

Sustainable management

Change in critical stock forage

The frequency of the palatable and perennial (2P) curly Mitchell grass at RAP sites at each assessment is used to report change in critical stock forage. As for landscape function, the same sites were assessed at least eight times between 1992 and 2003 (no data are available for 1998 and 1999) (Table 4.2).

[36] See http://www.environment.gov.au/erin/ndvi.html.

Table 4.1 Seasonally interpreted change in landscape function at RAP sites in the Darling Riverine Plains

Seasonal quality	Number of site by year combinations	Percentage of reassessed sites showing		
		Decline >4 decrease in index	No change	Increase >4 increase in index
Above average	62	2	90	8
Average	62	5	92	3
Below average	93	20	57	23

Note: The light grey cell indicates a likely adverse effect related to grazing management, in that no change or an increase in the landscape function indicator would be expected following above-average *seasonal quality*. The grey cell represents an encouraging result, as a decrease in landscape function would be expected following poor seasonal conditions.

Table 4.2 Seasonally interpreted change in critical stock forage at RAP sites in the Darling Riverine Plains

Seasonal quality	Number of site by year combinations	Percentage of reassessed sites showing		
		Decline >11 decrease in freq	No change	Increase >12 increase in freq
Above average	69	17	71	12
Average	46	17	65	18
Below average	69	9	82	9

Note: The light grey cell indicates a likely adverse effect related to grazing management, in that no change or an increase in curly Mitchell grass frequency would be expected following above-average *seasonal quality*. The grey cell represents an encouraging result, as a decrease in frequency would be expected following poor seasonal conditions.

Table 4.3 Seasonally interpreted change in native-plant species richness at RAP sites in the Darling Riverine Plains

Seasonal quality	Number of site by year combinations	Percentage of reassessed sites showing		
		Decline >12 decr. in no. spp.	No change	Increase >15 incr. in no. spp.
Above average	102	11	77	12
Average	68	24	75	1
Below average	102	11	66	23

See Table 4.2 for explanation of cell colours.

Note that sites selected for reporting change were restricted to those where curly Mitchell grass was present at the start of the period.

Species richness

Site-time assessments at RAP sites were used to determine seasonally interpreted change in native-plant species richness (Table 4.3). A higher percentage of sites had increased species richness following adverse seasons than declined following better *seasonal quality*.

Change in woody cover

The 'annualised rate' of woody vegetation change between 2004 and 2006 was 1468 ha based on analysis of satellite data using Queensland State-wide Landcover and Tree Study (SLATS) methods. Woody vegetation is defined as 'woody communities with 20% crown cover or more (eg woodlands, open forests and closed forests) and taller than about 2 metres'. The 'annualised rate' of clearing represents the 'annual rate of woody vegetation change, which is largely due to cropping, pasture and thinning' (DNR 2007).

It is not possible to report change for earlier years of the 1992–2005 period using this method.

Distance from stock water

Reporting on distance from stock water is for the whole Darling Riverine Plains bioregion.

Based on the locations of stock waterpoints (bores and dams) sourced from Geoscience Australia's Geodata Topo 250K vector product (Series 3, June 2006), the percentage of sub-IBRA area within 3 km and beyond 8 km of permanent and semipermanent sources of stock water is listed in Table 4.4. This analysis does not include the locations of natural waters (eg rivers), which provide many additional sources of water for stock. For some sub-IBRAs, the percentage area within 3 km of water may be understated and the area beyond 8 km overstated.

Table 4.4 Percentage of sub-IBRA area within 3 km or beyond 8 km of permanent and semipermanent sources of stock water (bores and dams only), Darling Riverine Plains

Sub-IBRA	% of sub-IBRA area	
	<3 km from water	>8 km from water
Culgoa–Bokhara (DRP1)	84.1	0.0
Warrambool–Moonie (DRP2)	100.0	0.0
Castlereagh–Barwon (DRP3)	36.5	20.6
Bogan–Macquarie (DRP4)	35.5	28.3
Louth Plains (DRP5)	56.5	0.4
Wilcannia Plains (DRP6)	48.4	4.0
Menindee (DRP7)	50.8	3.6
Great Darling Anabranch (DRP8)	62.9	1.8
Pooncarie–Darling (DRP9)	55.0	0.0

It is not possible to report change in watered area.

Weeds

Weeds known to occur in the bioregion include African boxthorn (*Lycium ferocissimum*), Athel pine (*Tamarix aphylla*), bitou bush (*Chrysanthemoides monilifera* subsp. *rotun*; in NSW), blackberry (*Rubus fruticosus*), mesquite (*Prosopis* spp.), mother of millions (*Bryophyllum tubiflorum* and hybrids), parkinsonia (*Parkinsonia aculeata*), broad leaf or tree privet (*Ligustrum lucidum*), silver leaf nightshade (*Solanum elaeagnifolium*), St Johns wort (*Hypericum perforatum*) and water hyacinth (*Eichhornia crassipes*).[37]

Components of total grazing pressure

Domestic stocking density

Eighty-eight per cent of the area of the Darling Riverine Plains bioregion was under pastoral land use in 1992, reducing to 80% in 2001. Based on Australian Bureau of Statistics (ABS)-sourced data and taking account of this reduced area, stocking density decreased from 11% above the 1983–91 average in 1992 to slightly below the 1983–91 base between 1993 and 2000 when mainly drier seasonal conditions prevailed (Figure 4.5). Stocking density then declined over the next three years to 75% of the base (in 2003). Stocking density increased slightly in 2004 to 77% of the 1983–91 average. Stocking density responded to *seasonal quality* but it is likely that expanded cropping also contributed to the overall decline in stocking density. Spatial averaging conceals likely variation in stocking density trends across the bioregion.

Kangaroo densities (Figure 4.6) were probably affected by changing seasonal conditions although this is not readily apparent from the graphed decile rainfalls. Contributing species to kangaroo density are reds, western and eastern greys.

Invasive animals

Invasive animal species known to occur in the bioregion include pig (*Sus scrofa*), goat (*Capra hircus*), fox (*Vulpes vulpes*), rabbit (*Oryctolagus cuniculus*), wild dog (*Canis lupus familiaris*), feral cat (*Felis catus*), starling (*Sturnus vulgaris*) and carp (*Cyprinus carpio*).[38]

37 See http://www.anra.gov.au

38 See http://www.anra.gov.au

Figure 4.5 Change in domestic stocking density (sheep and beef cattle) and seasonal quality as deciles of rainfall, Darling Riverine Plains bioregion

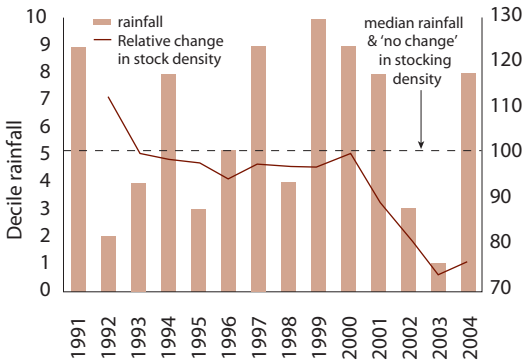
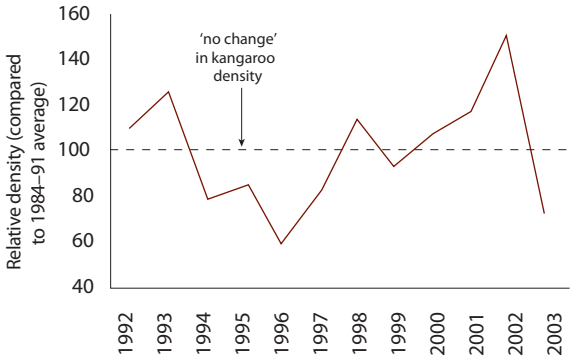


Figure 4.6 Kangaroo density, NSW component of the Darling Riverine Plains bioregion (DSEs)



Fire and dust

Fire

Fire was insignificant between 1997 and 2005 (the period of available data), with a maximum of 1.4% of the bioregion area burned in 2005.

The frequency of fire between 1997 and 2005 was very low compared with all rangeland bioregions (mean frequency (log_{10}transformed) = 0.07).

Dust

The mean DSI_3 value (1992–2005) was 1.40, a low value among all rangeland bioregions. Dust levels were lowest in the far northeast of the bioregion, near the NSW–Queensland border.

Biodiversity

There are Ramsar-listed wetlands in NSW and case studies of waterbirds (both components of the Biodiversity Working Group's indicator on wetlands).

Change in land use and land values

According to available National Land & Water Resources Audit (the Audit) data, 88% of the area of the Darling Riverine Plains bioregion was under pastoral land use in 1992, reducing to 80% in 2001.

Properties in the NSW part of the bioregion are relatively small compared with pastoral holdings in the northern, central and western parts of the rangelands. Based on all land parcels larger than 10 ha, average property size is 812 ha, with the largest holdings being greater than 30 000 ha (300 km^2). Most grazing enterprises are larger than 10 000 ha.

The market value of a typical (ie representative) property in the Brewarrina area increased by ~80% between 1996 and 2005 (values expressed in 2005 dollars).[39]