



# Murray–Darling Depression bioregion

## Description

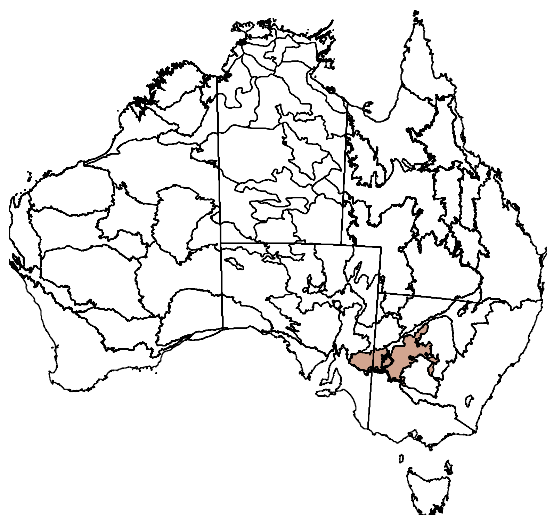
Area: 98 080 km<sup>2</sup>

The Murray–Darling Depression bioregion is characterised by extensive undulating plains, linear and parabolic dunes, and lakes. The Darling and Murray Rivers flow through the bioregion. The vegetation consists mainly of mallee shrublands with a chenopod shrub understorey, rosewood–belah open woodlands and bluebush chenopod shrublands. Leasehold grazing is the major tenure in rangeland areas, and small freehold blocks exist on the interface with the cropping zone. Irrigated and dryland cropping, sheep grazing, horticulture and mining are all important to the regional economy. Ivanhoe, Dareton and Gol Gol are the major population centres.

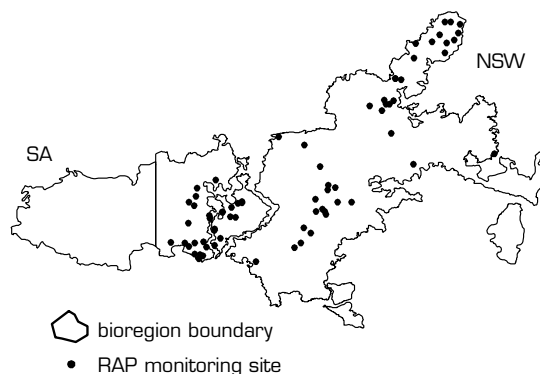
## Location

The Murray–Darling Depression bioregion is located in southwest New South Wales (NSW; 81% of the area) and southeast South Australia (SA; 19% of the area). Figures 1 and 2 show the location of the bioregion, as well as Rangeland Assessment Program (RAP) monitoring sites.

**Figure 1 Location of the Murray–Darling Depression bioregion**



**Figure 2 RAP monitoring sites in NSW**



## Data sources available

Data sources include:

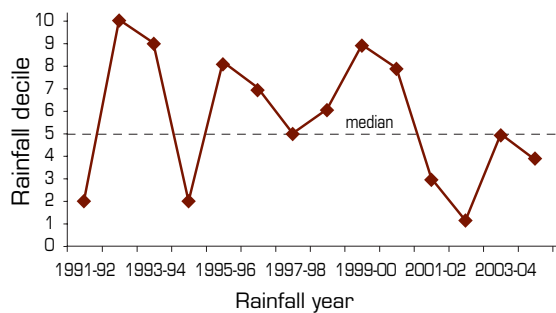
- NSW RAP, which provides moderate to high reliability for reporting change, with a relatively large number of sites, fairly uniform distribution, annual assessments, quantitative data, and a focus on perennial herbage species
- SA — no pastoral monitoring data are available
- domestic stocking density, which provides moderate reliability
- fire extent, intensity and frequency, which provides high reliability
- dust
- distance from water
- distribution and relative abundance of invasive animals and weeds
- land use
- land values.



## Climate

The Murray–Darling Depression bioregion has a semiarid climate with predominantly winter rainfall, and hot summers and mild winters. Spatially averaged median (1890–2005) rainfall is 230 mm (April to March rainfall year; see Figure 3).

**Figure 3 Decile rainfall for the period 1991–1992 to 2004–2005**



Annual rainfall is for the 12-month period 1 April to 31 March.

*Seasonal quality* as indicated by decile rainfall was highly variable during the reporting period. The years 1991–1992, 1994–1995 and 2002–2003 were very dry years and there were some wetter years up until 1999–2000.

Note that regional averaging of rainfall conceals spatial variability. Some parts of the Murray–Darling Depression bioregion probably experienced better *seasonal quality* and others worse during the 1992–2005 period.

## Landscape function

### New South Wales

**RAP, index based on the frequency and cover of perennial herbage species**

When *seasonal quality* was above average, 5% of site–time assessments showed a decline in the index of landscape function, while 1% of site–time assessments showed an increase when *seasonal quality* was below average.

<i>Seasonal quality</i>	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	134	5%	60%	35%
Average	469	12%	73%	15%
Below average	201	19%	80%	1%

### South Australia

There are no suitable data for reporting change.

## Sustainable management

### Critical stock forage

#### New South Wales

**RAP, frequency of the palatable and perennial (2P) grass, *Stipa* spp.**

When *seasonal quality* was above average, 2% of site–time assessments showed a decline in the frequency of *Stipa* spp., while 6% of site–time assessments showed an increase when *seasonal quality* was below average.

<i>Seasonal quality</i>	Number of site-by-year combinations	Percentage of reassessed sites showing:		
		Decline: > 29 decrease in frequency	No change	Increase: > 33 increase in frequency
Above average	138	2%	68%	30%
Average	621	16%	69%	15%
Below average	207	18%	76%	6%

Sites selected for reporting change were restricted to those where the 2P grass *Stipa* spp. was present at the start of the period. Frequency data from these same sites at subsequent reassessments were then used to report change.

## South Australia

There are no suitable data for reporting change.

## Plant species richness

### New South Wales

#### RAP, count of native perennial and annual herbage species

Approximately 5% of site–time assessments had decreased plant species richness following above-average *seasonal quality* and 8% of sites had increased plant species richness following below-average *seasonal quality*.

<i>Seasonal quality</i>	Number of site-by-year combinations	Percentage of reassessed sites showing:		
		Decline: > 9 decrease in no. species	No change	Increase: > 10 increase in no. species
Above average	142	5%	77%	18%
Average	639	15%	72%	13%
Below average	213	16%	76%	8%

## South Australia

There are no suitable data for reporting change.

## Change in woody cover

### New South Wales

The annualised rate of woody vegetation change between 2004 and 2006 was 2331 ha based on analysis of satellite data using Queensland **Statewide Landcover and Trees 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 two metres (DNR 2007). The annualised rate of clearing represents the annual rate of woody vegetation change, which is largely due to cropping, pasture and thinning (DNR 2007).

At this stage, it is not possible to report change for earlier years of the 1992–2005 period using this method.

## South Australia

There is substantial forest in the SA part of the bioregion based on the Australian Greenhouse Office definition and mapping of forest extent.<sup>1</sup> In 1991, 58.24% of the bioregion was forested, increasing by 2.65% to 60.89% in 2004. There is complete coverage of Landsat data for reporting this result.

## Distance from stock water

The percentage of sub-**Interim Biogeographic Regionalisation for Australia (IBRA)** area within three kilometres of permanent and semipermanent sources of stock water is summarised in the following table. The locations of stock waterpoints in SA were sourced from state mapping of lease infrastructure, and watered area is reported as the percentage of pastoral tenure within the one sub-IBRA. Data from NSW were obtained from Geoscience Australia's GEODATA TOPO 250K vector product (Series 3, June 2006), and watered area is the percentage of sub-IBRA area. Note that mapping differences between the SA data and the Geoscience Australia product (NSW) mean that the percentage watered areas reported by each data type are not directly comparable.

Sub-IBRA	South Australia		New South Wales	
	% sub-IBRA within 3 km of water	% sub-IBRA area analysed	% sub-IBRA within 3 km of water	% sub-IBRA area analysed
South Olary Plain, Murray Basin Sands (MDD1)	60.1	72.9	67.4	100
Darling Depression (MDD6)			66.9	100

IBRA = Interim Biogeographic Regionalisation for Australia;  
MDD = Murray–Darling Depression

Note that for NSW this analysis does not include the locations of natural waters, which may provide additional sources of water for stock, particularly following good rains. It is not possible to report change in watered area for the 1992–2005 period for either jurisdiction.

<sup>1</sup> See <http://www.greenhouse.gov.au/ncas/reports/tech09.html>

## Weeds

Weeds known to occur in the Murray–Darling Depression bioregion include:

Common name	Scientific name
African boxthorn	<i>Lycium ferocissimum</i>
Athel pine	<i>Tamarix aphylla</i>
Bathurst burr	<i>Xanthium spinosum</i>
Bridal creeper	<i>Asparagus asparagoides</i>
Golden dodder	<i>Cuscuta campestris</i>
Gorse	<i>Ulex europaeus</i>
Mesquite	<i>Prosopis</i> spp.
Mother of millions	<i>Bryophyllum tubiflorum</i> and hybrids
Parkinsonia	<i>Parkinsonia aculeata</i>
Patersons curse	<i>Echium plantagineum</i>
Silver leaf nightshade	<i>Solanum elaeagnifolium</i>
St John's wort	<i>Hypericum perforatum</i>
Wild mignonette	<i>Reseda luteola</i>

See [www.anra.gov.au](http://www.anra.gov.au) for distribution maps

## Components of total grazing pressure

### Domestic stocking density

Domestic stocking density data report for the whole bioregion. Most (90%) of the Murray–Darling Depression bioregion was grazed in 1992, reducing slightly to 86% in 2001. Based on data from the Australian Bureau of Statistics and taking account of the slightly reduced area grazed, stocking density in 1992 was 8% above the 1983–1991 average. Stocking density declined almost continuously to 1999 when it was 89% of the 1983–1991 base. It then increased temporarily in 2000 (to 5% above the base) before declining more sharply and consistently to 79% of the base value in 2003. Stocking density recovered slightly in 2004 (the end of available data) when it was 83% of the 1983–1991 average. The more-or-less continuous decline in stocking density was partly

attributable to poorer seasons, particularly the more rapid decrease since 2000 (see Figure 3, above). However, it is also likely that movement out of less-profitable wool growing into cropping contributed to the decline in stocking density.

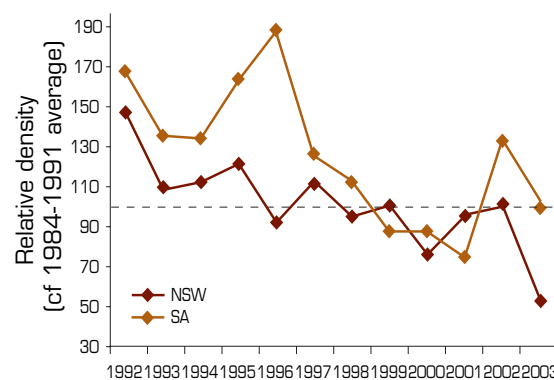
Note that spatial averaging conceals likely variation in stocking density trends across the bioregion.

## Kangaroos

The combined density of kangaroo species (on a dry sheep equivalent basis) declined almost continuously in the NSW part of the bioregion, with a much steeper decrease in the last year of available data (2003). Kangaroo density in the SA portion also declined but there was a spiked increase in density in 1995 and 1996 (when the density was 88% above the 1984–1991 average). The SA density also temporarily increased in 2002. It is probable that drier seasonal conditions since 1999–2000 contributed to the decrease in kangaroo density.

Figure 4 shows the change in kangaroo density across the bioregion (graphed relative to the average density for the 1984–1991 period). Contributing species are reds and western greys in SA, and these two species plus eastern greys in NSW.

**Figure 4 Kangaroo density in the NSW and SA parts of the Murray–Darling Depression bioregion**



## Invasive animals

Invasive animal species known to occur in the Murray–Darling Depression bioregion include:

Common name	Scientific name
Feral pig	<i>Sus scrofa</i>
Feral goat	<i>Capri hircus</i>
Fox	<i>Vulpes vulpes</i>
Rabbit	<i>Dryctolagus cuniculus</i>
Wild dog	<i>Canis</i> spp.
Feral cat	<i>Felis cattus</i>
Starling	<i>Sturnus vulgaris</i>
Carp	<i>Cyprinus carpio</i>
Donkey	<i>Equus asinus</i>

See [www.anra.gov.au](http://www.anra.gov.au) for distribution maps

## Products that support reporting of landscape function and sustainable management

### Fire

Fire data report for the whole bioregion. Fire was insignificant during the reporting period. The only recorded occurrence of fire in the 1997–2005 period was in 2003 when 0.1% of the bioregion burnt.

### Dust

Dust data report for the whole bioregion. The mean Dust Storm Index value (1992–2005) was 3.03, which was a moderate to high value among all rangeland bioregions. Dust levels were fairly uniform throughout the bioregion.

## Biodiversity

Information for NSW lists a case study (see **Monitoring wetlands and waterbirds in Chapter 3**) of wetland waterbirds (Biodiversity Working Group indicator: Wetlands; see **Section 7 of Chapter 3** of *Rangelands 2008 — Taking the Pulse*).

Ramsar-listed wetlands (Biodiversity Working Group indicator: Wetlands) also occur in the Murray–Darling Depression bioregion.

In SA, there were more than 55 000 bird records of 236 taxa (Biodiversity Working Group indicator: Fauna surveys) and more than 11 000 records of about 800 flora species (Biodiversity Working Group indicator: Flora surveys) by 2005.

In this bioregion, there are (Biodiversity Working Group indicator: Threatened species):

- 2 threatened plant species
- 1 threatened mammal species
- 4 threatened bird species
- 1 threatened reptile species.

## Socioeconomic characteristics

### Land use and value

In 1992, 90% of the Murray–Darling Depression bioregion was grazed; this reduced slightly to 86% in 2001.

In SA, the unimproved value of pastoral land increased, on average, by approximately 55% between 1998 and 2004 (values expressed in 2005 dollars).

In NSW, the market value of a typical property in the Wentworth area increased by approximately 20% between 1996 and 2005 (values expressed in 2005 dollars). Average property size is 2880 ha (maximum size of 71 310 ha) for all land parcels bigger than 10 ha.

## Key management issues and features

Key features and issues of the Murray–Darling Depression bioregion include the following:

- SA:
  - Woody thickening has occurred (woody weeds), particularly in conditions of average winter rainfall followed by a wet summer. These conditions suitable for woody thickening occurred in 1973–1974, 1983–1984 and perhaps 1999–2000.
  - Rabbit control programs and spread of rabbit haemorrhagic disease (calicivirus) in the mid-1990s significantly improved the potential for vegetation recovery.

- Feral and domesticated goats are a major management issue and a source of community polarisation. Some lessees want to run commercial goat operations whereas others are strongly opposed to any proposal to run goats on pastoral land. The Pastoral Board's policy of eradication of feral goats remains in place. The issue of domesticated goats remains unresolved.
  - Availability of stock water remains a limit to development. Surface water is collected in large storages and is subject to large evaporation losses.
  - African boxthorn is a weed of concern in some parts of the IBRA.
  - Much of the pastoral part of the IBRA is now dedicated to conservation use.
- NSW:
- Shrub populations in the chenopod shrublands are relatively dynamic. Chenopods thickened up during wet seasons of the 1970s and 1980s, but subsequently remained stable. Pastures are of relatively low diversity in comparison to other rangeland bioregions and are dominated by speargrass (*Austrostipa* spp.). The extent and quality of the rosewood–belah woodlands are declining. These areas were targeted for clearing during the 1990s due to favourable soil characteristics. Rosewood fails to regenerate or sucker even under relatively low grazing pressures and most existing stands consist of aged specimens. Associated communities, such as white cypress pine (*Callitris glaucophylla*) open woodland, are also at risk due to lack of regeneration through selective grazing of recruitment.
  - The mallee communities are of relatively low value for pastoralism but have been extensively cleared for cropping over the reporting period due to their responsive soil types. They have potentially high biodiversity values.
  - Many soils are sandy or calcareous, providing good habitat for rabbits. These were significantly impacting the landscape during the early 1990s. During the mid-1990s, control programs and the spread of rabbit haemorrhagic disease (calicivirus) reduced the impact of rabbit populations and improved the capacity of the landscape to recover from grazing.
  - High wool prices through the 1980s encouraged landholders to maintain high stock numbers. Removal of the wool floor price at the end of the 1980s reduced the value of sheep, and high numbers entered the drought in 1992, resulting in an adverse impact on land condition. The merino wool industry continued to decline during the 1990s.
  - There has been a significant conversion of rangeland to cereal cropping in the southern-most areas of the bioregion since the 1970s. This trend peaked during the late 1990s before native vegetation legislation was changed. While cereal cropping is regarded as a valuable diversification in the context of declining returns from grazing, much of the development has been initiated through the migration of cereal farmers seeking cheaper land values.
  - During the mid-1990s, export prices for goat and sheep meat improved. The harvesting of feral goats became an important source of property income, and infrastructure to support this, such as trapyards and appropriate fencing, has developed accordingly. Meat sheep and managed goats are now significant enterprises.
  - Hopbush (*Dodonea* spp.) is the main shrub species responsible for woody thickening in the bioregion.