



Broken Hill Complex bioregion

Description

Area: 56 825 km²

Land types of the Broken Hill Complex bioregion include low ranges, rounded hills and gently undulating downs. Chenopod downs country occupies the majority of this bioregion. Tenure is mostly pastoral leasehold with some nature reserves. Grazing, by sheep and increasingly cattle, is the most extensive land use. Mining for silver, lead, zinc and copper is still important to the bioregion's economy, and tourism has grown in recent years. Broken Hill is the major population centre.

Location

The bioregion is located in Western New South Wales (NSW; 67% of the bioregion) and eastern South Australia (SA; 33% of the bioregion). Figures 1 and 2 show the location of the Broken Hill Complex bioregion, and the monitoring sites and pastoral tenure.

Figure 1 Location of the Broken Hill Complex bioregion

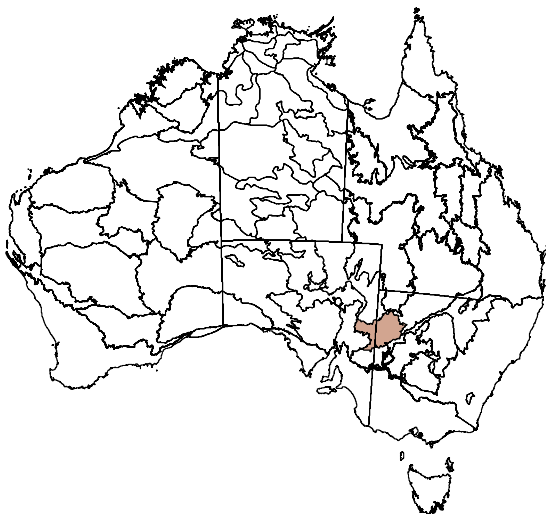
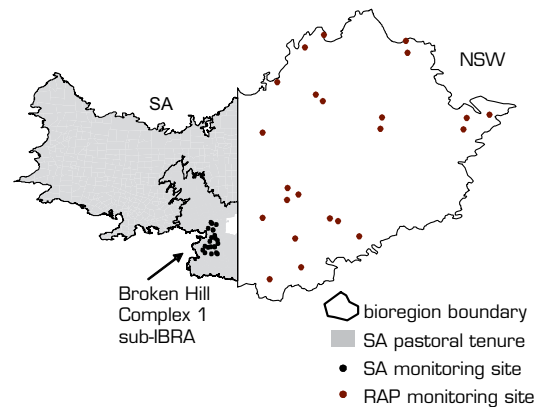


Figure 2 Monitoring sites and pastoral tenure (not shown for NSW)



Data sources available

Data sources include:

- NSW Rangeland Assessment Program (RAP) — moderate to high reliability for reporting change, because a moderate number of sites were assessed, which provided a fairly uniform distribution. Annual assessments are made. Quantitative data are collected, and there is a focus on perennial herbage species.
- SA pastoral monitoring sites are confined to the Broken Hill Complex I (BHCI) **sub-Interim Biogeographic Regionalisations for Australia (IBRA)**. Sites were last assessed in 1993 and therefore were not able to report change for the 1992–2005 period.

Other datasets include:

- domestic stocking density, which provides moderate reliability for reporting change
- fire extent, intensity and frequency, which provides high reliability
- dust
- distance from water

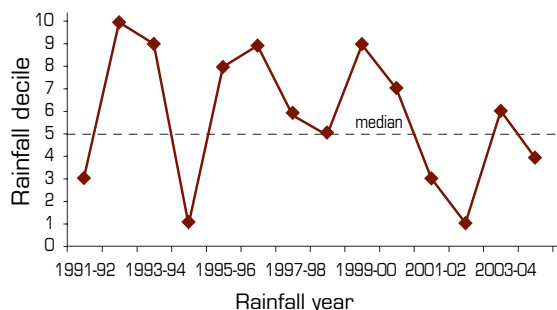


- distribution and relative abundance of invasive animals and weeds
- land use
- land values.

Climate

The climate of the Broken Hill Complex bioregion is arid with slightly summer-dominant rainfall. Spatially averaged median (1890–2005) rainfall is 174 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 1994–1995 and 2002–2003 were very dry, and there were some wetter years up until 1999–2000.

Note that regional averaging of rainfall conceals spatial variability. Some parts of the Broken Hill Complex 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, 13% of site–time assessments showed a decline in the index of landscape function, while 10% of site–time assessments showed an increase when *seasonal quality* was below average. The index values suggest that the bioregion has good resilience in landscape function and the capacity to respond to favourable seasons.

| <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 | 120 | 13% | 72% | 15% |
| Average | 144 | 4% | 83% | 13% |
| Below average | 72 | 10% | 80% | 10% |

Pastoral monitoring sites in SA were last assessed in 1993; therefore, there are no suitable data for reporting change for the 1992–2005 period.

Sustainable management

Critical stock forage

New South Wales

RAP, frequency of the palatable and perennial grass, *Astrelba lappacea*

When *seasonal quality* was above average, 17% of site–time assessments showed a decline in the frequency of *Astrelba lappacea*. No sites assessed following below-average *seasonal quality* showed an increase in the frequency of *A. lappacea*.

| <i>Seasonal quality</i> | Number of site-by-year combinations | Percentage of reassessed sites showing: | | |
|-------------------------|-------------------------------------|---|-----------|--------------------------------------|
| | | Decline: > 13 decrease in frequency | No change | Increase: > 14 increase in frequency |
| Above average | 30 | 17% | 63% | 20% |
| Average | 42 | 7% | 74% | 19% |
| Below average | 18 | 22% | 78% | 0% |

Sites selected for reporting change were restricted to those where the 2P (palatable and perennial) grass *A. lappacea* was present at the start of the period. Frequency data from these same sites at subsequent reassessments were then used to report change. The data suggest that *A. lappacea* is a persistent species that is able to respond well to favourable seasons.

South Australia

Sites in SA were last assessed in 1993 so change is not able to be reported for the 1992–2005 period.

Plant species richness

New South Wales

RAP, count of native perennial and annual herbage species

Approximately 23% of site–time assessments had decreased plant species richness following above-average *seasonal quality*, and 16% of site–time assessments had increased plant species richness following below-average *seasonal quality*. There appears to be a high capacity for native species to respond to favourable seasons.

| <i>Seasonal quality</i> | Number of site-by-year combinations | Percentage of reassessed sites showing: | | |
|-------------------------|-------------------------------------|---|-----------|--|
| | | Decline: > 14 decrease in number of species | No change | Increase: > 14 increase in number of species |
| Above average | 120 | 23% | 63% | 14% |
| Average | 168 | 11% | 73% | 16% |
| Below average | 72 | 8% | 76% | 16% |

South Australia

There are no suitable data for reporting change.

Change in woody cover

New South Wales

Statewide Landcover and Trees Study (SLATS)-type data are used for reporting change.

Based on analysis of satellite data using Queensland SLATS methods, there was no detected change in woody vegetation between 2004 and 2006. 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). At this stage, it is not possible to report change for earlier years of the 1992–2005 period using this method.

South Australia

It is not possible to report change in woody cover for the SA part of the bioregion.

Distance from stock water

The percentage of sub-IBRA area within three kilometres of permanent and semipermanent sources of stock water is summarised in the following table. Note that for SA, the locations of stock waterpoints were sourced from state mapping of lease infrastructure. NSW data were obtained from Geoscience Australia's GEODATA TOPO 250K vector product (Series 3, June 2006). The mapping differences mean that the percentage watered area 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 |
| Barrier Range (BHC1) | 62.2 | 94.8 | 69.1 | 100 |
| Mootwingee Downs (BHC2) | | | 62.6 | 100 |
| Scopes Range (BHC3) | | | 69.9 | 100 |
| Barrier Range Outwash (BHC4) | 47.4 | 98.4 | 63.2 | 100 |

BHC = Broken Hill Complex; IBRA = Interim Biogeographic Regionalisation for Australia

The analysis for the SA part of the bioregion includes the locations of natural waters. Any such waters in NSW are not included. These natural features can 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.

Weeds

Weeds known to occur in the Broken Hill Complex bioregion include:

| Common name | Scientific name |
|------------------------|-------------------------------|
| Athel pine | <i>Tamarix aphylla</i> |
| Mesquite | <i>Prosopis</i> spp. |
| Noogoora burr | <i>Xanthium occidentale</i> |
| Parkinsonia | <i>Parkinsonia aculeata</i> |
| Patersons curse | <i>Echium plantagineum</i> |
| Silver leaf nightshade | <i>Solanum elaeagnifolium</i> |
| Wild mignonette | <i>Reseda luteola</i> |

See www.anra.gov.au for distribution maps

Components of total grazing pressure

Domestic stocking density

Domestic stocking density data report for the whole bioregion. Approximately 96% of the Broken Hill Complex bioregion is grazed. Based on data sourced from the Australian Bureau of Statistics, domestic stocking density in 1992–1993 was approximately 4% below the 1983–1991 average. Stocking density then increased to 26% above this base in 1995 and then progressively declined to 93% of the base value in 2002. It then fell to 67% of the base in 2003 and recovered to 76% of the 1983–1991 average in 2004 (last year of available data). The decline in stocking density since 1995 is probably largely attributable to poorer seasons, particularly since 2000. However, reliance on dams (tanks) for stock water in large parts of this bioregion has probably enforced destocking at various times since the mid-1990s. Note that spatial averaging conceals likely variation in stocking density trends across the bioregion.

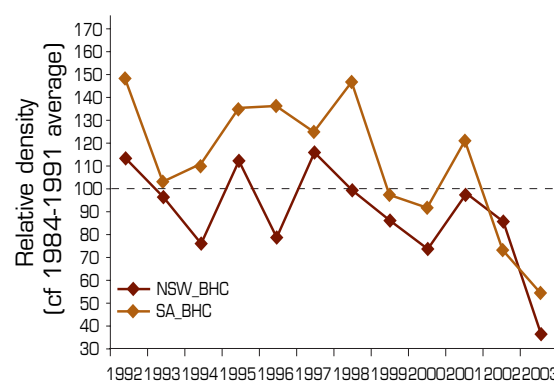
Kangaroos

The combined density of kangaroo species (on a dry sheep equivalent basis) fluctuated until 1997 (NSW) or 1998 (SA). The density of kangaroos in each state then decreased to 2000, increased temporarily in 2001 and declined further (markedly) to 2003 (the end of available data). The general decrease since 1998 is probably largely attributable to drier seasonal conditions.

Figure 4 shows kangaroo densities 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 Relative density of kangaroo species



Invasive animals

Invasive animal species known to occur in the Broken Hill Complex 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>Oryctolagus cuniculus</i> |
| Wild dog | <i>Canis</i> spp. |
| Starling | <i>Sturnus vulgaris</i> |
| Donkey | <i>Equus asinus</i> |
| Feral cat | <i>Felis catus</i> |

See www.anra.gov.au for distribution maps

Products that support reporting of landscape function and sustainable management

Fire

Fire data apply to the whole bioregion. Fire was insignificant during the reporting period. The only recorded occurrence of fire in the 1997–2005 period was in 2004 when 0.1% of the Broken Hill Complex bioregion burnt.

Dust

Dust data report for the whole bioregion. The mean Dust Storm Index value (1992–2005) was 2.50, which was moderate compared with all rangeland bioregions. Dust levels were highest in the east and decreased in the western (SA) part of the bioregion.

Biodiversity

In South Australia, there were more than 3600 records of approximately 600 flora species from more than 150 survey sites by 2005 (Biodiversity Working Group indicator: Flora surveys). In addition, there were more than 3000 bird records, 460 mammal records and 700 reptile records (Biodiversity Working Group indicator: Fauna surveys).

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

- 1 threatened plant species
- 1 threatened mammal species
- 1 threatened bird species.

Socioeconomic characteristics

Land use and value

Most (96%) of the Broken Hill Complex bioregion is grazed. This area has not changed appreciably over the 1992–2005 reporting period.

In SA, the unimproved value of pastoral land has increased, on average, by almost 60% between 1998 and 2004 (values expressed in 2005 dollars).

In NSW, the average property size is 3220 hectares (maximum size of 58 960 hectares) for all land parcels bigger than 10 hectares.

Key management issues and features

The major regional features and issues for the Broken Hill Complex bioregion are described below, by state.

South Australia

In the SA part of the bioregion, the available groundwater is saline and limited in extent. Surface water is the major available resource for stock and is used from large surface storages that intercept overland flow. These storages are often very large and can provide at least two years' supply.

Feral goats have been a chronic problem in the scrublands to the south of the bioregion. The SA Pastoral Board is under some pressure to allow commercial goat grazing in the bioregion.

The decline in rabbit populations following active control programs and the impact of the calicivirus in the mid-1990s has seen significant potential for vegetation recovery in the area.

The Honeymoon Uranium mine and proposed mines using the in-situ leaching mining method are located in the bioregion. Some concerns have been raised regarding possible aquifer contamination resulting from the mining method.

New South Wales

In the NSW part of the bioregion, landscapes produce limited biomass through ephemeral responses. Sparse perennial grasses and chenopod shrubs are important components of stability and productivity.

Rabbits had a significant impact on this part of the bioregion in the early 1990s. Rabbit control programs and the impact of rabbit haemorrhagic disease (calicivirus) have significantly improved the potential of the country to recover.

In 1991, there was a saltbush dieback event, which was largely attributed to caterpillar attack. There was considerable recovery through 1992 and 1993 associated with a high density of perennial sub-shrubs, including *Sclerolaena* spp. Interestingly, those properties that were conservatively stocked at the time of saltbush dieback were hit the hardest and suffered the worst recovery rates. This was related to available leaf area for moth eggs to be laid and hence the density of caterpillars.

The diversity of perennial ground-cover species has declined over the reporting period. Ground cover has also been declining, at least in part as a result of more recent drought conditions. Black bluebush (*Maireana pyramidata*) populations have remained relatively stable, while saltbush (*Atriplex vesicaria*) density has been dynamic.

Most soils in this area of the bioregion are protected by gibber cover but erosion is an issue where surface disturbance from roads or other factors disrupts runoff patterns.

The merino wool industry has declined. During the mid-1990s, export prices for meat improved. These factors have initiated a trend to meat breeds of sheep and increased harvesting of feral goats. In recent years, harvesting operations have become more efficient through better control of waterpoints. Goats are now an alternative grazing enterprise.

A lack of control of total grazing pressure due to the mobility of kangaroos and goats is the greatest challenge to land management. Landholders are widely adopting improved fencing strategies to better manage grazing, which commonly include the control of access to water.