CHAPTER 5

The Mulga Lands Bioregion

1. Location

The Mulga Lands Bioregion is in northern NSW, extending north and west into Qld. Of a total area of 25,449,547 ha, 25.75% (or 6,554,033 ha) of the bioregion lies in NSW, with the remainder in Qld.

The NSW section of the bioregion is contained wholly in the NSW Western Division and occupies 8.19% of the state. The bioregion is bounded by the Simpson-Strzelecki Dunefields and Broken Hill Complex bioregions in the west and the Darling River in the Darling Riverine Plains Bioregion bounds the Mulga Lands to the south and east. Several small townships are found in the NSW part of the bioregion, including Wanaaring, Enngonia, White Cliffs and Yantabulla, while Hungerford and Barringun lie across the border in Qld.

The Paroo River flows through Wanaaring at the centre of the bioregion, the Warrego River flows through Enngonia to the east, and further east the Culgoa River flows parallel to the northeastern border in the adjacent Darling Riverine Plains Bioregion. The bioregion lies mostly within the Murray-Darling Basin and encompasses the Bulloo, Lake Bancannia, Warrego, Paroo, Darling, Barwon and Culgoa River catchments.

2. Climate

The Mulga Lands Bioregion is dominated by a hot, persistently dry, semi-arid climate in the Warrego catchment. The western part of the bioregion has a more arid, desert climate.

3. Topography

Only a few areas of Palaeozoic bedrock are found in the bioregion, where resistant quartz sandstones emerge from the Cretaceous and Quaternary blankets of sediment. These form low rounded isolated ranges and hills such as Mt Pleasant and could be considered as outliers of the Cobar Peneplain Bioregion.

Mean Annual Temperature	Minimum Average Monthly Temperature	Maximum Average Monthly Temperature	Mean Annual Rainfall	Minimum Average Monthly Rainfall	Maximum Average Monthly Rainfall
10 – 18°C	-3.5 – 3.6°C	22.9 – 34.7°C	556 – 1270mm	31 – 83mm	76 – 137mm

4. Geology and geomorphology

The Mulga Lands Bioregion is dominated by horizontal Cretaceous sandstones and claystones deposited in an inland sea about 100 million years ago. These sediments vary in thickness across the basement rocks and they form the main water-bearing strata of the Great Australian Basin. Artesian mound springs from these aquifers have forced through overlying strata but most are now inactive, an important exception being Perry springs. Many parts of the surface sandstones and more recent sands were silicified during the Tertiary to form silcrete, a tough fine-grained quartzite. These rocks often contain plant fossil remains indicating much wetter environments than occur at present. Silcrete pebbles and boulders mantle the landscape as gibber and massive silcrete often forms the low cliff lines on plateau and tableland margins. The Cretaceous sediments have been gently folded and have small offset faults that are probably important in controlling the distribution of plateaus.

Alluvial fans of the Paroo and Warrego river systems have deposited sands and clays between the plateau areas of sandstones. Under today's rainfall these streams do not often flow into the Darling, and the clay pans toward the end of the fans are often saline, suggesting that groundwater may have an influence on them. Sand has been blown from the alluvial sediments and probably from Cretaceous sandstones to form extensive sandplains with limited areas of dunefield that encroach on the edges of the high ground. Elsewhere, the alluvial systems are dominated by grey and brown cracking clays in channels and claypans. Lakes and swamps are normally dry but all wetland systems are very important ecologically in wet years.

5. Geodiversity

Important features of the bioregion include the following:

- extensive ephemeral wetland systems;
- fans of both the Warrego and Paroo – excellent examples of Quaternary riverine landforms preserved in a semi-arid zone;
- Peery Springs, the last flowing mound spring in the NSW section of the Great Australian Basin;
- Lake Burkanoko and Lake Nichebulka, east of Wanaaring, both good examples of inland hypersaline lakes;
- the Paroo River – the last free-flowing tributary of the Darling, with no water control structures and no catchment cultivation;
- the White Cliffs and Gemville opal fields, the first commercial fields in the world which contain numerous heritage elements associated with mining and are still producing opal; and
- silcrete, which was widely used as a stone tool resource by Aboriginal people, so it is likely that the region contains numerous quarry sites.

6. Soils

The plateau and tablelands typically have shallow, stony, red-brown loams. These merge downslope, often through patterns of contour banding into brown texture contrast soils. Silcrete gibber is widespread as a surface lag gravel. In the sandplain areas, red earths and red siliceous sands are the norm but the colour is not as bright as in the larger dunes of the Simpson-Strzelecki Bioregion. Grey and brown cracking clays dominate the alluvial sequences with limited areas of sand deposition often reworked into source bordering sand sheets or low dunes. Most soils contain calcium carbonate in their sub-soil and clays in the claypans. Lake beds at the far end of the alluvial fans are often saline and contain gypsum.

7. Biodiversity

7.1 Plant communities

As its name suggests, the predominant vegetation of the bioregion is mulga (*Acacia aneura*). The eastern and northern parts of the bioregion support mulga, western bloodwood (*Eucalyptus terminalis*) and poplar box (*Eucalyptus populnea*), with mallee (*Eucalyptus* sp.), white cypress pine (*Callitris glaucophylla*), silver-leaf ironbark (*Eucalyptus melanophloia*), beefwood (*Grevillea striata*), leopardwood (*Flindersia maculosa*) and bluebush (*Maireana* sp.). Spinifex (*Triodia* sp.) is found on the Block Range ridges. Few trees grow on the western stony plateaus.

Dense areas of woody shrubs extend across the sandplains. Mulga with ironwood (*Acacia excelsa*), white cypress pine, wilga (*Geijera parviflora*), gidgee (*Acacia cambagei*), brigalow (*Acacia harpophylla*), rosewood (*Heterodendrum oliefolium*), budda (*Eremphila mitchellii*), belah (*Casuarina cristata*) and sandhill wattle (*Acacia ligulata*) occupy sandplains, dunes and red soil rises. Poplar box lines depressions in red country and occurs on the grey soil floodplains in the east.

Black box (*Eucalyptus largiflorens*), coolabah (*Eucalyptus microtheca*), river cooba (*Acacia stenophylla*), yapunyah (*Eucalyptus ochrophloia*) and eurah (*Eremophila bignoniflora*), together with lignum (*Muehlenbeckia cunninghamii*), canegrass (*Eragrostis autralasica*), saltbush (*Atriplex* sp.) and copperburr (*Sclerolaena* sp.) are typical of the alluvial clays, with some gidgee, leopardwood and wilga on claypan margins. Sparse mulga can be found on lunettes.

7.2 Significant flora

Although there are no strictly endemic species in the Mulga Lands Bioregion, there are several significant flora species. These include spiny sedge (*Cyperus gymnocaulos*), bore-drain sedge (*C. laevigatus*, found only between Milparinka and Wanaaring), smooth heliotrope (*Heliotropium curassavicum*) and Ellangowan poison-bush (*Myoporum deserti*) towards the east of the bioregion (Cunningham *et al.* 1981, Morton *et al.* 1995).

The bioregion also supports a *Utricularia* species, most likely the golden bladderwort *Utricularia aurea*, which has one or two records from the Paroo River but is mostly found along the coastal fringe of eastern Australia (Cunningham *et al.* 1981, Morton *et al.* 1995). The salt pipewort *Eriocaulon carsonii*, listed as endangered in the TSC Act, has been identified as a relict species of the bioregion and is also found in SA and Qld (Briggs and Leigh 1995).

7.3 Significant fauna

A review of fauna information in 1997 showed that 256 bird, 56 mammal, 94 reptile and 23 amphibian species have been recorded for the bioregion (National Land and Water Resources website – www.nlwra.gov.au). The eucalypt woodlands associated with riparian areas show the highest species richness (Sattler and Williams 1999).

The western quoll (*Dasyurus geoffroii geoffroii*), once believed to have been present in the bioregion, is presumed to be extinct. The greater bilby (*Macrotis lagotis*), night parrot (*Pezoporus occidentalis*) and plains rat (*Pseudomys australis*) are all believed to be Mulga Lands species that are endangered (Sattler and Williams 1999).

The Mulga Lands support similar faunal assemblages to other semi-arid bioregions in NSW. The woodlands of the bioregion are particularly important for avifauna, including the limited range species, the Hall's babbler (*Pomatostomus halli*).

Photo: Murray Ellis

Numbers of freshwater birds increased in this bioregion due to an increase in rainfall from the first survey period (1977-1981) and the second survey period (1998-2001), as did ground nesters, some seed-eaters and insect-eaters as well as some woodland species. Grassland birds have not decreased significantly as is the trend in the majority of other bioregions (Australian Terrestrial Biodiversity Assessment 2002). Long-term trends indicate probable decline in bird species numbers as a result of ongoing land clearing in the bioregion.

Other significant fauna of the Mulga Lands is most often found in the wetlands of the bioregion, as detailed below.

7.4 Significant wetlands

There are six significant wetlands of the Paroo-Warrego area, which comprises the eastern half of the Mulga Lands Bioregion. All these wetlands are considered to be in good condition, providing habitat for large numbers of waterbirds.

Lower Bells Lake supports many waterbird populations, including the pink-eared duck (*Malacorhynchus membranaceus*) and grey teal (*Anas gracilis*), as well as providing nesting habitat for the black swan (*Cygnus atratus*).

The Cuttaburra Channels provide an important refuge for many waterbirds, sometimes to extreme numbers of up to 10,000 individuals. The floodplain has provided nesting habitat for the Pacific black duck (*Anas superciliosa*), Pacific heron (*Ardea pacifica*), black swan (*Cygnus atratus*), whiskered tern (*Sterna hybrida*), red-necked avocet (*Recurvirostris novaehollandia*) and straw-necked ibis (*Threskiornis aethiopica*).

The Kichimiloo Claypan area is also thought to provide habitat for up to 10,000 waterbirds.

The Kerribree Creek floodplain supports the annual grass channel millet (*Echinochloa inundata*), which is considered to be rare and was used as grain by local Aborigines prior to European settlement (Vickery 1975, cited in Cunningham *et al*. 1981). This wetland has also been described as providing habitat for up to 20,000 waterbirds.

Another significant wetland is the Warrego River floodplain, which could support up to 14,000 waterbirds. However, like many other wetlands in the area, feral animals, exotic weeds and changed hydrology are slowly degrading the current habitat values.

The Warrego/Darling River confluence provides a home for the vulnerable barking owl (*Ninox connivens*) and red-tailed black cockatoo (*Calyptorhynchus banksii*) (RAOU). The vulnerable Major Mitchells cockatoo (*Cacatua leadbeateri*) and brolga (*Grus rubicunda*), and the endangered Australian bustard (*Ardeotis australis)* have all been recorded in the vicinity of this wetland.

Threats to these wetlands are feral animals, exotic weeds, water extraction, sedimentation and grazing pressure.

Other significant wetlands include Peery Springs and Paroo Wetlands, which have been identified as refugia for biodiversity in the bioregion (Morton *et al*. 1995).

Peery Springs are a pair of mound springs at the edge of Peery Lake towards the centre of the NSW part of the Mulga Lands Bioregion. These springs have remained active in a part of the Great Artesian Basin where, of the 45 springs in NSW, most are no longer actively flowing (Morton *et al*. 1995). These springs are now protected in Peery National Park.

The Paroo Wetlands are an enormous wetlands complex which are located on pastoral leases in the bioregion as well as being partly reserved in Nocoleche

Nature Reserve which lies across this and the Darling Riverine Plains bioregions. The wetlands are formed in swamps and playa lakes that are filled about every five years, when floodwaters flow southwest from Qld along the Paroo and Warrego Rivers and Cuttaburra Creek (Morton *et al*. 1995). These wetlands are threatened by changes to hydrology resulting from agriculture and vegetation changes caused by overgrazing (Morton *et al*. 1995).

These wetlands also provide habitat for large populations of waterbirds, many of which, such as the freckled duck (*Stictonetta naevosa*), are significant to the bioregion (Morton *et al*. 1995).

8. Regional History

8.1 Aboriginal occupation

For information on the Aboriginal occupation of the Mulga Lands Bioregion, refer to Chapter 1 under the heading "Regional history".

8.2 European occupation

White Cliffs was the site of several pastoral stations in the 1880s. The discovery of the lucrative opal fields that it is most famous for was made quite by accident. Four kangaroo shooters hired to reduce kangaroo numbers on one of the stations found opals and sent them to Adelaide for valuation. The valuer, Tullie Cornthwaite Wollaston, was so impressed with the specimens that he became the main promoter of the town, selling the opals across the USA and Europe. A small settlement based on mining appeared in the area in the 1890s. The town was known as White Cliffs in reference to the white shale which harboured the opals. The first store and pub appeared in 1892 and by 1897, once word had got around of the potential of opals in the area, the town supported a population of about 1,000.

Due to the lack of adequate building materials and the unbearable heat in summer, miners began in 1894 to live in their used mine shafts that were cut into the solid sandstone. These underground dwellings were popular at White Cliffs as they provided a constant temperature throughout the year.

In 1902 the growth and economy of the town reached a peak as opals worth around £140,000 were discovered. This discovery attracted a large number of miners until World War I broke out in 1914 and the population of the town declined to its current status. The permanent population of White Cliffs stands at about 200, which rises in the winter months due to an influx of those seeking their fortune in gems. In 1987 the production of opals from the White Cliffs fields was estimated to be $150 million (Walkabout Australian Travel Guide website – http://www.walkabout.com.au/).

In contrast to White Cliffs, the town of Barringun on the Mitchell Highway at the Qld border has a population of four. Although this town once thrived, only a few abandoned buildings remain, but the pub is never deserted (Walkabout Australian Travel Guide website – www.walkabout.com.au).

9. Bioregional-scale conservation

The Mulga Lands Bioregion has, along with the majority of NSW bioregions, less than 20% of its area managed in conservation tenures. Together, they occupy about 157,428 ha or 2.40% of the bioregion.

Tenures provided for under the NPW Act 1974, and specifically national parks and nature reserves, are responsible for the majority of land included in conservation. The bioregion supports three reserves protected under the NPW Act 1974: Nocoleche Nature Reserve, Peery National Park and a small section of the Culgoa National Park, most of which is found in the adjacent Darling Riverine Plains Bioregion. Together these occupy an area of 114,170 ha or 1.74% of the bioregion. None of these reserves is also managed as wilderness under the Wilderness Act 1987. There are no Aboriginal areas, no historic sites, no state recreation areas and no regional parks in the bioregion. No voluntary conservation agreements have been entered into with landholders, but there are 8 wildlife refuges, which are held on properties occupying about 43,258 ha or 0.66% of the bioregion.

No property agreements (NVC Act 1997) have been entered into with landholders in the bioregion.

The bioregion has no land managed under the Forestry Act 1916.

Photo: Murray Ellis

10. Subregions of the Mulga Lands Bioregion

(Morgan and Terrey 1992)

Subregion	Geology	Characteristic landforms	Typical soils	Vegetation
Nebine Plains	Cretaceous sandstones and claystones partly silicified. Quaternary aeolian sands and alluvial clays.	Low ridges partly overlain by dunes or sandplains. Channels and clay plains.	Red earths, brown loams on bedrock, red earths and red texture contrast soils on sandplains and cracking grey clays on fine alluvial sediment.	Mulga, western bloodwood, poplar box with mallee, white cypress pine, coolabah apple, silver-leaf ironbark and spinifex on ridges. Ironwood, mulga, white cypress pine, and wilga with gidgee and brigalow on sandplains. Black box, coolabah, and eurah with lignum and canegrass on clays.
Warrego River Plains	Quaternary alluvium and Aeolian sand.	Extensive alluvial plains with low sandy rises of the Warrego fan.	Red earths and red siliceous sands with widespread cracking grey and brown clays.	Coolabah, eurah, river cooba, lignum and canegrass on low areas. Black box fringing rises. Gidgee, brigalow ironwood, rosewood, wilga, white cypress pine, budda, poplar box, belah and dense shrubs on red soil rises.
Warrego Sands	Quaternary aeolian and alluvial sediments with some groundwater influence.	Sandplains, channels, floodplains and minor basins on the lower Warrego fan.	Red earths, reddish texture contrast soils and grey clays.	Poplar box with belah, ironwood, gidgee, white cypress pine, beefwood, and red box. Mulga on stony areas. Dense woody shrubs. Coolabah, black box, river cooba with lignum, canegrass, saltbush and copperburr on clays, some gidgee, leopardwood and wilga on higher margins.
Ursino Sandplain	Quaternary aeolian sands and alluvial sediments surrounding small areas of Cretaceous sandstone and Tertiary silcretes on tablelands.	Undulating sandplain with small areas of low, parallel dunes. Low tablelands and stony rises drained by local streams with small clay pans and depressions.	Loamy, calcareous red earths on sandplains, brown stony loams on tablelands and sandy red earths with minor grey clays on fine alluvial sediments.	Dense groves of mulga with ironwood, and some poplar box. Woody shrubs widespread. Canegrass and some black box on pans. Thinner mulga and western bloodwood on rises.
Paroo Sand Sheets	Quaternary aeolian sands and alluvial sediments surrounding small areas of Tertiary silcretes stony plain.	Undulating stony plain and sandplain with low linear dunes. Channels, floodplains and clay pans of Cuttaburra Creek.	Stony red loams and earths on the rises. Sandy red earths and grey clays on sandplains and fine alluvial sediments.	Open mulga, leopardwood and shrubs on rises. Iron wood, mulga, white cypress pine, rosewood, poplar box, and belah with shrubs on sandplains. Ironwood, mulga, poplar box with gidgee, belah, yapunyah, coolabah and black box on alluvial sediments.
Paroo Overflow	Quaternary alluvium and Aeolian sands on the lower alluvial fan of the Paroo River. Small areas of Palaeozoic bedrock.	Isolated rocky hills emerging from extensive source bordering dunefields. Clay plains and channels of the overflow system.	Pale red clayey sands, grey clays on fine alluvium.	Open mulga, rosewood and belah on hills and dunes. Canegrass, lignum, old man saltbush on clay pans with yapunyah and black box on margins.

10. Subregions of the Mulga Lands Bioregion *CONTINUED*

Subregion	Geology	Characteristic landforms	Typical soils	Vegetation
Paroo-Darling Sands	Devonian quartz sandstone emergent hills surrounded by Quaternary Aeolian sands and alluvial clays of the lower Paroo.	Rounded ridges with rocky hillslopes, flanked by dunes and sandplain. Channels, floodplain and saline claypans with lunettes in the alluvial system.	Limited areas of stony loams on bedrock. Deep red earths and brown texture contrast soils on dunes and plains, grey and brown saline cracking clays on fine alluvium.	Mulga, belah, rosewood with sandhill wattle, beefwood, leopardwood and bluebush. Poplar box in depressions in red country. Canegrass, lignum and old man saltbush on clays with yapunyah and black box on channels and lake margins. Sparse mulga on lunettes.
Kerribree Basin	Quaternary alluvial and aeolian sands derived from Warrego overflow.	Low linear dunes, undulating plains with drainage sinks, and saline clay pans and swamps associated with channel systems.	Red siliceous sands, sandy red earths, brown loamy soils and grey and brown cracking clays.	Ironwood, belah and white cypress pone on dunes. Poplar box, mulga, belah gidgee and leopardwood on plains. Sparse coolabah, gidgee and black box with canegrass and some lignum on alluvial systems.
West Warrego	Cretaceous sandstones and claystones with Tertiary silcrete. Margins of Quaternary aeolian sands.	Low hills and dissected tablelands.	Shallow stony loams and sandy red earths.	Mulga and poplar box with occasional red box, western bloodwood, belah, rosewood, white cypress pine and ironwood.
White Cliffs Plateau	Cretaceous sandstones and claystones with marginal Quaternary colluvium and limited alluvium.	Stony plateau, dissected tablelands with escarpments and stony slopes. Contour banding evident on flatter slopes. Gravelly alluvial plains and floodouts of local creeks.	Red brown loams and clays, some texture contrast soils. Gravelly loams and limited brown clays in alluvium.	Mitchell grass on plateaus. Bladder saltbush and bluebush with small patches of belah and gidgee. Sparse mulga with saltbush and bluebush on stony plains and slopes. River redgum and yapunyah on larger creek lines. Mulga, poplar box on alluvial plains with coolabah, and river cooba on channels.

11. References

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Websites

http://www.walkabout.com.au/fairfax/locations/NSWBarringun.shtml

http://www.walkabout.com.au/fairfax/locations/NSWWhiteCliffs.shtml

Mulga Lands Biogeographic Region (IBRA) - Location

Queensland

Tibooburra
Mount Sturt
Milparinka
Wanaaring
Yantabulla
Enngonia
Weilmoringle
Brewarrina
Bourke
Mount Oxley
Louth
Mount Gunderbooka
Byrock
White Cliffs
Fowlers Gap
Mootwingee
Wilcannia
Mount Grenfell
Mount Drysdale
Girilambone
Cobar
Hermidale
Nyngan
Emmdale
Nevertire
Nymagee
Tottenham
Broken Hill
Menindee
Ivanhoe
Trundle
Mossgiel
Manilla
Hillston
Booligal

0 25 50 75 Kilometres

PROJECTION : AMG z55

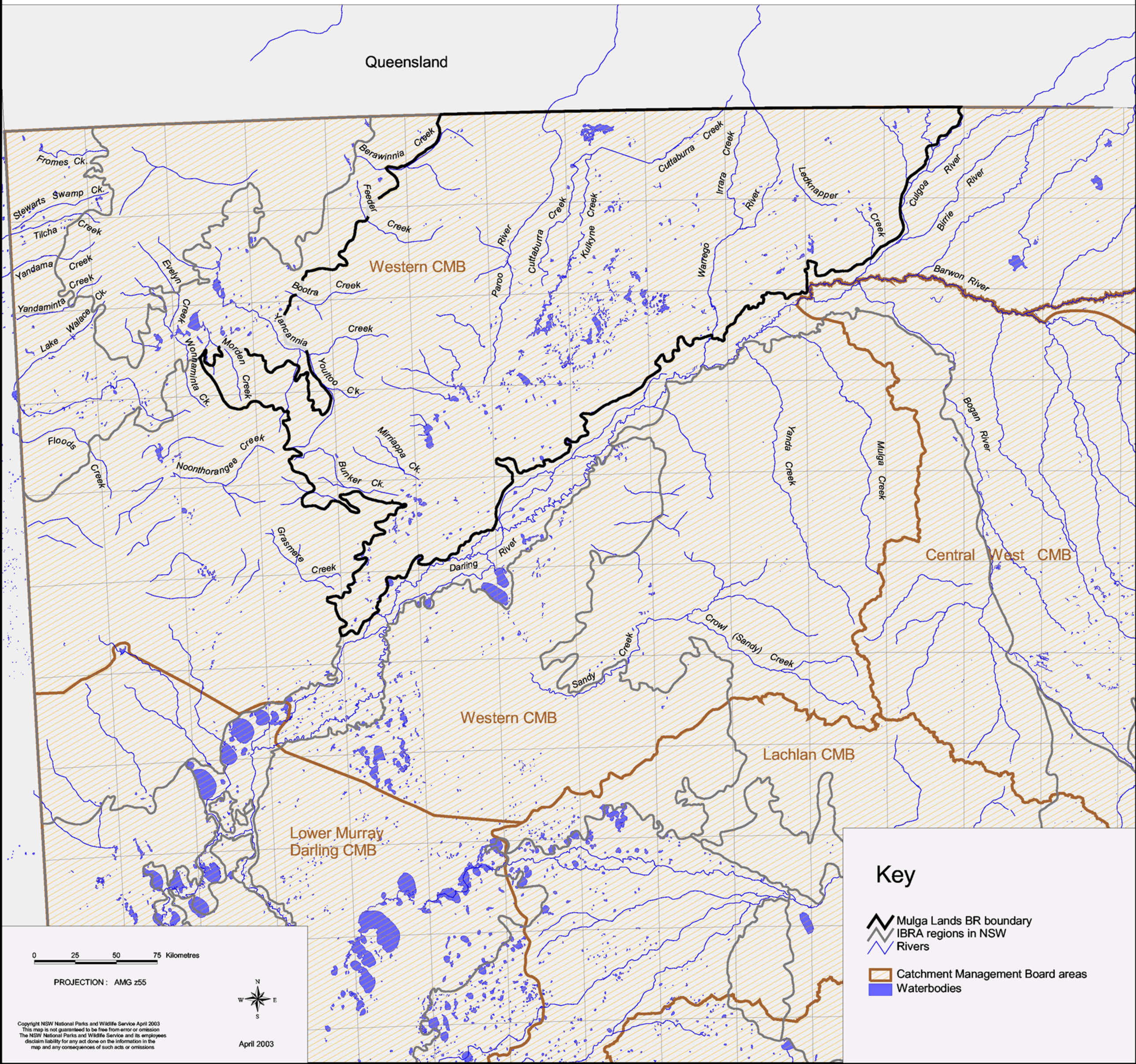
N W E S

April 2003

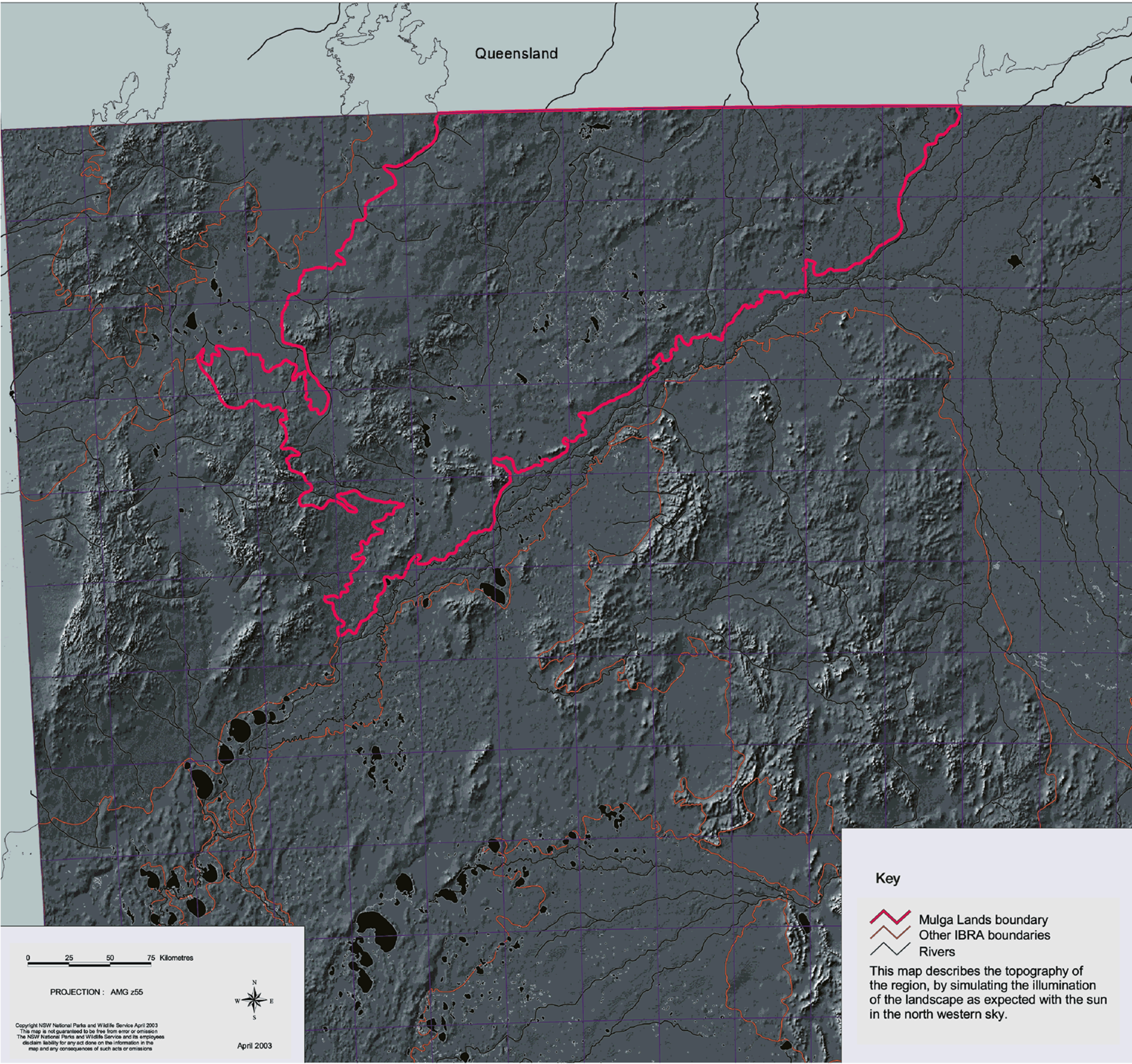
Key

- Towns
- Roads
- Rivers
- Waterbodies
- Mulga Lands
- IBRA regions in NSW
- IBRA regions interstate

Mulga Lands Biogeographic Region (IBRA) - Rivers



Mulga Lands Biogeographic Region (IBRA) - Topography



0 25 50 75 Kilometres

PROJECTION : AMG z55

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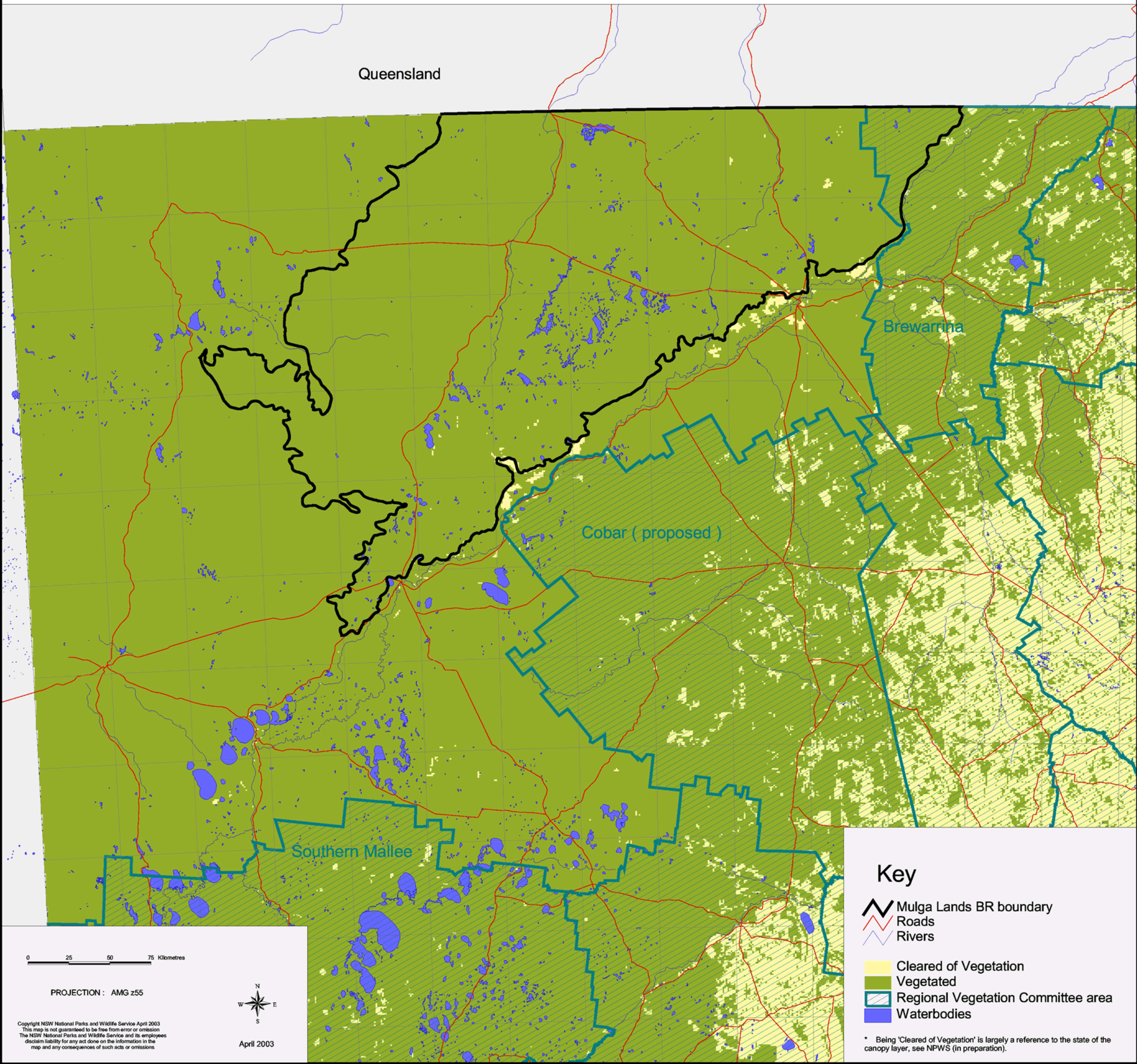
April 2003

Key

Mulga Lands boundary
Other IBRA boundaries
Rivers

This map describes the topography of the region, by simulating the illumination of the landscape as expected with the sun in the north western sky.

Mulga Lands Biogeographic Region (IBRA) - Vegetation



0 25 50 75 Kilometres

PROJECTION : AMG z55

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April 2003

Key

- Mulga Lands BR boundary
- Roads
- Rivers

- Cleared of Vegetation
- Vegetated
- Regional Vegetation Committee area
- Waterbodies

* Being 'Cleared of Vegetation' is largely a reference to the state of the canopy layer, see NPWS (in preparation).

Mulga Lands Biogeographic Region (IBRA) - Tenure/Reserves

Queensland

Key

- Mulga Lands BR boundary
- IBRA regions in NSW
- Roads
- Rivers
- Waterbodies

Wilderness (declared)
- on NPWS Estate
- on other tenure

NPWS Estate
- Aboriginal Area
- Crown Reserve
- Historic Site
- National Park/ Nature Reserve
- Regional Park
- State Recreational Area

Other tenure
- Marine Park (MPA)
- Voluntary Conservation Agreement
- Flora Reserve (SFNSW)
- State Forest (SFNSW)

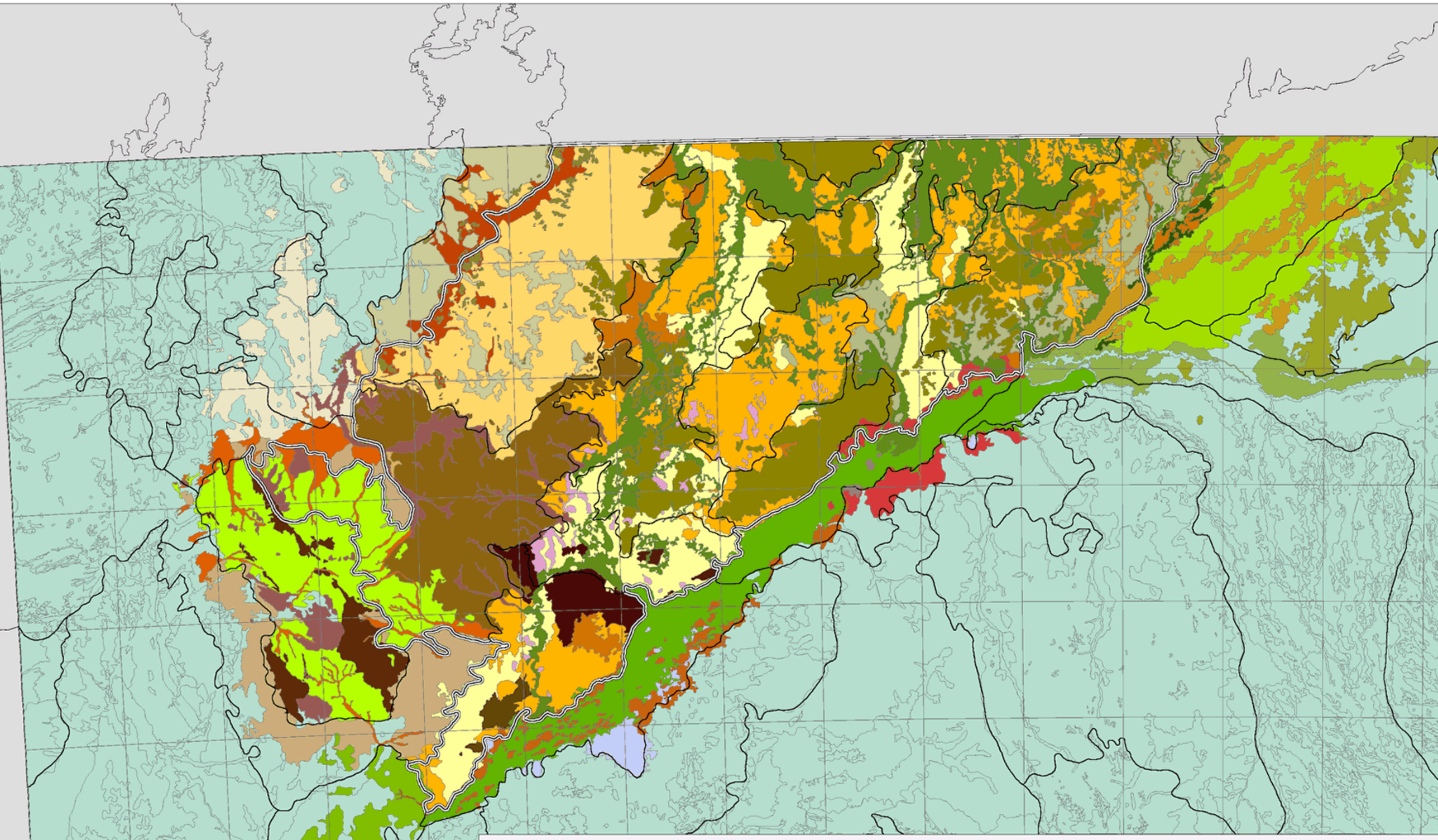
0 25 50 75 Kilometres

PROJECTION : AMG z54

N W E S

April 2003

Mulga Lands Biogeographic Region (IBRA) - Subregions and Landscapes (Mitchell, in preparation)



Key

Subregion boundaries (IBRA)

Mulga Lands (IBRA)

Landscapes of the Mulga Lands

- Barwon Channels and Floodplains
- Bulloo Linear Dunes
- Culgoa Channels and Floodouts
- Culgoa-Narran Alluvial Plains
- Culgoa-Narran Channels and Floodplains
- Mid Darling Alluvial Plains
- Mid Darling Channels and Floodplains
- Mid Darling Lakes and Swamps
- Mid Darling Plains
- Mid Darling Tablelands
- Mootwingee-Wonnaminta Alluvial Plains
- Mootwingee-Wonnaminta Downs
- Mootwingee-Wonnaminta Ranges
- Mootwingee-Wonnaminta Sandplains
- Mootwingee-Wonnaminta Tablelands
- Paroo-Warrego Alluvial Plains
- Paroo-Warrego Channels and Floodouts
- Paroo-Warrego Isolated Hills
- Paroo-Warrego Linear Dunes
- Paroo-Warrego Mt Murchison
- Paroo-Warrego Mt Pleasant
- Paroo-Warrego Plains
- Paroo-Warrego Salt Lakes
- Paroo-Warrego Sandplains
- Paroo-Warrego Tablelands and Downs
- Scopes Alluvial Plains
- Scopes Downs
- Upper Darling Tablelands and Downs
- Ursino Alluvial Plains
- Ursino Linear Dunes
- Ursino Sandplains
- Ursino Tablelands and Downs
- White Cliffs Alluvial Plains
- White Cliffs Sandplains
- White Cliffs Tablelands and Downs

Other Landscapes

IBRA regions interstate

0 25 50 75 Kilometres

PROJECTION : AMG z55

April 2003