CHAPTER 7

The Murray Darling Depression Bioregion

1. Location

The Murray Darling Depression Bioregion lies in the southwest corner of NSW and extends into Vic and SA. The total area of the bioregion is 19,717,651 ha with 40.71% (8,026,167 ha) of this area in NSW and covering 10.03% of the state.

The NSW portion of the bioregion is bounded in the north by the Broken Hill Complex Bioregion, with the Cobar Peneplain to the northeast and the Riverina Bioregion to the east. The Murray Darling Depression Bioregion also borders the Darling Riverine Plains to the northwest and contains outlying remnants of the Darling River and tributaries as they meet the Murray River at the Victorian border.

The bioregion lies entirely in the Western Division of NSW and contains few town centres, with Ivanhoe, just near the tip of the Riverina Bioregion, being the major settlement aside from Manilla, Emmdale and other pastoral stations in the bioregion.

The bioregion includes the Murray, Murrumbidgee, Lachlan, Darling, Barwon, Yanda River and Peacock Creek catchments.

2. Climate

The Murray Darling Depression Bioregion is dominated by a hot semi-arid climate in the northern section of the bioregion including the northeastern arms, and a warm semi-arid climate in the southern half of the bioregion and eastern outliers. Small patches in the west of the bioregion fall in the NSW arid zone (Stern *et al.* 2000).

3. Topography

The Murray Darling Depression Bioregion lies in the Murray Basin on Tertiary and Quaternary sediments deposited from a shallow sea, lakes and rivers. The bioregion extends into Vic and SA. The landscape is characterised by dunefields, sandplains and undulating plains of brown calcareous soils. There is very little structured drainage but numerous lakes, swamps and depressions are present, some of which are driven by saline groundwater.

Mean Annual Temperature	Minimum Average Monthly Temperature	Maximum Average Monthly Temperature	Mean Annual Rainfall	Minimum Average Monthly Rainfall	Maximum Average Monthly Rainfall
16 – 19°C	2.9 – 4.9°C	32.4 – 35°C	210 – 408mm	12 – 29mm	22 – 40mm

4. Geology and geomorphology

The Murray Basin is a shallow crustal depression filled with marine and terrestrial sediments to a maximum depth of 600m over the last 50-60 million years. Shallow seas have moved back and forth across the plains several times, leaving traces of parallel beach ridges and limestone sediments under the dunefields. At one stage the coast reached as far inland as Balranald.

Sandy surface sediments have been extensively reworked into dunes and sandplains that have blown onto the Cobar Peneplain. Some dunes have consistent east-west linear patterns, others are parabolic, suggesting differences in vegetation cover, sand supply or age. The Darling River and streams in the Riverina have cut through the sands and constructed numerous overflow lakes such as the Sayers Lake system and the abandoned Pleistocene channels and basins of the Willandra Lakes complex. Saline groundwaters have formed salt basins in many places where the sandplain or dune topography intersects the water table. All lakes and swamps have well-formed lunettes on their eastern margins that record evidence of climate change and human occupation. A few bedrock ridges rise above the sandplains as isolated ranges.

5. Geodiversity

The Murray Darling Depression Bioregion has many important wetlands. Other significant geodiversity features include:

- flooding frequency varies and water quality and lake or swamp environments are very diverse;
- abandoned systems, such as the Willandra Lakes, preserve evidence of past climates and environments along with abundant archaeology; there are many equivalent lunette sites that have not yet been examined;
- heavy sand mineral resources and large deposits of gypsum are known but not exploited.

6. Soils

Soils and vegetation differ according to the landform. On the dunefields red, brown and yellow calcareous sands occur with more clayey materials in the swales. On sandplains the soil tends to be heavier with brown gradational or texture contrast profiles, and mallee is found only on sandy rises.

Lakes and depressions all have clay floors. The more saline lakes have grey cracking clays and carry chenopods. Salt lake floors carry little vegetation. Lunettes comprise varying soils from clean sands, brown clayey sands, mixed sand to clay.

7. Biodiversity

7.1 Plant communities

Typical sandplain species include rosewood (*Heterodendrum oleifolium*), white cypress pine (*Callitris glaucophylla*), narrow-leaf hopbush (*Dodonea viscosa*), punty bush (*Cassia eremophila*), belah, copperburrs (*Sclerolaena* sp.), black bluebush (*Maireana pyramidata*) and variable spear grass. The dunes support diverse mallee (*Eucalyptus* sp.) communities with mixed shrubs and porcupine grass (*Triodia pungens*). Belah (*Casuarina pauper*), rosewood and variable spear grass (*Stipa variabilis*) occupy the swales.

Lakes and depressions all have clay floors, and vegetation relates to the presence or absence of salt and gypsum. Infrequently flooded freshwater lakes carry cane grass (*Eragrostis australasica*), lignum (*Muehlenbeckia cunninghamii*) and nitre goosefoot (*Chenopodium nitrariaceum*), with clumps of black box (*Eucalyptus largiflorens*) on the margins.

The vegetation on lunettes varies. Clean sands often have white cypress pine, while brown clayey sands support mallee with porcupine grass. Mixed sand and clay lunettes carry rosewood, belah, western pittosporum (*Pittosporum phylliraeoides*), narrow-leaf hopbush and bluebush.

The largest rocky hills, Maccullochs Range, carry mulga (*Acacia aneura*) dominated vegetation very similar to much of the Cobar Peneplain. Smaller hills have more of a mixture of local sandplain species and distant rocky slope species.

7.2 Significant flora

Stipa nullanulla, now *Austrostipa nullanulla*, has been identified as regionally endemic to the Murray Darling Depression Bioregion and is listed as endangered in the TSC Act 1995 (Bowen and Pressey 1993, cited in Morton *et al.* 1995).

Significant flora species in the bioregion include *Austrostipa metatoris*, Mossgiel daisy (*Brachycome papillosa*), *Atriplex infrequens*, and *Swainsona pyrophila*, all listed as vulnerable in NSW. The bioregion also supports irongrass (*Lomandra patens*), found mainly within the Cobar Peneplain Bioregion, desert carpet-weed (*Glinus orygioides*), found mainly in the far northwest, bluebush daisy (*Cratystylis conocephala*), which is very rare in NSW, *Olearia calcarea*, found only near White Cliffs, sand cress (*Pachymitus cardaminoides*), *Indigofera helmsii* and Menindee nightshade (*Solanum karsensis*) (Bowen and Pressey 1993, cited in Morton *et al.* 1995, Cunningham *et al.* 1981).

Other significant species are the salt pipewort (*Eriocaulon australasicum*) and *Codonocarpus pyramidalis* (Fox 1991, cited in Morton *et al.* 1995) as well as *Atriplex papillata* near salt lakes and the yellow Darling pea (*Swainsona laxa*). These are considered to be relict populations and rare in NSW, although *S. laxa* also occurs near Menindee in the Darling Riverine Plains Bioregion (Cunningham *et al.* 1981).

Photo: NPWS

Photo: G. Bridle

7.3 Significant fauna

The malleefowl (*Leipoa ocellata*), which is listed as endangered in the TSC Act, is found throughout western NSW, including in the Murray Darling Depression Bioregion (Priddel 1990, Garnett 1992, cited in Morton *et al*. 1995). The plains-wanderer (*Pedionomus torquatus*), listed as vulnerable in the TSC Act, is found in this bioregion as well as in the Riverina Bioregion (Baker-Gabb *et al*. 1990, Garnett 1992).

Black-eared miners (*Manorina melanotis*) are listed as endangered in both state and Commonwealth legislation, as they are at great risk of extinction and, within NSW, are now found only in the Murray Darling Depression Bioregion (Garnett 1992, cited in Morton *et al*. 1995). The preferred habitat of the black-eared miner is dense, undisturbed old-growth mallee, which has undergone widespread clearing in NSW since the arrival of European settlers. This has resulted in the species occupying more open habitat, which is the preference of the yellow-throated miner (*Manorina flavigula*). This in turn has promoted cross-breeding between the two species, reducing the occurrence of pure forms of the black-eared miner (NSW NPWS 1999a).

The endangered eastern subspecies of the regent parrot (*Polytelis anthopeplus ssp. anthopeplus*) is generally confined to areas where mallee occurs adjacent to riverine woodlands in both the Murray Darling Depression and Riverina bioregions (NSW NPWS 1999b). With an estimated NSW population of about 500 individuals, the species is considered to be at risk due to loss of potential nesting trees with the clearing of river red gum (*Eucalyptus camaldulensis*) and mallee communities (NSW NPWS 1999b, Morton *et al*. 1995). Bush thick-knees (*Burhinus grallarius*) are also considered to be at risk in the bioregion (Morton *et al*. 1995).

Although known to occur across most of NSW, the freckled duck (*Stictonetta naevosa*) is recorded as breeding in the wetlands of the Great Cumbung Swamp and Lowbidgee Floodplain in the Murray Darling Depression Bioregion and other nearby bioregions (Morton *et al*. 1995). Many waterbirds in the bioregion and species such as the azure kingfisher (*Alcedo azurea*) are reported to be of conservation concern because of changes in their habitats (Morton *et al*. 1995).

Birds of the chenopod shrublands in the bioregion seem to be at risk of decline (Reid and Fleming 1992, cited in Morton *et al*. 1995).

Most of the extant eastern mallee (*Eucalyptus* sp.) and its former range (now mostly wheatfields) lies in the Murray Darling Depression Bioregion. There are several large and many small mallee remnants in the bioregion. Three bird species are found mostly or entirely in the long unburnt mallee in this bioregion; the red-lored whistler (*Pachycephala rufogularis*), the vulnerable mallee emu-wren (*Stipiturus mallee*) and the endangered black-eared miner (*Manorina melanotis*).

Major populations of the endangered eastern subspecies of regent parrot (*Polytelis anthopeplus*), which moves between mallee and river red gum vegetation, are found in the bioregion. The western whipbird (*Psophodes nigrogularis*), the vulnerable malleefowl (*Leipoa ocellata*) and the endangered plains wanderer (*Pedionomus torquatus*), the range of which is centred on the Riverina, can also be found. More than 4% of birds observed in the bioregion are exotic species, including the Eurasian skylark (*Alauda arvensis*), European goldfinch (*Carduelis carduelis*) and the common starling (*Sturnus vulgaris*), all of which have adapted well to the agricultural landscapes of the bioregion.

Numbers of the musk lorikeet (*Glossopsitta concinna*) have increased in the bioregion, as have temperate forest and temperate woodland birds. Conversely, grassland, ground-nesting birds and ground-feeding insectivorous species have decreased in numbers. The general trend in this bioregion is a gradual decline in numbers in isolated habitat fragments, and extinctions that occur in major mallee blocks during rare, large-scale fires. The future of many bird populations in the bioregion may be dependent on appropriate fire management as well as the restoration, expansion and linking of habitat fragments.

The skink (*Ctenotus brachyonyx*) inhabits spinifex grasslands in the Murray Darling Depression and Simpson-Strzelecki Dunefields bioregions in NSW and also occurs in Qld. Populations of the elapid snake (*Notechis scutatus*) are declining in riverine habitats along the Murray-Darling system, while the python (*Morelia spilota variegata*) also appears to be declining in several vegetation types (Sadlier and Pressey 1994, cited in Morton *et al*. 1995). The distribution of the southern bell frog (*Litoria raniformis*) seems to be retracting from its northwestern limit (Sadlier and Pressey 1994, cited in Morton *et al*. 1995).

7.4 Significant wetlands

The Darling Anabranch Lakes provide large areas of habitat for waterbirds when inundated (ANCA 1996). The lakes are considered to be in a fair condition, although they are declining due to changed hydrology caused by salinity, water abstraction and regulation, weir construction upstream, construction of levee banks and lake bed cropping.

The Lowbidgee Floodplain has also been described as degraded although it provides an important refuge when other wetlands are dry, and it supports breeding colonies of Australian white ibis (*Threskiornis molucca*), glossy ibis (*Plegadis facinellus*), straw necked ibis (*Threskiornis spinicollis*), royal spoonbill (*Platalea regia*), great egret (*Casmerdius albus*) and intermediate egret (*Egretta intermedia*) (ANCA 1996).

Conoble Lake is a significant wetland of the bioregion, and is predicted to be able to support 11,000 waterbirds. There have been many sightings of the vulnerable Major Mitchell's cockatoo (*Cacatua leadbeateri*) near Conoble Lake, while two endangered plants, *Kippistia suaedifolia* and *Dysphania plantaginella*, have also been recorded.

Lake Victoria supports the endangered southern bell frog (*Litoria raniformis*), the vulnerable Major Mitchells Cockatoo and the endangered regent parrot (Australian Terrestrial Biodiversity Assessment 2002), as well as providing habitat for 20,000 waterbirds (Kingsford *et al.* 1997).

The Willandra Creek and Lakes is one of the most significant wetland areas in the bioregion, supporting a variety of threatened species even though it has been described as being in a degraded condition and declining (Australian Terrestrial Biodiversity Assessment 2002). Many sightings have been recorded here including the blue-billed duck (*Oxyura australis*), freckled duck (*Stictonetta naevosa*), black-breasted buzzard (*Hamirostra melanosternon*), Australasian bittern (*Botaurus poiciloptilus*), Major Mitchells cockatoo, painted honeyeater (*Grantiella picta*), barking owl (*Ninox connivens*), little pied bat (*Chalinolobus picatus*), inland forest bat (*Vespadelus baverstocki*), stripe-faced dunnart (*Sminthopsis macroura*), long-haired rat (*Rattus villosissimus*), slender darling pea (*Swainsona murrayana*) and mossgiel daisy (*Brachyscome papillosa*). Endangered species found at Willandra Creek include the southern bell frog (*Litoria raniformis*), Australian bustard (*Ardeotis australis*) and plains wanderer (*Pedionomus torquatus*) (Australian Terrestrial Biodiversity Assessment 2002).

Two other wetlands, which provide significant habitat for waterbirds but are currently described as being in a degraded condition are Gunnaramby Swamp and Moornanya Lake.

Gol Gol Lake (Benanee) lies partly in the Murray Darling Depression Bioregion but occurs mostly within the Riverina. Nettlegoe Lake and Poopelloe Lake fall partly in the bioregion but mainly in the Darling Riverine Plains Bioregion.

Threats to wetlands in the Murray Darling Depression Bioregion include feral animals, exotic weeds, salinity, water abstraction and regulation, and regulation producing perennial flooding (National Biodiversity Audit).

8. Regional history

8.1 Aboriginal occupation

For information on the Aboriginal occupation of the Murray Darling Depression Bioregion, refer to Chapter 1 under the heading "Regional history".

8.2 European occupation

Ivanhoe, the main town of the Murray Darling Depression Bioregion, was established after the first land was sold at the town in 1869. In 1870, Cobb and Co Coaches opened routes through Ivanhoe, and the town continued to develop, first with a general store and then with a post office. Police were present in Ivanhoe from 1879 to protect the public from the local Hatfield Bushrangers and by 1885 the mounted police had arrived. This same year the Ivanhoe Jockey Club held its first race meeting. The first bank opened in 1926 and the railway reached Ivanhoe in 1927, an important addition to the town as water could now be carried from nearby lakes from where it had previously been carted by dray. The pubs of Ivanhoe were an important part of the town, bringing visitors to stop in the town on their way. As in other bush towns, the development of bush pubs occurred along the route of the mail coaches, and their need for watering points – both for themselves and their horses.

The main land use around Ivanhoe in the 1870s was sheep and stations such as Kilfera, which employed close to 200 people at shearing time when 8,000 sheep per day were shorn. The station carried up to 200,000 merino sheep on its 832,000 acres.

9. Bioregional-scale conservation

Conservation management in the Murray Darling Depression Bioregion is achieved through a range of conservation mechanisms that together occupy about 421,082 ha or 5.25% of the bioregion.

Mechanisms provided for under the NPW Act 1974, and specifically national parks and nature reserves, are responsible for the majority of land conserved. Mallee Cliffs and Mungo National Parks (NPW Act 1974) both lie wholly within the bioregion. Eight nature reserves occur either partially or wholly within the bioregion and together with the national parks occupy 279,343 ha or 3.48% of the bioregion. None of the reserves in the bioregion is also managed as wilderness areas under the Wilderness Act 1987, although the Willandra Lakes Region is included on the globally recognised World Heritage list as one of three world heritage areas in NSW. Occupying approximately 240,000 ha or almost 3% of the bioregion, the Willandra Lakes region is protected by international convention as well as by the Commonwealth EPBC Act 1999, which automatically protects all Australian properties that are on the World Heritage List. About 10% of the Willandra Lakes Region World Heritage area is in Mungo National Park, which covers about two-thirds of Lake Mungo. Despite its name, the world heritage area is not within Willandra National Park in the Riverina Bioregion.

There are no Aboriginal areas, no historic sites, no state recreation areas and no regional parks in the bioregion. No voluntary conservation agreements or property agreements have been entered into with landholders, although 9 wildlife refuges are held by landholders and occupy about 1.76% of the bioregion.

A small proportion (0.07%) of the bioregion is managed as State forests for a range of forestry practices under the Forestry Act 1916, including timber production and forest management. There are 10 State Forests managed primarily for forestry activities and one flora reserve (Peacock Creek Flora Reserve) which occupies 0.001% of the bioregion and spans the border with the Riverina Bioregion.

Photo: NPWS

10. Subregions of the Murray-Darling Depression Bioregion

(Morgan and Terrey 1992)

Subregion	Geology	Characteristic landforms	Typical soils	Vegetation
South Olary Plain	Quaternary aeolian sands and lake sediments.	Dunefields, sandplains, dry lakes and groundwater basins.	Deep siliceous and calcareous red to yellow sands, sandy earths, brown texture contrast soils on dunes and sandplains. Saline, gypseous and calcareous clays on lake beds, mixed sands and pelleted clays in lunettes.	Diverse mallee on sands with; pointed mallee, congoo mallee, red mallee, lerp mallee, slender-leaf mallee, yorrell, white cypress pine, mallee cypress pine, belah, rosewood, with porcupine grass and diverse shrubs. Belah, rosewood, black bluebush, pearl bluebush, old man saltbush, on sandplains and heavier soils. Black box fringing depressions, halophytes on salinas, and chenopod shrublands on lunettes, sometimes with white cypress pine.
Darling Depression	Quaternary aeolian sands and lake sediments. Isolated Devonian quartz sandstone outcrops.	Extensive sandplains. Dunefields piled against Cobar Peneplain ranges. freshwater overflow lakes fed by rare floods in the Darling River. Stony ridges and ranges.	Deep siliceous and calcareous red to yellow sands, sandy earths, brown texture contrast soils on dunes and sandplains. Brown and grey and calcareous clays on lakes. Pale yellow sands on lunettes. Stony loams on hills.	Belah, rosewood, nelia, mulga wilga and woody shrubs on western sandplains. Pointed mallee, congoo mallee, yorrell with diverse shrubs and porcupine grass, occasional kurrajong and mallee cypress pine on eastern sandplains. Mulga, white cypress pine, red box, mallee, belah and poplar box on central dunes. Lignum, canegrass, black bluebush and black box or poplar box on margins and beds of swamps and lakes. Mulga with red box and shrubs on rocky hills.

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Website

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