CHAPTER 6

The Darling Riverine Plains Bioregion

1. Location

The Darling Riverine Plains Bioregion occupies a total area of 10,651,748 ha in northern NSW and Qld. The majority of the bioregion, 88.19% (9,394,263 ha), is in NSW and it occupies 11.74% of the state. The bioregion is surrounded by 6 others in both NSW and Qld, including the Brigalow Belt South Bioregion to the east, the Mulga Lands Bioregion to the northwest, and the NSW Southwestern Slopes, Cobar Peneplain, Murray Darling Depression and Broken Hill Complex bioregions in the south and southwest. The bioregion forms a bulky shape that extends into Qld, with a long, narrow riverine corridor that runs southwest along the Darling River. The main body of the bioregion extends from east of Bogabilla to Weilmoringle on the Qld border, south almost to Peak Hill and west to Nyngan and Bourke. The bioregion is traversed by the Western Division boundary.

In central north NSW, the Darling Riverine Plains Bioregion includes the lower reaches and alluvial fans of the Bogan, Macquarie, Castlereagh, Namoi, Barwon, Culgoa, Bokhara, Narran, Gwydir and Macintyre Rivers (Morgan and Terrey 1992). The Darling River corridor extends from Bourke almost to the southern edge of the Menindee Lakes, and south through the Murray Darling Depression Bioregion to the Victorian border where the Darling joins the Murray River.

The bioregion falls entirely in the Murray-Darling Basin and includes the Macintyre-Dumaresq, Culgoa, Narran, Warrego, Paroo, Moonie, Barwon, Gwydir, Namoi, Macquarie, Yanda, Castlereagh and Darling catchments.

2. Climate

The Darling Riverine Plains Bioregion lies in the semi-arid climatic zone which is hot and persistently dry (Stern *et al.* 2000). This semi-arid area occupies most of the western arm of the bioregion, accompanied by very small patches of both arid and warm semi-arid climate. The bioregion also contains minor patches of subtropical climate in the east with sub-humid areas in the southeast.

On average, the eastern portion of the bioregion receives higher and more reliable rainfall, with flooding occurring mainly in summer, while irregular cyclonic depressions can occur to the north of the bioregion (Morgan and Terrey 1992).

Mean Annual Temperature	Minimum Average Monthly Temperature	Maximum Average Monthly Temperature	Mean Annual Rainfall	Minimum Average Monthly Rainfall	Maximum Average Monthly Rainfall
17 – 20°C	2.4 – 4.9°C	32.5 – 35.4°C	213 – 607mm	11 – 37mm	22 – 86mm

3. Topography

The Darling Riverine Plains Bioregion occupies most of the upper catchments of the Darling and Barwon Rivers in northern NSW and southern Qld and includes the channels and floodplains of the lower reaches of these catchments. The upper catchment landscape is a series of overlapping, low gradient alluvial fans. The lower tract of the river is a narrow floodplain confined between bedrock landscapes, or by extensive sandplains and dunefields. Discharge from past and present streams control patterns of sediment deposition, soils, landscapes and vegetation. Much of the geology and geomorphology of the region is similar to that of the Riverina Bioregion.

4. Geology and geomorphology

The main streams contributing water and sediment to the alluvial fans of the plains are the Bogan, Macquarie, Castlereagh, Namoi, Gwydir, Macintyre, Narran, Bokhara and Culgoa rivers. Sheets of alluvium up to 100m thick have been deposited on older sedimentary rocks and contain marine sediments of an inland sea of Cretaceous age. Almost all bedrock features have been buried in this sedimentary basin, with only a few high points of basement rocks such as Mt Foster rising above the plain, and more extensive areas of the Cretaceous sandstones forming low rises around Lightning Ridge and in the Collarenebri interfluve.

Tributary streams below Bourke are ephemeral and contribute little water or sediment to the main stream. Downstream of Wilcannia the Darling breaks into several channels (anabranches) that flow on roughly parallel courses for up to 200 km before joining the Murray.

The Darling River is subject to extreme flow variation. River discharge declines downstream as water is lost through seepage and evaporation. The upper margins of the plain, especially in sandy soils, are part of the recharge area of the Great Australian Basin. The river may have zero discharge for several consecutive months, alternating with regional floods that may last nearly 12 months.

Overall the landscape is flat with river channel and floodplain features dominant. Not all of the region has been effectively mapped but in those areas where detail is available, such as Nyngan-Walgett, the complexities of geomorphology and surface sediment distribution all reflect past climates and different river discharge regimes.

Each main stream carries different sediments depending on catchment geology and rainfall. The Bogan, for example, rarely flows strongly and only carries suspended clay past Nyngan. In contrast, the Castlereagh floods more often and carries a sand bed load because it drains extensive areas of Jurassic sandstones with higher rainfall. The Namoi deposits clays derived from volcanic rock so the floodplains below Narrabri are some of the most productive soils in the state.

The Macquarie is the largest tributary and has the most complex alluvial fan. This river drains a large area of the South Eastern Highlands Bioregion, and because its headwaters are in the high rainfall zones of the Great Dividing Range to the east it has a high discharge, is subject to large floods, and is sensitive to climate change. Any long-term change in average discharge causes the river to change form and shifts the location of sand or clay deposition on the alluvial fans.

Between Bourke and Wilcannia the confined Darling River channel has a simpler landscape of channel, floodplains, billabongs and slightly higher red soil terraces. Below Wilcannia the stream breaks into anabranches and is often attached to large circular or ovoid overflow lakes, which can be up to 15 km in diameter but are only a few metres deep.

Three types of wetland are found in the bioregion: delta-like swamplands, terminal drainage basins and lakes, and overflow lakes filled by floodwaters that drain back to the river as the flood recedes. The Macquarie Marshes are the most important and extensive example of a throughflow delta-like swamp in the bioregion. Narran Lakes are an example of terminal basins at the end of the Narran River, a distributary channel of the Balonne. The Menindee Lakes complex are the overflow lakes.

All lake beds consist of grey cracking clays and the eastern margins of most lakes have well-formed sandy beaches and crescent-shaped dunes or lunettes up to 25 m high which are composed of fine cemented quartz sand with some layers of pelleted clay.

5. Geodiversity

Important features of this bioregion include the following:

- the wetlands of this bioregion are the most important wetland habitats in the inland regions of the state;
- the Gwydir raft below Moree is a classic example of a giant debris dam that is now causing the main stream to change course across the Gwydir fan;
- Lightning Ridge, also within the bioregion, is the only commercial black opal field in the world;
- the entire bioregion is an important example of an inland drainage system where the streams flow into an arid region; the catchment has a long geological history and contains numerous sites that have the potential to yield information about past climates, past environments and human pre-history; only a few of these have been examined and they have become important heritage sites as a consequence; examples are Cuddies Springs and the lunette of Lake Tandou.

6. Soils

Soils and vegetation directly reflect past patterns of sedimentation and today's flooding regime, with some variation in plant species across the region relating to summer or winter rainfall dominance.

Sandy soils are found in linear belts along the older stream channels, sometimes with local source dunes on their border. Texture contrast soils, often badly eroded, are found marginal to channels of all ages, and most of the plains are dominated by deposits of heavy dark-coloured clays. Many clay areas have gilgai micro-relief patterns, most crack extensively, and others are more or less permanently wet in swamplands.

The sandy soils have low nutrient levels and drain rapidly. The clay soils vary more depending on source rocks in the catchment, but all have only a limited amount of free water available to plants. Most soils contain high levels of calcium carbonate and some are saline.

7. Biodiversity

7.1 Plant communities

Modern river channels in the bioregion support river red gum (*Eucalyptus camaldulensis*) and river cooba (*Acacia stenophylla*) communities, with some areas of river paperbark (*Melaleuca trichostachya*), especially along the tributaries of the Barwon. These species grow on the channel margin in the annual flood zone. Coolabah (*Eucalyptus microtheca*) can be found on the northern rivers.

Photo: G. Robinson

Trees on the more distant flood plains differ with locality. Yellow box (*Eucalyptus melliodora*) communities are found in the upper Macquarie, poplar box (*Eucalyptus populnea*) communities occur on the Bogan, coolabah communities are found on the Culgoa and most of the more northern streams support black box (*Eucalyptus largiflorens*) vegetation. Only the hardiest trees can survive the heavy clays of the backplains. These species include myall (*Acacia pendula*), poplar box and belah (*Casuarina cristata*) on the Bogan and Macquarie, and coolabah and black box on northern streams. Many plains are treeless, supporting only shrubs and grasses such as oldman saltbush (*Atriplex nummularia*), bladder saltbush (*Atriplex vesicaria*) and Mitchell grass (*Astrebla* sp.).

Landscapes closer to the hills support western plains woodlands, which consist of grey box (*Eucalyptus microcarpa*), Blakely's red gum (*Eucalyptus blakelyi*), silver-leaf ironbark (*Eucalyptus melanophloia*), poplar box, wilga (*Geijera parviflora*), rosewood (*Heterodendrum oleifolium*), belah, kurrajong (*Brachychiton populneum*), white cypress pine (*Callitris glaucophulla*), yarran (*Acacia homalophylla*), some brigalow (*Acacia harpophylla*) and several other species of *Acacia*.

Sandy soils on levees of old channels and dunes often have stands of white cypress pine. Lake beds may be bare or covered by clumped lignum (*Muehlenbeckia cunninghamii*) with a fringe of black box. Lunettes support stands of belah, some mallee, white pine, prickly wattle (*Acacia victoriae*), black bluebush (*Maireana pyramidata*), and sandhill canegrass (*Zygochloa paradoxa*).

On the lower reaches of the Darling through the anabranch, river red gums line the banks with old man saltbush and lignum. Billabongs and floodplains are characterised by black box, canegrass (*Eragrostis australasica*) and lignum, and adjacent dunes support prickly wattle, belah, narrow-leaf hopbush (*Dodonea attenuata*) and various bluebush species.

Swamp vegetation varies with duration and depth of flooding. Marshes supplied with more permanent water support associations of common reed (*Phragmites australis*), cumbungi (*Typha* sp.), water couch (*Pseudoraphis spinescens*) and aquatic species such as water milfoil (*Myriophyllum propinquum*) and duckweed (*Lemna minor*). Less frequently flooded swamps support lignum and grasslands, especially water couch, and nardoo (*Marsilea hirsuta*) is also common.

7.2 Significant flora

Nineteen species listed in the TSC Act 1995 are known to occur within the Darling Riverine Plains Bioregion. Nine of these species are endangered and 10 are considered vulnerable (NSW NPWS 2001).

The Culgoa River floodplain supports a number of endangered species including the narrow-leaf bumble (*Capparis loranthifolia* var. *loranthifolia*) and climbing caustic (*Euphorbia sarcostemmoides*) (Kearle *et al*. 2002). Regionally rare species occurring on the floodplain include bull wiregrass (*Aristida longicollis*), wirewood (*Acacia coriacea*), bowl daisy (*Pluchea dentex*), hairy spurge (*Phyllanthus carpentarie*) and sandplain riceflower (*Pimelea penicillaris*) (Environment Australia 2001).

Four species known to occur within the Darling Riverine Plains Bioregion are now listed in the TSC Act as extinct in NSW. All of these are known from only one or two records and all are recorded in the Atlas of NSW Wildlife (NSW NPWS 2001).

Other species of conservation significance that have been recorded in the bioregion include the rare plants *Echinochloa lacunaria, Leptorhyncos waitzia, Ipomoea diamantinensis, Ptychosperma anomalum, Swainsona adenophylla, S. laxa,* and *Solanum karsensis* (Bowen and Pressey 1993, cited in Morton *et al*. 1995).

The Darling Riverine Plains Bioregion includes the following endangered ecological communities listed in the TSC Act:

- *Acacia loderi* shrublands;
- artesian Springs ecological community;
- Carbeen (*Corymbia tessellaris*) open forest community in the Darling Riverine Plains and Brigalow Belt South bioregions; and
- native vegetation on the cracking clay soils of the Liverpool Plains.

Two endangered ecological communities in the Darling Riverine Plains Bioregion are listed under the Commonwealth EPBC Act 1999. These are:

- Brigalow (*Acacia harpophylla* dominant or co-dominant); and
- the community of native species dependent on the natural discharge of groundwater from the Great Artesian Basin (Kearle *et al*. 2002).

7.3 Significant fauna

The bioregion is home to 25 amphibian species, 104 reptile species, 319 bird species and 58 mammal species. Of these, 63 species are listed in the TSC Act: 9 as extinct, 12 as endangered and 47 as vulnerable.

Records of amphibians in the Darling Riverine Plains include 7 species that are either endemic or largely restricted to the bioregion (Kearle *et al*. 2002). These are *Crinia parinsignifera, C. sloanei, Limnodynastes fletcheri* (long-thumbed frog), *Limnodynastes interioris* (giant banjo frog), *Neobatrachus sudelli, Notaden bennettii* (crucifix toad) and *Cyclorana verrucosa*.

No frog species known or predicted to occur in the Darling Riverine Plains Bioregion is listed as threatened in NSW. Although there are also no threatened populations of amphibians in the bioregion listed under the TSC Act, there have been no detailed studies of their status in the bioregion and areas such as the Gingham wetlands are considered to be worthy of such assessment (Kearle *et al*. 2002).

Six reptile species within the bioregion are listed in the schedules of the TSC Act, 1995. The fierce snake is listed as extinct in NSW, while 4 species are listed as vulnerable and one species, *Anomalopus mackayi*, is listed as endangered.

A number of reptile species recorded in the bioregion are either endemic or largely restricted to the bioregion (Kearle *et al*. 2002). These include *Emydura macquarii, Delma plebia* (leaden delma), *Ctenotus allotropis, Ctenotus brachyonyx, Egernia modesta, Hemiaspis damelii* (grey snake), *Pseudechis guttatus, Simoselaps australis* (coral snake), *Anomalopus leuckartii* (two-clawed worm-skink) and *Anomalopus mackayi* (listed under the TSC Act as endangered). The range of the worm-skink *Anomalopus mackayi* is largely restricted to the Darling Riverine Plains (Cogger 1992). Its range has decreased because suitable habitat has been cleared for cropping or degraded by grazing (Cogger *et al*. 1993; Sadlier and Pressey 1994, cited in Morton *et al*. 1995).

Several species of snake are also affected by clearing of habitat (Morton *et al*. 1995). These include elapid snakes (*Echiopsis curta*), which are confined to mallee areas of the bioregion, the *Notechis scutatus* and the python *Morelia spilota variegata*, both of which are found in the riverine environs along the Murray-Darling system.

Waterbirds are a significant component of the bird fauna of the Darling Riverine Plains and have been more extensively studied than other bird species (Kearle *et al*. 2002). Thirty-five bird species in the bioregion have been listed in the TSC Act, 8 as endangered and 27 as vulnerable (NSW NPWS 2001). Subtropical woodlands which occur in parts of the Darling Riverine Plains (as well as in portions of the Brigalow Belt South, Nandewar and New England Tableland bioregions) are recognised as key habitat areas for the conservation of threatened or near-threatened bird species (Garnett and Crowley 2000, cited in Kearle *et al*. 2002). Many waterbirds are known to breed in the bioregion, including the freckled duck (*Stictonetta naevosa*) (Blakers *et al*. 1984, cited in Morton *et al*. 1995).

A large proportion of the distribution of several bird species falls in the Darling Riverine Plains Bioregion. Such species include the spotted bowerbird (*Chlamydera maculata*), striped honeyeater (*Plectorhyncha lanceolata*) and plum-headed finch (*Neochemia modesta*) (Kearle *et al*. 2002). In NSW, the red-tailed black cockatoo (*Calyptorhyncus banksii graptogyne*) occurs largely in association with *Eucalyptus camaldulensis* woodland, where it uses large hollows for nesting (Smith *et al*. 1994, cited in Kearle *et al*. 2002). Most NSW records of red-tailed black cockatoos are from this bioregion, generally in the vicinity of the Barwon-Darling River (Kearle *et al*. 2002).

Twenty-two threatened mammal species described for the bioregion are listed in the TSC Act. Ten species, including the numbat (*Myrmecobius fasciatus*), bilby (*Macrotis lagotis*) and burrowing bettong (*Bettongia lesueur*), are listed as extinct in NSW. Nine species are listed as vulnerable and 3 species, the kultarr (*Antechinomys laniger*), southern hairy-nosed wombat (*Lasiorhinus latifrons*), which was recently rediscovered in this and the Murray Darling Depression Bioregion, (Ayers *et al*. 1996) and the silky mouse (*Pseudomys apodemoides*), are listed as endangered. (All three have TS profiles and the silky mouse is known from only one record.)

Populations of swamp wallaby (*Wallabia bicolor*), common brushtail possum (*Trichosurus vulpecula*), koala (*Phascolarctus cinereus*) and glider (*Petaurus spp.*), have been recorded in several surveys in the bioregion and are considered to be regionally significant (Smith *et al*. 1998, cited in Kearle *et al*. 2002), although they are not listed under the TSC Act. Populations of the greater long-eared bat (*Nyctophilus timoriensis*) and the yellow-bellied sheathtail bat (*Saccolaimus flaviventris*) are considered to be sparse and at risk because their tree-roosting behaviour leaves them exposed to loss of habitat and predation by cats (Dickman *et al*. 1993, cited in Morton *et al*. 1995).

The two-spined blackfish (*Gadopsis bispinosus*), Murray jollytail (*Galaxias rostrattus*), Australian rainbowfish (*Melanotaenia fluviatilis*), Macquarie perch (*Macquaria australasica*), Murray cod (*Maccullochella peeli*) and silver perch (*Bidyanus bidyanus*) are endemic to the Murray-Darling system (Lloyd *et al*. 1991, cited in Morton *et al*. 1995).

A number of feral, introduced mammals have been recorded in the bioregion, including foxes, cats and pigs.

The bioregion supports river red gum (*Eucalyptus camaldulensis*) corridors along the Darling River and nearby floodplains, which are important for the diversity of birds in the bioregion, including many species that are more common to the wetter bioregions in the south or east. Species such as the vulnerable superb parrot (*Polytelis swainsonii*) use these river red gum habitats or nearby woodlands, while the adjacent reedy swamps are home to the vulnerable Australasian bittern (*Botaurus poiciloptilus*). The pied currawong (*Strepera graculina*), little raven (*Corvus mellori*) and Torresian crow (*Corvus orru*) have increased in number in the bioregion, as have numbers of freshwater, woodland and forest species and some ground-feeding granivores. Species are likely to be lost unless efforts are made to protect, enhance and link forest fragments. Hollows within riparian forests in the bioregion must also be retained.

The distribution of the smooth knob-tailed gecko (*Nephrurus levis*) reaches its far eastern limit in the Broken Hill Complex Bioregion (Cogger 1992).

7.4 Significant wetlands

There are several bioregionally significant wetlands in the bioregion. The Namoi River Floodplain provides important habitat for the endangered bush stone curlew (*Burhinus grallarius*), even though its condition has been described as poor and still declining. Several vulnerable species, such as the koala (*Phascolarctos cinereus*), painted honeyeater (*Grantiella picta*) and brolga (*Grus rubicundus*) have been sighted on the floodplain.

Nettlegoe Lake occurs mainly in the Darling Riverine Plains Bioregion, with a small part extending into the Murray Darling Depression. It is described as being in fair condition. In 1993, Kingsford *et al*. (1997) recorded more than 10,000 waterbirds here including grey teal (*Anas gracilis*), pink-eared duck (*Malacorhynchus membranaceus*) and Eurasian coot (*Fulica atra*). The vulnerable freckled duck (*Stictonetta naevosa*) was recorded on the lake in 1983, 1990, 1993 and 1999.

Poopelloe Lake is another significant wetland within the bioregion, although it has been described as degraded and its condition is declining. Kingsford *et al*. (1997) used modelling to predict that the lake could support 20,000 waterbirds. The vulnerable Major Mitchell's cockatoo (*Cacatua leadbeateri*) has been recorded at the lake. Modelling has also been used for Wongalara Lake, also significant in the bioregion, to predict that it could provide habitat for 12,000 waterbirds.

The Darling River floodplain is another significant wetland, which supported almost 139,000 waterbirds in 1984. The species with the highest abundance were grey teal (*Anas gracilis*), hardhead (*Aythya australis*), black-tailed native hen (*Gallinula ventralis*) and Australian pelican (*Pelecanus conspicillatus*). In the same year the floodplain provided nesting habitat for almost 200 yellow-billed spoonbill (*Platalea flavipes*). In 1998, Pacific black duck (*Anas superciliosa*) also used the area for nesting.

This section of the Darling River is important for many threatened species. The vulnerable Major Mitchell's cockatoo, red-tailed black cockatoo (*Calyptorhynchus banksii*) and Australasian bittern (*Botaurus poiciloptilus*) have all been recorded here (NSW NPWS 2001).

Wetlands in the Darling Riverine Plains Bioregion are affected by changed hydrology, often where water regulation and abstraction results in increased flows for the lakes and decreased flows for the floodplains. Construction of levee banks, lakebed cropping and weir construction upstream is also a problem for some of the wetlands. Other impacts include feral animals, exotic weeds, salinity and grazing pressure. Despite these impacts, the wetlands still provide important habitat for waterbirds in the bioregion, and indeed across the state.

8. Regional History

8.1 Aboriginal occupation

For information on the Aboriginal occupation of the Darling Riverine plains, refer to Chapter 1 under the heading "Regional history"

8.2 European occupation

Pastoralists reached Menindee by 1850 and, like other towns such as Wilcannia, the town was developed as a Darling River port (NSW NPWS 1991).

A drover who camped where the town now stands during a spectacular storm gave the name to Lightning Ridge (NSW NPWS 1991). In 1902 the children of a boundary rider discovered some colourful stones which were later identified as opals. Within a year, the mining town of Lightning Ridge emerged and for some time was bathed in riches. The town was surrounded by several huge sheep stations whose owners employed opal miners with casual positions in fencing, timber cutting, carting wool and labouring their properties (NSW NPWS 1991).

Sheep grazing, cotton growing and tourism are the primary forms of land use in the bioregion (Morton *et al.* 1995).

Morton *et al.* (1995) identified the following management problems with the Darling Riverine Plains bioregion:

- land degradation through over-grazing;
- declining water quality in the rivers of the bioregion, mainly as a result of removal of water for irrigation and from increased salinity caused chiefly by irrigation runoff;
- clearing for agriculture in marginal lands; and
- control of vertebrate pests.

9. Bioregional-scale conservation

The Darling Riverine Plains Bioregion has a low conservation status in terms of overall area managed for conservation, which is 325,113.32 ha or 3.47% of the bioregion.

Lands managed under the provisions of the NPW Act contribute the most to land managed for conservation. However, lands currently managed as wildlife refuges contribute the most in terms of area. Culgoa and Kinchega National Parks (NPW Act 1974) lie within the bioregion, crossing bioregional boundaries into the Mulga Lands and Broken Hill Complex bioregions respectively. These, together with 7 nature reserves, 6 of which, including the Macquarie Marshes and Narran Lake Nature Reserves, lie wholly in the bioregion, occupy 87,410.26 ha or 0.94% of the bioregion. None of these reserves is also managed as wilderness under the Wilderness Act 1987.

Photo: G. Croft

None of the provisions of the NPW Act 1974 has been used to conserve land as historic sites, Aboriginal areas, state recreation areas or regional parks in the bioregion. However there is one voluntary conservation agreement occupying 18.98 ha (0.0002%) of the Darling Riverine Plains Bioregion, and 38 wildlife refuges which occupy 210,648.69 ha or 2.24% of the bioregion. Four property agreements (under the provisions of the NVC Act 1997) occupy about 421 ha or 0.0045% of the bioregion.

Land managed under the provisions of the Forestry Act 1916 includes 22 State forests (19 of which are wholly within the bioregion) which occupy 14,825 ha or 0.16% of the bioregion and one flora reserve (14.62 ha or 0.0002%), also wholly within the bioregion.

No data are currently available on conservation zones within State forests.

10. Subregions of the Darling Riverine Plains Bioregion

(Morgan and Terrey 1992)

Subregion	Geology	Characteristic landforms	Typical soils	Vegetation
Bogan-Macquarie	Bogan and Macquarie River alluvial fans of Quaternary age. Western margin is bedrock of the Cobar bioregion. Alluvial sediments from mixed Palaeozoic bedrock bury basement rock to 100m. Underlying sediments of Cretaceous and Jurassic age form part of the Great Artesian Basin.	Channels, floodplains, and through flow swamps of past and present river systems.	Grey and brown clays on the plains and depressions with texture contrast soils on the low rises of former levees and channels.	River red gum and river cooba on the channels. White cypress pine and poplar box on coarser levees. Black box, belah, myall and lignum on floodplains. Complex patterns of common reed, cumbungi, and water couch depending on water levels in marshes. Poplar box woodland with wilga, budda, white pine, grey box, yellow box and Blakely's red gum on red soils on fan margins.
Castlereagh-Barwon	Extensive plains on overlapping low angle alluvial fans of several rivers. Sediment derived from Jurassic sandstones on the Castlereagh fan and from basalts on the Namoi fan. Same structure as Bogan-Macquarie.	Channels, floodplains, crevasse splays, levees, source bordering dunes and through flow swamps of past and present river systems.	Grey and brown clays on the plains and depressions. Brown loamy sands, pale yellow or red sands, and texture contrast soils on the low rises of former levees and channels.	River red gum on larger streams. Coolabah with occasional myall, river cooba, whitewood belah and clumps of river paperbark. Mitchell grass with few trees on clay plains. Poplar box with wilga, whitewood, belah, white cypress pine, silver-leaf ironbark and occasional brigalow on higher red soils.
Culgoa-Bokhara	Clay plains of the alluvial fans of the Culgoa and Bokhara Rivers. All fine sediments of Quaternary age.	Channels, floodplains, and swamps of past and present river systems.	Grey clays on almost all landscapes.	Coolabah, river cooba and lignum along channels with some river red gum. Widespread Mitchell grass on the clay plains with some saltbush, patches of gidgee, wilga, leopard wood and poplar box.
Warrambool-Moonie	Alluvial fan and plains constructed by high level overflows from the Balonne River. Fine sediments of Quaternary age.	Channels, floodplains, and swamps of past and present river systems. These channels are usually dry but can be filled by high level flows in the Moonie and Balonne Rivers.	Grey clays on almost all landscapes.	Coolabah, river cooba, eurah and lignum along channels with some river red gum. Coolabah woodland with poplar box, belah, budda, wilga and myall on the plains. Limited white cypress pine on rare sandy soils.
Narran-Lightning Ridge	Cretaceous sandstones and claystones on the ridges. Terminal lake basins. Extensive floodplains of grey clay and limited sands of Quaternary age.	Low ridges on the sandstones, relief to 20m. Channels, floodplains, lakes and lunettes swamps of past and present river systems. These channels carry level flows in the Balonne and Maranoa Rivers.	Stony red earths on the ridges. Grey clays over most of the plains with sandy soils and some texture contrast soils on levees, low sand dunes and lunettes.	Silver leaf ironbark, white cypress pine, western bloodwood and mulga on the ridges. Poplar box on lower slopes with loamy soil. Coolabah, river red gum on channels and lake margins. Lignum in swamps and open water in Narran lakes.

10. Subregions of the Darling Riverine Plains Bioregion *CONTINUED*

Subregion	Geology	Characteristic landforms	Typical soils	Vegetation
Collarenebri interfluve One land system only	Cretaceous sandstones and claystone that are a small part of the Surat Sandstones subregion in Queensland.	Low rounded hills, relief to 10m, local dendritic drainage patterns.	Stony red earths often with a gravel pavement. Soils become deeper down slope and accumulate calcium carbonate in drainage lines.	Bimble box, wilga, white cypress pine, budda, warrior bush, ironwood, and belah with mixed grasses underneath.
Louth plains	Alluvial plains of the mid-Darling valley, confined between the Cobar peneplain and Mulga lands bioregions. Shallow Quaternary alluvial sediments over bedrock.	Channel and floodplain features. Anabranch streams rare, occasional small dunes.	Grey clays from channels to backplains with limited areas of higher red soils and patchy sands probably representing alluvial terraces.	Coolabah, river red gum, river cooba and some black box along the channels. Canegrass and lignum in depressions, with saltbush, bluebush and grasses on backplains. Poplar box, rosewood and some black box on red soils and valley margins.
Wilcannia Plains	Alluvial plains of the mid-Darling valley, confined between the Cobar peneplain and Mulga lands bioregions. Shallow Quaternary alluvial sediments over bedrock.	Channel and floodplain features. Anabranch streams present feeding valley margin lakes. Limited areas of dunes and sandplains.	Grey clays from channels to backplains and on lake beds. Red soils and patchy sands probably representing alluvial terraces.	Coolabah, river red gum, river cooba and black box along the channels. Canegrass and lignum in depressions, with saltbush, bluebush and grasses on backplains. Poplar box, belah, rosewood, black bluebush and black box on red soils and valley margins.
Menindee	Quaternary alluvial complex of river and lake sediments with associated aeolian landforms.	Channel and floodplain features, well developed anabranch streams and overflow lakes with lunettes and extensive sandplains and low dunes.	Grey clay and white sand in channels, lake beds and beaches. Brown clays on swamps, merging to red sands and some texture contrast soils on sandplains. Lunettes of white or pale yellow sand alternating with layers of pale brown pelleted clay.	River red gum, river cooba and black box along the channels and lake margins. Canegrass and lignum in swamps and depressions. Saltbush, bluebush, turpentine, prickly wattle, and grasses with belah, and rosewood, on red soils. Bluebush and sandhill canegrass on lunettes.
Great Darling Anabranch	Quaternary alluvial complex of river and lake sediments with associated aeolian landforms.	Channel and floodplain features of the Great Darling Anabranch with overflow lakes, lunettes and extensive sandplains and low dunes. This system carries high level Darling River flows.	Grey clay in channels, floodplains and lake beds. Limited areas of red sands and texture contrast soils. Lunettes of white or pale yellow sand alternating with layers of pale brown pelleted clay.	River red gum on channels, black box and river cooba widespread on floodplains. Lignum and black box on lake margins. Belah, white cypress pine, prickly wattle and bluebush on lunettes.
Pooncarie-Darling	As for the Great Darling Anabranch.	This system carries low level Darling River flows.	As for the Great Darling Anabranch.	As for the Great Darling Anabranch.

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