

DARLING RIVERINE PLAINS BIOREGION Background Report

NSW BIODIVERSITY STRATEGY

[JULY 2002]



DARLING RIVERINE PLAINS

BACKGROUND REPORT

**DARLING RIVERINE PLAINS
BIOREGION**

A project undertaken for the
NSW Biodiversity Strategy



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ISBN 0731365305

This project has been funded by the NSW Biodiversity Strategy and coordinated by Western Regional Assessments Unit, NSW National Parks and Wildlife Service

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Thanks to Gary Saunders for managing the project and providing valuable input.

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Murray Ellis, NSW National Parks and Wildlife Service;

Mike Fleming, NSW National Parks and Wildlife Service;

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Patrick Tap, State Forests of New South Wales.

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PROJECT SUMMARY

This report forms part of stage one of the two stage Darling Riverine Plains Conservation Assessment Project, funded by the NSW Biodiversity Strategy, which was released in 1999. The Biodiversity Strategy is a whole of government document and all government agencies are committed to working cooperatively towards conserving the biodiversity of NSW. The Strategy outlines a framework for coordinating and integrating government and community efforts to conserve biodiversity across all landscapes.

Project objectives and methods

The existing abiotic and biotic information of the Darling Riverine Plains bioregion (DRP) within New South Wales has been collated and synthesised in this report. This information provides a baseline for planning further work and conservation needs in this bioregion. The human activities in this region are also outlined as these have an impact on the natural distribution and abundance of plants and animals and affect the measures required for biodiversity conservation.

Key features of the DRP in NSW

The Darling Riverine Plains bioregion is a fluvial environment, having been almost entirely shaped and maintained by water flow and responses to water. This is reflected by the alluvial origin of the underlying geology and soils and by the gently undulating topography. Rivers and wetlands of the lower plains and floodplains of six catchments make up the bioregion and an understanding of the hydrology of the bioregion is fundamental to an understanding of the ecosystems. Flooding is essential for the healthy functioning of the ecosystem. Flooding is extremely irregular and does not follow predictable patterns.

The Darling Riverine Plains bioregion in NSW covers approximately 9 255 000 ha (approximately 12% of New South Wales) and includes the lower reaches and alluvial fans of the Bogan, Macquarie, Castlereagh, Namoi, Barwon, Culgoa, Bokhara, Narran, Gwydir and MacIntyre Rivers and the Darling River corridor from Bourke to the southern edge of the Menindee Lakes.

Although almost all of the bioregion lies within the semi-arid zone, there is substantial climatic variation. This is especially so for rainfall, which varies both spatially and

temporally. Annual averages are of little value for understanding the responses of ecological processes and requirements.

Major changes have been made to this natural environment since European occupation. Extensive areas have been cleared of native vegetation, especially in the east, and in the west the combination of drought and overgrazing by sheep and rabbits have led to extensive denudation of the land. Agricultural enterprises have created changes including altered run-off patterns, changes in turbidity and nutrient status of rivers and increased salinity in the rivers and in the soil. Stream regulation has changed flow and flooding patterns resulting in change to riverine and wetland ecosystems. Land tenure varies from large areas of leasehold land (50% of the bioregion) in the west, to predominantly freehold (40.5% of the bioregion) in the east. Approximately 9.5% of the bioregion is Crown land. The large number of administrative boundaries crossing this bioregion has resulted in inconsistent levels of research being carried out.

No systematic plant or animal surveys have been conducted across the entire bioregion but general descriptions of vegetation communities are broadly consistent, with several woodland, shrubland, grassland and wetland communities having been described. Coolibah, Black Box and River Red Gum communities are generally the most common associations. More detailed mapping of these communities is needed. There are three communities, *Corymbia tessellaris* (carbeen), *Acacia loderi* (nelia), and the artesian springs community listed as threatened under the *Threatened Species Conservation Act, 1995* (NSW) (*TSC Act*) and the *Acacia harpophylla* (brigalow) community has a preliminary determination. The brigalow and artesian springs communities are also listed under the *Environment Protection and Biodiversity Conservation Act, 1999* (Commonwealth of Australia) (*EPBC Act*) and several other communities have been noted as of concern.

A total of 1 129 plant taxa are recorded on databases covering the Darling Riverine Plains bioregion within NSW. Nineteen of these species are listed as vulnerable or endangered, five as extinct under the *TSC Act* and twenty are on the national register of Rare or Threatened Australian Plants (ROTAP) (Briggs & Leigh 1996). There are also 229 exotic species recorded. These plant records are unevenly distributed across the bioregion and detailed floristic surveys have been patchy with large areas never having been surveyed.

The distribution and abundance of terrestrial vertebrates is also based on few and scattered surveys and incidental records and there are substantial gaps in the coverage of the information. The most detailed information available is for waterbird fauna in the three major wetlands, Macquarie Marshes, Narran Lakes and the Gwydir Wetlands and some detailed analysis is possible. Five hundred and six terrestrial vertebrate species have been recorded from the DRP. Of these, 65 are listed under the *TSC Act*, 9 as extinct, 11 endangered and 45 as vulnerable. Other threatened species are noted as being predicted to occur in the bioregion or as of concern, either near threatened or in decline. Twenty-four species are listed under the Japan Australia and China Australia Migratory Bird Agreements (JAMBA and CAMBA).

The information available for invertebrates and fish is more limited than that for the terrestrial vertebrates. This needs to be rectified, not only to understand the biodiversity of the bioregion but also because of their importance as food resources for vertebrate species both within and outside the DRP and as indicators of ecosystem health. There are 30 fish species known from the DRP and three of these have been listed as threatened by the *Fisheries Management Act, 1994* (NSW).

High fire frequency, anthropogenic climate change, clearing of native vegetation, predation by feral cats, foxes and *Gambusia*, competition and land degradation by feral goats and

rabbits are listed as key threatening processes for the DRP under the *TSC Act* and/or the *EPBC Act*. There have also been preliminary determinations to list river regulation and competition by feral honeybees as key threatening processes. Weeds and pest animal species also pose significant threats to biodiversity within the DRP.

Implications for biodiversity conservation management

Conservation reserves make up less than one percent of the DRP bioregion and these do not cover the full range of plant communities present. Off-reserve conservation initiatives include the development of Catchment Management Plans, River Management Plans, Groundwater Management Plans, Regional Vegetation Management Plans and the declaration of Wildlife Refuges and Voluntary Conservation Agreements. There is insufficient information to define areas of biological significance but the major wetlands and Artesian Springs require consideration. The significance of the rivers as corridors for movement of wildlife also requires assessment.

This bioregion covers a large area within NSW for which the floristic and faunal records and vegetation mapping is inadequate. Further survey and assessment must be based on the gaps highlighted in both this report and in the accompanying data audit and gap analysis report. It is also important to define the internal landscape variation using refined province or land system boundaries and to ensure an even coverage of survey effort across these sub-regions rather than using mapsheet analysis. Recommendations for further work emerging from the background information reviewed and the gap analysis study are listed at the end of each part of this report.

1 INTRODUCTION

1.1 THE BACKGROUND REPORT

The aim of this report is to collate and synthesise the available abiotic and biotic information for the Darling Riverine Plains (DRP) Bioregion within New South Wales and to assess the current conservation status of the bioregion. The biotic information includes information about vegetation, flora, fauna, ecosystems, ecological processes and threatening processes. Simultaneously, a data audit and gap analysis is being undertaken in which the quality and completeness of the data will be assessed and inadequacies and gaps identified. These studies provide information which forms the basis of proposals for data collection and analysis of conservation values across the bioregion. Emerging from the information gathered are proposed recommendations for further work. This detailed information is required for regional conservation planning and the establishment of a protected area network (including formal reserves) and conservation management practices.

The following conventions are used throughout this report.

Abbreviations:

- DRP (Aus) - the total area of the Darling Riverine Plains bioregion (as defined by Thackway and Cresswell 1995);
- DRP - the portion of the DRP (Aus) in New South Wales; and
- DRP (Qld) - the portion of the DRP (Aus) in Queensland.

Names for flora and fauna will be cited in the following ways:

- for **birds, mammals (excluding bat species), invertebrates, and fish** – common name followed by scientific name when first used, then common name only used throughout; and
- for **reptiles, amphibians, bats and all flora** – scientific name followed by common name (where available) when first used, then scientific name only used throughout.

The naming authorities recognised and used in this report are as follows:

- for flora – Harden (1990-1993), Royal Botanic Gardens, Sydney (2001);
- for reptiles and amphibians – Cogger (2000);
- for birds – Simpson *et al.* (1999); and
- for mammals – Strahan (1995).

1.2 THE DRP BIODIVERSITY CONSERVATION ASSESSMENT PROJECT

This Background Report forms part of Stage 1 of the DRP Biodiversity Conservation Assessment Project. The recommendations for further work presented here together with the results of the data audit and gap analysis will be used to determine the content of the associated projects.

1.2.1 Objectives of the DRP project

The objectives of the DRP Biodiversity Conservation Assessment Project are to:

- compile appropriate bioregion-wide biotic and abiotic data for use by planners and land managers;
- identify bioregional conservation values for use in regional planning processes such as regional vegetation management planning, catchment management planning and river management planning;
- provide advice about appropriate conservation measures and management practices;
- provide advice about further detailed assessment needed for the creation of reserves;
- involve the community in information gathering and to present the findings in plain English; and
- establish long term monitoring sites that will allow ecological health to be assessed and the conservation management practices to be evaluated and reviewed.

The two stages in the project (NPWS 1999a) are:

Stage 1: Compilation and analysis of background information, broad data collection, development of broad conservation criteria and a biodiversity survey of sites selected to cover the ecological variation of the DRP. To undertake a preliminary analysis that identifies gaps in the data layers and establishes an understanding of environmental patterns and variation within the bioregion.

Stage 2: Information collected from Stage 1 of this project will be reviewed and used to design a targeted survey program, detailed assessment of the conservation status of the region and possible modelling to provide more detailed information for use in the broader conservation assessment. Areas targeted for more detailed analysis may include areas of high conservation value and those considered under greatest threat. Stage 2 will be used to identify the processes and funding requirements needed to complete the Integrated Biodiversity Conservation and Assessment process across the whole bioregion.

1.2.2 Funding for the DRP project

The DRP Biodiversity Conservation Assessment Project is funded from two sources:

- under priority action 13 of the New South Wales State Biodiversity Strategy (SBS); and
- the Commonwealth Natural Heritage Trust (NHT).

The SBS funding covers conservation assessment and vegetation mapping. The NHT funding covers community based nature conservation planning. SBS also funds long term monitoring sites established for invertebrate diversity assessment, a project conducted by the Australian Museum. A separate report will be produced for each project.

1.2.3 Associated projects

Figure 1.1 below shows how all aspects of the DRP Biodiversity Conservation Assessment Project are linked and the reports which shall be produced for this project. This background report is part of the initial stages of the project as shown in Figure 1.1. Each component of the project is outlined further in this section.

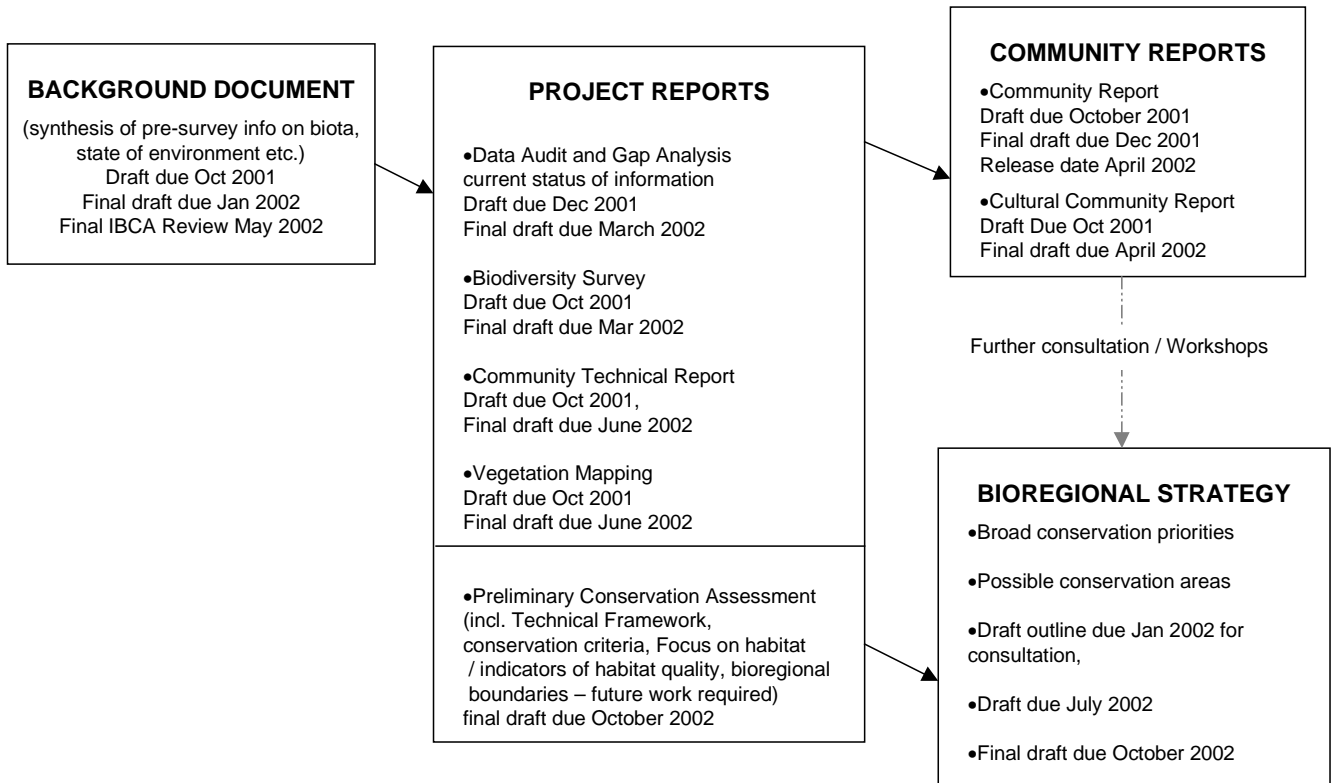


FIGURE 1.1 REPORTS RESULTING FROM THE DRP BIODIVERSITY CONSERVATION ASSESSMENT PROJECT

Data audit and gap analysis

The information available on the ecology and biological diversity of the DRP is limited in detail and extent. This is a significant impediment to informed land use planning, conservation management and regional development. In this project existing data will be audited and evaluated in order to develop targeted studies that will fill gaps in the data. This includes collation of readily available environmental data and the establishment of a baseline for a more comprehensive and detailed assessment of the bioregion. The data audit process also involves the maintenance of a comprehensive database.

A data audit of the western region of New South Wales for the Resource and Conservation Assessment Council (RACAC) included data relating to fauna, flora, geoscience, heritage, land, photography and imagery, vegetation and water (NPWS 1999c). The data were classified by bioregion and the DRP was found to have reasonable coverage of climatic and weather information, while vegetation, flora and fauna data are poor or unavailable. In general there is an incomplete coverage of all existing base data layers, a variation in methods of data collection, variable or unknown reliability of the records and a bias in collection locations.

Vegetation mapping

The aim of this project is to validate and integrate existing vegetation mapping. The resolution of the mapping area covered, methods used, type of information collected and currency of the data varies across the DRP. From this, targeted flora survey requirements will be defined and ecological and geographical patterns determined using a spatial analysis. Pre- and post-clearing vegetation maps of the bioregion, an inventory of vegetation communities, vascular plant communities and rare and threatened plant species, an assessment of the conservation status of vegetation communities and an understanding of the environmental influences on plant and vegetation distribution across the DRP will be provided.

Biodiversity survey

This project will develop an appropriate bioregion-wide biodiversity database and data layers, which will allow identification of priorities for further assessment, classification of biotic assemblages and habitats, areas of high biodiversity and conservation significance, identification of conservation management options and a technical report. An important component of this project is community participation in biodiversity surveys.

Regional based nature conservation planning

The aim of this project is ensure that any future bioregional plan for the Darling Riverine Plains incorporates best practices by providing opportunities for community participation and information exchange at all levels. It is designed to provide opportunities for all sectors of the community to assist with data collection and to provide fauna/flora records in a manner that can be used in the project.

This will be done by providing training, expertise, opportunities, networks and incentives for cooperative partnerships with private landholders, local and state government, non government organisations, industry and other relevant management authorities involved in long term management of key areas for the conservation of biodiversity. This whole of landscape approach to biodiversity conservation and appropriate long term conservation management practices can be achieved through programs such as the Land for Wildlife scheme (ie Land for Wildlife property registration and support), wildlife refuges, voluntary conservation agreements, Farming For The Future, Bushcare and the *Native Vegetation Conservation Act, 1997* (NSW).

Consultation with the Aboriginal community

For this project Aboriginal communities will be consulted about traditional or ecological knowledge and conservation issues the communities consider important. This may include field trips with members of the Aboriginal community to biodiversity survey sites or other locations, collecting information about past and present species distribution, habitat requirements and the impact of changes to ecosystems.

Conservation assessment

This assessment will identify highly significant areas and features of the DRP and provide advice on appropriate conservation measures. The report will focus on habitat definition, indicators of habitat health and the definition of the bioregional boundaries. It will outline the technical framework of the project and future work required.

Bioregional strategy

This strategy will use existing information and that generated by the project to prepare a bioregional conservation strategy. This will be developed through consultation with the broad network established by the NHT-funded project and public comment on the strategy.

1.3 THE DARLING RIVERINE PLAINS BIOREGION

1.3.1 Location and area

The DRP (Aus) bioregion was originally defined by Thackway and Cresswell (1995) in their Interim Biogeographic Regionalisation of Australia as having ‘Alluvial fans and plains; summer/winter rainfall in catchments, including occasional cyclonic influence; grey clays; woodlands and open woodlands dominated by *Eucalyptus species*.’

The total area of this bioregion is 10 550 000 hectares with 88% located within NSW and two small lobes extending into Queensland. It is surrounded by six other bioregions: to the east is the Brigalow Belt South, to the north-west the Mulga Lands, to the south and south-west the Cobar Penepain, Murray Darling Depression and Broken Hill Complex, and the New South Wales South Western Slopes in the Narromine area (Map 1). The bulk of the bioregion extends from east of Boggabilla to Weilmoringle on the Queensland border, south almost to Peak Hill and west to Nyngan and Bourke. South west from Bourke it becomes a narrow riverine corridor along the Darling River to the Menindee overflow lakes.

The New South Wales portion of the DRP covers approximately 9 255 000 hectares. It includes the lower reaches and alluvial fans of the Bogan, Macquarie, Castlereagh, Namoi, Barwon, Culgoa, Bokhara, Narran, Gwydir and MacIntyre Rivers and the Darling River corridor from Bourke to the southern edge of the Menindee Lakes (Map 2). The alluvial fans form extensive fertile plains.

The DRP (QLD) has been described by Sattler and Williams (1999) as forming two distinct provinces of the Brigalow Belt South Bioregion. These are the Balonne-Culgoa Fan (Province 35) that contains extensive quaternary alluvial sediments along the Balonne and Culgoa Rivers and the predominantly alluvial plains and associated riverine landforms of the MacIntyre-Weir Fan (Province 36) (refer to section 2.6.1 for an outline of the provinces described by Morgan and Terrey (1992) within the bioregion in New South Wales).

1.3.2 Human history

Aboriginal and cultural heritage

Aboriginal people have occupied this continent for approximately 55 000 years and their connection with this continent dates back to far earlier times, to the time of the creation itself. The Aboriginal people of Australia represent one of the oldest continuously living cultures in the world.

Approximately 3 000 people occupied the Barwon-Darling area prior to European settlement. The river tribes of the DRP settled along the main rivers during the summer months, moving to regular campsites on drier country in the winter months (Dargin, 1976).

The DRP covers land belonging to several Aboriginal nations including the Wiradjuri, Gamilaroi, Yullaroi, Murriwarri, Ngiyampaa/Wongaibon and Baarkinji. For Aboriginal people, the land, waterways, flora, fauna and the skies, are central to their traditional lifestyles and cultural beliefs and there are many areas of cultural significance within the DRP (NPWS undated; Dargin 1976).

In 1836 white settlement extended to the Barwon-Castlereagh River junction. Traditional life was disrupted, with the introduction of stock and agriculture and many Aboriginal women being forced to live with white stockmen (NPWS undated; Dargin 1976). Violent conflicts between the Aboriginal and white people occurred throughout the area during the 1880s (Dargin 1976; Butlin 1983). The dwindling Aboriginal population of the area was further decimated by the European-introduced small pox and venereal disease. Outbreaks of small pox within the Aboriginal populations of the Darling area lead occurred between 1820 and 1830, causing many deaths. Rapid population decline from disease, which mainly affected the old and young, coupled with venereal diseases, which caused sterility in some, greatly affected the recovery rate of the Aboriginal population of the region (Butlin 1983; NPWS 2000).

As white settlement of the area continued to expand, the newly appointed Protector of Aborigines called a census of Aboriginal people in 1882. The results of this census for the region found that a total of approximately 440 people of Aboriginal descent were living in Walgett, Brewarrina and Wilcannia (Dargin 1976).

The Brewarrina area was particularly important as one of the great intertribal meeting places of eastern Australia where Aboriginal elders deliberated on policies aimed at maintaining balance between tribes and their environment. Ceremonial grounds, burial areas and extensive stone flaking are the only remaining evidence of these meetings (Dargin 1976). The late 1880s saw the almost total demise of traditional Aboriginal life in the region (Dargin 1976; NPWS undated). The last traditional initiation ceremony occurring at the bora grounds at Collymogle, approximately 18km east-north-east of Collarenebri (Dargin 1976).

Many Aboriginal sites and areas of significance in the DRP have been mapped and include physical and non-physical or spiritual sites. Physical remains of earlier Aboriginal occupation as indicated by the presence of stone tools, rock art, rock peckings, rock engravings, scarred and carved trees are protected under the *National Parks and Wildlife Act, 1974* (NSW) and many are still being located. The spiritually important sites are more difficult to classify and map but can include a mountain range or a waterway incorporated in the creation stories, totemic animals or plants. These features of the landscape continue to be used by Aboriginal people.

Known and mapped sites of significance to Aboriginal people are spread throughout the DRP, with a high concentration in the Darling riverine corridor south of Wilcannia (Map 3). Two areas of high significance to the Ngiyampaa/Wongaibon people are the Brewarrina fish traps and Mt Grenfell. There are also other highly significant areas to the Ngiyampaa/Wongiabon and other nations within the DRP but many of these cannot be revealed to the broader community.

European settlement of the bioregion

The DRP has been significantly modified since European settlement that began after the early exploration along the rivers in 1817. John Oxley was the first European to the region, naming and crossing the Castlereagh River in 1818. George Clarke, an escaped convict, traversed the northern part of the DRP with the Kamilaroi people between 1826 and 1831. When recaptured, he reported to the acting governor a great inland river. This prompted Sir Thomas Mitchell to investigate and he found the Barwon River in 1832 (Fairfax 2001). European explorers, Charles Sturt and Hamilton Hume first reached the Darling River in 1829.

River frontage properties along the Barwon and Macquarie Rivers were taken up by the 1840s and extended to the Darling River in the 1850s. To begin with, the runs were unfenced and the lack of water restricted stock movement with only spasmodic occupation of the surrounding lands after rain. This pattern of occupation and development changed significantly in the 1870s and 1880s with the construction of wells, bores and tanks enabling the stock runs to expand permanently into the dryland. At the same time, good seasons and a strong demand for wool caused an almost complete change from cattle to sheep and a strong increase in sheep numbers. Fencing of stock runs began in this period along with the use of timber for construction of dwellings, firewood, lining of well and mine shafts and for stock fodder which led to the clearing of timber from large areas, especially in the Western Division. By the 1890s the massive build up of stock, invasion of rabbits and drought led to the broad scale and profound environmental degradation of the Western Division.

The river boat trade was a major contributing factor to the development of the DRP with 90 paddle steamers using the Darling River by 1890 (Outback NSW 2001a). Captain William Randall took the first riverboat up the Darling River in 1859 to the location where Brewarrina now stands. This was the beginning of the river trade at Brewarrina and Bourke. Bourke became the major port along the Darling River from 1860 to 1885. Menindee, Wilcannia and Brewarrina were also important river ports along the Darling River (Back O’ Bourke 2001; Australian Museums and Galleries Online 2001).

Menindee was the first town established on the Darling River (in the 1850s but was not gazetted until 1863), with Bourke being surveyed in 1862, Brewarrina being officially declared a town in 1863 and Wilcannia officially notified as a township in 1866 (renaming the town formerly known as Mount Murchison). These townships were developed to service the river trade (Outback NSW 2001b; Australian Museums and Galleries Online 2001).

In 1859, Vincent Dowling, the pioneer station builder of the Bourke area, brought his wife (the first white woman in the area) out to the Darling. In 1878 the Artesian Basin was tapped for the first time at Kallara and Kerbree Stations near Bourke. The cotton industry began in 1966 in the Bourke district (Back O’ Bourke 2001; Outback NSW 2001b).

A number of important historic sites of early European settlement exist. It is beyond the scope of this report to document these sites in detail but in addition to the more obvious sites of cemeteries and settlements there are graves scattered across the landscape. For example, the graves of the first settlers in the Macquarie Marshes area, George Gibson and Henry Wage are still located there and are a designated historic site within Warren Shire. The presence of marked European survey trees is evidence of early exploration of the area.

Land use

The most common land use across the bioregion is grazing, with average livestock densities of 0.85 animals/ha. Stock routes to the main markets were developed in the 1880s and these crossed the DRP from south to north, up the Darling River from Wilcannia to Bourke, across to Hungerford and over the border to Queensland. This major route also connected the south of the bioregion to others heading east to Dubbo and south to Deniliquin and Echuca. By the 1890s a vast network of stockroutes spanned the DRP (McKnight 1977).

Irrigated and dryland cropping is a more recent land use, but it is becoming more extensive. The cotton industry began with the construction of the Keepit Dam in 1960, with 20 000 ha of cotton planted in the Narrabri / Wee Waa area by 1968/69, increasing to 48 000 ha by 1989/90 (NWCMC 1996). The following land use descriptions by province have been drawn primarily from Morgan and Terry (1990) (see section 2.6.1 for a description and Map 21 for a map of the provinces).

In the **Bogan-Macquarie Province** grazing is the dominant land use with dryland and irrigated cropping becoming more significant in the south. Stock levels in the region range from six dry sheep equivalents per hectare (dse) in the pastoral eastern area, to 0.25 dse in the west (Macquarie 2100 Plan 1999).

Wheat, cotton, beef and wool dominate in the Narromine to Collie, Bogan River and Merri Merri Creek area with cropping increasing since livestock returns were reduced in 1994-5. Total gross value of cropping in this region was \$260 million in 1996 to 1997 and livestock, \$50 million, in the same period. The area cultivated for cotton production increased by 400% from 1981 to 1992 and 60% of the cotton is grown within five kilometres of the Macquarie River (Macquarie 2100 Plan 1999).

The **Castlereagh-Barwon Province** is the most intensively developed with rapid growth in the cropping industry. Dryland cropping is widespread and irrigated crops cover large areas near Wee Waa and Moree in the east and, to a lesser extent, near the Barwon River and Moomin Creek. In the Border Rivers region, which includes the northern portion of this province, 57 000 ha were irrigated for cotton, producing an income of approximately \$200 million per annum and 13 500 ha irrigated for summer crops such as lucerne (DNR & DLWC 2000). Grazing is also a significant land use in this province.

Throughout the remainder of the bioregion, land use is dominated by grazing but in the **Culgoa-Bokhara** and **Warrambool-Moonie** Provinces substantial areas have been cultivated for dryland cropping and this is increasing. Narran Lakes (**Narran-Lightning Ridge Province**) are also used for lakebed cropping and extensive clearing has recently occurred in the **Collarenebri Interfluve Province**. Horticulture is an expanding industry in the **Menindee Province**.

The fertility and higher moisture levels of the wetlands within the DRP has frequently resulted in a concentration of agricultural activities in these areas. The Gwydir Wetlands were mostly used for wool production during the early part of the century. By the 1970s beef cattle were the mainstay of the grazing industry. The crash of beef prices in the early 1970s when wheat prices were buoyant, resulted in many landholders clearing extensively for cultivation cropping but in the 1980s sheep and cattle re-emerged as important industries. Dryland cropping is still important but the produce has diversified to include barley, oats, chickpeas, safflower and canola. Irrigated cotton production is important upstream from the wetlands

around Moree since the construction of Copeton Dam, and there has been pressure to build another dam to allow for irrigation in the wetlands (Keyte 1994; NWCMC 1996).

1.3.3 Land tenure and administrative boundaries

Land tenure

The current land tenure of the DRP is shown in Map 4.

Crown lands

The available data on Crown lands (Map 4) (from Crown Lands Information Database, DLWC) at the time of writing is not totally accurate because there is considerable spatial overlap between classifications and a lack of data verification and updated information in the database. There are also inconsistencies in the data with some, but not all classifications coinciding. Leasehold land within the occupies approximately 4 628 000 ha, 50% of the bioregion. Crown reserves include travelling stock reserves, transport corridors, National Parks, Nature Reserve and State Forests that cover an estimated 9.5% (879 350 ha) of the bioregion (Map 4).

Freehold

The remaining 40.5% (3 748 800 ha approximately) of the DRP is freehold land, located mainly in the south and east of the bioregion (Map 4).

National Parks and Wildlife Service estate

Two national parks and six nature reserves cover 0.89% of the DRP. Two recent acquisitions by the NPWS, Mount Murchison, and Tillpilly Stations (45 km and 100 km north-east of Wilcannia respectively), partially fall within the DRP and are yet to be formally declared. Another ungazetted area adjacent to Narran Nature Reserve is also part of the NPWS estate within the DRP. These ungazetted areas of NPWS estate increase the total area of by NPWS estate within the DRP to 1.13% (Map 4). The largest reserves are Culgoa National Park in the far north west of the DRP, and Kincheha National Park in the far south west of the bioregion (Table 1.1).

Table 1.1 NPWS estate in the DRP

Name	Hectares within DRP	% within DRP	Protected area management category under the International Union for the Conservation of Nature (IUCN)
Kincheha National Park	37 861	86%	II – national park managed for ecosystem protection and recreation
Culgoa National Park	20 918	95%	II – national park managed for ecosystem protection and recreation
Macquarie Marshes Nature Reserve	18 192	100%	IV – habitat / species management area managed for conservation through management intervention
Narran Lake Nature Reserve	4 527	100%	Ia – strict nature reserve managed mainly for science
Midkin Nature Reserve	359	100%	Ia – strict nature reserve managed mainly for science
Borong Nature Reserve	195	100%	Ia – strict nature reserve managed mainly for science
Boomi Nature Reserve	156	100%	Ia – strict nature reserve managed mainly for science
Boomi West Nature Reserve	149	100%	Ia – strict nature reserve managed mainly for science
Mt Murchison ungazetted	13 677	30%	not assigned
Tillpilly ungazetted	5 048	21%	not assigned
Narran Lake ungazetted	3 691	100%	not assigned
Total area within DRP	104 773	1.13%	

State Forests of NSW estate

Twenty-two State Forests occur within, or partially within, the DRP (Map 4). These forests cover an estimated 13 900 ha, or 0.15% of the total area of the bioregion. Each State forest, and the area occurring within DRP, is listed in Table 1.2. They are all located in the southern part of the DRP, and in a narrow belt of 'Monkey scrub' (*Eucalyptus chloroclada-Callitris glaucophylla* community on a relict channel of the Castlereagh River) running to the north west of Gulargambone.

The Sandgate Flora Reserve within the DRP has been exempted from mining and is therefore equivalent to IUCN I-IV. Timber harvesting and grazing by domestic stock are not permitted in flora reserves unless specified in a working plan. To date State Forests within the DRP have not been assigned IUCN categories. However, parts of these forests are likely to qualify for IUCN categories of I-IV under future Forest Management Zoning and initiatives associated with habitat or species management.

Table 1.2 State Forests in the DRP

State Forest	Hectares intersecting DRP	% within DRP
Sandgate Flora Reserve	16	100%
Gilwarny State Forest	3 452	100%
Pilliga West State Forest	2 808	2%
Tallegar State Forest	1 601	100%
Narraway State Forest	881	100%
Sandgate State Forest	780	100%
Bourbah State Forest	623	100%
Merrinele State Forest	536	100%
Cowal State Forest	504	100%
Tenandra State Forest	490	100%
Nebea State Forest	361	100%
Warrie State Forest	295	100%
Wingadee State Forest	283	100%
Tailby State Forest	196	22%
Mellerstain State Forest	194	100%
Merri Merri State Forest	191	100%
Gilgandra State Forest	190	100%
Carrabear State Forest	174	100%
Holybon State Forest	125	100%
Berida State Forest	68	100%
Eringanerin State Forest	58	88%
Girilambone State Forest	53	100%
Gin Gin State Forest	39	100%
Total area within DRP	13 916	0.15%

Administrative boundaries

In addition to crossing a State border, the DRP (Aus) bioregion is divided by a number of other administrative boundaries. Among the more significant of these are the DLWC Regions (Map 9) that have influenced the coverage of research throughout the bioregion. Research carried out in the Western Division (Far West Region, Table 1.4, Map 9) has frequently differed in content and comprehensiveness from that undertaken in the regions to the east.

New South Wales State government

Four State Government electorates (Table 1.3, Map 6) intersect the DRP. Most of this bioregion is in the Electorate of Barwon (79%).

Table 1.3 State government electorates within the DRP

Electorate	Area intersecting DRP (ha)	% electorate	% DRP
Barwon	7 351 190	63%	79%
Murray – Darling	1 758 506	5%	19%
Dubbo	130 234	8%	1%
Northern Tablelands	13 432	0.4%	0.1%

Department of Land and Water Conservation administrative boundaries

The DRP lies within three Department of Land and Water Conservation (DLWC) Regions (Table 1.4, Map 9).

Table 1.4 DLWC regions within the DRP

DLWC Region	Area intersecting DRP (ha)	% region	% DRP
Far West	3 993 322	12%	43%
Central West	3 164 952	23%	34%
Barwon	2 093 817	23%	23%

National Parks and Wildlife Service administrative boundaries

99.9% of the DRP falls under the jurisdiction of the Western Directorate of NPWS, with the remaining 0.1% being within Northern Directorate (Map 7). Table 1.5 shows NPWS Directorates, Regions and Areas within these Directorates, and the area of the DRP covered by each. Narrabri Area Office has jurisdiction over 39% of the DRP, with Coonabarabran and Cobar Area Offices covering 23% and 25% respectively.

Table 1.5 NPWS administrative boundaries within the DRP

Directorate	Region	Area	Area intersecting DRP (ha)	% NPWS Area	% DRP
Western	Northern Plains	Narrabri	3 590 790	56%	39%
		Coonabarabran	2 117 223	56%	23%
	Upper Darling	Cobar	2 281 882	19%	25%
	Far West	Broken Hill	854 947	9%	9%
	Central West	Lachlan	394 384	10%	4%
Northern	Northern Tablelands	Glen Innes West	13581	1%	0.1%

State Forests of NSW administrative boundaries

Eight SFNSW Management Areas lie partially within the DRP (Table 1.6, Map 8). The Walgett Management Area covers the largest percentage of the DRP (41%).

Table 1.6 SFNSW administrative boundaries within the DRP

SF Management Area	Area intersecting DRP (ha)	% SF Management Area	% DRP
Walgett	3 828 033	99%	41%
Pilliga	1 728 155	44%	19%
Unincorporated	1 214 062	7%	13%
Dubbo	1 070 150	35%	12%
Gilgandra	943 077	65%	10%
Mildura	302 673	3%	3%
Inverell	119 265	6%	1%
Forbes	30 618	1%	0.3%
Condobolin	20 053	0.4%	0.2%

Rural Lands Protection Boards administrative boundaries

Sixteen Rural Lands Protection Boards (RLPBs) intersect the DRP, with the Walgett RLPB covering 27% of the DRP (Table 1.7, Map 10). Other RLPBs that are mostly within the DRP are Brewarrina, Coonamble and Moree.

Table 1.7 RLPBs within DRP

RLPB	Area intersecting DRP (ha)	% RLPB	%DRP
Walgett	2 471 851	96%	27%
Brewarrina	1 293 744	87%	14%
Coonamble	1 121 902	99%	12%
Moree	1 010 819	63%	11%
Nyngan	798 382	45%	9%
Dubbo	538 118	31%	6%
Wilcannia	515 072	11%	6%
Bourke	506 480	13%	5%
Broken Hill	339 875	8%	4%
Narrabri	299 695	24%	3%
Cobar	142 876	4%	2%
Warialda	128 837	10%	1%
Coonabarabran	49 447	4%	1%
Molong	18 836	2%	0.2%
Condobolin	16 871	1%	0.2%
Wentworth	539	0.02%	0.01%

Regional Vegetation Committees administrative boundaries

Of the seven Regional Vegetation Committees (RVCs) which cover portions of the DRP, the Lower Macquarie - Castlereagh and Walgett RVCs cover the largest land area within the bioregion (50%) as indicated in Table 1.8 and Map 11.

Table 1.8 RVCs within the DRP

RVC	Area intersecting DRP (ha)	% RVC	% DRP
Lower Macquarie – Castlereagh	2 470 760	72%	27%
Walgett	2 162 767	97%	23%
Brewarrina	1 400 409	73%	15%
Moree	1 120 193	63%	12%
Nth Lachlan – Bogan	301 993	13%	3%
Narrabri – Coonabarabran – Coolah	298 615	12%	3%
Mid – Lachlan	18 948	1%	0.2%

Water Management Committee administrative boundaries

Water management committees established under the *Water Management Act, 2000* whose coverages fall within the DRP are listed in Table 1.9.

Table 1.9 Water Management Committees within the DRP

(DLWC 2001a)

Water Management Committee
Gwydir River (Regulated) River Management Committee
Namoi Regulated River Management Committee
Gwydir Unregulated River Management Committee
Namoi Unregulated River Management Committee
Macquarie – Cudgeon (Regulated) River Management Committee
Central West (Unregulated) River Management Committee
Barwon-Darling River Management Committee
Great Artesian Basin Groundwater Management Committee
Gwydir Groundwater Management Committee
Macquarie Groundwater Management Committee
Namoi Groundwater Management Committee
Border Rivers Unregulated River and Groundwater Management Committee

Catchment Management Board administrative boundaries

Six Catchment Management Boards (CMBs) have jurisdiction over sections of the DRP (Table 1.10, Map 12) with Central West and Western CMBs covering 72% of the DRP. All CMBs within NSW are preparing Catchment Management Plans or Blueprints.

Table 1.10 CMBs within the DRP

CMB	Area intersecting DRP (ha)	% CMB	% DRP
Central West	3 563 432	39%	38%
Western	3 190 730	14%	34%
Gwydir	910 366	34%	10%
Namoi	779 814	19%	8%
Border Rivers	522 455	22%	6%
Lower Murray Darling	271 354	4%	4%

Local Government boundaries

The DRP is divided between 18 Local Government areas, covering 99% of the bioregion (Table 1.11, Map 13). The remaining 1% of the DRP is not under the jurisdiction of any local Government and is shown as unincorporated.

Table 1.11 Local Government areas which intersect the DRP

LGA	Area intersecting DRP (ha)	% LGA	% DRP
Walgett	2 162 767	97%	23%
Brewarrina	1 400 409	73%	15%
Moree Plains	1 120 193	63%	12%
Warren	1 069 140	100%	12%
Coonamble	908 063	91%	10%
Central Darling	753 005	14%	8%
Bourke	458 674	11%	5%
Narromine	358 423	68%	4%
Narrabri	296 398	23%	3%
Bogan	284 772	20%	3%
Cobar	143 013	3%	2%
Gilgandra	135 135	28%	1%
Unincorporated area	103 325	1%	1%
Parkes	18 948	3%	0.2%
Lachlan	17 221	1%	0.2%
Inverell	14 200	2%	0.2%
Yallaroi	9 576	2%	0.1%
Coonabarabran	2 217	0.3%	0.02%
Wentworth	752	0.03%	0.01%

Local Aboriginal Land Council administrative boundaries

Aboriginal Land Council boundaries within the DRP are shown on Map 5. Twenty-seven Aboriginal Land Councils (ALC) and an unincorporated area exist within the DRP. Local ALCs that cover the largest sections of the DRP are Walgett, Brewarrina, Collarenebri, Quambone and Coonamble (Table 1.12), covering 39% of the DRP. Collarenebri, Quambone, Lightning Ridge, Trangie, Warren-Macquarie and Goodooga LALCs all fall entirely within the DRP.

Table 1.12 Aboriginal Land Councils within the DRP

ALC	Area intersecting DRP (ha)	%ALC	%DRP
Walgett	1127 695	93.6%	12%
Brewarrina	881 442	89.5%	10%
Collarenebri	847 748	100.0%	9%
Quambone	765 698	100.0%	8%
Coonamble	732 096	96.1%	8%
Lightning Ridge	498 545	100.0%	5%
Mungindi	484 517	98.4%	5%
Wilcannia	473 773	13.2%	5%
Menindee	456 183	20.1%	5%
Warren-Macquarie	436 320	99.6%	5%
Nyngan	294 483	18.8%	3%
Goodooga	274 486	99.9%	3%
Nulla Nulla	262 499	21.4%	3%
Wee Waa	261646	73.1%	3%
Weilmoringle	219 042	49.8%	2%
Winbar	203 898	17.6%	2%
Toomelah	189 855	20.9%	2%
Peak Hill	170 015	17.4%	2%
Moree	141 622	14.1%	2%
Gilgandra	110 141	16.2%	1%
Trangie	109 059	100.0%	1%
Unincorporated	86 495	3.5%	1%
Narromine	71 737	43.7%	1%
Pilliga	16 858	4.9%	0.2%
Narrabri	13 750	2.7%	0.1%
Murrawari	13 509	1.7%	0.1%
Condobolin	13 002	0.8%	0.1%
Coonabarabran	755	0.1%	0.01%

2 ABIOTIC FEATURES

2.1 INTRODUCTION

In this section the climate, geology, topography, soils and hydrology of the DRP are described to provide a basis for mapping and predicting the distribution and stability of plant communities, habitats and species distributions. Predictive distributions are essential as survey cannot cover the entire land surface. This bioregion is strongly influenced by water systems and the hydrological parameters are crucial in the biological assessment of the region.

The effect of human activities, particularly clearing and agricultural activities also need to be understood in order to assess the changes to plant and animal distribution patterns, population viability and provenance, water quality and the conservation protocols required. Activities within the DRP can have an impact on flora and fauna outside the bioregion, for example, the disruption of migration routes for migratory vertebrate species or the loss of migratory invertebrate species through control of larval stages in agricultural areas. Activities within the DRP can also impact on downstream riverine health, water supply and water quality.

Consideration of abiotic factors is important in the development of a meaningful subdivision of the Bioregion into smaller, manageable units. Boundaries previously defined within the DRP are outlined in this section.

2.2 CLIMATE

Almost all of the DRP lies within the semi-arid zone of New South Wales, except for a small portion of the eastern edge that extends into the temperate zone. The semi-arid zone covers an extensive area and in order to evaluate the climatic influence on the ecological processes of that area the climatic data for six meteorological stations across the bioregion are used in the following analysis (Table 2.1, Australian Meteorological Bureau).

Table 2.1 DRP meteorological stations used in this analysis

Town	Location within DRP	Latitude	Longitude	Elevation (m)	Years of records
Moree	north-east	29.50 S	149.90 E	207	86
Mungindi	northern NSW border	28.98 S	148.99 E	160	113
Walgett	central	30.04 S	148.12 E	133	121
Trangie	south-east boundary	32.03 S	147.98 E	219	102
Bourke	north-west at the beginning of the Darling corridor	30.09 S	145.94 E	106	129
Menindee	south-western on the Darling River corridor	32.40 S	142.42 E	61	124

Variation in temperature and rainfall across the bioregion has also been modelled from the digital elevation model. The mapping shows that the variation in climatic variables is not affected by variation in local relief.

2.2.1 Rainfall: temporal and spatial variation

Most of the bioregion occurs within the summer rainfall region of New South Wales, with higher and more reliable rainfalls occurring in the east. The mean monthly rainfall ranges from about 60 mm in the east of the bioregion to 15 mm in the west and along most of the Darling River (Map 14). At the six meteorological stations, mean annual rainfall ranges from 578.6 mm at Moree to 508.3 mm at Mungindi, 504.8 mm at Trangie, 477.8 mm at Walgett, 355.1 mm at Bourke and 243.7 mm at Menindee (Bureau of Meteorology 2001). These mean values, however, mask the fact that the rainfall in the bioregion is highly variable in frequency and intensity and is generally unreliable. There are occasional periods of intense rainfall, which are often the products of deep extra-tropical depressions. Large portions of the bioregion also experience prolonged periods of no rainfall.

The annual rainfall recorded at Bourke from 1871, graphed on Figure 2.1, illustrates this variability, with annual total rainfall ranging from about 80mm to 850mm. This variability is also demonstrated by the mean and first and ninth deciles calculated for the Bourke's monthly rainfall averages (Figure 2.2). The first decile is the rainfall amount not exceeded by the lowest 10% of rainfall events. The ninth decile is the rainfall amount exceeded by the highest 10% of rainfall events. The first and ninth decile are measured to give the 'normal' rainfall range (that which 80% of all rainfall events falls within). The rainfall at Mungindi in the north east of the bioregion has a more definite summer pattern with January and February being the wettest months. The range between the first and ninth deciles is also greatest for those months (Figure 2.3). This contrasts with Menindee in the southwest (Figure 2.4) and Trangie in the southeast (Figure 2.5) where there is no evidence of summer dominance in the rainfall although the range between the first and ninth deciles is greatest in December and January. Monthly means and ranges, which illustrate the degree of rainfall variability, have also been calculated for Walgett in the centre of the bioregion (Figure 2.6). The distribution and intensity of rainfall is also illustrated by median monthly rainfall (Figure 2.7) and mean monthly rain days (Figure 2.8) (Bureau of Meteorology 2001).

Mean monthly rainfall and mean monthly rainfall graphs for each of these weather stations across the DRP are shown in Appendix A.

Bourke mean annual rainfall

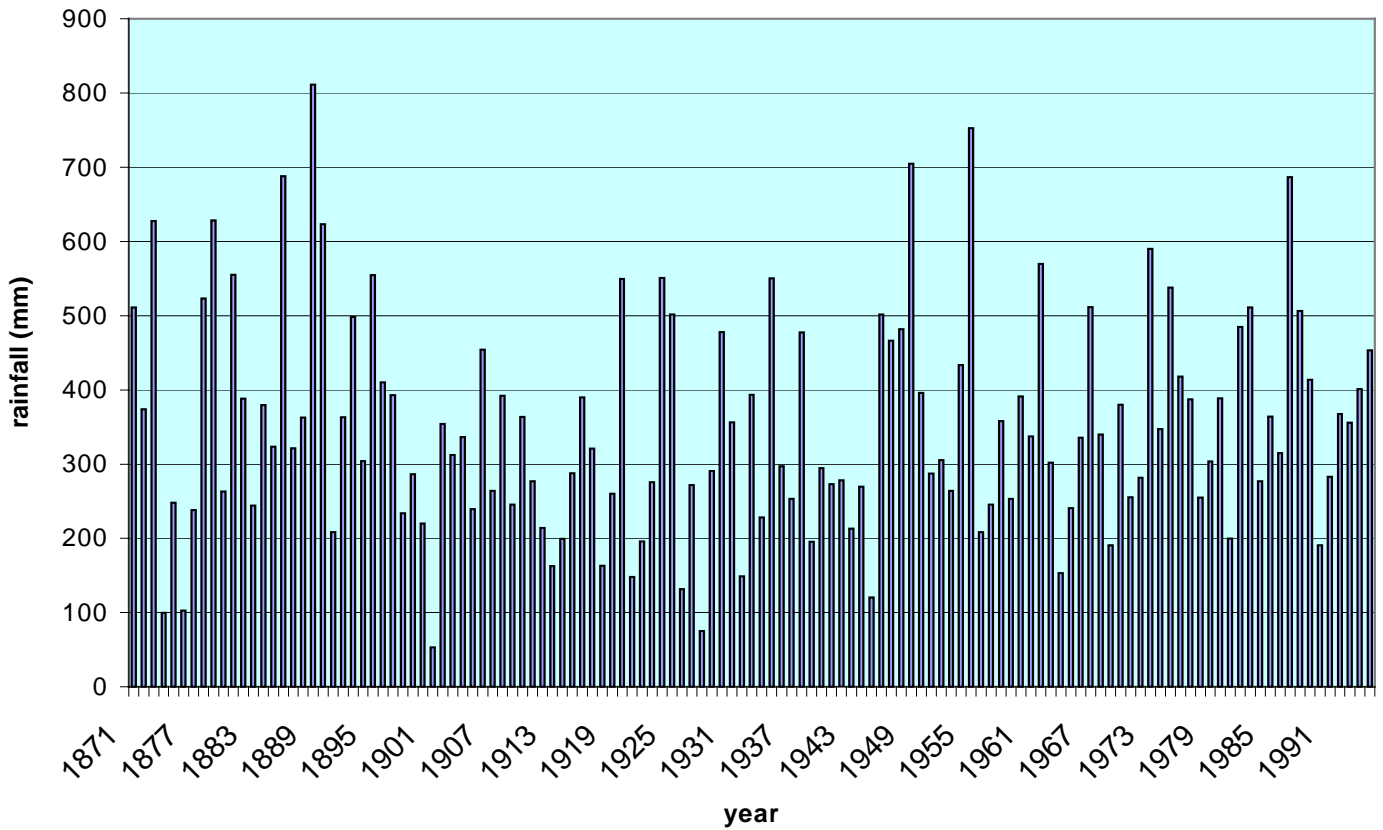


Figure 2.1 Annual rainfall records for Bourke 1871-1999

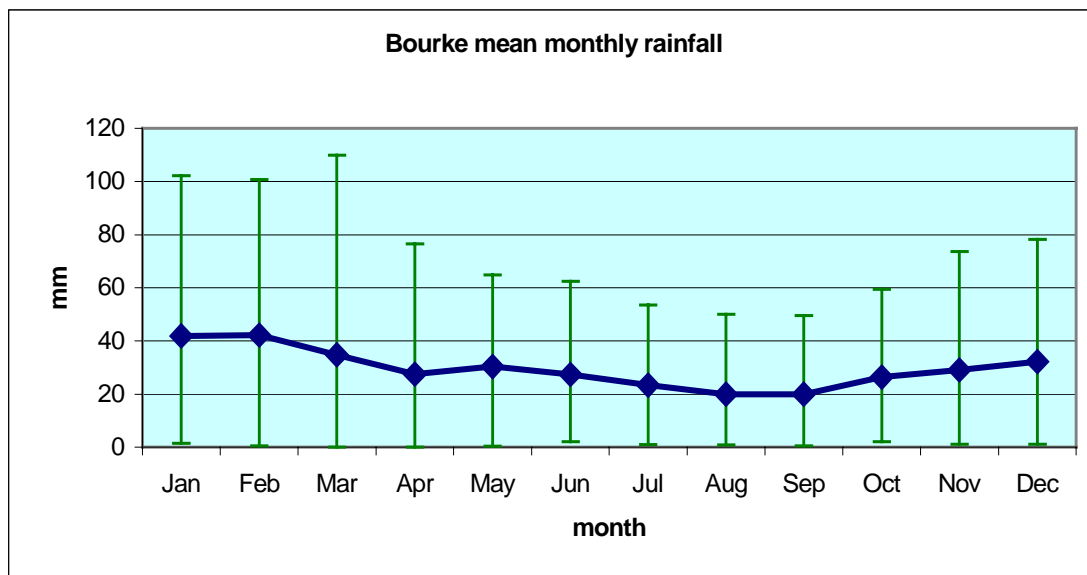


Figure 2.2 Bourke mean monthly rainfall and range between first and ninth decile
(Bureau of Meteorology 2001)

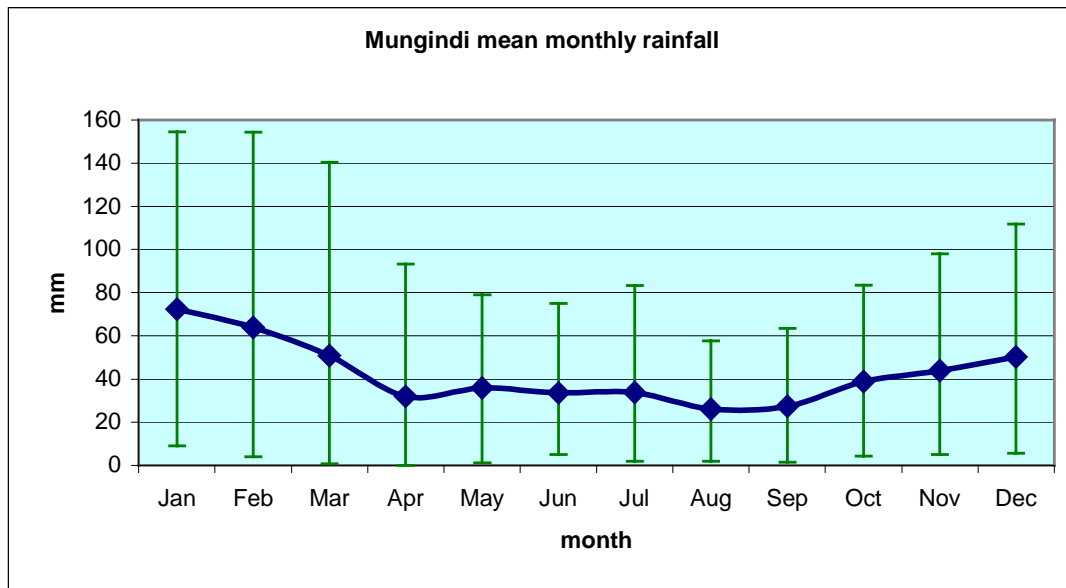


Figure 2.3 Mungindi mean monthly rainfall and range between first and ninth decile (Bureau of Meteorology 2001)

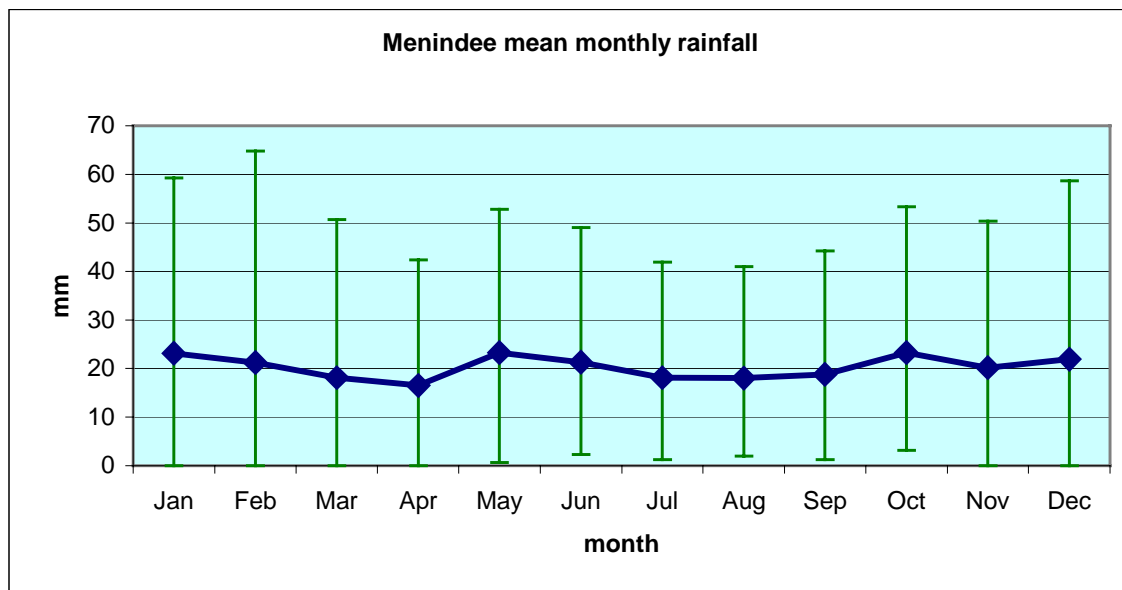


Figure 2.4 Menindee mean monthly rainfall and range between first and ninth decile (Bureau of Meteorology 2001)

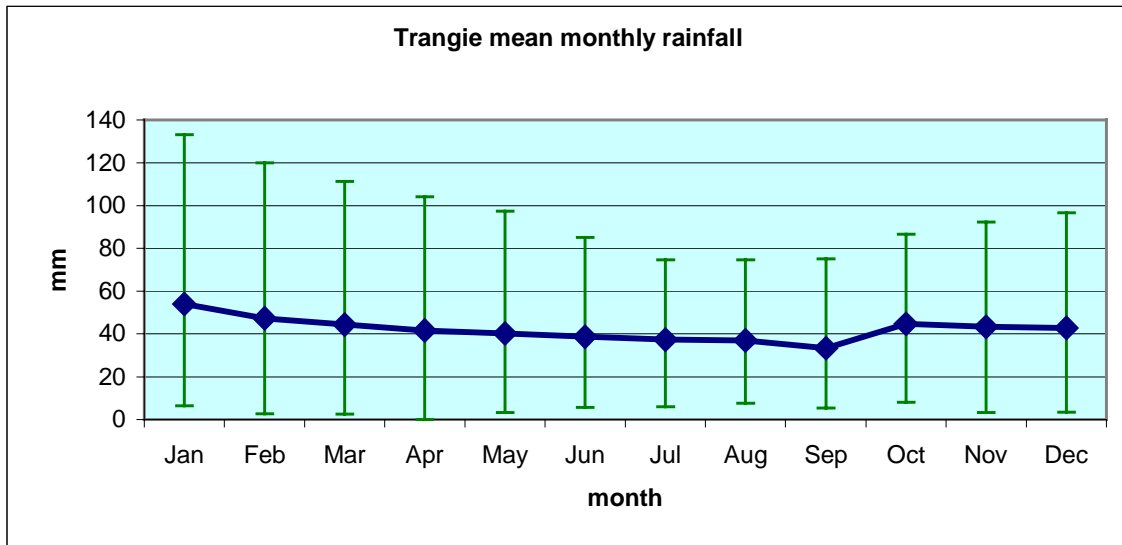


Figure 2.5 Trangie mean monthly rainfall and range between first and ninth decile
(Bureau of Meteorology 2001)

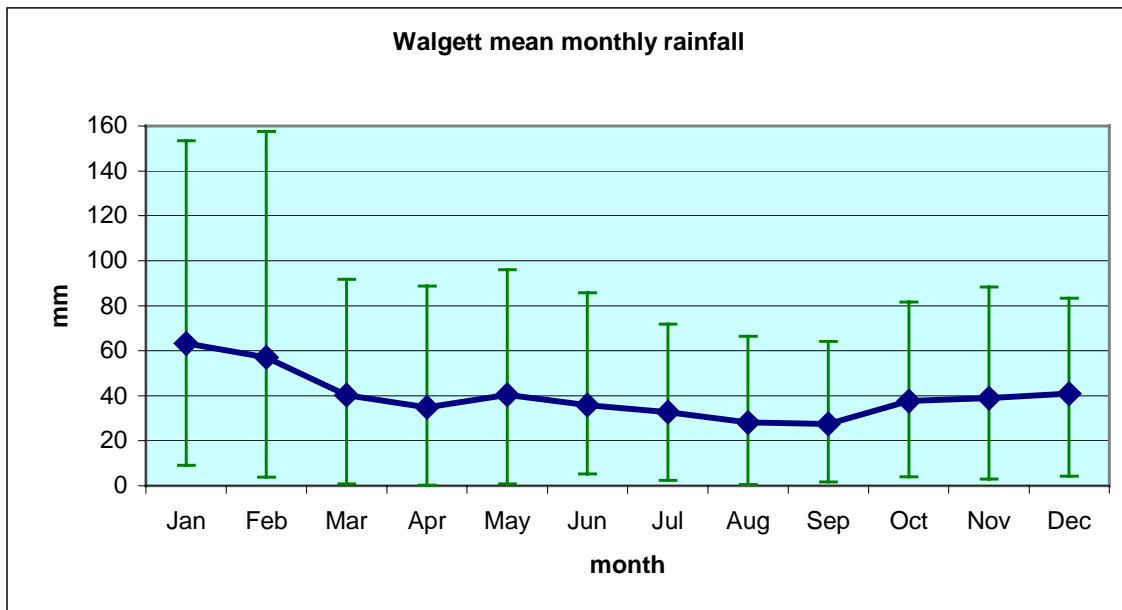


Figure 2.6 Walgett mean monthly rainfall and range between first and ninth decile
(Bureau of Meteorology 2001)

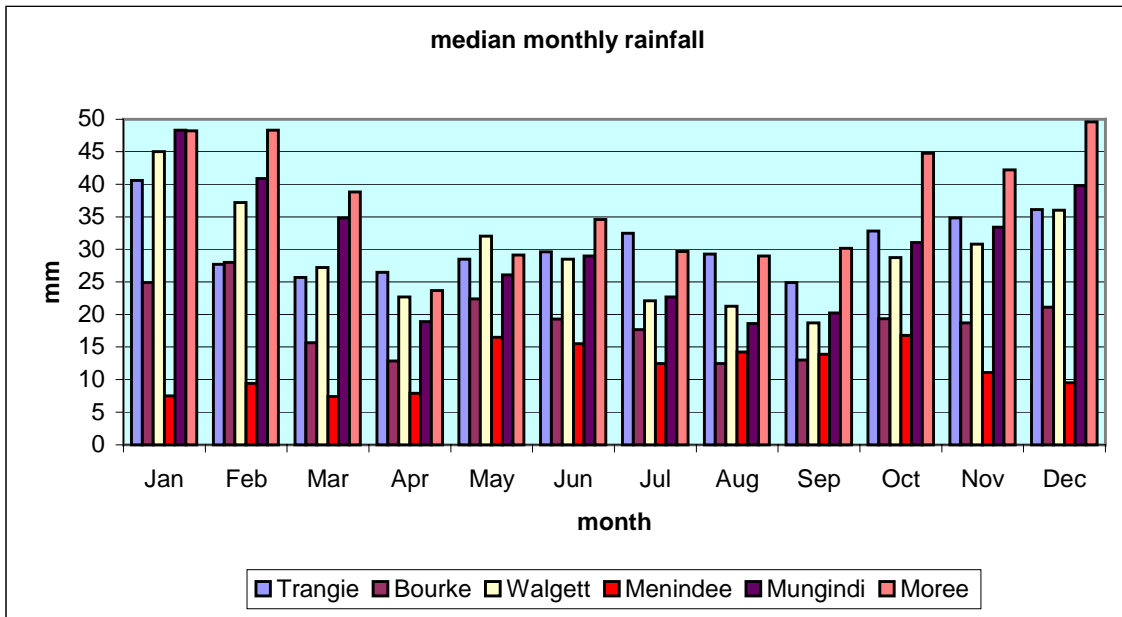


Figure 2.7 Median monthly rainfall for weather stations across the DRP
(Bureau of Meteorology 2001)

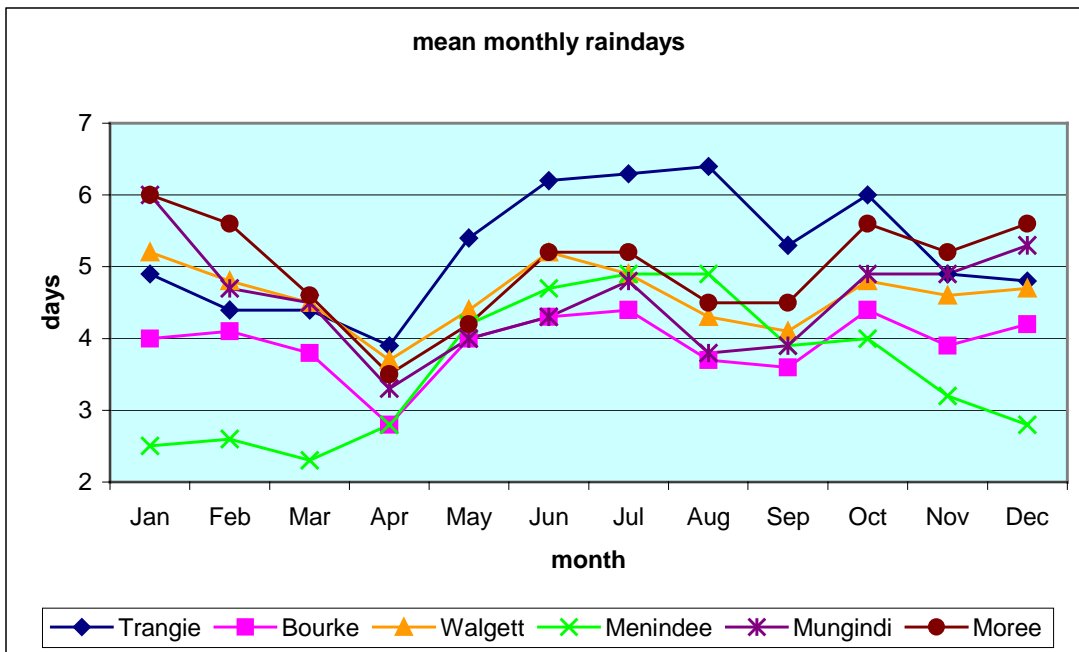


Figure 2.8 Mean monthly rain days recorded across the DRP
(Bureau of Meteorology 2001)

Long term rainfall variation

Trends in available moisture resulting from the annual variation in rainfall are determined by calculating the Cusum (cumulative residual mass) curves for Menindee, Mungindi, Trangie, Walgett and Bourke. These curves (Figure 2.9) indicate that the rainfall was high throughout the 1880s and 1890s but there was a steady decrease from about 1900 until 1948 with a resultant moisture deficit throughout the bioregion. The severity and timing of this deficit varied between the five locations. Since about 1950, the moisture availability generally shows an upward trend although this was delayed until 1974 at Menindee and was not sustained at Trangie from 1960 to 1974.

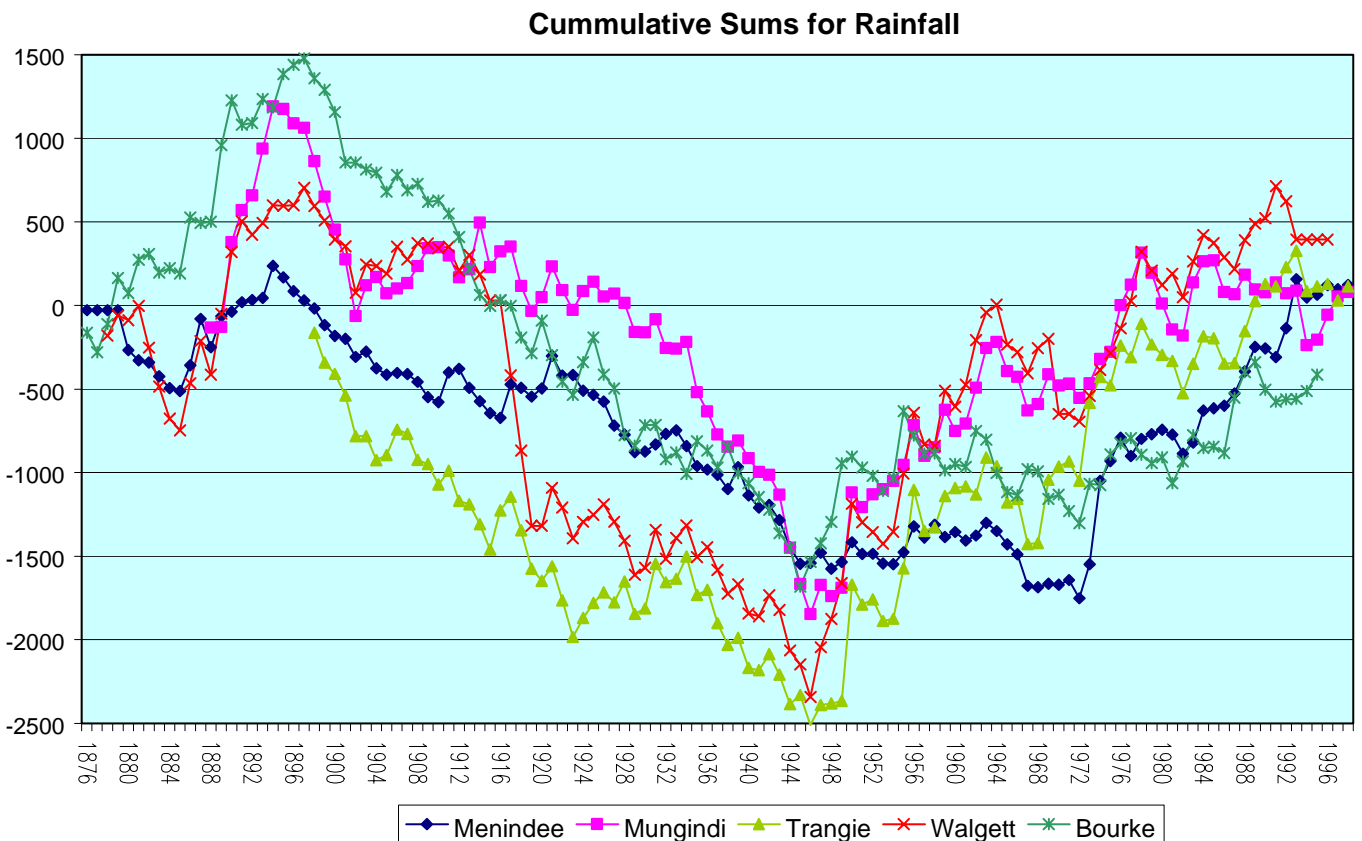


Figure 2.9 Rainfall CuSums for five locations in the DRP

The rainfall within the DRP does not have a regular annual cycle and plant growth and animal breeding patterns will be controlled by this long term pattern. This will influence the recovery rates of particular habitats and populations, with the current upward trend in the rainfall suggesting that conditions are favourable for potential re-establishment and recovery of populations. This may help explain the increased growth of the unpalatable native shrubs or 'woody weeds' in parts of the bioregion.

2.2.2 Winds

Wind has a strong influence on rainfall and the degree of erosion that occurs in the area. Nyngan is subjected to dominant southerly winds and subdominant north-easterlies in January with a modal speed of 11 to 20 km/hr. This changes to dominant southerlies of between six and 10 km/hr in winter. At Walgett, north-easterlies are dominant in summer with modal speeds of one to five km/hr, while in winter this changes to light southerlies and south-westerlies (Wolfgang 1998).

Figure 2.10 below shows that the mean monthly wind speed at 9am at Walgett, Menindee, Bourke and Mungindi varies from 13.1 km/hr at Menindee to 7.1 km/hr at Mungindi in December and from 7.4 km/hr at Menindee to 3.5 km/hr at Mungindi in June. Wind speeds of the DRP are greatest, on average, in the spring months at all stations, and lowest in the winter months at all stations. Only the weather stations with long term data have been included in Figures 2.10 and 2.11 (Bureau of Meteorology 2001).

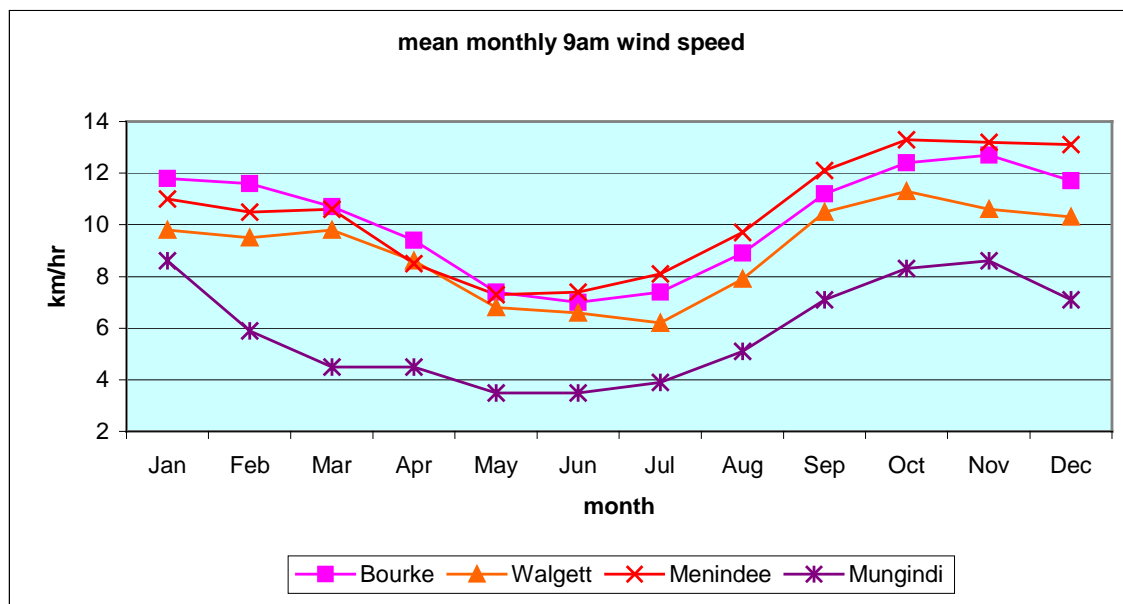


Figure 2.10 Mean monthly wind speed at 9am

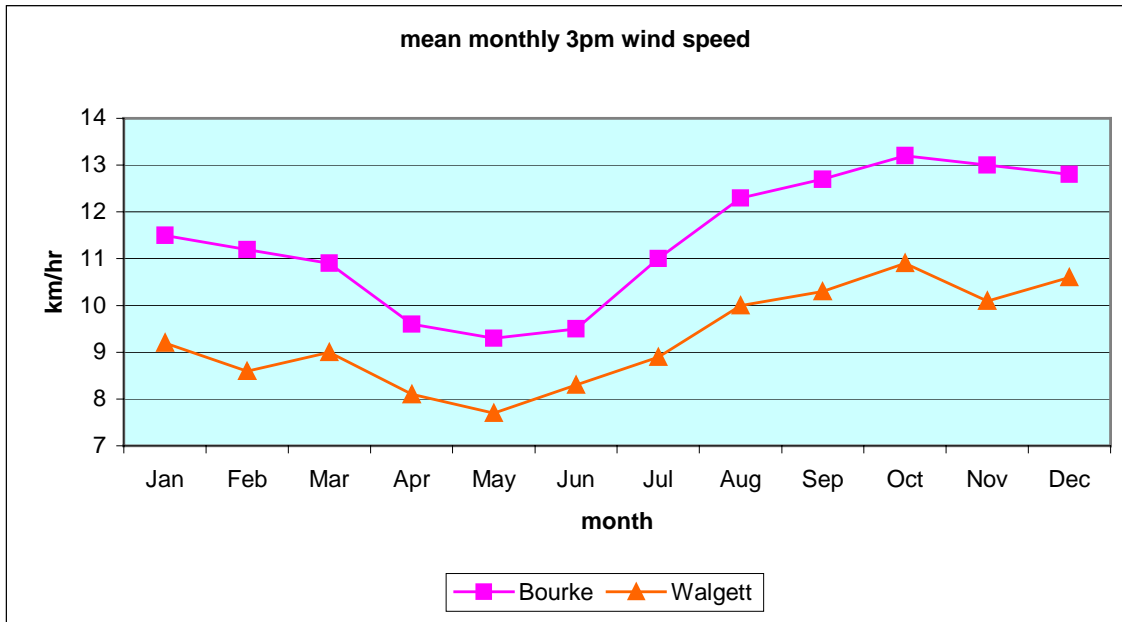


Figure 2.11 Mean monthly wind speed at 3pm

2.2.3 Temperature and evaporation

In general terms the summers are mild to hot and winters mild to cool. Across the bioregion the average annual temperatures increase from 17°C in the south east to 20°C in the northwest. Most of the bioregion has an annual average temperature of 18 or 19°C (Map 15). The average mean maximum temperature in January ranges from 33°C to 36°C and the average mean minimum temperature in July ranges from 3°C to 6°C (Bureau of Meteorology 2001). The mean monthly maximum and mean monthly minimum temperatures are illustrated in Figure 2.12 and Figure 2.13.

Average annual potential evaporation varies from 1 800 mm east of Trangie to 2 000 mm west of Bourke (Wolfgang 1998). Total average annual evaporation figures range from 2 131 mm at Moree to 1 825 mm at Bourke. Mean daily evaporation has been recorded for the Bourke and Walgett weather stations within the DRP. These figures are graphed in Figure 2.14 and range from 1.7mm at Walgett in June to 8.5 mm at Bourke in December (Bureau of Meteorology 2001).

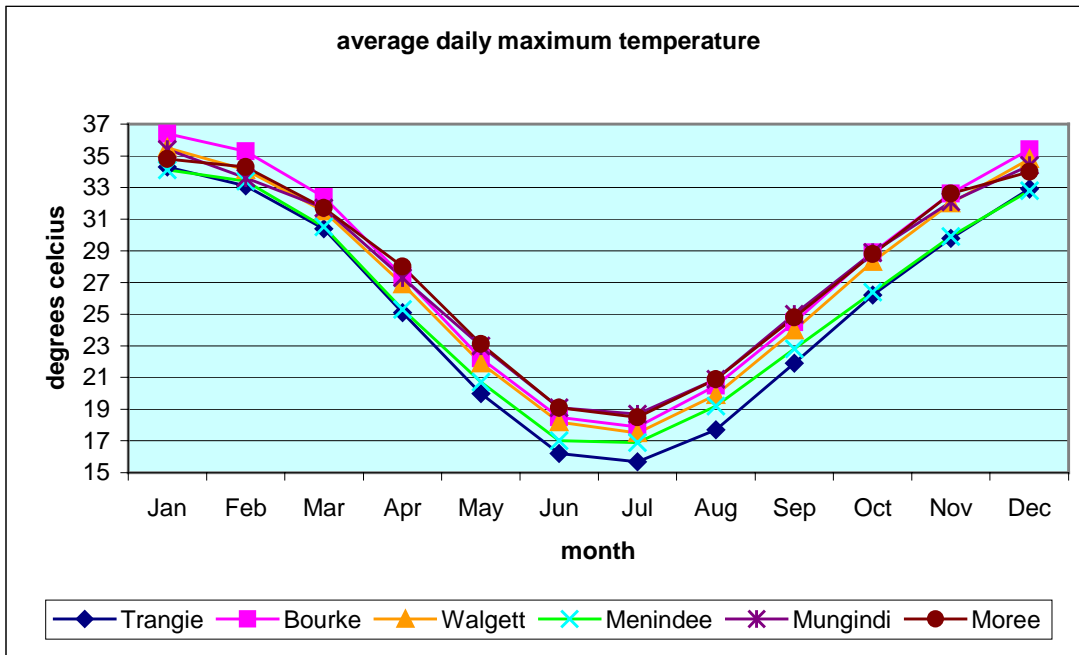


Figure 2.12 Mean monthly maximum temperatures

(Bureau of Meteorology 2001)

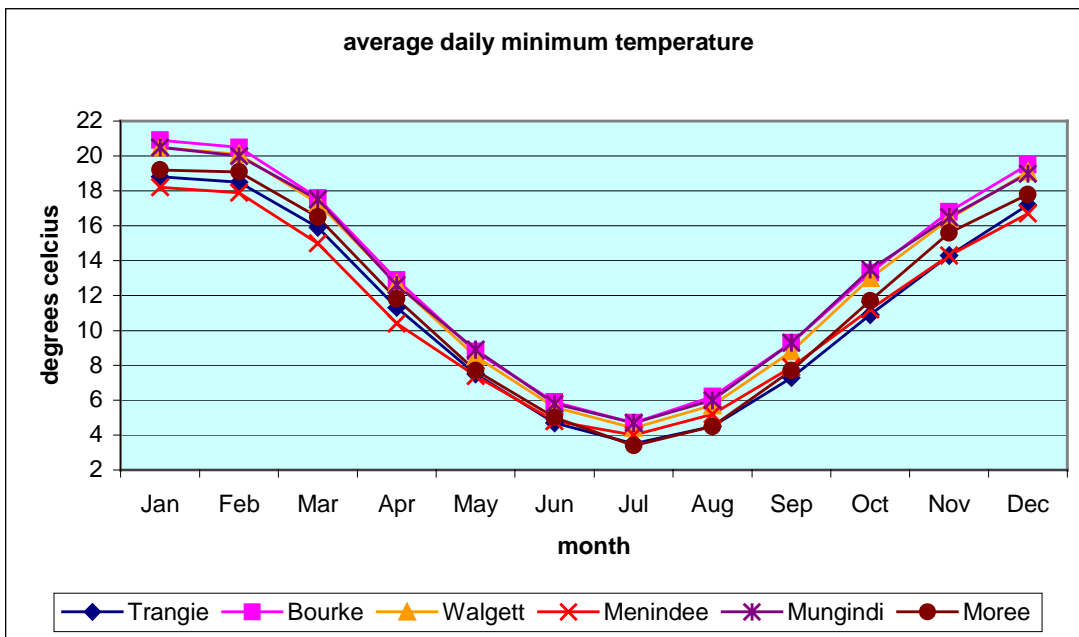


Figure 2.13 Mean monthly minimum temperatures

(Bureau of Meteorology 2001)

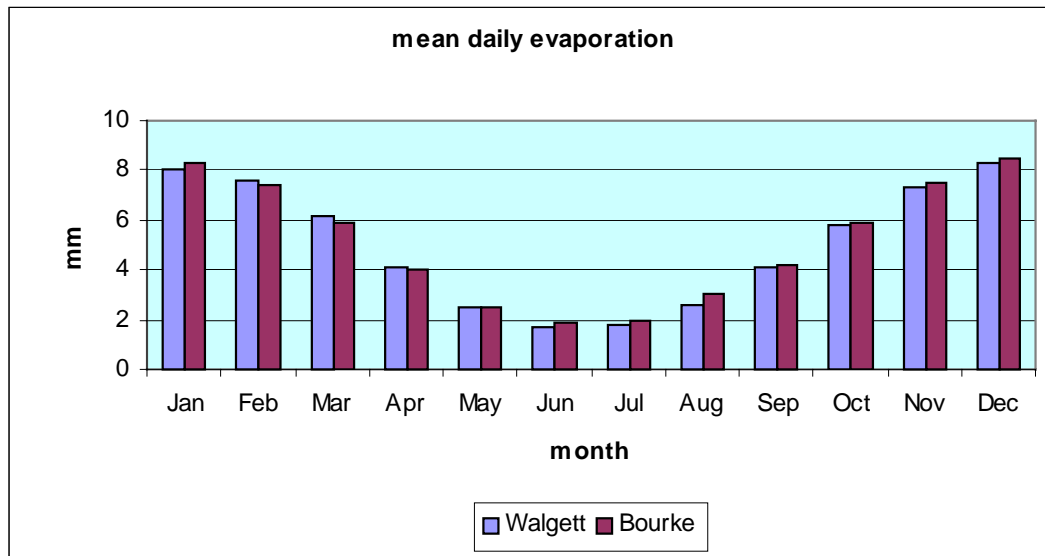


Figure 2.14 Mean daily evaporation at Walgett and Bourke

(Bureau of Meteorology 2001)

2.3 GEOLOGY, TOPOGRAPHY AND SOILS

2.3.1 Geological history

The underlying lithology of the bioregion is almost entirely formed from transported sediments. Cainozoic (Quaternary) alluvium is found in 87% of the area and the Cainozoic lacustrine sediments and Cainozoic residual and aeolian sands are present in another 10% of the region. The lacustrine sediments are found along the lower reaches of the Macquarie and Castlereagh Rivers, and the aeolian sands are along the lower reaches of the Darling River with large areas associated with the Menindee overflow lakes. The broad lithology of the bioregion has been mapped (Map 16) and there has also been more detailed geological mapping of some portions of the bioregion.

The Great Artesian Basin underlies the DRP bioregion, and this is divided into a series of smaller basins including the Surat and Euromanga Basins. The Great Artesian Basin consists of extensive Quaternary alluvial deposits associated with the Darling River. In a broader context, the entire Barwon-Darling basin can be described as a large intercratonic Cainozoic basin, which has been infilled with sediments derived mainly from continental alluvium (Thoms *et al.* 1995).

In two areas the lithology reflects the underlying geology. In the north of the bioregion the coarse grained Cretaceous Surat Basin sandstone has not been covered by the more recent alluvium, forming the Lightning Ridge and the Collarenebri Interfluves. In areas of rolling downs and lowlands between the Culgoa and Barwon Rivers there are ridges and residuals of various rock types including conglomerate, sandstone, claystone, shale, siltstone, quartzite and granite.

The geological history of the Walgett and Nyngan 1:250 000 map sheets, covering an area from Walgett in the north, south to Trangie, west to Girilambone and east to Coonamble, has

been mapped and the formations are illustrated on Figure 2.15 (Watkins & Meakin 1996). The geological history and stratigraphy of the Macquarie-Bogan catchment is also described by Wolfgang (1998) and geological framework studies have been carried out in the Bourke region (Thoms *et al.* 1995).

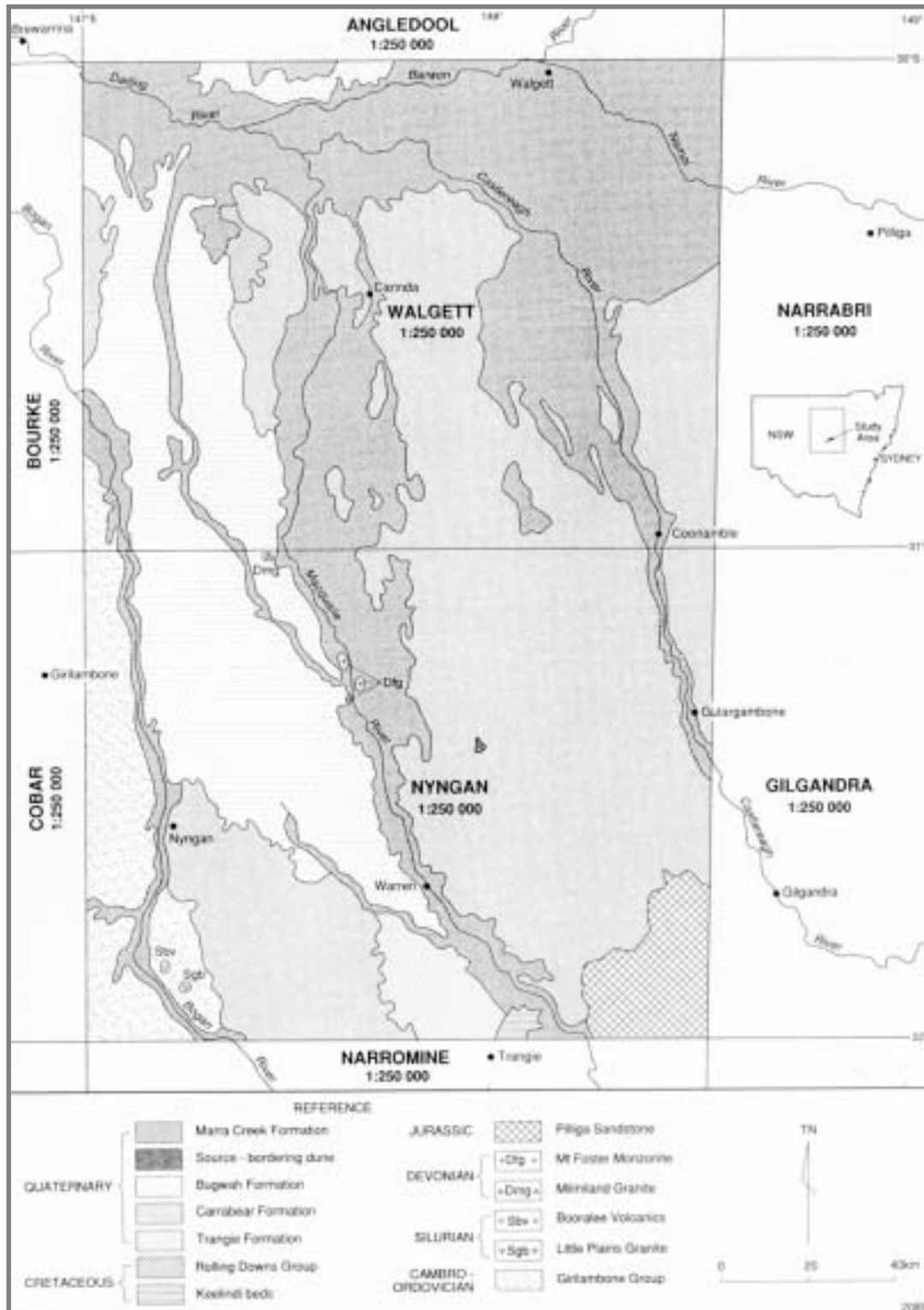


Figure 2.14 Geological history of the Nyngan and Walgett 1:250 000 map sheets (Watkins & Meakin 1996)

2.3.2 Topography and geomorphology

The alluvial deposits form extensive plains with slopes to the west and south of less than one degree and local relief rarely exceeds a few metres. The relief of the bioregion varies from 40m above sea level (asl) in the southwest to 300m asl in the east. A digital elevation model (DEM) for the bioregion has been developed using two different levels of resolution (Map 17). The coverage of the eastern third of the bioregion is at a 25 m grid size while the remainder is at 250 m. It would be preferable if the western portion was mapped at a finer resolution but this will not occur in the timeframe of this bioregional assessment.

While more detailed modelling is desirable, its value would be limited by the generally low relief and little variation in elevation within the bioregion. Minor relief may be locally important (run on and run off areas), but these subtle changes may not be detected even at a 25 m grid resolution. The Narrabri-Lightning Ridge and Collarenebri Interfluvial provinces (see Section 2.6) are the areas most likely to benefit from more detailed modelling.

The present day alluvial landscape of the bioregion is dominated by abandoned quaternary river systems, which are slightly higher than the modern river systems. Since the Pliocene (2-5 million years ago) the lower reaches of the tributaries of the Darling system have built outwash fans from material eroded from the eastern highlands. Watkins and Meakin (1996) defined four fluvial units in the alluvial landscape of the Nyngan and Walgett sheets: the Trangie formation, Carrabear formation, Bugwah formation and Marra Creek formation. The low hill lands adjacent to the riverine plain contain erosional surfaces of pre-Cainozoic rock blanketed by Quaternary residual and colluvial deposits.

As a part of the Smith *et al.* (1998) report on the fauna of the northern floodplains, nine landforms were defined and four of these are present in the DRP. These are:

- Alluvial plains and floodplains – permanent and temporary streams with channels to 15 m deep, alluvial plains with minor drainage lines and swamps, some small elevated areas (to 3 m), extensive scalds, some pans, dunes to 10 m, some dunes and rises in channel loops;
- Playas and basins – small to very large lakes, channels and floodouts, playas (shallow closed depressions occasionally filled with water), salt lakes, claypans and swamp basins, feeder channels, levees, lunettes to 10 m, low lying back plains;
- Rolling downs and lowlands – undulating or low rounded ridges and some higher remnant hills, broad to narrow drainage lines, rounded pans to 1 km wide, relief to 20 m; and
- Plains – deposited sediments with many small drainage sinks, broken drainage lines, floodouts, swamps, floodplains and sandplains, some lunettes, relief to 3 m.

Additional landforms occur in the portion of the DRP outside of the northern floodplains study area. Some are described within the descriptions of provinces and land units (Section 2.6).

2.3.3 Soils

The soils of the DRP have been mapped at a broad scale resolution (1:2 000 000) by DLWC. The mapping, current to 1988 (Map 18), shows the spatial arrangement of 10 broad soil groupings.

Grey, brown and black cracking clay soils cover the 70% of the bioregion in the lower lying plains and depressions. The areas of higher elevation result from prior stream deposits with

coarse red sediments deposited as levees during periods of high flow. This has produced the texture contrast soils, which have a well-drained coarser surface soil over red clays. Severe scalding is common on these soils that have been extensively and often heavily grazed. Scalding results from loss of the surface soils exposing the underlying red clays.

Deep red earths have formed on coarse-grained sediments in two areas in the north of the region and calcareous red and yellow earths have formed from the aeolian sands in the west. In the northern floodplains study (Smith *et al.* 1998) in the north west of the bioregion, soils were described as:

- water deposited sediments on the alluvial plains and floodplains - mostly cracking clays, often deep and sometimes crabholey, areas of texture contrast soils (often on rises), non-cracking clays on elevated areas, sands and sandy-earth on dunes;
- water deposited sediments on playas and basins - brown and grey cracking clays (heavy in lakes, more compact in channels and floodouts, saline in playas), often surrounded by red country;
- shallow to deep soils, often loamy and red, on rolling downs and lowlands - may be gritty or gravelly especially on upper slopes, grade into sandy red earths in drainage lines, clays in lakes and pans; and
- water-deposited sediments including moderate to deep red earths on plains - red-brown texture contrast soils, and grey or brown clays (non-cracking, cracking or gilgaied).

The Macquarie catchment and marshes generally have rich alluvial soils but they vary between high quality soils from basic parent rocks and poorer soils formed from the more acid granite materials. The soils are highly weathered and leached of the soluble nutrients and the brown to red-brown subsoil also contains concretions (Wolfgang 1998).

2.4 HYDROLOGY

2.4.1 Surface waters: rivers, catchments and wetlands

The DRP bioregion contains the Darling River, its tributaries and their catchments. Each of these catchments has unique flooding patterns and depositional characteristics and many rainfall events affecting these rivers originate outside the bioregion. Map 19 and Map 20 show the rivers, major wetlands, floodplains and catchments within the Barwon-Darling basin.

Three broad river reaches can be identified along the Barwon-Darling River system within New South Wales (Map 19). The river between Mungindi and Walgett is largely influenced by, and constrained within, the Cobar structural 'lineament'. From Walgett to Bourke it is not constrained by any structural 'lineaments' but is influenced by the mega scale alluvial fan morphology of the Gwydir, Namoi and Macquarie River systems. South from Bourke the river is again constrained by a structural 'lineament' - the Darling 'lineament' which continues into the Murray River basin (Lloyd *et al.* 1994).

Rivers

The Namoi, Gwydir, MacIntyre Rivers (and associated rivers) rise in the Great Dividing Range (North East Tablelands Bioregion) and flow across the Nandewar Bioregion. Relatively high and reliable summer rainfalls feed these waterways. The Macquarie River also originates in reliable rainfall regions of the Great Dividing Range and flows into the DRP

from the South Eastern Highlands, Brigalow Belt South and South Western Slopes Bioregions. These rivers are predominantly fed by winter rainfall and flooding is more likely to occur in winter-spring.

Under a natural flow regime, the Barwon-Darling system receives an average of 35% of its water from the border rivers (MacIntyre, Dumaresq, and Boomi), 25% from the Namoi River, 20% from the Condamine-Culgoa, 5% from the Macquarie-Bogan and 10% from the Gwydir. Modelling by DLWC has estimated that flows from the Namoi have been reduced by 70%, from the Condamine-Culgoa by 45% and from the Border Rivers by 45%. Total irrigation diversions from the Barwon-Darling system and tributaries exceed the natural median flow at Menindee (Thoms *et al.* 1995).

The highly variable rainfall within the bioregion is reflected by flow variability, a feature of the Darling-Barwon system. Annual variations in flow range from 0.04% to 911% of the long-term mean, and discharges from the major rivers in the basin are highly skewed with a large proportion of average flows being recorded in very wet years and during major floods. This river system mostly floods in summer but flow is intermittent downstream of Louth (Lloyd *et al.* 1994). The Macquarie River has the most variable flow of 18 selected rivers in the Murray-Darling Basin. Annual flows vary from 2% to 940% of the mean, and only about one third of the flow entering the Macquarie Marshes flows through to the end of the system, except during floods (Kingsford & Thomas 1995; DWR 1991).

Flooding is an important natural process that replenishes the floodplain with water and allows the large scale cycling of nutrients and biota. Inundation of the floodplain boosts invertebrate populations, breeding activity in waterbirds and fish, initiates growth and regeneration of riverine vegetation and creates extensive areas for colonisation by aquatic plants. Floodplains generally contain a mosaic of habitats ranging from those that are permanently wet to those that are rarely inundated. These all have different defining attributes and support distinctive communities. They are critical habitats for the biota in the floodplain and rivers (Lloyd *et al.* 1994).

Flood behaviour in the Barwon-Darling is complex with no two floods being the same and with a variety of localised forms of flooding. The relative contribution of the tributaries to this river system varies between floods. Mostly, the largest inflow is from the Namoi River but in the 1990 floods, the greatest inflow was from the Bogan River (most of this water was carried overland to the Bogan from the Macquarie River in the flood period). The Castlereagh River carries the Namoi and Barwon overflows as well as runoff from its own catchment to the Macquarie that then flows into the Barwon River. In 1998 extensive floodplain inundation occurred along the Darling between the Bogan and Warrego River junctions (DLWC 1999).

Wetlands

There are 4 810 defined wetlands covering 533 439 hectares in the DRP (Table 2.2). Wetlands are highly significant for the maintenance of biodiversity, regularly supporting significant breeding populations of waterbirds. They are also important refuges when drought occurs in other parts of arid and semi-arid Australia (Pressey, 1988). Parts of three wetlands within the DRP have been recognised by the Convention of Wetlands of International Importance (Ramsar Convention): the Gwydir wetlands west of Moree (Gingham watercourse and Lower Gwydir wetland), the Macquarie Marshes north of Warren and the Narran Lake system north-west of Walgett. In addition to these wetlands, the Menindee Lakes, Talyawalka Anabranche and Teryawynia Creek, Morella watercourse-Boobera lagoon-

Pungboughal lagoon, Great Artesian Basin springs, and the Culgoa River floodplain are recognised as wetlands of importance in Australia (Environment Australia 2001d). The wetlands and rivers of the DRP also feed two river Ramsar sites downstream in South Australia; ie Riverland Ramsar site adjacent to the Murray River and Coorong and Lakes Alexandrina and Albert Ramsar site at the mouth of the Murray River (Ellis, M., NPWS, pers. com. Dec. 2001).

Other wetlands occur throughout the bioregion including some 200 defined within the Walgett to Bourke section of the Darling-Barwon River alone (DLWC 1999). The significance of these smaller wetlands has not been fully assessed but they are critical for the movement of waterbirds between larger habitats. Much of the bioregion is characterised by smaller temporary to permanent wetlands, often known as cowals.

Table 2.2 Wetlands identified within each catchment of the DRP

(Source: Kingsford *et al.* 1999)

Catchment	Wetland type	Number of wetlands	Wetland area (ha)	Named wetlands within DRP	% within NPWS estate
Castlereagh	Floodplain wetlands	35	16 451	Broadsheet Lagoon	
	Reservoir	105	33 879	Yarraman Lagoon, Merrah Dam	
	Castlereagh totals	140	50 330		0
Gwydir	Floodplain wetlands	261	55 592	Collytootela Lagoon	
	Reservoir	172	11 501	Bluebush Swamp	
	Gwydir totals	433	67 093		0
Macintyre	Floodplain wetlands	62	91 868	Gooroo Lagoon, Poopoopirby Lagoon	
	Freshwater lake	1	7		
	Reservoir	54	2 468		
	Macintyre totals	117	94 343		0
Macquarie	Floodplain wetlands	817	53 260	The Big Waterhole, The Big Lagoon, Paddys Cowal, Moonachie Cowal, Meryon Cowal, Gewah Cowal, Dragon Cowal, Dead Gum Lake, Bay of Biscay Swamp	29%
	Freshwater lake	35	1 492		0
	Reservoir	98	2 175	Sandy Creek, Meringo Cowal, Ewenmar Creek, Euloon Cowal, Boothaguy Creek	0
	Macquarie totals	950	56 927		7%
Namoi	Floodplain wetlands	82	39 710		
	Reservoir	102	1 866		
	Namoi totals	184	41 576		0
Western	Floodplain wetlands	2 902	134 834	Yambie Lagoon, Well Lake, Saltbush Waterhole, Nartooka Lake, Louth Waterhole, Kangaroo Lake, Jims Lake, Four Mile Lake, Dead Horse Lake, Copi Hollow	19%
	Freshwater lake	52	87 755	Lake Are, Collins Lake, Paradise Tank, Travellers Lake, Wintlow Lake, Lake Bintullia, Lake Eurobilli, Malta Lake, Coonimby Lake, Lake Speculation, Pollioillaluke Lake, Cawndilla Creek, Angledool Lake, Packers Lake, Bijijie Lake, Jinki Lake, Emu Lake, Balaka Lake, Nettlegoe Lake, Tandure Lake, Lake Woytchugga, Gunyulka Lake, Coocoran Lake, Wongalara Lake, Pamamaroo Lake, Narran Lake, Lake Cawndilla, Poopelloe Lake, Lake Menindee	4%
	Reservoir	32	582		0%
	Western totals	2 986	223 170		13%
DRP TOTALS		4 810	533 439		8%

Catchments

There are six major river catchments within the DRP (Map 19, Table 2.3). The Western and Macquarie River catchments together cover 67% of the DRP and contain most of the wetlands.

Table 2.3 River catchments intersecting the DRP

Catchment	Area within DRP (ha)	% total catchment area	% DRP
Western including Barwon, Birrie, Bokhara, Culgoa, Darling, Little Weir, Moonie, Narran, Paroo and Warrego Rivers	3 472 620	12%	38%
Macquarie River including Barwon, Bogan, Darling, and Little Bogan Rivers	2 710 519	36%	29%
Gwydir River including Barwon, and Mehi Rivers	910 366	34%	10%
Castlereagh River	853 068	49%	9%
Namoi River	779 814	19%	8%
Macintyre River including Barwon, Boomi, Doondoona, and Dumaresq Rivers.	522 455	22%	6%

Western Catchment

The Condamine-Culgoa River system in south-central Queensland feeds the **Culgoa** and **Bokhara Rivers** of the western catchment. Beardmore Dam at St George regulates these rivers and an increase in water diversion for cotton irrigation has substantially reduced the river flow from Queensland into New South Wales. These rivers are mostly fed by summer floods from cyclonic depressions and are strongly seasonal.

The **Narran River** is also part of this system but it does not feed into the Darling system, terminating instead at Narran Lake and associated wetlands. It is unregulated with minimal water extraction occurring. It also receives flows from the Balonne River during periods of high flow, although the Balonne is regulated by Beardmore Dam and water is also extracted to on-farm water storages, affecting the flows into the Narran system.

The **Narran Lakes** are a large terminal lake system at the end of the Condamine - Balonne River system (Map 20). The Narran River has a small shallow main channel with a contiguous floodplain and several lakes lie along the floodplain. During a large flood event the Narran branches to fill Clear Lake while simultaneously flowing to and filling Narran Lake. Once Clear Lake has filled it overflows to fill Back Lake and the Long Arm and more water flows into Narran Lake (Ramsar 2000).

Flooding mostly occurs in summer and autumn, but floods have been recorded in winter and spring. Annual inflows are highly variable and more than one flood per year has occurred during a quarter of the recorded flood events. Once inundated, Narran Lake can hold water for up to 2 years, but in years of low flow water may not reach Lake Narran at all. Back and Clear Lakes, which are within Narran Lake Nature Reserve, will usually retain water for about 4-6 months after a single inundation. As a terminal system the lakes usually empty only by evaporation and seepage but during exceptional events the Lakes can overflow to the Barwon River. These lakes have an average inundation frequency of one per two years and this is more frequent than for other inland wetlands in New South Wales (Ramsar 2000).

Narran lakes was a major meeting and ceremonial centre for Aboriginal people and supported a large, semi-permanent Aboriginal population (Martin 1979; NPWS 2000a). The Narran Lake area is a highly productive area which played a vital role in the Aboriginal settlement pattern of the region (NPWS 2000a).

Teryawynia Lake is at the southern edge of the DRP and is one of a series of lakes which floods sequentially as high flows travel along the **Talyawalka Anabran** of the Darling River. This wetland system includes Teryawynia, Dry, White Water, Eucalyptus / Waterloo, Victoria, Brummeys, Dennys, Brennans, Sayers, Gum, Boolaboolka, North and Ratcatchers Lakes and associated wetlands. The Talyawalka Anabran and Teryawynia Creek wetlands, when inundated, provide important habitat for large numbers of waterbirds. Aboriginal middens are located within the dunes of the area (Withers 1996; Environment Australia 2001d).

These wetlands are mostly located on Western Lands leases and are characterised by a series of braided channels across the floodplain, interspersed with seasonally inundated lakes. Some lakebed cropping occurs occasionally, when sufficient moisture is available.

The **floodplain of the Balonne and Culgoa Rivers** at Byra just north of the New South Wales/Queensland border, supports a variety of wetland and floodplain vegetation. These wetlands are listed as nationally significant in the *Directory of Important Wetlands of Australia* (Environment Australia 2001d). They are mostly within the Culgoa National Park and support the largest contiguous *Eucalyptus coolabah* woodland remaining in NSW. They can be flooded for periods of up to four months with water depths reaching 10 metres. The Culgoa River floodplain is of traditional and social significance to the local Aboriginal people, the Gandugari group of the Morowari people.. English (1997) found strong evidence of extensive Aboriginal use of the sandy rises on the floodplain of the Culgoa River for camp sites, especially near water sources. This indicates the importance of long-term water sources to the local Aboriginal people.

The **Menindee Lakes** consist of Lake Pamamaroo, Lake Menindee, Lake Cawndilla, Lake Wetherell, Lake Tandou, Lake Balaka, Lake Malta, Tandure Lake, and Lake Bijji and cover approximately 45 000 ha (Environment Australia 2001d). Part of these wetlands fall within Kinchega National Park, with the remainder on Crown land and Western Lands Lease. The large number of Aboriginal sites within Kinchega National Park indicate the changing pattern of Aboriginal occupation of this area. Sites include middens, camps and hearths where the remains of freshwater mussels and yabbies can be found. Aboriginal scarred trees occur along the Darling River within the Menindee Lakes area (NPWS 1996).

Macquarie River Catchment and Macquarie Marshes

The Macquarie River is regulated by Burrendong dam, built in 1967 for flood mitigation and for irrigation. Windamere Dam, built in 1984, also regulates the flow in this river system and there are many weirs and storage dams built for town water supplies and other extractive purposes. Irrigation occurs extensively in the centre of the catchment with 50 - 60% of flows being used for cotton (Macquarie 2100 Plan 1999). Water flows can also be diverted to the Bogan from the Macquarie to provide adequate water supplies for Nyngan and Cobar. This river regulation has reduced flows to the Macquarie Marshes and in an attempt to compensate for this, a guaranteed level of water flows for the Marshes has been established. This is known as an environmental flow and is intended to maintain the diversity and productivity of

the wetland habitat. The allocation is generally insufficient to stimulate breeding so is timed to occur with natural triggers such as rainfall events (Kingsford & Thomas 1995).

The Macquarie Marshes are one of the largest inland semi-permanent wetlands in south-eastern Australia (Map 20). They cover approximately 200 000 hectares when flooded and are about 100 km long and 30 km wide. They have a flow through system rather than being a terminal basin. Water quality is increased by the anabranch flow, which acts as a filtration system and promotes a diverse and productive biological system (Wolfgang 1998). In 1818 when Oxley was exploring the area, the Macquarie Marshes were probably at least twice the size they are today. In 1863 a newspaper reported that 'The whole of the country between the Merri Merri [Creek, 24 to 41 km east of the Macquarie River] and the Macquarie [River] was one sea of water with scarcely a dry foot of ground' (quoted in Kingsford & Thomas 1995). The 1874 flood was reportedly even larger, but the largest on record was in 1955. These marshes contain extensive reed beds, *Eucalyptus camaldulensis* (red gum) swamps, open lagoons and *Muehlenbeckia florulenta* (lignum) covered gilgaied floodplains.

A range of significant Aboriginal sites have been recorded within the Macquarie Marshes including oven mounds. The Macquarie Marshes is the only area where oven mounds have been recorded outside the Murray Valley. Aboriginal culture in the area was influenced by the changing water regimes of the Macquarie Marshes (NPWS 1993).

The impact of rising salinity levels will be localised in areas where evaporation concentrates the salts into pools or depressions. At the point where the Macquarie River enters the Marshes, the expected average salinity for the year 2100, is 2 110 EC, well above the acceptable ANZECC (1999) trigger levels (DLWC 2000). Monthly salinity data from the Macquarie River at Narromine indicate that in 1998 the river had a 4% chance of exceeding the 1 500 EC threshold but extrapolation of this data indicates that this threshold will have a 23% chance of being exceeded in 2100, mostly during low flow periods. This could have a serious effect on in-stream biota and recruitment of biota into and between wetlands. This would result in a loss of species diversity and declines in abundance of species (MDBC 1999).

Gwydir River Catchment and Gwydir Wetlands

The Gwydir River is regulated by Copeton Dam which supplies irrigation water for the cotton industry. The Gwydir Valley is the largest cotton producing area in Australia and water supplies from Copeton Dam are over allocated. The dam rarely has sufficient supplies to meet demand resulting in significantly reduced water flows in the river and a subsequent increase in the usage of off-river storage to capture water during periods of high flow (EPA 1997).

Downstream of Moree the Gwydir divides into two major arms, the Gingham in the north and the Lower Gwydir in the south (Figure 2.16). Towards the end of these watercourses the water forms a delta with intermittent and semi-permanent wetlands. The distribution of flows into these wetlands is naturally dynamic. Prior to 1936 most small floods flowed into the Lower Gwydir and only the large flows reached the Gingham. This has changed with the development of the Gwydir Raft near the Tyreel Regulator. The raft is an accumulation of deposited timber debris and sediment which began to form in the early 1900s and effectively blocked the original river channel. The raft has continued to steadily accumulate and now extends for about 30 km. By the mid-1940s water flowed more readily to the north, increasing flows into the Gingham system (McCosker & Duggin 1993).

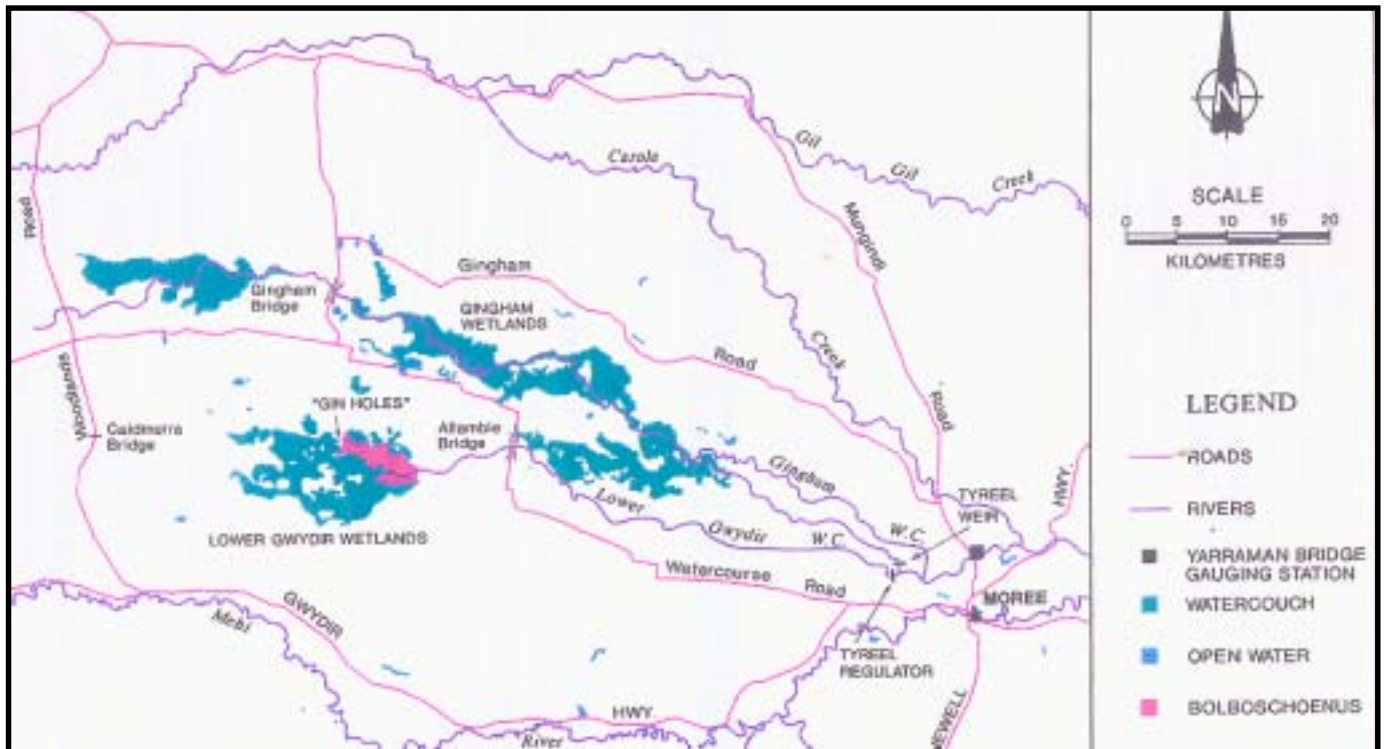


Figure 2.16 Lower Gwydir Wetlands

(Keyte 1994)

The construction of Copeton Dam has resulted in a substantial reduction in the number of major floods through this system and stabilisation of the raft. A new raft has formed on the Gingham Channel a few kilometres downstream of the head of the old raft and this may affect the distribution of future floodwaters. The formation of these rafts (accumulations of timber, debris and sediment) is thought to result from the combination of human activities such as the clearing of the upper catchment and natural depositional processes. Currently, with flows of between 2 500 and 40 000 ML/day, 70% of the Gwydir flows into the Gingham and 30% into the Lower Gwydir. Flows of 40 000 ML/day or more produce over-bank flows and the water divides evenly into each watercourse (McCosker & Duggin 1993; Keyte 1994).

Significant flooding of the watercourse is irregular and occurs most frequently in January and February. Secondary floods occur in winter. Long term residents recall the Gwydir River entering the wetlands 'until the River emptied' but most of the flow is now diverted for irrigation and domestic use before reaching the wetlands. Before regulation the Gwydir wetlands would have received flows sufficient to inundate their core and watercourse wetlands (20 000 ha) in 192 months during a 93 year period or 17% of the time and large flows would have been a maximum of three years apart. With regulation, flows large enough to fully inundate the wetlands occur only 5% of the time, a 70% reduction (McCosker & Duggin 1993; Keyte 1994).

The Gwydir wetlands are a flow through system and are likely to be affected by salinity in a similar way to the Macquarie Marshes. The estimated average salinity in the Gwydir as it enters the wetlands is expected to rise to 740 EC in 2100, and the probability of exceeding the threshold of 1 500 EC (this threshold is considered to be where direct biological effects are

likely to occur in river, stream and wetland ecosystems) is likely to change from 3% in 1998 to 12% in 2100 at Pallamallawa. The impact of periods of high salt levels will be similar to that predicted for the Macquarie Marshes, with possible salt scalding where the saline waters become highly concentrated (MDBC 1999).

Macintyre, Namoi and Castlereagh River Catchments

The **Macintyre River** (with tributaries known as the border rivers) receives most of its 760 GL per year of flow from its catchment within New South Wales. Pindari dam in NSW, and Coolmundie and Glenlyon dams in Queensland are major water storages in the Macintyre catchment. About 222 GL per year are drawn from this river, less than for the Gwydir (300 GL/year) and Namoi Rivers (248 GL/year) (DITAR 1996).

The **Morella Watercourse, Boobera Lagoon and Pungbougul Lagoon** wetlands are the remnants of a previous course of the Macintyre River. They are permanent water bodies and provide important habitat for many waterbirds. Boobera Lagoon has great significance to the local Aboriginal people, the Kamilaroi, and is considered to be an exceptionally important Aboriginal site in south-eastern Australia as the local Aboriginal people, the Kamilaroi, believe that Boobera Lagoon is the resting place of the rainbow serpent. Boobera Lagoon plays an important role in the teaching of Aboriginal culture (Environment Australia 2001d).

The **Namoi River** is dammed by Lake Keepit, constructed in 1960. Trials for cotton production began in the Narrabri / Wee Waa area soon after this. Cotton is now extensively grown in the area and 54% of the natural median flow of this river is used for irrigation. This regulation has resulted in the loss of natural variation in flow levels, with periods of low flow very rare, and a reduction in overall flow volume (Inland Rivers Network 1999; EPA 1997).

The **Castlereagh River** rises in the Warrumbungle Ranges in the Brigalow Belt South bioregion, an area of comparatively high rainfall. Most of the upper catchment is sandy and, along some of its length, the river flows through the sand to reappear as pools further downstream. This is one of the least regulated rivers in the bioregion, with no dams and only a few weirs and limited use for irrigation (EPA 2001).

2.4.2 Groundwaters

There are two sources of groundwater within the bioregion, the Great Artesian Basin and several alluvial aquifers.

The Great Artesian Basin

The Great Artesian Basin (GAB) aquifer is a multi-layered, confined system with a large synclinal structure. Much of the artesian water in New South Wales originates in Queensland, but a significant amount is contributed through the Pilliga Sandstones, the primary intake area in New South Wales (Watkins & Meakin 1996, Figure 2.17). The artesian water has total dissolved solids of 500 to 1 500 mg/l, making it suitable for stock and domestic uses but the sodium-bicarbonate-chloride chemistry of this water makes it unsuitable for irrigation (NWCMC 1996).

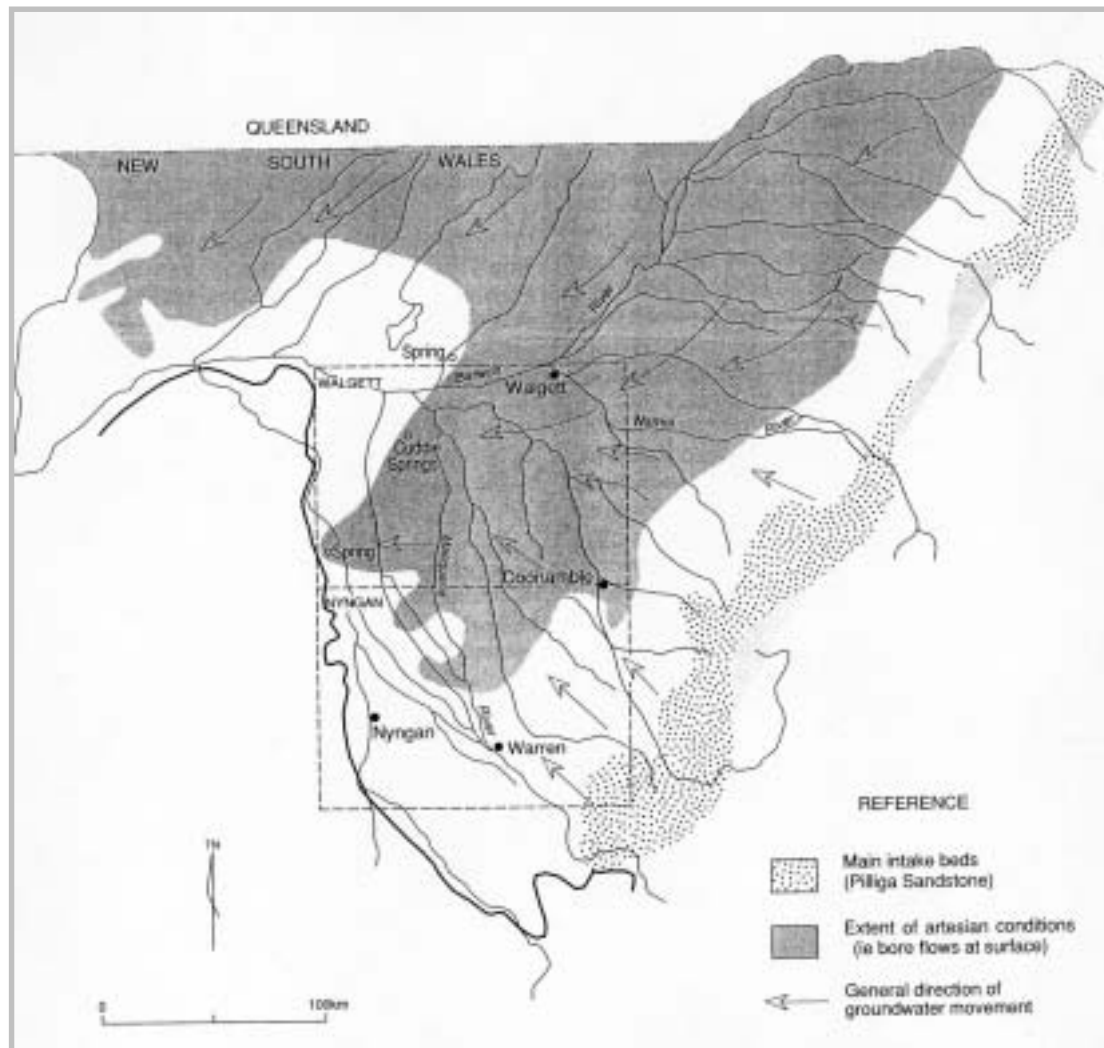


Figure 2.17 Groundwater features of the Coonamble Embayment of the Great Artesian Basin
(Watkins & Meakin 1996)

One thousand, four hundred bores tap the deeper aquifers of the GAB in New South Wales but nearly half of these have ceased to flow as a result of artesian pressure having decreased markedly over the past 100 years. About 250 of the bores operating in New South Wales have uncontrolled flow (DLWC & AFF 2000).

The Great Artesian Basin Mound Springs are wetlands found mostly within the Mulga Lands bioregion but some occur within the DRP. Mound springs in the Great Artesian Basin provide important habitat for more than 40 species of freshwater snails which are endemic to these springs and some which are endemic to an individual spring (Environment Australia 2000d). About one third of the mound springs have dried up as a result of the decreased artesian flows.

Alluvial aquifers

The Namoi catchment alluvial aquifer is the most extensive and most intensively developed aquifer system in New South Wales. It accounts for nearly 40% of all good quality, high yield groundwater extracted. This is mainly used for irrigation and is currently over-allocated (Table 2.4). Alluvial aquifers are also of great importance in the Gwydir and the Macquarie

catchments. The alluvial aquifer near Narromine has yielded 10 litres/second and is being tapped extensively for crop irrigation between Narromine and Warren (NWCMC 1996).

Table 2.4 Groundwater resources of the Lower Namoi Catchment

(NWCMC 1996)

Total area of alluvium (km ²)	5 100
Volume of storages (ML)	20 million
Volume available for extraction (ML)	6.6 million
Estimated recharge (ML/yr)	82 500
Entitlements (ML/yr)	208 000

About 5.4 million hectares of land in New South Wales have groundwater at or near the surface; this is mostly on the western slopes (MDBC 1999). There are estimates that up to 12.3 million hectares, about 20% of the Murray-Darling Basin in New South Wales (a more extensive area than the DRP) may be experiencing rising groundwater tables. In addition, an estimated 40% to 80% of the individual catchments east of the Bogan and Darling Rivers, which make up the majority of the DRP bioregion, have rising groundwater levels. There have been very few detailed groundwater studies in the DRP (DLWC 1999).

The area of land with high water tables and which could become salt affected has not been precisely estimated, but a waterlogged area of between five and seven million hectares is considered to be realistic. Serious salination is predicted to affect between two and four million hectares (MDBC 1999). Salt loads in the Darling River also appear to be enhanced by the inflow of saline groundwater, which originates in the Cainozoic valley-fill aquifers of the Bourke Graben (Mount 1995). Sturt (1833), on his expeditions into the interior of southern Australia describes the Darling River as follows: “as a river it ceased to flow; the only supply it received was from brine springs, which, without imparting a current, rendered its waters saline and useless”. This suggests that salinities within the Darling River are affected by naturally saline ground water.

2.5 LAND CONDITION

2.5.1 Land degradation

The north east portion of the bioregion, the alluvial fans of the Darling tributaries, has been extensively cleared with remnant vegetation now often only found in woodland ‘islands’ on infertile or non-arable land. Goldney and Bowie (1990) have described this region as “islands of woodlands and forests in a sea of agricultural land”. Land clearing began with the early settlement in the 1830s. The plains of the lower Namoi catchment were originally covered by grasslands and open woodlands and the black cracking clays of these plains are now mostly used for cropping. In this area there is an average tree cover of nine percent (NWCMC 1996).

Important causes of land degradation in the bioregion include:

- soil erosion;
- streambank erosion;
- tree decline;
- rising groundwater and dryland salinity;

- soil structure decline;
- soil acidity;
- decline in water quality; and
- contamination of water and soil by sheep dips, pesticides and wastes.

Morgan and Terry (1992) identify the following land degradation indicators:

- scalding of rises in the Bogan-Macquarie, Castlereagh-Barwon, Culgoa-Bokhara, Warrambool-Moonie and Narran-Lightning Ridge provinces;
- scalding of floodplains in the Louth Plains, Wilcannia Plains and Menindee provinces;
- dieback in *Eucalyptus camaldulensis* (river red gum) in the Bogan-Macquarie province;
- sheet and gully erosion on the ridges of the Narran-Lightning Ridge province; and
- wind and gully erosion in the Menindee province.

2.5.2 River and wetland degradation

Streambank and gully erosion, turbidity and sedimentation, high nutrient levels, blue-green algal blooms, exotic plants and contamination by rising salinity are degradation issues posing a threat to wetlands and rivers in the DRP. During the last 15 years, levels of blue green algae were generally above acceptable safe swimming levels in the Macquarie River. *Escherichia coli* exceeded acceptable levels for swimming at times in the Macquarie River, and phosphate levels were also sometimes high.

River regulation and water extraction for irrigation have had a detrimental effect on wetlands within the bioregion. In 1996 the Gwydir wetlands were filled with the first substantial flow for twelve years, less than the estimated natural average of three years (McCosker and Duggin 1994). Environmental flows are an essential requirement for the survival of these wetlands and a key element in wetland health is the natural wetting and drying cycle produced by irregular flooding.

Slumping of riverbanks as a result of increased flows due to river regulation, uncontrolled stock access, no buffer zones, big wets following long dries causing flow diversion, increased turbidity, the presence of European carp (*Cyprinus carpio*) and poor water quality (caused by the location of garbage and septic systems) have been identified as problems within the Macquarie system. More than 1 300 km of streambank erosion along the Macquarie River occurs upstream of Narromine (Macquarie 2100 Plan 1999).

Aquatic biodiversity has been lost because weirs and dams impede the movement of various species to their spawning grounds. Fish ladders have been constructed on some weirs but the success of these is questionable as some have not been used. Control of river flows by dams has also changed the river level and flow requirements of many species for successful breeding (Thoms *et al.* 1995).

An infestation of *Eichhornia crassipes* (water hyacinth), a highly invasive aquatic weed, was first observed in the Gingham watercourse during the 1950s, spreading to cover an area of more than 7 000 ha by the mid 1970s. An integrated control program was established in 1976 with physical, chemical and biological control measures implemented. The management program included construction of diversion banks across the many natural off takes to prevent water inflow to the wetlands during the control period. The seed bank could not survive the resultant drying and when the area was later flooded any seed germination was controlled by

herbicides and subsequent drying out before seed set (McCosker and Duggin 1993). The infestation had been monitored and controlled regularly until two large floods through the wetlands in the summer of 2000-01, when the previously dormant seedbank of *Eichhornia crassipes* germinated and quickly became established throughout much of the wetland area.

2.5.3 Salinity

Dryland salinity occurs in non-irrigated areas. Salinity is the result of a build up of salt in the soil, usually caused by a rising watertable. Evaporation of saline water at the soil surface tends to concentrate salts to the point where they affect the environment (DLWC 2001a). In the Macquarie River catchment (approximately 7 500 000ha) dryland salinity affects at least 3 850 ha, mostly in areas with extensive vegetation clearing (1 560 ha) and in areas with salt-induced sheetwash (627 ha) and bare scalds (1664 ha). Saline scalds are most common in the drier lower floodplain of the Macquarie (Taylor 1994). In the coarser red soils of the more elevated land, grazing has caused the compaction or loss of surface soil, producing patches of scalded red clay.

Salinity from irrigation is caused by supplying water excess to crop requirements, inefficient water use, poor drainage, irrigation of unsuitable or "leaky" soils, allowing water to pond for long periods and seepage from irrigation channels, drains and storages. Introduced land management practices (such as irrigation) generally have different water use characteristics than native vegetation and allow more rainfall to enter the groundwater. If more water is being added than can be accommodated in the groundwater aquifer, the groundwater level will rise. As the watertables reach the land surface, the soil becomes waterlogged. The significant difference between dryland and irrigation salinity is that the application of irrigation water to land can exaggerate the leakage of surplus water past the root zone to groundwater (recharge), increasing the rate at which the watertable rises (DLWC 2001a, EPA 1997).

River salinity is caused by the movement of saline water from areas of dryland, irrigation and urban salinity into creeks and rivers. As salinity in a catchment worsens, the rivers become increasingly saline (DLWC 2001a).

The salinity levels and predicted changes in the salinity of the rivers in the DRP have been assessed in a salinity audit for the Murray-Darling Basin. The salt loads study carried out as a part of the salinity audit has estimated the potential salinity levels for 2020, 2050 and 2100 for each of the river valleys supplying water to the Murray and Darling Rivers. The average salinity levels for the Macquarie, Namoi and Bogan have been estimated as being likely to exceed the 800 EC threshold of the World Health Organisation for acceptable drinking water within 20 years and the Castlereagh within 50 years under current management practices (Table 2.5). These predicted salinity levels have serious implications for both agriculture and the supply of drinking water for the population centres (MDBC 1999), as well as for the region's biodiversity. The predicted salinity levels for the Darling River are not yet available but generally the salinity level of the Darling is currently less than 800 EC throughout its length. At Menindee the salt levels are predicted to increase from about 250 EC in 1998 to 500 EC in 2100 (MDBC 1999).

Table 2.5 Actual and predicted average salinity levels for major rivers in the DRP

(MDBC, 1999)

River valley	1998	2020	2050	2100
Bogan River	730	1 500	1 950	2 320
Macquarie River	620	1 290	1 730	2 110
Castlereagh River	640	760	1 100	1 230
Namoi River	680	1 050	1 280	1 550
Gwydir River	560	600	700	740

Trends in the levels of salt concentrations in the rivers have indicated that within the DRP they are increasing by 2-4 tonnes per km per annum in the Castlereagh / Macquarie systems, and more than 1 tonne per km per annum in the Namoi River. The amount of salt mobilised to the land surface in the Murray Darling Basin is predicted to double from five million tonnes annually in 1998 to 10 million tonnes annually in 2100. The predictions are significant for the river catchments within the DRP (Table 2.6) (MDBC 1999).

Table 2.6 Predictions of the tonnes of salt mobilised to the land surface per year for river catchments of the DRP

(MDBC 1999)

Catchment	1998	2020	2050	2100
Macquarie River	240 000	490 000	660 000	790 000
Castlereagh River	161 000	180 000	320 000	330 000
Namoi River	60 000	100 000	120 000	150 000
Gwydir River	7 000	20 000	50 000	60 000
Macintyre River	80 000	80 000	80 000	80 000

The economic impact of rising watertables and salinity has been estimated for the Little and Talbragar Rivers in the Upper Macquarie catchment. The estimated annual cost of rising water tables and salinity for the Talbragar River catchment was \$1 612 421, with the major costs for repairs, maintenance and preventative works being borne by farmers (MDBC 1999). In the lower Macquarie area water tables are rising at 0.3m/year in some areas and between 15 and 20 thousand hectares have water less than three metres below the surface. Water will be unsuitable for irrigation in this area as a result of high salinity loads by 2100 (Macquarie 2100 Plan 1999).

2.6 BOUNDARIES WITHIN THE DRP

The land within the DRP has been described and subdivided using a variety of criteria and scales. Some descriptions most widely used by land managers are the province and regional descriptions by Morgan and Terrey (1992) and land system descriptions of the Western Division by Walker (1991).

2.6.1 Provinces

In NSW nine provinces have been described for the DRP (Morgan & Terrey 1992). Five of these cover each of the northern alluvial fans, one is an interfluvium of the weathered sandstones near Collarenebri and three are different types of alluvial deposits along the Darling River, south from Bourke (Map 21). Within Queensland the northern extent of the DRP is described as two distinct provinces of the Brigalow Belt South Bioregion (Sattler & Williams 1999).

Northern Alluvial Fans

The catchment characteristics of each of the northern alluvial fans have resulted in variation in the flood patterns and alluvial deposits between each province.

Bogan-Macquarie Province

This alluvial complex formed by the Bogan and Macquarie Rivers lies in the south east of the bioregion. The province has a large catchment extending beyond the DRP bioregion south east of Bathurst and east to the Liverpool Range. Quaternary alluvials are underlain mostly by Paleozoic sediments and small areas of basalt and sandstone. The coarser-textured high red ridges and *Eucalyptus populnea subsp. bimbil* (poplar box) woodlands dominate the eastern portion of this province. Grey and brown clays dominate on the plains and depressions, alluvial soils on levees and river channels with texture contrast soils occurring on the low and gently undulating rises.

The wetlands and low-level floodplains of the Macquarie River dominate the central areas of the province. Much of this area has been cleared, although the wettest areas within the Macquarie Marshes Nature Reserve retain significant areas of native vegetation. The western parts of this province are associated with the Bogan River and receive high level overflows from the Macquarie River. Flooding is infrequent and the finer soils of low scalded rises and clay plains are dominant.

Castlereagh-Barwon Province

Extensive plains of quaternary alluvials with a strong basaltic influence form the Castlereagh-Barwon province. This is the most intensively developed province of the bioregion, including both dryland and irrigated cropping. It includes the alluvial fans of the Castlereagh, Namoi, Gwydir and Macintyre Rivers and the broad plains of the Barwon and upper Darling Rivers. Seasonal and semi-permanent wetlands are present on the major tributaries including the significant wetlands of the Gwydir.

The landform contains three co-dominant formations: river channels, levees and lower floodplains with riparian woodland vegetation; upper floodplains predominantly covered by *Astrela lappacea* (curly Mitchell grass); and wooded low rises with some higher gently undulating areas. Soils range from grey clays of the floodplains to texture contrast soils,

occasional sands and brown clays on low rises. A broad, complex floodplain dominated by high-level grey clay plains lies between the confluence of the Barwon and Macquarie Rivers and Bourke.

Culgoa-Bokhara Province

Grasslands or forbfields occur on the plains of quaternary alluvium of the Culgoa and Bokhara Rivers. Grey clays predominate on the floodplains, with some texture contrast soils on low rises. These low level flood plains and channels contain extensive areas of *Astrebla* (Mitchell grass) grasslands, much of which has been heavily grazed and cultivated. In many areas the *Astrebla* grasslands have become degraded and are now replaced by opportunistic weed species such as *Sisymbrium* (mustard weed).

Warrambool-Moonie Province

This province contains no major river but is criss-crossed by a complex of distinct channels (the Big Warrambool). The channels are usually dry but are filled periodically by high level overflows of the Moonie and Balonne Rivers to the north. The channels are usually dry. The landform varies from low-level floodplains and channels to high-level floodplains, low rises and high-flow channels. Grey clay soils occur on the floodplains, and texture contrast soils and sands occur on low rises. The vegetation of this province is generally quite open with *Eucalyptus coolabah* (coolibah) and *Eucalyptus populnea subsp. bimbil* woodlands on the higher areas. Much of the land is heavily grazed and some areas are cultivated. The low red rises are generally severely scalded.

Narran-Lightning Ridge Province

A dominant feature of this province is a north-south ridge of Cretaceous sediments, adjacent to low-level Quaternary alluvials on the floodplains. The Narran River, which lies to the west of the ridge, receives flow from low-level floods in the Balonne-Maranoa River system in Queensland. Water from this system mostly flows around the ridge and is retained in a large number of basins formed around the lower slopes. The largest of these basins is Narran Lake, the terminal basin for the Narran River. The Narran wetlands are terminating basins with little or no flushing. They also receive a large quantity of local runoff from the adjacent sedimentary ridge. During high flows this basin overflows to the west and the Narran River overflows to join the Big Warrambool (Province 4).

The two most common landforms in this province are low rounded ridges and some rocky hills with *Eucalyptus melanophloia* (silver-leaf ironbark) open woodland and level to gently undulating floodplains, low rises and sand dunes with a riparian woodland. There are also depressions and backplains, lunettes, salinas and levees where grasses, forbs and some riparian plant communities occur. The soils on the ridge vary from red earths to lithosols and grey clays are again dominant on the plains.

Collarenebri Interfluvial Province

This province is the southern-most tip of the Northern Surat Basin, an extensive region of coarse-grained deeply weathered Cretaceous sediments in south-eastern Queensland. This narrow area of land west of the Barwon River is slightly undulating, with low rounded hills. It separates the parts of the DRP bioregion that receive drainage from Queensland from those fed mainly by drainage from the slopes and tablelands of New South Wales. The loamy deep red earths of this area are easily compacted and susceptible to water and wind erosion following clearing of the *Eucalyptus populnea subsp. bimbil* woodlands in this province.

Darling Alluvials

Between Bourke and Wilcannia Paleozoic sediments underlie the Quaternary alluvials associated with the Darling River. The river is mostly confined to a narrow meandering belt with broad alluvial plains. Near Tilpa, high-level flows are restricted by bedrock and some of the river flow is directed into the Paroo overflow.

Louth Plains Province

The Louth Plains Province contains broad, relatively uniform alluvial plains. This province stretches along the northern part of the Darling River and in addition to the flows from the northern alluvial provinces is fed by flows from central southern Queensland via the Warrego River, outside the DRP bioregion. The dominant landforms are high-level floodplains and small channels with grey clays, and fringing areas of dunes and old red alluvials. In the south there are dunefields typical of the northern part of the Murray-Darling Depression bioregion and the bedrock ranges and ancestral alluvials of the Cobar Peneplain bioregion. *Astrelba* grasslands were once widespread through this province but are now generally degraded.

Wilcannia Plains Province

This province contains a broad complex riverine plain. It contains the river channel, small lakes and anabranches on the high level floodplain, with low rises, dunes, and pans. Soils range from grey clays of the river channel and floodplain, to texture contrast soils on low rises and occasional sands. In addition to the flows along the Darling River the province can receive water from south west Queensland when the Paroo is in flood.

Menindee Province

The Menindee Province contains broad alluvial complex dominated by rises and plains. In this province the Darling River begins to flow more slowly and form anabranches and associated overflow lakes. The province contains an intricate system of flood channels, floodplains, back plains and dunes. The province includes the Darling River floodplain with the main channel, billabongs, swamps and occasional low sandhills, higher alluvial plains and dunes, large overflow lakes and basins, and associated lunettes. Soils are varied, from grey clays and sands of the Darling River floodplain, to sands, texture contrast soils and clays of undulating plains and dunes, and clays, texture contrast earths and sands of overflow lakes and basins.

Provinces in Queensland

The provinces in Queensland are the Balonne-Culgoa Fan (Province 35) and the Macintyre-Weir Fan (Province 36). The Balonne-Culgoa Fan is the larger of these two provinces and contains extensive quaternary alluvial sediments along the Balonne and Culgoa Rivers. The alluvial plains and wetlands of this province have texture contrast soils with *Eucalyptus coolabah* grassy woodlands on areas subject to periodic flooding and *Eucalyptus populnea subsp. bimbil* with *Eucalyptus melanophloia* and *Casuarina cristata* (belah) on higher ground. The Macintyre Weir Fan features predominantly alluvial plains and associated riverine landforms. The mean annual rainfall in this province is higher (550 mm) than in the more western province (450 mm) and the general elevation is also a little higher (200 m compared with 150 m).

Regional ecosystems have also been described by Sattler and Williams (1999). Two of these are of particular interest as they are restricted in Queensland to the Balonne-Culgoa province, and their conservation status is poor. The fringing woodland of *Eucalyptus coolabah* with *Acacia stenophylla* (river cooba) and *Muehlenbeckia florulenta* (lignum) found on the heavy

soils of swampy stream channels, occurs only in the extreme south-west of this province. About 40% of this ecosystem has been cleared and the remaining 60% is subject to total grazing pressure and ringbarking. The other ecosystem of concern is also in the south west of this province and is extensively grazed. It is low open woodland of *Flindersia maculosa* (leopardwood) and *Atalaya hemiglauca* (whitewood) with *Acacia omalophylla*, *Acacia cambagei* (gidgee) and *Tripogon loliiformis* (five-minute grass).

2.6.2 Land systems

Land systems are an area or group of areas throughout which there is a recurring pattern of topography, soil and vegetation (Walker 1991). Ninety-one of the land systems defined and mapped by Walker cover 46% of DRP. These land systems are listed in Appendix B, which includes a brief description of topography and dominant vegetation. The percentage of the DRP covered by each land system ranges from 4.5% (Nelyambo - floodplains with *Eucalyptus coolabah*), less than one percent (45 landsystems each cover less than one percent of the DRP) (Appendix B). Several land systems occur almost entirely within the DRP and thirty-five have less than 10% of their total area within the DRP. The distribution of the land systems which each cover more than 1% of the area is illustrated on Map 22. Approximately 90% of the mapped area contains land systems described as playas and basins or alluvial plains.

2.7 SUMMARY AND PROPOSED FURTHER WORK

2.7.1 Summary

The DRP lies almost entirely in a semi-arid climatic zone, with only a small portion in the temperate zone in the east and the south-western arm of the bioregion in an arid zone. There is a substantial variation in conditions throughout the bioregion. Rainfall varies both spatially and temporally with annual averages being of only limited value for understanding the requirements and responses of the vegetation and fauna. In the north there is a summer dominance in mean monthly rainfall but in the south it is evenly distributed throughout the year and the mean monthly temperatures, both maxima and minima, are lower than in the north.

The native geology, topography and soils of the DRP demonstrates that this is a derived, water driven environment. The geological substrate is of alluvial origin, the topography is generally low in relief with most areas of higher elevation being the product of deposits from prior streams, and the soils are predominantly clays typical of alluvial fans and floodplains. The Collarenebri Interfluvium is the most obvious exception to this. Rivers and wetlands are significant features of the DRP as it consists of the lower fans and floodplains of six catchments. Wetlands and riverine corridors are critical components of this bioregion.

Morgan and Terrey (1992) have subdivided the DRP into smaller units (provinces) and Walker (1991) has mapped land systems and land units for the western third of the bioregion. These two classifications need to be compared and the boundaries of the provinces refined.

Since European settlement the DRP has been subjected to high levels of disturbance with the impact of clearing and introduced pests combining with extreme climatic conditions in the 1890s and the middle of this century to destroy much of the original vegetation. The extent and rate of land degradation must be taken into account if effective biodiversity conservation

measures are to be developed. Increasing levels of salinity in the rivers, wetlands, sub-surface waters and the soil, and river regulation are some of the most significant problems affecting this bioregion in addition to the loss of extensive areas of forests and woodlands and consequent loss of habitat.

2.7.2 Proposed further work

Further work needed in relation to abiotic features of the DRP includes the following:

- detailed climatic analysis to develop an understanding of the impact of irregularity and unreliability of rainfall through the bioregion and through time;
- more detailed assessment of boundaries of the DRP and the provinces using detailed mapping of the basic abiotic features and vegetation communities;
- development of maps of land condition and the disturbance history of the bioregion;
- mapping of landunits across the bioregion; and
- mapping of landsystems over the 54% of the bioregion not currently mapped for landsystems.

3 VEGETATION

3.1 VEGETATION IN 1750 AND SUBSEQUENT MODIFICATION

Prior to European settlement, the vegetation of the bioregion is likely to have been mostly open woodland on alluvial fans and riverine corridors, with woodland in the eastern margins of the bioregion and large areas of grassland. Since European settlement, this has changed to a predominance of grassland as a result of extensive clearing of the woodlands. An estimated 50% of the DRP has been cleared and 28% converted to intensive agricultural production (DEST 1996).

Carnahan (1976) mapped the presumed 1750 vegetation of the DRP at a scale of 1:5 000 000, indicating that most of the fans and the riverine corridor to near Wilcannia was a eucalypt woodland (10 - 30 m height, <10% cover) over an *Astrebla* grassland. A more dense eucalypt woodland (10 - 30 m height, 10 - 30% cover) was dominant along the eastern edge of the fans, as well as occurring in large patches north east of Brewarrina. Large areas of *Astrebla* grassland (30 - 70% cover) occurred throughout the DRP. From Wilcannia to Menindee and along the Bogan, the vegetation was predominantly a low woodland (<10 m height, 10 - 30% cover) with acacias, eucalypts and casuarinas dominant in the upper storey and a grassy understorey (Carnahan 1976).

In addition to this very broad scale of mapping there have been some more detailed projects to describe probable pre-European vegetation communities. Pickard and Norris (1994) mapped north western New South Wales at a coarse scale (1:1 000 000) and defined vegetation communities by structure and characteristic species. This mapping covers the western arm (43%) of the bioregion. More recent mapping of the pre-European vegetation has been undertaken within the Moree region (Ecology Australia Pty Ltd undated). Thirteen woodland communities, two grassland and two wetland communities have been defined and mapped throughout that area (Map 23).

Descriptions of the pre-European vegetation have also been obtained from early historical records. Denny (1994) obtained descriptions of vegetation from explorers' journals, accurately located the sites and then reassessed the vegetation. These sites were in western New South Wales and covered most of the DRP bioregion, but not the north eastern corner. Denny (1994) concluded that there has been an overall decline in vegetation cover (of all regions in Western NSW), with some decrease in cover in the upper, lower and middle strata on nearly 50% of all sites surveyed. In the area of the Namoi, Macquarie, Bogan and Barwon River fans, 58% of sites showed a decrease in cover in the upper, middle and lower strata. Where the vegetation has remained, tree species composition is similar to that described by the explorers and many of the shrub and grass species described by Sturt and others were observed during the survey in 1990. On the riverine plains south from Bourke, tree and shrub

cover had decreased for only a few sites and less than half the sites had a decrease in grass cover (Denny 1994). This study suggests that vegetation modification has been most extensive on the eastern alluvial fans of the DRP and less along the Darling River south of Bourke.

The initial impact of cutting trees for timber and the effects of stock grazing, drought and rabbits on land condition in western NSW has been well documented. As a case study, Palmer (1994) describes historical changes in land condition on Teryawynia Station, south of Wilcannia. The manager of Teryawynia Station told the Royal Commission of 1901 that:

‘... 100 000 acres (of a total of 463 000 acres), is as bare as the floor in spite of the great rains which they have had. About 50 miles of fencing has been silted up by the sand. All the stockyards are filled in (with sand). There is a stockyard seven feet high on Abermarle Station ... in less than 18 months (after erection) he drove a buggy over the top of the yards.’ (cited in Palmer 1994).

In 1945 these same yards had about 50 cm of the rails above the sand and in 1983 at the time the drought broke, there was only about 2 cm of sand in the bottom as a result of the revegetation of the surrounding country. In the 1950s this Station covered 600 000 acres and was carrying at least 60 000 sheep with five or six watering points in addition to Darling River frontage. Some of the watering points had to provide water for some 20 000 sheep each, denuding the surrounding area for a radius of several kilometres (Palmer 1994).

Teryawynia has now been broken up with the area of each new property being 60 000 acres and each carrying 5 000 sheep, with 15 or more watering points. In the 1940s most of this station was bare of *Maireana pyramidata* (black bluebush), except for scattered individuals. Today the same area is covered with *M. pyramidata* spaced between two and ten metres all over (Palmer 1994). This suggests that there has been a notable recovery of the vegetation in at least portions of the Western Division in recent times, however, *M. pyramidata* is generally regarded as a coloniser species of degraded land, particularly land which has been overgrazed (Lewer, S., DLWC, pers. com. Dec. 2001). If Denny had undertaken his assessment in 1950 rather than in the early 1990s he is likely to have found a much higher percentage of sites with a loss of vegetation cover.

Intensive grazing of the plant communities by domestic stock has caused a decrease in numbers of some species, increases in numbers of some species and has aided in the proliferation of exotic species. Decreasing species are those highly palatable and nutritious to stock and which stock grazed in preference to other species, and which became depleted in the plant community - for example *Atriplex nummularia* (old man saltbush) and *A. vesicaria* (bladder saltbush). Increasing species are those not preferentially eaten by stock, or those that respond positively to grazing such as *Maireana* spp. (bluebushes), *Sclerolaena* spp. (copperburrs), *Aristida* spp. (wiregrasses) and unpalatable woody shrubs. Woody shrubs were also advantaged by the reduction in the frequency of fire associated with grazing. Invasion of native plant communities by exotics has been extensive. For example, *Marrubium vulgare* (horehound) became very common on Bogan River runs only 10 years after occupation. There has been a rapid change in plant communities from those dominated by chenopod shrublands to disclimax grasslands. A disclimax community is one where recurring disturbances, such as grazing or periodic burning exert the predominant influence in maintaining the structure and composition of the steady-state vegetation. The *Acacia pendula*

(myall) community, for example, has greatly diminished as a community and is not well conserved (Mitchell 1991).

The pre-1750 vegetation of the DRP bioregion has been substantially modified but not in a consistent way or degree throughout the bioregion. In the eastern portion, clearing of the forests and woodlands on the productive alluvial plains has left an extensively changed landscape, one dominated by agricultural uses and containing only small patches of remnant native vegetation communities. In the western semi-arid portion of the bioregion the initial effects of overgrazing were extreme, but with changes in management there has been some recovery of the vegetative cover. In general terms there has been a shift from woodland to a larger proportion of grassland but of different and predominantly introduced species.

3.2 VEGETATION MAPPING AND DESCRIPTION IN THE DRP

Vegetation mapping covering the DRP is limited to very broad-scale datasets, with some detailed mapping of small areas. Only the Murray Darling Basin Commission basin-wide mapping of structural and floristic attributes of the vegetation (M305) covers the entire DRP (MDBC 1991) (Map 24). This M305 mapping indicates that only 6.2% of the DRP is now covered with woody vegetation. In the Macquarie catchment 6.4% of the area is covered with woody vegetation (M305). *Eucalyptus populnea subsp. bimbil* (bimble box) communities are dominant, but are in poor health, with the grassy/herbaceous *E. populnea subsp. bimbil* woodland of the relic floodplains being severely fragmented through cropping, while the more shrubby *E. populnea subsp. bimbil* woodlands have been largely affected by grazing, thinning, ring-barking and cropping (Lewer, S., DLWC, pers. com. Dec. 2001). Understorey species have almost completely disappeared and less than 13% of the region retains natural pastures (MDBC 1991; Macquarie 2100 report). The value of the M305 vegetation mapping is limited, as it omits native grasslands and shrublands with less than 20% woody cover and provides no specific indication of species composition or community health.

The precision, scale, methodology and coverage of mapping with floristic interpretation varies throughout the region. Other broad-scale vegetation datasets are listed in Table 3.1.

Table 3.1 Existing broad-scale vegetation mapping in the DRP

Dataset	Scale mapping	of	Notes / references	% of DRP covered
The Vegetation of Australia	1:10 000 000		Beadle (1981)	100%
AUSLIG Atlas of Australian Resources: Vegetation	1:5 000 000		AUSLIG (1990)	100%
The Natural Vegetation of North-Western New South Wales	1:1 000 000		Pickard and Norris (1994)	21%
Murray Darling Basin Commission M305 Datalayer	1:100 000 (nominal)		Broad Landsat structural and floristic interpretation of woody/non-woody vegetation in the Murray-Darling Basin (MDBC 1991).	98%
Conservation Atlas of Plant Communities	Point data used to estimate locations of vegetation communities		Specht <i>et al.</i> (1995) not available in electronic form – published only in hard copy.	100%
Natural Vegetation of the Southern Wheatbelt	1:250 000		Sivertsen and Metcalfe (1995)	57%

The eastern 57% of the bioregion has been mapped as part of the NPWS wheatbelt mapping project (Sivertsen & Metcalfe 1995). This includes systematic site survey data and includes updated mapping layers which incorporate information about clearing of native vegetation, covering the period from 1987 to 1998 (Sivertsen & Metcalfe 1999). This mapping identifies woody vegetation of greater than 5% cover and a remnant patch sizes of greater than 10 hectares.

The lower reaches of the Macquarie and Bogan Rivers have been surveyed and mapped during a number of studies. Beadle (1948) mapped the area in the west and Biddiscombe (1953,1963), the east. These maps outline the vegetation communities of the area but do not indicate the densities of woody vegetation cover. Steenbeeke (1996) mapped the lower Macquarie floodplain, upstream of the Macquarie Marshes using aerial photography; Peasley (1999) mapped Moree Plains and East Walgett; and Sawtell (undated) mapped the West Walgett and Brewarrina Regional Vegetation Committee (RVC) areas. Two additional surveys did not include mapping. These were the survey of native vegetation in the lower Macquarie valley irrigation area by Hassall and Associates (1996); and the vegetation survey of stock routes in the central west by Nowland (1997). The survey report by Hassall and Associates (1996) outlines the health of native vegetation and discusses the distribution and decline in woody vegetation cover since European settlement. The spatial distribution of recent fine-scale vegetation mapping indicates a gap in floristic community information in the centre of the DRP (Map 25). Lee (1925) includes excerpts from the diary of the botanist on Oxley's expedition from Condobolin to the Bogan River describing the vegetation of the area. Surveys of the natural pastures were undertaken of the north-west slopes of New South Wales by Williams (1979).

Several authors have provided general descriptions of plant communities in the DRP. In their descriptions of the provinces defined for the DRP, Morgan and Terrey (1992) described briefly the dominant plant communities. These descriptions are very broad but cover the entire bioregion. Plant communities in the portion of the bioregion within the western division of New South Wales have also been described by Walker (1991) and Cunningham *et al.* (1992), and the plant communities of the northern floodplains are described in Smith *et al.* (1998). None of these descriptions has been based on quadrat sampling or detailed plant community analysis.

The Sivertsen and Metcalfe (1995) mapping also contributed to the description of plant communities within the eastern portion of the DRP which overlaps with the majority of the Macquarie catchment within the DRP, and the entire area of the Macintyre, Gwydir, Namoi and Castlereagh catchments within the DRP. Howling (1997) described seven woodland communities for the Central West catchment (including Macquarie, Bogan and Castlereagh Catchments), highlighting the importance of riparian, wetland, shrubland and native grassland communities.

3.3 PLANT COMMUNITY DESCRIPTIONS

The distribution of plant communities in the DRP is influenced by climate, landform, drainage and soil/substrate attributes. This distribution has been extensively modified as a result of European settlement and land use, the introduction of rabbits and other pest species, and modification of drainage regimes due to the rapid expansion of irrigation since the 1930s. In particular, distribution and floristic composition of grassy or herbaceous communities has been profoundly affected by disturbance, particularly from grazing by domestic stock and rotational cropping (Walker & Hodgkinson 1999; Kirkpatrick 1997; Lewer, S., DLWC, pers. com. Dec. 2001).

In this section, broad descriptions of vegetation types from reports covering the DRP have been integrated in an attempt to provide an overview of the dominant vegetation communities and the changes across the landscape resulting from landform variation, increasing aridity from east to west and north-south climatic influences. These descriptions generally include the dominant species in the overstorey, shrub layer and grass cover and while they are too broad to indicate local variation and subtle habitat changes, they provide a general picture of the landscape. The vegetation descriptions are taken from *Plants of Western NSW* (Cunningham *et al.* 1992); land systems descriptions by Walker (1991); vegetation descriptions provided by Morgan and Terrey (1992); the eight communities defined for the northern floodplains (Smith *et al.* 1998); and descriptions of the riverine plains of the Namoi catchment (NWCMC 1996). The province diagrams taken from Morgan and Terrey (1992) (Figure 3.1 through to Figure 3.11) indicate in more detail some of the plant community-landform associations throughout the DRP. The key conservation areas are described in section 8.4.1.

	co-dominant	co-dominant	sub-dominant
Land Profile			
Geology	Medium and coarse Quaternary alluvials	Fine Quaternary alluvials.	Quaternary alluvials
Landform and Soils	Low, gently undulating rises. Red texture contrast soils	Plains with shallow depressions and channels. Brown and grey clays.	Creek and river channels, levees and immediate flood plain. Alluvial soils.
Vegetation	Woodland to open woodland of leopardwood, wilga, budda, native orange, warrior bush with bimble box woodland on higher areas and occasional white cypress on deeper soils. Understorey includes salt bushes and copper burrs. Occasional rosewood and whitewood, and, in the south, grey box, yellow wood and Blakely's red gum.	Open woodland and grasslands, includes myall, black box, belah, eurah, leopardwood, whitewood and occasional wilga, lignum, flowering lignum. May be prominent understorey of old man saltbush. Occasional areas of curly Mitchell grass.	River cooba, eurah, black box, belah, lignum with coolabah becoming common in the west. River red gum lines larger channels, cumbungi on waterlogged areas. White cypress and bimble box on coarse textured levee deposits
Condition	Usually heavily thinned with severe scalding. Some cropping on coarser soils.	Usually heavily thinned and heavily grazed. Cropping in the south.	Heavily grazed. Some cropping. Dieback in river red gums.
Reservation	None	Minor areas in Macquarie Marshes NR	Macquarie Marshes NR (18 21 Iha)
Key Areas	1, 2, 3		

Figure 3.1 Profile of the Bogan-Macquarie Province

(adapted from Morgan & Terrey 1992)

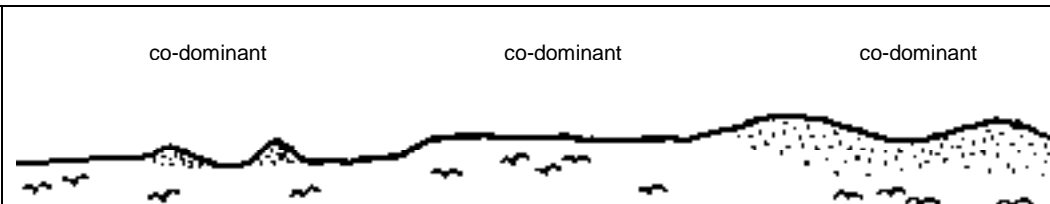
			
Land Profile			
Geology	Quaternary alluvials	Quaternary alluvials	Quaternary alluvials
Landform and Soils	River channels, levees and lower floodplains. Grey clays.	Upper floodplains. Light grey clays and brown clays.	Low rises and high, gently undulating areas. Texture contrast soils, occasional sands and brown clays
Vegetation	Coolabah low open woodlands and woodlands. Occasional myall, cooba, whitewood and belah with areas of lignum and mimosa bush. River red gum on larger tributaries, billabongs and depressions. Occasional black box in the west.	Predominantly grassland of curly Mitchell grass, with occasional whitewood, coolabah, and wilga, and bimbale box on low rises.	Bimbale box woodland, with wilga, native orange and leopardwood; and with whitewood, belah and occasional brigalow on lower areas. White cypress on higher, coarser soils in the east with silver-leaf ironbark. Moreton Bay ash and occasional bloodwood on sands
Condition	Largely cultivated, particularly in the east	Some cultivation, usually heavily grazed with annual becoming predominant	Some cultivation, largely thinned and heavily grazed. Scalding widespread.
Reservation	None	None	Midkin NR (359ha) Borongra NR (195ha) Boomi West NR (149ha) Boomi NR (156ha)
Key Areas	4, 5, 3, 6, 7		

Figure 3.2 Profile of the Castlereagh-Barwon Province

(adapted from Morgan & Terrey 1992)

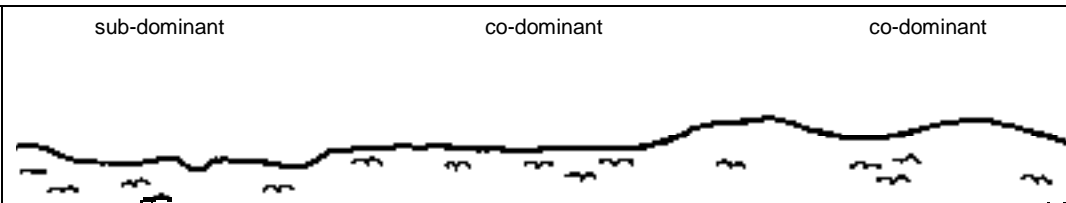
			
Land Profile			
Land Systems	Upper Darling, Long Meadow	Goodooga, Wombiera	Rostella, Wongal
Geology	Quaternary alluvials	Quaternary alluvials	Quaternary alluvials
Landform and Soils	Low level flood plains, channels. Grey clays	High level flood plains, occasional low rises. Grey clays.	Low rises, some high flow channels. Clays and texture contrast.
Vegetation	Coolabah open woodland, with occasional lignum, river cooba, eurah, golden goosefoot, whitewood, black box. River red gum fringing channels.	Grassland of Mitchell grasses and annuals, occasional lignum, coolabah and whitewood. Areas of gidgee in the west.	Forblands dominated by saltbushes. Areas of gidgee, occasional wilga, leopardwood, warrior bush. Bimbale box in the north-east.
Condition	Heavily grazed	Heavily grazed, some cultivation	Severe scalding and loss of tree cover in most areas.
Reservation	None	None	None
Key Areas	8		

Figure 3.3 Profile of the Culgoa-Bokhara Province

(adapted from Morgan & Terrey 1992)

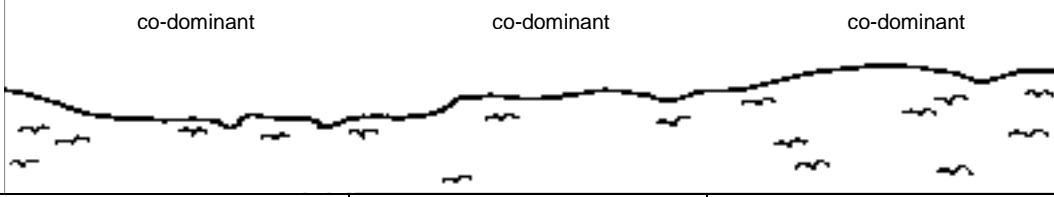
			
Land Profile			
Land Systems	Llanillo, Upper Darling (Moonie River only)	Jomara, Gingie (in the south only)	Rugby
Geology	Quaternary alluvials	Quaternary alluvials	Quaternary alluvials, prior stream deposits.
Landform and Soils	Low level floodplain, channels. Grey clays	High level floodplains, shallow drainage lines. Grey clays	Low rises, minor dunes, raised channels. Texture contrast soils and sands. Minor grey clay.
Vegetation	Coolabah, eurah, river cooba and lignum on wetter areas with river red gum on larger channels. Occasional bumble box and belah on higher areas. Areas of high grassland.	Coolabah open woodland with belah and myall. Bumble box on higher areas. Occasional whitewood, wilga and leafless cherry.	Bumble box woodland with budda and wilga. White cypress on coarser soils, belah on finer soils. Coolabah on enclosed channels, usually with belah.
Condition	Heavily grazed, some cultivation	Usually thinned, some cultivation	Usually thinned, some clearing. Often severe scalding
Reservation	None	None	None
Key Areas	9, 10		

Figure 3.4 Profile of the Warrambool-Moonie Province

(adapted from Morgan & Terrey 1992)

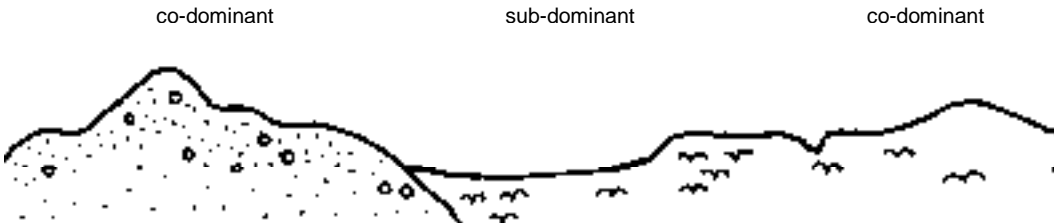
			
Land Profile			
Land Systems	Lightning Ridge	Rotten Plain, Narran	Upper Darling, Wombiera, Goodooga, Long Meadow, Llanillo, Nigery, Rostella, Tatala.
Geology	Fine and medium-grained Cretaceous sediments	Quaternary alluvials	Quaternary alluvials
Landform and Soils	Low rounded ridges with some rocky hills. Red earths and lithosols	Extensive depressions and backplains, minor lunettes, salinas and levees. Grey clays	Level to gently undulating floodplains, low rises and low sand dunes. Grey clays, texture contrast soils and sands
Vegetation	Open woodland with silver leaf ironbark. White cypress, western bloodwood and mulga on coarser, shallower soils and bumble box on loamier soils and lower slopes. Occasional rough-barked apple, supplejack, warrior bush, kurrajong and beefwood.	Grasses and forbs within depressions with areas of lignum. River red gum fringes in wetter areas with river cooba, while coolabah fringes seasonal swamps with eurah.	Coolabah, river red gum and occasional black box fringing main channels with scattered coolabah, myall, whitewood and flowering lignum on floodplains. Bumble box, wilga, budda, belah and occasional leopardwood on low rises. Supplejack, white cypress and wild lemon on dunes.
Condition	Generally thinned and grazed. Sheet and gully erosion widespread. Frequent dense regrowth of cypress and mulga.	Largely cultivated	Generally thinned and grazed. Higher areas usually scalded. Coolabah regrowth dense in some areas.
Reservation	Kurrajong (9,000ha)	None	None
Key Areas	11, 12		

Figure 3.5 Profile of the Narran-Lightning Ridge Province

(adapted from Morgan & Terrey 1992)

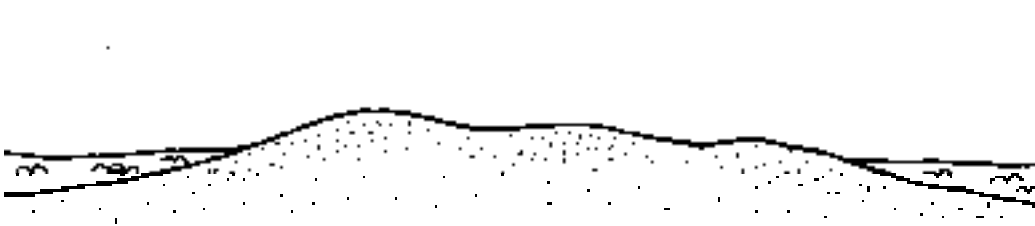
	
Land Profile	
Land Systems	Araluen
Geology	Cretaceous sediments, deeply weathered
Landform and Soils	Slightly undulating with low rounded hills. Predominantly deep red earths
Vegetation	Woodlands and open forests dominated by bumble box and white cypress with budda and wilga and occasional belah and leopardwood
Condition	Heavily grazed with some thinning and logging. Small areas of clearing
Reservation	None
Key Areas	13

Figure 3.6 Profile of the Collarenebri Interfluve Province

(Morgan & Terrey 1992)

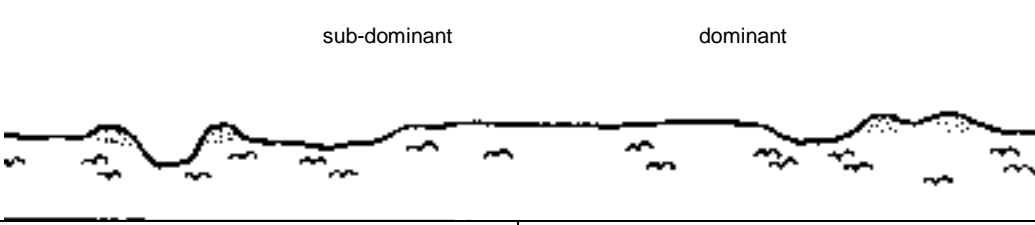
	<div style="display: flex; justify-content: space-around;"> sub-dominant dominant </div> 	
Land Profile		
Land Systems	Mid Darling	Nelyambo, minor Dunoak
Geology	Quaternary alluvials	Quaternary alluvials
Landform and Soils	Main river channel and adjacent low level flood plains. Grey clays	High level flood plains with small channels. Small fringing areas of dunes and old red alluvials. Grey clays, minor sands and texture contrast soils
Vegetation	Open forests and woodlands of coolabah and river red gum. Occasional black box and river cooba	Forbfields and grasslands, coolabah and black box on channels, canegrass or lignum in small pans. Higher fringing areas with occasional black box, rosewood and bumble box
Condition	Heavily grazed, some scalding	Heavily grazed, scalding, minor cultivation in the north
Reservation	None	None
Key Areas	14	

Figure 3.7 Profile of the Louth Plains Province

(Morgan & Terrey 1992)


	Minor	dominant	sub-dominant
Land Profiles			
Land Systems	Mid Darling	Nelyambo, areas of Thackenbe, Budda, Acres Billabong	Dunoak in the north, Denian in the south
Geology	Quaternary alluvials	Quaternary alluvials	Quaternary alluvials
Landform and Soils	Main river channel and adjacent low level flood plain. Grey clays	High level floodplain patterned by small lakes, low rises and dunes, and high level anabranches. Grey clays, areas of sands and texture contrast soils	Plains with low rises, pans and low dunes. Texture contrast soils.
Vegetation	Coolabah and river red gum fringing channels. Occasional black box and river cooba on the flood plain	Forbfields; black box and coolabah fringing lakes and bases of dunes, river red gum on anabranches, lignum in lakes, shrubs on low rises and dunes with occasional rosewood.	Bimble box and black box fringing low rises and in depressions, rosewood and shrubs on low rises. Black bluebush common in the south.
Condition	Heavily grazed, some scalding	Heavily grazed. Scalding common especially on coarser soils.	Heavily grazed and scalded
Reservation	None	None	None
Key Areas	15, 40		

Figure 3.8 Profile of the Wilcannia Plains Province

(adapted from Morgan & Terrey 1992)

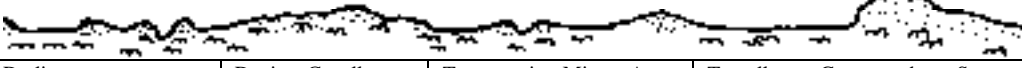
	sub-dominant	dominant	minor	sub-dominant
Land Profile				
Land Systems (in part)	Darling	Denian, Canally	Teryawynia, Minor Acres Billabong	Travellers, Gunnaramby, Sayers, minor Thackenbe.
Geology	Quaternary alluvials, minor aeolian	Quaternary alluvials and aeolians	Quaternary alluvials	Quaternary alluvials and aeolians
Landform and Soils	Darling River flood plain with main channel, billabongs, swamps and occasional low sandhills. Grey clay and sands	Undulating plains and dunes, and higher alluvial plains. Sands, texture contrast soils and clays.	Floodplains, backplains and distributary channels. Heavy clays, some texture contrast and sands.	Large overflow lakes and basins and associated lunettes. Clays, texture contrast earths and sands.
Vegetation	Black box woodlands and open woodlands with river cooba and areas of lignum. River red gum on levees.	Lower areas fringed by black box. Areas of prickly wattle, bluebush and woody shrubs.	Scattered black box, areas of lignum and canegrass, occasional old man saltbush. River red gum, river cooba and occasional coolabah on larger channels	Lignum on lake beds with black box fringing. Bluebush, sandhill canegrass and sparse belah and acacias on lunettes.
Condition	Heavily grazed and scalded	Local severe scalding and wind erosion	Heavily grazed and scalded	Wind and gully erosion of lunettes. Water levels manipulated in several areas for off-river storage. Cultivation of lake beds.
Reservation	Kincheha NP (44 182ha)	Kincheha NP	None	Kincheha NP
Key Areas	To be determined			

Figure 3.9 Profile of the Menindee Province

(adapted from Morgan & Terrey 1992)


	co-dominant		co-dominant	
Land Profile				
Land Systems	Anabranche	Travellers		
Geology	Quaternary alluvials		Quaternary alluvials and aeolians	
Landform and Soils	Floodplains, channels, billabongs and plains. Grey clays, minor texture contrast		Large overflow lakes, lunettes and plains. Grey clays and sands	
Vegetation	Black box open woodland with occasional river cooba and areas of lignum. River red gum on channels.		Lignum and occasional black box on lake margins. Belah, white cypress and prickly wattle on lunettes.	
Condition	Heavily grazed, local severe scalding		Lunettes heavily grazed. Scalding and wind erosion	
Reservation	None		Nearie Lake NR (4 347ha)	
Key Areas	To be determined			

Figure 3.10 Profile of the Great Darling Anabranche Province

(adapted from Morgan & Terrey 1992)

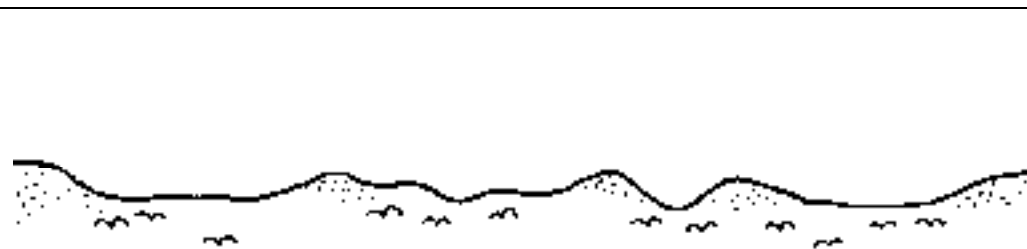
Land Profile				
Land Systems	Darling, minor Canally and Wentworth			
Geology	Quaternary alluvials, minor aeolian			
Landform and Soils	Floodplain, main channels, billabongs, swamps, back channels and low dunes. Grey clays and sands			
Vegetation	Black box open woodland with river cooba and areas of lignum. River red gum on major channels.			
Condition	Heavily grazed, areas of severe scalding			
Reservation	None			
Key Areas	To be determined			

Figure 3.11 Profile of the Pooncarie-Darling Province

(adapted from Morgan & Terrey 1992)

The most common plant communities within the DRP are open woodlands dominated by *Eucalyptus coolabah* (coolibah), *Eucalyptus largiflorens* (black box) and *Eucalyptus camaldulensis* (river red gum) with significant areas of *Eucalyptus populnea subsp. bimbil* (bimble box) woodlands and grasslands and minor areas of shrublands (Cunningham *et al.* 1992; NWCMC 1996). On the northern fans there is a variety of communities including mulga, northern floodplain community, gidgee and brigalow, bimble box and white cypress pine and Mitchell grass plains. Along the Darling River from Bourke to the Menindee Lakes, communities change from a dominance of Northern Floodplain plant communities to Southern Riverine Woodlands, with belah and bluebush communities becoming increasingly common to the south (Walker 1991). Walker's descriptions contain greater detail than other reports about plant species composition in the break down of the land systems into land units for the Western Division.

3.3.1 Forests and woodlands

***Eucalyptus populnea subsp. bimbil* (bimble box) - *Callitris glaucophylla* (white cypress pine) woodlands**

These woodland communities are widespread on level to undulating lands with red and red brown earths, including the coarse textured ridges (levee deposits) formed by prior streams in the Bogan-Macquarie and Castlereagh-Barwon provinces of the bioregion, much of which is now cleared. The relative abundance of the two dominant species varies from almost pure stands of each to co-dominance. *Eucalyptus populnea subsp. bimbil* can occur with *Eucalyptus largiflorens* (black box) on low rises fringing the floodplain in the Wilcannia Plains province within the Bogan River catchment, often occurring as an ecotonal community on the relict floodplains, and on the outer floodplains of the Macquarie Marshes area within the Bogan-Macquarie province.

Along the edge of the northern Darling River floodplain this community consists of open woodlands, woodlands and open forest with canopy trees ranging from four to 12 m in height and a canopy cover of two to 40%. Dominant tree species are *Eucalyptus populnea subsp. bimbil*, *Acacia aneura* (mulga), *Acacia excelsa* (ironwood) and *Grevillea striata* (beefwood). Common shrub species: *Eremophila mitchellii* (budda), *Eremophila sturtii* (turpentine), *Dodonaea viscosa subsp. angustissima* (narrow-leaf hopbush), *Acacia aneura*, *Senna form taxon 'filifolia'* and *Geijera parviflora* (wilga). Ground cover species include *Monachather paradoxa* (bandicoot grass), *Eriachne mucronata* (mountain wanderrie grass), *Austrostipa* spp., *Sclerolaena convexula* (tall copperburr), *Rhodanthe floribunda* (common white sunray), *Calotis cuneifolia* (purple burr-daisy), *Brachyscome* spp. (daisies), and *Cheilanthes lasiophylla* (mulga fern). *Atalaya hemiglauca* (whitewood) and *Exocarpus cupressiformis* (native cherry) are associated in Warrambool-Moonie province.

On the red ridge country around the town of Lightning Ridge these woodlands are more diverse, occurring as open woodlands and woodlands with canopy height from six to 14 m and canopy cover from three to 20%. Dominant trees are *Callitris endlicheri* (black cypress pine), *Callitris glaucophylla*, *Eucalyptus coolabah*, *Eucalyptus populnea subsp. bimbil* and *Acacia aneura*. Common shrub species include *Geijera parviflora*, *Eremophila mitchellii*, *Acacia aneura* and *Exocarpus aphyllus* (leafless cherry). Ground cover species include *Chloris truncata* (windmill grass), *Eragrostis eriopoda* (woollybutt), *Enneapogon* spp., *Einadia nutans* (climbing saltbush), *Enchylaena tomentosa* (ruby saltbush), *Chenopodium curvispicatum* (cottony saltbush), *Sclerolaena muricata* (black roly-poly), *Sclerolaena tricuspis* (streaked poverty-bush), *Sclerolaena convexula* (tall copperburr), *Dissocarpus biflorus* (twin-horned copperburr), *Capparis lasiantha* (nepine), *Marsilea drummondii* (nardoo) and *Calotis cuneifolia*.

On dunes in the Narran-Lightning Ridge province *Ventilago viminalis* (supplejack) and *Canthium* spp. can occur with *Callitris glaucophylla* and occasional *Angophora floribunda* (rough-barked apple), *Ventilago viminalis*, *Apophyllum anomalum* (warrior bush) and *Brachychiton populneus* (kurrajong). *Grevillea striata* (beefwood) are found with *Eucalyptus populnea subsp. bimbil* on the loamier soils and lower slopes.

***Casuarina cristata* (belah) - *Alectryon oleifolius* (rosewood) woodlands**

These communities vary structurally and are widely distributed across western New South Wales. They generally occur on solonised brown soils or calcareous red earths as open forests, woodlands and open woodlands with canopy height ranging from eight to 20 m and cover from five to 65%. On the northern floodplains the dominant tree species is *Casuarina cristata*, which occasionally co-exists with *Geijera parviflora*, *Eucalyptus populnea subsp. bimbil* or *Myoporum platycarpum* (sugarwood). Among the common shrub species are *Alectryon oleifolius*, *Nitraria billardierei* (dillon bush), *Dodonaea viscosa subsp. angustissima*, *Olearia pimeleoides* (showy daisy-bush), *Olearia muelleri* (Muller's daisy-bush) and *Eremophila sturtii*. Groundcover species may include *Atriplex stipitata* (bitter saltbush), *Enchylaena tomentosa* (ruby saltbush), *Rhagodia spinescens* (thorny saltbush), *Sclerolaena diacantha* (grey copperburr), *Sclerolaena obliquicuspis* (limestone copperburr), *Maireana* spp. (bluebushes), *Austrostipa* spp. (spear grasses), *Zygophyllum apiculatum* (gall-weed) and *Vittadinia cervicularis* (a daisy). Associated species in other areas include *Acacia loderi* (nelia), *Acacia homalophylla* (yarran), *Enneapogon* spp. (bottle washers) and herbs.

Dense monotypic forests of *Casuarina cristata* occur on heavy clay soils of floodplains in the eastern portions of western NSW.

***Eucalyptus largiflorens* (black box) woodlands**

E. largiflorens common on the massive and self-mulching clay soils of floodplains, and as fringing communities around ephemeral lakes. In the north and west of the Bogan-Macquarie and Castlereagh-Barwon provinces, this community merges with *Eucalyptus coolabah* woodlands and these two species can be co-dominant. *Acacia stenophylla* (river cooba), *Acacia pendula* (myall), *Acacia salicina* (cooba), *Acacia oswaldii* (miljee), *Eremophila bignoniiflora* (eurah), *Casuarina cristata*, *Muehlenbeckia florulenta*, *Eremophila polyclada* (flowering lignum) and *Exocarpos aphyllus* are scattered throughout the community. Ground cover ranges from forbs and perennial grasses such as panic grasses and *Paspalidium* spp., to pasture species.

Along the Barwon River canopy trees range from eight to 16 m in height with a canopy cover of ten to 60%. In addition to *Eucalyptus largiflorens*, dominant trees include *Eucalyptus coolabah*, *Casuarina cristata*, *Eucalyptus populnea subsp. bimbil* and *Atalaya hemiglauca*. Common shrub species are *Muehlenbeckia florulenta*, *Chenopodium nitrariaceum* and *Eremophila mitchellii*. Groundcovers include *Astrebla elymoides* (hoop Mitchell grass), *Astrebla lappacea* (curly Mitchell grass), *Tripogon loliiformis* (five-minute grass), *Paspalidium jubiflorum* (warrego summer-grass), *Atriplex nummularia* (old man saltbush), *Atriplex leptocarpa* (slender-fruited saltbush), *Sclerolaena calcarata* (red copperburr), *Sclerolaena muricata*, *Dissocarpus biflorus* (twin-horned copperburr), *Capparis lasiantha*, *Marsilea drummondii*, *Centipeda cunninghamii* (common sneezeweed) and *Vittadinia cuneata* (fuzzweed).

The floodplains of the Menindee province, which represent the most southern and western extremity of the bioregion, are dominated by *Eucalyptus largiflorens* woodlands and open woodlands with some *Acacia stenophylla*. *Eucalyptus camaldulensis* can occur with *Eucalyptus largiflorens* on the levees and patches of *Acacia victoriae* (prickly wattle) grow on the higher alluvial plains.

***Eucalyptus coolabah* (coolibah) woodlands**

Eucalyptus coolabah woodlands are common on clay soils in areas subject to flooding in the north, becoming mixed with *Eucalyptus largiflorens* in similar habitats in the south. Other tree and shrub species are uncommon, but include *Eucalyptus camaldulensis*, *Eremophila bignoniiflora*, *Casuarina cristata*, *Acacia stenophylla*, *Atalaya hemiglauca*, *Capparis lasiantha* and *Exocarpos aphyllus*. The groundcovers are similar to those in *Eucalyptus largiflorens* communities. In the Bogan-Macquarie and Castlereagh-Barwon provinces *Eucalyptus coolabah* can be associated with *Acacia pendula* (myall) *Muehlenbeckia florulenta* and *Acacia farnesiana* (mimosa bush). *Chenopodium auricomum* (golden goosefoot) is associated with this community in the Culgoa-Bokhara province.

Species associated with this community vary with topography. For example, *Muehlenbeckia florulenta* occurs in wetter areas and *Casuarina cristata* and *Acacia pendula* are found on the higher level floodplains.

On the floodplains of the Culgoa and Narran Rivers, *Eucalyptus coolabah* is found as closed and open forest, woodland and open woodland with tree canopy height ranging from six to 15 m and canopy cover from five to 70%. *Eucalyptus coolabah* is found with varying densities of *Acacia stenophylla*, *Eucalyptus camaldulensis*, *Eucalyptus largiflorens* and *Eucalyptus populnea subsp. bimbil*. Common shrub species are *Muehlenbeckia florulenta*, *Eremophila bignoniiflora*, *Eremophila sturtii*, *Myoporum montanum* (western boobialla), *Geijera parviflora* and *Alstonia constricta* (quinine bush). Groundcover species include *Paspalidium jubiflorum*, *Cyperus concinnus* (trim sedge), *Eleocharis pallens* (pale spike-rush) and *Muehlenbeckia florulenta*.

***Eucalyptus camaldulensis* (river red gum) open forests and woodlands**

These communities predominantly occur as ribbons along rivers, swamps, billabongs and ephemeral sandy creeks. They are widely distributed across western New South Wales and can be grouped as open forests, woodlands and open woodlands with canopy trees up to 20 m in height and a canopy cover of 40 to 50%. In addition to *Eucalyptus camaldulensis*, tree and shrub species can include *Eucalyptus largiflorens*, *Eucalyptus coolabah*, *Eucalyptus melliodora* (yellow box), *Corymbia tessellaris* (carbeen), *Acacia stenophylla*, *Acacia salicina*, *Acacia oswaldii* and *Muehlenbeckia florulenta* and ground cover frequently contains grasses, sedges, forbs and some low shrubs such as *Enchylaena tomentosa* and *Chenopodium* spp.

Common shrub species on the northern floodplains include *Nicotiana glauca* (wild tobacco), *Swainsona greyana* (darling pea), *Eremophila longifolia* (emu bush), *Eremophila bignoniiflora*, *Eremophila mitchelli* and *Muehlenbeckia florulenta*, and groundcover *Myriocephalus sturtii* (poached eggs), *Enneapogon avenaceus* (common bottle washers), *Capparis lasiantha* and *Marsilea drummondii*.

***Eucalyptus melanophloia* (silver-leaf ironbark) woodlands**

These woodlands typically occur in the north of the region on skeletal soils of gravelly to stony ridges, and on deep red sandy earths on sandplains. Associated tree and shrub species can include *Acacia aneura*, *Grevillea juncifolia* (honeysuckle spider flower), *Hakea* spp., *Acacia excelsa*, *Alstonia constricta*, *Brachychiton populneus*, *Ventilago viminalis*, *Geijera parviflora*, *Capparis lasiantha* and *Callitris glaucophylla*. *Corymbia tessellaris* can co-occur on the higher coarser soils and with *Corymbia dolichocarpa* (bloodwood) on sandy soils in

the east of the Castlereagh-Barwon province and with *Corymbia terminalis* (western bloodwood) and *Acacia aneura* in the coarser, shallower soils of the Narran-Lightning Ridge province. Perennial grasses dominate the groundcover, with *Triodia mitchellii* var. *breviloba* (buck spinifex) common in the north, and *Monachather paradoxa*, *Eragrostis eriopoda* (woolybutt) and others prominent elsewhere.

***Geijera parviflora* (wilga) - *Flindersia maculosa* (leopardwood) woodlands**

This community is mostly restricted to the Bogan-Macquarie area, occurring on red-brown earths that are often scalded and on low gently undulating rises away from the main watercourses. Communities can vary from being monotypic stands of either species to a mixture. Other species include *Atalaya hemiglauca*, *Eremophila mitchellii*, *Capparis mitchellii* (native orange), *Apophyllum anomalum*, *Eucalyptus populnea* subsp. *bimbil* (on higher areas) and occasional *Callitris glaucophylla*, *Alectryon oleifolius* *Eucalyptus microcarpa* (grey box) and *Eucalyptus blakelyi* (Blakley's red gum) in the south. Understorey includes saltbushes and *Sclerolaena* spp. (copper burrs). This community can intergrade with the *Eucalyptus largiflorens* community on plains with shallow depressions and channels and *Eucalyptus populnea* subsp. *bimbil* on the higher slopes.

On the low rises of the Culgoa-Bokhara province *Geijera parviflora*, *Flindersia maculosa*, *Apophyllum anomalum* and *Acacia cambagei* occur together.

***Acacia pendula* (myall) woodlands**

These occur as open to dense woodlands on clay and clay loam textured soils of the river floodplains. *Casuarina cristata*, *Acacia stenophylla*, *Acacia oswaldii*, *Senna artemisioides* ssp. *circinnata* (spring-pod cassia), *Capparis lasiantha*, *Acacia victoriae*, *Acacia homalophylla* and *Alectryon oleifolius* may also occur with the *Acacia pendula*. The groundcover species include saltbushes, grasses and forbs such as *Sclerolaena* spp..

***Acacia harpophylla* (brigalow) woodlands**

Monotypic stands of *Acacia harpophylla* form on red clays and red earths with sandy clay loam topsoils. Shrubs are rare to absent, and the groundcover consists of saltbushes, *Sclerolaena* spp. and annual forbs. This shrubland is found in the north of the bioregion and in lower parts of the landscape can mix with the species of the *Flindersia maculata* and *Geijera parviflora* community in the Castlereagh-Barwon province.

3.3.2 Shrublands

Tall *Acacia* Shrublands

Acacia loderi (nelia) shrublands

This community exists on sandy calcareous red earths and sandy accumulations on broad plains of solonised brown soils in the west of the region. Associated trees include *Acacia aneura* in the north and *Casuarina cristata* in the south. Shrubs include *Maireana sedifolia* (pearl bluebush), *Templetonia egena* (desert broombush), *Eremophila sturtii* and *Senna* form taxon '*filifolia*' (punky bush).

Saltbush Shrublands

This community is widely distributed across western New South Wales as forblands, open chenopod shrublands, chenopod shrublands and sparse shrublands. Common shrubs include

Nitraria billardierei, *Maireana pyramidata* (black bluebush), *Atriplex vesicaria* (bladder saltbush), *Atriplex nummularia*, *Enchylaena tomentosa*, and *Chenopodium nitrariaceum*. Groundcover species include *Sclerolaena diacantha*, *Sclerolaena obliquicuspis*, *Austrostipa* spp., *Calotis erinacea* (tangled burr-daisy), *Atriplex vesicaria*, *Atriplex leptocarpa* (slender-fruited saltbush), and *Atriplex lindleyi* (eastern flat-top saltbush), *Disphyma crassifolium* ssp. *clavellatum* (pigface), *Medicago minima* (medic) and *Sonchus oleraceus* (common sowthistle).

Atriplex vesicaria (bladder saltbush) shrublands

Within the DRP this community occurs on alluvial plains with grey and brown clays and shallow-surfaced red-brown earths. It is often a treeless community, or has scattered *Eucalyptus largiflorens* or *Acacia pendula*, and occurs interspersed with wetland communities, watercourses and sand ridges. Associated chenopods can include *Atriplex nummularia*, *Maireana pyramidata*, *Maireana aphylla* (cottonbush), and occasionally *Nitraria billardieri*. Grasses and forbs grow between the shrubs.

Maireana pyramidata (black bluebush) - *Maireana sedifolia* (pearl bluebush) shrublands

This bluebush community exists on solinized brown soils on plains and dunefields in the DRP, with composition ranging from monospecific stands of either species to a mixed community. It often intergrades into the *Atriplex vesicaria* community. Grasses and forbs grow between the shrubs. These saltbush shrublands become more common in the south-west of the bioregion, occurring extensively across the southern Wilcannia Plains and the Menindee provinces.

3.3.3 Grassland and wetland communities

***Astrebla* spp. (Mitchell grass) perennial grasslands**

This community is common in the northern part of the bioregion, occurring on grey clay soils of the floodplains and is usually treeless. Other grass species found with the *Astrebla* spp. are *Eragrostis setifolia* (neverfail) and *Dichanthium sericeum* (Queensland bluegrass), as well as many annuals such as *Iseilema* spp. (Flinders grass) and *Dactyloctenium radulans* (button grass) after wet seasons. Pastoral landuses such as grazing of stock has significantly altered this community (Fisher 1999).

Eriochloa australiensis (Australian cupgrass) and *Eriochloa crebra* (tall cupgrass) are often co-dominant in *Astrebla lappacea* (curly Mitchell grass) closed grasslands in the Bogan-Macquarie province. These communities also have a number of common forbs including *Boerhavia dominii* (tarvine), *Hibiscus trionum* (bladder ketmia), *Cullen tenax* (emu foot), and *Brachyscome heterodonta* (lobed-seed daisy) (Lewer, S., DLWC, pers. com. Dec. 2001).

Astrebla lappacea occurs on upper floodplains with *Atriplex nummularia* and occasional *Atalaya hemiglauca*, *Eucalyptus coolabah* and *Geijera parviflora* in Bogan-Macquarie and Castlereagh-Barwon provinces. In the Culgoa-Bokhara province *Muehlenbeckia florulenta* and *Acacia cambagei* can be found in *Astrebla* grasslands, especially towards the west.

***Triodia mitchellii* var. *breviloba* (buck spinifex) grasslands**

This spinifex community is restricted to the deep sands of the sandplains in the north of the region, often mixing with the *Eucalyptus melanophloia* community. Common shrubs include

Grevillea juncifolia, *Grevillea albiflora* (white spider-flower), *Acacia murrayana* (sandplain wattle) and *Acacia johnsonii* (gereera wattle).

***Austrostipa aristiglumis* (plains grass) grasslands**

Grey and brown clays of floodplains of major rivers support this community. Associated species include other grasses, perennial forbs and, following winter rains, annual grasses and forbs.

***Austrostipa* spp. (variable speargrasses) and *Enneapogon* spp. (bottle washers) grassland**

This grassland community also often forms the groundcover of the *Casuarina cristata* - *Alectryon oleifolius* and *Acacia loderi* shrubland communities. It is found on solonized brown soils, calcareous red earths and desert loams and occurs with other grasses, chenopods, perennial forbs, and after winter rains, annual forbs. The dominance of *Austrostipa variabilis* is favoured by winter rains and *Enneapogon* spp. by summer rains.

Floodplain communities

A sparse to open chenopod shrubland and open grassland is found on the floodplains, playas and basins within the northern floodplains region. The height of this community ranges from 0.5 to three metres and cover from five to 50%. Most common shrubs are *Muehlenbeckia florulenta*, *Chenopodium auricomum* (golden goosefoot), and occasionally regeneration of *Eucalyptus camaldulensis*. Ground cover species include *Agrostis avenacea* (blown grass), *Eragrostis setifolia*, *Eleocharis pallens* (pale spike-rush), *Pycnosorus chrysanthus* (golden billy-buttons), *Atriplex pseudocampanulata* (mealy saltbush) and *Pimelea simplex* (desert riceflower).

Muehlenbeckia florulenta and *Chenopodium nitrariaceum* can form distinct communities although their boundaries can be indistinct depending on the degree, frequency and reliability of flooding.

The ***Muehlenbeckia florulenta* community** occurs on alluvial areas with cracking grey soils and periodic flooding. It can be a treeless community, or have scattered *Eucalyptus largiflorens*, *Eucalyptus camaldulensis*, *Eucalyptus coolabah* or *Acacia stenophylla*. Associated shrub species include *Eragrostis australasica*, *Leptochloa digitata* (umbrella canegrass), *Chenopodium nitrariaceum* and *Typha* spp. (cumbungi). After floodwaters recede, a pasture of *Marsilea drummondii*, *Eleocharis* spp. (spike-rushes) and *Eragrostis setifolia* (neverfail) often grows between shrubs.

Muehlenbeckia florulenta grows on the beds of the large overflow lakes and basins of the Menindee province, fringed by *Eucalyptus largiflorens*, *Maireana pyramidata* and *Zygochloa paradoxa* (sandhill canegrass) and sparse *Casuarina cristata* and acacias on the lunettes.

The ***Chenopodium nitrariaceum* community** is found on the grey clay soils of the beds of periodically flooded lakes and flooded alluvial sites along major rivers. Trees are usually absent and complementary shrub species include *Eragrostis australasica*, *Leptochloa digitata* and *Muehlenbeckia florulenta*. Pastures similar to those found in the *Muehlenbeckia florulenta* communities occur after flooding.

Eragrostis australasica (cane grass) and *Leptochloa digitata* (umbrella canegrass) community *Eragrostis australasica* (cane grass) swamps occur in pans in sand dune country and on lakebeds with compact clay soils that are subject to periodic inundation. Few species are associated with this community except for scattered *Eremophila bignoniiflora*.

Swamp or marsh communities

These communities occur on sites with permanent, or effectively permanent, still or slow-moving shallow water. Vegetation is commonly composed of *Phragmites australis* (common reed), *Typha* spp. and other aquatic species, with or without emergent *Eucalyptus largiflorens*, *Eucalyptus camaldulensis* and *Eucalyptus coolabah*.

3.3.4 Plant communities of major DRP wetlands

Mapping and survey of plant communities in some of the major wetlands within the DRP indicates that there are distinct differences between them. These distinctive features suggest that each of the wetlands is significant in its own right, as well as being critical in the interconnecting, but diminishing, network of wetland habitats which support waterbird movements. The wetlands of the DRP are dynamic and strongly influenced by the irregular and uneven distribution of rain events and rainfall intensity in their catchments. They are adapted to this variability, with the relative proportions of particular wetland vegetation associations varying in relation to the prevailing climatic conditions.

The frequency and duration of flood events mostly determine the distribution, composition and structure of wetland plant communities. The regulation of river flows has changed the dynamic nature of this system, stabilising and enlarging the area of the drier plant communities while reducing the core wetlands and causing long term community changes through the loss of conditions suitable for the recruitment of some tree species (Kingsford & Thomas 1995). Table 3.2 below gives a brief summary of the dominant plant communities within the major wetlands of the DRP.

Table 3.2 Dominant plant communities of major wetlands of the DRP

Plant community	Dominant species	Major wetlands of DRP	Area within each major wetland (ha)
Forests and woodlands	<i>Eucalyptus populnea</i> subsp. <i>bimbil</i> woodlands	Macquarie Marshes	10 023
	<i>Eucalyptus largiflorens</i> woodlands	Macquarie Marshes	15 800
	<i>Eucalyptus coolabah</i> woodlands	Macquarie Marshes	8 040
		Gwydir Wetlands	50 000
		Gingham Wetlands	150 000*
	<i>Eucalyptus coolabah</i> – <i>Eucalyptus camaldulensis</i> woodlands	Gingham Wetlands	2 000
	<i>Eucalyptus camaldulensis</i> woodlands	Macquarie Marshes	39 500
		Narran Lakes	nd
<i>Eucalyptus camaldulensis</i> – <i>Eucalyptus coolabah</i> – <i>Eucalyptus largiflorens</i> – <i>Acacia stenophylla</i> woodlands	Narran Lakes	nd	
<i>Casuarina cristata</i> woodlands	Gingham Wetlands		
Shrublands	<i>Acacia pendula</i> shrublands	Macquarie Marshes	8 600
	<i>Acacia stenophylla</i> shrublands	Macquarie Marshes	3 270
	<i>Acacia stenophylla</i> and <i>Muehlenbeckia florulenta</i> shrublands	Gingham Wetlands	42 000*
	<i>Muehlenbeckia florulenta</i> shrublands	Macquarie Marshes	2 840
Narran Lakes		nd	
Grasslands and reedlands	<i>Phragmites australis</i> and <i>Typha</i> spp. Reed beds	Macquarie Marshes	nd
	Marsh club-rush <i>Bulboschoenus fluviatilis</i> , <i>Eleocharis plana</i> , <i>Paspalum distichum</i> and <i>Juncus aridicola</i> communities	Gwydir Wetlands	10 000
	<i>Paspalum distichum</i> and <i>Eleocharis</i> spp. communities	Gingham Wetlands	13 500*
	Grasslands	Macquarie Marshes	108 000

* estimated area prior to construction of Copeton Dam on the Gwydir River
nd = no data

Macquarie Marshes

The plant communities of the Macquarie Marshes include 108 000 ha of grassland, 10 023 ha of *Eucalyptus populnea subsp. bimbil* woodland, 8 600 ha of *Acacia pendula*, 2 840 ha of *Muehlenbeckia florulenta*, 15 800 ha of *Eucalyptus largiflorens*, 8 040ha of *Eucalyptus coolabah*, 3 270ha of *Acacia stenophylla* and 39 500 ha of *Eucalyptus camaldulensis* forest (Bray 1994b). Slow flowing channels have *Vallisneria gigantea* (ribbon reed), *Potamogeton crispus* (curly pondweed), *Azolla filiculoides* (red azolla), duckweeds, rushes and *Paspalum distichum* (water couch). *Typha* sp. occurs in the more permanently wet channels within reed beds. The Macquarie Marshes contain the most northern occurrence of extensive reed beds of *Phragmites australis* (Wolfgang 1998).

In the Macquarie Marshes, tree health has been affected by variation in flood regimes, raised water tables and salinisation, herbicide spray drift, tree senescence, fire damage, pathogens and insects. The area of wetland vegetation in the Marshes has declined as a result of river regulation which has reduced the frequency of large and medium flows. This has, in turn, led to a change to a vegetation association more suited to a drier environment. Reed beds were formerly dominant in south marsh, but this area has recently been colonised by chenopods (*Atriplex* and *Sclerolaena* spp.). Weeds are also prevalent. Large areas have been cleared for farming, with the area of *Eucalyptus camaldulensis* in the southern marshes having been reduced from an estimated 1 406 ha in 1931 to 636 ha in 1981 (Wolfgang 1998).

Lower Gwydir Wetlands

The Lower Gwydir supports about 24 000 ha of semi-permanent wetland and floodplain plant communities, including 7 500 ha of *Paspalum distichum* and *Juncus aridicola* (tussock rush) and a 700 ha stand of *Bolboschoenus fluviatilis* (marsh club-rush), the largest area of *Bolboschoenus fluviatilis* known in New South Wales. One third of this area (2 500 ha) in the west is highly degraded. Intermittent wetland areas of the lower Gywdir wetlands include 4 000ha of lignum (*Muehlenbeckia florulenta*) and river coobah (*Acacia stenophylla*). Approximately 4 880ha of coolibah (*Eucalyptus coolabah*) occurs on the floodplain of the lower Gywdir Wetland. Other significant plant species in this wetland include *Eleocharis plana* (ribbed spike-rush), *Eleocharis sphacelata* (tall spike-rush), *Juncus aridicola* (tussock rush) and *Typha* spp. (cumbungi) (Johnson 2001; Ramsar 1999).

The main wetland area contains stands of dead *Eucalyptus coolabah* killed by prolonged inundation from the 1955 and 1970 floods and the release of water from Copeton Dam for spillway modifications in the 1970s. The dominant species in the seven distinct landform types within the wetland are shown on Figure 3.12 and listed in Table 3.3 (Keyte 1994).

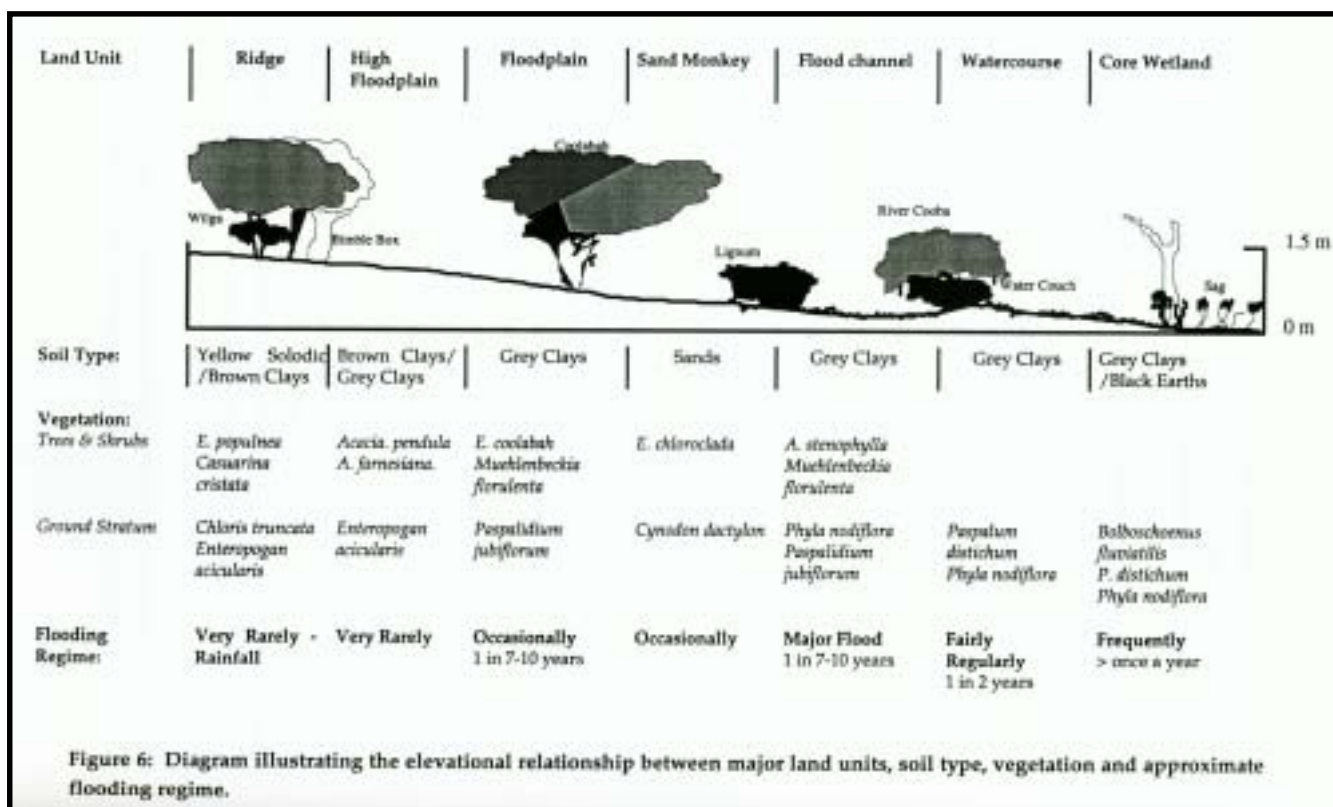


Figure 3.12 Profile of land units within the Lower Gwydir Wetlands

(Keyte 1994)

Table 3.3 Dominant plant species in the Lower Gwydir Watercourse

(Keyte 1994)

Land unit	Common name	Species name	Nature of species
Ridge	windmill grass	<i>Chloris truncata</i>	1
	curly windmill grass	<i>Enteropogon acicularis</i>	1
High floodplain	mimosa bush	<i>Acacia farnesiana</i>	2
	native millet	<i>Panicum decompositum</i>	1
	curly windmill grass	<i>Enteropogon acicularis</i>	1
Floodplain	warrego summer grass	<i>Paspalidium jubiflorum</i>	1
	nutgrass	<i>Cyperus victoriensis</i>	1
	ribbed spike-rush	<i>Eleocharis plana</i>	1
	soft roly poly	<i>Salsola tragus</i>	2
Flood channel	river cooba	<i>Acacia stenophylla</i>	1
	lignum	<i>Muehlenbeckia florulenta</i>	1
	water couch	<i>Paspalum distichum</i>	1
	lippia	<i>Phyla canescens</i>	2
Watercourse	tussock rush	<i>Juncus aridicola</i>	1
	water couch	<i>Paspalum distichum</i>	1
	soft roly poly	<i>Salsola tragus</i>	2,3
	black roly poly	<i>Sclerolaena muricata</i>	2,3
	black thistle	<i>Cirsium vulgare</i>	2,3
	nardoo	<i>Marsilea drummondii</i>	1
	lippia	<i>Phyla canescens</i>	2
Bathurst burr	<i>Xanthium spinosum</i>	2,3	
Core wetland	water couch	<i>Paspalum distichum</i>	1
	sag	<i>Bolboschoenus fluviatilis</i>	1
	black thistle	<i>Cirsium vulgare</i>	2,3
	wild lettuce	<i>Lactuca saligna</i>	3
	Bathurst burr	<i>Xanthium spinosum</i>	2,3

Key

- 1 natural wetland species
- 2 invasive species
- 3 terrestrial species

Gingham Wetlands

The plant communities of the Gingham Wetland prior to the construction of Copeton Dam have been mapped using historical photos (McCosker & Duggin 1993). The communities and the area they covered were:

- about 2 000 ha of mixed *Eucalyptus coolabah* and *Eucalyptus camaldulensis* forests and woodlands at the head of the watercourse near the Gwydir Raft. Much of this forest only became established in the 1950s as the raft progressed and caused more extensive flooding in the area;
- 13 500 ha of semi-permanent swamps and low wetland areas with *Paspalum distichum* and *Eleocharis* spp. which only dried out in exceptionally dry years; this area included several open water bodies;
- 42 000 ha of semi-permanent core wetlands that are surrounded by *Acacia stenophylla* and *Muehlenbeckia florulenta*, critical habitat for waterbirds; and
- 150 000 ha of open *Eucalyptus coolabah* woodlands which was only inundated during major floods.

By 1993 about 1 000 ha of healthy *Eleocharis* spp. and *Paspalum paspalodes* (water couch) remained, and a further 7 000 ha still supported these plant species but insufficient flooding resulted in the loss of wetland vigour and weed invasion. The remaining 5 500 ha of former core wetland has lost almost all aquatic and semi-aquatic vegetation (McCosker & Duggin 1993). *Phyla canescens* and terrestrial weeds such as *Silybum marianum* and *Xanthium spinosum* (Bathurst burr) occur extensively over this land. Little, if any, of the *Acacia stenophylla* and *Muehlenbeckia florulenta* remained in a healthy state, having not been flooded between 1984 and 1996. *Muehlenbeckia florulenta* bushes were reduced to clumps 30 cm high while the *Acacia stenophylla* showed signs of extreme stress. Some areas of dead *Eucalyptus coolabah* may have resulted from prolonged inundation during the 1950s. *Casuarina cristata* and *Eucalyptus coolabah* are also present in the western part of the watercourse. Remnant lines of *Casuarina cristata* and numerous rotting *Casuarina cristata* logs suggest these trees were once much more abundant (McCosker & Duggin 1993).

Narran Lakes

There are six dominant vegetation communities in the Narran Lake Nature Reserve in addition to the wetland associations. These are: chenopod low open shrublands; ephemeral herbs; mixed low woodlands; riparian low open forest; and spinifex grassland. Other associations are found outside the Reserve, in other parts of the Lakes system. Extensive areas of river red gum with lignum occur to the south of the reserve and a large area of river red gum occurs to the north-east of Clear Lake. The most detailed mapping of plant communities has been done within the Nature Reserve.

The wetland communities within Narran Lakes Nature Reserve are:

- sedges, grasses and ephemeral herbs on the playa lakes and the main lake beds after floodwaters recede;
- *Muehlenbeckia florulenta* in dense shrublands in extensive areas in and around Clear Lake and Back Lake;

- *Phragmites australis* in small patches amongst the *Muehlenbeckia florulenta*;
- *Eucalyptus camaldulensis*, *Eucalyptus coolabah*, *Eucalyptus largiflorens* and *Acacia stenophylla* association fringing the Narran River and wetland channels with *Muehlenbeckia florulenta*, *Myoporum* sp., *Alstonia constricta*, *Acacia brachystachya* (umbrella mulga) *Paspalidium jubiflorum*; and
- aquatic plants such as *Azolla filiculoides* following the inundation of wetland areas (NPWS 2000a).

The sandy lakeshore and dune areas are generally treeless as a result of past grazing. Areas with minimal erosion support a scattered cover of *Chloris truncata* (windmill grass), *Eragrostis eriopoda*, *Eragrostis dielsii* (mallee lovegrass) and chenopods such as *Sclerolaena* spp.

3.4 CONSERVATION STATUS OF VEGETATION COMMUNITIES IN THE DRP

Three plant communities found in the bioregion have been listed as Endangered Ecological Communities in New South Wales under Schedule 1 of the *Threatened Species Conservation Act (TSC Act) 1995* (New South Wales NPWS 2001a). These are: the *Corymbia tessellaris* (carbeen) open forest community; the *Acacia loderi* shrublands; and, the artesian springs ecological community. Two additional communities occurring in the DRP listed as endangered under the federal *Environment Protection and Biodiversity Conservation (EPBC) Act, 1999* are: *Acacia harpophylla* (brigalow) (dominant and co-dominant) (this also has a preliminary determination under the *TSC Act*); and, the community of native species dependant on natural discharges of groundwater from the Great Artesian Basin.

Benson (1989) considers *Acacia pendula* woodland with an *Atriplex nummularia* understorey to be a very poorly conserved and endangered by clearing but it has not been listed under the *TSC Act* nor the *EPBC Act*.

Several communities in the Narran Lakes area are considered to be endangered, poorly conserved or of conservation interest (Benson 1989; Ramsar 2000). These are:

- *Muehlenbeckia florulenta* shrublands, with one of the largest and healthiest expanses of this community in New South Wales occurring at Narran Lakes;
- *Eucalyptus melanophloia*, *Brachychiton populneus* subsp. *trilobus* (kurrajong), *Geijera parviflora* and *Grevillea striata* (beefwood) woodland on sandy ridge country;
- *Triodia mitchelli* (spinifex) and *Acacia murrayana* (sandplain wattle), which are restricted to deep sandy soils;
- *Atriplex nummularia* shrubland;
- *Eucalyptus populnea* subsp. *bimbil* woodland;
- *Grevillea striata* and *Acacia aneura* shrubland;
- *Eremophila maculata* (native fuchsia) shrubland;
- *Acacia cambagei*;
- *Phragmites australis* sedgeland;
- *Eucalyptus camaldulensis* woodlands and open forests;
- *Eucalyptus melanophloia* woodland; and
- *Acacia excelsa* (ironwood) and *Callitris glaucophylla* shrubland.

3.4.1 *Corymbia tessellaris* (carbeen) open forest

Corymbia tessellaris open forest is listed as an endangered ecological community under the *TSC Act*. This community occurs on siliceous sands, earthy sands and clayey sands on the riverine plains of the Meehi, Gwydir, Macintyre and Barwon Rivers in the DRP and Brigalow Belt South bioregions. It was originally an open forest but is now more likely to be found as woodland or remnant trees. In addition to *Corymbia tessellaris*, *Callitris glaucophylla*, *Corymbia dolichocarpa*, *Eucalyptus populnea* subsp. *bimbil*, *Eucalyptus camaldulensis*, *Casuarina cristata* and *Allocasuarina leuhmannii* are characteristic tree species. Other plant species characterising the community are:

<i>Abutilon oxycarpum</i>	<i>Acacia excelsa</i>
<i>Acacia salicina</i>	<i>Alectryon oleifolius</i>
<i>Alstonia constricta</i>	<i>Aristida calycina</i>
<i>Atalaya hemiglauca</i>	<i>Austrostipa scabra</i> ssp. <i>scabra</i>
<i>Capparis mitchellii</i>	<i>Chloris truncata</i>
<i>Crinum flaccidum</i>	<i>Cymbidium canaliculatum</i>
<i>Einadia nutans</i>	<i>Eremophila mitchellii</i>
<i>Geijera parviflora</i>	<i>Panicum decompositum</i>
<i>Petalostigma pubescens</i>	<i>Rhagodia spinescens</i>
<i>Sclerolaena birchii</i>	

The complete plant species list is larger than this but many species may be only present at one or two sites or have a very low abundance. The species composition of a site will be influenced by the size of the site and its recent disturbance history (NPWS 2001a).

This community has been extensively cleared for grazing and cropping and is further threatened by clearing for agriculture, grazing, inappropriate fire management, land grooming for irrigation and weed invasion. The remaining stands are typically fragmented and isolated (NPWS 2001a).

3.4.2 *Acacia loderi* (nelia) shrublands

Acacia loderi shrublands are listed as an endangered ecological community under the *TSC Act*. The *Acacia loderi* shrublands are found in south western New South Wales, from Hillston to White Cliffs with large stands between Broken Hill, Ivanhoe and Wilcannia. Isolated stands are found in other areas. These shrublands grow on the solonised brown and duplex soils on level to undulating plains or on calcareous red earths. Most remnants are on pastoral lands but there are also some in Kinchega and Mungo National Parks (NPWS 2001a).

Acacia loderi is the dominant species and occurs with *Acacia aneura*, *Acacia oswaldii*, *Callitris gracilis*, *Casuarina pauper* and *Flindersia maculosa*. The mistletoes *Amyema quandang* and *Lysiana exocarpi* frequently infest *A. loderi*.

Understorey species include:

<i>Aristida contorta</i>	<i>Atriplex</i> spp.
<i>Atriplex angulata</i>	<i>Atriplex holocarpa</i>
<i>Atriplex stipitata</i>	<i>Brachyscome</i> spp.
<i>Dissocarpus paradoxus</i>	<i>Dodonaea viscosa</i>
<i>Enchylaena tomentosa</i>	<i>Enneapogon avenaceus</i>
<i>Eremophila maculata</i>	<i>Eremophila sturtii</i>
<i>Grevillea huegelii</i>	<i>Haloragis glauca</i> forma <i>glauca</i>
<i>Ixiolaena tomentosa</i>	<i>Lotus cruentus</i>
<i>Lycium australe</i>	<i>Maireana georgei</i>
<i>Maireana pyramidata</i>	<i>Maireana sclerolaenoides</i>
<i>Maireana sedifolia</i>	<i>Myoporum deserti</i>
<i>Pimelea microcephala</i>	<i>Plantago drummondii</i>
<i>Ptilotus atriplicifolius</i>	<i>Pycnosorus pleiocephalus</i>
<i>Rhodanthe floribunda</i>	<i>Sauropus trachyspermus</i>
<i>Sida fibulifera</i>	<i>Sclerolaena</i> spp.
<i>Sclerolaena divaricata</i>	<i>Sclerolaena obliquicuspis</i>
<i>Sclerolaena patenticuspis</i>	<i>Senna artemisioides</i>
<i>Austrostipa</i> spp.	<i>Swainsona formosa</i>
<i>Templetonia egena</i>	<i>Tetragonia tetragonioides</i>
<i>Teucrium racemosum</i>	<i>Zygophyllum simile</i>

3.4.3 Artesian springs ecological community

The artesian springs ecological community is listed as an endangered ecological community under the *TSC Act*. This community is restricted in New South Wales to artesian springs at the southern and western margins of the Great Artesian Basin (GAB) in the north-west of the state, in the Mulga Lands, DRP and Cobar Peneplain bioregions. The Artesian Springs Ecological Community varies between springs, as they differ in shape, water flow, topographic position and geographic location (NPWS 2001a). Typical plant species may include:

<i>Abutilon otocarpum</i>	<i>Acacia victoriae</i>
<i>Alternanthera denticulata</i>	<i>Alternanthera angustifolia</i>
<i>Atriplex</i> spp.	<i>Boerhavia coccinea</i>
<i>Calandrinia ptychosperma</i>	<i>Centipeda minima</i>
<i>Centipeda thespidioides</i>	<i>Chamaesyce drummondii</i>
<i>Chenopodium cristatum</i>	<i>Chenopodium melanocarpum</i>
<i>Chloris pectinata</i>	<i>Cyperus bulbosus</i>
<i>Cyperus iria</i>	<i>Cyperus laevigatus</i>
<i>Cyperus squarrosus</i>	<i>Dactyloctenium radulans</i>
<i>Diplachne fusca</i>	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>
<i>Einadia nutans</i> subsp. <i>nutans</i>	<i>Eragrostis</i> spp.
<i>Eremophila deserti</i>	<i>Eucalyptus largiflorens</i>
<i>Geijera parviflora</i>	<i>Marsilea</i> spp.
<i>Oxalis</i> spp.	<i>Portulaca oleracea</i>
<i>Sclerostegia</i> spp.	<i>Sporobolus caroli</i>
<i>Stemodia florulenta</i>	<i>Trianthema triquetra</i>
<i>Eremophila sturtii</i>	<i>Eucalyptus populnea</i> subsp. <i>bimbil</i>

<i>Glinus lotoides</i>	<i>Myoporum montanum</i>
<i>Pimelea microcephala</i> subsp. <i>microcephala</i>	<i>Sclerolaena</i> spp.
<i>Solanum esuriale</i>	<i>Sporobolus mitchellii</i>
<i>Swainsona</i> spp.	

Mounds of salt and sediment resulting from the evaporation of artesian water as it emerges through rock, are the features on which this community depends. The community often supports unique aquatic invertebrate and vertebrate fauna, including freshwater snail and fish species that may occur at one spring only. Threats include trampling and grazing by stock and feral animals, and the alteration of flow or unsustainable extraction of artesian water leading to reduce flows at mound springs. Some mound springs have dried in the past 100 years, probably causing the extinction of undescribed aquatic invertebrates (NPWS 2001a).

3.4.4 The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin.

The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin is listed as a threatened ecological community on the *EPBC Act*. This community includes natural surface discharge points within the GAB discharge area of aquifers in the Triassic, Jurassic and Cretaceous sedimentary sequence. The native species in this community depend on the discharge of groundwater for their existence and include some wide-ranging species as well as locally endemic species (restricted to one or more GAB spring). Examples of these species include:

<i>Jardinella</i> sp. (endemic snail)	<i>Schoenoplectus pungens</i> (flora)
<i>Utricularia</i> sp. (aquatic forb)	<i>Cyperus gymnocaulos</i> (flora)
<i>Cyperus laevigatus</i> (flora)	<i>Eriocaulon carsonii</i> (aquatic herb – endemic to mound springs of Peery Lake)
<i>Eucalyptus camaldulensis</i> (flora)	<i>Heliotropium curassavicum</i> (flora)
<i>Myoporum desertii</i> (flora)	<i>Sclerostegia</i> sp. (flora)
<i>Chlamydogobius</i> sp. (fish)	

This community has become threatened through excessive extraction of groundwater from the GAB, leading to the extinction of some springs and a reduction in flow at remaining springs. Other threats include grazing and trampling by livestock and feral animals, mechanical modification such as dam construction and the introduction of exotic pasture species (Environment Australia 2001b).

3.4.5 *Acacia harpophylla* (brigalow dominant or co-dominant)

The *Acacia harpophylla* community is listed as threatened under the *EPBC Act* and a preliminary determination has been made to list this community as an endangered ecological community under the *TSC Act*. It has suffered a severe decline in extent since clearance of land for agriculture. Less than 10% of its original extent remains (Environment Australia 2001a). Within NSW there are several species associations. These are *Acacia harpophylla* with *Casuarina cristata* (belah) and *Geijera parviflora* (wilga) or yellow wood, with wilga, with vine thickets of ooline or mixed species or softwoods, with *Eucalyptus populnea* subsp. *bimbil* (bimble box) and *Eucalyptus pilligaensis* (Pilliga box), with *Eucalyptus coolabah* (coolibah), with gidgee and other acacias and occur as regenerated brigalow (Pulsford 1984).

3.5 SUMMARY AND PROPOSED FURTHER WORK

3.5.1 Summary

The vegetation of the DRP has been described in a variety of ways and at several levels of detail. There have been some attempts to describe the pre-European vegetation at both a landscape level and for smaller portions of the bioregion. However, detailed survey and mapping has been very limited. Broadscale mapping has mostly been from aerial photo analysis, which is limited to a crude structural analysis and naming of the dominant tree species, but this has not been extensively ground truthed. There has also been variation in the scale of vegetation mapping between the east and the western portions of the bioregion with smaller quadrat sizes being used in the east.

In broad terms the original vegetation of the DRP is thought to have been open woodland on alluvial fans and riverine corridors. The height and density of the overstorey decreased from east to west and the grassy ground cover was dominated by Mitchell grasses (*Astrebla species*). Since European settlement the proportion of grassland has increased and is dominated by introduced species. Description of the pre-European vegetation is of most value in determining the rate and extent of change that may have occurred as a result of European settlement of the bioregion. The 1750 mapping by Carnahan (1976) indicates that the lower reaches of the Darling floodplains within the bioregion were *Astrebla* grasslands. This region then suffered from a period of extreme conditions as a result of drought in association with rabbit infestation and sheep grazing resulting in almost total denudation of the landscape. This area has now recovered and is dominated by black bluebush communities. Carnahan's mapping indicates that there has been a change in the dominant plant community after the recovery of the landscape or that the area is at a seral stage in the re-establishment of the vegetation. Any attempts to map pre-European vegetation based on existing remnants should consider these possibilities and ensure that detailed analyses of historical documents are also incorporated.

The existing broad vegetation communities within the DRP have been defined by several authors. These descriptions show a high degree of consistency and fifteen communities can be described. These include seven forest/woodland communities, tall Acacia shrublands, saltbush shrublands, grasslands with varying dominant genera (*Astrebla*, *Triodia* or *Austrostipa*) and wetland, swamp and marsh communities. While these community definitions are not based on systematic floristic surveys and could be considered subjective, their consistency indicates that they provide a sound broad definition of the plant communities of the bioregion. The fundamental importance of riverine and alluvial landforms is clearly demonstrated by the dominance of water tolerant communities.

Variation within these broad plant communities has not been mapped across the bioregion but the mapping of land units by Walker (1991) in the Western Region and the relationship between topographic variation and vegetation associations indicated by Morgan and Terrey (1990) for all provinces provide an indication and could be analysed further. The more detailed vegetation descriptions for small areas within the bioregion could be used to verify these descriptions.

Of the plant communities occurring within the DRP, the *Corymbia tessellaris* open forest, *Acacia loderi* shrublands, and the Artesian Springs community are listed under the *TSC Act*.

In addition, the Brigalow communities and community of native species dependant on natural discharge of groundwater from the Great Artesian Basin have been listed under the *EPBC Act*. The Brigalow community has also been given a preliminary determination by the NSW Scientific Committee for listing under the *TSC Act*. There are other communities considered to be endangered, poorly conserved or of conservation interest but they have not yet been nominated for listing under the *TSC Act*. There has been no analysis of declining plant communities that may require monitoring and assessment.

3.5.2 Proposed further work

Further work required related to vegetation in the DRP includes the following:

- mapping of the defined broadscale plant communities across the whole bioregion in NSW;
- determination and mapping of '1750' pre-European vegetation across the whole bioregion in NSW using indicators from extant vegetation and abiotic factors and validation from historical descriptions;
- integration of other vegetation descriptions and mapping that covers portions of the DRP in more detail with the broad descriptions;
- development of a systematic sampling regime to build on the existing vegetation data and definition in more detail of the variation within the broad communities;
- development of profiles and descriptions of plant communities present in the DRP;
- review of the conservation status of defined plant communities and, if considered to be under threat, preparation of nominations for listing under the *TSC Act*. This review will include assessing changes in extent of each vegetation community since European settlement and determining declining and threatened plant communities;
- assessment of the response of the defined vegetation communities to disturbance and threats present in the DRP;
- identification of threats to plant communities and preparation of nominations for listing of key threatening processes under the *TSC Act*; and
- assessment of the spatial configuration of remnants within the landscape.

4 FLORA

4.1 AVAILABLE INFORMATION

4.1.1 Sources of data

Plant species records from the DRP have been extracted from the databases of the Royal Botanic Gardens (NSW), National Herbarium, NPWS Wildlife Atlas and other vegetation surveys within the DRP. Other herbaria may also have plant records from the DRP but this information will be obtained as part of the DRP vegetation mapping, biodiversity survey and conservation assessment projects.

Threatened species under the *TSC Act*, Schedule 13 species listed under the *National Parks and Wildlife Act, 1974* (NSW), and ROTAP (Rare and Threatened Australian Plants) species were taken from the complete list. The provenance, distribution of the remaining plant species and most recent common names were determined from Harden (1990-94) and exotic species were then removed from this list and placed in a separate database. Records of questionable accuracy or those species not described by Harden were further investigated using the Royal Botanic Gardens Plants of NSW Database. Distribution and current common names were checked. Species still considered of a questionable reliability were deleted from the list. Separate lists of historical records (pre-1970) and extinct flora were also created.

Systematic surveys

Only a limited number of systematic floristic surveys have been conducted in the DRP and these are listed in Table 4.1. Not all of these surveys have full floristic sampling or precise location information (such as AMG reference) and some of the studies included sites from outside the DRP.

Table 4.1 Summary of floristic surveys conducted within the DRP

Dataset author & date	Site selection	Survey methods	No. sites	Survey period	Full floristic
Natural Vegetation of the Southern Wheatbelt (Sivertsen & Metcalfe 1995)	Stratified - based on API, replications within each veg type, no private land	20x20m, cover/abundance, geomorphology, structure veg	530	Oct 1991-Feb 1992	Yes
Vegetation of Wombeira Land System (Dick 1993)	Stratified - based on API, 3 replications within each veg type	20x40m, cover/abundance, geomorphology, structure veg	65	30/10/90 – 10/11/90	Yes
Floristic Description of Grasslands of the Moree Plains (Hunter & Earl 1999)	Sites stratified on vegetation types	20x20m, cover/abundance, geomorphology, structure veg	152	20/2/99 – 8/5/99 & 12/7/99 – 10/8/99	Yes
Natural Resources Study – Murray-Darling action plan (Centre of Environmental Management 1998)	Sites geographically spread	30 x 30m, cover/abundance, geomorphology, structure veg	272	2/9/96 – 31/1/97	Yes
Vegetation survey of riparian zones within the Namoi River catchment, north-west New South Wales (Beckers 1996)			3	03/10/95 – 16/05/96	-
Macquarie Marshes Vegetation Mapping (Wilson 1992)		20 x 20m, cover/abundance	251	01/04/92 – 30/10/92	-
Vegetation Mapping of the Lower Macquarie Floodplain (Steenbeeke 1996)	Sites selected randomly	20 x 20m, cover / abundance, geomorphology	90	9/96 – 11/96	Yes

The survey by Dick (1993) of the vegetation of the Wombeira land system on the floodplains of the Culgoa, Birrie and Narran Rivers in northern NSW is one of the more intensive surveys undertaken to date in the DRP. This was a quadrat-based survey with structural and floristic data collected from sixty-five sites.

4.1.2 Plant species diversity of the DRP

A total of 1 129 plant taxa (species, subspecies and varieties) have been recorded from the DRP. Native species are listed in Appendix C and the 229 exotic plant species are listed Appendix D.

Plant species records in the Wildlife Atlas are unevenly distributed across the bioregion (Map 26) (NPWS 1999c). On a coarse scale (1:100 000 mapsheets), much of the eastern section of the DRP has a relatively moderate number of records (101-1000) compared with other regions in NSW. The southern portion of the arm of the DRP along the Darling River has few records. The mapsheet of the Culgoa floodplain contains the greatest number of records in the DRP.

The survey by Dick (1993) recorded 175 plant species, with the species richness per 20x40 m quadrat ranging from an average of 25.3 species on parts of the floodplain without channels to 20 species in the channels and 19 species on slight rises. With the inclusion of previous records a total of 230 species is known from the Wombeira landsystem (Dick 1993). The families Asteraceae, Chenopodiaceae and Poaceae contributed the largest number of species

in this survey. Introduced species were uncommon with only 17 species recorded from 32% of quadrats.

4.2 SPECIES OF CONSERVATION CONCERN

4.2.1 Threatened and ROTAP species

Nineteen threatened species (listed in the schedules of the *TSC Act*) have been recorded in the DRP, nine of which are endangered (E1) and ten are considered vulnerable (V) (Table 4.2). Nine of these species are also listed as threatened on the *EPBC Act*. The majority of threatened species records are from the Menindee area with the remainder scattered throughout the bioregion (Map 27). Twenty species are also included on the ROTAP list (Briggs and Leigh 1996, Table 4.2) and four are protected by the *National Parks and Wildlife Act 1974* (Table 4.2).

Listed endangered species recorded from the Culgoa River floodplain are *Capparis loranthifolia* var. *loranthifolia* (narrow-leaf bumble), and *Euphorbia sarcostemmoides* (climbing caustic). Regionally rare species occurring on the floodplain include *Aristida longicollis* (bull wiregrass), *Acacia coriacea* (wirewood), *Pluchea dentex* (bowl daisy), *Phyllanthus carpentariae* (hairy spurge) and *Pimelea penicillaris* (sandplain riceflower) (Environment Australia 2001d). *Goodenia macbarronii* has been located recently in the Narran Lakes Nature Reserve (Hunter 1999).

Table 4.2 Plant species of conservation concern recorded in the DRP

Family	Scientific name	Common name	Legal Status ¹	Number of records	Dataset ²
Brassicaceae	<i>Lepidium monoplacoides</i>	Winged Peppergrass	*E (3ECi)	5	WLA (1), RBG (1), NH (1), NLNRVS(2)
Capparaceae	<i>Capparis loranthifolia</i> var. <i>loranthifolia</i>		E	6	WLA (4), RBG (1), NH (1)
Fabaceae (Faboideae)	<i>Desmodium campylocaulon</i>	Creeping Tick-trefoil	E	14	WLA (1), NH (1), Moree(12)
Fabaceae (Faboideae)	<i>Indigofera leucotricha</i>		E	16	WLA (1), RBG (6), NH (9)
Convolvulaceae	<i>Ipomoea diamantinensis</i>		E	7	WLA (2), RBG (2), NH (3)
Euphorbiaceae	<i>Phyllanthus maderaspatensis</i>		E	22	WLA (1), NH (3), Moree(18)
Thymelaeaceae	<i>Pimelea elongata</i>		E	10	WLA (1), RBG (4), NH (5)
Malvaceae	<i>Sida rohlenae</i>		E	9	WLA (3), RBG (2), NH (3), Namoi(1)
Fabaceae (Faboideae)	<i>Swainsona adenophylla</i>		E	2	WLA (1), NH (1)
Solanaceae	<i>Solanum karsense</i>		*V (3VCa)	58	WLA (29), RBG (14), NH (15)
Surianaceae	<i>Cadellia pentastylis</i>		*V (3RCa)	2	WLA (1), NH (1)
Fabaceae (Faboideae)	<i>Swainsona pyrophila</i>		*V (3RCa)	118	WLA
Poaceae	<i>Bothriochloa biloba</i>		*V (3V)	3	RBG (1), NH (2)
Sterculiaceae	<i>Rulingia procumbens</i>		*V (3V)	3	RBG (1), NH (2)
Haloragaceae	<i>Haloragis exalata</i>		*V (3VCa)	9	WLA
Fabaceae (Mimosoideae)	<i>Acacia carneorum</i>	Needle Wattle	*V (3VCi)	14	NH (5), WLA (9)
Fabaceae	<i>Swainsona plagiotropis</i>		*V (3VCi)	3	WLA (2), RBG (1)

Family	Scientific name	Common name	Legal Status ¹	Number of records	Dataset ²
(Faboideae)					
Goodeniaceae	<i>Goodenia macbarronii</i>		V (3VC-)	4	NLNRVS(4)
Fabaceae (Faboideae)	<i>Swainsona murrayana</i>		V (3VCi)	1	Moree(1)
Poaceae	<i>Echinochloa lacunaria</i>		2K	9	WLA (5), RBG (4)
Apiaceae	<i>Actinotus paddisonii</i>		3K	7	WLA (3), RBG (4)
Chenopodiaceae	<i>Atriplex morrisii</i>		3K	2	WLA
Proteaceae	<i>Persoonia cuspidifera</i>		3K	1	BBSpi2(1)
Chenopodiaceae	<i>Sclerolaena blackiana</i>		3K	4	WLA (2), RBG (2)
Rutaceae	<i>Philotheca ericifolia</i>		3RC-	2	RBG (2), NH (2)
Lomandraceae	<i>Lomandra patens</i>		3RCa	1	WLA
Rutaceae	<i>Phebalium obcordatum</i>	Club-leaved Phebalium	3RCa	1	WLA
Rutaceae	<i>Boronia rubiginosa</i>		P13 (2RCa)	4	WLA
Casuarinaceae	<i>Casuarina cunninghamiana</i> <i>ssp cunninghamiana</i>	River Oak, River Sheoak	P13	8	WLA (6), NWB(1), Namoi(1)
Orchidaceae	<i>Cymbidium canaliculatum</i>	Tiger Orchid	P13	125	WLA(116), NWB(8), BBSpi2(1)
Fabaceae (Faboideae)	<i>Swainsona formosa</i>	Sturt's Desert Pea	P13	2	WLA

¹ Identified status of species on *Threatened Species Conservation Act* (E1 - endangered, E4 - extinct, V - vulnerable), *Environmental Protection and Biodiversity Conservation Act* (those species listed indicated by *), *National Parks and Wildlife Act 1974* (protected species - P13) and Rare and Threatened Australian Plants (ROTAP) (for definition of ROTAP codes see Briggs and Leigh 1996)

² Key

WLA	Atlas of NSW Wildlife
NH	National Herbarium, Canberra
RBG	Royal Botanic Gardens, Sydney
BBSPil	Brigalow Belt South Study - Pilliga State Forest
BBSSF	Forestry survey of the Pilliga forests
Moree	Moree Plains Grasslands survey of Moree Plains Shire and Walgett Shire east of the Barwon River
NWB	Northern Wheatbelt Vegetation Survey
Wombeira	Wombeira Landsystem Vegetation Survey
NLNRVS	Narran Lake Nature Reserve Vegetation Survey.
MMVS	Macquarie Marshes Vegetation Survey
WFS	Walgett fauna survey sites
BrigOut	Brigalow Outlier (NE of Bourke) Vegetation Survey
Brigfauna	Fauna sites for the Brigalow second survey, related to the Brigalow dataset from 1991.
BBSPil2	Pilliga State Forest Survey - part of Brigalow Belt South Bioregional Assessment
BBSSF&NR	Brigalow Belt South Study - State Forest and Nature Reserves of the Dubbo region.
Namoi	Vegetation survey of riparian zones within the Namoi River catchment, north-west New South Wales

4.2.2 Predicted threatened species

Six endangered plant species, one extinct species, two vulnerable species (*TSC Act 1995*) and one ROTAP species have not been recorded, but are predicted to occur in the DRP bioregion on the basis of bioclimatic analysis (Table 4.3).

Table 4.3 Plant species of conservation concern predicted to occur in the DRP

Family	Plant species	Legal Status ¹
Chenopodiaceae	<i>Osteocarpum scleropterum</i>	E1
Euphorbiaceae	<i>Monotaxis macrophylla</i>	E1

Family	Plant species	Legal Status ¹
Fabaceae (Mimosoideae)	<i>Acacia notabilis</i>	E1
Sapindaceae	<i>Dodonaea microzyga</i> var. <i>microzyga</i>	E1
Asteraceae	<i>Leptorhynchos waitzia</i>	E1
Poaceae	<i>Austrostipa wakoolica</i>	*E1
Asteraceae	<i>Senecio behrianum</i>	E4
Euphorbiaceae	<i>Bertya</i> sp. A (Cobar-Coolabah)	*V
Brassicaceae	<i>Lepidium aschersonii</i>	*V
Aizoaceae	<i>Glinus orygioides</i>	3K

¹ Status codes as for Table 4.2

4.2.3 Extinct species and historical records

Four species now regarded as extinct in NSW (*TSC Act*) have been recorded from the DRP (Table 4.4).

Table 4.4 Extinct plant species in New South Wales previously recorded from the DRP

Family	Scientific name	Legal status ¹	Number of records	Dataset ²	Last date recorded
Asteraceae	<i>Acanthocladium dockeri</i>	*E4	1	WLA	1788
Proteaceae	<i>Grevillea nematophylla</i>	E4	2	WLA (1), RBG (1)	1788
Chenopodiaceae	<i>Maireana lanosa</i>	E4	1	WLA	1800
Brassicaceae	<i>Stenopetalum velutinum</i>	E4	2	WLA (1), RBG (1)	1903

¹ - Legal status codes as for Table 4.2

² - Database sources as for Table 4.2

An additional ten listed plant species are only known from historical (pre-1970) records (Table 4.5). The current status of these species in the DRP is unknown and it is possible some may be regionally extinct.

Table 4.5 Plant species of conservation concern known historically from the DRP but with no recent records

Family	Scientific name	Legal status ¹	Number of records	Dataset ²	Last date recorded
Adiantaceae	<i>Cheilanthes sieberi</i> ssp. <i>pseudovellea</i>	E1	2	RBG (1), NH (1)	1952
Chenopodiaceae	<i>Atriplex infrequens</i>	*V (2V)	4	WLA (1), RBG (1), NH (2)	1861
Myrtaceae	<i>Thryptomene hexandra</i>	3RC-	2	RBG	1913
Rutaceae	<i>Zieria granulata</i>	*E1	1	RBG	1899
Fabaceae (Faboideae)	<i>Indigofera efoliata</i>	*E (2E)	1	NH	1955
Fabaceae (Faboideae)	<i>Swainsona murrayana</i>	*V (3VCi)	10	WLA (3), RBG (3), NH (4)	1955
Fabaceae (Faboideae)	<i>Swainsona recta</i>	*E1 (3ECi)	5	WLA (1), RBG (2), NH (2)	1911
Eriocaulaceae	<i>Eriocaulon carsonii</i>	*E1 (3E)	2	RBG (1), NH (1)	1888
Cyperaceae	<i>Cyperus conicus</i>	E1	2	RBG (1), NH (1)	1968
Poaceae	<i>Dichanthium setosum</i>	*V	2	WLA (1), NH (1)	1892

¹ - Legal status codes as for Table 4.2

² - Database sources as for Table 4.2

4.2.4 Regionally endemic species and significant populations

There are no listed threatened populations of these species on the *TSC Act 1995* and there has been no assessment of declining populations or regionally threatened populations. Regionally threatened populations are to be included in Regional Vegetation Management Plans and other management strategies.

There has been no evaluation of regionally endemic species within the DRP.

4.3 WEED AND INTRODUCED SPECIES

There are many introduced plant species in the DRP and these are often in high densities. A total of 229 exotic species have been recorded (Appendix D). Some native species also respond very favourably to change in environmental conditions, including disturbance, and become agricultural weeds. The abundance of both native and weed species will vary from season to season depending on rainfall. Some of the most abundant 'weeds' include:

blackberry	<i>Rubus fruticosus</i> species complex
prickly pear	<i>Opuntia stricta</i>
Paterson's curse	<i>Echium plantagineum</i>
African boxthorn	<i>Lycium ferocissimum</i>
lippia	<i>Phyla canescens</i>
*galvanised burr	<i>Sclerolaena birchii</i>
variegated thistle	<i>Silybum marianum</i>
mimosa bush	<i>Acacia farnesiana</i>
water hyacinth	<i>Eichhornia crassipes</i>
tiger pear	<i>Opuntia aurantiaca</i>

* = native species which are not endemic to the DRP

4.4 SUMMARY AND PROPOSED FURTHER WORK

4.4.1 Summary

Floristic surveys of the DRP have been very patchy with large areas having never been systematically surveyed, especially in the western half of the bioregion. The lower portion of the Darling River (south from Bourke to just north of Menindee) has few records in the NPWS Wildlife Atlas (Map 26), with most 1:100 000 scale mapsheets having only one to ten records. This area should be a priority for flora survey. The most detailed systematic floristic surveys have been conducted in the eastern and northern portions of the bioregion, such as the northern floodplains (Dick 1993), Moree (Hunter 1999) and the wheatbelt (Sivertsen & Metcalfe 1995).

Thirty-one species of conservation concern (*TSC Act*, *EBPC Act*, ROTAP) have been recorded from the DRP, another ten are predicted to occur in the bioregion, four are considered extinct and ten have not been recorded since 1970. Very little is known about the distribution and abundance of these species or the processes threatening their survival. Targeted searches for these species are needed if they are to be managed effectively and if recovery plans are to be prepared. No threatened plant species listed under the *TSC Act*

known from the DRP have a completed recovery plan. Most threatened species records are concentrated around Menindee (Map 27).

A large number of introduced plant species have been recorded from the bioregion but there is little information about their abundance, distribution or environmental impact. The diversity and abundance of introduced species can be used as an indicator of community disturbance (Commissioner for the Environment 2000). The result of the survey by Dick (1993) indicated a low abundance of these species in the Wombeira landsystem but relative abundances of these species may be higher on the eastern alluvial fans and wetlands of the bioregion. Research into this area is of high priority given the extent of occurrence of some weed species, such as *Eichhornia crassipes*, *Phyla canescens* and *Lycium ferocissimum*. The impact of native woody weed species on the distribution and abundance of fauna is currently being investigated.

4.4.2 Proposed further work

Further work required in relation to flora within the DRP includes the following:

- collation and analysis of all datasets from previous surveys in the DRP;
- systematic floristic surveys across the DRP using a stratified sampling procedure based on a gap analysis of existing data (such as map sheets with less than ten records), to provide information about the patterns of plant distribution and abundance at the bioregional level;
- targeted surveys to locate species of conservation concern unlikely to be recorded in systematic surveys as a result of factors such as low abundance, seasonal conditions and habitat preferences;
- assessment of the status of each species and populations to identify those that may require listing under the *TSC Act*;
- identification of declining species, assessment of their rate of decline and measures required to prevent them becoming threatened species;
- preparation of species profiles for priority species (including threatened and declining species) to identify distribution and abundance, status and threats;
- population viability analysis and predictive habitat modelling for selected priority plant species;
- identification of areas of significance for threatened species and populations;
- preparation and implementation of recovery plans for threatened species and populations not already being prepared; and
- research into the abundance, impact and control of exotic plant species in the DRP.

5 TERRESTRIAL VERTEBRATE FAUNA

5.1 AVAILABLE INFORMATION

5.1.1 Sources of data

Datasets

Records of terrestrial vertebrate fauna from the DRP have been obtained from the Atlas of NSW Wildlife (NPWS), Australian Museum, CSIRO, Australian Bird and Bat Banding Scheme, Birds Australia and various fauna survey reports. Not all of these datasets cover all faunal groups. Records from other sources were not included in this initial analysis and all records were subjected to expert review to identify dubious records. Any records considered to be dubious have been removed from the database used in this analysis. Records for which the location information appears correct but which appear doubtful are identified in the list of native fauna in Appendix E.

Surveys

Fauna surveys using systematic techniques that have been carried out in the DRP prior to this study are listed in Table 5.1. This table lists the study area, methods of site selection and fauna survey, the number of sites and the survey period for each of these studies.

Table 5.1 Summary of systematic fauna surveys conducted within the DRP

Dataset	Site selection	Survey methods (* = incidental data)	Number of sites	Survey period
Midkin Nature Reserve Flora Fauna Survey Hunt (1993b)	Stratified based on veg types identified through aerial photography	Elliots, pitfalls, spotlighting, bird census	6	26/5/93 – 30/5/93
Boronga Nature Reserve Biodiversity Survey Hunt (1993a)	Stratified based on veg types identified through aerial photography	Elliots, cages, pitfalls, harp traps, bird census, spotlighting	14	16/9/93 – 20/9/93
Lumeah – Biodiversity and Resource Survey Henderson (1998)	Systematically selected based on veg types	Elliots, cages, pitfalls, bird census*, spotlighting, herp search*	5	19/10/98 – 28/10/98
Boomi and Boomi West Nature Reserves Biodiversity Survey Butler (1996)	Stratified based on veg types identified through aerial photography	Elliots, pitfalls, bird census, herp searches	6	6/12/96 – 14/12/96

Dataset	Site selection	Survey methods (* = incidental data)	Number of sites	Survey period
Native Small Mammals and Reptiles in Cropped and Uncropped Parts of Lakebeds Briggs (1996)	targeted surveys at specific locations for mammals and reptiles only	Elliots*, pitfalls*	10	Sep-Oct 1992 & Oct 1993
Fauna Survey for the Gwydir Watercourse Spark (1998)	Systematically selected based on veg types	Elliots, hair sampling, cages, bird census, habitat search, call playback, spotlighting, herp search, pitfall, noc search, anabat and harp trap*	7	15/9/97 – 26/9/97
Trangie Agricultural Research Centre – Faunal Biodiversity Survey Kerle (1998)	Stratified based on land conditions	Elliots, bird census*, spotlight*, pitfall, harp trap*	5	26/3/98 – 29/3/98
Vertebrate Fauna of the Narran River Floodplain Smith (1993)	Survey range of habitats	Elliots, cages, bird census, spotlight*, pitfalls, harp traps	10	3/1992 - 4/1992
Natural Resources Study – Murray-Darling Water Management Action Plan Centre of Environmental Management (1998)	Based on veg types, habitat, disturbance & geography	Elliots, cages, bird census, spotlight, pitfall, herp search, & harp trap	14 (4)	2/9/96 – 31/1/97
An Overview of the Vertebrate Fauna of the Brigalow Belt North East of Bourke, NSW Ellis and Wilson (1992)	Stratification based on veg types, biophysical attributes	Pitfall, mistnets, harp traps	13 (2)	10/1991
Fauna of Western New South Wales - Northern Floodplains Smith <i>et al</i> (1998)	Stratification based on veg types, biophysical attributes	Elliots, cages*, bird census*, call playback*, spotlight*, pitfall, herp search*, harp trap*	12	1994-1996
Fauna Survey in the Floodplain of the Great Anabranche of the lower Darling River Read (1995)	Variety of vegetation communities	Elliots, bird census*, spotlight*, pitfall	4	27/3/94 – 6/4/94
Ecological Management of Lakebed Cropping on Great Anabranche Jenkins and Briggs (1995)	6 major habitats surveyed	Elliots, bird census, pitfall,	8	winter & spring 1994
Vertebrate Fauna Survey of Culgoa and Birrie River Floodplains Dick and Andrew (1993)	Range of habitats covered	Hair sampling, cages*, Elliots, bird census, pitfall, herp search*, harp trap*	32 (approx 10 systematic)	30/10/90-10/11/90, 14/10/91-25/10/91 & 11/4/92 – 28/4/92
Narran Lake Nature Reserve Amphibian Survey Henderson (1999b)	Targeted water bodies	Herp search*, pitfall*	7	8/11/99 – 13/11/99

5.1.2 Species diversity of terrestrial vertebrates in the DRP

Five hundred and six species of vertebrates have been recorded in the DRP in the datasets. These comprise 25 species of amphibian, 104 reptile species, 319 bird species and 58 mammal species (Appendix E). Of these 65, species are listed by the NSW *TSC Act*, nine as extinct (Schedule 1, part 4), 11 as endangered (Schedule 1, part 1) and 45 as vulnerable (Schedule 2). The status of the species is indicated in the tables for each taxonomic group in addition to species of conservation concern, species listed on the JAMBA and CAMBA international agreements, species that have not been recorded since 1970 and exotic species.

5.2 AMPHIBIANS

5.2.1 Known species diversity and distribution

There are 3 532 records of 25 amphibian species recorded from the DRP with both wetland and burrowing frogs being represented. The number of amphibian records in the DRP is lower than for all other vertebrate taxa and these records are unevenly distributed across the bioregion (Map 29). Record numbers per 1:100 000 mapsheet range from no records from 33 mapsheets to 51 records for the mapsheet containing Narran Lake (Map 30) (NPWS 1999c).

Eight broad herpetofaunal habitat types have been defined within the Darling Basin by Ayers *et al.* (in press), six of which are present in the DRP. These are:

- Channels - no frog species live entirely within the channels, all use the adjoining riparian zone as well;
- Riparian Zone - undisturbed riparian zones are generally diverse, rich and well watered habitats. Tree hollows and crevices, soil crevices and logs are important habitat elements. Species include *Litoria caerulea* (green tree frog) and *Litoria peronii* (Peron's tree frog), which survive the drier times within tree hollows, and *Limnodynastes tasmaniensis* (spotted marsh frog), which shelters under logs and in soil crevices;
- Woodlands - these contain a high diversity of habitats (tree hollows, logs, soil crevices, temporary wetlands) and can support a high level of frog diversity;
- Shrublands – some species of burrowing frogs occur in the various shrublands, for example, *Neobatrachus sudelli* (common spadefoot toad) in Chenopod shrubland, *Notaden bennettii* (crucifix toad) in mulga communities;
- Grasslands - Canegrass contains burrowing species such as *Neobatrachus sudelli* (common spadefoot toad); and
- Wetlands - ground debris and fallen timber are used for shelter by species such as *Limnodynastes salmini* (salmon-striped frog) and *Uperoleia rugosa*. Several *Litoria* species rely on trees with deep hollows, spouts or hollow interiors for shelter, feeding and calling.

Twenty frog species are known from the Northern Floodplain region (which includes areas outside the DRP), with 18 being recorded during the Northern Floodplains survey (NPWS 1998a). Three species were also recorded from the Narran River floodplain (Smith 1993) and six during the Culgoa and Birrie floodplains survey (Dick & Andrew 1993). These species were found in all major habitats.

Fourteen frog species have been recorded in the Gwydir wetlands with some very high densities, for example, 8 834 individuals of six species were caught at seven sites during 342 pitfall trap-nights (Spark 1998). Seventeen species of frogs have been recorded in the Macquarie Marshes (Metcalf *et al.* 1994).

5.2.2 Species of conservation concern

No frog species known or predicted to occur in the DRP are listed as threatened in New South Wales, but several have been identified as of conservation concern in the western division (Sadler & Pressey 1994) and these could be found in the DRP. These are:

- *Cyclorana novaehollandiae* (wide-mouthed frog)

- *Cyclorana verrucosa* (warty water-holding frog)
- *Litoria albobuttata* (striped burrowing frog)
- *Crinia deserticola*
- *Crinia parinsignifera*.

5.2.3 Regionally endemic species and significant populations

Seven amphibian species recorded in the DRP are either endemic to or have a majority of their distribution within the Darling Basin (Ayres *et al.* in press). These are *Crinia parinsignifera* and *Crinia sloanei*, *Limnodynastes fletcheri* (long-thumbed frog), *Limnodynastes interioris* (giant banjo frog), *Neobatrachus sudelli*, *Notaden bennettii* (crucifix toad) and *Cyclorana verrucosa*.

No threatened populations of amphibians in the bioregion have been listed under the *TSC Act* (1995) but there has also been no detailed assessment of the status of populations of amphibians in the DRP. Areas such as the Gingham wetlands may be worthy of assessment.

5.3 REPTILES

5.3.1 Known species diversity and distribution

There are 5 467 records of 104 reptile species in the datasets with dragons, skinks, goannas and geckoes being the most frequently reported. The distribution of reptile records from the Wildlife Atlas is uneven and record numbers are generally low across the whole bioregion (Map 31, Map 32) (NPWS 1999c). The density of records reflects the intensity of surveys with a high proportion of records from the Narran Lake, Culgoa floodplain and Menindee mapsheets.

Seven of the eight broad reptile habitat types defined for the Darling Basin occur in the DRP (Ayers *et al.* in press). These are:

- Channels - Turtle species of the Darling River and tributaries are the only species that can be defined as true channel inhabitants. Several turtle species use the billabongs, oxbows and other associated wetlands. Turtles feed from and shelter in the channel, mating occurs in the water, and eggs are laid above the high water level on river and stream banks. *Physignathus lesueurii* (eastern water dragon) and *Eulamprus quoyii* (eastern water skink) have also been able to colonise the major drainage channels along the Darling River;
- Riparian Zone - Tree hollows, crevices, and hollow limbs provide a shelter for a variety of medium sized reptiles including *Egernia striolata* (tree skink), *Oedura marmorata* (marbled velvet gecko), *Lophognathus gilberti* (Gilbert's dragon) and *Varanus tristis* (black-headed monitor). *Gehyra dubia* (northern dtella), *Cryptoblepharus carnabyi* (Carnaby's wall skink) and *Hoplocephalus bitorquatus* (pale headed snake) live under bark while *Morelia spilota variegata* (carpet python) and *Varanus varius* (lace monitor) feed and shelter in trees and on the ground. Other microhabitats include logs and rocks harbouring fossorial reptiles such as legless lizards, blind snakes, small skinks and snakes, and geckoes, such as *Heteronotia binoei* (Bynoe's gecko). Burrowing species include larger skinks of the genus *Ctenotus*;
- Woodlands - Arboreal reptile species are found in many woodland types and include *Egernia striolata* and *Diplodactylus intermedius* (eastern spiny-tailed gecko) which shelter in crevices and hollows or under bark. Large species such as *Pogona barbata*

(bearded dragon) sit on trunks or limbs of trees well above ground. Litter dwelling skinks include *Menetia greyii* (Grey's skink);

- Shrublands - Chenopod shrublands harbour *Underwoodisaurus milii* (thick-tailed gecko) and *Pogona barbata*. Many ground dwelling lizards occur in the woody weed shrublands including *Rhynchoedura ornata* (beaked gecko) and various *Ctenotus* species;
- Grasslands - *Tympanocryptis lineata* (lined earless dragon) and *Diplodactylus tessellatus* (tessellated gecko) are among the species that occur in canegrass habitat;
- Rocky outcrops - The DRP has few rocky outcrops, however these areas provide good shelter and sites for thermoregulation for reptiles such as *Antaresia stimsoni* (Stimson's python); and
- Wetlands - the rich diversity of aquatic and terrestrial habitats support turtles in permanent waterholes, and a variety of snake species such as *Pseudechis porphyriacus* (red-bellied black-snake), *Denisonia devisi* (De Vis' banded snake) and *Morelia spilota*.

Seventy-seven reptile species have been recorded from the Northern Floodplains region which includes areas outside the DRP. These species include four turtles, 12 geckos, five legless lizards, seven dragons, three goannas, 25 skinks, five blind snakes, two pythons, one rear-fanged snake and 13 front-fanged snakes (Smith *et al.* 1998). Sixty of these were recorded during the Northern Floodplains survey (Smith *et al.* 1998) and Smith (1993) found 21 reptile species on the Narran River floodplain. Dick and Andrew (1993) list 23 species of reptiles (five geckos, one legless lizard, three dragons, two goannas, eight skinks and four snakes) from the Culgoa and Birrie floodplains and Coolibah woodlands with a grassy understorey contained the greatest diversity of reptile fauna. Fifty-two species of reptiles are known from the Macquarie Marshes (Metcalf *et al.* 1994), including 14 snake species. In the Gwydir watercourse Spark (1998) recorded 26 reptiles including *Morelia spilota* and *Chelodina expansa* (broad-shelled turtle).

5.3.2 Species of conservation concern

Six species of reptiles recorded from the DRP bioregion are listed under the *TSC Act* (Table 5.2). Another five species recorded within the bioregion are considered rare, insufficiently known or vulnerable under the IUCN criteria as defined by Cogger *et al.* (1993). Records of threatened reptile species in the DRP from the Wildlife Atlas are shown on Map 32. Twenty additional species not listed on the *TSC Act* have been identified as being of conservation concern in the western division of New South Wales (Sadler & Pressey 1994) and those occurring in the DRP bioregion are listed in Table 5.2.

Three additional listed species may occur in the DRP bioregion. *Cyclodomorphus branchialis* (Gunther's skink) and *Simoselaps fasciolatus* (narrow-banded snake) are predicted by bioclimatic analysis to occur in the DRP. *Cyclodomorphus branchialis* has, however, recently been split into two taxa, and as such bioclimatic analysis may have to be undertaken on these two species separately to determine if either occur within the DRP (Ellis, M., NPWS, pers.com., Dec. 2001). A turtle species *Elseya belli* (Namoi River elseya), is currently known from the Namoi and Gwydir rivers and may also occur in the DRP bioregion, with unconfirmed records of this species from the Macquarie Marshes (Cogger *et al.* 1993).

Table 5.2 Reptile species of conservation concern recorded within the DRP

Common name	Scientific name	Conservation status	Number of records	Datasets
broad-shelled river turtle	<i>Chelodina expansa</i>	R/IKCCSE, RSP	22	AM (10), WLA (9), MD (2), Gwy (1)
eastern snake-necked turtle	<i>Chelodina longicollis</i>	RWDSP	602	AM (5), WLA (576), CSIRO (15), Lum, Tra (2), MD (2), Gwy (2)
Murray turtle	<i>Emydura macquarii</i>	R/IKCCSE, IK/VWDSP	49	AM (33), WLA (11), CSIRO (1), MD (4)
ocellated velvet gecko	<i>Oedura monilis</i>	RWDSP	15	AM (3), WLA (2), CSIRO (10)
gibber earless dragon	<i>Tympanocryptis intima</i>	RSP	2	AM (1), WLA (1) (historic records)
	<i>Anomalopus mackayi</i>	E1, VCCSE	4	WLA
skink	<i>Ctenotus ingrami</i>	RSP	26	AM (4), WLA (14), CSIRO (5), Bor (3)
skink	<i>Ctenotus strauchii</i>	subsp <i>varius</i> RSP	17	AM (6), WLA (9), Bor (2)
skink	<i>Egernia modesta</i>	RWDSP	2	AM (1), WLA (1)
eastern water skink	<i>Eulamprus quoyii</i>	RWDSP	23	AM (8), WLA (6), MD (9)
skink	<i>Lerista xanthura</i>	DPWDSP	28	AM (14), WLA (14)
skink	<i>Proablepharus kinghorni</i>	RSP	19	AM (2), WLA (11), CSIRO (4), Cul (2)
western blue-tongued lizard	<i>Tiliqua occipitalis</i>	V	1	WLA
blind snake	<i>Ramphotyphlops proximus</i>	RWDSP	10	AM (5), WLA (5)
woma	<i>Aspidites ramsayi</i>	V	2	AM (1), WLA (1)
Stimson's python	<i>Liasis stimsoni</i>	V	2	AM (1), WLA (1) (last recorded in 1969 in Wilcannia)
carpet python	<i>Morelia spilota variegata</i>	IK/EWDSP	5	WLA (4), Gwy (1)
green tree snake	<i>Dendrelaphis punctulata</i>	RWDSP	5	AM (2), WLA (3)
common death adder	<i>Acanthophis antarcticus</i>	R/IKCCSE, RWDSP	2	AM (1), WLA (1)
	<i>Denisonia maculata</i>	VCCSE	1	AM (last recorded in 1788 in Wee Waa)
pale-headed snake	<i>Hoplocephalus bitorquatus</i>	V	16	AM (11), WLA (4), CSIRO (1)
eastern tiger snake	<i>Notechis scutatus</i>	RWDSP	1	WLA
fierce snake	<i>Oxyuranus microlepidotus</i>	E4	1	WLA (last recorded in 1881)
spotted black snake	<i>Pseudechis guttatus</i>	RWDSP	42	AM (17), WLA (20), CSIRO (1), Gwy (4)
red-bellied black snake	<i>Pseudechis porphyriacus</i>	RWDSP	117	AM (43), WLA (68), CSIRO (2), Gwy (4)
ringed brown snake	<i>Pseudonaja nuchalis</i>	RSP	18	AM (13), WLA (3), CSIRO (1), MD (1)
black-headed snake	<i>Suta spectabilis</i>	RSP	4	WLA (3), Cul (1)
bandy bandy	<i>Vermicella annulata</i>	R/IKCCSE	21	AM (9), WLA (10), CSIRO (2)

Key

V	Vulnerable under schedule 2 <i>TSC Act</i> (1995)
E1	Endangered under schedule 1 <i>TSC Act</i> (1995)
E4	Extinct under Schedule 4 of the <i>TSC Act</i> (1995)
R/IKCCSE	rare or insufficiently known as defined by Cogger <i>et al</i> 1993
VCCSE	vulnerable as defined by Cogger <i>et al</i> 1993
RSP	rare in NSW as defined by Sadlier and Pressey 1994
IK/RSP	insufficiently known (possibly rare) in NSW as defined by Sadlier and Pressey 1994
RWDSP	rare in the western division of NSW as defined by Sadlier and Pressey 1994
DPWDSP	disjunct population in the western division of NSW as defined by Sadlier and Pressey 1994
IK/EWDSP	insufficiently known (possibly endangered) in western division as defined by Sadlier and Pressey 1994
IK/VWDSP	insufficiently known (possibly vulnerable) in western division as defined by Sadlier and Pressey 1994
WLA	Atlas of NSW Wildlife Dataset
AM	Australian Museum Dataset
CSIRO	CSIRO Dataset
MD	Murray Darling Water Management Action Plan – Natural Resources Study (note: some records may have been detected outside the DRP)
Gwy	Fauna Survey for the Gwydir Watercourse

Threats to reptile populations mostly come from habitat modification resulting from clearing, grazing pressure, cropping, predation, urban development, pasture improvement and changed fire regimes (Cogger *et al.* 1993).

5.3.3 Regionally endemic species and significant populations

Ten reptile species recorded in the DRP are either endemic to or have a majority of their distribution within the Darling Basin (Ayres *et al.* in press). These are: *Emydura macquarii*, *Delma plebeia* (leaden delma), *Anomalopus leuckartii* (two-clawed worm-skink), *Anomalopus mackayi*, *Ctenotus allotropis*, *Ctenotus brachyonyx*, *Egernia modesta*, *Hemiaspis damelii* (grey snake), *Pseudechis guttatus* and *Simoselaps australis* (coral snake). All except *Ctenotus brachyonyx* (only potential occurrence) have been recorded in the bioregion.

No threatened populations of reptiles have been identified in the bioregion under the *TSC Act* but changes in the distribution of several reptile species in the DRP have been noted. *Morelia spilota* has been recorded from the vicinity of the Darling and Macquarie Rivers, however populations around Bourke may have become locally extinct as the last record for this species in this area was prior to 1909 (Shine 1994; Sadlier & Pressey 1994). The range of *Anomalopus mackayi* appears to have contracted eastwards, with no recent records from west of Moree (Cogger *et al.* 1993). There has been no detailed assessment of the status of populations of reptiles in the DRP.

5.4 BIRDS

5.4.1 Known species diversity and distribution

There are 2 412 100 records of 319 bird species in the DRP databases. Parrots, cockatoos, honeyeaters, wrens, crows and birds of prey are the most frequently recorded. The distribution of records since 1970 across the DRP is uneven and there are many mapsheets with few bird records when compared with coastal NSW (Map 34, Map 35) (NPWS 1999c). The number of bird records per mapsheet also declines from south to north across the state. The central Macquarie River, Menindee Lakes and the Culgoa River floodplain have the highest number of bird records.

Eighty-two species were recorded in the northern floodplain biodiversity survey, with an additional 73 species having been previously known from this area (Smith *et al.* 1998). In the Narran Lakes area, 105 species of land birds have been recorded including 85 species listed by Smith (1993). In the Gwydir watercourse, Spark (1998) recorded 75 bird species, including two threatened birds, the barking owl and black-chinned honeyeater. Many additional species, including several threatened species, are recorded on the NSW NPWS Atlas for the area (Spark 1998). Dick and Andrew (1993) recorded 112 species of native bird and one introduced species in their systematic surveys of fauna in the Culgoa and Birrie River floodplains. Like the Narran lakes, most bird species were from the woodland habitats.

Waterbirds are a significant component of the bird fauna of the DRP and the wetland bird communities, particularly in the Macquarie Marshes and Narran Lakes, have been more intensively studied than terrestrial communities. Both these wetlands are significant sites for waterbird breeding in southern Australia and during the floods of 1990 supported the largest

breeding colonies of ibis in the Murray-Darling basin (Smith 1993). In general, there are very few major colonial waterbird breeding sites in Australia, consequently those that exist are extremely important. Ibis breeding is localised and uncommon and is triggered by wetland flooding. In general terms, the bigger the flood, the bigger the breeding response (Maher 1999).

Estimated population sizes of the colonial nesting waterbird species in the three most significant wetlands in the DRP are:

- Ibis (three species): 100 000 to 150 000 Gwydir Wetlands; 75 000 to 80 000 Narran; 70 000 to 75 000 Macquarie Marshes (800 glossy ibis, 2 000 Australian white ibis, more than 12 000 straw-necked ibis);
- Large egret: 10 000 to 15 000 Gwydir Wetlands; 3 000 to 5 000 Macquarie Marshes;
- Intermediate egret: 17 000 Macquarie Marshes;
- Rufous night heron: 10 000 to 15 000 Gwydir Wetlands;
- Australian pelican: 1 000 to 1 500 Narran Lakes;
- Magpie geese: eight pairs Narran; 20 pairs Gwydir Wetlands; 20 pairs Macquarie Marshes;
- Royal spoonbill: 8 000 to 9 000 pairs in Narran Lakes; and
- Brolga: six to eight pairs Macquarie Marshes.

These estimated numbers confirm the significance of these wetlands within NSW and the Murray-Darling Basin (Kingsford & Thomas 1995; Maher 1999).

The Macquarie Marshes provide habitat for more than 70 species of waterbirds, including 42 species that breed in the area, and 130 species of land birds. It is one of the few wetlands supporting breeding colonies of all four species of egret and three species of ibis. The threatened magpie goose has also bred in the wetlands. In 1984, the marshes supported at least 88 000 waterbirds, considerably more than any other wetland in the area (Kingsford & Thomas 1995).

Sixty-five species of waterbirds have been recorded from the Narran wetlands and 46 species breed in the area (Ley 1998a; Ley 1998b; Henderson 1999a). The wetlands support the largest recorded breeding colonies in Australia of straw-necked ibis, little black cormorant and royal spoonbill and large numbers of sixteen other species (NPWS 2000a; Ramsar 2000). An estimated 200 000 pairs of ibis bred in the Narran Lake Nature Reserve in 1983, the largest breeding event ever recorded in Australia (Marchant & Higgins 1993). Smith (1993) lists the estimated number of breeding pairs of waterbirds at Narran Lake during the period 1971 to 1991 as ranging from 50 to 200 000 pairs in any one year, and these numbers are largely dependant on inundation and water availability. Narran wetlands flood every two to three years on average, which is more frequent than most other wetlands in north western New South Wales (NPWS 2000a).

Threatened species known to breed at Narran Lakes include the brolga (*Grus rubicunda*), blue-billed duck (*Oxyura australis*), freckled duck (*Stictonetta naevosa*) and the most western known breeding record of magpie geese in New South Wales. Breeding occurs in lakes and associated channels (Ley 1998a; NPWS 2000a). Large numbers of waders, including the threatened black-tailed godwit (*Limosa limosa*), also congregate on freshly exposed mudflats after flooding, and eleven of these species are listed under the JAMBA and CAMBA agreements (Ley 1998a).

Lake Menindee, Lake Cawndilla and associated wetlands provide important waterfowl habitat, breeding sites and drought refuge in the New South Wales western division. Breeding species include cormorants, egrets, pelicans, spoonbills, darters and ibis. Annual aerial waterbird surveys have been undertaken by Kingsford *et al.* (2002) since 1983 over NSW. Major wetland areas within the DRP which are covered by this survey include Menindee Lakes (includes Lake Cawndilla, Lake Menindee, Emu Lake and Eurobilli Lake) and the Macquarie Marshes. A summary of waterbird counts for these wetlands is shown in Appendix F. This summary shows that the waterbird species with the highest counts recorded by Kingsford *et al.* (2002) during the survey period between 1983 and 2001 for the Macquarie Marshes were:

- grey teal - with 82 378 records overall and a yearly range from 84 records in 1991 to 48 881 records in 1984;
- straw-necked ibis - with 47 706 records overall and a yearly range from 15 records in 2001 to 11 269 records in 1984;
- pacific black duck - with 17 426 records overall and a yearly range from five records in 1994 to 6 006 records in 1983; and
- Australian white ibis - with 15 227 records overall and a yearly range from three records in 2000 to 6 739 records in 1983.

Appendix F also shows that the waterbird species with the highest counts recorded by Kingsford *et al.* (2002) during the survey period between 1983 and 2001 for the Menindee Lakes were:

- grey teal - with 48 997 records overall and a yearly range from two records in 1998 to 44 923 in 1995;
- pink-eared duck - with 15 671 records overall and a yearly range from four records in 1990 to 13 832 records in 1995;
- little black cormorant - with 8 096 records overall and a yearly range from two records in 1990 to 3 164 records in 1984; and
- Eurasian coot - with 7 585 records overall and a yearly range from 14 records in 1998 to 2 780 records in 1987.

5.4.2 Species of conservation concern

Eight endangered and 32 vulnerable bird species have been recorded in the DRP. These species and those listed on the international treaties, JAMBA and CAMBA, are listed in Table 5.3 and the post - 1970 records of threatened species have been plotted on Map 36. Some of the recorded threatened species include: from Narran Lake Nature Reserve - Australian bustard (*Ardeotis australis*), grey falcon (*Falco hypoleucos*), Major Mitchell's cockatoo (*Cacatua leadbeateri*), barking owl (*Ninox connivens*) and masked owl (*Tyto novaehollandiae*) (NPWS 2000a); from Culgoa and Birrie River floodplains - grey falcon, Australian bustard, Major Mitchell's cockatoo and painted honeyeater (*Grantiella picta*); and, from Kinchega National Park - freckled duck and Major Mitchell's cockatoo (NPWS 1996). Eighteen threatened bird species and nine species protected by JAMBA and CAMBA agreements have been recorded in the Macquarie Marshes.

Garnett and Crowley (2000) have evaluated the national conservation status of all Australian birds against the internationally recognised criteria developed by the International Union for the Conservation of Nature (IUCN). A number of taxa not currently recognised as threatened in New South Wales were identified, including several species and subspecies of birds currently thought to be in decline (see over page). Conversely, several listed threatened taxa in New South Wales (*TSC Act*), have not been identified as being threatened nationally. These species and their recommended status are listed in Table 5.3. Endangered species are those facing a very high risk of extinction in the wild in the near future, Vulnerable, those facing a high risk of extinction in the medium-term future and near-threatened species and those close to qualifying for vulnerable (IUCN 1994; Maxwell *et al.* 1996). Subtropical woodlands (in portions of the DRP, Brigalow Belt South, Nandewar and New England Tablelands bioregions) have been identified in Garnett and Crowley (2000) as key areas for the conservation of several threatened or near-threatened bird species. The conservation status of bird species from the western division of New South Wales has also been assessed by Smith *et al.* (1994) and species of concern in the DRP are listed in Table 5.3.

Table 5.3 Bird species of conservation significance recorded from the DRP.

Common name	Scientific name	Conservation status	Number of records	Dataset
brown quail	<i>Coturnix ypsilophora</i>	PTWDSPS	14	AM (1), WLA (10), Cul (1), MD (2)
malleefowl	<i>Leipoa ocellata</i>	E1, VGC, *VSPS	2	AM (1), WLA (1)
red-chested button-quail	<i>Turnix pyrrhorostrax</i>	PTWDSPS	18	BA (8), AM (1), WLA (9)
brown booby	<i>Sula leucogaster</i>	J & C	1	BA
red-tailed tropicbird	<i>Phaethon rubricauda</i>	V, NTGC	1	WLA
magpie goose	<i>Anseranas semipalmata</i>	V, EvSPS	344	WLA (340), Narw (4)
freckled duck	<i>Stictonetta naevosa</i>	V, *PTSPS	1,314	BA (25), AM (3), WLA (1285), CSIRO (1)
cotton pygmy-goose	<i>Nettapus coromandelianus</i>	E1, NTGC	1	WLA
blue-billed duck	<i>Oxyura australis</i>	V, PTWDSPS	457	BA (17), WLA (442), Narw (1)
Lewin's rail	<i>Rallus pectoralis</i>	ExWDSPS	8	WLA
great egret	<i>Ardea alba</i>	J & C	4,662	BA (339), AM (11), ABBBS (1), WLA (4134), Cul (5), Narw (168), MD (4)
cattle egret	<i>Ardea ibis</i>	J & C	623	BA (16), WLA (604), Narw (2), Gwy (1)
black bittern	<i>Ixobrychus flavicollis</i>	V, XSPS	1	BA
little bittern	<i>Ixobrychus minutus</i>	NTGC	22	BA (7), AM (1), WLA (13), CSIRO (1)
Australasian bittern	<i>Botaurus poiciloptilus</i>	V, VGC, *PTSPS	6,753	BA (15), AM (1), WLA (6737)
black-necked stork	<i>Ephippiorhynchus asiaticus</i>	E1	13	BA (9), WLA (4)
glossy ibis	<i>Plegadis falcinellus</i>	C	25,329	BA (134), AM (5), WLA (25153), CSIRO (1), Cul (2), Lum, Narw (34)
brolga	<i>Grus rubicunda</i>	V, PTSPS	585	BA (126), AM (10), WLA (449)
whimbrel	<i>Numerius phaeopus</i>	J & C	2	BA
wood sandpiper	<i>Tringa glareola</i>	J & C	10	BA (1), WLA (9)
common greenshank	<i>Tringa nebularia</i>	J & C	591	BA (42), WLA (544), Narw (1), MD (4)
marsh sandpiper	<i>Tringa stagnatilis</i>	C	629	BA (21), WLA (132), Narw (475), MD (1)
common sandpiper	<i>Actitis hypoleucos</i>	J & C	27	BA (8), WLA (19)
Latham's snipe	<i>Gallinago hardwickii</i>	J & C, PTnWDSPS	254	BA (48), AM (1), WLA (205)
bar-tailed godwit	<i>Limosa lapponica</i>	J & C	5	BA (3), WLA (2)
black-tailed godwit	<i>Limosa limosa</i>	V (J & C)	136	BA (6), WLA (60), Narw (70)
red knot	<i>Calidris canutus</i>	J & C	1	WLA
sharp-tailed sandpiper	<i>Calidris acuminata</i>	J & C	8,263	BA (44), AM (2), WLA (7727), Narw (490)
red-necked stint	<i>Calidris ruficollis</i>	J & C	212	BA (5), WLA (207)
sanderling	<i>Calidris alba</i>	V (J & C)	2	WLA

Common name	Scientific name	Conservation status	Number of records	Dataset
curlew sandpiper	<i>Calidris ferruginea</i>	J & C	12	BA (3), WLA (9)
painted snipe	<i>Rostratula benghalensis</i>	V, VGC, *PTSPS	22	BA (8), AM (4), WLA (10)
bush stone-curlew	<i>Burhinus grallarius</i>	E1, NTGC, VSPS	66	BA (21), WLA (45)
lesser golden plover	<i>Pluvialis dominica</i>	J & C	1	BA
grey plover	<i>Pluvialis squatarola</i>	J & C	1	WLA
lesser sand plover	<i>Charadrius mongolus</i>	V (J & C)	7	WLA
white-winged black tern	<i>Chlidonias leucopterus</i>	J & C	553	BA (1), WLA (352), Narw (200)
caspian tern	<i>Sterna caspia</i>	C	212	BA (25), WLA (131), Narw (11), MD (45)
letter-winged kite	<i>Elanus scriptus</i>	PTSPS	6	BA (4), WLA (1), CSIRO (1)
osprey	<i>Pandion haliaetus</i>	V	1	WLA
black-breasted buzzard	<i>Hamirostra melanosternon</i>	V, PTSPS	22	BA (7), ABBBS (1), WLA (14)
square-tailed kite	<i>Lophoictinia isura</i>	V, *PTSPS	42	BA (6), WLA (33), MD (3)
turquoise parrot	<i>Neophema pulchella</i>	V, NTGC, *PTSPS	8	BA (2), AM (1), WLA (5)
red goshawk	<i>Erythrotriorchis radiatus</i>	E1, VGC	1	WLA
grey falcon	<i>Falco hypoleucos</i>	V, NTGC, *PTSPS	22	BA (9), AM (2), WLA(8), Cul(3)
flock bronzewing	<i>Phaps histrionica</i>	E1, NTGC, EvSPS	3	WLA
red-tailed black-cockatoo	<i>Calyptorhynchus banksii</i>	V, PTSPS	2,683	BA (117), AM (2), WLA (2559), CSIRO (5)
glossy black-cockatoo	<i>Calyptorhynchus lathami</i>	V, (subsp <i>lathami</i> NTGC), *PTSPS	112	BA (24), WLA (88)
Major Mitchell's cockatoo	<i>Cacatua leadbeateri</i>	V, (subsp <i>leadbeateri</i> NTGC)	529	BA (103), ABBBS (19), WLA (402), CSIRO (1), Cul (4), Lum
regent parrot	<i>Polytelis anthopeplus</i>	E1(subsp <i>monarchoides</i> EGC), *VSPS	1	BA (1)
superb parrot	<i>Polytelis swainsonii</i>	*V, VGC, *VnSPS	323	BA (14), AM (5), ABBBS (4), WLA (173), CSIRO (2), Tra (125)
Bourke's parrot	<i>Neopsephotus bourkii</i>	PTSPS	1	BA
barking owl	<i>Ninox connivens</i>	V, (subsp <i>connivens</i> NTGC), PTWSDPS	25	AM (3), BA (14), Bor, MD (1), Gwy (7)
grass owl	<i>Tyto capensis</i>	V	13	BA (1), WLA (12)
fork-tailed swift	<i>Apus pacificus</i>	J & C	23	BA (12), WLA (9), Gwy (2)
white-throated needletail	<i>Hirundapus caudacutus</i>	J & C	37	BA (22), WLA (4), MD (11)
red-browed pardalote	<i>Pardalotus rubricatus</i>	PTSPS	11	BA (1), WLA (10)
redthroat	<i>Pyrholaemus brunneus</i>	V, PTSPS	1	CSIRO
striated fieldwren ¹	<i>Calamanthus fuliginosus</i>	V	1	BA
speckled warbler	<i>Chthonicola sagittata</i>	V, NTGC	7	BA (5), ABBBS (1), WLA (1)
noisy friarbird	<i>Philemon corniculatus</i>	PTWSDPS	98	BA (58), WLA (36), Bor, Boo, Cul (4), Lum
black-chinned honeyeater	<i>Melithreptus gularis</i>	V (subsp <i>gularis</i> NTGC), PTWSDPS	54	BA (23), AM (2), WLA (17), Cul (2), MD (8), Gwy (2)
painted honeyeater	<i>Grantiella picta</i>	V, NTGC, *PTSPS	22	BA (14), WLA (7), Cul (1)
chestnut-breasted quail-thrush	<i>Cinclosoma castaneothorax</i>	*PTSPS	5	WLA
grey-crowned babbler	<i>Pomatostomus temporalis</i>	V, NTGC	784	BA (415), AM (26), ABBBS (10), WLA (313), CSIRO (2), Cul (14), Tra (2), MD (1), Gwy (1)
hooded robin	<i>Melanodryas cucullata</i>	V	312	BA (196), AM (10), ABBBS (3), WLA (80), Cul (13), Nar (7), MD (3)
crested shrike-tit	<i>Falcunculus frontatus</i>	PTWSDPS	88	BA (39), AM (3), WLA (33), Cul (5), MD (8)
Gilbert's whistler	<i>Pachycephala inornata</i>	V, PTSPS	6	BA (4), WLA (2)
golden whistler	<i>Pachycephala pectoralis</i>	PTWSDPS	39	BA (21), AM (2), WLA (11), MD (5)
olive-backed oriole	<i>Oriolus sagittatus</i>	PTWSDPS	93	BA (66), ABBBS (2), WLA (25)
diamond firetail	<i>Stagonopleura guttata</i>	V, NTGC, PTWSPS	88	BA (26), AM (2), ABBBS (12), WLA (48), Lum

Common name	Scientific name	Conservation status	Number of records	Dataset
Australian bustard	<i>Ardeotis australis</i>	E1, NTGC	70	BA (2), AM (5), WLA (62), Cul(1)

¹*Calamanthus fuliginosus* has recently been split into two separate species, striated fieldwren *Calamanthus fuliginosus*, and the rufous fieldwren *Calamanthus campestris* (Christides and Boles 1994). The rufous fieldwren occurs in the DRP, with recent records from near Menindee (Map 36). To date the impact of this taxonomic revision on the schedules of the *TSC Act* and their interpretation have yet to be determined.

Key

V	Vulnerable under schedule 2 <i>TSC Act</i> (1995) An asterisk denotes those species which are also listed as nationally vulnerable under the EPBC Act.
E	Endangered under schedule 1 <i>TSC Act</i> (1995)
J	JAMBA: agreement between the government of Australia and the government of Japan for the protection of migratory birds and birds in danger of extinction and their environment
C	CAMBA: agreement between the government of Australia and the government of the People's Republic of China for the protection of migratory birds and their environment
EGC	endangered as defined by Garnett and Crowley 2000
VGC	vulnerable as defined by Garnett and Crowley 2000
NTGC	near threatened as defined by Garnett and Crowley 2000
*ExSPS	Extinct at a national and taxon level as defined by Smith <i>et al</i> 1994
*ESPS	Endangered at a national and taxon level as defined by Smith <i>et al</i> 1994
*VSPS	vulnerable at a national and taxon level as defined by Smith <i>et al</i> 1994
*VnSPS	vulnerable at a national and taxon level as defined by Smith <i>et al</i> 1994 with recent records probably only non-breeding
*PTSPS	possibly threatened at a national and taxon level as defined by Smith <i>et al</i> 1994
ExSPS	extinct in New South Wales as defined by Smith <i>et al</i> 1994
EvSPS	endangered in New South Wales as defined by Smith <i>et al</i> 1994 with recent records probably only vagrants
VSPS	vulnerable in New South Wales as defined by Smith <i>et al</i> 1994
PTSPS	possibly threatened in New South Wales as defined by Smith <i>et al</i> 1994
ExWDS	extinct in the western division of New South Wales as defined by Smith <i>et al</i> 1994
PTWDS	possibly threatened in the western division of New South Wales as defined by Smith <i>et al</i> 1994
PTnWDS	possibly threatened in the western division of New South Wales as defined by Smith <i>et al</i> 1994 with recent records probably only non-breeding
BA	Birds Australia Dataset
WLA	Atlas of NSW Wildlife Dataset
AM	Australian Museum Dataset
CSIRO	CSIRO Dataset
Bor	Borongra NR Biodiversity Survey
Cul	Culgoa and Birrie River Floodplain Vertebrate Fauna Survey
Lum	Lumeah (Narran Lake NR) Biodiversity Survey
Narw	Narran Lake NR Waterbird Monitoring Program
Tra	Trangie Agricultural Research Centre - Faunal Biodiversity Survey
MD	Murray Darling Water Management Action Plan - Natural Resources Study (note: some records may have been detected outside the DRP)

This list of threatened species occurring in the DRP is not necessarily comprehensive, as it includes only the datasets identified in Section 5.1. Other species, such as Hall's babbler from Culgoa National Park have also been recorded (NPWS 2001b). The endangered swift parrot (*Lathamus discolor*), squatter pigeon (*Geophaps scripta*), and plains wanderer (*Pedionomus torquatus*), and the vulnerable scarlet-chested parrot (*Neophema splendida*), southern scrub-robin (*Drymodes brunneopygia*), masked owl (*Tyto novaehollandiae*) and pied honeyeater (*Certhionyx variegatus*) are predicted by bioclimatic analysis to occur in the DRP.

In their analysis of the birds of conservation concern of the New South Wales western division, Smith *et al.* (1994) defined 60 threatened species and sub-species of native birds. Twenty-three of these are listed as threatened at the national level (*EPBC Act*), 23 are listed as threatened in New South Wales (*TSC Act*) and 14 considered under threat in the Western Division. Smith *et al.* (1994) also identified another 31 species of conservation concern because of their restricted breeding distribution in the division. This analysis includes more habitats than are present in the DRP bioregion.

The analysis by Smith *et al.* (1994) is complemented by the analysis of threatened and declining birds in the New South Wales sheep-wheat belt (Reid 1999) which covers the eastern portion of the DRP. In addition to the species formally listed under the *TSC Act*, this

analysis identified declining species. Eighty-five species of birds were identified in at least one study of wheatbelt birds to be locally extinct, declining or otherwise at risk and 16 species were identified to be locally extinct, declining or otherwise at risk in at least three studies. These were the emu (*Dromaius novaehollandiae*), painted button-quail (*Turnix varia*), brown treecreeper, chestnut-rumped thornbill (*Acanthiza uropygialis*), southern whiteface (*Aphelocephala leucopsis*), jacky winter (*Microeca fascinans*), red-capped robin (*Petroica goodenovii*), eastern yellow robin (*Eopsaltria australis*), white-browed babbler (*Pomatostomus superciliosus*), varied sittella (*Daphoenositta chrysoptera*), crested shrike-tit (*Falcunculus frontatus*), crested bellbird, rufous whistler (*Pachycephala rufiventris*), restless flycatcher (*Myiagra inquieta*), white-browed woodswallow (*Artamus superciliosus*) and dusky woodswallow (*Artamus cyanopterus*). All of these species are found within the DRP. They occur in temperate eucalypt woodland habitats and represent a suite of formerly common and widespread bird species of the woodlands of the DRP that is in decline.

Trill and Duncan (2000) also assessed the conservation status of woodland birds in NSW and defined the eastern population of the crested bellbird as an endangered population, and another ten species as 'near threatened', as defined by IUCN criteria. They also defined a temperate woodland bird community and suggested that this community satisfies the criteria required for listing as an endangered ecological community.

Historical evidence indicates a massive change in the abundance and distribution of the flock bronzewing in the DRP. Collectors and naturalists from 1839 to 1920 recorded this species on a number of occasions on the northern plains in the Narrabri, Moree and Gwydir districts, occasionally in large flocks (thousands) and breeding. In more recent times, there have been few records from the DRP, with the most recent being of a single bird south west of Goodooga in 1988. The decline of this pigeon throughout its range in New South Wales, where it is now only an irregular visitor, has been linked to the spread of livestock and rabbits and their impact on grassland habitats (McAllan 1996).

Waterbird habitats and breeding requirements have also been adversely affected by human activities. Major change to hydrological regimes, combined with clearing and agricultural activities has substantially decreased the amount of inland waterfowl habitat and breeding sites and has changed flooding regimes (Briggs *et al.* 1994).

5.4.3 Regionally endemic species and significant populations

No threatened populations of birds have been listed for the bioregion in the *TSC Act* but several species have a large proportion of their total distribution within the bioregion. These include the spotted bowerbird (*Chlamydera maculata*), striped honeyeater (*Plectorhyncha lanceolata*) and plum-headed finch (*Neochmia modesta*). In New South Wales, the red-tailed black cockatoo is closely associated with *Eucalyptus camaldulensis* woodland, requiring the large hollows for nesting (Smith *et al.* 1994). Nearly all records of red-tailed black cockatoos in New South Wales are from the DRP bioregion, primarily in the vicinity of the Barwon-Darling River. This population of the red-tailed black cockatoo may also be isolated from other populations of the species (Simpson *et al.* 1999). The conservation of this population, and the other bird species identified as having large portions of their range within the DRP, will depend on land management within the DRP.

5.4.4 Introduced and pest species

Six feral bird species have been recorded from the DRP (Table 5.4, Map 37). The number of records of each species has been included to indicate the severity of the problem posed by these species.

Table 5.4 Feral bird species recorded in the DRP

Common name	Scientific name	Number of records	Dataset
mallard	<i>Anas platyrhynchos</i>	4	BA (2), WLA (2)
rock dove	<i>Columba livia</i>	158	BA (101), WLA (55), MD (1), Gwy (1)
house sparrow	<i>Passer domesticus</i>	468	BA (337), WLA (130), Tra, MD (1)
spotted turtle-dove	<i>Streptopelia chinensis</i>	2	BA
common starling	<i>Sturnus vulgaris</i>	1 193	BA (670), AM (3), WLA (488), Tra (>30), Gwy (2)
common blackbird	<i>Turdus merula</i>	9	BA (8), WLA (1)

Key

BA	Birds Australia Dataset
WLA	Atlas of NSW Wildlife Dataset
AM	Australian Museum Dataset
Tra	Trangie Agricultural Research Centre - Faunal Biodiversity Survey
MD	Murray Darling Water Management Action Plan - Natural Resources Study (note: some records may have been detected outside the DRP)
Gwy	Fauna Survey for the Gwydir Watercourse

5.5 MAMMALS

5.5.1 Known species diversity and distribution

There are 1 515 records of 70 species of mammals recorded from the DRP, including 332 records of 17 bat species (Map 38). Historical records indicate that there has been a significant decline in terrestrial mammal species in the bioregion with 23 species known to have occurred in western New South Wales now extinct. The spatial distribution of mammal records per 1:100 000 mapsheets (Map 39) indicates a bias in the location of records, both within the DRP and in comparison with other areas of the state (NPWS 1999c). The majority of mammal records are from the northern portion of the DRP.

Thirty-seven species of native mammals have been recorded in the northern floodplains, as well as nine introduced mammal species (Smith *et al* 1998). Fourteen species of mammals have been recorded from the Macquarie Marshes, including the threatened *Chalinolobus picatus* (little pied bat) (NPWS 1993) and *Saccolaimus flaviventris* (yellow-bellied sheath-tail bat) (Wilson *et al.* 1993). Sixteen species of mammal have been recorded in the Narran Lake Nature Reserve; four macropods, the echidna (*Tachyglossus aculeatus*), two dasyurids, the common brushtail possum (*Trichosurus vulpecula*), seven bats and the water rat (*Hydromys chrysogaster*) (NPWS 2000a). Seventeen native mammal species were found in the broader Narran River floodplain study (Smith 1993). No threatened species of mammal have been recorded from Narran Lake Nature Reserve to date but the koala (*Phascolarctos cinereus*) occurs in the general area.

In the Gwydir watercourse study, Spark (1998) recorded nine terrestrial mammal species and 18 bat species. Terrestrial mammals include the narrow-nosed planigale (*Planigale*

tenuirostris), common brushtail possum and sugar glider (*Petaurus breviceps*). The identification of several of the 18 bat species is questionable as they were only identified from echolocation calls and include several species not likely to occur in this area. No unusual bat species were caught in harp traps. The threatened stripe-faced dunnart (*Sminthopsis macroura*) has also been recorded in previous survey of the area (Spark 1998).

The Culgoa and Birrie River floodplain survey in the early 1990s recorded 19 native and seven introduced mammal species (Dick & Andrew 1993). The terrestrial mammal fauna of this area was dominated by dasyurids, with the only native rodent being the water rat in aquatic habitats. The four dasyurid species included the threatened stripe-faced dunnart. Two species of macropod were present, and the regionally rare swamp wallaby (*Wallabia bicolor*) had been reported from nearby properties. There were also three species of arboreal mammal: koala, common brushtail possum and an unidentified *Petaurus* glider. All of these species are of regional significance in this area. Seven species of bats included *Chalinolobus picatus* (little pied bat) and several species which are of conservation concern in the western division.

5.5.2 Species of conservation concern

Eight extinct, two endangered and nine vulnerable species listed in the *TSC Act* have been recorded in the DRP (databases; Dickman & Read 1992; Dickman 1993). Recent records of threatened species are mostly confined to the northern tip of the bioregion (Table 5.5, Map 40).

Table 5.5 Mammal species of conservation concern recorded in the DRP.

Common name	Scientific name	Legal status	Number of records	Dataset
platypus	<i>Ornithorhynchus anatinus</i>	VDPLP	6	AM (5), WLA (1)
spotted-tailed quoll	<i>Dasyurus maculatus</i>	V (subsp. <i>maculatus</i> VMBM), EDPLP	3	WLA
yellow-footed antechinus	<i>Antechinus flavipes</i>	VDPLP	15	AM (2), WLA (13)
brush-tailed phascogale	<i>Phascogale tapoatafa</i>	V (subsp. <i>tapoatafa</i> NTMBM), PEDPLP	1	CSIRO
kultarr	<i>Antechinomys laniger</i>	E1, PEDPLP	8	AM (4), WLA (4)
stripe-faced dunnart	<i>Sminthopsis macroura</i>	V	22	AM (10), WLA (9), CSIRO (1), Cul (2)
western barred bandicoot	<i>Perameles bougainville</i>	E4 (subsp. <i>fasciata</i> EXMBM)	1	WLA (last recorded in 1840)
bilby	<i>Macrotis lagotis</i>	E4, VMBM	5	AM (3), WLA (2) (last recorded in 1940)
koala	<i>Phascolarctos cinereus</i>	V (NTMBM), PEDPLP	167	AM (1), WLA (164), Cul (1), MD (1)
sugar glider	<i>Petaurus breviceps</i>	PEDPLP	9	AM (2), WLA (1), Boo, Gwy (6)
squirrel glider	<i>Petaurus norfolcensis</i>	V (NTMBM)	1	WLA
common ringtail possum	<i>Pseudocheirus peregrinus</i>	EDPLP	2	AM (1), WLA (1)
common brushtail possum	<i>Trichosurus vulpecula</i>	VDPLP	119	AM (4), WLA (58), Bor (2), Cul (6), Nar (3), Tra (14), Gwy (32)
burrowing bettong	<i>Bettongia lesueur</i>	E4 (subsp. <i>graii</i> EXMBM)	1	WLA (last recorded in 1879)
brush-tailed bettong	<i>Bettongia penicillata</i>	E4 (subsp. <i>penicillata</i> EXMBM)	1	WLA (last recorded in 1882)
northern bettong	<i>Bettongia tropica</i>	E4, EXMBM	1	WLA (last recorded in 1840)
eastern hare-wallaby	<i>Lagorchestes leporides</i>	*E4 (EXMBM)	2	WLA (last recorded in 1863)
swamp wallaby	<i>Wallabia bicolor</i>	PEDPLP	128	AM (2), WLA (106), Bor (2), Lum, Nar (2), Gwy (16)

Common name	Scientific name	Legal status	Number of records	Dataset
yellow-bellied sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V	28	AM (7), WLA (21)
Gould's long-eared bat	<i>Nyctophilus gouldi</i>	PEDPLP	29	AM (9), WLA (12), Cul (3), Nar (1), Gwy (4)
little pied bat	<i>Chalinolobus picatus</i>	V, NTDBM	14	AM (4), WLA (9), Cul (1)
inland forest bat	<i>Vespadelus baverstocki</i>	V	7	AM (2), WLA (2), MD (3)
white-footed rabbit-rat	<i>Conilurus albipes</i>	*E4	2	WLA (last recorded in 1846)
silky mouse	<i>Pseudomys apodemoides</i>	E1, ExDPLP	1	WLA (historic record – last recorded in DRP near Walgett in 1800)
Gould's mouse	<i>Pseudomys gouldii</i>	*E4	1	WLA (last recorded in 1858)
pale field-rat	<i>Rattus tunneyi</i>	XDPLP	2	WLA
long-haired rat	<i>Rattus villosissimus</i>	V, VDPLP	3	WLA (historic record – last recorded in 1887 in the Tilpa District)

Key

V	Vulnerable under schedule 2 <i>TSC Act</i> (1995) An asterix denotes those species which are also listed as nationally vulnerable under the EPBC Act.
E1	Endangered under schedule 1 <i>TSC Act</i> (1995)
E4	Extinct under Schedule 4 <i>TSC Act</i> (1995)
NTDBM	Near threatened as defined by Duncan <i>et al</i> 1999
EXMBM	Extinct as defined by Maxwell <i>et al</i> 1996
EMBM	Endangered as defined by Maxwell <i>et al</i> 1996
VMBM	Vulnerable as defined by Maxwell, <i>et al</i> 1996
NTMBM	Near threatened as defined by Maxwell <i>et al</i> 1996
XDPLP	Extinct in the Western Division of New South Wales as defined by Dickman <i>et al</i> 1993.
ExDPLP	Probably extinct in the Western Division of New South Wales as defined by Dickman <i>et al</i> 1993
EDPLP	Endangered in the Western Division of New South Wales as defined by Dickman <i>et al</i> 1993
PEDPLP	Possibly endangered in the Western Division of New South Wales as defined by Dickman <i>et al</i> 1993.
VDPLP	Vulnerable in the Western Division of New South Wales as defined by Dickman <i>et al</i> 1993
WLA	Atlas of NSW Wildlife Dataset
AM	Australian Museum Dataset
CSIRO	CSIRO Dataset
Bor	Borongra NR Biodiversity Survey
Boo	Boomi and Boomi West NRs Survey
Cul	Culgoa and Birrie River Floodplain Vertebrate Fauna Survey
Lum	Lumeah (Narran Lake NR) Biodiversity Survey
Nar	Vertebrate Fauna Survey of Narran River Floodplain
Tra	Trangie Agricultural Research Centre - Faunal Biodiversity Survey
MD	Murray Darling Water Management Action Plan - Natural Resources Study (note: some records may have been detected outside the DRP)
Gwy	Fauna Survey for the Gwydir Watercourse

The endangered yellow-footed rock-wallaby (*Petrogale xanthopus*) and vulnerable brush-tailed rock-wallaby (*Petrogale penicillata*) listed under the *TSC Act* are also predicted to occur in the DRP but these predictions do not include the assessment of the presence of suitable habitat for these species.

Grazing by stock, disturbance by feral mammals and land clearance have been identified as the major current threats to these species of conservation concern (Dickman *et al.* 1993).

5.5.3 Regionally endemic species and significant populations

No threatened populations of mammals have been identified in the bioregion under the *TSC Act*. Populations of swamp wallaby, common brushtail possum, koala and *Petaurus* glider which were recorded in the Northern Floodplains and Culgoa Birrie surveys and are regarded as regionally significant (Smith *et al.* 1998), but are not listed under the *TSC Act*.

5.5.4 Introduced and pest species

Twelve feral mammal species have been recorded from the DRP in the databases (Table 5.6, Map 40). The number of records of each species has been included to indicate the severity of the problem posed by these species.

Table 5.6 Feral mammals recorded from the DRP.

Common name	Scientific name	Number of records	Dataset
cattle (feral)	<i>Bos taurus</i>	105	WLA (90), Bor (15)
dingo and dog (feral)	<i>Canis familiaris</i>	5	WLA
goat (feral)	<i>Capra hircus</i>	121	WLA (88), Cul (20), Lum, MD (13)
horse (feral)	<i>Equus caballus</i>	3	WLA
cat (feral)	<i>Felis catus</i>	58	WLA (42), Lum, MD (6), Gwy (10)
brown hare	<i>Lepus capensis</i>	97	WLA (84), Bor (2), Cul (1), Lum, Nar (4), MD (2), Gwy (4)
house mouse	<i>Mus musculus</i>	393	AM (26), WLA (114), CSIRO (4), Mid(28), Bor (7), Cul (2), Nar (5), Tra (29), MD (9), Gwy (169)
rabbit	<i>Oryctolagus cuniculus</i>	159	WLA (136), Bor (4), Cul (1), MD (18)
sheep (feral)	<i>Ovis aries</i>	4	WLA (4)
black rat	<i>Rattus rattus</i>	4	AM (1), WLA (3)
pig (feral)	<i>Sus scrofa</i>	8,838	AM (1), WLA (8800), Cul (23), Lum, Nar (2), MD (7), Gwy (5)
fox	<i>Vulpes vulpes</i>	304	WLA (262), Mid(1), Bor (1), Cul (3), Lum, Nar (3), Tra (18), MD (9), Gwy (7)

Key

BA	Birds Australia Dataset
WLA	Atlas of NSW Wildlife Dataset
AM	Australian Museum Dataset
CSIRO	CSIRO Dataset
Mid	Midkin NR Flora Fauna Survey
Bor	Boronga NR Biodiversity Survey
Cul	Culgoa and Birrie River Floodplain Vertebrate Fauna Survey
Lum	Lumeah (Narran Lake NR) Biodiversity Survey
Nar	Vertebrate Fauna Survey of Narran River Floodplain
Tra	Trangie Agricultural Research Centre - Faunal Biodiversity Survey
Gwy	Fauna Survey for the Gwydir Watercourse
MD	Murray Darling Water Management Action Plan - Natural Resources Study (note: some records may have been detected outside the DRP)

Feral pigs are widespread in the Namoi catchment with higher densities in the wetland or riverine environments on the plains, causing considerable damage to vegetation and crops and fouling water supplies. This problem is not confined to that part of the DRP and associated catchments.

5.6 SUMMARY AND PROPOSED FURTHER WORK

5.6.1 Summary

Information about the distribution and abundance of the terrestrial vertebrate fauna across the bioregion is based on a few scattered systematic surveys and incidental records. As is illustrated on Maps 30, 32, 35 and 39, there are substantial gaps in the coverage of records and most of the mapsheets have been inadequately sampled. An exception is the number of bird records (5 001-26 785) for the Macquarie Marshes and the northern floodplains which are the most intensively sampled areas. Some mapsheets have no mammal, reptile or amphibian records and the areas with the lowest number of terrestrial vertebrate records are the upper and lower Bogan River. These areas should be targeted for fauna survey.

Planning for future surveys within the DRP should focus on vegetation communities and landscapes that have not been intensively sampled. Habitat preference and expected distribution throughout the bioregion can be predicted from this data. Population viability assessments are also required for threatened vertebrate fauna in the DRP. In summary the status of the four terrestrial vertebrate taxa are shown in Table 5.7. In this table: listed species means those species which are listed under the TSC Act as endangered or vulnerable; species of concern are those species which are considered of concern as outlined in sections 5.2.2, 5.3.2, 5.4.2 and 5.5.2; and predicted listed species are those species listed on the TSC Act which have been predicted to occur within the DRP using bioclimatic analysis.

Table 5.7 Summary of vertebrate taxa in the DRP

Taxon	Total recorded species diversity	Listed species (TSC Act)	Species of concern	Predicted listed species (TSC Act)
Amphibians	25	0	5	0
Reptiles	104	6	25	2
Birds	319	40	25	7
Mammals	58	19	8	10

There are also six feral bird species and 12 feral mammal species known to occur within the DRP.

On the basis of existing records, the Macquarie Marshes and part of the Menindee Lakes have most records of vulnerable species (Map 42). There is an apparent bias in the distribution of threatened species to the areas which have been more intensively surveyed suggesting that the gaps in the distribution of vulnerable species (Map 42) reflect a lack of survey effort rather than an absence of these species.

5.6.2 Proposed further work

Further work related to terrestrial vertebrate fauna in the DRP includes the following:

- collation of all datasets from previous surveys in the DRP;
- carefully located systematic and stratified fauna surveys across the DRP which fill the gaps in the existing survey database as indicated by mapsheets with few records (eg. along the Bogan River);
- targeted fauna surveys for cryptic, rare or other species unlikely to be adequately sampled by systematic methods;
- detailed description of habitats including structural and floristic information on fauna survey sites;
- review of the status of all terrestrial vertebrate fauna occurring in the DRP in order to identify species and populations at risk;
- preparation of nominations for identified species and populations for listing on the *TSC Act* where appropriate;
- preparation of profiles of priority species (threatened, declining and otherwise unusual species);
- population viability analysis and predictive habitat modelling for selected priority species;
- identification of areas of significance for threatened species, communities and populations;
- prioritisation of significant areas for conservation within the normal purchasing/property agreement arrangement;
- preparation of recovery plans for those threatened species and populations not already covered and implementation of recommendations and objectives;
- research priorities to be developed for exotic fauna species in the DRP, including a threat assessment, information about the abundance, impact on native species and communities and most effective control methods.

6 OTHER FAUNA

6.1 INVERTEBRATES

Very little is known about invertebrate diversity within the bioregion. Not only is this knowledge of importance for assessing the biodiversity of the area, but invertebrates also perform an essential role in ecosystem function. They are of critical importance as food for many species (such as bats, insectivorous birds, water birds, waders, dasyurids and reptiles) and play an important role as decomposer organisms and in nutrient cycling. Some species can also be agricultural pests. Due to the lack of information about invertebrates, it is not possible to estimate rates of extinction or decline. As invertebrates play a critical role in the functioning of natural systems, improving the information base and therefore the conservation management for this group is critical to any strategy for conserving biodiversity (New 1984; NPWS 1992). A list of invertebrate taxa recorded from the DRP is shown in Appendix G.

6.1.1 Aquatic invertebrates

Rivers and streams exist as a patchwork of habitats, which can be classified into three broad habitat types for aquatic invertebrates. Macrohabitats are the large distinct reaches of the river system; mesohabitats are smaller habitats including the main channel, backwaters, billabongs, effluent creeks and floodplain channels; and microhabitats are the smallest habitat types which include snags (fallen timber), aquatic vegetation and different substrate types.

In a survey of aquatic invertebrates in these three primary habitat types in the Darling River between Bourke and Wilcannia, Sheldon (1995) found insects were the dominant group, comprising 85% of taxa and 81% of individuals. Of these Dipterans (flies) and Coleopterans (beetles) were most abundant. Billabongs had a greater number of taxa and individuals than channel habitats and temporary billabongs had more individuals than permanent billabongs. Overall, river geomorphology was found to significantly influence aquatic invertebrate assemblages through the diversity of mesohabitats and microhabitats it supports. Flow regulation also modifies the assemblage composition by favouring the development of specific microhabitat and isolating mesohabitats (Sheldon 1995).

In the Macquarie Marshes a baseline survey of aquatic invertebrates found 197 taxa of which 85% were insects (65 Coleopteron taxa, 54 Dipterans, 24 Hemipterans). In general, cumbungi swamps, lagoons, slow moving streams and intermittent streams had the greatest number of taxa present (Bray 1994a). *Cherax destructor* (yabby), a common resident in the Marshes, survives dry periods by burrowing into the mud.

6.1.2 Terrestrial invertebrates

Dr Robyn Gunning (New South Wales Agriculture, Tamworth) undertakes regular invertebrate surveys for the Department of Agriculture and her survey area includes parts of the DRP. Results of these surveys need to be incorporated into an assessment of the biodiversity of the bioregion. A large collection of invertebrates from around New South Wales is housed at New South Wales Agriculture, Orange.

6.2 FISH

6.2.1 Known species diversity and distribution

In surveys conducted by New South Wales Fisheries in 1996 and Llewellyn in 1983 of the rivers of the Darling region (including New South Wales tributaries and extending east of the DRP bioregion) 30 fish species were recorded or considered likely to occur (Table 6.1 and Table 6.2). Of these species, 15 were found in the Gwydir River basin, 16 in the Namoi, eight in the Castlereagh, 21 in the Macquarie and 13 in the Darling River (Harris & Gehrke 1997).

Table 6.1 Fish species known or likely to occur in the Darling Region

(Harris & Gehrke, 1997; Harris, 1995)

Family	Scientific Name	Common Name	Catchment Recorded
Atherinidae	<i>Craterocephalus stercusmuscarum</i>	flyspecked hardyhead	N, B-D
Clupeidae	<i>Nematalosa erebi</i>	bony herring	G, N, C, M, D, B-D
Eleotridae	<i>Hypseleotris sp.</i>	gudgeon	G, N, C, M, D
Eleotridae	<i>Hypseleotris klunzingeri</i>	western carp gudgeon	B-D
Eleotridae	<i>Hypseleotris sp1</i>	Lake's carp gudgeon	B-D
Eleotridae	<i>Hypseleotris sp2</i>	Midgley's carp gudgeon	B-D
Eleotridae	<i>Mogurnda mogurnda</i>	northern purple-spotted gudgeon	B-D
Galaxiidae	<i>Galaxias olidus</i>	mountain galaxis	G, N, M, B-D
Melanotaeniidae	<i>Melanotaenia fluviatilis</i>	crimson-spotted rainbowfish	G, N, M, D, B-D
Percichthyidae	<i>Macquaria ambigua</i>	golden perch	G, N, M, D, B-D
Retropinnidae	<i>Retropinna semoni</i>	Australian smelt	G, N, C, M, D, B-D
Terapontidae	<i>Leiopotherapon unicolor</i>	spangled perch	G, N, C, M, D, B-D
Ambassidae	<i>Ambassis castelnaui</i>	olive perchlet	B-D
Atherinidae	<i>Craterocephalus amniculus</i>	Darling River hardyhead	B-D
Galaxiidae	<i>Galaxias rostratus</i>	Murray jollytail	Predicted
Plotosidae	<i>Neosilurus hyrtlii</i>	Hyrtl's tandan	Predicted
Eleotridae	<i>Philypnodon sp.</i>	dwarf flathead gudgeon	B-D

Key

G = Gwydir River Catchment

N = Namoi River Catchment

C = Castlereagh River Catchment

M = Macquarie River Catchment

D = Darling River Catchment

B-D = Barwon Darling River

Twenty-three fish species are known to occur in the Barwon-Darling River system (Table 6.1 and Table 6.2). This list does not include some species found only in the tributaries and five

of the recorded species are introduced (Thoms *et al.* 1995). Most of the native species are carnivorous, eating crustaceans, insects and other fish. *Nematalosa erebi* (bony herring) is herbivorous and some other species are omnivores. Two distinct food chains support fish production in the Darling River:

- *Nematalosa erebi* feed on the algal/bacterial/fungal biofilms on riverbanks, snags, rocks and the algae attached to aquatic plants. *Nematalosa erebi* are then a food source for the predator species such as *Macquaria ambigua* (golden perch) and *Maccullochella peelii* (Murray cod); and
- plant litter washed into the river is consumed by midge larvae and shrimps that are in turn preyed upon by small and medium-sized fish.

Many terrestrial vertebrates rely on these species as they form part of the total food web of wetland habitats.

Fifteen species of fish have been recorded in the Macquarie Marshes, two of which are introduced. The native species include *Nematalosa erebi*, *Macquaria ambigua*, *Melanotaenia fluviatilis* (rainbow fish), *Retropinna semoni* (Australian smelt) and *Hypseleotris klunzingeri* (western carp-gudgeon). Introduced species are *Cyprinus carpio* (European carp) and *Gambusia holbrooki* (gambusia). Diversity and abundance of native fish species is low and appears to be in decline, with species like *Tandanus tandanus* (catfish) once being common but now rarely seen (Harris & Gehrke 1997). The fish diversity and relative abundance in the ephemeral wetlands of the Narran Lakes differs from that in the Macquarie Marshes. Five species were recorded by surveys of Clear Lake, with a high abundance of *Macquaria ambigua* being recorded (NPWS 2000a).

Seven fish species were predicted to occur but were not recorded in surveys of the Darling catchment (Harris & Gehrke 1997). One of these, Hyrtl's tandan (*Neosilurus hyrtlii*), probably only occurs in the Paroo system, which is not part of the DRP, and another, the dwarf flathead gudgeon (*Philypnodon sp 1*), is only known from the Bathurst area, also outside the bioregion. The other unrecorded species were *Ambassis agassizii* (olive perchlet), *Craterocephalus amniculus* (Darling River hardyhead), *Mogurnda adspersa* (purple-spotted gudgeon), *Galaxias rostratus* (Murray jollytail) and *Maccullochella macquariensis* (trout cod).

6.2.2 Species of conservation concern

Three fish species known from the Darling region have been listed under Schedules 3 and 5 of the *Fisheries Management Act (FMA) 1994*, and two of these species are also listed on the *EPBC Act* (Table 6.2). The western populations of two species within the DRP are listed as endangered populations under Schedule 4 of the *FMA 1994*. Reasons for listing of species under this Act include habitat changes due to agricultural practices, spawning failures due to cold water releases from dams, predation by, and competition with, introduced species such as *Perca fluviatilis* and *Gambusia holbrooki*, and construction of barriers to migration and recolonisation (FSC, 2001e). Five species are also considered to be of concern in New South Wales by Fletcher and McVea (2001).

Table 6.2 Fish species of conservation concern within the DRP

(Harris & Gehrke 1997; Harris 1995)

Family	Scientific Name	Common Name	Catchment Recorded	Status
Atherinidae	<i>Craterocephalus fluviatilis</i>	Murray hardyhead	N, M	E FMAct, VEPBC
Percichthyidae	<i>Maccullochella macquariensis</i>	trout cod	Predicted	*E FMAct
Terapontidae	<i>Bidyanus bidyanus</i>	silver perch	G, N, M, D, B-D	V FMAct, IUCNV
Ambassidae	<i>Ambassis agassizii</i>	olive perchlet	M	CC1
Eleotridae	<i>Philypnodon grandiceps</i>	flathead gudgeon	M	CC1
Galaxiidae	<i>Gadopsis marmoratus</i>	river blackfish	G, N, C, M	CC2
Percichthyidae	<i>Maccullochella peelii</i>	Murray cod	G, N, M, D, B-D	CC3
Plotosidae	<i>Tandanus tandanus</i>	freshwater catfish	G, N, M, B-D	CC4

Key

IUCNV = Classified as vulnerable under IUCN Red List Classifications (Fletcher and McVea 2001)

VEPBC = Listed as vulnerable under the Environment Protection and Biodiversity Conservation Act, 1999

E FMAct = Listed as endangered under Schedule 3 of the Fisheries Management Act, 1994 an asterisk denotes that the species is also listed as endangered under the Environment Protection and Biodiversity Conservation Act, 1999

V FMAct = Listed as vulnerable under Schedule 5 of the Fisheries Management Act, 1994

CC1 = of conservation concern due to reduced distribution and abundance inland (Fletcher and McVea 2001)

CC2 = of conservation concern due to susceptibility to increased sediment load (Fletcher and McVea 2001)

CC3 = of conservation concern due to reduced and fragmented distribution (Fletcher and McVea 2001)

CC4 = of conservation concern due to scarcity in many inland habitats (Fletcher and McVea 2001)

G = Gwydir River Catchment

N = Namoi River Catchment

C = Castlereagh River Catchment

M = Macquarie River Catchment

D = Darling River Catchment

B-D = Barwon-Darling River

The distribution and population size of many native fish species within the Murray-Darling system have contracted markedly as a result of changes in the rivers (Morton *et al.* 1995). Threats in this river system include river diversion, over-fishing, water quality (salinity, eutrophication) and the impact of introduced species, particularly *Cyprinus carpio*, *Perca fluviatilis* (redfin perch) and *Gambusia holbrooki*. The significant change in the natural pattern of high and low flows has also had an impact on the two fundamental food webs in the system. Biofilms on riverbanks are now constrained to a single narrow strip, rather than a broad band, because river heights are tightly controlled. Significant quantities of plant litter now lie unused on the floodplain and in anabranches for much longer periods. River flow diversion also creates another, little acknowledged, problem with many small fish being sucked from the river into irrigation systems and lost (Harris 1995).

The construction of weirs and dams has had a significant effect on the life cycle of many species. Some species spawn in one part of the river system, use a different part as a nursery area and then disperse into a third area for growth into adults. *Macquaria ambigua* spawn during floods in lowland reaches of rivers, the young move into the floodplain or river-margin nurseries and finally travel upstream in river channels. *Maccullochella peelii* (Murray cod) make upstream spawning migrations using anabranches and flood-runners and then make a precise homing migration to their original territory. These fish therefore require the survival of each of these habitats and the maintenance of free passage between them. The scale of

movements varies between species: the migratory species *Macquaria ambigua* and *Bidyanus bidyanus* (silver perch) can travel the length of the Murray-Darling system, while some small species such as hardyheads and gudgeons require only a few kilometres of river to complete their life cycle. Obstruction of migratory movements can lead to the extinction of populations and species and this problem requires large scale change to river management to be effective (Harris 1995). The NSW Rivers survey found that there were proportionally more native species than introduced species in unregulated rivers and 13 native fish species showed a negative response to river regulation (Harris & Gehrke 1997).

The severity of the decline in fish diversity and abundance in this system has not been fully documented, although some significant falls have been documented in catches of *Maccullochella peelii*, *Tandanus tandanus* and the near disappearance of *Bidyanus bidyanus* from the Darling. Overall, in New South Wales rivers 62% of native fish have undergone reductions in range and/or abundance, suggesting that they are more vulnerable to disturbance than was previously thought. *Maccullochella peelii* has undergone a significant reduction in range and abundance and is now relatively uncommon in many areas (Harris & Gehrke 1997).

6.2.3 Regionally endemic species and significant populations

Two significant populations of fish have been identified as occurring in the DRP. The population of *Mogurnda adspersa* in western New South Wales has been listed as an endangered population under the *FMA 1994*. This species was once widespread throughout the Murray-Darling system and in coastal streams. The eastern population now occurs in coastal drainages north of the Clarence River, but its distribution throughout the Murray-Darling system is very limited and has significantly declined in recent years. There has been only a single record of this species in the Murray-Darling since 1983. These eastern and western populations may be genetically distinct. The causes of the decline of the western populations of this species are thought to include predation by *Gambusia holbrooki* and *Perca fluviatilis*, habitat loss and rapid fluctuations in water levels as a result of water regulation, which affects reproduction and recruitment (FSC 2001e).

The Fisheries Scientific Committee has also listed the western population of *Ambassis agassizii* as an endangered population under the *FMA 1994*. This population has declined seriously in recent decades and is now possibly absent from the majority of Murray-Darling waterways (FSC 2001e).

Regionally endemic species include *Gadopsis bispinosus* (two-spined blackfish), *Galaxias rostratus*, *Melanotaenia fluviatilis* (Australian rainbowfish), *Maccullochella peelii* and *Bidyanus bidyanus* (Morton *et al.* 1995).

6.2.4 Introduced fish species

Of all rivers within NSW, the Darling River catchment contains the greatest diversity of introduced species, with six being present. These species are *Cyprinus carpio*, *Carassius auratus* (goldfish), *Gambusia holbrooki*, *Perca fluviatilis*, *Oncorhynchus mykiss* (rainbow trout) and *Salmo trutta* (brown trout). The two trout species and *Perca fluviatilis* are probably not present in the DRP bioregion, preferring the higher reaches of the Darling tributaries. Introduced species represented 25.1% of the total fish catch in the Darling system (Harris and Gehrke 1997).

Table 6.3 Introduced fish species recorded within the Barwon-Darling Region

(Harris & Gehrke 1997; Harris 1995)

Family	Scientific Name	Common Name	Catchment Recorded
Atherinidae	<i>Carassius auratus</i>	goldfish	G, N, C, M, D, B-D
Cyprinidae	<i>Cyprinus carpio</i>	European carp	G, N, C, M, D, B-D
Percidae	<i>Perca fluviatilis</i>	redfin perch	G, M, D, B-D
Poeciliidae	<i>Gambusia holbrooki</i>	gambusia	G, N, C, M, D, B-D
Salmonidae	<i>Oncorhynchus mykiss</i>	rainbow trout	M
Salmonidae	<i>Salmo trutta</i>	brown trout	M
Salmonidae	<i>Salvelinus fontinalis</i>	brook trout	M
Cyprinidae	<i>Tinca tinca</i>	tench	B-D

Key

G = Gwydir River Catchment

M = Macquarie River Catchment

N = Namoi River Catchment

D = Darling River Catchment

C = Castlereagh River Catchment

B-D = Barwon Darling River

Gambusia

Gambusia holbrooki have been implicated in the decline in abundance or range of 35 fish species world-wide, and there is circumstantial evidence that several Australian native fish species have been adversely affected by the spread of this species. Predation by *Gambusia* has been listed as a key threatening process under the *TSC Act*, primarily because of predation of tadpoles and eggs of some frog species in eastern New South Wales. The impact of *Gambusia* on native fish species occurs through a variety of mechanisms including direct competition for resources, interference, competition and predation. The species is an adaptable generalist predator, which feeds on a wide range of both terrestrial and aquatic organisms (Harris & Gehrke 1997).

European carp

Numbers of European carp increased greatly in the Macquarie and Bogan River system in the mid-1970s, assisted by the floods of 1974 and 1975 (Macquarie 2100 plan 1999). It has been estimated that European carp make up 50% of the total biomass in the river. European carp damage the river habitat by increasing water turbidity, decreasing water plant diversity and abundance, increasing water nutrients, increasing algal concentrations by preying on zooplankton, reducing native fish numbers, decreasing small insect numbers and eroding stream banks (King 1995). European carp are the dominant fish species of the Murray-Darling system. Their abundance is demonstrated at one site in the lower reaches of the Bogan River, where there was an average of one European carp per square metre of river surface area. Flow regulation has allowed the development of suitable habitat for European carp while promoting the destruction of suitable habitat for the less sedentary native species (Harris & Gehrke 1997).

6.3 SUMMARY AND PROPOSED FURTHER WORK

6.3.1 Summary

The knowledge of invertebrate biodiversity within the DRP is extremely limited but it is essential for a variety of reasons. In addition to their own contribution to the biodiversity of the ecosystem, invertebrate species are fundamental to the survival of many vertebrate species as a food resource, can be used as indicator species for land health and are an essential component of ecosystem function. It is also important to recognise that the impact of land management on invertebrate populations is not necessarily restricted to the DRP for example, the bogong moths which breed in the floodplains of the DRP are an essential food source for the threatened mountain pygmy possum (*Burramys parvus*) when they migrate to the alpine regions prior to winter and also have important cultural significance to Aboriginal people in the alpine regions.

Although more information is available about the diversity of aquatic invertebrates than terrestrial invertebrates in the DRP, this information is still insufficient to classify aquatic habitats such as wetlands as critical habitats for waterbirds. Like the bogong moth, many of the aquatic invertebrates can have an impact on vertebrate biodiversity beyond the DRP bioregion.

The health of fish populations can also affect the conservation of terrestrial vertebrates. Research into the distribution, abundance and status of fish in New South Wales is primarily the responsibility of NSW Fisheries, but as the DRP is a fluvial environment the health of the rivers and the fish fauna is an essential component of the overall conservation of this bioregion.

6.3.2 Proposed further work

Further work related to the full range of fauna in the DRP includes the following:

- continued survey of aquatic invertebrates across the variety of wetlands in order to determine the significance of each wetland for the maintenance of waterbird populations;
- collation of existing information about terrestrial invertebrates and determination of priorities for further work, especially in relation to terrestrial vertebrate conservation strategies;
- assessment of terrestrial invertebrates critical for the survival of threatened vertebrate species;
- assessment of information relating to the fish fauna and determination of priorities for further work, especially in relation to terrestrial vertebrate conservation strategies; and
- further research into the relationship between invertebrate diversity and abundance and flood events in the various river catchments within the DRP.

7 ECOLOGICAL AND THREATENING PROCESSES

7.1 ECOLOGICAL PROCESSES

The State Biodiversity Strategy requires the maintenance of ecological processes such as nutrient cycling, soil formation and hydrological processes.

7.1.1 Nutrient cycling and soil formation

Nutrients are essential for the growth of plants and include potassium, nitrogen, magnesium, calcium, iron and phosphorus. Nutrients are cycled through an ecosystem by various mechanisms including animals eating plants and depositing faeces, rain and groundwater flows washing nutrients from one place to another, wind and water erosion of soils transporting nutrients, soil fauna such as microbes and invertebrates, and uptake of nutrients by plants followed by subsequent decomposition and return of nutrients to the soil. These processes ensure continuous cycling of nutrients through the system. Fluctuation or disruption of nutrient cycles may be caused by factors such as removal of vegetation, bushfire and drought. (APASE 2001)

Soil formation processes involve the continuous breaking down of rock material through physical, chemical and biological mechanisms. This is affected by the parent rock type, living organisms (e.g. fungi, burrowing insects, animals and man), climate, topography and time. Soil formation processes may take a very long time and the parent rock type mostly determines the soil characteristics. Soil formation processes can be disrupted by erosion, clearing of vegetation and agriculture. Deep rooted trees and shrubs act as nutrient “pumps” for weathering substrates from between ten and 20m below the surface (Nix, H., ANU, pers.com 2001).

7.1.2 Hydrological regimes

The Mehi, Macintyre, Namoi and Macquarie Rivers, and Moomin, Carole, Gunningbar, and Duck Creeks are regulated rivers and parts of the Gwydir and Darling Rivers are also regulated. Regulated rivers are those that “have large dams supplying irrigation water (and some town and industrial water) for substantial distances downstream. Downstream tributary inflows are typically supplemented during the irrigation season, resulting in fairly stable and unnaturally high water levels. River flow is substantially reduced during the non- or low-irrigation seasons. At any time of year in periods which would normally have high or very high flow, flows may be substantially reduced by the trapping of water in a large dam” (EPA 2001). River Management Committees are considering and implementing environmental flows to improve this flow reduction.

The Castlereagh River and all other streams within the Castlereagh catchment in the DRP, the Bogan River, Whalan Creek, Thalaba Creek, Marra Creek, and Talyawalka Creek are classified as unregulated rivers. Unregulated or uncontrolled streams are those streams where “flow patterns are largely natural. Flows can occur in these streams from local runoff. They are typically ephemeral (flowing only during floods and freshes). Frequently, they open into or flow through wetlands and billabongs” (EPA 2001).

The Barwon, Culgoa, Birrie, Bokhara, Narran, and Boomi Rivers, the Gwydir Watercourse and Pian Creek, and the parts of the lower Gwydir, lower Macquarie and upper Darling Rivers are classified as controlled rivers with reduced flow. Controlled rivers with reduced flows include:

1. “River reaches downstream of the major regulated sections where the water is extracted or diverted. Flow is generally reduced throughout the year. Water is delivered from the main stream for stock, domestic, some irrigation, and town water supplies several times a year.
2. Sections of rivers immediately below town water supply dams, where water is diverted directly from the dam. Flows can be substantially reduced throughout the year, though special environmental releases may be possible” (EPA 2001).

The majority of the bioregion is categorised as either over-extracted in relation to groundwater or with an extraction level of greater than 100% of the sustainable yield for groundwater systems. Two smaller areas in the east and south of the bioregion have a total extraction level of between 70 and 100%. The remainder of the bioregion has an abstraction of greater than 30% sustainable yield. This area is mostly the Darling riverine corridor of the bioregion (EPA 2000).

EPA (2000) lists good-quality (or low-salinity) ground water as that found in aquifers including those in the Darling River corridor. The yields from aquifers within the Darling River corridor are generally low and more suitable for domestic and stock use or small-scale irrigation (for example, for orchards). Aquifers that have good-quality water and high yields within the DRP include the river corridors of the Namoi and Upper Gwydir. These aquifers are used mainly for irrigated agriculture and stock watering, but potable water extraction is also an important use. Ground water from the aquifers bounded by the Lachlan, Darling and Bogan rivers and the south-western corner of the State is generally of poor quality or extremely low-yielding (EPA 2000).

Contamination of groundwater by pesticides has been recorded in the lower Namoi Valley but monitoring of pesticides in groundwater is limited and further sampling and monitoring is required to assess accurately levels of contamination (EPA 2000).

7.2 LISTED AND POTENTIAL THREATENING PROCESSES

Key threatening processes listed under the *TSC Act* are those that threaten, or may have the capability of threatening, the survival or evolutionary development of species, populations or ecological communities. Eight of the key threatening processes (KTPs) listed under Schedule 3 of the *TSC Act* affect the ecology of the DRP bioregion. A preliminary determination has also been made by the NSW Scientific Committee to support the listing of the 'competition with feral honeybees *Apis mellifera*' as a KTP (NPWS 2001A).

The *Fisheries Management Act 1994* (NSW) (*FMA 1994*) also lists key threatening processes. The NSW Fisheries Scientific Committee has made final recommendations to list 'degradation of native riparian vegetation along New South Wales watercourses', 'removal of large woody debris', and 'introduction of fish to fresh waters within a river catchment outside their natural range' as key threatening processes under the *FMA 1994*. The Fisheries Scientific Committee has also made a recommendation to list 'installation and operation of instream structures that modify flow' as a key threatening process under the *FMA 1994*.

The *EPBC Act* lists nine KTPs of relevance to the DRP. Some of these identify the same process as listed on the *TSC Act* but may define them differently (Environment Australia 2001c).

7.2.1 Listed Threatening Processes

High frequency fire

'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' has been listed as a key threatening process under the *TSC Act*. The NSW Scientific Committee defines high frequency fire as 'two or more successive fires close enough together in time to interfere with or limit the ability of plants or animals to recruit new individuals into a population, or for plants to build up a seedbank sufficient in size to maintain the population through the next fire' (NPWS 2001A). The rate of decrease of woody vegetation across New South Wales between 1990 and 1995 due to bushfires has been estimated to be 33 520 ha / year. 66% of this area of woody vegetation is expected to regenerate quickly (Bureau of Rural Sciences 1999).

Threatened species known from the DRP likely to be affected by high frequency fires include *Swainsona plagiotropis*, glossy black-cockatoo, malleefowl, rufous bettong, black-striped wallaby, spotted-tailed quoll and squirrel glider (NPWS 2001a). Species not yet listed but occurring in the DRP that could become threatened by high frequency fires include feathertail glider (*Acrobates pygmaeus*), common ringtail possum, yellow-footed antechinus (*Antechinus flavipes*) and sugar glider (*Petaurus breviceps*) (NPWS 2001a).

Anthropogenic climate change

Anthropogenic climate change is listed as a key threatening process under the *TSC Act* and the *EPBC Act*. Natural climate change has been a major ecological driving force throughout geological history but there is evidence to suggest that modification of the environment by

humans may cause future climate change. Many landscapes in New South Wales, including the DRP, are highly modified and the ability of organisms to survive climate change through dispersal will be limited (Brasher & Pittock 1998). The EBPC Act also specifically lists the impact of greenhouse emissions.

Species that would be at risk from anthropogenic climate change include those that have long generations, poor mobility, narrow ranges, specific host relationships, isolated and specialised species, and those with large home ranges (Hughes & Westoby 1994). Threatened species recorded within the DRP that would be at risk from anthropogenic climate change in New South Wales include malleefowl, plains-wanderer, red-tailed black-cockatoo and regent parrot (NPWS 2001a).

Predation by the feral cat (*Felis catus*)

Predation by the feral cat is listed as a key threatening process under the *TSC Act* and the *EPBC Act*. Many species are threatened by predation from cats including species already listed as threatened and those at risk of becoming threatened. Small mammals such as the sandy inland mouse and ground-nesting birds are particularly at risk (NPWS 2001a). The malleefowl (*Leipoa ocellata*) is one species listed by the Commonwealth Threat Abatement Plan for Predation by Feral Cats which is perceived to be further threatened by this process (Environment Australia 1999c).

Predation by the European red fox (*Vulpes vulpes*)

Predation by the European red fox is listed as a key threatening process under the *TSC Act* and the *EPBC Act*. Species threatened by predation from foxes include species already listed as threatened and at risk of becoming threatened. This includes some larger arboreal species such as the common brushtail possum that are in significant decline in the DRP bioregion. The malleefowl (*Leipoa ocellata*) is one species identified under both the Commonwealth Threat Abatement Plan for Predation by the European Red Fox (Environment Australia 1999d) and the NSW Draft Threat Abatement Plan (NPWS 2001c). Other species identified under the NSW Draft Threat Abatement Plan as high priority species for fox control recorded within the DRP are the bush stone-curlew (*Burhinus grallarius*), chestnut quail thrush (*Cincoloma castanotus*), flock bronzewing (*Phaps histrionica*), Australian bustard (*Ardeotis australis*), Australasian bittern (*Botaurus poiciloptilus*), brolga (*Grus rubicunda*), woma (*Aspidites ramsayi*), and the western blue-tongued lizard (*Tiliqua occipitalis*). The medium priority species, spotted tail quoll (*Dasyurus maculatus*) and brush-tailed phascogale (*Phascogale tapoatafa*). Foxes have also been identified as being a vector for bitou bush (*Chrysanthemoides monilifera rotundata*) (NPWS 2001a). Priority areas for fox control within the DRP include the Macquarie Marshes and Narran Lakes (NPWS 2001c)

Predation by gambusia (*Gambusia holbrooki*)

Predation by the gambusia is listed as a key threatening process under the *TSC Act*. *Gambusia holbrooki* preys upon eggs and tadpoles of several frog species, particularly the bell frogs (*Littoria spp.*) (NPWS 2001a). Due to the largely aquatic nature of the bioregion, and records of *Gambusia holbrooki* within the waterways, this process is likely to threaten species of the DRP.

Competition and land degradation by Feral Goats (*Capra hircus*)

Competition and land degradation by the feral goats is listed as a key threatening process under the *EPBC Act*. A variety of habitats, particularly the semi-arid habitats, in the DRP have been successfully occupied by feral goats. They compete with native fauna for food, water and shelter and threaten the survival of some native plant species. The malleefowl (*Leipoa ocellata*) is one species listed under the Commonwealth Threat Abatement Plan for Competition and Land Degradation by Feral Goats known to be further threatened by this process. Plant species within the DRP seriously affected by this process include *Alectryon oleifolius*, *Santalum acuminatum*, *Santalum spicatum* and *Capparis mitchelli* (Environment Australia 1999e).

Competition and land degradation by feral rabbits (*Oryctolagus cuniculus*)

Competition and land degradation by feral rabbits is listed as a key threatening process under the *EPBC Act*. Rabbits inhibit regeneration of native vegetation (Crisp 1978; Lange & Graham 1983; Cooke 1987), compete with native fauna for food (Dawson & Ellis 1979) and shelter (Martin & Sobey 1983; Priddel *et al.* 1995), support populations of introduced canids and felids (Catling 1988), and cause soil erosion (McManus 1979; Norman 1988). The malleefowl (*Leipoa ocellata*) is one species listed under the Commonwealth Threat Abatement Plan for Competition and Land Degradation by Feral Rabbits which is perceived to be further threatened by this process with rabbits attracting predators to this species (Environment Australia 1999f).

Predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)

Predation habitat degradation, competition and disease transmission by feral pigs is listed as a key threatening process under the *EPBC Act*. Feral pigs prey on bird chicks, reptiles, reptile and bird eggs, frogs, soil organisms, invertebrates, and plants. They cause habitat changes by destroying plants, reducing regeneration of native plants, changing floristic composition, altering soil structure, enhancing invasion and spread of weed species, increasing access for other predators, reducing the amount and quality of water available, spreading exotic earthworms and creating suitable habitat for disease vectors such as the root-rot fungus *Phytophthora cinnamomi* (Environment Australia 2001c).

Invasion of native communities by *Chrysanthemoides monilifera* subsp. *rotundata* (bitou bush)

Invasion of native communities by *Chrysanthemoides monilifera* subsp. *rotundata* (bitou bush) is listed as a key threatening process under the *TSC Act*. This key threatening process has a deleterious impact on several threatened species, populations and endangered ecological communities in coastal NSW (NPWS 2001a). The threat posed to native communities by this weed is substantially less in the DRP but there is an infestation of *Chrysanthemoides monilifera* at Menindee and this weed species is recorded for the DRP in the NPWS Wildlife Atlas (Appendix D).

Clearing of native vegetation and land clearance

Clearing of native vegetation is listed as a key threatening process under the *TSC Act* and land clearance is listed as a key threatening process under the *EPBC Act*. Clearing of vegetation results in habitat loss and fragmentation and a decline in the quality of habitat for a number of species across a wide range of ecosystems (EPA 2000). The NSW Scientific Committee

(NPWS 2001a) defines clearing as:

- loss or modification of native vegetation for cropping, establishment of plantations or for improved pasture;
- loss or modification of native vegetation for urban development;
- loss or modification of native vegetation for development of industry and infrastructure (eg quarries, mines, factory sites, dams, roads, railways, powerlines); and
- clearing of understorey (and/ or replacement by exotic species) for example, along roadsides.

EPA (2000) states that ‘vegetation clearance is the single greatest threat to terrestrial biological diversity in New South Wales and is still causing significant biodiversity losses in the State’. NPWS (2001a) outline the impacts of clearing on biodiversity as:

- destruction of habitat resulting in loss of local populations of individual species;
- expansion of dryland salinity;
- riparian zone degradation;
- increased greenhouse gas emissions;
- increased habitat for exotic species;
- loss of leaf litter layer; and
- loss or disruption of functioning ecological interactions.

Many threatened species of flora and fauna and ecological communities occurring in the DRP are threatened by clearing. These include the seven mammals, three reptiles, 24 bird species and five plant species (NPWS 2001a).

Dieback caused by *Phytophthora cinnamomi* (cinnamon fungus)

Dieback caused by *Phytophthora cinnamomi* is listed as a key threatening process under the *EPBC Act*. Dieback in plants caused by *Phytophthora cinnamomi* is mainly a problem in other bioregions and states or territories and it has not yet been recorded in western New South Wales. This lack of data on the fungus is justified by climatic variables not being suitable in the area because it is not humid enough and that the cost of undertaking extensive mapping of the fungus nationally is extreme (Environment Australia 1999a, 1999b). Several species present in the DRP have the potential to be adversely affected.

Psittacine circoviral (beak and feather) disease

Psittacine circoviral disease is listed as a key threatening process under the *EPBC Act*. Psittacine Circoviral disease affects parrots and their allies (Psittacines) and is usually fatal. The virus is long-lived and has the potential to persist in nest hollows causing their long-term contamination. The virus is widespread in wild Psittacines, including in galahs (*Cacatua roseicapilla*) and sulphur-crested cockatoos (*C. galerita*). Potentially catastrophic losses could occur if an infestation was to occur in bird populations that had been dramatically reduced (Environment Australia 2001c). It has been specifically listed as a KTP for nationally endangered parrots, none of which have been recorded within the DRP but species such as the superb parrot could also be at risk. No threat abatement plan has been prepared for this KTP.

Removal of large woody debris

Removal of large woody debris has been listed as key threatening process under the *FMA 1994*. Large woody debris includes “large masses of trees or shrubs that have fallen or that have been washed into rivers and streams” (FSC 2001a). Large woody debris (FSC 2001a):

- provide habitat for benthic plants;
- lead to organic enrichment by capturing detritus and contributing to secondary production by degradation of the debris itself;
- provide refuges from predators and interactions between competitors for fish and invertebrates;
- provide velocity refuges that minimise energy costs of swimming;
- provide spawning sites essential for successful reproduction;
- provide home range markers for territorial and migratory fish species;
- provide refuge and spawning habitats in the riparian zone during overbank flooding;
- assist in erosion prevention by stabilising sediments of stream banks and riparian zones; and
- assist in the scouring of deep holes adjacent to woody debris which acts as temperature and drought refuges.

Threatened fish species that occur within the DRP and which are affected by this process include trout cod (*Maccullochella macquariensis*) and silver perch (*Bidyanus bidyanus*) (FSC 2001a).

Degradation of native riparian vegetation along New South Wales water courses

‘Degradation of native riparian vegetation along New South Wales water courses’ has been listed as a key threatening process under the *FMA 1994*. The Fisheries Scientific Committee defines riparian vegetation as “any vegetation on land which adjoins, directly influences, or is influenced by a body of water” (FSC 2001b). Degradation of native riparian vegetation includes invasion of riparian vegetation by non-native species. Negative effects of degradation of native riparian vegetation include increased amounts of sediment and nutrients via runoff and increased light penetration to the waterbody leading to increased algal growth and smothering of benthic communities, reduced inputs of organic carbon which are a major energy source in most stream ecosystems, reduced inputs of large woody debris entering the system leading to a reduction in spawning and habitat sites of several fish and aquatic invertebrates, destabilisation of river banks, and reduced overhanging riparian vegetation leading to decreased shelter and shade for fish. Threatened fish species recorded within the DRP affected by this process include trout cod (*Maccullochella macquariensis*), Murray hardyhead (*Craterocephalus fluviatilis*), and silver perch (*Bidyanus bidyanus*) and the endangered populations of purple-spotted gudgeon (*Mogurnda adspersa*), and olive perchlet (*Ambassis agassizii*) (FSC 2001b).

Introduction of fish to fresh waters within a river catchment outside their natural range

‘Introduction of fish to fresh waters within a river catchment outside their natural range’ is listed as a key threatening process under the *FMA, 1994*. Introduced fish recorded in the DRP (brown trout (*Salmo trutta*), rainbow trout (*Onchorynchus mykiss*), European carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), gambusia (*Gambusia holbrooki*) and redfin perch (*Perca fluviatilis*)) all have self-sustaining populations within the waterways of New South Wales (FSC 2001c). Introduced fish affect populations of native fauna and flora by direct predation, competition for food, competition for spawning localities, competition for habitat, habitat degradation through uprooting vegetation and disturbance of sediments and promotion of the spread of diseases in native species. Threatened fish species recorded within the DRP affected by this process include Murray hardyhead (*Craterocephalus fluviatilis*), trout cod (*Maccullochella macquariensis*), and silver perch (*Bidyanus bidyanus*) the endangered

populations of olive perchlet (*Ambassis agassizii*), and purple-spotted gudgeon (*Mogurnda adspersa*) (FSC 2001c).

7.2.2 Potential Threatening Processes

Competition from honeybees (*Apis mellifera*) (preliminary determination)

The NSW Scientific Committee have made a preliminary determination to list competition from honeybees as a key threatening process under the *TSC Act*. Breeding colonies of honeybees compete with native hollow-dependant fauna for tree hollows. At least 20% of bird species are hollow dependant (Saunders *et al.* 1982) and all native arboreal marsupials depend on tree hollows except the koala (Lindenmayer *et al.* 1991). Threatened species likely to be affected by competition from feral honeybees include the squirrel glider, Major Mitchell's cockatoo, glossy black-cockatoo and superb parrot (NPWS 2001a).

Honeybees, both feral and managed, often remove up to 80% of the floral resources produced by plants, and this may result in the displacement of native fauna such as honeyeaters and native bees which rely on these resources (Paton 1993, 1996, 2000; Sugden & Pyke 1991; Sugden *et al.* 1996). Apiary has an unmeasured impact on biodiversity and some studies have shown that where nectar and pollen resources are limited *Apis mellifera* may reduce the degree of seed set in some plant species (Gibbs & Muirhead 1998; Paton 1996; Pyke & Blazer 1985).

Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands (preliminary determination)

The NSW Scientific Committee has made a preliminary determination to list 'alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands' as a key threatening process under the *TSC Act*. The NSW Scientific Committee has found that this process is recognised as a major factor contributing to loss of biological diversity and ecological function in aquatic ecosystems, including floodplains (NPWS 2001a). The NSW Scientific Committee describes alterations to natural flow regimes as either reducing or increasing flows, altering seasonality of flows, reducing frequency, duration and magnitude of flow events, altering water levels and increasing the rate of fall of water levels (Walker 1985; Cadwallader & Lawrence 1990; Gehrke *et al.* 1995; Kingsford 1995. Maheshwari *et al.* 1995; Robertson *et al.* 1999, 2001; NPWS 2001a).

A high proportion of flow alterations to the majority of streams across New South Wales have had a major impact on the pattern of natural flows in these waterways. Alteration of flows reduces habitat by changing the area, frequency and duration of flooding of floodplains and terminal wetlands. Increasing flows causes more permanent flooding of wetlands, riparian zone degradation, increased habitat for invasive species, and loss or disruption of ecological function. Threatened species recorded within the DRP affected by this process include the blue-billed duck, and freckled duck (NPWS 2001a).

Installation and operation of instream structures that modify flow (proposed recommendation)

The Fisheries Scientific Committee has made a recommendation to list 'Installation and operation of instream structures that modify flow' as a key threatening process under the *FMA, 1994*. The Fisheries Scientific Committee identifies instream structures which modify flow as including dams, weirs, navigation locks, floodgates, culverts, flow regulators, levee

banks, erosion control structures and causeways (FSC 2001d). Ecosystem effects related to these structures include: cold water releases from dams impair spawning, growth, recruitment, feeding and other life cycle processes in native fish species; present barriers to migration of native fish species and provide ideal habitat for invasive species; changes of seasonality and variability of flow regimes disrupt natural environmental cues necessary for reproductive cycles in native fish, reduction in total availability of water for riverine ecosystems, and interrupt or change natural processes of sediment deposition, erosion and transport which result in loss of fish habitat including important feeding and breeding sites. Threatened fish species recorded in the DRP affected by this process include Murray hardyhead (*Craterocephalus fluviatilis*), trout cod (*Maccullochella macquariensis*), and silver perch (*Bidyanus bidyanus*) and endangered populations of olive perchlet (*Ambassis agassizii*) and purple-spotted gudgeon (*Mogurnda adspersa*) (FSC, 2001d).

7.3 WEEDS AND PEST ANIMALS

7.3.1 Weeds

The invasive and degrading nature of environmental weeds poses a significant threat to the management of remnant vegetation and the conservation of native fauna and flora. Weed problems throughout this bioregion are becoming progressively worse, exacerbated by land degradation, the increased mobility of vehicles and population pressures. Weeds can compete vigorously with native plants for resources, affecting the microclimate and increasing the susceptibility of native plants to disease. Weeds also generally provide poor habitat for native fauna when compared with native plants. The impact of weed invasion on vegetation communities increases with a decrease in the size of remnant native vegetation communities.

Aquatic weeds such as *Eichhornia crassipes* and floodplain weeds such as *Phyla canescens* are an especially significant problem for the extensive wetlands and rivers of this bioregion. In Narran Lakes Nature Reserve noogoora burr (*Xanthium occidentale*) and Bathurst burr (*Xanthium spinosum*) are common along the river. Golden dodder (*Cuscuta campestris*) is a weed that has invaded the wetlands, particularly the lignum communities (NPWS 2000a). In the Macquarie Marshes Nature Reserve, lippia (*Phyla cansecens*) has also become a common weed (Shelly, D., DLWC, pers. com. Dec. 2001).

Bitou bush is the only weed of national significance which has been recorded within the DRP (National Weeds Strategy Executive Committee 1999). Only two records of this species are listed in the DRP databases (Section 4.1.1).

Declared noxious weeds in the DRP and the area for which they are declared are listed in Table 7.1 and Appendix D lists all exotic flora recorded within the DRP.

Table 7.1 Declared noxious weeds occurring within the DRP

(NSW Agriculture, 2001)

Scientific Name	Common Name	Categories	Area Declared
<i>Alternanthera pungens</i>	khaki weed	W2	W
<i>Heliotropium amplexicaule</i>	blue heliotrope	W2	Bo, C, L, Nbi, Nmn
<i>Raphanus raphanistrum</i>	wild radish	W2	L, P
<i>Cuscuta campestris</i>	golden dodder	W2	Bo, Bk, Bre, CD, C, L, MP, Nbi, Nmn, P, U, W
<i>Sorghum halepense</i>	Johnson grass	W2	Bo, Bk, Bre, CD, C, L, MP, Nbi, Nmn, P, U, W
<i>Cenchrus incertus</i>		W2	Bk, Bre, C, L, MP, Nbi, Nmn, P, W
<i>Cestrum parqui</i>	green cestrum	W2	Bo, Bk, Bre, CD, C, MP, Nbi, Nmn, P, U
<i>Lycium ferocissimum</i>	African boxthorn	W2	Bk, Bre, CD, C, L, MP, Nbi, P, U, W
<i>Solanum rostratum</i>	pincushion nightshade	W2	L
<i>Ibicella lutea</i>	yellow-flowered devil's claw	W2, W3	W, L, P
<i>Asphodelus fistulosus</i>	onion weed	W3	W
<i>Xanthium occidentale</i>	noogoora burr	W3	Bo, Bk, Bre, C, L, MP, Nbi, Nmn, P, W
<i>Xanthium orientale</i>	Californian burr	W3	Bo, Bk, Bre, C, L, MP, Nbi, Nmn, P, W
<i>Xanthium spinosum</i>	Bathurst burr	W3	Bo, Bk, Bre, C, L, MP, Nbi, Nmn, P, W
<i>Echium plantagineum</i>	Patterson's curse	W3	MP
<i>Salvia reflexa</i>	mintweed	W3	MP
<i>Marrubium vulgare</i>	horehound	W3	W
<i>Pennisetum villosum</i>	feathertop	W3	MP
<i>Phyla canescens</i>	lippia	W4c	MP
<i>Phyla nodiflora var nodiflora</i>	lippia	W4c	MP
<i>Opuntia aurantiaca</i>	tiger pear	W4f	Bo, Bk, Bre, CD, C, L, MP, Nbi, Nmn, P, U, W
<i>Opuntia stricta</i>	prickly pear	W4f	Bo, Bk, Bre, CD, C, L, MP, Nbi, Nmn, P, U, W
<i>Opuntia stricta var stricta</i>	common prickly pear	W4f	Bo, Bk, Bre, CD, C, L, MP, Nbi, Nmn, P, U, W

KEY

Bo	Bogan	MP	Moree Plains
Bk	Bourke	Nbi	Narrabri
Bre	Brewarrina	Nmn	Narromine
CD	Central Darling	P	Parkes
C	Cobar	U	Unincorporated
L	Lachlan	W	Wentworth

1.1.2 Dense tree and shrub regeneration

The problem of unpalatable native shrubs or 'woody weeds' in this region is viewed as a threat to both agriculture and conservation. Woody weeds are dense regeneration of some native species of trees and woody shrubs as a result of favourable climatic conditions in association with the prevailing agricultural management of the land. The Macquarie-Bogan floodplain has extensive areas of 'woody weeds' with most occurring to the west of the Bogan River adjacent to the Barwon River. Shrubs regarded as a problem include *Eremophila sturtii*, *Eremophila mitchellii*, *Dodonaea viscosa subsp. angustissima*, *Senna artemisioides* var. *nemophila* (punky bush) and *Senna artemisioides* (silver cassia) (Howling 1997, Noble 1997). There is an urgent need to research the ecological processes producing the 'woody weed problem'. It is important to remember that they are native species and that they have been recorded as growing in impenetrable densities at the time the early explorers moved through this region and some prefer or are restricted to dense communities.

7.3.2 Kangaroos

Aerial survey by NPWS of red and grey kangaroos *Macropus rufus*, *M. giganteus* and *M. fuliginosus* in 1995 and 1996 indicate that densities in the western region portion of the DRP vary from quite low to moderately high and vary between years. Extremely high numbers of kangaroos occur through the Gingham watercourse subjecting the regularly flooded areas to extremely high grazing pressure (McCosker 1996). All wetlands within the DRP potentially become drought refuges in dry years, leading to very high numbers concentrated in relatively small areas and, therefore, increased grazing pressure in these areas.

7.3.3 Feral animals

The alluvial plains and basins of the DRP in the Western Division are considered to be primary pig habitat. Pigs are widespread throughout the DRP. However large number occur in richer areas such as the Gingham wetlands and the Macquarie Marshes. Numbers have been reduced significantly in these two wetlands through control programs. This needs to be maintained. Foxes and cats are present in the Gingham wetlands and the Macquarie Marshes and can cause significant damage to the nesting waterbirds and their fledglings. Other feral mammal species recorded in the DRP are listed in section 5.5.4.

7.4 OTHER THREATS TO BIODIVERSITY

Other factors considered to potentially reduce biodiversity in the DRP include illegal hunting and collecting, firewood collection and private timber harvesting. The effects of salinity on wetland, river and land health are discussed in Chapter 2.

7.4.1 Firewood collection and timber harvesting on private lands

The tree species most commonly used for firewood in NSW are *Eucalyptus polyanthemos* (red box), *Eucalyptus melliodora*, *Eucalyptus blakelyi* and *Eucalyptus camaldulensis*, all of which occur and are harvested in the DRP. Seventy six per cent of all firewood collected in New South Wales is taken from fallen timber resources, 19% from standing dead timber and 5% from standing live timber. Many species of invertebrates feed on dead wood and are likely to be adversely affected by firewood collection. This affects other species such as fungi that rely on these invertebrates for their dispersal and also affects the rates of decay within forests and woodlands (Driscoll *et al.* 2000). Firewood distribution to wood yards can also distribute invertebrate species outside their natural range and enhance the potential for competition with local indigenous species (Todd & Horwitz 1990).

Threatened species recorded in the DRP which may be affected by firewood collection include the spotted-tailed quoll, squirrel glider, square-tailed kite, bush stone curlew, glossy black-cockatoo, superb parrot, turquoise parrot, barking owl, masked owl, regent honeyeater, painted honeyeater and *Hoplocephalus bitorquatus* (Driscoll *et al.* 2000).

Timber harvesting particularly affects tree-dwelling or hollow-nesting native fauna and can destroy understorey vegetation and vegetation structure, which is also essential for the maintenance of biodiversity (Benson 1999).

7.4.2 Grazing

Grazing by domestic sheep and cattle together with the introduced goat and rabbit, and the increasing numbers of native macropods, has led to a reduction in total plant biomass and an altered vegetation structure. Continuous grazing can prevent plant regeneration and reduce seedling recruitment (Benson 1999). Grazing of domestic stock mostly occurs on leasehold and private land, with grazing permits also being issued by Rural Lands Protection Board and NSW State Forests for some Crown land.

7.5 SUMMARY AND PROPOSED FURTHER WORK

7.5.1 Summary

Fifteen listed or preliminary determinations of key threatening processes have been made under the *TSC Act* and/or *EPBC Act* which are likely to negatively affect the biodiversity of the DRP. Another four key threatening processes are listed for fish under the *FMA, 1994* by the Fisheries Scientific Committee. In addition to these threatening processes, weeds and pest animals, firewood collection, private timber harvesting and grazing are threats to the biodiversity of the bioregion.

The extent and severity of the majority of these identified threats in the DRP has not been assessed nor have threat abatement procedures been determined.

7.5.2 Proposed further work

It is necessary that data be gathered for the assessment of conservation values of the DRP, allowing for a comprehensive bioregional assessment to be undertaken and to assist in the development of conservation strategies for threatening processes. This requires:

- collection of detailed information about listed key threatening processes and their effects on biodiversity within each province;
- development of monitoring strategies for effects of key threatening processes;
- definition and mapping of ecosystems at a useful resolution such as across the whole of the DRP to assist conservation assessment and reservation or restoration of these endangered ecological communities; and
- identification of ecological processes and establishment of studies to examine the function of ecological processes and their function in the DRP.

8 EXISTING CONSERVATION MANAGEMENT

8.1 EXISTING CONSERVATION ASSESSMENTS

The conservation of biodiversity, regardless of the mechanisms used, requires an understanding of the natural variation and patterns inherent across landscapes, ecosystems, habitats, communities, populations and species. Critical to the retention of biodiversity is the need to protect whole ecosystems or landscapes rather than individual components of these.

Priority Action 13 of the New South Wales Biodiversity Strategy aims to “adopt a standardised, integrated, whole-of Government approach to the collection, analysis and distribution of biodiversity data for use in assessing the conservation significance of land areas throughout New South Wales” (NPWS 1999b). This calls for assessments to be made on a bioregional basis with the aim of providing biodiversity information for all tenures, with a priority being the systematic and cost-effective collection of information, enabling gaps in information to be identified and addressed. A bioregional approach to conservation recognises homogeneity of environmental patterns and ecological processes and the processes that generally threaten biodiversity, such as landscape degradation, erosion and vegetation clearing. The framework for the bioregional conservation assessment is illustrated in Figure 8.1.

The NSW Biodiversity Strategy defines the primary objective of bioregional conservation assessments as to ‘identify areas and features of high biodiversity significance and to advise on appropriate conservation measures’. These measures will then be used to make informed land management decisions through the following mechanisms and organisations (NPWS 1999b):

- *Native Vegetation Conservation Act, 1997 (NVC Act)*. The Regional Vegetation Committees empowered by this act will use ecosystem-based biodiversity information to develop Regional Vegetation Management Plans;
- Catchment management under the *Catchment Management Act, 1989*. Catchment Management Boards are developing Catchment Blueprints which will set targets for improved land management across all catchments;
- Voluntary participation by landholders using programs such as Land for Wildlife, Wildlife Refuges and Voluntary Conservation Agreements ;

- River Management Plans under the *Water Management Act, 2000*. Water Management Committees have developed interim river flow objectives for all catchments across the state;
- Farming for the Future programs run cooperatively between NPWS, NSW Agriculture, Department of Land and Water Conservation and NSW Farmers Association;
- Bushcare regional planning funded by Natural Heritage Trust;
- Comprehensive, adequate and representative (CAR) reserve system planning;
- Local and Regional Environmental Plans under the *Environmental Planning and Assessment Act, 1979*; and
- Recovery Planning for threatened species and endangered ecological communities and Threat Abatement Planning under the *TSC Act*.

The DRP is dominated by water driven, and water derived habitats and environments. One of the major requirements in planning for the conservation of this landscape is to assess the abiotic and biotic factors that drive the ecosystem function of the bioregion. Conservation criteria are required to identify conservation values across the bioregion and integrated planning should include modelling of the climatic influences and an analysis of the issues affecting river health within the bioregion.

At this stage less than one percent of the DRP bioregion is managed as conservation reserve (Pressey *et al.* 2000), with 0.89% as National Parks or Nature Reserves. The existing reserves are unrepresentative of the range of physical and ecological characteristics of the bioregion (Thackway & Cresswell 1995). Most of the defined landscapes within the DRP are not within reserves, and those within the eastern portion of the DRP have no potential for reservation, because there are no large areas of native vegetation remaining. Areas along the Macquarie River have intermediate levels of reservation and landscapes in the western division have been classified as having a lower priority for immediate conservation action (Table 8.1, Pressey *et al.* 2000). Some key areas which are appropriate for inclusion in a integrated landscape conservation network were defined by Morgan and Terry (1992) using a range of factors including size, diversity, shape, level of disturbance, integrity of catchments, adjoining land uses and, for the western division, property boundaries.

Table 8.1 Reservation status of major regional ecosystems in the DRP

(adapted from Morgan & Terry 1992)

Province	No. major regional ecosystems	Reservation Status*		
		Adequate	Inadequate	Nil
Bogan-Macquarie	3	1	1	1
Castlereagh-Barwon	3		1	2
Culgoa-Bokhara	3			3
Warrambool-Moonie	3			3
Narran-Lightning Ridge	3		1	2
Collarenebri Interfluve	1			1
Louth Plains	2			2
Wilcannia Plains	3			3
Menindee	4	2	1	1

NB: These figures do not include the additions to the NPWS estate of Culgoa National Park (Culgoa – Bokhara Province), Tillpilly station (Wilcannia Plains Province) and Mount Murchison (Wilcannia Plains Province)

KEY

* Number of ecosystems having the following reservation status:

Adequate – protected in large reserve, or in several smaller reserves

Inadequate – protected only in small and isolated reserves, or a small occurrence in a larger reserve

Nil - Not protected to any extent

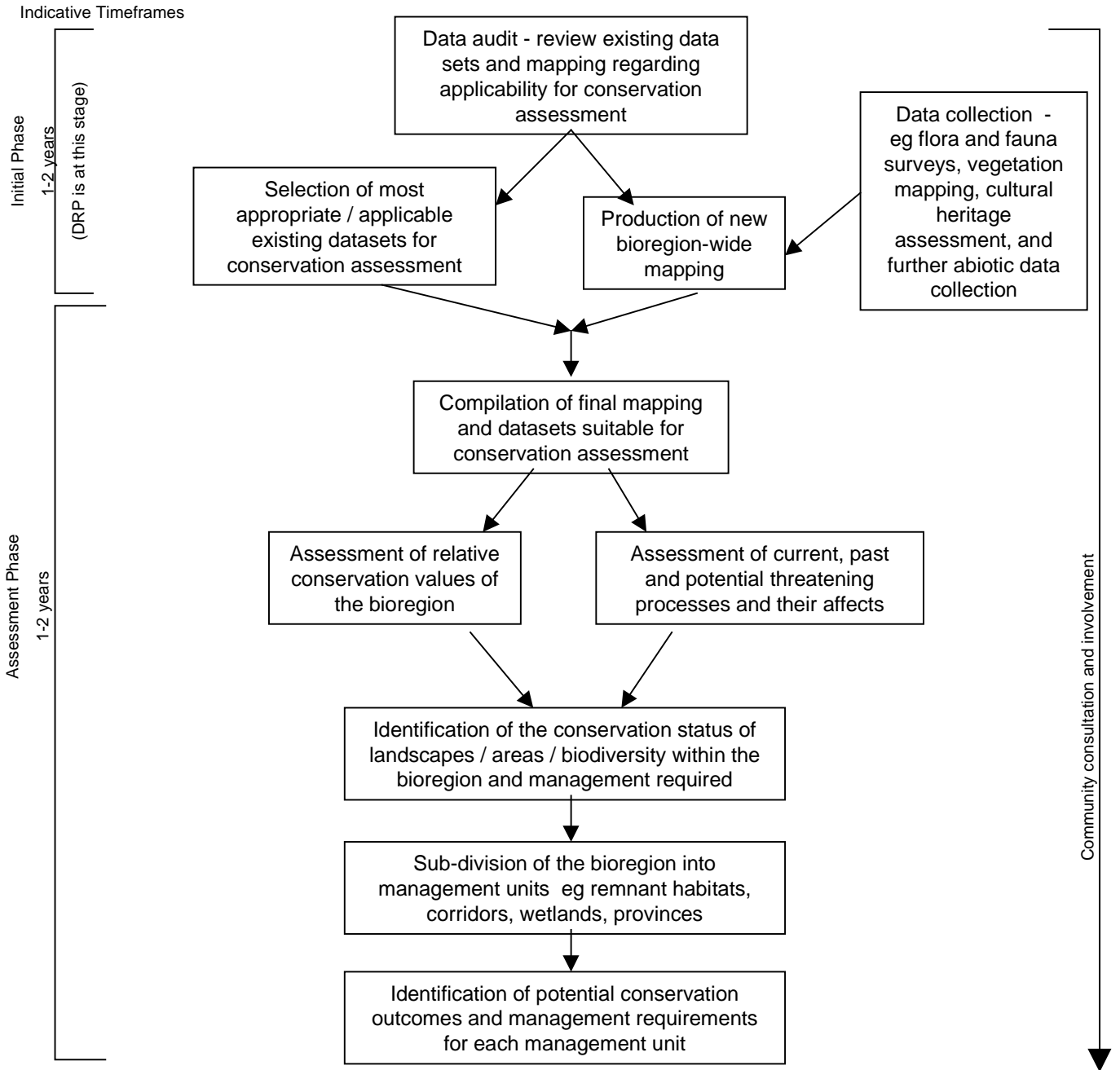


Figure 8.1. Bioregional conservation assessment framework

8.2 FORMAL RESERVES AND OTHER CROWN LANDS

8.2.1 National Parks and Nature Reserves

Eight conservation reserves and two recently acquired properties managed by the New South Wales NPWS are within or partially within the DRP (Map 4). These reserves cover an estimated area of 82 357ha, or 0.89% of the total land area of the bioregion.

Culgoa National Park

Culgoa NP (NPWS 2001b) is located 40 km west of Goodooga in northern NSW and adjacent to the Queensland border. The reserve was created in 1996, with additions in 1998, and covers an area of 22 430 ha along the Culgoa River and associated floodplains. The reserve is made up of the former pastoral leases of Byerawering, Cawwell and Burbank Grange. The 42 800 ha Culgoa Floodplain NP in Queensland joins the north western boundary of Culgoa NP creating a nationally significant park system.

The significance of Culgoa National Park is described in the draft plan of management (NPWS 2001b). The park includes one of the least disturbed floodplains in New South Wales and it also incorporates regionally and nationally significant vegetation and faunal communities. The vegetation communities present are otherwise poorly represented or unrepresented within the current reserve system. The Culgoa floodplain also contains the core of the largest and least disturbed area of continuous Coolabah (*Eucalyptus coolabah*) woodland remaining in NSW. It contains a diverse fauna, with 19% of species present being of regional or national conservation significance.

The soils of Culgoa River floodplain are dominated by grey cracking clays, interspersed with sandy soils and non-cracking clays associated with rises and claypans. In the western section of the reserve, boulders of silicified sandstone and conglomerate combined with red and brown silt and sand form a type of gibber plain which is more widespread outside of the reserve.

Vegetation communities in Culgoa NP include:

Riverine communities - *Eucalyptus camaldulensis* and *Melaleuca trichostachya* (river paperbark) line the river channel, with *Acacia stenophylla*, *Eremophila bignoniiflora*, *Paspalidium jubiflorum* and *Cyperus concinnus* in the shrub and understorey layers.

Floodplain communities - Forests and woodlands near the Culgoa River are dominated by *Eucalyptus coolabah*, with an understorey of grasses, sedges or *Muehlenbeckia florulenta*.

Woodland on grey cracking clays and red-brown soils - In the western sections of the reserve woodland of *Eucalyptus coolabah*, *Acacia harpophylla* and *Acacia cambagei* with an understorey of chenopods including *Atriplex nummularia*, *Atriplex vesicaria* and *Enchylaena tomentosa*.

Woodland on low, sandy rises - Low sandy rises support mixed woodland of *Eucalyptus coolabah*, *Eucalyptus populnea* subsp. *bimbil*, *Acacia cambagei* and *Acacia harpophylla*. Common shrubs and understorey plants include *Atalaya hemiglauca*, *Alectryon oleifolius*, *Myoporum montanum* and *Apophyllum anomalum*.

Shrubland on red and white sand deposits - This community consists of *Acacia murrayana*, *Callitris glaucophylla*, *Santalum lanceolatum* (sandalwood), *Ventilago viminalis*, *Canthium oleifolius*, *Geijera parviflora*, *Dodonaea viscosa* subsp. *angustifolia* (narrow-leaved hopbush) and *Pimelea penicillaris* (sandhill rice-flower).

Grasslands - To the east of the Culgoa River grasslands of *Agrostis avenacea* and *Eragrostis setifolia* occur with scattered *Muehlenbeckia florulenta*. On scalded or sandy rises daisies and chenopods become more common.

Kincheha National Park

This National Park covers an area of 44 182 ha and is 113 km south east of Broken Hill. The majority of this reserve occurs within the DRP with a small portion extending into the Broken Hill Complex bioregion. The park was established in 1967 with the acquisition of Western Lands leases within Kars and Kincheha stations. Prior to acquisition, the area had been grazed for more than 100 years (NPWS 1996).

Kincheha National Park is the only national park in New South Wales on the Darling River, and includes Lake Menindee and Lake Cawndilla, two of the largest lakes of the Menindee Lakes Storage Scheme. These lakes provide important habitat for regionally significant waterbird species. The National Park also includes several land units of the lower Darling River including areas of floodplain, overflow lakes and channels, lunettes, sandplains and sand dunes. The alluvial habitats have been superimposed on extensive areas of red sandplain. In this area of increasing agricultural development along the lower Darling River, the Park protects a nucleus of viable ecological communities.

The natural overflow depressions of Lake Menindee and Lake Cawndilla are managed by the Department of Land and Water Conservation (DLWC) which retains the right to fill and empty the lakes as part of its water management operations. The lakebeds are held as a permissive occupancy by the New South Wales NPWS from DLWC and are managed as part of the park.

A large number of Aboriginal sites exist in the Park. Most are less than 5 000 years old and show a changing pattern of occupation as the Willandra Lakes system dried out and Aboriginal people moved into wetter areas near the lower Darling River. Sites include burials, campsites, middens, cooking pits, stone artefacts and scarred trees. A number of significant fossil animal remains have been found in the lunettes adjacent to the lakes.

Kincheha Station was one of the earliest European settlements along the Darling River. The woolshed was built from local timbers in 1872 and has been restored.

Vegetation communities include:

***Eucalyptus camaldulensis* open forest** - along the Darling River and major channels on heavy-textured cracking clay;

***Eucalyptus largiflorens* open woodland** - on flat, black soil floodplains extending away from the river, with *Eucalyptus coolabah* on billabong banks;

Lake foreshore - dominated by *Morgania glabra* (blue rod) and *Zygochloa paradoxa* (sandhill canegrass);

Red sand-dune shrubland - *Casuarina cristata*, *Alectryon oleifolius*, *Acacia* sp. and *D. attenuata* are dominant on the dune crests, with *Acacia victoriae*, *Acacia loderi*, *Hakea leucoptera* (needlewood) and *Maireana pyramidata* on the sandplains

***Maireana pyramidata* / *Zygochloa paradoxa* lunettes** - on sand and clay dunes on the lake margins.

Borong Nature Reserve

This Reserve covers 195 ha and is located 16 km east of Boomi. Borong State Forest was dedicated in 1920 and used for grazing and timber extraction until the dedication of the nature reserve in 1976. Cropping, grazing and cotton production properties surround the reserve. Soils of the reserve range from dark clay floodplain soils to deep sand ridges (Hunt 1993a).

Borong Nature Reserve contains a carbeen open forest community, which is listed as an endangered ecological community under the *TSC Act*. This community is only reserved in the three small areas of Borong, Boomi and Boomi West Nature Reserves. The surrounding area have been extensively modified for agricultural production.

Vegetation communities in the reserve are:

***Callitris glaucophylla* woodland** - mature and regrowth *Callitris glaucophylla* with scattered *Corymbia tessellaris* and grassy understorey on sandy soils;

***Eucalyptus populnea* subsp. *bimbil* woodland** - clay soils support *Eucalyptus populnea* subsp. *bimbil* woodland with scattered *Eucalyptus melanophloia* and a shrub layer of *Geijera parviflora* and *Eremophila mitchellii*;

***Casuarina cristata* woodland** - on seasonally waterlogged clay soil areas, with no shrub understorey and few grasses;

***Corymbia tessellaris* woodland** - *Corymbia tessellaris* with *Eucalyptus populnea* subsp. *bimbil* and *Callitris glaucophylla*, understorey of *Geijera parviflora*, *Eremophila mitchellii* and *Corymbia dolichocarpa* on sandy soils;

***Casuarina cristata* / *Eremophila mitchellii* shrubland** - on clay soils;

***Corymbia tessellaris* / *Corymbia dolichocarpa* woodland** - on sandy soils with *Callitris glaucophylla*;

Cleared grassland – on sandy soils;

***Corymbia tessellaris* / *Callitris glaucophylla* woodland** - woodland on sandy soils with a grassy understorey, sometimes mixed with *Eucalyptus blakelyi*.

Boomi and Boomi West Nature Reserves

Boomi Nature Reserve covers 156 ha and is located 2 km east of Boomi and 17 km south of the Macintyre River. Boomi West Nature Reserve covers 149 ha and is located 6.5 km west of Boomi and 17 km south of the Macintyre River (Butler 1996).

These reserves contain carbeen open forest community, which is a listed endangered ecological community under the *TSC Act*. This community is only reserved in one other small area within Borong Nature Reserve. Aboriginal scarred trees exist on the reserve and the wetland area provides habitat for a variety of waterbirds.

Vegetation communities include:

Native grassland - dominated in Boomi by *Chloris truncata* (windmill grass) and *Aristida jerichoensis* (No. 9 wiregrass) with emergent *Acacia salicina*, *Geijera parviflora*, *Acacia excelsa* and *Atalaya hemiglauca*; in Boomi West contains *Panicum* sp. (hairy panic), *Bothriochloa macra* (red grass), *Setaria geniculata* (pale pigeon grass) and a number of weed species;

***Eucalyptus populnea* subsp. *bimbil* woodland** - shrub species include *Eremophila mitchellii*, *Casuarina cristata* and *Geijera parviflora*, and the groundcover *Bassia birchii* (galvanised burr), *Themeda australis* (kangaroo grass) and *Bassia divaricata* (pale poverty bush);

***Callitris glaucophylla* forest** - associated species *Corymbia tessellaris*, *Eucalyptus populnea* subsp. *bimbil* and *Eucalyptus coolabah*. The understorey contains *Paspalidium jubiflorum*; ***Eucalyptus coolabah* / *Casuarina cristata* woodland** - in Boomi West with an understorey containing *Paspalidium jubiflorum*.

Macquarie Marshes Nature Reserve

The Macquarie Marshes Crown Land was first declared a game reserve in 1900 and then declared a sanctuary (*Birds and Animals Protection Act 1918-1930* and *Fauna Protection Act 1980*). The reserve covers an area of 18 143 hectares and is divided into two sections: the Northern Marsh and Southern Marsh. The importance of the Marshes has been recognised by its inclusion in several agreements and registers including the Ramsar Convention, JAMBA and CAMBA. The plant communities in this reserve are described in Section 3.3.4.

The Macquarie Marshes Nature Reserve protects part of the internationally important Macquarie Marshes, one of the largest remaining inland semi-permanent wetlands in south eastern Australia. The Marshes contain the largest area of reeds (*Phragmites* sp.) in south eastern Australia. The Nature Reserve includes significant stands of river red gum (*Eucalyptus camaldulensis*) and coolibah (*E. coolabah*). They are important to nine migratory bird species listed in the Japan-Australia and China-Australia Migratory Bird Agreements and eighteen endangered bird species. The Marshes are also a refuge for many native animals and are the western limit of the known distribution of Gould's long eared bat (*Nyctophilus gouldii*) in NSW.

A range of significant Aboriginal sites including oven mounds, surface campsites, scarred trees and artefacts exist within the Nature Reserve.

Narran Lake Nature Reserve

Narran Lake Nature Reserve is located between Brewarrina and Walgett in northern New South Wales and includes part of the terminal wetlands of the Narran River. The 5 538 ha reserve was dedicated in 1988 and an additional 3 547 ha adjoining the reserve is owned by the NPWS and managed as part of the reserve. The reserve covers the north-eastern third of the Narran Lake wetland system and does not include Narran Lake itself (NPWS 2000a).

This Reserve is listed on the national estate and recognised as a wetland of international importance under the Ramsar convention. Approximately half of the nature reserve consists of wetlands subject to inundation by the Narran River, including two small lakes, Back and Clear Lakes, and extensive surrounding channelised wetlands. Aeolian lunettes and sandy levees border the wetlands. The other half of the reserve has gently undulating sandy and rocky ridges with several semi-saline playa lakes and drainage depressions.

Aboriginal camp sites are present around the lake and the area also contains oven mounds and shell middens, scatters of stone artefacts associated with clay ground ovens and several small silcrete quarries on the colluvial ridge system.

There are six dominant vegetation communities:

***Muehlenbeckia florulenta* thickets** - dense shrublands in the littoral zone of Clear and Back Lake; small areas of *Phragmites australis* between the lignum and sedges, ephemeral herbs and grasses grow on playa lakes and the main lake beds after floodwaters recede.

Riparian open forest - *Eucalyptus camaldulensis*, *Eucalyptus coolabah*, *Eucalyptus largiflorens* and *Acacia stenophylla* fringe the river and wetland channels, *Acacia stenophylla* extends into lignum shrublands;

Chenopod low open scrub and ephemeral herbfield - chenopods such as *Sclerolaena diacantha* and *Sclerolaena decurrens* and grasses grow on sandy lakeshore and dune areas;

Mixed low woodlands - woodland of *Eucalyptus populnea subsp. bimbil*, *Callitris glaucophylla* and a variety of tall shrubs grows on sandy ridge country;

Acacia aneura low woodland - rocky areas support small stands of *Acacia aneura*;

Spinifex hummock grassland and low woodlands - Small areas of woodland of *Eucalyptus melanophloia*, *Brachychiton populneum* and *Angophora melanoxylon* (coolibah apple) grow in association with *Triodia mitchellii* (spinifex).

Midkin Nature Reserve

This 360 ha reserve is located approximately 16 km north-west of Moree. It was formerly a State Forest (established in 1921) and was subject to timber harvesting and grazing until the dedication of the nature reserve in 1976. Land surrounding the reserve is used for cropping, grazing and cotton production. Black clays, sands and gravel form the soils of the reserve (Hunt 1993b).

Vegetation communities in the reserve, in addition to cleared grassland, are:

***Eucalyptus coolabah* open woodland** - woodland with various grasses restricted to a small patch on the edge of the reserve;

***Eucalyptus populnea subsp. bimbil* woodland** - contains stands of *Callitris glaucophylla*, and the understorey species *Eremophila mitchellii*, *Geijera parviflora* and *Capparis mitchellii*;

***Eucalyptus populnea subsp. bimbil* / *Eucalyptus melanophloia* woodland** - located in the centre of the reserve with *Callitris glaucophylla* regrowth and grassy understorey.

Tilpilly additions

In 2000 the New South Wales NPWS acquired the former Tilpilly Station, south east of Tilpa and north-east of Wilcannia. Most of the property lies within the Cobar Penepplain bioregion but a small section around Lake Tilpilly is within the DRP. The property has been grazed and some of the land has been cleared of woody vegetation. The area is identified as distinct within the Murray-Darling Depression.

Within the landscape there is a closed drainage depression (Coonavitra Lake) surrounded by *Eucalyptus populnea subsp. bimbil* (bimble box) and *Eucalyptus largiflorens* (black box). Tilpilly Station is likely to provide an ideal habitat for many of the JAMBA and CAMBA bird species. The area on the Darling Riverine Plains provides a large overflow lake (Tilpilly Lake). These *Muehlenbeckia florulenta* (lignum) and *Chenopodium spp.* (goosefoot) areas would provide ideal breeding habitat for many duck species while the flooded grasslands would attract, among others, swans and grebes. These wetlands are set in a grassy open woodlands context. The woodlands contain a variety of trees including *Casuarina sp.* (belah), *Callitris glaucophylla* (white cypress pine), *Alectryon oleifolius* (rosewood), *Acacia aneura* (mulga) and shrubs including *Eremophila sturtii* (turpentine), *Dodonaea sp.* (hopbush), *Senna spp.* (cassia), *Eremophila longifolia* (emu bush) and are the dominant vegetation type of the Northern Dunefields area.

Mount Murchison

In September 2001 the NPWS acquired the former Mount Murchison property, north-east of Wilcannia. Mount Murchison consists of the riverine corridor and floodplains of the Darling River and Darling Riverine Plains Bioregion, extending north into undulating country associated with the Mulga Lands Bioregion. The property includes 57 km of Darling River frontage. During heavy rain and flooding, there is a series of lakes, swamps and channels on the floodplain adjoining the Darling River that fill with water. Jamiesons Billabong in the south-eastern portion of the property is five kilometres long when full and can hold water for more than 12 months. The western portion of Mount Murchison also contains part of the Paroo Overflow, with the confluence of the Paroo River and the Darling River occurring just west of the property (NPWS 2001d).

Mount Murchison provides habitat for a number of species listed under the *TSC Act*, including Australian bustard (*Ardeotis australis*), blue-billed duck (*Oxyura australis*), square-tailed kite (*Lophoictinia isura*), black-breasted buzzard (*Hamirostra melanosternon*), red-tailed black-cockatoo (*Calyptorhynchus banksii*), Major Mitchell's cockatoo (*Cacatua leadbeateri*), *Chalinolobus picatus* (little pied bat), and *Grevillea nematophylla* (silver-leaved water tree) (NPWS 2001d).

The main vegetation types on Mount Murchison include *Eucalyptus camaldulensis* (river red gum) open forest as a riparian strip along the Darling River, *Eucalyptus coolabah* (coolibah) open woodland on the Darling River floodplains, with *Maireana pyramidata* (black bluebush) and *E. largiflorens* (black box) low open shrubland on the adjoining hummocky sandplains. Off the floodplain, *Casuarina pauper* (belah) and *Flindersia maculosa* (leopardwood) tall open shrubland occurs on level sandplains, while an extensive herbland dominated by *Eragrostis australasica* (cane grass) and *Muehlenbeckia florulenta* (lignum) occurs on the undulating sandplain of McIntyres Plain at the northern end of the property. In general, the vegetation on Mount Murchison has been lightly grazed and is in excellent condition (NPWS 2001d).

8.2.2 Other Crown lands Managed For Conservation

Other Crown lands, including Crown reserves, travelling stock reserves, state forests and leasehold lands, contribute to the conservation of biodiversity. Land area covered by these leases is indicated in section 1.3.3. Management practices carried out on each of these types of lands may differ across the bioregion and many of these areas have significant conservation values because the native vegetation has been retained and there has been minimal degradation.

Sandgate Flora Reserve

Sandgate Flora Reserve was gazetted in 1977 and is located within the Sandgate State Forest. The reserve covers 16 ha of *Callitris glaucophylla* (white cypress pine) – *Eucalyptus blakelyi* (Blakely's red gum) forest. Mining is excluded in the reserve (Forestry Commission of NSW 1989).

State Forests

State forests within the DRP where threatened species have been recorded are listed in Table 8.2.

Table 8.2 Threatened fauna recorded within State forests of the DRP

Common name	Scientific name	State Forest
bush stone-curlew	<i>Burhinus grallarius</i>	Bourbah SF, Narraway SF
barking owl	<i>Ninox connivens</i>	Bourbah SF, Narraway SF, Sandgate SF, Tallegar SF
speckled warbler	<i>Pyrrholaemus sagittatus</i>	Gilgandra SF
superb parrot	<i>Polytelis swainsonii</i>	Mellerstain SF, Sandgate SF
glossy black-cockatoo	<i>Calyptorhynchus lathami</i>	Narraway SF
little pied bat	<i>Chalinolobus picatus</i>	Narraway SF
yellow-bellied sheathtail bat	<i>Saccolaimus flaviventris</i>	Narraway SF
koala	<i>Phascolarctos cinereus</i>	Pilliga West SF
diamond firetail	<i>Stagonopleura guttata</i>	Sandgate SF, Tailby SF

The dominant vegetation types within State forests of the DRP are listed in Table 8.3.

Table 8.3 Dominant vegetation types within State forests of the DRP

(Forestry Commission of NSW 1984; 1986; 1988)

Vegetation type	State forests
bimble box (<i>Eucalyptus populnea</i> subsp. <i>bimbi</i>)	Berida SF, Bourbah SF, Sandgate SF, Tailby SF
bimble box – belah (<i>Casuarina cristata</i>)	Bourbah SF
bimble box – white cypress pine (<i>Callitris columellaris</i>)	Berida SF, Bourbah SF, Gilgandra SF, Narraway SF, Pilliga West SF, Sandgate SF, Tailby SF, Tallegar SF, Warrie SF
bimble box – white cypress pine – forest oak (<i>Allocasuarina luehmannii</i>)	Merrinele SF
fuzzy box (<i>E. conica</i>)	Eringanerin SF
Blakely's red gum (<i>E. blakelyi</i>) – rough barked apple (<i>Angophora floribunda</i>) – white cypress pine	Berida SF, Eringanerin SF
Blakely's red gum – white cypress pine	Bourbah SF, Eringanerin SF, Gilgandra SF, Merri Merri SF, Narraway SF, Sandgate SF, Tailby SF, Tallegar SF, Warrie SF
Blakely's red gum	Bourbah SF
white cypress pine – bimble box	Bourbah SF, Pilliga West SF, Sandgate SF, Tailby SF, Tallegar SF, Warrie SF
white cypress pine – fuzzy box	Gilgandra SF
white cypress pine – narrowleaf ironbark (<i>E. crebra</i>) – forest oak	Pilliga West SF
white cypress pine – narrowleaf ironbark – Blakely's red gum	Pilliga West SF
white cypress pine – Blakely's red gum – roughbark apple	Berida SF, Eringanerin SF
white cypress pine – bimble box – forest oak	Merrinele SF
white cypress pine – Blakely's red gum	Bourbah SF, Eringanerin SF, Gilgandra SF, Merri Merri SF, Narraway SF, Sandgate SF, Tailby SF, Tallegar SF, Warrie SF
white cypress pine – Blakely's red gum – narrowleaf ironbark	Pilliga West SF
white cypress pine – forest oak	Merrinele SF

8.3 OFF-RESERVE CONSERVATION

8.3.1 Voluntary Conservation Agreements

Voluntary conservation agreements (VCAs) are permanent arrangements between landholders and the Minister for the Environment of New South Wales regarding the use and management of the specified land. The National Parks and Wildlife Service administers these agreements. Conditions regarding agricultural use of the land vary. One VCA currently exists within the DRP and covers approximately 19 hectares.

8.3.2 Wildlife Refuges

Wildlife Refuges are a voluntary agreement between a landholder and the NPWS. Wildlife Refuges provide legal protection for the native plants and animals on the property. Wildlife Refuges can be entered into for the following purposes:

- conserving, preserving, propagating, and studying native plant and animals;
- conserving and studying natural environments; or
- creating simulated natural environments.

Forty-eight Wildlife Refuges have been gazetted in the DRP, covering approximately 550 000 ha (Table 8.4).

Table 8.4 Wildlife Refuges within the DRP

NPWS Area	Approximate total area (ha)	Number of Wildlife Refuges
Broken Hill	232 000	11
Cobar	169 000	7
Coonabarabran	64 000	10
Narrabri	87300	20

Forest Management Zones

Forest Management Zones (FMZs) are a classification system used by State Forest of NSW to classify areas of their estate in terms of intended management. This classification system is based on the “*Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia*” (JANIS 1997). FMZs 1-4 afford varying degrees of protection for natural and cultural values. FMZs 1-4, their management guidelines and relation to JANIS criteria are outlined in Table 8.5 below. FMZ classification is not yet finalised for the DRP.

Table 8.5 Forest Management Zones

(SFNSW 1999)

FMZ category	JANIS criterion	Management objectives	Size and boundaries	Activities not permitted
Zone 1 – special protection	dedicated formal reserves	management to maximise protection of very high natural and cultural conservation values	<ul style="list-style-type: none"> 40ha or greater preferred boundaries to be based on topographic features in combination with major cadastral boundaries 	any activity not permitted by a working plan
Zone 2 – special management	informal reserves	specific management and protection of natural and cultural conservation values	<ul style="list-style-type: none"> 40ha or greater preferred boundaries to be based on topographic features in combination with major cadastral boundaries 	any operation prohibited by the Minister
Zone 3a – harvesting exclusions	values protected by prescription	management for conservation of identified values and/or forest ecosystems and their natural processes	<ul style="list-style-type: none"> minimum size is size required for the protection of value and facilitation of other management activity boundaries to be based on topographic features in combination with major cadastral boundaries 	case by case assessment dependent on specific special value involved
Zone 3b – special prescription	values protected by prescription	management for conservation of identified values and/or forest ecosystems and their natural processes	<ul style="list-style-type: none"> minimum size is size required for the protection of value and facilitation of other management activity boundaries to be based on topographic features in combination with major cadastral boundaries 	case by case assessment dependent on specific special value involved
Zone 4 – general management	contributes to JANIS criteria values protected by prescription	management for native timber production and conservation of broad area habitat and environmental values	<ul style="list-style-type: none"> size based on harvesting practicalities – dependant of local conditions boundaries based on surrounding FMZs 	none

8.3.3 Catchment Blueprints

Catchment blueprints are 10 year plans produced by Catchment Management Boards. Catchment blueprints provide directions for natural resource activities and investment within each catchment. The purpose of catchment blueprints is to set targets for improved land management across all catchments. They will provide “focus and direction to individual and community initiatives, help coordinate government investment, such as extension work and grant funding, and contribute to the implementation of legislation such as the *Native Vegetation Conservation Act 1997* and the *Water Management Act, 2000*” (DLWC 2001b). Draft catchment blueprints have been prepared for all Catchment Management Boards within the DRP.

8.3.4 Water Management Plans

Water management committees, which include River Management Committees, have the responsibility of developing river flow regulations. Jurisdictions of water management committees vary, as some deal with regulated rivers and others deal with unregulated rivers and groundwater. Interim river flow objectives have been developed for all catchments within the DRP and river management committees use these objectives in preparing the flow regulations for their management plans (EPA 2000). Environmental flows aim to restore, to some degree, natural flows within each catchment.

River flow regulations differ from catchment to catchment and include various combinations of the following criteria (EPA 2000):

- “off-allocation access rules - restrictions on extraction of naturally occurring high flows;
- transparent dam rules - releases from water storages are matched to inflows (usually confined to relatively small inflows);
- translucent dam rules - a percentage of inflows to the dam must be released (usually confined to periods outside the irrigation season);
- contingency allowances - a bank of water reserved in the dam and released for specific environmental purposes (such as flushing algal blooms or providing water to complete fish or waterbird breeding);
- end of system flows - releases to ensure that the river provides water for downstream waterways (beyond the end of the river); and
- diversion thresholds - these require extractions to be reduced or to cease when flows are below a defined level.”

River Management Committees for all major regulated rivers and the Barwon-Darling River developed flow rules in 1999 for 1999-2000 (EPA 2000) (Table 8.6).

Table 8.6 River flow rules and implementation status within the DRP

(EPA 2000)

Drainage region	River flow rule type	Implementation status
Border rivers (Regulated)	Low-flow protection (Severn River)	Operating since 1999; rules for other regulated sections are being negotiated with Queensland
Gwydir (Regulated)	Protect low flows; off-allocation access rules; provision of water for environmental contingencies	Operating since 1995
Namoi (Regulated)	Off-allocation limits; retain low-flow requirements; off-allocation access rules	Operating since 1998
Macquarie (Regulated)	Maximum annual stock and domestic flows; off-allocation limits; provision of water for environmental contingencies	Water for Macquarie Marshes supplied since 1986
Barwon-Darling (Unregulated)	Protect low flows	Being implemented in 2000
Namoi, Castlereagh, Macquarie, Bogan, Condamine-Culgoa, Warrego, Paroo, (all Unregulated)	Interim extraction limits	Being developed
Border rivers, Gwydir (all Unregulated)	Protect low flows	Being developed

Groundwater management plans (GMPs) are being developed for areas of significant groundwater use or where groundwater resources require protection. The preparation of GMPs for specific areas and aquifers has been prioritised based on a risk assessment undertaken by DLWC, and is being managed by the Great Artesian Basin, Gwydir, Macquarie, and Namoi groundwater management committees within the DRP (EPA 2000).

RMCs within the DRP are required to produce water sharing plans (Table 8.7). These plans are designed to establish environmental water rules, requirements for basic landholder rights, requirements for water extraction under access licences, and bulk access regimes for extraction licences (which determines how much water will be available for extraction by licensed water users) (DLWC 2001a).

Table 8.7 Water sharing plans being prepared within the DRP

(DLWC 2001a)

Water management area	Water management committee (MC)	Type of water source	Water source for which a water sharing plan is being prepared
Central West	Macquarie Cudgegong River MC	Regulated river	Macquarie- Cudgegong Rivers
	Central West Unregulated Streams MC	Subcatchment	Castlereagh River above Binnaway
	Macquarie Groundwater MC	Groundwater	Lower Macquarie aquifer
Gwydir	Gwydir River (Regulated) River MC	Regulated river	Gwydir River
	Gwydir Unregulated River MC	Subcatchment	Upper Horton River, Lower Horton River, Cobbodah Creek, Rocky Creek
	Gwydir Groundwater MC	Groundwater	Gwydir aquifer
Namoi	Namoi Regulated River MC	Regulated river	Namoi River
	Namoi Unregulated River MC	Subcatchment	Phillips Creek, Mooki River, Quirindi Creek, Warrah Creek
	Namoi Groundwater MC	Groundwater	Upper Namoi aquifer, Lower Namoi aquifer
Western, Border Rivers, Gwydir, Namoi, Central West	Great Artesian Basin Groundwater MC	Groundwater	Great Artesian Basin

8.3.5 Regional Vegetation Management Plans

Regional Vegetation Committees (RVCs) are responsible for producing Regional Vegetation Management Plans. Through the RVCs these plans enable communities to develop their own localised plans which deal with the native vegetation issues most affecting their region, such as native vegetation conservation, viability of agricultural production, dryland salinity and the conservation of native species (NSW Govt. 1999). RVCs are governed by the *NVC Act, 1997* and are coordinated through DLWC.

By November 2001, the Mid-Lachlan RVC was the only RVC within the DRP that had completed a Regional Vegetation Management Plan. All other RVC's within the DRP have Regional Vegetation Management Plans in varying stages of development.

8.3.6 Salinity Management Plans

The New South Wales Salinity Strategy (DLWC 2000) has established a series of targets aimed at reducing the effects of salinity in the state. A river-based end-of-valley salinity target program has been established to monitor overall salinity conditions. Six of these are located within the DRP. They are on the:

- Namoi River at Goangra;
- Macintyre River at Mungindi;
- Gwydir River near Collarenebri;
- Macquarie River at Carinda;
- Bogan River at Gongolgon; and
- Barwon-Darling River at Menindee.

These end-of-valley salinity targets will measure the cumulative impact of past actions and the effects of future actions across each valley. Some of the management targets will include:

- no net loss of vegetation;
- revegetation of 20% of salt affected land;
- revegetation of 30% of recharge areas;
- introduction of deep rooted perennial pastures on 20% of pastures;
- development of and adherence to mid-catchment salinity targets to protect wetlands;
- changes in a variety of farming practices; and
- engineering solutions.

A variety of pilot projects and government initiatives have been proposed and recommended as a part of the New South Wales salinity strategy.

8.4 AREAS OF BIOLOGICAL SIGNIFICANCE

8.4.1 Key areas

Twenty key conservation areas and two corridors within the DRP were identified by Morgan and Terry (1992). Five of these are mainly located in adjoining bioregions but extend into the DRP. These areas cover 5 040 km² and are:

Key area 1: Cowal State Forest (~ 500 ha) - the largest forested area remaining in the southern part of the Bogan-Macquarie province;

Key area 2: A western extension of the northern section of the Macquarie Marshes Nature Reserve, containing *Flindersia maculosa* and *Acacia pendula* woodlands, in the Bogan-Macquarie province (350 km²);

Key area 3: Overlapping the boundary of the Bogan-Macquarie and Castlereagh-Barwon provinces, incorporating wetlands on a tributary of the Castlereagh and *Eucalyptus populnea* subsp. *bimbil* ridge country (270 km²);

Corridor: A major corridor along the Macquarie River downstream of Warren, connecting the Macquarie Marshes with Narran Lakes including the most reliable riverine environment in the sub-region;

Key area 4: On the lower floodplain and channels of the Barwon River below Collarenebri, and including some higher areas of grey clays, in the Castlereagh-Barwon province (440 km²);

Key area 5: In the Castlereagh-Barwon province near Thalaba Creek to the north west of Narrabri. The area consists of prior stream deposits and high-level floodplains of the upper alluvial fans (330 km²);

Corridor: A corridor along Thalaba Creek, mainly following the stock route along the Millie-Merrywinebone Road, connecting key areas 4 and 5;

Key area 6: An extension from the Narran Lakes area south to the Barwon River to sample the broad and complex flood plain of the Barwon in the Castlereagh-Barwon province (300km²);

Key area 7: Based on the discontinuous band of State Forests on a low red rise in the south of the Castlereagh-Barwon province. Tallegar and Sandgate State Forests are the largest and least disturbed remnants and form part of a proposed corridor linking Warrie State Forest in the south-east to Narraway State Forest in the north-west (40 km²);

Key area 8: Includes the major land systems within the Culgoa-Bokhara province, and connects with proposed key area 11 for the Narran Lakes area (160 km²);

Key area 9: Contains land systems typical of the northern part of the Warrambool-Moonie province, and adjoins proposed key area 13 in the Collarenebri Interfluve province (140 km²);

Key area 10: Adjoins the large Narran Lakes key area, and is representative of the southern part of the Warrambool-Moonie province (410 km²);

Key area 11: A large and complex area within the Narran-Lightning Ridge province, including Narran Lake Nature Reserve. This would expand the Nature Reserve to include adjoining land systems and connect to key areas in adjacent provinces (1 380 km²);

Key area 12: In the northern section of the Narran-Lightning Ridge province and containing a wetland and sandstone ridge (150 km²);

Key area 13: The largest remaining example of intact natural vegetation in the Collarenebri Interfluve province, which is a restricted land unit in New South Wales (250 km²);

Key area 14: Spans the Darling flood plain and contains representative examples of all provincial land systems in the Louth Plains province (550 km²);

Key area 15: Spans the Darling flood plain and contains most of the land systems of the Wilcannia Plains province (330 km²);

Key area 23: Extends over the Culgoa River to include river fringing and flood plain communities typical of the Culgoa-Bokhara province, and areas of the Warrego fan natural region (360 km²);

Key area 40: Mostly located within the Darling Depression natural region, but contains areas representative of the overflow basins of the Wilcannia Plains province (240 km²);

Key area 55: Straddles the border of the Castlereagh-Barwon province and the northern sandstones natural region (mainly in the latter), and contains areas of grey clay communities (160 km²);

Key area 61: Extends from the Pilliga outwash natural region north west to the Namoi River, which is at the edge of the Castlereagh-Barwon province (220 km²);

Key area 90: Mostly located within the Cobar Peneplain natural region, but extends into the Louth Plains province on ancestral alluvials (790 km²).

8.4.2 Refugia

Refugia are defined by EPA (2000) as 'areas which have escaped the great changes undergone by a region as a whole, providing conditions in which relic communities of plants and animals can survive'. The DRP contains three of the nationally significant biological refugia listed in Morton *et al.* (1995) for arid and semi-arid Australia. They are the Macquarie Marshes, Narran Lakes and the Darling and Talyawalka Anabranck Lakes (Figure 8.2). Morton *et al.* (1995) also identified the Paroo wetlands, most of which are located in the

adjoining Mulga Lands bioregion, as a nationally significant biological refugium. This analysis does not include the north eastern corner of the DRP which may contain significant refugia and requires analysis.

The Macquarie Marshes provide drought refuge when other wetlands, especially inland wetlands, are dry. They provide habitat for a diverse reptile fauna that are aquatic or are strongly associated with water. Narran wetlands also provide important drought refuge for waterbirds when other inland wetlands are dry and support large nesting colonies of straw-necked ibis *Threskiornis spinicollis* and large concentrations of ducks when water levels recede. The third refuge area, the Talyawalka Anabranch of the Darling River and its distributary Teryawynia Creek, between Wilcannia and Menindee has large areas of *Eucalyptus largiflorens* (black box) and when inundated provides habitat for large numbers of waterbirds.

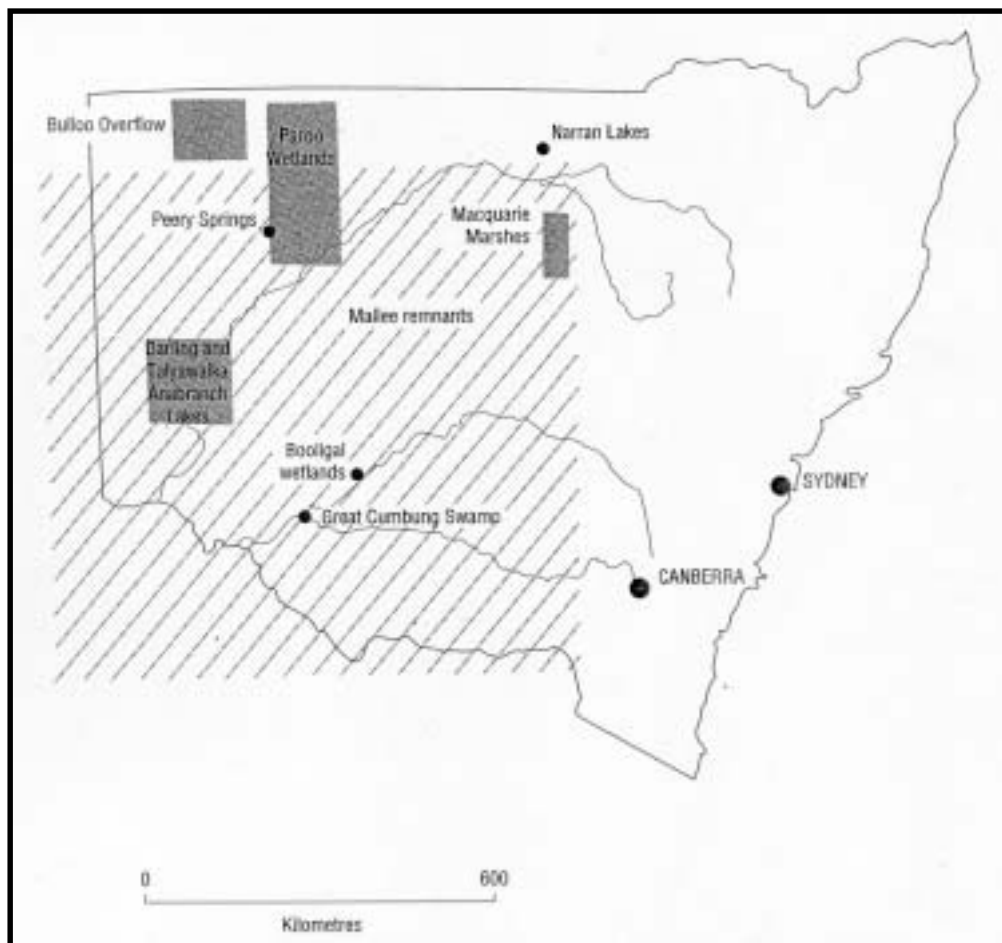


Figure 8.2. Nationally significant biological refugia within the DRP

(Morton *et al.* 1995)

8.4.3 Centres of endemism

The springs of the Great Artesian Basin contain unique and endemic biota and represent the only known centre of endemism within the DRP. This is discussed in Section 3.4. The fluvial landscape of the DRP has generally subtle biophysical changes with few unique and restricted

landscapes, such as unique lithologies or mountain ranges, that may result in the evolution of centres of endemism for flora or vertebrate fauna.

8.4.4 Areas of high biodiversity

The patchy distribution of biodiversity data and data collection in the DRP makes it impossible to assess accurately the levels of biodiversity across the entire DRP. Most assessments have taken place in core blocks of remnant vegetation in the east of the bioregion, and diverse areas in the west of the bioregion where clearing has not had a great impact on biodiversity. The Macquarie Marshes and Narran Lakes wetlands appear to represent areas of high biodiversity but there have been no comparative analyses enabling areas of high biodiversity within the DRP to be defined.

8.5 WILDERNESS VALUES IN THE DRP(NSW)

The *Wilderness Act, 1987* defines wilderness as an area of land that:

- (a) with its plant and animal communities, is in a state that has not been substantially modified by humans and their works or is capable of being restored to such a state;
- (b) is of a sufficient size to make its maintenance in such a state feasible; and
- (c) is capable of providing opportunities for solitude and appropriate self-reliant recreation.

As outlined in the *Wilderness Act, 1987*, wilderness areas are to be managed so as to:

- (a) restore (if applicable) and to protect the unmodified state of the area and its plant and animal communities;
- (b) preserve the capacity of the area to evolve in the absence of significant human interference; and
- (c) permit opportunities for solitude and appropriate self-reliant recreation.

The National Wilderness Inventory uses four indicators of wilderness quality: remoteness from settlement; remoteness from access; aesthetic naturalness; and biophysical naturalness. Knight (1998) identified 14 areas in a study of the wilderness quality of the Western Division of New South Wales. None of these fell within the DRP. This assessment did not include the portion of the DRP bioregion east of the Western Division administrative boundary (Map 9). With the extensive modification of land that has occurred in the eastern portion of the DRP since European settlement there is limited opportunity for any of this area to satisfy the requirements of the *Wilderness Act*.

8.6 SUMMARY AND PROPOSED FURTHER WORK

8.6.1 Summary

Less than one percent of the DRP is managed in conservation reserves and a variety of other off-reserve conservation procedures are in operation within this bioregion. At present, the lack of detailed information makes it difficult to identify specific areas of high biodiversity or centres of endemism in this bioregion. Three nationally significant biological refugia have been identified in the western portion of the bioregion but more areas may be important at the bioregional level.

Conservation assessment has been very limited in this bioregion but there have been 22 key areas identified as being important if the conservation gaps are to be filled. In the absence of detailed flora and fauna surveys and ecosystem mapping of the DRP, detailed analysis of the vegetation communities represented within the conservation reserves as a proportion of defined plant communities, and assessment of the Key areas should be carried out.

8.6.2 Proposed further work

Further work required in the DRP include the following:

- Evaluation of Water Management Plans, Catchment Management Plans and Regional Vegetation Management Plans to determine how the information contained in these documents can be used in a bioregional context;
- Implementation of a comprehensive and systematic conservation assessment of the DRP;
- Determination of the conservation values of the bioregion and each of its provinces using measures of diversity of land capability, vegetation communities, soils, species and habitats; and
- Preparation of a preliminary bioregional landscape framework with options for developing conservation management plans integrating conservation and production including:
 - ⇒ lists and descriptions of priority plant communities and priority conservation areas (e.g. largest remaining area of native vegetation, corridors, wetlands, rivers etc);
 - ⇒ identification of priority areas for restoration and regeneration;
 - ⇒ identification of other areas of regional significance such as aquifer recharge zones and priority catchments for management actions.

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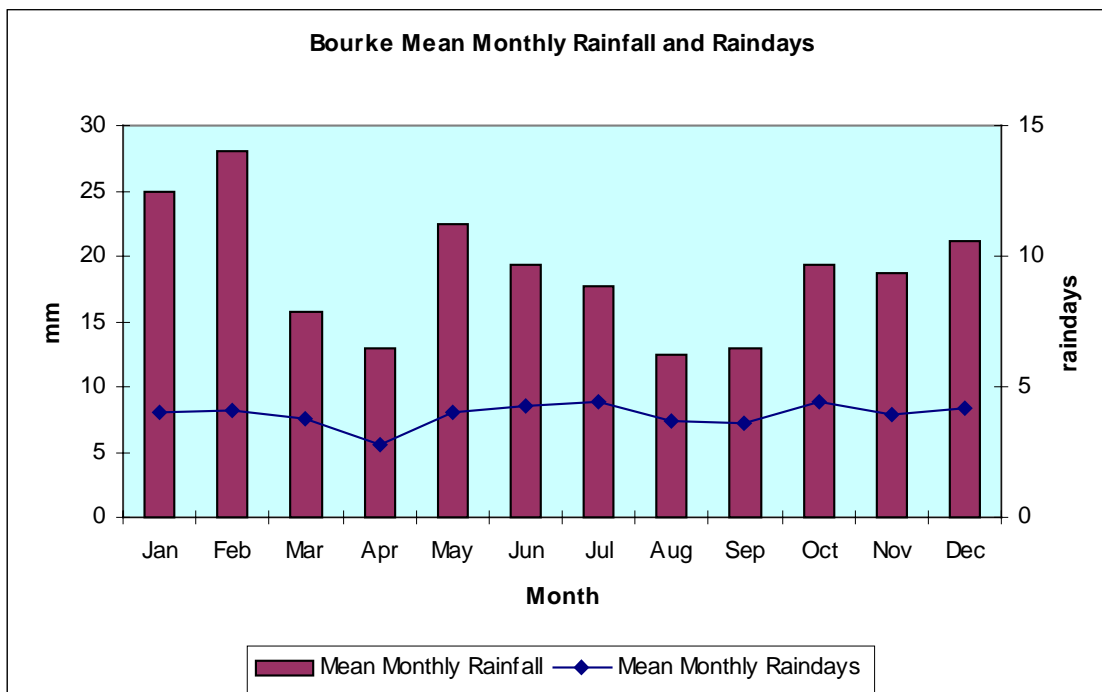
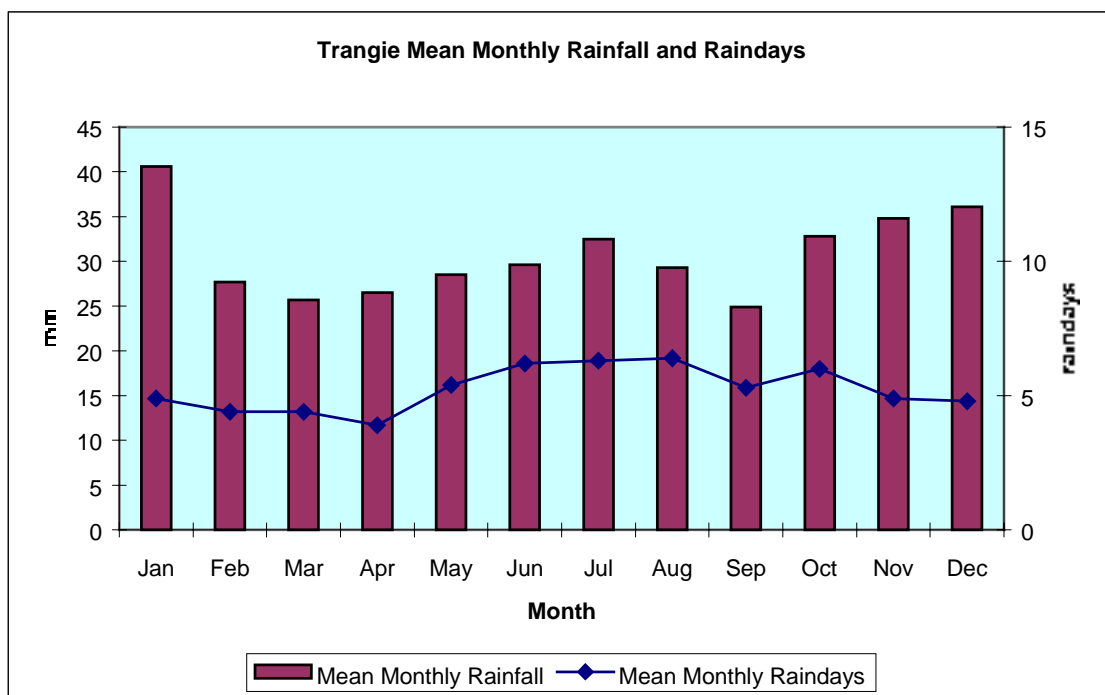
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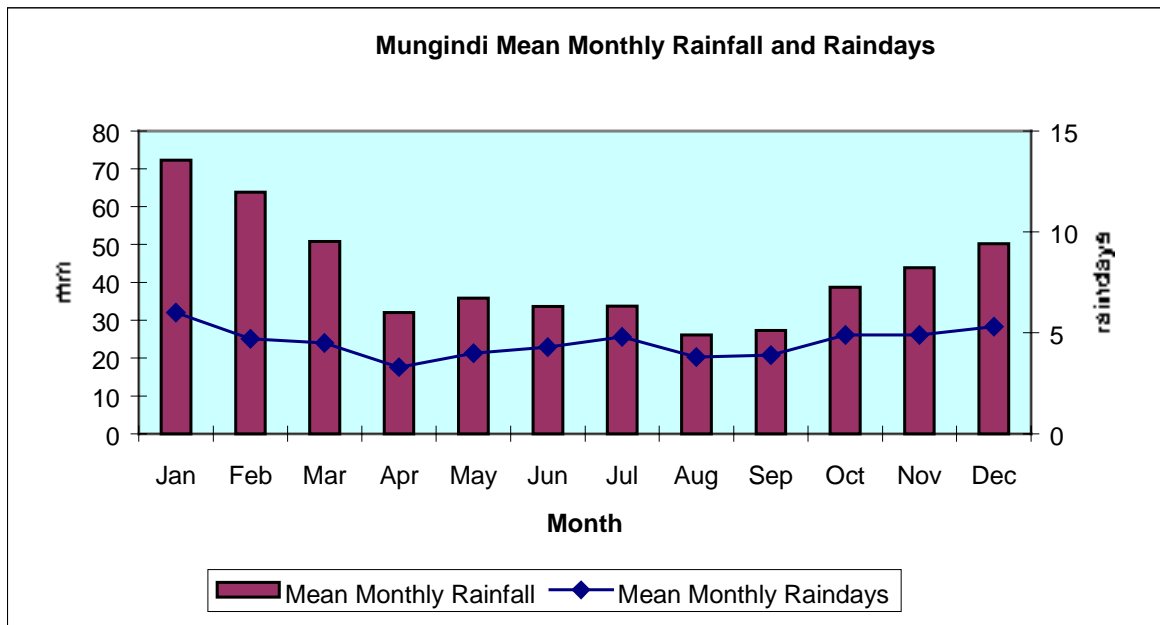
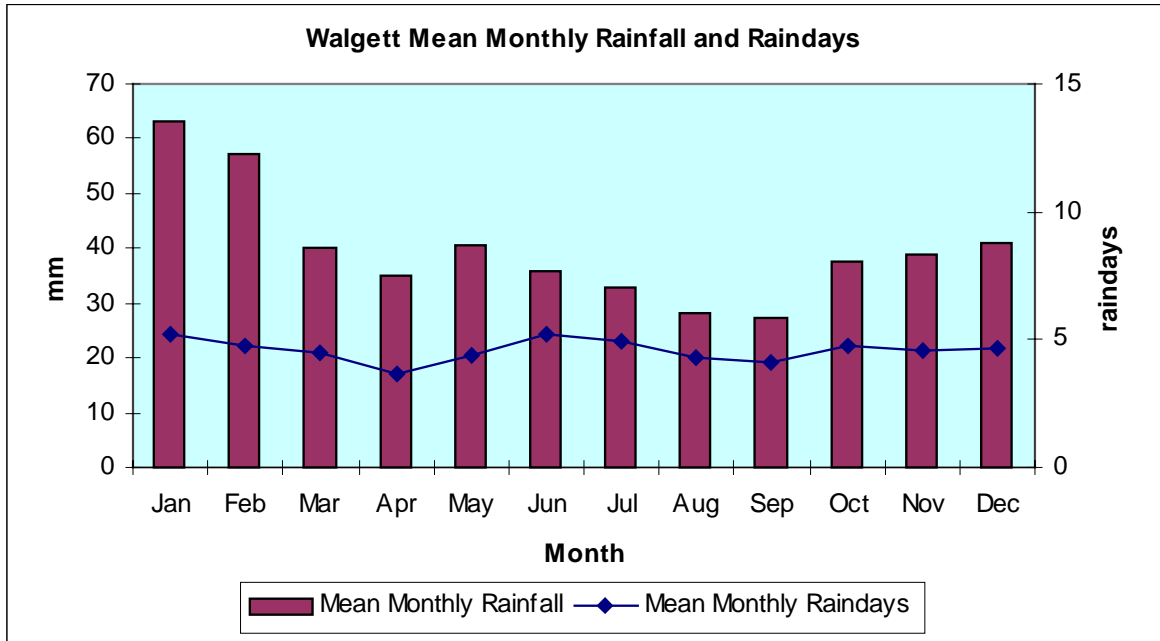
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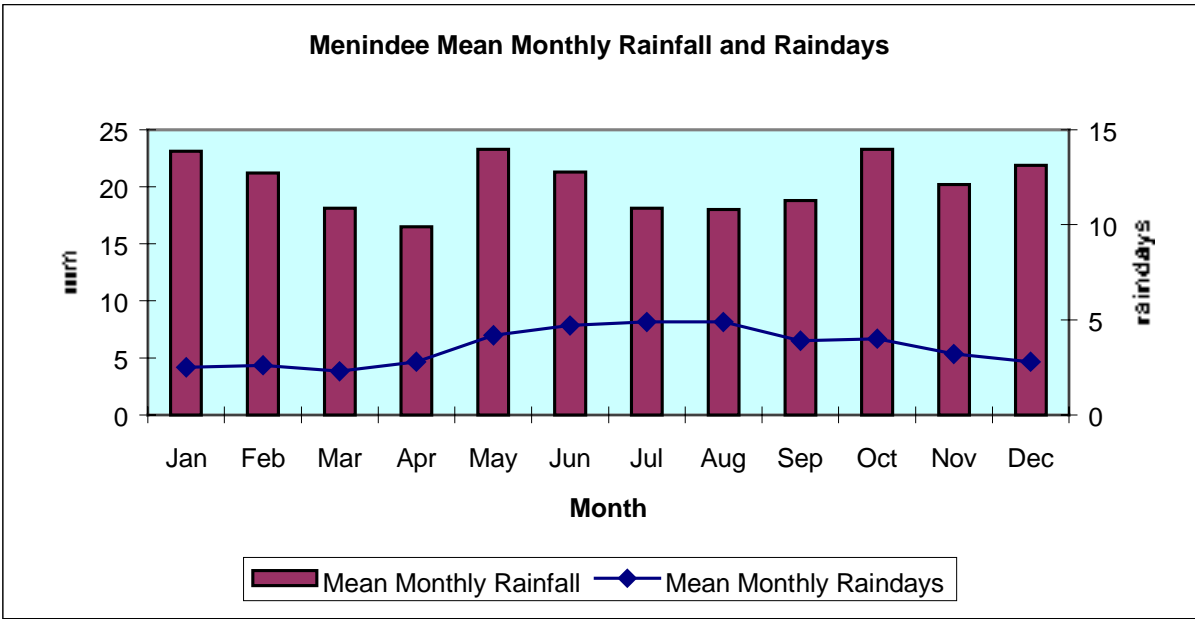
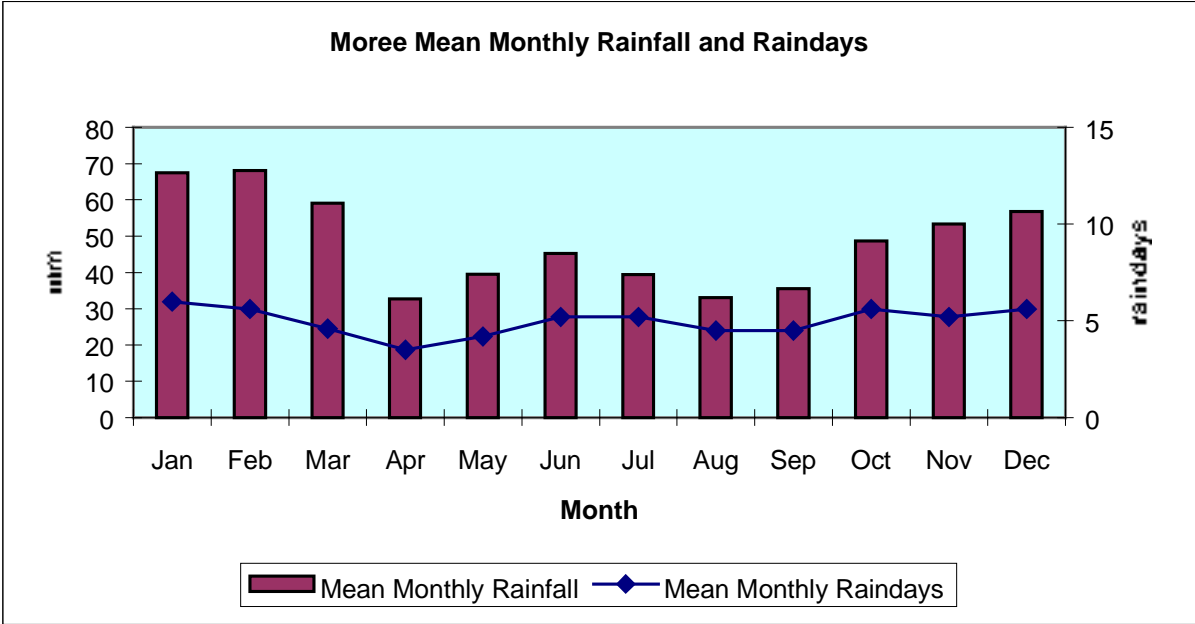
10 APPENDICES

Appendix A: Mean Monthly Rainfall and Raindays for DRP

(Bureau of Meteorology, 2001)







Appendix B: Land Systems within the DRP
(Walker 1991)

Major Rangetype	Rangetype	Physiography	Land System	Area intersecting DRP (ha)	% Land System	% DRP
Northern Floodplains	Scalded floodplains	Playas and Basins	Popelloe	14 883	66%	0.2%
			Alluvial plains	Rugby	192 317	99%
		Hermidon		158 645	97%	1.7%
		Rostella		150 674	99%	1.6%
		Dunoak		50 482	68%	0.5%
		Gingie		48 969	99%	0.5%
		Budda		37 878	98%	0.4%
		Geera		27 146	99%	0.3%
		Tatala		19 706	81%	0.2%
		Dumble		17 252	98%	0.2%
		Pendiana		14 638	49%	0.2%
	Lakes and swamps	Playas and Basins	Thackenbie	50 700	96%	0.5%
			Rotten Plain	48 448	99%	0.5%
			Narran	27 196	99%	0.3%
			Walkdens	16 449	13%	0.2%
			Cobham	26	<0.1%	<0.1%
	Floodplains with <i>Eucalyptus coolabah</i>	Playas and Basins	Paroo Overflow	339	0.4%	<0.1%
			Alluvial plains	Nelyambo	415 059	95%
		Llanillo		335 911	99%	3.6%
		Long Meadow		297 886	88%	3.2%
		Nidgerly		285 181	95%	3.1%
		Wombeira		148 168	99%	1.6%
		Eurie		131 230	99%	1.4%
		Wongal		108 487	99%	1.2%
		Mid-Darling		82 278	98%	0.9%
		Upper Darling		67 198	96%	0.7%
		Acres Billabong		42 005	92%	0.5%
		Ledknapper		5 649	<0.1%	0.1%
		Warrego	4 236	1%	<0.1%	
Total % DRP					30%	
Southern Riverine Woodlands	Lakebeds and swamps	Playas and Basins	Travellers	64 094	50%	0.7%
			Popiltah	433	6%	<0.1%
	Floodplains with <i>Eucalyptus largiflorens</i> and/or <i>Eucalyptus camaldulensis</i>	Alluvial plains	Darling	128 563	62%	1.4%
			Canally	86 299	60%	0.9%
			Teryawynia	43 878	87%	0.5%
Anabranche	34 721	36%	0.4%			
Total % DRP					4%	
Mitchell Grass Plains	Floodplains with <i>Astrelba</i> spp. (mitchell grass)	Alluvial plains	Goodooga	165 716	99%	1.8%
			Jomara	93 979	98%	1.0%
			Buckanbe	5 171	100%	0.1%
Total % DRP					3%	
<i>E. populnea</i> - Pine	Ranges and hills with <i>Callitris glaucophylla</i>	Hills and Footslopes	Boppy	205	1%	<0.1%
	Plains and ridges with <i>Eucalyptus populnea</i> and <i>Callitris glaucophylla</i>	Rolling Downs and Lowland	Lightning Ridge	186 176	97%	2.0%
			Araluen	74 562	99%	0.8%
		Alluvial plains	Yanda	392	0.6%	<0.1%
Pangee	55	<0.1%	<0.1%			
Total % DRP					3%	
Belah and Bluebush	Undulating sandplains with <i>Maireana</i> spp. (bluebush)	Sandplain	Frenchmans	5 075	6%	0.1%

Major Rangetype	Rangetype	Physiography	Land System	Area intersecting DRP (ha)	% Land System	% DRP
			Oulilla	2 008	2%	<0.1%
		Dunefields	Haythorpe	27 000	23%	0.3%
		Alluvial plains	Denian	85 172	65%	0.9%
	Sandplains and dunefields with <i>Casuarina cristata</i> and <i>Alectryon oleifolius</i>	Sandplain	Menilta	14 543	9%	0.2%
			Bulgamura	7 403	1%	0.1%
			Overnewton	3 932	1%	<0.1%
			Belvedere	2 540	1%	<0.1%
			Nelia	1 857	0.3%	<0.1%
			Plains	Vidale	2 977	4%
		Plains	Nangara	2 399	7%	<0.1%
			Curranyalpa	920	5%	<0.1%
			Coonavitra	112	0.3%	<0.1%
		Dunefields	Nelgadale	33 254	20%	0.4%
			Ashmont	3 622	4%	<0.1%
			Mutapa	2 270	2%	<0.1%
Cairo	163		0.3%	<0.1%		
Bellvale	85		<0.1%	<0.1%		
Total % DRP					2%	
Gidgee and Brigalow	Sandplains and alluvial plains with <i>Acacia cambagei</i> and/or <i>A. harpophylla</i>	Sandplain	Ellerslie	193	0.1%	<0.1%
		Plains	Cartlands	23 847	68%	0.3%
			East Toorale	23 410	9%	0.3%
			Myuna	10 935	7%	0.1%
	Alluvial plains	Toulby	16 955	35%	0.2%	
Total % DRP					1%	
Mulga	Mulga - sandplains and dunefields	Sandplain	Euramurtie	1 704	2%	<0.1%
			Trilby	89	0.4%	<0.1%
		Dunefields	Copago	2 359	2%	<0.1%
			Klondyke	2 230	1%	<0.1%
	Mulga - ranges and hills	Tablelands	Womparley	2 124	0.9%	<0.1%
		Ranges	Booroodarra	2 373	1%	<0.1%
			Mount Pleasant	972	1%	<0.1%
			Maccullochs	11	<0.1%	<0.1%
		Hills and Footslopes	Mulga downs	540	0.4%	<0.1%
	Mulga - hard red ridges and flats	Rolling Downs and Lowland	Tindera	4 034	42%	<0.1%
			Landsdowne	2 687	1%	<0.1%
			Prattenville	1 928	72%	<0.1%
			Pirillie	1 269	1%	<0.1%
			Kanimbla	1 073	34%	<0.1%
Cobar			1 011	0.1%	<0.1%	
Plains		Kenilworth	2 828	1%	<0.1%	
Coronga	2 439	1%	<0.1%			
Total % DRP					0.3%	
Downs Country	Stony downs and associated plains with saltbush and <i>Maireana</i> spp.	Tablelands	Pulgamurtie	1 870	1%	<0.1%
		Sandplain	Kars	2 116	1%	<0.1%
		Rolling Downs and Lowland	Oakvale	203	0.1%	<0.1%
		Alluvial plains	Caloola	428	0.2%	<0.1%
			Fowlers	166	0.1%	<0.1%
Total % DRP					0.1%	
Mallee	Sandplains and dunefields with mallee	Playas and Basins	Birdwood	479	1%	<0.1%
		Dunefields	Mandelman	21	<0.1%	<0.1%

Major Rangetype	Rangetype	Physiography	Land System	Area intersecting DRP (ha)	% Land System	% DRP
			Ennisvale	1	<0.1%	<0.1%
					Total % DRP	<0.1%

Appendix C : Native Flora Other Than Those of Conservation Significance Recorded in the DRP

Family	Scientific Name	Common Name	No. Records	Dataset
Isoetaceae	<i>Isoetes muelleri</i>		5	MMVS(5)
Ophioglossaceae	<i>Ophioglossum polyphyllum</i>		2	WLA
Adiantaceae	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>		43	WLA(10), BBSPil(5), BBSSF&NR(1), Moree(1), NLNRVS(12), NWB(10), BBSpil2(2), WFS(2)
Adiantaceae	<i>Cheilanthes lasiophylla</i>		3	WLA(2), NWB(1)
Adiantaceae	<i>Cheilanthes distans</i>	Bristly Cloak Fern	26	WLA(10), BBSPil(3), BBSSF(1), NLNRVS(2), NWB(10)
Adiantaceae	<i>Cheilanthes austrotenuifolia</i>	Rock Fern	24	WLA(12), MMVS(2), NWB(10)
Aspleniaceae	<i>Pleurosorus rutifolius</i>	Blanket Fern	1	WLA
Marsileaceae	<i>Marsilea hirsuta</i>		2	WLA(1), NWB(1)
Marsileaceae	<i>Marsilea exarata</i>		4	WLA(2), NWB(2)
Marsileaceae	<i>Marsilea drummondii</i>	Common Nardoo	1478	WLA(1146), MMVS(121), Moree(85), NLNRVS(7), NWB(68), WFS(1), Wombeira(50)
Marsileaceae	<i>Marsilea costulifera</i>		5	WLA(2), MMVS(1), NLNRVS(2)
Azollaceae	<i>Azolla pinnata</i>		1001	WLA(1000), MMVS(1)
Azollaceae	<i>Azolla filiculoides</i>		42	WLA (16), MMVS(15), NLNRVS(5), NWB(6)
Cupressaceae	<i>Callitris gracilis</i> subsp. <i>murrayensis</i>	Murray Pine	1	WLA
Cupressaceae	<i>Callitris glaucophylla</i>	White Cypress Pine	220	WLA(94), BBSPil(8), BBSSF&NR(1), BBSSF(1), MMVS(5), NLNRVS(20), NWB(87), BBSpil2(2), WFS(2)
Cupressaceae	<i>Callitris endlicheri</i>	Black Cypress Pine	3	WLA(1), NWB(1), BBSpil2(1)
Ranunculaceae	<i>Ranunculus undosus</i>		80	WLA(8), MMVS(66), Moree(2), NWB(4)
Ranunculaceae	<i>Ranunculus sessiliflorus</i>		1	WLA
Ranunculaceae	<i>Ranunculus sceleratus</i>		1	MMVS(1)
Ranunculaceae	<i>Ranunculus pumilio</i>		27	WLA(9), MMVS(14), NWB(1), Wombeira(3)
Ranunculaceae	<i>Ranunculus pentandrus</i> var <i>pentandrus</i>		2	WLA(1), NWB(1)
Ranunculaceae	<i>Ranunculus pentandrus</i> subsp. <i>platycarpus</i>		10	WLA
Ranunculaceae	<i>Ranunculus lappaceus</i>	Common Buttercup	2	Moree(2)
Ranunculaceae	<i>Ranunculus inundatus</i>		12	WLA(6), NWB(6)
Ranunculaceae	<i>Myosurus minimus</i> var <i>australis</i>	Mousetail	15	WLA(9), Wombeira(6)
Ranunculaceae	<i>Clematis microphylla</i> var <i>microphylla</i>	Small-leaved Clematis	2	WLA
Papaveraceae	<i>Papaver aculeatum</i>	Native Poppy	1	WLA
Portulacaceae	<i>Portulaca oleracea</i>	Pigweed	269	WLA(61), Brigfauna(1), MMVS(115), Moree(61), NLNRVS(6), NWB(12), Namoi(3), WFS(10)
Portulacaceae	<i>Portulaca filifolia</i>		52	WLA(50), BBSPil(1), NLNRVS(1)
Portulacaceae	<i>Calandrinia volubilis</i>		2	WLA
Portulacaceae	<i>Calandrinia pumila</i>		2	WLA(1), NLNRVS(1)
Portulacaceae	<i>Calandrinia ptychosperma</i>		1	WLA
Portulacaceae	<i>Calandrinia eremaea</i>		25	WLA(7), NLNRVS(15), NWB(3)
Portulacaceae	<i>Calandrinia balonensis</i>		13	WLA(2), NLNRVS(11)
Portulacaceae	<i>Anacampseros australiana</i>		2	WLA(1), MMVS(1)
Nyctaginaceae	<i>Boerhavia repleta</i>	Tarvine	10	Moree(9), NLNRVS(1)

Family	Scientific Name	Common Name	No. Records	Dataset
Nyctaginaceae	<i>Boerhavia dominii</i>	Tarvine	563	WLA(353), BBSPil(5), Brigfauna(1), BBSSF(1), MMVS(94), Moree(77), NLNRVS(3), NWB(7), Namoi(3), WFS(15), Wombeira(4)
Aizoaceae	<i>Zaleya galericulata subsp. galericulata</i>		3	WLA
Aizoaceae	<i>Zaleya galericulata subsp. australis</i>		36	WLA(2), MMVS(34)
Aizoaceae	<i>Zaleya galericulata</i>	Hogweed	23	WLA
Aizoaceae	<i>Trianthema triquetra</i>		97	WLA(2), MMVS(91), NLNRVS(2), WFS(2)
Aizoaceae	<i>Tetragonia tetragonoides</i>	New Zealand Spinach	115	WLA
Aizoaceae	<i>Tetragonia moorei</i>		1	BBSPil(1)
Aizoaceae	<i>Tetragonia eremaea</i>		1	WLA
Aizoaceae	<i>Glinus lotoides</i>		31	WLA(23), MMVS(6), NWB(2)
Aizoaceae	<i>Disphyma crassifolium subsp. clavellatum</i>		2	WLA
Chenopodiaceae	<i>Sclerolaena ventricosa</i>		9	WLA(8), NWB(1)
Chenopodiaceae	<i>Sclerolaena tubata</i>		1	Moree(1)
Chenopodiaceae	<i>Sclerolaena tricuspis</i>	Giant Redburr	83	WLA(49), BrigOut(2), MMVS(12), Moree(4), NWB(14), Wombeira(2)
Chenopodiaceae	<i>Sclerolaena tetracuspis</i>	Brigalow Burr	2	WLA(1), NWB(1)
Chenopodiaceae	<i>Sclerolaena stelligera</i>		61	WLA(31), MMVS(12), Moree(10), NWB(7), WFS(1)
Chenopodiaceae	<i>Sclerolaena patenticuspis</i>		23	WLA
Chenopodiaceae	<i>Sclerolaena parviflora</i>		1	WLA
Chenopodiaceae	<i>Sclerolaena parallelicuspis</i>		5	NLNRVS(5)
Chenopodiaceae	<i>Sclerolaena obliquicuspis</i>		20	WLA
Chenopodiaceae	<i>Sclerolaena muricata var villosa</i>	Black Rolypoly	95	WLA(7), Moree(85), NWB(2), Wombeira(1)
Chenopodiaceae	<i>Sclerolaena muricata var semiglabra</i>	Black Rolypoly	44	WLA(2), Moree(41), NWB(1)
Chenopodiaceae	<i>Sclerolaena muricata var muricata</i>	Black Rolypoly	118	WLA(50), Moree(68)
Chenopodiaceae	<i>Sclerolaena muricata</i>	Black Rolypoly	512	WLA(183), Brigfauna(1), MMVS(140), NWB(152), Namoi(1), WFS(10), Wombeira(25)
Chenopodiaceae	<i>Sclerolaena longicuspis</i>		3	Moree(3)
Chenopodiaceae	<i>Sclerolaena limbata</i>		6	MMVS(1), Moree(4), NWB(1)
Chenopodiaceae	<i>Sclerolaena lanicuspis</i>	Woolly Copperburr	6	WLA
Chenopodiaceae	<i>Sclerolaena intricata</i>		19	WLA(18), Moree(1)
Chenopodiaceae	<i>Sclerolaena glabra</i>		2	WLA
Chenopodiaceae	<i>Sclerolaena divaricata</i>	Tangled Copperburr	54	WLA(45), NLNRVS(1), NWB(5), Wombeira(3)
Chenopodiaceae	<i>Sclerolaena diacantha</i>	Grey Copperburr	95	WLA(67), Brigfauna(1), NWB(16), WFS(6), Wombeira(5)
Chenopodiaceae	<i>Sclerolaena decurrens</i>		28	WLA(22), NLNRVS(4), NWB(2)
Chenopodiaceae	<i>Sclerolaena cuneata</i>		1	NWB(1)
Chenopodiaceae	<i>Sclerolaena convexula</i>		14	WLA(2), NLNRVS(12)
Chenopodiaceae	<i>Sclerolaena calcarata</i>	Redburr	95	WLA(39), MMVS(26), Moree(12), NWB(12), WFS(5), Wombeira(1)
Chenopodiaceae	<i>Sclerolaena brachyptera</i>		48	WLA(45), MMVS(1), NWB(1), Wombeira(1)
Chenopodiaceae	<i>Sclerolaena birchii</i>	Galvanized Burr	372	WLA(155), BrigOut(1), MMVS(36), Moree(19), NLNRVS(11), NWB(137), Namoi(1), WFS(7), Wombeira(5)
Chenopodiaceae	<i>Sclerolaena bicornis var horrida</i>	Goathead Burr	60	WLA(29), NWB(29), Wombeira(2)
Chenopodiaceae	<i>Sclerolaena bicornis var bicornis</i>	Goathead Burr	24	WLA(5), Moree(7), NLNRVS(5), NWB(7)
Chenopodiaceae	<i>Sclerolaena bicornis</i>	Goathead Burr	77	WLA(28), BrigOut(2), MMVS(21),

Family	Scientific Name	Common Name	No. Records	Dataset
				NWB(21), WFS(5)
Chenopodiaceae	<i>Sclerolaena anisacanthoides</i>	Yellow Burr	17	WLA(1), MMVS(8), Moree(7), NWB(1)
Chenopodiaceae	<i>Scleroblitum atriplicinum</i>	Purple Goosefoot	20	WLA(14), MMVS(6)
Chenopodiaceae	<i>Salsola tragus</i>		308	WLA(140), Moree(28), NLNRVS(1), BBSPil(1), MMVS(86), NWB(47), WFS(3), Wombeira(2)
Chenopodiaceae	<i>Rhagodia spinescens</i>		376	WLA(180), BrigOut(1), MMVS(20), Moree(9), NWB(162), WFS(1), Wombeira(3)
Chenopodiaceae	<i>Osteocarpum dipterocarpum</i>		3	WLA(1), NLNRVS(2)
Chenopodiaceae	<i>Osteocarpum acropterum var deminuta</i>		24	WLA(15), MMVS(8), NWB(1)
Chenopodiaceae	<i>Osteocarpum acropterum</i>		34	WLA(33), MMVS(1)
Chenopodiaceae	<i>Neobassia proceriflora</i>	Soda Bush	10	WLA(8), NLNRVS(1), NWB(1)
Chenopodiaceae	<i>Malacocera tricornis</i>	Soft Horns	10	WLA(8), MMVS(1), NWB(1)
Chenopodiaceae	<i>Maireana tomentosa subsp. urceolata</i>		1	WLA
Chenopodiaceae	<i>Maireana sedifolia</i>	Pearl Bluebush	6	WLA
Chenopodiaceae	<i>Maireana sclerolaenoides</i>		3	WLA
Chenopodiaceae	<i>Maireana pyramidata</i>	Black Bluebush	66	WLA(65), NWB(1)
Chenopodiaceae	<i>Maireana pentatropis</i>		3	WLA
Chenopodiaceae	<i>Maireana pentagona</i>	Hairy Bluebush	5	WLA(2), MMVS(1), NWB(2)
Chenopodiaceae	<i>Maireana microphylla</i>		20	WLA(8), NWB(11), BBSPil2(1)
Chenopodiaceae	<i>Maireana lobiflora</i>		1	WLA
Chenopodiaceae	<i>Maireana integra</i>		2	WLA
Chenopodiaceae	<i>Maireana georgei</i>		2	WLA
Chenopodiaceae	<i>Maireana enchylaenoides</i>		4	WLA(1), MMVS(2), NWB(1)
Chenopodiaceae	<i>Maireana decalvans</i>	Black Cotton Bush	127	WLA(78), MMVS(15), Moree(6), NWB(28)
Chenopodiaceae	<i>Maireana coronata</i>		27	WLA(15), MMVS(1), Moree(3), NLNRVS(1), NWB(3), WFS(1), Wombeira(3)
Chenopodiaceae	<i>Maireana ciliata</i>		6	MMVS(6)
Chenopodiaceae	<i>Maireana brevifolia</i>		9	WLA(8), MMVS(1)
Chenopodiaceae	<i>Maireana astrotricha</i>	Low Bluebush	2	WLA
Chenopodiaceae	<i>Maireana appressa</i>		8	WLA(6), NLNRVS(2)
Chenopodiaceae	<i>Maireana aphylla</i>	Cotton Bush	96	WLA(46), MMVS(3), Moree(6), NWB(40), Wombeira(1)
Chenopodiaceae	<i>Halosarcia pergranulata</i>		1	NLNRVS(1)
Chenopodiaceae	<i>Enchylaena tomentosa</i>	Ruby Saltbush	229	WLA(153), BBSPil(5), Brigfauna(1), BBSSF(1), MMVS(18), Moree(2), NWB(44), WFS(1), Wombeira(4)
Chenopodiaceae	<i>Einadia trigonos subsp. leiocarpa</i>		4	Moree(4)
Chenopodiaceae	<i>Einadia trigonos</i>	Fishweed	8	WLA(2), BBSPil(2), Moree(1), BBSPil2(1), Namoi(2)
Chenopodiaceae	<i>Einadia polygonoides</i>		46	WLA(1), Moree(44), Wombeira(1)
Chenopodiaceae	<i>Einadia nutans subsp. nutans</i>	Climbing Saltbush	282	WLA(10), BBSPil(5), BBSSF(1), Moree(3), NLNRVS(17), NWB(245), BBSPil2(1)
Chenopodiaceae	<i>Einadia nutans subsp. linifolia</i>	Climbing Saltbush	18	WLA(6), BBSPil(1), Moree(5), NWB(6)
Chenopodiaceae	<i>Einadia nutans subsp. eremaea</i>		1	Moree(1)
Chenopodiaceae	<i>Einadia nutans</i>	Climbing Saltbush	452	WLA(302), BBSSF&NR(1), BrigOut(2), Brigfauna(1), MMVS(125), NWB(2), WFS(6), Wombeira(13)
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush	54	WLA(22), BBSSF(1), Moree(9), NWB(22)

Family	Scientific Name	Common Name	No. Records	Dataset
Chenopodiaceae	<i>Dysphania rhadinostachya</i> subsp. <i>inflata</i>		1	WLA
Chenopodiaceae	<i>Dysphania littoralis</i>		2	WLA
Chenopodiaceae	<i>Dysphania kalpari</i>		2	WLA
Chenopodiaceae	<i>Dysphania glomulifera</i> subsp. <i>eremaea</i>		1	Moree(1)
Chenopodiaceae	<i>Dissocarpus paradoxus</i>	Cannonball Burr	38	WLA(35), NLNRVS(3)
Chenopodiaceae	<i>Dissocarpus biflorus</i> var <i>cephalocarpus</i>		25	WLA(10), Moree(2), NWB(10), WFS(3)
Chenopodiaceae	<i>Dissocarpus biflorus</i>		8	WLA(5), NWB(1), WFS(2)
Chenopodiaceae	<i>Chenopodium truncatum</i>		4	WLA(3), Moree(1)
Chenopodiaceae	<i>Chenopodium pumilio</i>	Small Crumbweed	1129	WLA(1015), MMVS(100), Moree(11), NWB(3)
Chenopodiaceae	<i>Chenopodium nitrariaceum</i>	Nitre Goosefoot	67	WLA(48), Moree(8), NWB(5), WFS(2), Wombeira(4)
Chenopodiaceae	<i>Chenopodium melanocarpum</i>	Black Crumbweed	40	WLA(3), BBSPil(1), MMVS(14), NLNRVS(14), NWB(1), WFS(5), Wombeira(2)
Chenopodiaceae	<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i>		16	WLA(11), NWB(3), Wombeira(2)
Chenopodiaceae	<i>Chenopodium desertorum</i> subsp. <i>desertorum</i>		5	BBSPil(1), NLNRVS(3), Namoi(1)
Chenopodiaceae	<i>Chenopodium desertorum</i> subsp. <i>anidiophyllum</i>		3	NWB(3)
Chenopodiaceae	<i>Chenopodium desertorum</i>		21	WLA
Chenopodiaceae	<i>Chenopodium curvispicatum</i>		43	WLA(23), MMVS(3), NLNRVS(15), NWB(1), Wombeira(1)
Chenopodiaceae	<i>Chenopodium cristatum</i>	Crested Goosefoot	8	WLA
Chenopodiaceae	<i>Chenopodium auricomum</i>		34	WLA(14), Brigfauna(2), Moree(5), NWB(6), WFS(1), Wombeira(6)
Chenopodiaceae	<i>Atriplex vesicaria</i> subsp. <i>macrocytidia</i>		3	Moree(2), NLNRVS(1)
Chenopodiaceae	<i>Atriplex vesicaria</i>	Bladder Saltbush	34	WLA(17), MMVS(2), NWB(15)
Chenopodiaceae	<i>Atriplex velutinella</i>		6	WLA
Chenopodiaceae	<i>Atriplex suberecta</i>		35	WLA(17), MMVS(1), Moree(15), WFS(1), Wombeira(1)
Chenopodiaceae	<i>Atriplex stipitata</i>	Mallee Saltbush	14	WLA
Chenopodiaceae	<i>Atriplex spongiosa</i>	Pop Saltbush	9	WLA(7), NWB(2)
Chenopodiaceae	<i>Atriplex spinibractea</i>		3	WLA(1), Moree(2)
Chenopodiaceae	<i>Atriplex species B</i>		7	Moree(7)
Chenopodiaceae	<i>Atriplex semibaccata</i>	Creeping Saltbush	54	WLA(10), MMVS(22), Moree(9), NWB(12), WFS(1)
Chenopodiaceae	<i>Atriplex pseudocampanulata</i>		56	WLA(31), MMVS(2), NWB(17), Wombeira(6)
Chenopodiaceae	<i>Atriplex nummularia</i>	Old Man Saltbush	50	WLA(29), MMVS(4), NLNRVS(2), NWB(13), WFS(2)
Chenopodiaceae	<i>Atriplex muelleri</i>		135	WLA(115), Moree(14), NWB(4), Wombeira(2)
Chenopodiaceae	<i>Atriplex lindleyi</i>		42	WLA(31), BrigOut(1), MMVS(4), Moree(4), Wombeira(2)
Chenopodiaceae	<i>Atriplex limbata</i>		32	WLA(29), Wombeira(3)
Chenopodiaceae	<i>Atriplex leptocarpa</i>	Slender-fruit Saltbush	310	WLA(190), MMVS(45), Moree(28), NWB(43), WFS(4)
Chenopodiaceae	<i>Atriplex holocarpa</i>	Pop Saltbush	18	WLA(13), NLNRVS(2), Wombeira(3)
Chenopodiaceae	<i>Atriplex eardleyae</i>		23	WLA(19), MMVS(1), Moree(2), WFS(1)
Chenopodiaceae	<i>Atriplex conduplicata</i>		18	WLA(15), MMVS(1), NWB(1), Wombeira(1)
Chenopodiaceae	<i>Atriplex angulata</i>	Fan Saltbush	22	WLA

Family	Scientific Name	Common Name	No. Records	Dataset
Amaranthaceae	<i>Ptilotus semilanatus</i>		118	WLA(105), MMVS(1), Moree(7), NWB(2), WFS(1), Wombeira(2)
Amaranthaceae	<i>Ptilotus polystachyus</i> var <i>polystachyus</i>		16	NLNRVS(16)
Amaranthaceae	<i>Ptilotus obovatus</i> var <i>parviflorus</i>		7	Moree(7)
Amaranthaceae	<i>Ptilotus obovatus</i> var <i>obovatus</i>	Smoke Bush	12	WLA(3), NLNRVS(7), NWB(2)
Amaranthaceae	<i>Ptilotus obovatus</i>		2	WFS(2)
Amaranthaceae	<i>Ptilotus nobilis</i>		2	WLA(1), NWB(1)
Amaranthaceae	<i>Ptilotus macrocephalus</i>	Green Pusstails	4	WLA(1), Moree(2), NWB(1)
Amaranthaceae	<i>Ptilotus exaltatus</i> var <i>exaltatus</i>	Tall Mulla Mulla	24	WLA(13), Moree(1), NWB(9), WFS(1)
Amaranthaceae	<i>Ptilotus atriplicifolius</i> var <i>atriplicifolius</i>		1	NWB(1)
Amaranthaceae	<i>Amaranthus mitchellii</i>		5	Moree(5)
Amaranthaceae	<i>Amaranthus macrocarpus</i> var <i>pallidus</i>		12	Moree(12)
Amaranthaceae	<i>Amaranthus macrocarpus</i> var <i>macrocarpus</i>		21	Moree(21)
Amaranthaceae	<i>Amaranthus macrocarpus</i>	Dwarf Amaranth	35	WLA(14), MMVS(17), NWB(3), Namoi(1)
Amaranthaceae	<i>Amaranthus grandiflorus</i>		2	WLA
Amaranthaceae	<i>Alternanthera species A</i>		3	BBSPil(1), BBSSF(1), BBSpil2(1)
Amaranthaceae	<i>Alternanthera nodiflora</i>	Common Joyweed	40	WLA(22), Moree(14), Namoi(1), Wombeira(3)
Amaranthaceae	<i>Alternanthera nana</i>	Hairy Joyweed	30	WLA(15), MMVS(1), NWB(5), Wombeira(9)
Amaranthaceae	<i>Alternanthera denticulata</i>	Lesser Joyweed	1241	WLA(1028), BrigOut(1), MMVS(131), Moree(53), NLNRVS(6), NWB(15), Namoi(1), WFS(6)
Amaranthaceae	<i>Alternanthera angustifolia</i>		2	NLNRVS(2)
Caryophyllaceae	<i>Stellaria angustifolia</i>	Swamp Starwort	267	WLA(213), MMVS(22), Moree(5), NLNRVS(14), NWB(2), Wombeira(11)
Caryophyllaceae	<i>Scleranthus pungens</i>		1	MMVS(1)
Caryophyllaceae	<i>Scleranthus minusculus</i>		1	WLA
Caryophyllaceae	<i>Scleranthus biflorus</i>		6	WLA(2), MMVS(2), NWB(2)
Caryophyllaceae	<i>Polycarpaea corymbosa</i> var <i>minor</i>		1	NLNRVS(1)
Caryophyllaceae	<i>Gypsophila tubulosa</i>		12	NLNRVS(12)
Polygonaceae	<i>Rumex tenax</i>	Shiny Dock	6	WLA(2), Moree(3), NWB(1)
Polygonaceae	<i>Rumex stenoglottis</i>		2	WLA(1), Namoi(1)
Polygonaceae	<i>Rumex dumosus</i>		23	Moree(23)
Polygonaceae	<i>Rumex crystallinus</i>	Shiny Dock	102	WLA(30), MMVS(48), Moree(5), NWB(1), Wombeira(18)
Polygonaceae	<i>Rumex brownii</i>	Swamp Dock	65	WLA(39), BBSPil(1), MMVS(13), Moree(2), NWB(7), Namoi(3)
Polygonaceae	<i>Rumex bidens</i>		1	MMVS(1)
Polygonaceae	<i>Polygonum plebeium</i>	Small Knotweed	1014	WLA
Polygonaceae	<i>Persicaria prostrata</i>	Creeping Knotweed	17	WLA(7), MMVS(3), NLNRVS(1), NWB(1), Namoi(1), Wombeira(4)
Polygonaceae	<i>Persicaria orientalis</i>	Princes Feathers	1	WLA
Polygonaceae	<i>Persicaria lapathifolia</i>	Pale Knotweed	1012	WLA(1009), NWB(2), Namoi(1)
Polygonaceae	<i>Persicaria hydropiper</i>	Water Pepper	11	WLA(8), NWB(3)
Polygonaceae	<i>Persicaria decipiens</i>	Slender Knotweed	52	WLA(4), MMVS(46), NWB(2)
Polygonaceae	<i>Persicaria attenuata</i>		3	WLA(2), NWB(1)
Polygonaceae	<i>Muehlenbeckia horrida</i>		23	WLA(22), MMVS(1)
Polygonaceae	<i>Muehlenbeckia florulenta</i>	Lignum	426	WLA(185), Brigfauna(1), MMVS(55), Moree(31), NLNRVS(13), NWB(83), Namoi(1), WFS(2), Wombeira(55)
Dilleniaceae	<i>Hibbertia obtusifolia</i>		2	BBSSF&NR(1), BBSpil2(1)

Family	Scientific Name	Common Name	No. Records	Dataset
Sterculiaceae	<i>Melhania oblongifolia</i>		1	NLNRVS(1)
Sterculiaceae	<i>Lasiopetalum baueri</i>		4	WLA(2), NWB(2)
Sterculiaceae	<i>Brachychiton populneus</i>	Kurrajong	11	WLA(6), MMVS(2), NWB(3)
Malvaceae	<i>Sida trichopoda</i>		196	WLA(113), MMVS(21), Moree(50), NWB(8), Wombeira(4)
Malvaceae	<i>Sida spinosa</i>		2	WLA(1), Namoi(1)
Malvaceae	<i>Sida species B</i>		1	Moree(1)
Malvaceae	<i>Sida species A</i>		10	NLNRVS(6), NWB(2)
Malvaceae	<i>Sida pleiantha</i>		4	WLA(2), Wombeira(2)
Malvaceae	<i>Sida phaeotricha</i>		4	WLA(2), Wombeira(2)
Malvaceae	<i>Sida petrophila</i>		2	WLA
Malvaceae	<i>Sida intricata</i>		25	WLA(24), NWB(1)
Malvaceae	<i>Sida goniocarpa</i>		1	WLA
Malvaceae	<i>Sida filiformis</i>		22	WLA(12), NWB(5), Wombeira(5)
Malvaceae	<i>Sida fibulifera</i>		50	WLA(5), MMVS(40), NWB(4), WFS(1)
Malvaceae	<i>Sida cunninghamii</i>		36	WLA(8), BBSPil(2), MMVS(4), Moree(5), NLNRVS(12), NWB(4), BBSPil2(1)
Malvaceae	<i>Sida corrugata</i>		108	WLA(64), MMVS(19), Moree(10), NWB(11), WFS(3), Wombeira(1)
Malvaceae	<i>Sida ammophila</i>		5	Moree(1), NLNRVS(4)
Malvaceae	<i>Malva australiana</i>	Native Hollyhock	6	WLA
Malvaceae	<i>Hibiscus trionum</i>	Bladder Ketmia	151	WLA(120), MMVS(3), Moree(28)
Malvaceae	<i>Hibiscus sturtii</i> var <i>sturtii</i>		6	Moree(2), NLNRVS(4)
Malvaceae	<i>Hibiscus sturtii</i>	Hill Hibiscus	11	WLA(5), BBSPil(1), NWB(5)
Malvaceae	<i>Hibiscus krichauffianus</i>	Velvet-leaf Hibiscus	1	WLA
Malvaceae	<i>Hibiscus brachysiphonius</i>		18	WLA(5), Moree(9), NWB(2), Wombeira(2)
Malvaceae	<i>Abutilon oxycarpum</i> var <i>subsagittatum</i>	Flannel Weed	1	WLA
Malvaceae	<i>Abutilon oxycarpum</i>	Flannel Weed	195	WLA(144), BBSPil(1), BBSSF(1), Moree(4), NWB(43), Wombeira(2)
Malvaceae	<i>Abutilon otocarpum</i>		3	MMVS(1), WFS(2)
Malvaceae	<i>Abutilon malvifolium</i>		6	WLA(1), MMVS(5)
Malvaceae	<i>Abutilon leucopetalum</i>		13	WLA(5), NLNRVS(4), NWB(4)
Malvaceae	<i>Abutilon fraseri</i>		16	WLA(6), MMVS(1), NLNRVS(5), NWB(4)
Urticaceae	<i>Urtica incisa</i>	Stinging Nettle	3	WLA(2), NWB(1)
Urticaceae	<i>Parietaria debilis</i>		1	MMVS(1)
Rhamnaceae	<i>Ventilago viminalis</i>	Supple Jack	23	WLA(12), MMVS(2), NLNRVS(1), NWB(8)
Thymelaeaceae	<i>Pimelea trichostachya</i>		30	WLA(8), Moree(1), NLNRVS(21)
Thymelaeaceae	<i>Pimelea trichostachya</i>		22	Moree(1), NLNRVS(21)
Thymelaeaceae	<i>Pimelea simplex</i> subsp. <i>continua</i>		1	WLA
Thymelaeaceae	<i>Pimelea simplex</i>		28	WLA(24), Wombeira(4)
Thymelaeaceae	<i>Pimelea penicillaris</i>		9	WLA(7), NWB(2)
Thymelaeaceae	<i>Pimelea pauciflora</i>		2	NWB(2)
Thymelaeaceae	<i>Pimelea neo-anglica</i>		2	WLA
Thymelaeaceae	<i>Pimelea microcephala</i> subsp. <i>microcephala</i>		76	WLA(35), MMVS(5), Moree(1), NLNRVS(8), NWB(25), WFS(2)
Thymelaeaceae	<i>Pimelea linifolia</i> subsp. <i>linifolia</i>		3	BBSPil(3)
Thymelaeaceae	<i>Pimelea linifolia</i>		5	WLA(2), NWB(2), BBSPil2(1)
Euphorbiaceae	<i>Sauropus trachyspermus</i>		1	Moree(1)
Euphorbiaceae	<i>Poranthera microphylla</i>		5	NLNRVS(5)

Family	Scientific Name	Common Name	No. Records	Dataset
Euphorbiaceae	<i>Phyllanthus virgatus</i>		37	WLA(11), BBSPil(3), BBSSF(1), MMVS(1), Moree(19), NLNRVS(1), BBSpil2(1)
Euphorbiaceae	<i>Phyllanthus lacunellus</i>		25	WLA
Euphorbiaceae	<i>Petalostigma pubescens</i>	Bitter Bark	19	WLA(9), NWB(10)
Euphorbiaceae	<i>Euphorbia stevenii</i>	Bottle-tree Spurge	1	WLA
Euphorbiaceae	<i>Euphorbia planiticola</i>		19	MMVS(3), Moree(16)
Euphorbiaceae	<i>Euphorbia eremophila</i>	Desert Spurge	2	WLA
Euphorbiaceae	<i>Croton phebaloides</i>		3	WLA
Euphorbiaceae	<i>Chamaesyce species B</i>		1	Moree(1)
Euphorbiaceae	<i>Chamaesyce drummondii</i>	Caustic Weed	293	WLA(68), BBSPil(4), Brigfauna(1), BBSSF(1), MMVS(135), Moree(40), NLNRVS(10), NWB(19), BBSpil2(1), WFS(8), Wombeira(6)
Euphorbiaceae	<i>Chamaesyce dallachyana</i>		102	WLA(101), Namoi(1)
Euphorbiaceae	<i>Chamaesyce australis</i>		2	WLA(1), Wombeira(1)
Euphorbiaceae	<i>Adriana tomentosa var tomentosa</i>		2	WLA(1), Namoi(1)
Violaceae	<i>Hybanthus monopetalus</i>		1	NLNRVS(1)
Cucurbitaceae	<i>Zehneria micrantha</i>	Desert Cucumber	7	WLA
Cucurbitaceae	<i>Cucumis melo subsp. agrestis</i>		1	Moree(1)
Frankeniaceae	<i>Frankenia uncinata</i>		1	WLA
Frankeniaceae	<i>Frankenia serpyllifolia</i>		1	WLA
Frankeniaceae	<i>Frankenia connata</i>		4	WLA
Capparaceae	<i>Capparis mitchellii</i>	Native Orange	172	WLA(85), MMVS(6), Moree(7), NWB(73), WFS(1)
Capparaceae	<i>Capparis lasiantha</i>	Nepine	306	WLA(246), BBSPil(2), MMVS(4), Moree(3), NWB(45), WFS(6)
Capparaceae	<i>Apophyllum anomalum</i>	Warrior Bush	157	WLA(77), BBSPil(1), BrigOut(1), MMVS(5), Moree(1), NWB(71), WFS(1)
Brassicaceae	<i>Stenopetalum sphaerocarpum</i>		1	Moree(1)
Brassicaceae	<i>Stenopetalum lineare</i>		5	WLA
Brassicaceae	<i>Sisymbrium erysimoides</i>	Smooth Mustard	55	WLA(54), NWB(1)
Brassicaceae	<i>Rorippa laciniata</i>		2	WLA
Brassicaceae	<i>Rorippa eustylis</i>		72	WLA(2), MMVS(64), Moree(3), NLNRVS(3)
Brassicaceae	<i>Phlegmatospermum cochlearinum</i>	Oval-podded Cress	14	WLA
Brassicaceae	<i>Lepidium sagittulatum</i>		18	WLA(8), Moree(4), NLNRVS(1), NWB(5)
Brassicaceae	<i>Lepidium pseudohyssopifolium</i>	Peppergrass	60	WLA(43), BBSPil(2), Moree(2), NLNRVS(1), NWB(12)
Brassicaceae	<i>Lepidium phlebopetalum</i>	Veined Peppergrass	2	WLA
Brassicaceae	<i>Lepidium papillosum</i>	Warty Peppergrass	1	WLA
Brassicaceae	<i>Lepidium oxytrichum</i>		2	WLA
Brassicaceae	<i>Lepidium hypenation</i>		2	Moree(2)
Brassicaceae	<i>Lepidium fasciculatum</i>		39	WLA(17), MMVS(3), Moree(8), NWB(11)
Brassicaceae	<i>Harmsiodoxa puberula</i>		2	WLA
Brassicaceae	<i>Harmsiodoxa brevipes var major</i>		2	NLNRVS(2)
Brassicaceae	<i>Harmsiodoxa brevipes var brevipes</i>		2	WLA(1), NWB(1)
Brassicaceae	<i>Harmsiodoxa brevipes</i>		3	WLA
Brassicaceae	<i>Harmsiodoxa blennodioides</i>		6	WLA(5), Moree(1)
Brassicaceae	<i>Cuphonotus andraeanus</i>		8	WLA
Brassicaceae	<i>Blennodia canescens</i>	Wild Stock	2	WLA
Brassicaceae	<i>Arabidella trisecta</i>		7	WLA(6), NWB(1)
Brassicaceae	<i>Arabidella procumbens</i>		2	WLA

Family	Scientific Name	Common Name	No. Records	Dataset
Brassicaceae	<i>Arabidella nasturtium</i>		3	WLA
Brassicaceae	<i>Arabidella eremigena</i>		1	WLA
Gyrostemonaceae	<i>Gyrostemon australasicus</i>		1	WLA
Clusiaceae	<i>Hypericum gramineum</i>	Small St John's Wort	7	BBSPil(2), Moree(1), NLNRVS(4)
Droseraceae	<i>Drosera peltata</i>		1	NLNRVS(1)
Droseraceae	<i>Drosera indica</i>	Sundew	1	WLA
Casuarinaceae	<i>Casuarina pauper</i>	Belah	8	WLA
Casuarinaceae	<i>Casuarina cristata</i>	Belah	291	WLA(143), BBSPil(1), MMVS(8), Moree(2), NWB(135), WFS(2)
Casuarinaceae	<i>Allocasuarina verticillata</i>	Drooping Sheoak	1	WLA
Casuarinaceae	<i>Allocasuarina luehmannii</i>	Bulloak	58	WLA(25), BBSPil(4), BBSSF&NR(1), BBSSF(1), MMVS(1), NWB(24), BBSPil2(2)
Casuarinaceae	<i>Allocasuarina diminuta</i> subsp. <i>diminuta</i>		1	BBSpil2(1)
Crassulaceae	<i>Crassula sieberiana</i>	Australian Stonecrop	14	WLA(1), NLNRVS(13)
Crassulaceae	<i>Crassula decumbens</i> var <i>decumbens</i>		1	WLA
Crassulaceae	<i>Crassula colorata</i>		35	WLA(33), BrigOut(1), NWB(1)
Proteaceae	<i>Persoonia sericea</i>		2	WLA(1), NWB(1)
Proteaceae	<i>Hakea tephrosperma</i>	Hooked Needlewood	6	WLA(5), NWB(1)
Proteaceae	<i>Hakea leucoptera</i>	Needlewood	122	WLA(113), BBSPil(1), NLNRVS(1), NWB(7)
Proteaceae	<i>Hakea decurrens</i>		2	NLNRVS(2)
Proteaceae	<i>Grevillea striata</i>	Beefwood	28	WLA(22), NLNRVS(2), NWB(4)
Proteaceae	<i>Grevillea floribunda</i> subsp <i>floribunda</i>	Seven Dwarfs Grevillea	2	WLA(1), BBSpil2(1)
Proteaceae	<i>Grevillea albiflora</i>		2	WLA
Myrtaceae	<i>Micromyrtus hexamera</i>		4	WLA
Myrtaceae	<i>Micromyrtus ciliata</i>		4	WLA(2), NWB(2)
Myrtaceae	<i>Melaleuca uncinata</i>	Broombush	1	WLA
Myrtaceae	<i>Melaleuca trichostachya</i>		19	WLA(16), NWB(1), Wombeira(2)
Myrtaceae	<i>Melaleuca densispicata</i>		2	WLA(1), NWB(1)
Myrtaceae	<i>Melaleuca bracteata</i>		6	WLA(3), NWB(3)
Myrtaceae	<i>Melaleuca armillaris</i>		1	WLA
Myrtaceae	<i>Leptospermum polygalifolium</i>		2	WLA(1), NWB(1)
Myrtaceae	<i>Eucalyptus viridis</i>	Green Mallee	1	WLA
Myrtaceae	<i>Eucalyptus socialis</i>	Red Mallee	3	WLA
Myrtaceae	<i>Eucalyptus sideroxylon</i>	Mugga Ironbark	2	WLA
Myrtaceae	<i>Eucalyptus populnea</i> subsp. <i>bimbil</i>	Bimble Box	551	WLA(311), BBSPil(2), MMVS(27), Moree(2), NLNRVS(8), NWB(196), WFS(5)
Myrtaceae	<i>Eucalyptus pilligaensis</i>	Narrow-leaved Grey Box	7	WLA(2), BBSPil(2), NWB(2), BBSpil2(1)
Myrtaceae	<i>Eucalyptus microcarpa</i>	Western Grey Box	25	WLA(12), BBSSF(1), NWB(11), WFS(1)
Myrtaceae	<i>Eucalyptus melliodora</i>	Yellow Box	19	WLA(10), NWB(9)
Myrtaceae	<i>Eucalyptus melanophloia</i>	Silver-leaved Ironbark	18	WLA(8), NLNRVS(4), NWB(6)
Myrtaceae	<i>Eucalyptus largiflorens</i>	Black Box	290	WLA(154), MMVS(29), Moree(7), NLNRVS(1), NWB(92), WFS(7)
Myrtaceae	<i>Eucalyptus dwyeri</i>	Dwyer's Red Gum	4	WLA(2), NWB(2)
Myrtaceae	<i>Eucalyptus dumosa</i>	White Mallee	1	WLA
Myrtaceae	<i>Eucalyptus dealbata</i>	Tumbledown Red Gum	11	WLA(6), NWB(5)

Family	Scientific Name	Common Name	No. Records	Dataset
Myrtaceae	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark	11	WLA(4), BBSPil(1), BBSSF(1), NWB(4), BBSpil2(1)
Myrtaceae	<i>Eucalyptus coolabah</i>	Coolibah	2445	WLA(2207), Brigfauna(1), MMVS(30), Moree(15), NLNRVS(3), NWB(140), Namoi(2), WFS(4), Wombeira(43)
Myrtaceae	<i>Eucalyptus conica</i>		1	BBSpil2(1)
Myrtaceae	<i>Eucalyptus chloroclada</i>	Dirty Gum	27	WLA(11), BBSPil(4), MMVS(1), NWB(11)
Myrtaceae	<i>Eucalyptus camaldulensis</i>	River Red Gum	513	WLA(334), MMVS(91), NLNRVS(5), NWB(73), Namoi(2), WFS(6), Wombeira(2)
Myrtaceae	<i>Eucalyptus blakelyi</i>	Blakely's Red Gum	6	WLA(2), BBSPil(1), BBSSF&NR(1), NWB(1), BBSpil2(1)
Myrtaceae	<i>Corymbia tumescens</i>		2	WLA
Myrtaceae	<i>Corymbia trachyphloia</i>	White Bloodwood	1	WLA
Myrtaceae	<i>Corymbia tessellaris</i>	Carbeen	52	WLA(33), NWB(14), WFS(5)
Myrtaceae	<i>Corymbia dolichocarpa</i>	Long-fruited Bloodwood	32	WLA(21), NWB(11)
Myrtaceae	<i>Calytrix tetragona</i>		1	BBSpil2(1)
Myrtaceae	<i>Calytrix longiflora</i>		3	WLA
Myrtaceae	<i>Callistemon viminalis</i>	Weeping Bottlebrush	1	WLA
Myrtaceae	<i>Callistemon linearis</i>	Narrow-leaved Bottlebrush	2	WLA(1), NWB(1)
Myrtaceae	<i>Angophora melanoxydon</i>		22	WLA(20), NLNRVS(2)
Myrtaceae	<i>Angophora leiocarpa</i>		1	NWB(1)
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple	4	WLA(2), BBSpil2(1), Namoi(1)
Myrtaceae	<i>Angophora costata</i>	Sydney Red/Rusty Gum	1	WLA
Lythraceae	<i>Lythrum salicaria</i>	Purple Loosestrife	100	WLA
Lythraceae	<i>Lythrum hyssopifolia</i>	Hyssop Loosestrife	11	WLA (2), MMVS (8), Wombeira (1)
Lythraceae	<i>Ammannia multiflora</i>	Jerry-jerry	11	WLA
Onagraceae	<i>Epilobium hirtigerum</i>	Willowherb	7	WLA(5), MMVS(2)
Haloragaceae	<i>Myriophyllum verrucosum</i>	Red Water-milfoil	10	WLA(7), NLNRVS(2), Wombeira(1)
Haloragaceae	<i>Myriophyllum striatum</i>		1	WLA
Haloragaceae	<i>Myriophyllum simulans</i>		2	WLA
Haloragaceae	<i>Myriophyllum propinquum</i>		16	MMVS(14), NWB(2)
Haloragaceae	<i>Haloragis odontocarpa</i>		2	Moree(2)
Haloragaceae	<i>Haloragis heterophylla</i>		7	WLA(1), MMVS(5), WFS(1)
Haloragaceae	<i>Haloragis glauca forma glauca</i>		105	WLA(47), MMVS(7), Moree(6), NLNRVS(7), NWB(2), WFS(1), Wombeira(35)
Haloragaceae	<i>Haloragis aspera</i>		7	WLA(2), MMVS(3), NLNRVS(1), NWB(1)
Haloragaceae	<i>Gonocarpus elatus</i>		1	WLA
Rutaceae	<i>Geijera parviflora</i>	Wilga	423	WLA(193), BBSPil(5), BBSSF(1), MMVS(25), Moree(1), NLNRVS(12), NWB(179), BBSpil2(1), WFS(6)
Rutaceae	<i>Phebalium squamulosum</i>	Scaly Phebalium	1	WLA
Rutaceae	<i>Phebalium glandulosum</i>	Desert Phebalium	1	WLA
Rutaceae	<i>Flindersia maculosa</i>	Leopardwood	54	WLA(25), BBSPil(1), BrigOut(1), MMVS(7), NLNRVS(3), NWB(17)
Rutaceae	<i>Citrus glauca</i>	Desert Lime	9	WLA(6), NWB(3)
Meliaceae	<i>Owenia acidula</i>	Gruiie	24	WLA(19), NLNRVS(1), NWB(4)
Sapindaceae	<i>Dodonaea viscosa subsp. spatulata</i>		3	BBSPil(2), BBSpil2(1)

Family	Scientific Name	Common Name	No. Records	Dataset
Sapindaceae	<i>Dodonaea viscosa subsp. mucronata</i>	Hop Bush	2	WLA(1), NWB(1)
Sapindaceae	<i>Dodonaea viscosa subsp. cuneata</i>	Hop Bush	1	WLA
Sapindaceae	<i>Dodonaea viscosa subsp. angustissima</i>	Hop Bush	33	WLA(30), NWB(3)
Sapindaceae	<i>Dodonaea viscosa</i>	Hop Bush	27	WLA(11), MMVS(1), NLNRVS(6), NWB(9)
Sapindaceae	<i>Dodonaea peduncularis</i>		1	BBSpil2(1)
Sapindaceae	<i>Atalaya hemiglauca</i>	Whitewood	164	WLA(88), MMVS(9), Moree(1), NLNRVS(8), NWB(53), WFS(1), Wombeira(4)
Sapindaceae	<i>Alectryon oleifolius subsp. elongatus</i>	Western Rosewood, Bonaree	1	WLA
Sapindaceae	<i>Alectryon oleifolius subsp. canescens</i>	Western Rosewood, Bonaree	10	WLA(9), Moree(1)
Sapindaceae	<i>Alectryon oleifolius</i>	Western Rosewood, Bonaree	254	WLA(121), MMVS(17), NWB(107), Namoi(1), WFS(7), Wombeira(1)
Fabaceae (Caesalpinioideae)	<i>Senna form taxon 'zygophylla'</i>		7	WLA(2), BBSPil(3), NWB(2)
Fabaceae (Caesalpinioideae)	<i>Senna form taxon 'petiolaris'</i>	Woody Cassia	8	WLA
Fabaceae (Caesalpinioideae)	<i>Senna form taxon 'filifolia'</i>	Silver Cassia	11	WLA(9), NWB(2)
Fabaceae (Caesalpinioideae)	<i>Senna circinnata</i>	Silver Cassia	9	WLA(6), NWB(3)
Fabaceae (Caesalpinioideae)	<i>Senna form taxon 'sturtii'</i>	Grey Cassia	2	WLA
Fabaceae (Caesalpinioideae)	<i>Senna form taxon 'coriacea'</i>	Silver Cassia	7	WLA
Fabaceae (Caesalpinioideae)	<i>Senna form taxon 'artemisioides'</i>	Silver Cassia	9	WLA(6), NWB(3)
Fabaceae (Caesalpinioideae)	<i>Senna artemisioides</i>	Silver Cassia	5	WLA(4), NWB(1)
Fabaceae (Caesalpinioideae)	<i>Petalostylis labicheoides var labicheoides</i>	Butterfly Bush	1	WLA
Fabaceae (Caesalpinioideae)	<i>Lysiphyllum gilvum</i>		1	WLA
Fabaceae (Faboideae)	<i>Trigonella suavissima</i>	Coopers Clover	61	WLA(33), NWB(1), Wombeira(27)
Fabaceae (Faboideae)	<i>Tephrosia sphaerospora</i>		5	NLNRVS(5)
Fabaceae (Faboideae)	<i>Templetonia egena</i>	Desert Broombush	1	WLA
Fabaceae (Faboideae)	<i>Swainsona swainsonioides</i>		52	WLA(45), MMVS(3), Moree(1), NLNRVS(1), Wombeira(2)
Fabaceae (Faboideae)	<i>Swainsona stipularis</i>		1	WLA
Fabaceae (Faboideae)	<i>Swainsona similis</i>		2	WLA
Fabaceae (Faboideae)	<i>Swainsona purpurea</i>		5	WLA
Fabaceae (Faboideae)	<i>Swainsona procumbens</i>	Broughton Pea	112	WLA(111), Wombeira(1)
Fabaceae (Faboideae)	<i>Swainsona phacoides</i>		10	WLA(8), NWB(1), Wombeira(1)
Fabaceae (Faboideae)	<i>Swainsona oligophylla</i>		1	WLA
Fabaceae (Faboideae)	<i>Swainsona monticola</i>		2	WLA

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Fabaceae (Faboideae)	<i>Swainsona microphylla</i>		3	WLA(2), WFS(1)
Fabaceae (Faboideae)	<i>Swainsona luteola</i>		21	WLA
Fabaceae (Faboideae)	<i>Swainsona greyana</i>	Darling Pea	33	WLA(29), NWB(4)
Fabaceae (Faboideae)	<i>Swainsona galegifolia</i>	Smooth Darling Pea	6	WLA(3), NWB(3)
Fabaceae (Faboideae)	<i>Swainsona campylantha</i>		2	WLA
Fabaceae (Faboideae)	<i>Swainsona affinis</i>		3	WLA
Fabaceae (Faboideae)	<i>Sesbania cannabina var cannabina</i>	Sesbania Pea	29	WLA(9), MMVS(13), Moree(1), Namoi(3), WFS(2), Wombeira(1)
Fabaceae (Faboideae)	<i>Rhynchosia minima</i>	Ryncho	17	WLA(4), MMVS(1), Moree(10), NWB(2)
Fabaceae (Faboideae)	<i>Ptychosema anomalum</i>		2	WLA
Fabaceae (Faboideae)	<i>Muelleranthus stipularis</i>	Sand Pea	2	WLA(1), NLNRVS(1)
Fabaceae (Faboideae)	<i>Millotia greevesii subsp glandulosa</i>		3	NLNRVS(3)
Fabaceae (Faboideae)	<i>Melilotus indicus</i>		8	MMVS(8)
Fabaceae (Faboideae)	<i>Lotus cruentus</i>	Red-flowered Lotus	32	WLA
Fabaceae (Faboideae)	<i>Kennedia procurrens</i>	Purple Running Pea	5	WLA(2), NLNRVS(3)
Fabaceae (Faboideae)	<i>Indigofera linnaei</i>	Birdsville Indigo	1	WLA
Fabaceae (Faboideae)	<i>Indigofera coronillifolia</i>		2	WLA(1), NWB(1)
Fabaceae (Faboideae)	<i>Indigofera colutea</i>	Sticky Indigo	2	WLA(1), NWB(1)
Fabaceae (Faboideae)	<i>Indigofera brevidens</i>		2	WLA
Fabaceae (Faboideae)	<i>Indigofera australis</i>		8	WLA(3), MMVS(2), NWB(3)
Fabaceae (Faboideae)	<i>Glycyrrhiza acanthocarpa</i>	Native Liquorice	27	WLA(25), NWB(2)
Fabaceae (Faboideae)	<i>Glycine tomentella</i>	Woolly Glycine	4	WLA(2), NWB(2)
Fabaceae (Faboideae)	<i>Glycine tabacina</i>		21	WLA(7), BBSPil(4), BBSSF&NR(1), BBSSF(1), Moree(1), NWB(7)
Fabaceae (Faboideae)	<i>Glycine latifolia</i>		1	Moree(1)
Fabaceae (Faboideae)	<i>Glycine clandestina</i>	Twining Glycine	29	WLA(9), MMVS(7), Moree(2), NLNRVS(3), NWB(7), Namoi(1)
Fabaceae (Faboideae)	<i>Glycine canescens</i>	Silky Glycine	21	WLA(6), BBSPil(2), BBSSF(1), NLNRVS(10), NWB(2)
Fabaceae (Faboideae)	<i>Desmodium varians</i>	Slender Tick-trefoil	1	BBSSF(1)
Fabaceae (Faboideae)	<i>Desmodium brachypodum</i>	Large Tick-trefoil	3	BBSPil(3)
Fabaceae (Faboideae)	<i>Daviesia genistifolia</i>		1	BBSpil2(1)
Fabaceae (Faboideae)	<i>Cullen tenax</i>	Emu-foot	215	WLA(166), MMVS(6), Moree(33), Namoi(1), Wombeira(9)
Fabaceae (Faboideae)	<i>Cullen patens</i>		1	WLA
Fabaceae (Faboideae)	<i>Cullen pallidum</i>		14	WLA
Fabaceae (Faboideae)	<i>Cullen cinereum</i>	Annual Verbine	6	WLA(5), MMVS(1)
Fabaceae	<i>Crotalaria dissitiflora subsp.</i>	Grey Rattlepod	3	WLA(1), Moree(2)

Family	Scientific Name	Common Name	No. Records	Dataset
(Faboideae)	<i>dissitiflora</i>			
Fabaceae (Faboideae)	<i>Bossiaea walkeri</i>	Cactus Pea	1	WLA
Fabaceae (Faboideae)	<i>Aotus mollis</i>		1	BBSpil2(1)
Fabaceae (Faboideae)	<i>Aeschynomene indica</i>	Budda Pea	1019	WLA(1002), MMVS(16), NLNRVS(1)
Fabaceae (Mimosoideae)	<i>Neptunia gracilis forma gracilis</i>	Sensitive Plant	156	WLA(105), MMVS(1), Moree(50)
Fabaceae (Mimosoideae)	<i>Acacia victoriae subsp. victoriae</i>	Prickly Wattle	24	WLA
Fabaceae (Mimosoideae)	<i>Acacia victoriae</i>	Prickly Wattle	8	WLA(6), NWB(1), Wombeira(1)
Fabaceae (Mimosoideae)	<i>Acacia triptera</i>	Spurwing Wattle	1	WLA
Fabaceae (Mimosoideae)	<i>Acacia tetragonophylla</i>	Dead Finish	1	WLA
Fabaceae (Mimosoideae)	<i>Acacia stenophylla</i>	River Cooba	279	WLA(133), MMVS(33), Moree(6), NLNRVS(5), NWB(61), Namoi(3), Wombeira(38)
Fabaceae (Mimosoideae)	<i>Acacia spectabilis</i>	Mudgee Wattle	3	WLA(1), BBSSF&NR(1), BBSpil2(1)
Fabaceae (Mimosoideae)	<i>Acacia salicina</i>	Cooba	74	WLA(38), MMVS(7), NWB(27), Namoi(2)
Fabaceae (Mimosoideae)	<i>Acacia rigens</i>	Needle Wattle	2	WLA
Fabaceae (Mimosoideae)	<i>Acacia pycnantha</i>	Golden Wattle	2	WLA(1), NWB(1)
Fabaceae (Mimosoideae)	<i>Acacia polybotrya</i>		1	BBSpil2(1)
Fabaceae (Mimosoideae)	<i>Acacia penninervis</i>	Mountain Hickory	2	WLA(1), NWB(1)
Fabaceae (Mimosoideae)	<i>Acacia pendula</i>	Boree	99	WLA(45), MMVS(8), Moree(3), NLNRVS(3), NWB(40)
Fabaceae (Mimosoideae)	<i>Acacia paradoxa</i>		1	MMVS(1)
Fabaceae (Mimosoideae)	<i>Acacia oswaldii</i>	Miljee	45	WLA(25), MMVS(7), NLNRVS(1), NWB(10), Wombeira(2)
Fabaceae (Mimosoideae)	<i>Acacia murrayana</i>		6	WLA(2), NLNRVS(2), NWB(1), Wombeira(1)
Fabaceae (Mimosoideae)	<i>Acacia loderi</i>	Nealie	8	WLA
Fabaceae (Mimosoideae)	<i>Acacia ligulata</i>	Umbrella Bush	11	WLA
Fabaceae (Mimosoideae)	<i>Acacia leptoclada</i>		2	WLA(1), NWB(1)
Fabaceae (Mimosoideae)	<i>Acacia jennerae</i>	Coonavittra Wattle	1	WLA
Fabaceae (Mimosoideae)	<i>Acacia ixiophylla</i>		1	BBSPil(1)
Fabaceae (Mimosoideae)	<i>Acacia homalophylla</i>	Yarran	13	WLA(7), BBSPil(1), NLNRVS(1), NWB(4)
Fabaceae (Mimosoideae)	<i>Acacia harpophylla</i>	Brigalow	24	WLA(13), BrigOut(2), NWB(9)
Fabaceae (Mimosoideae)	<i>Acacia hakeoides</i>	Hakea Wattle	2	WLA(1), NWB(1)
Fabaceae (Mimosoideae)	<i>Acacia flexifolia</i>		2	WLA(1), NWB(1)
Fabaceae (Mimosoideae)	<i>Acacia filicifolia</i>	Fern-leaved Wattle	8	WLA(4), NWB(4)
Fabaceae (Mimosoideae)	<i>Acacia excelsa</i>	Ironwood	34	WLA(19), MMVS(1), NLNRVS(1), NWB(13)
Fabaceae (Mimosoideae)	<i>Acacia doratoxylon</i>	Currawang	10	WLA(6), NWB(4)
Fabaceae (Mimosoideae)	<i>Acacia decora</i>	Western Golden Wattle	4	WLA(3), NWB(1)

Family	Scientific Name	Common Name	No. Records	Dataset
Fabaceae (Mimosoideae)	<i>Acacia deanei</i> subsp. <i>deanei</i>		2	WLA (1), NWB(1)
Fabaceae (Mimosoideae)	<i>Acacia deanei</i> subsp. <i>paucijuga</i>		3	BBSSF(1), BBSpil2(2)
Fabaceae (Mimosoideae)	<i>Acacia deanei</i>	Green Wattle	28	WLA(11), BBSPil(5), BBSSF&NR(1), NWB(11)
Fabaceae (Mimosoideae)	<i>Acacia coriacea</i> subsp. <i>sericophylla</i>	Wirewood	8	WLA(4), Moree(4)
Fabaceae (Mimosoideae)	<i>Acacia colletioides</i>	Wait-a-while	2	WLA(1), NWB(1)
Fabaceae (Mimosoideae)	<i>Acacia caroleae</i>		1	BBSpil2(1)
Fabaceae (Mimosoideae)	<i>Acacia cambagei</i>	Gidgee	13	WLA(6), BrigOut(1), Brigfauna(2), Wombeira(4)
Fabaceae (Mimosoideae)	<i>Acacia buxifolia</i> subsp. <i>buxifolia</i>	Box-leaved Wattle	1	WLA
Fabaceae (Mimosoideae)	<i>Acacia brachystachya</i>		4	NLNRVS(4)
Fabaceae (Mimosoideae)	<i>Acacia brachybotrya</i>	Grey Mulga	1	WLA
Fabaceae (Mimosoideae)	<i>Acacia aneura</i>	Mulga	14	WLA(10), NLNRVS(4)
Fabaceae (Mimosoideae)	<i>Acacia acuminata</i> subsp. <i>burkittii</i>	Sandhill Wattle	1	NLNRVS(1)
Zygophyllaceae	<i>Zygophyllum simile</i>		1	WLA
Zygophyllaceae	<i>Zygophyllum ovatum</i>	Dwarf Twinleaf	1	WLA
Zygophyllaceae	<i>Zygophyllum iodocarpum</i>	Violet Twinleaf	10	WLA(9), Moree(1)
Zygophyllaceae	<i>Zygophyllum glaucum</i>		21	MMVS(21)
Zygophyllaceae	<i>Zygophyllum ermaeum</i>	Climbing Twinleaf	2	WLA
Zygophyllaceae	<i>Zygophyllum aurantiacum</i>	Shrubby Twinleaf	1	WLA
Zygophyllaceae	<i>Zygophyllum apiculatum</i>	Gallweed, Pointed or Common Twinleaf	3	WLA(2), NWB(1)
Zygophyllaceae	<i>Zygophyllum ammophilum</i>	Sand Twinleaf	8	WLA(5), Wombeira(3)
Zygophyllaceae	<i>Tribulus micrococcus</i>	Yellow Vine, Spineless Caltrop	19	WLA(1), Moree(17), Namoi(1)
Nitrariaceae	<i>Nitraria billardieri</i>	Dillon Bush	4	WLA
Linaceae	<i>Linum marginale</i>	Native Flax	1	WLA
Oxalidaceae	<i>Oxalis radicata</i>		13	Moree(13)
Oxalidaceae	<i>Oxalis perennans</i>	Wood Sorrel	97	WLA(21), BBSPil(5), BBSSF(1), MMVS(1), Moree(62), NLNRVS(2), NWB(1), BBSpil2(1), Namoi(3)
Oxalidaceae	<i>Oxalis chnoodes</i>		165	Moree(13), NLNRVS(20), NWB(132)
Geraniaceae	<i>Pelargonium australe</i>	Native Storksbill	6	WLA(3), NWB(3)
Geraniaceae	<i>Geranium solanderi</i> var. <i>solanderi</i>	Native Geranium	11	WLA(3), Moree(4), NWB(4)
Geraniaceae	<i>Geranium solanderi</i>	Native Geranium	2	WLA
Geraniaceae	<i>Erodium cicutarium</i>	Common Crowfoot	9	WLA
Geraniaceae	<i>Erodium cygnorum</i> subsp. <i>glandulosum</i>		3	WLA(1), NLNRVS(2)
Geraniaceae	<i>Erodium crinitum</i>	Blue Storksbill	56	WLA(14), MMVS(32), Moree(7), NWB(2), WFS(1)
Celastraceae	<i>Maytenus cunninghamii</i>	Yellow-berry Bush	10	WLA(2), BBSPil(5), BBSSF(1), NWB(2)
Celastraceae	<i>Cassine australis</i> var. <i>angustifolia</i>	Red Olive Plum	6	WLA(3), NWB(3)
Stackhousiaceae	<i>Stackhousia viminea</i>	Slender Stackhousia	5	WLA(2), Moree(1), NWB(2)
Stackhousiaceae	<i>Stackhousia muricata</i>		4	BBSPil(2), Moree(1), BBSpil2(1)
Stackhousiaceae	<i>Stackhousia monogyna</i>	Creamy Candles	3	WLA(2), NWB(1)
Olacaceae	<i>Olax stricta</i>		2	WLA(1), NWB(1)

Family	Scientific Name	Common Name	No. Records	Dataset
Oleaceae	<i>Jasminum lineare</i>	Desert Jasmine	66	WLA(28), BBSPil(4), MMVS(7), NLNRVS(3), NWB(23), Namoi(1)
Loranthaceae	<i>Lysiana subfalcata</i>		4	WLA(2), MMVS(1), NWB(1)
Loranthaceae	<i>Lysiana murrayi</i>		1	WLA
Loranthaceae	<i>Lysiana linearifolia</i>		6	WLA(3), NWB(3)
Loranthaceae	<i>Lysiana exocarpi</i> subsp. <i>tenuis</i>		7	WLA(3), BBSSF(1), NWB(3)
Loranthaceae	<i>Lysiana exocarpi</i> subsp. <i>exocarpi</i>		8	WLA(5), NWB(3)
Loranthaceae	<i>Lysiana exocarpi</i>		28	WLA(17), NWB(11)
Loranthaceae	<i>Diplatia grandibractea</i>		6	WLA(5), Wombeira(1)
Loranthaceae	<i>Dendrophthoe glabrescens</i>		6	WLA(4), NWB(2)
Loranthaceae	<i>Amyema quandang</i> var <i>quandang</i>		7	WLA(3), MMVS(1), NWB(2), Wombeira(1)
Loranthaceae	<i>Amyema quandang</i> var <i>bancroftii</i>		3	WLA
Loranthaceae	<i>Amyema quandang</i>		16	WLA(8), NWB(8)
Loranthaceae	<i>Amyema preissii</i>		2	WLA(1), NWB(1)
Loranthaceae	<i>Amyema pendulum</i> subsp. <i>longifolium</i>		3	WLA(2), NWB(1)
Loranthaceae	<i>Amyema miraculosum</i> subsp. <i>boormanii</i>		56	WLA(36), BBSPil(4), BrigOut(1), MMVS(1), NWB(10), Wombeira(4)
Loranthaceae	<i>Amyema miquelii</i>		85	WLA(49), MMVS(6), NWB(21), BBSPil2(1), Wombeira(8)
Loranthaceae	<i>Amyema maidenii</i> subsp. <i>maidenii</i>		2	WLA(1), NWB(1)
Loranthaceae	<i>Amyema maidenii</i> subsp. <i>angustifolium</i>		1	WLA
Loranthaceae	<i>Amyema maidenii</i>		4	WLA(2), NWB(2)
Loranthaceae	<i>Amyema lucasii</i>		3	WLA(1), MMVS(2)
Loranthaceae	<i>Amyema linophyllum</i> subsp. <i>orientale</i>		12	WLA(6), BBSPil(1), BBSSF(1), NWB(4)
Loranthaceae	<i>Amyema gaudichaudii</i>		2	MMVS(2)
Loranthaceae	<i>Amyema cambagei</i>		6	WLA(2), NWB(4)
Santalaceae	<i>Santalum lanceolatum</i>	Northern Sandalwood	12	WLA(7), NLNRVS(1), NWB(4)
Santalaceae	<i>Santalum acuminatum</i>	Sweet Quandong	8	WLA(5), BBSPil(1), NWB(2)
Santalaceae	<i>Exocarpos cupressiformis</i>	Native Cherry	1	NLNRVS(1)
Santalaceae	<i>Exocarpos aphyllus</i>	Leafless Ballart	16	WLA(9), BBSPil(1), NWB(6)
Pittosporaceae	<i>Pittosporum angustifolium</i>	Butterbush	46	WLA (28), NLNRVS(2), NWB(16)
Pittosporaceae	<i>Bursaria spinosa</i>	Native Blackthorn	8	WLA(4), NWB(4)
Apiaceae	<i>Trachymene ochracea</i>	White Parsnip	10	WLA(4), NLNRVS(6)
Apiaceae	<i>Trachymene incisa</i> subsp. <i>corrugata</i>		4	WLA(2), NWB(2)
Apiaceae	<i>Platysace ericoides</i>		4	WLA(1), BBSSF&NR(1), NWB(1), BBSPil2(1)
Apiaceae	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort	1	WLA
Apiaceae	<i>Eryngium plantagineum</i>	Long Eryngium	31	WLA(16), NWB(1), Wombeira(14)
Apiaceae	<i>Eryngium paludosum</i>		3	Moree(3)
Apiaceae	<i>Daucus glochidiatus</i>	Native Carrot	90	WLA(36), BBSPil(1), MMVS(4), Moree(21), NLNRVS(9), NWB(11), WFS(3), Wombeira(5)
Apiaceae	<i>Actinotus gibbonsii</i>		9	NLNRVS(8), BBSPil2(1)
Campanulaceae	<i>Wahlenbergia tumidifructa</i>		4	WLA
Campanulaceae	<i>Wahlenbergia stricta</i> subsp. <i>stricta</i>		1	BBSPil(1)
Campanulaceae	<i>Wahlenbergia stricta</i> subsp. <i>alterna</i>		20	BBSPil(3), NLNRVS(17)
Campanulaceae	<i>Wahlenbergia stricta</i>	Tall Bluebell	73	WLA(39), NWB(5), WFS(1), Wombeira(28)
Campanulaceae	<i>Wahlenbergia queenslandica</i>		11	WLA(6), NWB(5)
Campanulaceae	<i>Wahlenbergia planiflora</i> subsp. <i>planiflora</i>		2	WLA(1), NWB(1)
Campanulaceae	<i>Wahlenbergia planiflora</i> subsp.		6	BBSPil(6)

Family	Scientific Name	Common Name	No. Records	Dataset
	<i>Longipila</i>			
Campanulaceae	<i>Wahlenbergia luteola</i>		3	WLA(1), Moree(1), NWB(1)
Campanulaceae	<i>Wahlenbergia graniticola</i>	Granite Bluebell	4	WLA(3), NLNRVS(1)
Campanulaceae	<i>Wahlenbergia gracilis</i>	Sprawling or Australian Bluebell	1	Moree(1)
Campanulaceae	<i>Wahlenbergia gracilentia</i>	Annual Bluebell	7	WLA(6), BBSSF&NR(1)
Campanulaceae	<i>Wahlenbergia fluminalis</i>	River Bluebell	36	WLA(21), Moree(2), NLNRVS(7), NWB(6)
Campanulaceae	<i>Wahlenbergia communis</i>	Tufted Bluebell	38	WLA(13), BBSPil(2), MMVS(2), Moree(13), NWB(8)
Campanulaceae	<i>Wahlenbergia aridicola</i>		2	WLA(1), NWB(1)
Lobeliaceae	<i>Pratia purpurascens</i>	Whiteroot	6	WLA(3), Wombeira(3)
Lobeliaceae	<i>Pratia darlingensis</i>	Darling Pratia	3	WLA(2), NWB(1)
Lobeliaceae	<i>Pratia concolor</i>	Poison Pratia	148	WLA(25), MMVS(87), Moree(16), NLNRVS(1), NWB(15), Wombeira(4)
Lobeliaceae	<i>Isotoma axillaris</i>	Showy Isotome	4	WLA(2), NWB(2)
Asteraceae	<i>Vittadinia triloba</i>		5	WFS(5)
Asteraceae	<i>Vittadinia sulcata</i>		17	WLA(1), BBSPil(3), BBSSF(1), Moree(5), NLNRVS(5), BBSPil2(1), Namoi(1)
Asteraceae	<i>Vittadinia pustulata</i>		1	NLNRVS(1)
Asteraceae	<i>Vittadinia pterochaeta</i>	Rough Fuzzweed	57	WLA(5), MMVS(26), Moree(21), NWB(4), BBSPil2(1)
Asteraceae	<i>Vittadinia hispidula</i>		1	NWB(1)
Asteraceae	<i>Vittadinia dissecta var hirta</i>		10	WLA(3), BBSPil(1), BBSSF(1), NWB(4), BBSPil2(1)
Asteraceae	<i>Vittadinia dissecta var dissecta</i>		1	WLA
Asteraceae	<i>Vittadinia cuneata var cuneata</i>	Fuzzweed	2	WLA(1), NWB(1)
Asteraceae	<i>Vittadinia cuneata</i>	Fuzzweed	276	WLA(255), BBSPil(2), BBSSF&NR(1), MMVS(4), Moree(7), NWB(3), WFS(1), Wombeira(3)
Asteraceae	<i>Vittadinia cervicalis var cervicalis</i>		2	BBSPil(2)
Asteraceae	<i>Vittadinia cervicalis</i>		2	NLNRVS(2)
Asteraceae	<i>Vernonia cinerea var cinerea</i>		2	BBSPil(2)
Asteraceae	<i>Triptilodiscus pygmaeus</i>		5	WLA(4), NWB(1)
Asteraceae	<i>Stuartina muelleri</i>	Spoon Cudweed	7	WLA(1), BrigOut(1), NLNRVS(5)
Asteraceae	<i>Stuartina hamata</i>	Hooked Cudweed	2	WLA
Asteraceae	<i>Solenogyne dominii</i>		4	WLA(2), NWB(2)
Asteraceae	<i>Sigesbeckia orientalis subsp. orientalis</i>	Indian Weed	4	WLA(2), NLNRVS(2)
Asteraceae	<i>Senecio runcinifolius</i>	Tall Groundsel	57	WLA(32), MMVS(6), Moree(1), NLNRVS(4), Wombeira(14)
Asteraceae	<i>Senecio quadridentatus</i>	Cotton Fireweed	75	WLA(53), MMVS(1), Moree(1), NLNRVS(3), Wombeira(17)
Asteraceae	<i>Senecio platylepis</i>		1	WLA
Asteraceae	<i>Senecio murrayanus</i>		3	WLA
Asteraceae	<i>Senecio lautus subsp. lautus</i>	Variable Groundsel	2	WLA
Asteraceae	<i>Senecio lautus subsp. dissectifolius</i>	Variable Groundsel	9	WLA(6), MMVS(3)
Asteraceae	<i>Senecio lautus</i>	Variable Groundsel	5	WLA(4), BBSPil(1)
Asteraceae	<i>Senecio hispidulus var dissectus</i>	Hill Fireweed	1	WLA
Asteraceae	<i>Senecio gregorii</i>		1	WLA
Asteraceae	<i>Senecio glossanthus</i>		27	WLA
Asteraceae	<i>Senecio daltonii</i>		1	WLA
Asteraceae	<i>Senecio cunninghamii var serratus</i>		7	WLA
Asteraceae	<i>Senecio cunninghamii</i>		6	WLA(5), MMVS(1)
Asteraceae	<i>Rutidosia helichrysoides</i>		1	WLA

Family	Scientific Name	Common Name	No. Records	Dataset
Asteraceae	<i>Rhodanthe uniflora</i>		6	WLA(5), Wombeira(1)
Asteraceae	<i>Rhodanthe stuartiana</i>		15	WLA
Asteraceae	<i>Rhodanthe stricta</i>	Slender Sunray	12	WLA(11), BrigOut(1)
Asteraceae	<i>Rhodanthe pygmaea</i>	Pigmy Sunray	2	WLA
Asteraceae	<i>Rhodanthe moschata</i>		29	WLA(8), NLNRVS(16), NWB(1), WFS(2), Wombeira(2)
Asteraceae	<i>Rhodanthe floribunda</i>		67	WLA(38), BrigOut(1), NLNRVS(5), NWB(1), WFS(3), Wombeira(19)
Asteraceae	<i>Rhodanthe diffusa</i>	Ascending Sunray	8	WLA(4), Wombeira(4)
Asteraceae	<i>Rhodanthe corymbiflora</i>	Small White Sunray	27	WLA
Asteraceae	<i>Pycnosorus pleiocephalus</i>		15	WLA(13), NWB(2)
Asteraceae	<i>Pycnosorus globosus</i>		41	WLA(13), Moree(14), NWB(14)
Asteraceae	<i>Pycnosorus chrysanthes</i>		16	WLA(9), NWB(1), Wombeira(6)
Asteraceae	<i>Pterocaulon sphacelatum</i>	Applebush	2	WLA
Asteraceae	<i>Pseudognaphalium luteoalbum</i>	Jersey Cudweed	173	WLA (146), BBSPil(1), Moree(5), NLNRVS(1), NWB(1), WFS(1), Wombeira(18)
Asteraceae	<i>Polycalymma stuartii</i>	Poached Eggs	1	Wombeira(1)
Asteraceae	<i>Podolepis longipedata</i>	Tall Copper-wire Daisy	10	WLA(5), NWB(1), Wombeira(4)
Asteraceae	<i>Podolepis jaceoides</i>	Showy Copper-wire Daisy	30	WLA(14), NLNRVS(10), Wombeira(6)
Asteraceae	<i>Podolepis canescens</i>	Large Copper-wire Daisy	4	WLA(3), Wombeira(1)
Asteraceae	<i>Pluchea dentex</i>		11	Moree(8), NLNRVS(3)
Asteraceae	<i>Pluchea baccharoides</i>	Narrow-leaved Plains-bush	1	WLA
Asteraceae	<i>Picris squarrosa</i>		1	WLA
Asteraceae	<i>Olearia viscidula</i>	Wallaby Weed	2	WLA(1), NWB(1)
Asteraceae	<i>Olearia pimeleoides</i>		8	WLA(7), BBSPil(1)
Asteraceae	<i>Olearia muelleri</i>		1	WLA
Asteraceae	<i>Olearia decurrens</i>		2	WLA(1), NWB(1)
Asteraceae	<i>Myriocephalus stuartii</i>	Poached Eggs	57	WLA
Asteraceae	<i>Myriocephalus rhizocephalus</i>	Woolly-heads	4	WLA(3), BrigOut(1)
Asteraceae	<i>Minuria leptophylla</i>		16	WLA(15), MMVS(1)
Asteraceae	<i>Minuria integerrima</i>		84	WLA(42), MMVS(7), NLNRVS(1), NWB(10), Wombeira(24)
Asteraceae	<i>Minuria denticulata</i>		5	WLA(3), MMVS(1), NWB(1)
Asteraceae	<i>Minuria cunninghamii</i>		10	WLA(8), MMVS(2)
Asteraceae	<i>Minuria annua</i>		1	WLA
Asteraceae	<i>Leucochrysum molle</i>	Hoary Sunray	2	WLA(1), NWB(1)
Asteraceae	<i>Leucochrysum albicans</i>		1	WLA
Asteraceae	<i>Leptorhynchos panaetioides</i>	Woolly Buttons	14	WLA(5), Moree(8), Wombeira(1)
Asteraceae	<i>Ixiolaena tomentosa</i>	Woolly Ixiolaena	26	WLA(15), NWB(10), Wombeira(1)
Asteraceae	<i>Ixiolaena leptolepis</i>		27	WLA(17), Moree(1), NWB(6), Wombeira(3)
Asteraceae	<i>Ixiolaena brevicompta</i>		113	WLA(49), Moree(19), NLNRVS(5), NWB(8), Wombeira(32)
Asteraceae	<i>Isoetopsis graminifolia</i>	Grass Cushion	6	WLA(4), MMVS(2)
Asteraceae	<i>Hyalosperma semisterile</i>		3	WLA
Asteraceae	<i>Hyalosperma glutinosum subsp. glutinosum</i>		1	WLA
Asteraceae	<i>Helichrysum semifertile</i>	Dainty Everlasting	5	WLA(2), BrigOut(1), Moree(2)
Asteraceae	<i>Gnephosis tenuissima</i>		2	WLA(1), MMVS(1)

Family	Scientific Name	Common Name	No. Records	Dataset
Asteraceae	<i>Gnephosis arachnoidea</i>		8	WLA(7), Wombeira(1)
Asteraceae	<i>Glossogyne tannensis</i>	Cobbler's Tack	22	WLA(10), BBSPil(1), BBSSF(1), MMVS(1), Moree(1), NLNRVS(7), WFS(1)
Asteraceae	<i>Flaveria australasica</i>	Speedy Weed	32	WLA(8), Moree(16), Wombeira(8)
Asteraceae	<i>Euchiton sphaericus</i>		122	WLA(53), Moree(17), NLNRVS(6), NWB(3), WFS(1), Wombeira(42)
Asteraceae	<i>Euchiton involucratus</i>	Star Cudweed	3	WLA
Asteraceae	<i>Euchiton gymnocephalus</i>	Creeping Cudweed	1	BBSSF&NR(1)
Asteraceae	<i>Eriochlamys species A</i>		12	NLNRVS(12)
Asteraceae	<i>Eriochlamys behrii</i>	Woolly Mantle	5	WLA
Asteraceae	<i>Epaltes cunninghamii</i>	Tall Nut-heads	27	WLA(14), Wombeira(13)
Asteraceae	<i>Epaltes australis</i>	Spreading Nut-heads	27	WLA(25), BBSPil(1), Wombeira(1)
Asteraceae	<i>Eclipta platyglossa</i>		129	WLA(30), MMVS(97), Namoi(1), Wombeira(1)
Asteraceae	<i>Cymbonotus lawsonianus</i>	Bear's Ear	2	WLA(1), NWB(1)
Asteraceae	<i>Craspedia variabilis</i>		3	WLA
Asteraceae	<i>Craspedia haplorrhiza</i>		3	WLA(2), Moree(1)
Asteraceae	<i>Cotula australis</i>	Common Cotula	14	WLA(2), MMVS(9), Moree(3)
Asteraceae	<i>Chthonocephalus pseudevax</i>	Ground-heads	7	WLA(3), NLNRVS(4)
Asteraceae	<i>Chrysocephalum semipapposum</i>	Clustered Everlasting	1	Moree(1)
Asteraceae	<i>Chrysocephalum semicalvum subsp. semicalvum</i>	Hill Everlasting	22	WLA(1), Moree(21)
Asteraceae	<i>Chrysocephalum apiculatum</i>	Common Everlasting	134	WLA(115), BBSPil(1), NLNRVS(9), NWB(8), WFS(1)
Asteraceae	<i>Centipeda thespidioides</i>	Desert Sneezeweed	30	WLA(18), BrigOut(1), Moree(4), NWB(1), Wombeira(6)
Asteraceae	<i>Centipeda minima var minima</i>	Spreading Sneezeweed	1000	WLA
Asteraceae	<i>Centipeda minima var lanuginosa</i>		5	Moree(3), NLNRVS(2)
Asteraceae	<i>Centipeda minima</i>	Spreading Sneezeweed	57	WLA(14), MMVS(32), Wombeira(11)
Asteraceae	<i>Centipeda cunninghamii</i>	Common Sneezeweed	63	WLA(43), BrigOut(1), NLNRVS(6), WFS(6), Wombeira(7)
Asteraceae	<i>Cassinia quinquefaria</i>		1	WLA
Asteraceae	<i>Cassinia laevis</i>	Cough Bush	1	WLA
Asteraceae	<i>Calotis scapigera</i>	Tufted Burr-daisy	119	WLA(67), MMVS(10), Moree(19), NLNRVS(9), NWB(10), Namoi(1), Wombeira(3)
Asteraceae	<i>Calotis scabiosifolia var scabiosifolia</i>	Rough Burr-daisy	60	WLA(23), MMVS(5), Moree(29), NWB(3)
Asteraceae	<i>Calotis scabiosifolia var integrifolia</i>	Rough Burr-daisy	2	WLA(1), NWB(1)
Asteraceae	<i>Calotis scabiosifolia</i>	Rough Burr-daisy	18	WLA(12), NWB(2), Wombeira(4)
Asteraceae	<i>Calotis plumulifera</i>	Woolly-headed Burr-daisy	2	WLA
Asteraceae	<i>Calotis latiuscula</i>		1	WLA
Asteraceae	<i>Calotis lappulacea</i>	Yellow Burr-daisy	1079	WLA(1033), BBSPil(5), BBSSF(1), Moree(2), NLNRVS(8), NWB(29), BBSPil2(1)
Asteraceae	<i>Calotis hispidula</i>	Bogan Flea	39	WLA(17), MMVS(15), Moree(4), WFS(1), Wombeira(2)
Asteraceae	<i>Calotis erinacea</i>	Tangled Burr-daisy	23	WLA
Asteraceae	<i>Calotis cymbacantha</i>	Showy Burr-daisy	14	WLA(10), WFS(3), Wombeira(1)
Asteraceae	<i>Calotis cuneifolia</i>	Purple Burr-Daisy	59	WLA(15), BBSPil(6), BBSSF&NR(1), BBSSF(1), NLNRVS(21), NWB(10), BBSPil2(2), WFS(3)

Family	Scientific Name	Common Name	No. Records	Dataset
Asteraceae	<i>Calotis cuneata var cuneata</i>	Mountain Burr-Daisy	19	WLA(8), Moree(3), NWB(8)
Asteraceae	<i>Calotis cuneata</i>	Mountain Burr-Daisy	3	WLA(1), NWB(1), WFS(1)
Asteraceae	<i>Calocephalus sonderi</i>	Pale Beauty-heads	5	WLA(3), NLNRVS(2)
Asteraceae	<i>Calendula arvensis</i>	Field Marigold	13	WLA
Asteraceae	<i>Bracteantha viscosa</i>	Sticky Everlasting	1	BBSSF&NR(1)
Asteraceae	<i>Bracteantha bracteata</i>	Golden Everlasting	11	WLA(3), BBSPil(1), MMVS(1), NLNRVS(3), Wombeira(3)
Asteraceae	<i>Brachyscome whitei</i>	Spreading Daisy	11	WLA(5), MMVS(3), NWB(3)
Asteraceae	<i>Brachyscome trachycarpa</i>		3	Moree(3)
Asteraceae	<i>Brachyscome smithwhitei</i>		5	WLA(3), NWB(2)
Asteraceae	<i>Brachyscome scapigera</i>		1	NLNRVS(1)
Asteraceae	<i>Brachyscome multifida var multifida</i>		4	BBSPil(4)
Asteraceae	<i>Brachyscome multifida</i>		3	Moree(3)
Asteraceae	<i>Brachyscome microcarpa</i>		2	Moree(2)
Asteraceae	<i>Brachyscome melanocarpa</i>	Black-seeded Daisy	17	WLA(9), Moree(6), Wombeira(2)
Asteraceae	<i>Brachyscome lineariloba</i>	Hard-headed Daisy	17	WLA(16), MMVS(1)
Asteraceae	<i>Brachyscome leptocarpa</i>		1	MMVS(1)
Asteraceae	<i>Brachyscome heterodonta var heterodonta</i>		26	Moree(26)
Asteraceae	<i>Brachyscome heterodonta</i>		153	WLA(120), MMVS(22), NWB(11)
Asteraceae	<i>Brachyscome gracilis</i>		1	Moree(1)
Asteraceae	<i>Brachyscome goniocarpa</i>		1	NLNRVS(1)
Asteraceae	<i>Brachyscome debilis</i>		9	MMVS(9)
Asteraceae	<i>Brachyscome curvicarpa</i>		21	WLA(15), NWB(5), Wombeira(1)
Asteraceae	<i>Brachyscome ciliocarpa</i>	Showy Daisy	1	WLA
Asteraceae	<i>Brachyscome ciliaris var subintegrifolia</i>	Variable Daisy	2	WLA(1), NWB(1)
Asteraceae	<i>Brachyscome ciliaris var ciliaris</i>	Variable Daisy	8	WLA(3), NLNRVS(4), NWB(1)
Asteraceae	<i>Brachyscome ciliaris</i>	Variable Daisy	34	WLA(30), NWB(3), Wombeira(1)
Asteraceae	<i>Brachyscome basaltica var gracilis</i>	Swamp Daisy	15	WLA(6), MMVS(5), Wombeira(4)
Asteraceae	<i>Brachyscome angustifolia var heterophylla</i>		3	NWB(3)
Asteraceae	<i>Brachyscome angustifolia var angustifolia</i>		3	WLA
Asteraceae	<i>Angianthus brachypappus</i>	Spreading Cup-flower	17	WLA(1), NLNRVS(16)
Asteraceae	<i>Anemocarpa podolepidium</i>	Rock Everlasting	1	WLA
Asteraceae	<i>Actinobole uliginosum</i>	Flannel Cudweed	16	WLA(8), NLNRVS(8)
Solanaceae	<i>Solanum tetrathecum</i>		4	BBSPil(3), BBSpil2(1)
Solanaceae	<i>Solanum sturtianum</i>	Thargomindah Nightshade	18	WLA(1), Moree(14), NLNRVS(2), NWB(1)
Solanaceae	<i>Solanum parvifolium</i>		18	WLA(9), NWB(9)
Solanaceae	<i>Solanum lacunarium</i>	Lagoon Nightshade	1	WLA
Solanaceae	<i>Solanum ferocissimum</i>		18	WLA(8), BBSSF(1), NLNRVS(3), NWB(6)
Solanaceae	<i>Solanum esuriale</i>	Quena	469	WLA(248), MMVS(94), Moree(86), NWB(34), Namoi(1), WFS(4), Wombeira(2)
Solanaceae	<i>Solanum coactiliferum</i>	Western Nightshade	5	WLA(3), NWB(2)
Solanaceae	<i>Solanum cleistogamum</i>		1	NLNRVS(1)
Solanaceae	<i>Nicotiana velutina</i>		48	WLA(38), MMVS(5), Wombeira(5)
Solanaceae	<i>Nicotiana simulans</i>		13	MMVS(1), Moree(1), NLNRVS(11)
Solanaceae	<i>Nicotiana megalosiphon subsp. megalosiphon</i>		9	WLA(6), Moree(2), NWB(1)

Family	Scientific Name	Common Name	No. Records	Dataset
Solanaceae	<i>Lycium australe</i>	Australian Boxthorn	3	WLA(2), NWB(1)
Convolvulaceae	<i>Polymeria pusilla</i>		119	WLA(100), Moree(19)
Convolvulaceae	<i>Polymeria longifolia</i>		18	WLA(1), Moree(17)
Convolvulaceae	<i>Ipomoea lonchophylla</i>		25	WLA(10), Moree(15)
Convolvulaceae	<i>Evolvulus alsinoides var decumbens</i>		14	WLA(4), BBSPil(4), BBSSF(1), MMVS(1), NWB(4)
Convolvulaceae	<i>Evolvulus alsinoides</i>		13	WLA(3), NLNRVS(6), NWB(2), BBSpil2(1), Wombeira(1)
Convolvulaceae	<i>Dichondra species A</i>		5	BBSPil(3), BBSSF(1), BBSpil2(1)
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	35	WLA(11), MMVS(4), Moree(8), NWB(11), Namoi(1)
Convolvulaceae	<i>Cuscuta victoriana</i>		11	MMVS(11)
Convolvulaceae	<i>Convolvulus remotus</i>		1	Moree(1)
Convolvulaceae	<i>Convolvulus erubescens</i>		177	WLA(43), MMVS(62), Moree(61), NLNRVS(7), NWB(2), Namoi(1), WFS(1)
Boraginaceae	<i>Plagiobothrys plurisepalus</i>		4	WLA
Boraginaceae	<i>Plagiobothrys plurisepaleus</i>		1	MMVS(1)
Boraginaceae	<i>Plagiobothrys elachanthus</i>		1	WLA
Boraginaceae	<i>Omphalolappula concava</i>	Burr Stickseed	3	WLA
Boraginaceae	<i>Ehretia membranifolia</i>	Peach Bush	15	WLA(8), NWB(7)
Boraginaceae	<i>Cynoglossum australe</i>		19	WLA(5), BBSPil(2), MMVS(2), NLNRVS(7), NWB(2), Wombeira(1)
Epacridaceae	<i>Styphelia triflora</i>		2	WLA(1), NWB(1)
Epacridaceae	<i>Melichrus urceolatus</i>	Urn Heath	5	WLA(2), NWB(2), BBSpil2(1)
Epacridaceae	<i>Melichrus erubescens</i>	Ruby Urn Heath	2	WLA(1), NWB(1)
Epacridaceae	<i>Leucopogon muticus</i>		1	BBSpil2(1)
Epacridaceae	<i>Leucopogon attenuatus</i>		1	BBSSF&NR(1)
Epacridaceae	<i>Brachyloma daphnoides</i>		4	WLA(1), BBSSF&NR(1), NWB(1), BBSpil2(1)
Epacridaceae	<i>Astroloma humifusum</i>		1	BBSSF&NR(1)
Sambucaceae	<i>Sambucus gaudichaudiana</i>	White Elderberry	2	WLA(1), NWB(1)
Goodeniaceae	<i>Velleia paradoxa</i>		1	MMVS(1)
Goodeniaceae	<i>Velleia arguta</i>		9	NLNRVS(9)
Goodeniaceae	<i>Scaevola spinescens</i>		14	WLA(10), NWB(4)
Goodeniaceae	<i>Scaevola humilis</i>		1	BBSPil(1)
Goodeniaceae	<i>Goodenia willisiana</i>		1	WLA
Goodeniaceae	<i>Goodenia pusilliflora</i>		1	WLA
Goodeniaceae	<i>Goodenia pinnatifida</i>		6	WLA
Goodeniaceae	<i>Goodenia lunata</i>		2	MMVS(2)
Goodeniaceae	<i>Goodenia heteromera</i>		17	WLA
Goodeniaceae	<i>Goodenia hederacea subsp. hederacea</i>		7	NLNRVS(7)
Goodeniaceae	<i>Goodenia hederacea</i>		5	MMVS(5)
Goodeniaceae	<i>Goodenia glauca</i>		74	WLA(27), MMVS(26), NLNRVS(3), Wombeira(18)
Goodeniaceae	<i>Goodenia glabra</i>		7	WLA(2), BBSPil(3), NWB(1), Namoi(1)
Goodeniaceae	<i>Goodenia fascicularis</i>		263	WLA(153), MMVS(16), Moree(44), NWB(45), Wombeira(5)
Goodeniaceae	<i>Goodenia delicata</i>		1	NLNRVS(1)
Goodeniaceae	<i>Goodenia cycloptera</i>		20	WLA(10), BBSPil(4), BBSSF(1), MMVS(1), NWB(4)
Goodeniaceae	<i>Dampiera lanceolata var lanceolata</i>		2	WLA
Goodeniaceae	<i>Brunonia australis</i>		8	NLNRVS(8)
Loganiaceae	<i>Logania albiflora</i>		2	WLA(1), NWB(1)

Family	Scientific Name	Common Name	No. Records	Dataset
Rubiaceae	<i>Synaptantha tillaeacea</i>		2	WLA(1), NLNRVS(1)
Rubiaceae	<i>Pomax umbellata</i>		1	BBSpil2(1)
Rubiaceae	<i>Opercularia diphylla</i>		1	BBSpil2(1)
Rubiaceae	<i>Galium gaudichaudii</i>	Rough Bedstraw	6	WLA(3), NWB(3)
Rubiaceae	<i>Coprosma hirtella</i>		3	WLA
Rubiaceae	<i>Canthium oleifolium</i>	Wild Lemon	32	WLA(16), BBSPil(1), BBSSF(1), MMVS(1), NLNRVS(2), NWB(11)
Rubiaceae	<i>Canthium odoratum</i>	Shiny-leaved Canthium	4	WLA(2), NWB(2)
Rubiaceae	<i>Canthium latifolium</i>	Native Currant	2	WLA(1), NWB(1)
Rubiaceae	<i>Asperula gemella</i>	Twin-leaved Bedstraw	46	WLA(23), Wombeira(23)
Rubiaceae	<i>Asperula cunninghamii</i>	Twining Woodruff	2	WLA(1), NWB(1)
Rubiaceae	<i>Asperula conferta</i>	Common Woodruff	141	WLA(114), Moree(15), NWB(12)
Menyanthaceae	<i>Nymphoides spinulosperma</i>		2	RBG
Menyanthaceae	<i>Nymphoides crenata</i>		4	MMVS(4)
Gentianaceae	<i>Centaurium spicatum</i>	Spike Centaury	90	WLA (50), Moree(9), NLNRVS(4), Wombeira(27)
Apocynaceae	<i>Parsonsia lanceolata</i>		8	WLA(4), NWB(4)
Apocynaceae	<i>Parsonsia eucalyptophylla</i>	Gargaloo	41	WLA(19), BBSPil(2), BBSSF(1), NLNRVS(4), NWB(14), WFS(1)
Apocynaceae	<i>Carissa ovata</i>	Currant Bush	7	WLA(4), NWB(3)
Apocynaceae	<i>Alstonia constricta</i>	Quinine Bush	74	WLA(37), MMVS(2), NLNRVS(4), NWB(29), WFS(2)
Asclepiadaceae	<i>Marsdenia australis</i>	Doubah	12	WLA(6), Brigfauna(1), MMVS(1), NWB(4)
Bignoniaceae	<i>Pandorea pandorana</i>	Wonga Wonga Vine	8	WLA(4), MMVS(2), NWB(2)
Myoporaceae	<i>Myoporum platycarpum</i>	Sugarwood	25	WLA(12), BBSSF&NR(1), MMVS(11), NWB(1)
Myoporaceae	<i>Myoporum montanum</i>	Western Boobialla	49	WLA(21), BBSPil(6), BBSSF(1), MMVS(4), Moree(1), NWB(15), Wombeira(1)
Myoporaceae	<i>Eremophila sturtii</i>	Turpentine Bush	34	WLA
Myoporaceae	<i>Eremophila polyclada</i>	Flowering Lignum	6	WLA(5), NWB(1)
Myoporaceae	<i>Eremophila mitchellii</i>	Budda	292	WLA(132), BBSPil(2), BrigOut(2), Brigfauna(1), MMVS(8), NLNRVS(8), NWB(126), WFS(13)
Myoporaceae	<i>Eremophila maculata</i>	Spotted Fuchsia	50	WLA(30), Moree(3), NWB(16), WFS(1)
Myoporaceae	<i>Eremophila longifolia</i>	Emubush	69	WLA(33), BBSPil(6), BBSSF(1), MMVS(1), NLNRVS(1), NWB(26), WFS(1)
Myoporaceae	<i>Eremophila glabra</i>	Tar Bush	4	WLA(3), NWB(1)
Myoporaceae	<i>Eremophila divaricata</i>	Spreading Emubush	3	WLA
Myoporaceae	<i>Eremophila deserti</i>	Turkeybush	17	WLA(10), MMVS(1), NWB(6)
Myoporaceae	<i>Eremophila debilis</i>	Amulla	36	WLA(22), MMVS(3), NWB(11)
Myoporaceae	<i>Eremophila bowmanii</i>	Silver Turkeybush	1	WLA
Myoporaceae	<i>Eremophila bignoniiflora</i>	Eurah	129	WLA(64), Moree(6), NLNRVS(4), NWB(24), WFS(3), Wombeira(28)
Scrophulariaceae	<i>Veronica plebeia</i>	Trailing Speedwell	2	WLA(1), NWB(1)
Scrophulariaceae	<i>Stemodia glabella</i>		5	WLA(1), Moree(4)
Scrophulariaceae	<i>Stemodia florulenta</i>	Bluerod	33	WLA(31), Moree(2)
Scrophulariaceae	<i>Misopates orontium</i>	Lesser Snapdragon	2	WLA
Scrophulariaceae	<i>Mimulus repens</i>	Creeping Monkey-flower	8	WLA(4), NWB(4)
Scrophulariaceae	<i>Mimulus prostratus</i>	Small Monkey-flower	8	WLA(5), NWB(3)

Family	Scientific Name	Common Name	No. Records	Dataset
Scrophulariaceae	<i>Mimulus gracilis</i>	Slender Monkey-flower	253	WLA(226), MMVS(5), Moree(1), NWB(8), Namoi(1), Wombeira(12)
Scrophulariaceae	<i>Limosella curdieana</i>	Large Mudwort	1	WLA
Scrophulariaceae	<i>Limosella australis</i>	Australian Mudwort	4	WLA(3), NLNRVS(1)
Scrophulariaceae	<i>Glossostigma diandrum</i>		1	NLNRVS(1)
Scrophulariaceae	<i>Euphrasia collina subsp. paludosa</i>		2	Moree(2)
Plantaginaceae	<i>Plantago varia</i>		16	WLA(3), NLNRVS(13)
Plantaginaceae	<i>Plantago turrifera</i>		27	WLA(25), MMVS(1), NWB(1)
Plantaginaceae	<i>Plantago drummondii</i>		39	WLA(28), Moree(3), NWB(2), WFS(5), Wombeira(1)
Plantaginaceae	<i>Plantago debilis</i>		4	WLA(1), Moree(2), Namoi(1)
Plantaginaceae	<i>Plantago cunninghamii</i>		117	WLA(61), MMVS(1), Moree(14), NWB(18), Wombeira(23)
Acanthaceae	<i>Rostellularia adscendens subsp. adscendens var pogonanthera</i>		1000	WLA
Acanthaceae	<i>Rostellularia adscendens subsp. adscendens var adscendens</i>		1	BBSSF(1)
Acanthaceae	<i>Rostellularia adscendens subsp. adscendens</i>		50	WLA(23), BBSPil(2), Moree(2), NLNRVS(1), NWB(22)
Acanthaceae	<i>Pseuderanthemum variabile</i>	Pastel Flower	4	BBSPil(3), BBSpil2(1)
Acanthaceae	<i>Brunoniella australis</i>	Blue Trumpet	125	WLA(111), BBSSF(1), NLNRVS(2), NWB(11)
Chloanthaceae	<i>Spartothamnella puberula</i>		1	BBSPil(1)
Callitrichaceae	<i>Callitriche sonderi</i>		1	WLA
Lamiaceae	<i>Teucrium racemosum</i>	Grey Germander	56	WLA(39), Brigfauna(1), MMVS(6), Moree(2), NLNRVS(3), NWB(2), Wombeira(3)
Lamiaceae	<i>Prostanthera nivea</i>		2	Moree(2)
Lamiaceae	<i>Plectranthus parviflorus</i>		2	WLA(1), NWB(1)
Lamiaceae	<i>Mentha satureioides</i>	Native Pennyroyal	2	WLA(1), NWB(1)
Lamiaceae	<i>Mentha diemenica</i>	Slender Mint	2	WLA(1), Moree(1)
Lamiaceae	<i>Mentha australis</i>	River Mint	14	WLA(12), MMVS(1), Wombeira(1)
Lamiaceae	<i>Lycopus australis</i>	Australian Gypsywort	1	NLNRVS(1)
Lamiaceae	<i>Ajuga australis</i>	Austral Bugle	7	WLA(3), NLNRVS(1), NWB(3)
Hydrocharitaceae	<i>Vallisneria gigantea</i>	Eelweed	5	WLA(4), NWB(1)
Alismataceae	<i>Damasonium minus</i>	Starfruit	14	WLA(1), MMVS(12), Wombeira(1)
Juncaginaceae	<i>Triglochin procerum</i>	Water Ribbons	3	MMVS(3)
Juncaginaceae	<i>Triglochin calcitrapum</i>	Spurred Arrowgrass	2	WLA
Potamogetonaceae	<i>Potamogeton tricarinatus</i>	Floating Pondweed	2	WLA
Potamogetonaceae	<i>Potamogeton crispus</i>	Curly Pondweed	3	WLA
Lemnaceae	<i>Lemna disperma</i>		106	WLA(101), MMVS(1), NLNRVS(4)
Luzuriagaceae	<i>Eustrephus latifolius</i>	Wombat Berry	2	WLA(1), NWB(1)
Lomandraceae	<i>Lomandra multiflora subsp. multiflora</i>	Many-flowered Mat Rush	12	WLA(2), BBSPil(4), BBSSF&NR(1), BBSSF(1), NWB(2), BBSpil2(2)
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	10	WLA(5), NWB(5)
Lomandraceae	<i>Lomandra leucocephala subsp. robusta</i>	Woolly Mat-rush	1	WLA
Lomandraceae	<i>Lomandra leucocephala subsp. leucocephala</i>	Woolly Mat-rush	5	WLA
Lomandraceae	<i>Lomandra leucocephala</i>	Woolly Mat-rush	2	WLA(1), NWB(1)
Lomandraceae	<i>Lomandra filiformis</i>	Wattle Matt-rush	4	WLA(1), BBSSF&NR(1), NWB(1), BBSpil2(1)
Hypoxidaceae	<i>Hypoxis glabella var glabella</i>		3	MMVS(3)
Phormiaceae	<i>Dianella sp. aff. revoluta 'Pilliga'</i>		1	BBSpil2(1)

Family	Scientific Name	Common Name	No. Records	Dataset
Phormiaceae	<i>Dianella revoluta</i> var <i>vinosa</i>		4	BBSPil(4)
Phormiaceae	<i>Dianella revoluta</i>		9	WLA(3), MMVS(2), NLNRVS(1), NWB(3)
Phormiaceae	<i>Dianella longifolia</i> var <i>longifolia</i>		12	WLA(7), NLNRVS(1), NWB(4)
Phormiaceae	<i>Dianella longifolia</i>		2	BBSPil(1), BBSSF(1)
Phormiaceae	<i>Dianella 'admixta'</i>		1	BBSpil2(1)
Asphodelaceae	<i>Bulbine semibarbata</i>	Wild Onion	68	WLA(32), Moree(3), NLNRVS(13), NWB(16), WFS(3), Wombeira(1)
Asphodelaceae	<i>Bulbine bulbosa</i>	Bulbine Lily	18	WLA(14), NWB(1), Wombeira(3)
Asphodelaceae	<i>Bulbine alata</i>	Native Leek	1	WLA
Anthericaceae	<i>Tricoryne elatior</i>	Yellow Autumn-lily	5	WLA(2), NWB(2), WFS(1)
Anthericaceae	<i>Thysanotus tuberosus</i> subsp. <i>tuberosus</i>		1	BBSPil(1)
Anthericaceae	<i>Thysanotus baueri</i>		2	WLA
Anthericaceae	<i>Laxmannia gracilis</i>		3	BBSPil(2), BBSSF(1)
Anthericaceae	<i>Dichopogon strictus</i>	Chocolate Lily	2	WLA(1), NWB(1)
Anthericaceae	<i>Caesia calliantha</i>		1	Moree(1)
Anthericaceae	<i>Arthropodium minus</i>		5	NLNRVS(5)
Amaryllidaceae	<i>Crinum flaccidum</i>	Darling Lily	62	WLA(35), MMVS(7), Moree(1), NLNRVS(2), NWB(15), Namoi(1), Wombeira(1)
Amaryllidaceae	<i>Calostemma purpureum</i>	Garland Lily	30	WLA(16), NWB(13), Namoi(1)
Pontederiaceae	<i>Monochoria cyanea</i>		3	WLA(2), NWB(1)
Philydraceae	<i>Philydrum lanuginosum</i>	Frogsmouth	20	WLA
Typhaceae	<i>Typha orientalis</i>	Broad-leaved Cumbungi	501	WLA
Typhaceae	<i>Typha domingensis</i>	Narrow-leaved Cumbungi	67	WLA(16), MMVS(40), NWB(11)
Commelinaceae	<i>Commelina ensifolia</i>		2	Moree(2)
Commelinaceae	<i>Commelina cyanea</i>		18	WLA(6), BBSPil(3), BBSSF(1), NLNRVS(2), NWB(4), Namoi(2)
Juncaceae	<i>Juncus usitatus</i>		22	WLA(14), NWB(2), Wombeira(6)
Juncaceae	<i>Juncus subsecundus</i>		10	BBSPil(2), MMVS(1), Moree(7)
Juncaceae	<i>Juncus radula</i>		2	MMVS(2)
Juncaceae	<i>Juncus ochrocoleus</i>		4	WLA(2), NWB(2)
Juncaceae	<i>Juncus flavidus</i>		5	WLA(1), NLNRVS(3), NWB(1)
Juncaceae	<i>Juncus filicaulis</i>		2	BBSPil(2)
Juncaceae	<i>Juncus continuus</i>		4	WLA(2), NWB(2)
Juncaceae	<i>Juncus aridicola</i>		64	WLA(27), MMVS(8), Moree(2), NWB(11), Wombeira(16)
Juncaceae	<i>Juncus amabilis</i>		17	MMVS(17)
Cyperaceae	<i>Scleria mackaviensis</i>		2	BBSPil(2)
Cyperaceae	<i>Schoenus ericetorum</i>		1	BBSpil2(1)
Cyperaceae	<i>Schoenoplectus validus</i>		2	MMVS(1), Namoi(1)
Cyperaceae	<i>Gahnia aspera</i>		1	BBSpil2(1)
Cyperaceae	<i>Fimbristylis dichotoma</i>		23	WLA(1), BBSPil(1), Moree(5), NLNRVS(15), NWB(1)
Cyperaceae	<i>Eleocharis sphacelata</i>	Tall Spike Rush	152	WLA(102), MMVS(48), NWB(2)
Cyperaceae	<i>Eleocharis pusilla</i>		27	WLA(9), MMVS(8), NLNRVS(2), NWB(7), Wombeira(1)
Cyperaceae	<i>Eleocharis plana</i>		1119	WLA(1033), MMVS(43), Moree(8), NLNRVS(9), NWB(18), Wombeira(8)
Cyperaceae	<i>Eleocharis pallens</i>		126	WLA(45), MMVS(22), Moree(17), NWB(15), Wombeira(27)
Cyperaceae	<i>Eleocharis acuta</i>		2	WLA

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Cyperaceae	<i>Cyperus victoriensis</i>		4	MMVS(1), Moree(3)
Cyperaceae	<i>Cyperus subulatus</i>		2	WLA(1), Namoi(1)
Cyperaceae	<i>Cyperus squarrosus</i>		1	WLA
Cyperaceae	<i>Cyperus pygmaeus</i>		14	WLA(8), MMVS(4), Wombeira(2)
Cyperaceae	<i>Cyperus polystachyos</i>		2	WLA
Cyperaceae	<i>Cyperus lucidus</i>		5	WLA(1), Moree(3), NWB(1)
Cyperaceae	<i>Cyperus iria</i>		2	WLA(1), NWB(1)
Cyperaceae	<i>Cyperus involucratus</i>		1	MMVS(1)
Cyperaceae	<i>Cyperus gymnocaulos</i>		29	WLA(22), NLNRVS(3), NWB(2), Namoi(2)
Cyperaceae	<i>Cyperus gracilis</i>		7	BBSPil(5), BBSSF(1), BBSpil2(1)
Cyperaceae	<i>Cyperus fulvus</i>		7	WLA(1), BBSPil(5), BBSpil2(1)
Cyperaceae	<i>Cyperus flaccidus</i>		1002	WLA(1000), NLNRVS(2)
Cyperaceae	<i>Cyperus exaltatus</i>		28	WLA(15), MMVS(2), NWB(3), Namoi(2), Wombeira(6)
Cyperaceae	<i>Cyperus difformis</i>	Dirty Dora	1030	WLA(1002), MMVS(26), NLNRVS(1), NWB(1)
Cyperaceae	<i>Cyperus dactyloides</i>		2	MMVS(2)
Cyperaceae	<i>Cyperus concinnus</i>		77	WLA(28), MMVS(1), Moree(20), Wombeira(28)
Cyperaceae	<i>Cyperus bifax</i>		100	WLA(2), MMVS(37), Moree(59), NLNRVS(2)
Cyperaceae	<i>Carex inversa</i>	Knob Sedge	49	WLA(19), MMVS(10), Moree(1), NWB(17), BBSpil2(1), Namoi(1)
Cyperaceae	<i>Carex appressa</i>		5	WLA(3), NWB(2)
Cyperaceae	<i>Bulbostylis barbata</i>		4	BBSSF(1), NLNRVS(3)
Poaceae	<i>Zygochloa paradoxa</i>	Sandhill Canegrass	6	WLA
Poaceae	<i>Vetiveria filipes</i>	Australian Vetiver	4	WLA(3), NWB(1)
Poaceae	<i>Triraphis mollis</i>	Purple Needlegrass	14	WLA(12), NLNRVS(1), NWB(1)
Poaceae	<i>Triopogon loliiformis</i>	Fiveminute Grass	28	WLA(7), Brigfauna(1), MMVS(1), Moree(5), NLNRVS(9), NWB(3), WFS(2)
Poaceae	<i>Triodia scariosa</i> subsp. <i>scariosa</i>	Porcupine Grass	1	WLA
Poaceae	<i>Triodia mitchellii</i> var. <i>breviloba</i>	Buck Spinifex	2	WLA
Poaceae	<i>Triodia mitchellii</i>		9	NLNRVS(9)
Poaceae	<i>Triodia scariosa</i>	Porcupine Grass	6	WLA(4), NWB(2)
Poaceae	<i>Tragus australianus</i>	Small Burrgrass	76	WLA(56), MMVS(1), Moree(9), NLNRVS(1), NWB(2), Namoi(2), WFS(5)
Poaceae	<i>Thyridolepis xerophila</i>		5	NLNRVS(5)
Poaceae	<i>Thyridolepis mitchelliana</i>	Mulga Mitchell Grass	14	WLA(6), BBSPil(1), NLNRVS(2), NWB(5)
Poaceae	<i>Themeda avenacea</i>	Native Oatgrass	7	WLA(1), MMVS(1), Moree(5)
Poaceae	<i>Themeda australis</i>	Kangaroo Grass	11	WLA(8), NWB(3)
Poaceae	<i>Thellungia advena</i>	Coolibah Grass	28	WLA(19), NWB(9)
Poaceae	<i>Sporobolus virginicus</i>		2	WLA(1), NWB(1)
Poaceae	<i>Sporobolus mitchellii</i>	Rat's Tail Couch	1137	WLA(1013), MMVS(58), Moree(65), Namoi(1)
Poaceae	<i>Sporobolus elongatus</i>	Slender Rat's Tail Grass	41	Moree(41)
Poaceae	<i>Sporobolus creber</i>	Slender Rat's Tail Grass	9	WLA(1), BBSPil(2), BBSSF(1), Moree(4), Namoi(1)
Poaceae	<i>Sporobolus contiguus</i>		1	MMVS(1)
Poaceae	<i>Sporobolus caroli</i>	Fairy Grass	1168	WLA(1023), MMVS(43), Moree(75), NLNRVS(1), NWB(19), Namoi(1), WFS(4), Wombeira(2)
Poaceae	<i>Sporobolus actinocladus</i>	Katoora Grass	4	WLA(2), NLNRVS(2)
Poaceae	<i>Pseudoraphis spinescens</i>	Spiny Mudgrass	1003	WLA

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Poaceae	<i>Poa labillardierei</i> var <i>labillardierei</i>	Tussock	3	WLA (2), NWB(1)
Poaceae	<i>Poa fordeana</i>		21	WLA(11), Moree(1), NWB(5), Wombeira(4)
Poaceae	<i>Phragmites australis</i>	Common Reed	29	WLA(9), MMVS(15), NLNRVS(1), NWB(4)
Poaceae	<i>Paspalum distichum</i>	Water Couch	1088	WLA (1015), MMVS(69), NWB(2), Namoi(2)
Poaceae	<i>Paspalidium jubiflorum</i>	Warrego Grass	256	WLA(58), MMVS(126), Moree(27), NLNRVS(2), NWB(2), Namoi(1), WFS(6), Wombeira(34)
Poaceae	<i>Paspalidium gracile</i>	Slender Panic	43	WLA(20), BBSPil(2), MMVS(1), NWB(19), Namoi(1)
Poaceae	<i>Paspalidium globoideum</i>		24	Moree(23), NWB(1)
Poaceae	<i>Paspalidium distans</i>		1021	WLA(1010), BBSPil(1), Moree(1), NWB(9)
Poaceae	<i>Paspalidium criniforme</i>		2	WLA(1), NWB(1)
Poaceae	<i>Paspalidium constrictum</i>	Knottybutt Grass	56	WLA(11), BBSPil(2), Brigfauna(1), MMVS(2), Moree(27), NWB(12), BBSPil2(1)
Poaceae	<i>Paspalidium aversum</i>		45	WLA(22), BBSSF(1), NWB(20), Namoi(2)
Poaceae	<i>Paractaenum novae-hollandiae</i>	Reflexed Panic Grass	1	WLA
Poaceae	<i>Panicum subxerophilum</i>	Gilgai Grass	11	WLA(4), Moree(4), NWB(3)
Poaceae	<i>Panicum queenslandicum</i> var <i>queenslandicum</i>		15	Moree(15)
Poaceae	<i>Panicum queenslandicum</i>		1	NWB(1)
Poaceae	<i>Panicum laevinode</i>	Pepper Grass	14	WLA(4), MMVS(5), Moree(5)
Poaceae	<i>Panicum laevifolium</i>		1	Namoi(1)
Poaceae	<i>Panicum effusum</i>	Poison or Hairy Panic	11	WLA(3), BBSPil(3), MMVS(1), Moree(1), NWB(1), BBSPil2(1), WFS(1)
Poaceae	<i>Panicum decompositum</i>	Native Millet	1163	WLA(1019), MMVS(41), Moree(89), NWB(11), Namoi(2), WFS(1)
Poaceae	<i>Panicum buncei</i>		10	Moree(10)
Poaceae	<i>Notodanthonia longifolia</i>	Long-leaved Wallaby Grass	2	WLA(1), NWB(1)
Poaceae	<i>Monachather paradoxa</i>	Bandicoot Grass	2	WLA(1), NLNRVS(1)
Poaceae	<i>Microlaena stipoides</i>		1	BBSPil2(1)
Poaceae	<i>Leptochloa divaricatissima</i>		14	Moree(14)
Poaceae	<i>Leptochloa digitata</i>	Umbrella Canegrass	114	WLA(81), MMVS(5), Moree(1), NWB(26), Namoi(1)
Poaceae	<i>Leptochloa decipiens</i>		1	NWB(1)
Poaceae	<i>Leptochloa ciliolata</i>		3	WLA(1), NWB(1), BBSPil2(1)
Poaceae	<i>Iseilema vaginiflorum</i>	Red Flinders Grass	22	WLA(1), Moree(21)
Poaceae	<i>Iseilema membranaceum</i>	Small Flinders Grass	21	WLA(12), Moree(9)
Poaceae	<i>Homopholis proluta</i>		24	WLA(13), NWB(5), Wombeira(6)
Poaceae	<i>Heteropogon contortus</i>	Bunch Speargrass	50	WLA
Poaceae	<i>Eulalia aurea</i>	Silky Browntop	105	WLA(100), Moree(5)
Poaceae	<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass	1012	WLA(1008), NWB(2), Namoi(2)
Poaceae	<i>Eriochloa procera</i>	Spring Grass	2	WLA(1), Namoi(1)
Poaceae	<i>Eriochloa crebra</i>	Cup Grass	1099	WLA(1005), MMVS(1), Moree(92), Wombeira(1)
Poaceae	<i>Eriochloa australiensis</i>		1201	WLA
Poaceae	<i>Echinochloa inundata</i>	Marsh Millet	3	WLA(2), Moree(1)
Poaceae	<i>Eriachne mucronata</i>	Mountain Wanderrrie Grass	4	WLA(2), NWB(2)

Family	Scientific Name	Common Name	No. Records	Dataset
Poaceae	<i>Eriachne helmsii</i>	Woollybutt Wanderrie Grass	1	WLA
Poaceae	<i>Eriachne aristidea</i>	Threawn Wanderrie Grass	3	WLA(2), NWB(1)
Poaceae	<i>Eragrostis tenellula</i>	Delicate Lovegrass	2	WLA(1), NWB(1)
Poaceae	<i>Eragrostis sororia</i>		2	BBSPil(1), BBSpil2(1)
Poaceae	<i>Eragrostis setifolia</i>	Neverfail	126	WLA(39), MMVS(7), Moree(42), NWB(9), WFS(4), Wombeira(25)
Poaceae	<i>Eragrostis parviflora</i>	Weeping Lovegrass	231	WLA(205), MMVS(19), Moree(6), NLNRVS(1)
Poaceae	<i>Eragrostis molybdea</i>		33	WLA(1), Moree(31), NWB(1)
Poaceae	<i>Eragrostis microcarpa</i>		1	WLA
Poaceae	<i>Eragrostis megalosperma</i>		10	WLA(5), NWB(5)
Poaceae	<i>Eragrostis leptostachya</i>	Paddock Lovegrass	1	BBSSF&NR(1)
Poaceae	<i>Eragrostis leptocarpa</i>	Drooping Lovegrass	2	WLA(1), Wombeira(1)
Poaceae	<i>Eragrostis laniflora</i>		6	NLNRVS(6)
Poaceae	<i>Eragrostis lacunaria</i>	Purple Lovegrass	41	WLA(7), BBSPil(5), BBSSF(1), MMVS(4), Moree(1), NLNRVS(12), NWB(7), BBSpil2(1), WFS(3)
Poaceae	<i>Eragrostis kennedyae</i>	Small-flowered Lovegrass	6	WLA(1), MMVS(5)
Poaceae	<i>Eragrostis falcata</i>	Sickle Lovegrass	9	WLA(5), MMVS(1), NWB(3)
Poaceae	<i>Eragrostis eriopoda</i>	Woollybutt	15	WLA(1), Moree(14)
Poaceae	<i>Eragrostis elongata</i>	Clustered Lovegrass	5	WLA(2), MMVS(1), NWB(1), Namoi(1)
Poaceae	<i>Eragrostis dielsii</i>	Mallee Lovegrass	17	WLA(16), NLNRVS(1)
Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass	7	WLA(2), BBSSF(1), NWB(2), WFS(2)
Poaceae	<i>Eragrostis australasica</i>	Canegrass	5	WLA
Poaceae	<i>Enteropogon acicularis</i>		1462	WLA(1237), BBSPil(5), Moree(81), NLNRVS(1), NWB(136), Namoi(2)
Poaceae	<i>Enneapogon nigricans</i>	Niggerheads	3	WLA(1), MMVS(1), NWB(1)
Poaceae	<i>Enneapogon intermedius</i>		5	WLA
Poaceae	<i>Enneapogon gracilis</i>	Slender Nineawn	1005	WLA(1000), Moree(5)
Poaceae	<i>Enneapogon cylindricus</i>	Jointed Nineawn	3	WLA
Poaceae	<i>Enneapogon avenaceus</i>	Bottle Washers	39	WLA
Poaceae	<i>Elytrophorus spicatus</i>	Spikegrass	2	WLA
Poaceae	<i>Elymus scaber</i>		19	WLA(12), Moree(6), NWB(1)
Poaceae	<i>Echinochloa colona</i>	Awnless Barnyard Grass	42	WLA(4), MMVS(7), Moree(30), NWB(1)
Poaceae	<i>Diplachne parviflora</i>	Small-flowered Beetle Grass	1001	WLA(1000), BBSPil(1)
Poaceae	<i>Diplachne muelleri</i>		4	WLA(2), NWB(2)
Poaceae	<i>Diplachne fusca</i>		11	WLA(5), MMVS(1), Moree(3), NWB(2)
Poaceae	<i>Digitaria divaricatissima</i>	Umbrella Grass	44	WLA(5), Moree(36), NWB(3)
Poaceae	<i>Digitaria diffusa</i>		5	BBSPil(4), BBSSF(1)
Poaceae	<i>Digitaria brownii</i>	Cotton Panic Grass	106	WLA(101), BBSPil(2), BBSSF(1), NWB(1), WFS(1)
Poaceae	<i>Digitaria breviglumis</i>		4	Moree(2), BBSpil2(1), WFS(1)
Poaceae	<i>Digitaria ammophila</i>		8	Moree(6), NLNRVS(1), WFS(1)
Poaceae	<i>Dichelachne micrantha</i>	Shorthair Plumegrass	2	WLA(1), NWB(1)
Poaceae	<i>Dichanthium sericeum subsp. sericeum</i>	Queensland Bluegrass	64	WLA(3), Moree(58), NWB(3)
Poaceae	<i>Dichanthium sericeum</i>	Queensland Bluegrass	20	WLA(10), NWB(3), Namoi(3), WFS(4)

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Poaceae	<i>Dactyloctenium radulans</i>	Button Grass	1155	WLA(1108), MMVS(15), Moree(24), NWB(3), Namoi(2), WFS(3)
Poaceae	<i>Cynodon dactylon</i>	Common Couch	1135	WLA(1046), Brighfauna(1), MMVS(55), Moree(4), NLNRVS(2), NWB(22), Namoi(2), Wombeira(3)
Poaceae	<i>Cymbopogon refractus</i>	Barbed Wire Grass	4	WLA(2), NWB(2)
Poaceae	<i>Cymbopogon oblectus</i>	Silky Heads	5	WLA(3), NWB(2)
Poaceae	<i>Chloris ventricosa</i>	Tall Chloris	1000	WLA
Poaceae	<i>Chloris truncata</i>	Windmill Grass	2347	WLA(2170), BBSPil(4), MMVS(45), Moree(67), NLNRVS(6), NWB(38), Namoi(1), WFS(6), Wombeira(10)
Poaceae	<i>Chloris divaricata var divaricata</i>	Slender Chloris	88	WLA(6), MMVS(80), NWB(2)
Poaceae	<i>Bromus arenarius</i>		1	NWB(1)
Poaceae	<i>Brachyachne convergens</i>	Common Native Couch	1000	WLA
Poaceae	<i>Bothriochloa macra</i>	Red Grass	1003	WLA(1001), Moree(1), Namoi(1)
Poaceae	<i>Bothriochloa ewartiana</i>	Desert Bluegrass	22	WLA
Poaceae	<i>Bothriochloa decipiens</i>	Red Grass	9	WLA(3), Moree(3), NWB(3)
Poaceae	<i>Bothriochloa bladhii subsp bladhii</i>	Forest Bluegrass	4	WLA(2), Namoi(2)
Poaceae	<i>Austrostipa verticillata</i>		49	WLA(32), BBSPil(3), Moree(2), NWB(11), BBSpil2(1)
Poaceae	<i>Austrostipa setacea</i>	Corkscrew Grass	5	WLA(2), NWB(2), BBSpil2(1)
Poaceae	<i>Austrostipa scabra subsp scabra</i>		31	WLA(11), BBSPil(7), BBSSF(1), NWB(11), BBSpil2(1)
Poaceae	<i>Austrostipa scabra subsp falcata</i>		2	NWB(2)
Poaceae	<i>Austrostipa scabra</i>	Speargrass	282	WLA(197), BBSSF&NR(1), MMVS(13), Moree(6), NLNRVS(13), NWB(50), Namoi(1), Wombeira(1)
Poaceae	<i>Austrostipa ramosissima</i>	Stout Bamboo Grass	8	WLA(5), NWB(3)
Poaceae	<i>Austrostipa nodosa</i>		1	WLA
Poaceae	<i>Austrostipa nitida</i>		1	WLA
Poaceae	<i>Austrostipa elegantissima</i>	Feather Speargrass	1	WLA
Poaceae	<i>Austrostipa drummondii</i>		1	WLA
Poaceae	<i>Austrostipa aristiglumis</i>	Plains Grass	13	WLA(5), Moree(4), NWB(3), Namoi(1)
Poaceae	<i>Austrodanthonia setacea</i>		5	WLA(4), Moree(1)
Poaceae	<i>Austrodanthonia richardsonii</i>	Wallaby Grass	1	Moree(1)
Poaceae	<i>Austrodanthonia pilosa</i>	Smooth-flowered Wallaby Grass	1	BBSpil2(1)
Poaceae	<i>Austrodanthonia fulva</i>		2	WLA(1), NWB(1)
Poaceae	<i>Austrodanthonia eriantha</i>		2	WLA(1), BBSSF&NR(1)
Poaceae	<i>Austrodanthonia caespitosa</i>	Ringed Wallaby Grass	7	WLA(2), MMVS(5)
Poaceae	<i>Austrodanthonia bipartita</i>	Wallaby Grass	1132	WLA(1112), Moree(4), NWB(13), BBSpil2(1), Namoi(2)
Poaceae	<i>Astrebla squarrosa</i>		3	Moree(3)
Poaceae	<i>Astrebla pectinata</i>	Barley Mitchell Grass	54	WLA(5), MMVS(1), Moree(43), WFS(1), Wombeira(4)
Poaceae	<i>Astrebla lappacea</i>	Curly Mitchell Grass	1225	WLA(1209), Moree(7), NWB(4), WFS(5)
Poaceae	<i>Astrebla elymoides</i>		33	Moree(31), WFS(2)
Poaceae	<i>Aristida ramosa var speciosa</i>		5	WLA(2), NWB(2), BBSpil2(1)
Poaceae	<i>Aristida ramosa var scaberula</i>		5	WLA(2), BBSPil(2), NWB(1)
Poaceae	<i>Aristida ramosa var ramosa</i>		1	BBSpil2(1)
Poaceae	<i>Aristida ramosa</i>		109	WLA(105), NWB(4)
Poaceae	<i>Aristida psammophila</i>		100	WLA
Poaceae	<i>Aristida platychaeta</i>		1005	WLA(1001), Moree(3), NWB(1)

Family	Scientific Name	Common Name	No. Records	Dataset
Poaceae	<i>Aristida obscura</i>		2	WLA(1), NWB(1)
Poaceae	<i>Aristida muricata</i>		7	WLA(2), BBSPil(2), MMVS(1), NWB(2)
Poaceae	<i>Aristida longicollis</i>		1	WLA
Poaceae	<i>Aristida leptopoda</i>	White Speargrass	1021	WLA(1002), Moree(19)
Poaceae	<i>Aristida leichhardtiana</i>		1	Moree(1)
Poaceae	<i>Aristida latifolia</i>		1	Moree(1)
Poaceae	<i>Aristida jerichoensis</i> var <i>subspinulifera</i>		4	WLA(1), NLNRVS(2), BBSPil2(1)
Poaceae	<i>Aristida jerichoensis</i> var <i>jerichoensis</i>		8	WLA(4), NWB(4)
Poaceae	<i>Aristida jerichoensis</i>	Jericho Wiregrass	8	WLA(3), BBSPil(2), BBSSF&NR(1), BBSSF(1), NWB(1)
Poaceae	<i>Aristida holathera</i> var <i>holathera</i>	Erect Kerosene Grass	2	WLA
Poaceae	<i>Aristida contorta</i>	Bunched Kerosene Grass	2	WLA
Poaceae	<i>Aristida caput-medusae</i>		1	BBSPil(1)
Poaceae	<i>Aristida calycina</i>		1014	WLA(1007), NWB(7)
Poaceae	<i>Ancistrachne uncinulata</i>	Hooked-hairy Panic Grass	26	WLA(25), BBSPil(1)
Poaceae	<i>Amphipogon caricinus</i> var <i>caricinus</i>		1	NLNRVS(1)
Poaceae	<i>Amphipogon caricinus</i>	Long Greybeard Grass	2	WLA
Poaceae	<i>Agrostis avenacea</i> var <i>avenacea</i>		160	WLA(69), MMVS(15), Moree(18), NWB(13), WFS(3), Wombeira(42)
Poaceae	<i>Agrostis aemula</i> var <i>aemula</i>		24	NLNRVS(24)
Poaceae	<i>Agrostis aemula</i>	Blowngrass	2	WLA

Key

WLA	Atlas of NSW Wildlife
RBG	Royal Botanic Gardens, Sydney
BBSPil	Brigalow Belt South Study - Pilliga State Forest
BBSSF	Forestry survey of the Pilliga forests
Moree	Moree Plains Grasslands survey of Moree Plains Shire and Walgett Shire east of the Barwon River
NWB	Northern Wheatbelt Vegetation Survey
Wombeira	Wombeira Landsystem Vegetation Survey
NH	National Herbarium, Canberra
NLNRVS	Narran Lake Nature Reserve Vegetation Survey.
MMVS	Macquarie Marshes Vegetation Survey
WFS	Walgett fauna survey sites
BrigOut	Brigalow Outlier (NE of Bourke) Vegetation Survey
Brigfauna	Fauna sites for the Brigalow second survey, related to the Brigalow dataset from 1991.
BBSPil2	Pilliga State Forest Survey - part of Brigalow Belt South Bioregional Assessment
BBSSF&NR	Brigalow Belt South Study - State Forest and Nature Reserves of the Dubbo region.
Namoi	Vegetation survey of riparian zones within the Namoi River catchment, north-west New South Wales

Appendix D: Exotic Flora Recorded Within the DRP

Family	Scientific Name	Common Name	No Records	Dataset
Ranunculaceae	<i>Ranunculus muricatus</i>	Sharp Buttercup	2	WLA(1), NWB(1)
Ranunculaceae	<i>Ranunculus sceleratus</i>	Celery Buttercup	1	WLA
Papaveraceae	<i>Argemone ochroleuca</i> subsp. <i>ochroleuca</i>	Mexican Poppy	22	WLA (15), Moree(2), NWB(5)
Papaveraceae	<i>Papaver aculeatum</i>		1	NWB(1)
Fumariaceae	<i>Fumaria densiflora</i>	Narrow-leaved Fumitory	2	WLA
Fumariaceae	<i>Fumaria indica</i>	Fumitory	4	WLA (2), NWB(2)
Phytolaccaceae	<i>Phytolacca octandra</i>	Inkweed	2	WLA(1), NWB(1)
Portulacaceae	<i>Calandrinia menziesii</i>		1	WLA
Aizoaceae	<i>Psilocalon tenue</i>	Wiry Noon-flower	1	WLA
Cactaceae	<i>Eriocereus martinii</i>	Moonlight Cactus	200	WLA
Cactaceae	<i>Opuntia aurantiaca</i>	Tiger Pear	121	WLA(111), NWB(9), BBSpil2(1)
Cactaceae	<i>Opuntia stricta</i>	Prickly Pear	69	WLA(33), BBSSF(1), Moree(4), NLNRVS(1), NWB(27), WFS(3)
Cactaceae	<i>Opuntia stricta</i> var <i>stricta</i>	Common Prickly Pear	7	WLA(2), BBSpil(4), BBSpil2(1)
Chenopodiaceae	<i>Chenopodium album</i>	Fat Hen	4	WLA (2), NWB(1), Namoi(1)
Chenopodiaceae	<i>Chenopodium murale</i>	Nettle-leaf Goosefoot	13	WLA (2), MMVS(11)
Amaranthaceae	<i>Alternanthera pungens</i>	Khaki Weed	30	WLA (23), MMVS(2), Moree(4), Namoi(1)
Amaranthaceae	<i>Amaranthus viridis</i>	Green Amaranth	1	WLA (1), Namoi(1)
Amaranthaceae	<i>Gomphrena celosoides</i>	Gomphrena Weed	13	WLA(12), Namoi(1)
Caryophyllaceae	<i>Moenchia erecta</i>	Erect Chickweed	1	WLA
Caryophyllaceae	<i>Polycarpon tetraphyllum</i>	Four-leaved Allseed	1	WLA
Caryophyllaceae	<i>Silene gallica</i>	Catchfly	3	WLA
Caryophyllaceae	<i>Spergula arvensis</i>		2	NLNRVS(2)
Caryophyllaceae	<i>Spergularia marina</i>		1	Moree(1)
Caryophyllaceae	<i>Spergularia rubra</i>	Sandspurry	19	WLA(8), MMVS(10), NLNRVS(1)
Caryophyllaceae	<i>Stellaria media</i>	Common Chickweed	7	WLA(3), MMVS(1), NWB(3)
Caryophyllaceae	<i>Vaccaria hispanica</i>	Cow Soapwort	1	MMVS(1)
Polygonaceae	<i>Acetosa vesicaria</i>	Bladder Dock	4	WLA
Polygonaceae	<i>Acetosella vulgaris</i>	Sorrel, Sheep Sorrel	8	WLA (4), NWB(2), Wombeira(2)
Polygonaceae	<i>Emex australis</i>	Spiny Emex	25	WLA(14), Moree(1), NWB(6), WFS(2), Wombeira(2)
Polygonaceae	<i>Persicaria orientalis</i>		15	MMVS(15)
Polygonaceae	<i>Polygonum arenastrum</i>	Wireweed	6	WLA(1), Moree(5)
Polygonaceae	<i>Polygonum aviculare</i>	Wireweed	40	WLA(12), Brigfauna(1), MMVS(24), NWB(2), Wombeira(1)
Polygonaceae	<i>Polygonum patulum</i>		1	Moree(1)
Polygonaceae	<i>Rumex crispus</i>	Curled Dock	5	WLA(2), Moree(3)
Malvaceae	<i>Abutilon theophrasti</i>		4	WLA (1), MMVS (2), Namoi (1)
Malvaceae	<i>Malva neglecta</i>		4	Moree(4)
Malvaceae	<i>Malva sylvestris</i>		1	MMVS(1)
Malvaceae	<i>Malva parviflora</i>	Small-flowered Mallow	140	WLA(41), MMVS(86), NWB(12), Namoi(1)
Malvaceae	<i>Malva verticillata</i>		1	Moree(1)
Malvaceae	<i>Malvastrum americanum</i>	Spiked Malvastrum	226	WLA(67), MMVS(71), Moree(65), NWB(10), Namoi(2), WFS(11)
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow	12	WLA(5), Moree(3), NWB(4)

Family	Scientific Name	Common Name	No Records	Dataset
Malvaceae	<i>Pavonia hastata</i>		14	WLA(7), NWB(7)
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	49	WLA(27), MMVS(15), NWB(5), Namoi(2)
Moraceae	<i>Maclura pomifera</i>	Osage Orange	2	WLA(1), Namoi(1)
Urticaceae	<i>Urtica urens</i>	Small Nettle	11	WLA(5), MMVS(3), NWB(3)
Euphorbiaceae	<i>Chamaesyce prostrata</i>	Red Caustic Weed	3	WLA (2), NWB(1)
Euphorbiaceae	<i>Euphorbia peplus</i>	Petty Spurge	1	WLA
Euphorbiaceae	<i>Ricinus communis</i>	Castor Oil Plant	14	WLA(12), NWB(1), Namoi(1)
Cucurbitaceae	<i>Citrullus colocynthis</i>		9	MMVS(3), Moree(6)
Cucurbitaceae	<i>Citrullus lanatus var lanatus</i>	Wild Melon, Camel Melon, Bitter	12	WLA (9), Namoi(2), WFS(1)
Cucurbitaceae	<i>Cucumis myriocarpus subsp leptodermis</i>	Paddy Melon	101	WLA (15), MMVS(45), Moree(39), WFS(2)
Cucurbitaceae	<i>Cucumis zeyheri</i>		3	Moree
Salicaceae	<i>Salix babylonica</i>	Weeping Willow	11	WLA(7), NWB(3), Namoi(1)
Brassicaceae	<i>Alyssum linifolium</i>	Flax-leaf Alyssum	18	WLA
Brassicaceae	<i>Brassica juncea</i>	Indian Mustard	2	WLA (1), Wombeira(1)
Brassicaceae	<i>Brassica rapa subsp. sylvestris</i>	Turnip	2	WLA
Brassicaceae	<i>Brassica tournefortii</i>	Mediterranean Turnip	25	WLA (20), MMVS(4), Wombeira(1)
Brassicaceae	<i>Capsella bursa-pastoris</i>	Shepherd's Purse	11	WLA (3), MMVS(6), Moree(2)
Brassicaceae	<i>Carrichtera annua</i>	Ward's Weed	62	WLA
Brassicaceae	<i>Coronopus didymus</i>		1	Moree(1)
Brassicaceae	<i>Diplotaxis muralis</i>	Wall Rocket	2	WLA
Brassicaceae	<i>Hirschfeldia incana</i>	Buchan Weed	12	WLA(1), Moree(11)
Brassicaceae	<i>Lepidium africanum</i>		4	WLA(3), NWB(1)
Brassicaceae	<i>Lepidium bonariense</i>		16	WLA(12), Moree(2), NLNRVS(1), NWB(1)
Brassicaceae	<i>Raphanus raphanistrum</i>	Wild Radish	2	WLA
Brassicaceae	<i>Rapistrum rugosum</i>	Turnip Weed	239	WLA(77), MMVS(15), Moree(86), NWB(61)
Brassicaceae	<i>Rorippa palustris</i>	Yellow Cress	7	WLA(6), MMVS(1)
Brassicaceae	<i>Sinapis alba</i>	White Mustard	1	WLA
Brassicaceae	<i>Sinapis arvensis</i>		12	Moree(8), WFS(4)
Brassicaceae	<i>Sisymbrium irio</i>	London Rocket	32	WLA(15), MMVS(5), Moree(4), NWB(8)
Brassicaceae	<i>Sisymbrium officinale</i>	Hedge Mustard	3	WLA(2), NWB(1)
Primulaceae	<i>Anagallis arvensis</i>	Scarlet/Blue Pimpernel	21	WLA (16), MMVS(1), NWB(4)
Onagraceae	<i>Oenothera mollissima</i>		6	NLNRVS(6)
Onagraceae	<i>Oenothera indecora subsp. bonariensis</i>		3	MMVS(3)
Onagraceae	<i>Oenothera rosea</i>		2	Moree(2)
Onagraceae	<i>Ludwigia peploides subsp. montevidensis</i>	Water Primrose	1078	WLA(1024), MMVS(46), NLNRVS(1), NWB(6), Namoi(1)
Anacardiaceae	<i>Schinus areira</i>	Pepper Tree	8	WLA(6), NWB(1), Namoi(1)
Meliaceae	<i>Melia azedarach</i>	White Cedar	5	WLA(3), NWB(1), Namoi(1)
Fabaceae (Caesalpinioideae)	<i>Senna occidentalis</i>		3	WLA(1), Namoi(2)
Fabaceae (Mimosoideae)	<i>Acacia farnesiana</i>	Mimosa Bush	206	WLA(137), Moree(34), NWB(34), Namoi(1)
Fabaceae (Faboideae)	<i>Lotus uliginosus</i>	Birds-foot Trefoil	1	WLA
Fabaceae (Faboideae)	<i>Medicago arabica</i>	Spotted Burr Medic	15	WLA(7), Moree(1), NWB(7)

Family	Scientific Name	Common Name	No Records	Dataset
Fabaceae (Faboideae)	<i>Medicago laciniata</i>	Cut-leaved Medic	114	WLA(18), MMVS(77), Moree(13), NWB(4), Wombeira(2)
Fabaceae (Faboideae)	<i>Medicago minima</i>	Woolly Burr Medic	60	WLA(27), MMVS(12), Moree(12), NWB(2), WFS(7)
Fabaceae (Faboideae)	<i>Medicago polymorpha</i>	Burr Medic	353	WLA(124), MMVS(69), Moree(53), NWB(105), Namoi(1), Wombeira(1)
Fabaceae (Faboideae)	<i>Medicago praecox</i>	Small-leaved Burr Medic	4	WLA(2), NWB(2)
Fabaceae (Faboideae)	<i>Medicago sativa</i>	Lucerne	1	WLA
Fabaceae (Faboideae)	<i>Medicago truncatula</i>	Barrel Medic	10	WLA(3), Moree(5), NWB(1), WFS(1)
Fabaceae (Faboideae)	<i>Melilotus indicus</i>	Hexham Scent	19	WLA
Fabaceae (Faboideae)	<i>Vicia monantha</i> subsp. <i>monantha</i>	Square-stemmed Vetch	2	WLA
Fabaceae (Faboideae)	<i>Vicia sativa</i> subsp. <i>angustifolia</i>	Narrow-leaved Vetch	1	WLA
Zygophyllaceae	<i>Tribulus terrestris</i>	Catshead	225	WLA (122), MMVS(54), Moree(30), NWB(16), Namoi(1), WFS(2)
Oxalidaceae	<i>Oxalis corniculata</i>	Creeping Oxalis	241	WLA(138), MMVS(94), WFS(3), Wombeira(6)
Oxalidaceae	<i>Oxalis pes-caprae</i>	Soursob	1	WLA
Geraniaceae	<i>Erodium malacoides</i>		6	MMVS(6)
Apiaceae	<i>Ammi majus</i>	Bishop's Weed	2	WLA (2), Namoi(2)
Apiaceae	<i>Ammi visnaga</i>		1	MMVS(1)
Apiaceae	<i>Apium graveolens</i>	Celery	2	WLA (1), NWB(1)
Apiaceae	<i>Cyclosporum leptophyllum</i>	Slender Celery	23	WLA (21), Moree(1), NWB(1)
Apiaceae	<i>Foeniculum vulgare</i>	Fennel	8	WLA (4), NWB(4)
Asteraceae	<i>Arctotheca calendula</i>	Capeweed	6	WLA
Asteraceae	<i>Aster subulatus</i>	Wild Aster	161	WLA (104), MMVS(54), Moree(1), NWB(1), Namoi(1)
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	8	WLA (3), Moree(1), NWB(2), Namoi(1), WFS(1)
Asteraceae	<i>Bidens subalternans</i>	Greater Beggar's Ticks	2	WLA (1), Namoi(1)
Asteraceae	<i>Calendula arvensis</i>		4	Moree(4)
Asteraceae	<i>Carduus tenuiflorus</i>	Winged Slender Thistle	1	WLA
Asteraceae	<i>Carthamus lanatus</i>	Saffron Thistle	1017	WLA (1004), MMVS(9), Moree(4)
Asteraceae	<i>Carthamus tinctorius</i>		4	Moree(4)
Asteraceae	<i>Centaurea melitensis</i>	Maltese Cockspur	1133	WLA (1075), MMVS(31), Moree(22), NWB(2), Wombeira(3)
Asteraceae	<i>Centaurea solstitialis</i>	St Barnabys Thistle	7	WLA (2), NLNRVS(3), NWB(2)
Asteraceae	<i>Centaurea</i> spp.		2	WFS(2)
Asteraceae	<i>Chondrilla juncea</i>	Skeleton Weed	10	WLA (2), BBSPil(6), Moree(2)
Asteraceae	<i>Chrysanthemoides monilifera</i>	Bitou Bush	2	WLA
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	111	WLA (49), BBSPil(2), MMVS(46), Moree(12), NWB(2)
Asteraceae	<i>Conyza albida</i>	Tall Fleabane	31	WLA (2), MMVS(21), NLNRVS(6), NWB(2)
Asteraceae	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	112	WLA (41), BBSPil(5), MMVS(5), Moree(54), NWB(3), BBSpil(2), Namoi(3)
Asteraceae	<i>Cotula coronopifolia</i>	Water Buttons	4	WLA (1), MMVS(3)
Asteraceae	<i>Dittrichia graveolens</i>	Stinkwort	15	WLA
Asteraceae	<i>Hedypnois rhagadioloides</i> subsp.	Cretan Weed	25	WLA(18), Moree(6), NWB(1)

Family	Scientific Name	Common Name	No Records	Dataset
	<i>cretica</i>			
Asteraceae	<i>Helianthus annuus</i>	Common Sunflower	1	WLA
Asteraceae	<i>Hypochaeris glabra</i>	Smooth Catsear	28	WLA(2), BBSPil(3), MMVS(3), Moree(2), NLNRVS(18)
Asteraceae	<i>Hypochaeris radicata</i>	Catsear	40	WLA(20), MMVS(14), Moree(1), NWB(5)
Asteraceae	<i>Lactuca saligna</i>	Willow-leaved Lettuce	8	WLA(1), MMVS(1), Moree(5), Namoi(1)
Asteraceae	<i>Lactuca serriola</i>	Prickly Lettuce	31	WLA(18), MMVS(4), Moree(1), NLNRVS(2), NWB(4), Wombeira(2)
Asteraceae	<i>Leontodon taraxacoides subsp. taraxacoides</i>	Lesser Hawkbit	1	MMVS(1)
Asteraceae	<i>Onopordum acanthium subsp. acanthium</i>	Scotch Thistle	21	WLA (10), MMVS(4), NWB(7)
Asteraceae	<i>Picris hieracioides</i>		1	MMVS(1)
Asteraceae	<i>Silybum marianum</i>	Variegated Thistle	36	WLA(19), MMVS(6), Moree(7), NWB(3), Wombeira(1)
Asteraceae	<i>Sonchus asper subsp. glaucescens</i>	Prickly Sowthistle	19	WLA (18), Wombeira(1)
Asteraceae	<i>Sonchus oleraceus</i>	Common Sowthistle	217	WLA(70), BBSPil(6), BBSSF&NR(1), MMVS(41), Moree(50), NLNRVS(4), NWB(30), Wombeira(15)
Asteraceae	<i>Taraxacum officinale</i>	Dandelion	21	WLA(11), NWB(8), Wombeira(2)
Asteraceae	<i>Urospermum picroides</i>	False Hawkbit	1	WLA
Asteraceae	<i>Verbesina encelioides subsp. encelioides</i>	Crownbeard	21	WLA(8), MMVS(1), NLNRVS(6), NWB(6)
Asteraceae	<i>Xanthium occidentale</i>	Noogoora Burr, Cockle Burr	113	WLA(50), MMVS(40), Moree(13), NWB(7), Namoi(3)
Asteraceae	<i>Xanthium orientale</i>	Californian Burr	5	WLA (4), MMVS(1)
Asteraceae	<i>Xanthium spinosum</i>	Bathurst Burr	159	WLA(36), MMVS(77), Moree(39), NLNRVS(2), NWB(3), Namoi(1), WFS(1)
Solanaceae	<i>Cestrum parqui</i>	Green Cestrum	1	WLA
Solanaceae	<i>Datura ferox</i>	Fierce Thornapple	10	WLA (6), Moree(3), Namoi(1)
Solanaceae	<i>Datura innoxia</i>	Downy Thornapple	1	WLA
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn	112	WLA(65), MMVS(7), Moree(4), NWB(34), Namoi(2)
Solanaceae	<i>Nicotiana glauca</i>	Tree Tobacco	14	WLA(13), MMVS(1)
Solanaceae	<i>Physalis ixocarpa</i>	Ground Cherry	12	WLA(8), MMVS(1), Namoi(3)
Solanaceae	<i>Solanum nigrum</i>	Black-berry Nightshade	62	WLA(29), BBSPil(2), MMVS(22), Moree(5), NWB(3), Namoi(1)
Solanaceae	<i>Solanum pseudocapsicum</i>	Madeira Winter Cherry	4	WLA(2), NWB(2)
Solanaceae	<i>Solanum rostratum</i>	Pincushion Nightshade	3	WLA(2), NWB(1)
Convolvulaceae	<i>Convolvulus arvensis</i>		15	Moree(14), WFS(1)
Convolvulaceae	<i>Cuscuta campestris</i>	Golden Dodder	1007	WLA (1006), Namoi(1)
Boraginaceae	<i>Amsinckia calycina</i>		4	WLA
Boraginaceae	<i>Amsinckia intermedia</i>	Common Fiddleneck	1	WLA
Boraginaceae	<i>Buglossoides arvensis</i>	Sheepweed	1	WLA
Boraginaceae	<i>Echium plantagineum</i>	Patterson's Curse	1040	WLA (1025), BBSPil(1), MMVS(12), NWB(2)
Boraginaceae	<i>Heliotropium amplexicaule</i>	Blue Heliotrope	20	WLA
Boraginaceae	<i>Heliotropium curassavicum</i>	Smooth Heliotrope	22	WLA
Boraginaceae	<i>Heliotropium europaeum</i>	Common Heliotrope	3	WLA
Boraginaceae	<i>Heliotropium supinum</i>	Prostrate Heliotrope	19	WLA(9), MMVS(8), NWB(2)
Rubiaceae	<i>Galium aparine</i>	Goosegrass	4	WLA (2), (2), NWB(2)

Family	Scientific Name	Common Name	No Records	Dataset
Gentianaceae	<i>Centaurium tenuiflorum</i>		10	WLA (10), Wombeira(10)
Asclepiadaceae	<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush	2	WLA(1), Namoi(1)
Scrophulariaceae	<i>Verbascum virgatum</i>	Twiggy Mullein	10	WLA (3), MMVS(4), NWB(3)
Scrophulariaceae	<i>Veronica peregrina</i>	Wandering Speedwell	1	WLA
Plantaginaceae	<i>Plantago lanceolata</i>	Lamb's Tongues	5	WLA(2), Moree(1), Wombeira(2)
Martyniaceae	<i>Ibicella lutea</i>	Yellow-flowered Devil's Claw	6	WLA(1), Moree(4), NWB(1)
Verbenaceae	<i>Phyla nodiflora</i>	Carpet Weed	10013	WLA
Verbenaceae	<i>Phyla nodiflora var nodiflora</i>	Lippia	68	MMVS(44), Moree(12), NLNRVS(3), NWB(8), Namoi(1)
Verbenaceae	<i>Verbena aristigera</i>		109	WLA(101), Moree(7), NWB(1)
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	5	WLA(2), MMVS(1), Moree(1), Namoi(1)
Verbenaceae	<i>Verbena hispida</i>		2	Moree(2)
Verbenaceae	<i>Verbena officinalis</i>	Common Verbena	349	WLA(142), MMVS(43), Moree(94), NLNRVS(2), NWB(29), Wombeira(39)
Verbenaceae	<i>Verbena rigida</i>	Veined Verbena	4	WLA(1), BBSPil(1), NWB(1), Namoi(1)
Verbenaceae	<i>Verbena supina</i>	Trailing Verbena	7	WLA
Callitrichaceae	<i>Callitriche stagnalis</i>	Common Starwort	1	WLA
Lamiaceae	<i>Lamium amplexicaule</i>	Dead Nettle	4	WLA(1), MMVS(2), NWB(1)
Lamiaceae	<i>Marrubium vulgare</i>	Horehound	51	WLA(27), MMVS(6), Moree(1), NWB(16), Namoi(1)
Lamiaceae	<i>Salvia reflexa</i>	Mintweed	11	WLA(3), Moree(7), Namoi(1)
Lamiaceae	<i>Salvia verbenaca</i>	Wild Sage	6	WLA(3), MMVS(1), Moree(1), NWB(1)
Lamiaceae	<i>Stachys arvensis</i>	Stagger Weed	6	WLA(1), MMVS(4), NWB(1)
Asphodelaceae	<i>Asphodelus fistulosus</i>	Onion Weed	14	WLA
Cyperaceae	<i>Cyperus aggregatus</i>		2	WLA (1), NWB(1)
Cyperaceae	<i>Cyperus eragrostis</i>		2	BBSSF&NR(1), NLNRVS(1)
Cyperaceae	<i>Cyperus involucratus</i>		1	WLA
Cyperaceae	<i>Cyperus rotundus</i>	Nutgrass	2	WLA (1), Namoi(1)
Poaceae	<i>Aira cupaniana</i>		5	BBSSF&NR(1), NLNRVS(4)
Poaceae	<i>Alopecurus geniculatus</i>	Marsh Foxtail	6	WLA
Poaceae	<i>Alopecurus pratensis</i>	Meadow Foxtail	2	WLA (1), NWB(1)
Poaceae	<i>Arundo donax</i>	Giant Reed	5	WLA
Poaceae	<i>Avena fatua</i>	Wild Oats	7	WLA (1), MMVS(1), Moree(4), NWB(1)
Poaceae	<i>Avena ludoviciana</i>	Ludo Wild Oats	1	WLA
Poaceae	<i>Avena sativa</i>		1	Moree(1)
Poaceae	<i>Bromus catharticus</i>	Prairie Grass	13	WLA (7), Moree(2), NWB(3), Namoi(1)
Poaceae	<i>Bromus diandrus</i>	Great Brome	1	WLA
Poaceae	<i>Bromus racemosus</i>		1	Moree(1)
Poaceae	<i>Bromus rubens</i>	Red Brome	17	WLA
Poaceae	<i>Cenchrus ciliaris</i>	Buffel Grass	35	WLA (23), Moree(6), NLNRVS(1), NWB(3), WFS(2)
Poaceae	<i>Cenchrus echinatus</i>	Mossman River Grass	3	WLA (2), Namoi(1)
Poaceae	<i>Cenchrus incertus</i>		2	WFS(2)
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	208	WLA (205), NWB(1), Namoi(2)
Poaceae	<i>Chloris virgata</i>	Feathertop Rhodes Grass	10	WLA (2), Moree(8)

Family	Scientific Name	Common Name	No Records	Dataset
Poaceae	<i>Cynodon incompletus</i>		5	MMVS(5)
Poaceae	<i>Echinochloa crusgalli</i>	Barnyard Grass	110	WLA (106), NWB(1), Namoi(3)
Poaceae	<i>Ehrharta longiflora</i>	Annual Veldtgrass	1	WLA
Poaceae	<i>Eleusine indica</i>	Crowsfoot Grass	2	WLA (1), NWB(1)
Poaceae	<i>Eleusine tristachya</i>	Goose Grass	1	WLA
Poaceae	<i>Eragrostis cilianensis</i>	Stinkgrass	52	WLA (7), MMVS(19), Moree(23), NWB(2), Namoi(1)
Poaceae	<i>Eragrostis curvula</i>		23	Moree(23)
Poaceae	<i>Eragrostis pilosa</i>		2	MMVS(1), Moree(1)
Poaceae	<i>Festuca pratensis</i>		1	NLNRVS(1)
Poaceae	<i>Holcus lanatus</i>	Yorkshire Fog	1	WFS(1)
Poaceae	<i>Hordeum glaucum</i>	Northern Barley Grass	1	WLA
Poaceae	<i>Hordeum leporinum</i>	Barley Grass	198	WLA(148), MMVS(13), Moree(18), NWB(16), WFS(1), Wombeira(2)
Poaceae	<i>Lamarckia aurea</i>	Goldentop	5	WLA
Poaceae	<i>Lolium loliaceum</i>	Stiff Ryegrass	5	WLA
Poaceae	<i>Lolium rigidum</i>		1	Moree(1)
Poaceae	<i>Panicum capillare</i>	Witchgrass	2	WLA(1), Wombeira(1)
Poaceae	<i>Panicum coloratum</i>	Coolah Grass	2	WLA(1), Wombeira(1)
Poaceae	<i>Panicum coloratum var makarikariense</i>		2	Moree(2)
Poaceae	<i>Panicum gilvum</i>		1	Namoi(1)
Poaceae	<i>Panicum miliaceum</i>		1	MMVS(1)
Poaceae	<i>Parapholis incurva</i>	Coast Barb Grass	1	WLA
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	8	WLA(4), MMVS(2), Moree(1), NWB(1)
Poaceae	<i>Pennisetum villosum</i>	Feathertop	1	WLA
Poaceae	<i>Phalaris aquatica</i>	Phalaris	2	WLA
Poaceae	<i>Phalaris paradoxa</i>	Paradoxa Grass	119	WLA(109), Moree(5), NWB(3), Wombeira(2)
Poaceae	<i>Piptatherum miliacea</i>	Rice Millet	1	WLA
Poaceae	<i>Poa annua</i>	Winter Grass	11	WLA(2), MMVS(9)
Poaceae	<i>Poa pratensis</i>	Kentucky Bluegrass	2	WLA(1), WFS(1)
Poaceae	<i>Polypogon monspeliensis</i>	Annual Beardgrass	5	WLA(3), Wombeira(2)
Poaceae	<i>Rostraria cristata</i>	Annual Cat's Tail	1	WLA
Poaceae	<i>Rostraria pumila</i>	Rough-tail	8	WLA
Poaceae	<i>Schismus barbatus</i>	Arabian Grass	89	WLA
Poaceae	<i>Sorghum halepense</i>	Johnson Grass	2	WLA(1), Namoi(1)
Poaceae	<i>Sporobolus indicus</i>		3	Moree(3)
Poaceae	<i>Urochloa panicoides</i>	Urochloa Grass	81	WLA(54), Moree(25), Namoi(2)
Poaceae	<i>Vulpia bromoides</i>	Squirrel Tail Fescue	2	WLA(1), NWB(1)
Poaceae	<i>Vulpia muralis</i>	Rat's Tail Fescue	2	WLA
Poaceae	<i>Vulpia myuros forma megalura</i>	Rat's Tail Fescue	1	WLA

Key

WLA	Atlas of NSW Wildlife
BBSPil	Brigalow Belt South Study - Pilliga State Forest
BBSSF	Forestry survey of the Pilliga forests
Moree	Moree Plains Grasslands survey of Moree Plains Shire and Walgett Shire east of the Barwon River

NWB	Northern Wheatbelt Vegetation Survey
Wombeira	Wombeira Landsystem Vegetation Survey
NLNRVS	Narran Lake Nature Reserve Vegetation Survey.
MMVS	Macquarie Marshes Vegetation Survey
WFS	Walgett fauna survey sites
BrigOut	Brigalow Outlier (NE of Bourke) Vegetation Survey
Brigfauna	Fauna sites for the Brigalow second survey, related to the Brigalow dataset from 1991.
BBSPi2	Pilliga State Forest Survey - part of Brigalow Belt South Bioregional Assessment
BBSSF&NR	Brigalow Belt South Study - State Forest and Nature Reserves of the Dubbo region.
Namoi	Vegetation survey of riparian zones within the Namoi River catchment, north-west New South Wales

**APPENDIX E: Fauna Other than Those of Conservation Significance
Recorded Within the DRP**

Common Name	Scientific Name	No Records	Dataset
	<i>Crinia deserticola</i>	34	WLA
Plains Froglet	<i>Crinia parinsignifera</i>	88	AM (7), WLA (19), CSIRO (4), MD (52), Gwy (6)
Common Eastern Froglet	<i>Crinia signifera</i>	113	AM (31), WLA (63), Bor (15), MD (4)
Sloane's Toadlet	<i>Crinia sloanei</i>	25	AM (2), Cul (1), MD (22)
	<i>Cyclorana cultripes</i>	3	AM (2), WLA (1)
	<i>Cyclorana novaehollandiae</i>	10	WLA
Water-holding Frog	<i>Cyclorana platycephala</i>	54	AM (14), WLA (37), CSIRO (3)
	<i>Cyclorana verrucosa</i>	20	AM (2), WLA (18)
Eastern Banjo Frog	<i>Limnodynastes dumerilii</i>	5	AM (1), WLA (1), MD (3)
Long-thumbed Frog	<i>Limnodynastes fletcheri</i>	7,262	AM (91), WLA (160), CSIRO (2), MD (61), Nara, Gwy (6948)
Giant Banjo Frog	<i>Limnodynastes interioris</i>	1	WLA
Ornate Burrowing Frog	<i>Limnodynastes interioris</i>	85	AM (18), WLA (67), Boo
Salmon-striped Frog	<i>Limnodynastes salmini</i>	601	AM (34), WLA (96), CSIRO (9), Cul (1), Lum, Nara, Gwy (461)
Spotted Grass Frog	<i>Limnodynastes tasmaniensis</i>	2,954	AM (149), WLA (273), CSIRO (9), Bor (10), Boo, Cul (2), Lum, Tra (16), MD (189), Nara, Gwy (2306)
Striped Burrowing Frog	<i>Litoria alboguttata</i>	233	AM (12), WLA (211), CSIRO (2), Gwy (8)
Green Tree Frog	<i>Litoria caerulea</i>	395	AM (84), WLA (272), CSIRO (4), Cul (1), MD (8), Gwy (26)
	<i>Litoria latopalmata</i>	148	AM (12), WLA (81), CSIRO (1), Gwy (54)
Peron's Tree Frog	<i>Litoria peronii</i>	526	AM (60), WLA (447), CSIRO (4), Cul (1), Lum, Nara, Gwy (14)
Desert Tree Frog	<i>Litoria rubella</i>	355	AM (79), WLA (267), CSIRO (7), Cul (1), Lum, Tra (1), Gwy (1)
Common Spadefoot Toad	<i>Neobatrachus sudelli</i>	40	AM (8), WLA (29), CSIRO (1), MD (1), Gwy (1)
Crucifix Frog	<i>Notaden bennettii</i>	317	AM (23), WLA (278), CSIRO (5), Bor (9), Boo, Gwy (2)
Bibron's Toadlet	<i>Pseudophryne bibronii</i>		Nara
	<i>Uperoleia capitulata</i>	22	AM (8), Bor (14)
	<i>Uperoleia rugosa</i>	66	AM (31), WLA (29), CSIRO (6)
Jacky Lizard	<i>Amphibolurus muricatus</i>	7	AM (1), WLA (6)
Nobbi	<i>Amphibolurus nobbi</i>	26	AM (7), WLA (10), CSIRO (9)
Southern Rainbow Skink	<i>Carlia tetradactyla</i>	1	CSIRO
Marbled Gecko	<i>Christinus marmoratus</i>	34	WLA (21), MD (13)
Carnaby's Wall Skink	<i>Cryptoblepharus carnabyi</i>	300	AM (112), WLA (131), CSIRO (10), Cul (12), Nar (1), Tra (4), MD (3), Gwy (27)
	<i>Cryptoblepharus plagiocephalus</i>	1	CSIRO
Central Netted Dragon	<i>Ctenophorus nuchalis</i>	1	WLA
Painted Dragon	<i>Ctenophorus pictus</i>	16	AM (2), WLA (14)
	<i>Ctenotus allotropis</i>	18	AM (5), WLA (7), CSIRO (5), Nar (1)
	<i>Ctenotus leonhardii</i>	3	AM (1), WLA (2)
	<i>Ctenotus regius</i>	61	AM (28), WLA (32), MD (1)
Striped Skink	<i>Ctenotus robustus</i>	39	AM (16), WLA (21), CSIRO (1), Lum, Tra (1)
	<i>Ctenotus schomburgkii</i>	1	WLA
Olive Legless Lizard	<i>Delma inornata</i>	31	AM (15), WLA (14), CSIRO (1), Cul (1)
	<i>Delma tincta</i>	3	AM (2), WLA (1)
Yellow-faced Whip Snake	<i>Demansia psammophis</i>	20	AM (17), WLA (3)
De Vis' Banded Snake	<i>Denisonia devisi</i>	120	AM (48), WLA (61), CSIRO (10), Cul (1), Gwy (3)
Spiny-tailed Gecko	<i>Diplodactylus ciliaris</i>	8	AM (3), WLA (5)
Eastern Spiny-tailed Gecko	<i>Diplodactylus intermedius</i>	16	AM (5), WLA (9), CSIRO (2)
	<i>Diplodactylus steindachneri</i>	33	AM (3), WLA (26), Nar (1), MD (3)
Tesselated Gecko	<i>Diplodactylus tessellatus</i>	153	AM (36), WLA (85), CSIRO (6), Cul (22), MD (3), Gwy (1)
Stone Gecko	<i>Diplodactylus vittatus</i>	30	AM (3), WLA (27)
Soft-tailed Gecko	<i>Diplodactylus williamsi</i>	18	AM (6), WLA (10), CSIRO (2)
	<i>Drysdalia rhodogaster</i>	1	AM

Common Name	Scientific Name	No Records	Dataset
Tree Skink	<i>Egernia striolata</i>	275	AM (49), WLA (138), CSIRO (23), Cul (5), Nar (17), MD (10), Gwy (33)
Saw-shelled Tortoise	<i>Elseya latisternum</i>	1	WLA
Narrow-banded Sand Swimmer	<i>Eremiascincus fasciolatus</i>	5	AM (1), WLA (4)
Broad-banded Sand Swimmer	<i>Eremiascincus richardsonii</i>	14	AM (3), WLA (8), MD (3)
Barred-side Skink	<i>Eulamprus tenuis</i>	4	WLA
Red-naped Snake	<i>Furina diadema</i>	40	AM (17), WLA (21), CSIRO (1), Gwy (1)
	<i>Furina ornata</i>	1	AM
	<i>Gehyra dubia</i>	132	AM (25), WLA (79), Cul (1), Gwy (27)
Tree Dtella	<i>Gehyra variegata</i>	359	AM (163), WLA (116), CSIRO (28), Cul (12), Lum, Nar (11), Tra (1), MD (23), Gwy (5)
Grey Snake	<i>Hemiaspis damelii</i>	88	AM (30), WLA (39), CSIRO (12), Gwy (7)
Bynoe's Gecko	<i>Heteronotia binoei</i>	348	AM (92), WLA (167), CSIRO (6), Cul (21), Nar (1), MD (2), Gwy (59)
Grass Skink	<i>Lampropholis delicata</i>	1	WLA
	<i>Lerista aericeps</i>	3	CSIRO
	<i>Lerista labialis</i>	1	AM
	<i>Lerista muelleri</i>	95	AM (48), WLA (32), CSIRO (7), Bor (1), Cul (7)
	<i>Lerista punctatovittata</i>	171	AM (53), WLA (22), CSIRO (7), Gwy (2)
Burton's Legless Lizard	<i>Lialis burtonis</i>	36	AM (15), WLA (19), CSIRO (1), Gwy (1)
Gilbert's Dragon	<i>Lophognathus gilberti</i>	77	AM (38), WLA (20), CSIRO (5), Cul (3), Nar (1), Gwy (10)
Beaded Gecko	<i>Lucasium damaeum</i>	79	AM (26), WLA (48), MD (5)
Grey's Skink	<i>Menetia greyii</i>	109	AM (40), WLA (36), CSIRO (9), Cul (10), Nar (1), Tra (4), MD (9)
Carpet or Diamond Python	<i>Morelia spilota</i>	11	AM (5), WLA (6)
	<i>Morethia adelaidensis</i>	7	AM (3), WLA (4)
Boulenger's Skink	<i>Morethia boulengeri</i>	508	AM (262), WLA (132), CSIRO (17), Bor(1), Cul (14), Nar (2), Tra (9), MD (36), Gwy (35)
Smooth Knob-tailed Gecko	<i>Nephrurus levis</i>	10	AM (6), WLA (4)
Marbled Velvet Gecko	<i>Oedura marmorata</i>	44	AM (29), WLA (11), CSIRO (1), Cul (2), Nar (1)
Eastern Water Dragon	<i>Physignathus lesueurii</i>	6	WLA
Bearded Dragon	<i>Pogona barbata</i>	127	AM (36), WLA (81), CSIRO (3), Boo, Cul (2), Lum, Gwy (5)
Central Bearded Dragon	<i>Pogona vitticeps</i>	25	AM (5), WLA (17), MD (3)
Mulga Snake	<i>Pseudechis australis</i>	44	AM (19), WLA (13), CSIRO (5), MD (7)
Eastern Brown Snake	<i>Pseudonaja textilis</i>	161	AM (100), WLA (54), CSIRO (5), MD (1), Gwy (1)
Common Scaly-foot	<i>Pygopus lepidopodus</i>	4	AM (2), WLA (2)
Hooded Scaly-foot	<i>Pygopus nigriceps</i>	67	AM (32), WLA (33), CSIRO (2)
	<i>Ramphotyphlops bituberculatus</i>	26	AM (10), WLA (14), CSIRO (2)
	<i>Ramphotyphlops ligatus</i>	6	AM (5), WLA (1)
	<i>Ramphotyphlops wiedii</i>	24	AM (12), WLA (12)
Beaked Gecko	<i>Rhynchoedura ornata</i>	34	AM (6), WLA (27), Lum, Nar (1)
Coral Snake	<i>Simoselaps australis</i>	14	AM (6), WLA (6), CSIRO (2)
	<i>Suta spectabilis dwyeri</i>	31	AM (14), WLA (13), CSIRO (3), Gwy (1)
Curl Snake	<i>Suta suta</i>	88	AM (57), WLA (19), CSIRO (7), Cul (3), MD (1), Gwy (1)
Eastern Blue-tongued Lizard	<i>Tiliqua scincoides</i>	134	AM (44), WLA (84), Boo, Lum, Gwy (6)
Shingleback	<i>Trachydosaurus rugosus</i>	133	AM (31), WLA (88), CSIRO (3), Lum, MD (10), Gwy (1)
Lined Earless Dragon	<i>Tympanocryptis lineata</i>	37	AM (10), WLA (23), CSIRO (2), Cul (1), Nar (1)
	<i>Tympanocryptis tetraporophora</i>	4	WLA (1), CSIRO (3)
Thick-tailed Gecko	<i>Underwoodisaurus milii</i>	11	AM (5), WLA (6)
Gould's Goanna	<i>Varanus gouldii</i>	73	AM (13), WLA (53), CSIRO (1), Cul (1), Lum, Gwy (5)
	<i>Varanus tristis</i>	20	AM (12), WLA (6), CSIRO (1), Nar (1)

Common Name	Scientific Name	No Records	Dataset
Lace Monitor	<i>Varanus varius</i>	223	AM (8), WLA (183), CSIRO (4), Bor(1), Boo, Cul (8), MD (8), Gwy (11)
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>	532	BA (314), AM (16), WLA (174), Cul (10), Nar (17), MD (1), Gwy (1)
Inland Thornbill	<i>Acanthiza apicalis</i>	104	BA (44), ABBBS (1), WLA (32), Cul (2), Lum, MD (25)
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	691	BA (479), AM (4), ABBBS (11), WLA (164), CSIRO (2), Cul (1), Nar (1), MD (29)
Yellow Thornbill	<i>Acanthiza nana</i>	279	BA (178), ABBBS (2), WLA (86), Bor, Cul (10), Nar (3)
Brown Thornbill	<i>Acanthiza pusilla</i>	10	WLA
Buff-rumped Thornbill	<i>Acanthiza reguloides</i>	20	BA (7), WLA (10), Gwy (3)
Chestnut-rumped Thornbill	<i>Acanthiza uropygialis</i>	391	BA (208), AM (9), ABBBS (3), WLA (141), CSIRO (1), Cul (8), Lum, MD (21)
Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>	63	BA (48), WLA (13), Cul (2)
Brown Goshawk	<i>Accipiter fasciatus</i>	105	BA (85), WLA (18), Tra (1), MD (1)
Grey Goshawk	<i>Accipiter novaehollandiae</i>	4	BA (1), AM (1), WLA (2)
Clamorous Reed-Warbler	<i>Acrocephalus stentoreus</i>	314	BA (178), AM (5), ABBBS (1), WLA (112), MD (17), Gwy (1)
Australian Owlet-nightjar	<i>Aegotheles cristatus</i>	232	BA (68), AM (5), WLA (122), Cul (24), Lum, Gwy (13)
Azure Kingfisher	<i>Alcedo azurea</i>	7	BA (3), AM (2), WLA (2)
Australian King-Parrot	<i>Alisterus scapularis</i>	1	BA
Chestnut Teal	<i>Anas castanea</i>	63	BA (22), AM (17), WLA (22), MD (2)
Grey Teal	<i>Anas gracilis</i>	289,110	BA (548), AM (14), ABBBS (2), WLA (286688), Cul (3), Lum, Narw (1361), Tra (7), MD (487)
Australasian Shoveler	<i>Anas rhynchotis</i>	6,212	BA (84), AM (3), WLA (6052), Lum, Narw (68), MD (5)
Pacific Black Duck	<i>Anas superciliosa</i>	60,194	BA (589), AM (13), WLA (59432), Lum, Narw (85), Tra (25), MD (50)
Darter	<i>Anhinga melanogaster</i>	5,119	BA (228), AM (2), ABBBS (6), WLA (4757), Lum, Narw (118), Tra (4), MD (4)
Red Wattlebird	<i>Anthochaera carunculata</i>	12	BA (2), WLA (6), Bor, MD (4)
Richard's Pipit	<i>Anthus novaeseelandiae</i>	616	BA (461), AM (5), ABBBS (1), WLA (139), Cul (2), Lum, Nar (1), Tra, MD (7)
Southern Whiteface	<i>Aphelocephala leucopsis</i>	304	BA (150), AM (12), WLA (99), Cul (3), MD (40)
Red-winged Parrot	<i>Aprosmictus erythropterus</i>	353	BA (269), AM (9), WLA (272), Bor, Cul (29), Lum, Nar (10), MD (7), Gwy (2)
Wedge-tailed Eagle	<i>Aquila audax</i>	536	BA (340), AM (13), WLA (171), Mid, Cul(7), Lum, Nar (3), Tra, Gwy (2)
Intermediate Egret	<i>Ardea intermedia</i>	25,575	BA (76), AM (2), ABBBS (4), WLA (25492), Narw (6), Tra, Gwy (1)
White-necked Heron	<i>Ardea pacifica</i>	2,370	BA (657), AM (6), WLA (1641), Boo, Cul (6), Lum, Narw (15), Tra, MD (36), Gwy (3)
Black-faced Woodswallow	<i>Artamus cinereus</i>	728	BA (542), AM (30), WLA (128), CSIRO (1), Cul (15), MD (12)
Dusky Woodswallow	<i>Artamus cyanopterus</i>	180	BA (119), WLA (48), Boo, Cul (6), MD (7)
White-breasted Woodswallow	<i>Artamus leucorhynchus</i>	574	BA (285), AM (12), WLA (178), Boo, Cul (60), Lum, Nar (2), MD (36), Gwy (1)
Little Woodswallow	<i>Artamus minor</i>	112	BA (28), WLA (74), Cul (4), Nar (6)
Masked Woodswallow	<i>Artamus personatus</i>	325	BA (116), AM (11), WLA (191), Cul (6), MD (1)
White-browed Woodswallow	<i>Artamus superciliosus</i>	1,166	BA (313), AM (16), WLA (743), Cul (89), Lum, Nar (4), MD (1)
Pacific Baza	<i>Aviceda subcristata</i>	6	BA (4), AM (1), WLA (1)
Hardhead	<i>Aythya australis</i>	17,527	BA (193), AM (2), WLA (17196), Lum, Narw (91), MD (45)
Mallee Ringneck	<i>Barnardius zonarius barnardi</i>	954	BA (493), AM (24), ABBBS (3), WLA (324), Mid, Cul (45), Lum, Nar (15), Tra (9), MD (41), Gwy (2)
Musk Duck	<i>Biziura lobata</i>	1,529	BA (106), AM (2), WLA (1421)
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	538	BA (239), AM (5), ABBBS (2), WLA (204), Mid, Bor, Boo, Cul (2), Tra, MD (85), Gwy (1)
Galah	<i>Cacatua roseicapilla</i>	3,058	BA (1160), AM (15), ABBBS (3), WLA (1341),

Common Name	Scientific Name	No Records	Dataset
			CSIRO (2), Mid, Bor, Boo, Cul (69), Lum, Nar (16), Tra (>261), MD (188), Gwy (3)
Little Corella	<i>Cacatua sanguinea</i>	391	BA (95), WLA (215), CSIRO (8), MD (73)
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	47	BA (35), WLA (12)
Brush Cuckoo	<i>Cacomantis variolosus</i>	2	BA (1), WLA (1)
Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>	1	BA
Black Honeyeater	<i>Certhionyx niger</i>	16	BA (5), WLA (11)
Inland Dotterel	<i>Charadrius australis</i>	4	AM (1), WLA (1), CSIRO (2)
Double-banded Plover	<i>Charadrius bicinctus</i>	1	WLA
Red-capped Plover	<i>Charadrius ruficapillus</i>	603	BA (6), WLA (442), Narw (154), MD (1)
Australian Wood Duck	<i>Chenonetta jubata</i>	28,519	BA (637), AM (10), ABBBS (3), WLA (26922), Boo, Cul (27), Lum, Narw (581), Tra (90), MD (248), Gwy (1)
White-backed Swallow	<i>Cheramoeca leucosternus</i>	90	BA (67), WLA (21), Nar (1), MD (1)
Spotted Bowerbird	<i>Chlamydera maculata</i>	300	BA (204), AM (37), ABBBS (6), WLA (49), Nar (3), Gwy (1)
Whiskered Tern	<i>Chlidonias hybridus</i>	4,971	BA (69), AM (3), WLA (4407), Lum, Narw (492)
Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>	197	BA (141), AM (2), ABBBS (2), WLA (36), Cul (1), Nar (2), MD (12), Gwy (1)
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>	22	BA (7), WLA (8), MD (7)
Black-eared Cuckoo	<i>Chrysococcyx osculans</i>	26	BA (16), AM (1), WLA (8), MD (1)
Brown Songlark	<i>Cinclorhampus cruralis</i>	214	BA (161), AM (3), WLA (48), MD (2)
Rufous Songlark	<i>Cinclorhampus mathewsi</i>	367	BA (278), AM (15), ABBBS (1), WLA (69), CSIRO (1), MD (3)
Swamp Harrier	<i>Circus approximans</i>	130	BA (95), WLA (35)
Spotted Harrier	<i>Circus assimilis</i>	122	BA (104), WLA (17), Tra, MD (1)
Golden-headed Cisticola	<i>Cisticola exilis</i>	70	BA (51), ABBBS (3), WLA (16)
Banded Stilt	<i>Cladorhynchus leucocephalus</i>	2	BA (1), WLA (1)
White-browed Treecreeper	<i>Climacteris affinis</i>	41	BA (5), AM (1), WLA (10), Cul (4), MD (21)
Brown Treecreeper	<i>Climacteris picumnus</i>	865	BA (479), AM (33), ABBBS (1), WLA (234), CSIRO (1), Boo, Cul (51), Nar (8), MD (57), Gwy (1)
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	802	BA (444), AM (4), WLA (189), CSIRO (1), Boo, Cul (40), Lum, Nar (17), MD (105), Gwy (2)
Ground Cuckoo-shrike	<i>Coracina maxima</i>	181	BA (129), AM (2), WLA (50)
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	1,032	BA (743), AM (5), WLA (193), Bor, Boo, Cul (22), Nar (16), Tra, MD (49), Gwy (4)
White-bellied Cuckoo-shrike	<i>Coracina papuensis</i>	167	BA (84), AM (1), WLA (58), Cul (10), Nar (5), MD (9)
Cicadabird	<i>Coracina tenuirostris</i>	2	WLA
White-winged Chough	<i>Corcorax melanorhamphos</i>	1,296	BA (581), AM (28), WLA (544), Bor, Boo, Cul (12), Lum, Nar (1), Tra (52), MD (77), Gwy (1)
White-throated Treecreeper	<i>Cormobates leucophaeus</i>	31	BA (4), AM (4), ABBBS (3), WLA (2), MD (18)
Little Crow	<i>Corvus bennetti</i>	299	BA (101), WLA (184), CSIRO (4), Cul (2), MD (8)
Australian Raven	<i>Corvus coronoides</i>	1,664	BA (732), AM (12), WLA (378), CSIRO (1), Bor, Cul (44), Lum, Nar (9), Tra (1), MD (193), Gwy (5)
Little Raven	<i>Corvus mellori</i>	1,272	BA (92), WLA (1112), CSIRO (3), Mid, Cul (4), Tra (>61)
Torresian Crow	<i>Corvus orru</i>	9	BA (1), AM (3), WLA (5)
King Quail	<i>Coturnix chinensis</i>	1	WLA
Stubble Quail	<i>Coturnix pectoralis</i>	95	BA (56), AM (16), WLA (23)
Pied Butcherbird	<i>Cracticus nigrogularis</i>	1,328	BA (1012), AM (25), ABBBS (1), WLA (231), CSIRO (2), Mid, Bor, Cul (26), Lum, Nar (14), Tra (7), MD (15), Gwy (2)
Grey Butcherbird	<i>Cracticus torquatus</i>	698	BA (484), AM (6), ABBBS (2), WLA (145), Bor, Cul (16), Nar (5), Tra, MD (31), Gwy (2)
Pallid Cuckoo	<i>Cuculus pallidus</i>	272	BA (209), AM (4), WLA (55), MD (4)
Black Swan	<i>Cygnus atratus</i>	24,031	BA (298), AM (2), ABBBS (2), WLA (24331), Lum, Narw (355), Tra, MD (43)
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	917	BA (650), AM (14), ABBBS (1), WLA (189), Mid, Bor, Boo, Cul (11), Lum, Nar (2), Tra (1), MD (45), Gwy (4)

Common Name	Scientific Name	No Records	Dataset
Varied Sittella	<i>Daphoenositta chrysoptera</i>	71	BA (10), AM (1), WLA (24), CSIRO (3), MD (33)
Wandering Whistling-Duck	<i>Dendrocygna arcuata</i>	42	BA (1), AM (2), WLA (39)
Plumed Whistling-Duck	<i>Dendrocygna eytoni</i>	29,814	BA (76), AM (4), WLA (29719), Lum, Tra (15)
Mistletoebird	<i>Dicaeum hirundinaceum</i>	538	BA (379), AM (7), WLA (99), CSIRO (1), Mid, Cul (22), Nar (9), MD (18), Gwy (3)
Spangled Drongo	<i>Dicrurus bracteatus</i>	4	WLA
Emu	<i>Dromaius novaehollandiae</i>	3,257	BA (597), AM (14), WLA (2583), Mid, Bor, Cul (53), Lum, MD (5), Gwy (5)
Little Egret	<i>Egretta garzetta</i>	1,550	BA (79), WLA (1470), CSIRO (1)
White-faced Heron	<i>Egretta novaehollandiae</i>	4,364	BA (790), AM (6), WLA (3363), Cul (7), Lum, Narw (159), Tra (1), MD (36), Gwy (2)
Black-shouldered Kite	<i>Elanus axillaris</i>	311	BA (254), AM (4), WLA (48), Mid, Tra, MD (5)
Black-fronted Dotterel	<i>Elseynornis melanops</i>	2,436	BA (345), AM (14), ABBBS (6), WLA (2011), Boo, Cul (9), Lum, Narw (19), MD (32)
Blue-faced Honeyeater	<i>Entomyzon cyanotis</i>	461	BA (337), AM (7), WLA (103), Cul (5), Tra (3), MD (3), Gwy (3)
Eastern Yellow Robin	<i>Eopsaltria australis</i>	70	BA (40), AM (3), ABBBS (3), WLA (22), Bor, Lum, Nar (2)
White-fronted Chat	<i>Epthianura albifrons</i>	250	BA (99), AM (8), WLA (140), Lum, Nar (3)
Orange Chat	<i>Epthianura aurifrons</i>	56	WLA
Crimson Chat	<i>Epthianura tricolor</i>	170	BA (63), AM (7), WLA (100)
Red-kneed Dotterel	<i>Erythronyctes cinctus</i>	2,881	BA (111), AM (6), WLA (2606), CSIRO (1), Narw (142), MD (15)
Spotted Nightjar	<i>Eurostopodus argus</i>	24	BA (14), WLA (10), Lum
Dollarbird	<i>Eurystomus orientalis</i>	123	BA (107), ABBBS (1), WLA (15)
Brown Falcon	<i>Falco berigora</i>	542	BA (412), AM (4), ABBBS (1), WLA (119), CSIRO (2), Bor, Cul (1), Lum, Nar (1), Tra, MD (2)
Nankeen Kestrel	<i>Falco cenchroides</i>	1,180	BA (944), AM (19), ABBBS (1), WLA (179), CSIRO (1), Cul (26), Nar (6), Tra (1), MD (2), Gwy (1)
Australian Hobby	<i>Falco longipennis</i>	210	BA (157), WLA (50), Bor, Cul (1), Nar (1), Tra, Gwy (1)
Peregrine Falcon	<i>Falco peregrinus</i>	51	BA (27), AM (1), ABBBS (1), WLA (18), CSIRO (2), Tra (1), MD (1)
Black Falcon	<i>Falco subniger</i>	76	BA (52), WLA (24)
Eurasian Coot	<i>Fulica atra</i>	95,389	BA (243), AM (6), ABBBS (1), WLA (94757), Lum, Narw (341), Tra (1), MD (40)
Dusky Moorhen	<i>Gallinula tenebrosa</i>	914	BA (143), AM (1), WLA (762), MD (8)
Black-tailed Native-hen	<i>Gallinula ventralis</i>	7,719	BA (132), AM (4), WLA (5761), Lum, Narw (1733), Tra (3), MD (86)
Buff-banded Rail	<i>Gallirallus philippensis</i>	16	BA (1), AM (3), WLA (12)
Diamond Dove	<i>Geopelia cuneata</i>	150	BA (66), AM (7), WLA (62), Lum, MD (15)
Bar-shouldered Dove	<i>Geopelia humeralis</i>	184	BA (104), AM (1), WLA (72), Nar (6), Gwy (1)
Peaceful Dove	<i>Geopelia striata</i>	823	BA (472), AM (12), WLA (284), Bor, Boo, Cul (11), Nar (4), MD (39), Gwy (1)
Western Gerygone	<i>Gerygone fusca</i>	201	BA (111), AM (3), ABBBS (2), WLA (34), Bor, Boo, Cul (1), Lum, MD (50)
White-throated Gerygone	<i>Gerygone olivacea</i>	20	BA (7), WLA (10), Mid, Boo, Gwy (3)
Little Lorikeet	<i>Glossopsitta pusilla</i>	2	BA
Magpie-lark	<i>Grallina cyanoleuca</i>	2,219	BA (1266), AM (14), ABBBS (7), WLA (674), CSIRO (1), Bor, Cul (53), Lum, Nar (10), Tra (14), MD (176), Gwy (4)
Australian Magpie	<i>Gymnorhina tibicen</i>	1,862	BA (1172), AM (9), ABBBS (3), WLA (436), CSIRO (2), Mid, Bor, Boo, Cul (83), Lum, Nar (20), Tra (38), MD (99), Gwy (3)
Whistling Kite	<i>Haliastur sphenurus</i>	731	BA (471), AM (8), ABBBS (1), WLA (217), CSIRO (2), Cul (7), Lum, Nar (4), MD (25)
Little Eagle	<i>Hieraaetus morphnoides</i>	200	BA (132), WLA (45), Bor, Boo, Nar (1), MD (21), Gwy (1)
Black-winged Stilt	<i>Himantopus himantopus</i>	11,035	BA (188), AM (4), WLA (10189), Lum, Narw (649), Tra (5)
Fairy Martin	<i>Hirundo ariel</i>	808	BA (322), WLA (428), CSIRO (1), Cul (2), MD (55)
Welcome Swallow	<i>Hirundo neoxena</i>	1,835	BA (678), AM (6), ABBBS (1), WLA (1037), Cul (30),

Common Name	Scientific Name	No Records	Dataset
			Lum, Nar (3), Tra (>30), MD (49), Gwy (1)
Tree Martin	<i>Hirundo nigricans</i>	849	BA (452), AM (2), WLA (310), Cul (18), Nar (5), MD (61), Gwy (1)
Chestnut-rumped Heathwren	<i>Hylacola pyrrhopygia</i>	2	BA
White-winged Triller	<i>Lalage sueurii</i>	343	BA (223), AM (23), WLA (91), Bor, Lum, MD (6)
Silver Gull	<i>Larus novaehollandiae</i>	3,772	BA (158), AM (1), ABBBS (1), WLA (3585), Narw (21), MD (6)
Franklin's Gull	<i>Larus pipixcan</i>	1	WLA
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	11	BA (5), AM (2), ABBBS (3), WLA (1)
Fuscous Honeyeater	<i>Lichenostomus fuscus</i>	3	BA (1), AM (1), Gwy (1)
White-eared Honeyeater	<i>Lichenostomus leucotis</i>	6	BA (2), MD (4)
Yellow-plumed Honeyeater	<i>Lichenostomus ornatus</i>	20	BA (4), AM (1), WLA (15)
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	2,528	BA (760), AM (40), ABBBS (10), WLA (1017), Mid, Bor, Cul (220), Lum, Nar (25), Tra (21), MD (435)
Grey-fronted Honeyeater	<i>Lichenostomus plumulus</i>	5	BA (1), AM (3), MD (1)
Singing Honeyeater	<i>Lichenostomus virescens</i>	276	BA (202), AM (6), WLA (63), Boo, Cul (2), Nar (2), MD (1)
Brown Honeyeater	<i>Lichmera indistincta</i>	19	BA (6), WLA (7), Boo, MD (6)
Chestnut-breasted Mannikin	<i>Lonchura castaneothorax</i>	1	WLA
Pink-eared Duck	<i>Malacorhynchus membranaceus</i>	40,321	BA (104), AM (4), WLA (38863), Lum, Narw (1325), MD (25)
Superb Fairy-wren	<i>Malurus cyaneus</i>	487	BA (143), AM (4), ABBBS (20), WLA (139), MD (179), Gwy (2)
Variiegated Fairy-wren	<i>Malurus lamberti</i>	509	BA (223), ABBBS (1), WLA (129), Mid, Cul (8), Nar (11), MD (137)
White-winged Fairy-wren	<i>Malurus leucopterus</i>	495	BA (311), AM (11), ABBBS (60), WLA (106), Cul (1), Nar (6), MD (16)
Splendid Fairy-wren	<i>Malurus splendens</i>	49	BA (9), AM (1), WLA (35), Nar (4)
Yellow-throated Miner	<i>Manorina flavigula</i>	1,673	BA (861), AM (30), ABBBS (8), WLA (631), CSIRO (5), Cul (111), Nar (7), MD (20)
Noisy Miner	<i>Manorina melanocephala</i>	1,190	BA (442), AM (5), ABBBS (57), WLA (314), Mid, Bor, Boo, Lum, Tra (>179), MD (187), Gwy (6)
Little Grassbird	<i>Megalurus gramineus</i>	134	BA (86), AM (7), ABBBS (2), WLA (39)
Tawny Grassbird	<i>Megalurus timoriensis</i>	5	BA
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>	122	BA (32), AM (1), ABBBS (3), WLA (31), Lum, MD (55)
White-naped Honeyeater	<i>Melithreptus lunatus</i>	3	WLA (1), Boo, Tra (1), Gwy (1)
Budgerigar	<i>Melopsittacus undulatus</i>	2,146	BA (81), AM (10), WLA (2040), CSIRO (1), Cul (4), Nar (2), MD (8)
Rainbow Bee-eater	<i>Merops ornatus</i>	555	BA (197), AM (54), WLA (295), Boo, Cul (1), Lum, MD (7), Gwy (1)
Jacky Winter	<i>Microeca fascinans</i>	756	BA (439), AM (9), ABBBS (3), WLA (194), CSIRO (2), Mid, Bor, Boo, Cul (46), Lum, Nar (16), MD (46), Gwy (1)
Black Kite	<i>Milvus migrans</i>	573	BA (326), AM (2), ABBBS (7), WLA (195), Tra, MD (42), Gwy (1)
Singing Bushlark	<i>Mirafrja javanica</i>	173	BA (111), AM (5), WLA (54), CSIRO (2), Cul (1)
Satin Flycatcher	<i>Myiagra cyanoleuca</i>	5	BA (2), WLA (3)
Restless Flycatcher	<i>Myiagra inquieta</i>	557	BA (418), AM (11), WLA (106), Cul (14), Nar (6), MD (2)
Leaden Flycatcher	<i>Myiagra rubecula</i>	11	BA (3), WLA (7), MD (1)
Plum-headed Finch	<i>Neochmia modesta</i>	445	BA (47), WLA (398)
Red-browed Finch	<i>Neochmia temporalis</i>	7	BA (1), AM (3), ABBBS (2), WLA (1)
Blue-winged Parrot	<i>Neophema chrysostoma</i>	15	BA (3), WLA (2), MD (10)
Green Pygmy-Goose	<i>Nettapus pulchellus</i>	2	WLA
Southern Boobook	<i>Ninox novaeseelandiae</i>	122	BA (76), ABBBS (3), WLA (38), CSIRO (1), Bor, Cul (2), Lum, MD (2), Gwy (1)
Blue Bonnet	<i>Northiella haematogaster</i>	1,182	BA (679), AM (33), WLA (389), CSIRO (16), Cul (5), Lum, Nar (1), Tra (18), MD (39), Gwy (3)
Nankeen Night Heron	<i>Nycticorax caledonicus</i>	19,573	BA (142), AM (5), ABBBS (2), WLA (19409), Cul (2),

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			Narw (10), MD (2), Gwy (1)
Cockatiel	<i>Nymphicus hollandicus</i>	1,420	BA (717), AM (16), WLA (660), CSIRO (2), Cul (13), Lum, Nar (9), Tra (21), Gwy (3)
Crested Pigeon	<i>Ocyphaps lophotes</i>	1,783	BA (1009), AM (42), ABBBS (3), WLA (507), Mid, Bor, Boo, Cul (66), Lum, Nar (12), Tra (58), MD (80), Gwy (6)
Crested Bellbird	<i>Oreoica gutturalis</i>	311	BA (168), AM (2), WLA (105), Cul (20), Lum, Nar (3), MD (13)
Rufous Whistler	<i>Pachycephala rufiventris</i>	510	BA (337), AM (1), ABBBS (2), WLA (134), Mid, Cul (8), Lum, Nar (3), Tra (1), MD (22), Gwy (2)
Spotted Pardalote	<i>Pardalotus punctatus</i>	36	BA (27), WLA (9)
Yellow-rumped Pardalote	<i>Pardalotus punctatus xanthopygus</i>	1	BA
Striated Pardalote	<i>Pardalotus striatus</i>	650	BA (474), AM (3), ABBBS (3), WLA (120), CSIRO (1), Bor, Cul (5), Nar (7), MD (37)
Australian Pelican	<i>Pelecanus conspicillatus</i>	50,481	BA (385), AM (4), ABBBS (6), WLA (45620), Boo, Cul (1), Lum, Narw (4230), Tra (1), MD (234)
Red-capped Robin	<i>Petroica goodenovii</i>	418	BA (223), AM (9), ABBBS (4), WLA (120), Boo, Cul (3), Lum, Nar (6), MD (53)
Scarlet Robin	<i>Petroica multicolor</i>	3	BA (2), WLA (1)
Flame Robin	<i>Petroica phoenicea</i>	4	BA (1), AM (3)
Great Cormorant	<i>Phalacrocorax carbo</i>	3,326	BA (315), ABBBS (103), WLA (2346), CSIRO (2), Cul (1), Narw (310), MD (249)
Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>	15,185	BA (340), AM (5), WLA (14819), Narw (3), Tra (2), MD (16)
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	14,660	BA (313), AM (3), ABBBS (1), WLA (14135), Narw (28), Tra (21), MD (159)
Pied Cormorant	<i>Phalacrocorax varius</i>	2,107	BA (121), ABBBS (82), WLA (1095), Lum, Narw (781), MD (28)
Common Bronzewing	<i>Phaps chalcoptera</i>	262	BA (121), ABBBS (2), WLA (109), Cul (12), Lum, Nar (4), MD (13), Gwy (1)
Little Friarbird	<i>Philemon citreogularis</i>	772	BA (375), AM (9), WLA (227), CSIRO (1), Mid, Bor, Cul (17), Lum, Nar (15), Tra (3), MD (126)
White-fronted Honeyeater	<i>Phylidonyris albigrons</i>	17	BA (9), WLA (8)
Yellow-billed Spoonbill	<i>Platalea flavipes</i>	10,162	BA (502), AM (4), ABBBS (2) WLA (9431), Lum, Narw (267), Tra (6), MD (28), Gwy (2)
Royal Spoonbill	<i>Platalea regia</i>	11,246	BA (164), AM (1), ABBBS (3), WLA (10948), Lum, Narw (124), Tra (3), MD (3)
Pale-headed Rosella	<i>Platycercus adscitus</i>	181	BA (72), AM (2), WLA (99), Mid, Bor, Cul (4), Lum, Nar (1), Gwy (3)
Crimson Rosella	<i>Platycercus elegans</i>	8	BA (1), WLA (1), MD (6)
Yellow Rosella	<i>Platycercus elegans flaveolus</i>	287	BA (24), WLA (12), MD (251)
Eastern Rosella	<i>Platycercus eximius</i>	108	BA (60), AM (4), ABBBS (2), WLA (19), CSIRO (2), Tra (19), Gwy (2)
Striped Honeyeater	<i>Plectorhyncha lanceolata</i>	399	BA (288), AM (13), ABBBS (2), WLA (91), Bor, Cul (5), Lum, Nar (5)
Tawny Frogmouth	<i>Podargus strigoides</i>	223	BA (150), AM (4), WLA (48), Boo, Cul (12), Lum, Tra, MD (1), Gwy (8)
Great Crested Grebe	<i>Podiceps cristatus</i>	527	BA (56), AM (2), WLA (469)
Hoary-headed Grebe	<i>Poliiocephalus poliocephalus</i>	10,064	BA (122), AM (1), WLA (9881), Narw (51), Tra, MD (9)
Chestnut-crowned Babbler	<i>Pomatostomus ruficeps</i>	199	BA (120), AM (9), WLA (52), MD (18)
White-browed Babbler	<i>Pomatostomus superciliosus</i>	636	BA (69), AM (1), WLA (552), Mid, Cul (3), Lum, MD (11)
Purple Swamphen	<i>Porphyrio porphyrio</i>	8,871	BA (126), AM (1), WLA (8740), Narw (2), Tra (1), MD (1)
Australian Spotted Crake	<i>Porzana fluminea</i>	16	BA (4), AM (6), WLA (5), Narw (1)
Baillon's Crake	<i>Porzana pusilla</i>	18	BA (3), AM (7), WLA (8)
Spotless Crake	<i>Porzana tabuensis</i>	11	BA (5), WLA (6)
Red-rumped Parrot	<i>Psephotus haematonotus</i>	1,711	BA (720), AM (15), ABBBS (4), WLA (559), CSIRO (1), Mid, Bor, Boo, Cul (114), Nar (1), Tra (28), MD (267), Gwy (3)

Common Name	Scientific Name	No Records	Dataset
Mulga Parrot	<i>Psephotus varius</i>	179	BA (61), AM (10), WLA (83), Cul (7), Lum, Nar (2), MD (16)
Chirruping Wedgebill	<i>Psophodes cristatus</i>	84	BA (41), AM (1), WLA (39), MD (3)
Red-necked Avocet	<i>Recurvirostra novaehollandiae</i>	13,754	BA (16), AM (1), WLA (13321), Lum, Narw (411), MD (5)
Grey Fantail	<i>Rhipidura fuliginosa</i>	301	BA (199), ABBBS (13), WLA (77), CSIRO (3), Bor, Cul (3), Lum, Nar (1), Tra (4), Gwy (1)
Willie Wagtail	<i>Rhipidura leucophrys</i>	1,758	BA (1059), AM (13), ABBBS (3), WLA (444), Bor, Boo, Cul (56), Lum, Nar (23), Tra (7), MD (148), Gwy (5)
Rufous Fantail	<i>Rhipidura rufifrons</i>	2	BA (1), WLA (1)
Channel-billed Cuckoo	<i>Scythrops novaehollandiae</i>	3	BA (2), WLA (1)
White-browed Scrubwren	<i>Sericornis frontalis</i>	2	ABBBS
Weebill	<i>Smicromis brevirostris</i>	630	BA (337), AM (10), ABBBS (1), WLA (121), CSIRO (5), Cul (19), Nar (1), MD (134), Gwy (2)
Gull-billed Tern	<i>Sterna nilotica</i>	1,549	BA (22), WLA (1527)
Australian Pratincole	<i>Stiltia isabella</i>	66	BA (37), AM (2), WLA (29)
Pied Currawong	<i>Strepera graculina</i>	27	BA (23), AM (1), WLA (3)
Apostlebird	<i>Struthidea cinerea</i>	1,932	BA (724), AM (48), ABBBS (23), WLA (1004), CSIRO (1), Mid, Bor, Cul (11), Lum, Tra (69), MD (47), Gwy (5)
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>	3,912	BA (258), AM (6), WLA (3541), Lum, Narw (99), Tra (8)
Australian Shelduck	<i>Tadorna tadornoides</i>	1,347	BA (51), ABBBS (1), WLA (1272), MD (23)
Double-barred Finch	<i>Taeniopygia bichenovii</i>	472	BA (242), AM (9), ABBBS (8), WLA (211), Bor, Gwy (2)
Zebra Finch	<i>Taeniopygia guttata</i>	651	BA (320), AM (12), ABBBS (12), WLA (305), Nar (1), Tra, Gwy (1)
Australian White Ibis	<i>Threskiornis molucca</i>	580,807	BA (385), AM (6), WLA (580284), CSIRO (4), Cul (1), Lum, Narw (48), Tra, MD (78), Gwy (1)
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	862,349	BA (512), AM (5), ABBBS (6), WLA (861628), CSIRO (12), Lum, Narw (177), Tra, MD (8), Gwy (1)
Forest Kingfisher	<i>Todiramphus macleayii</i>	1	WLA
Red-backed Kingfisher	<i>Todiramphus pyrrhopygia</i>	124	BA (92), AM (10), WLA (15), MD (7)
Sacred Kingfisher	<i>Todiramphus sanctus</i>	56	BA (322), AM (7), ABBBS (2), WLA (107), CSIRO (3), Boo, Cul (9), Lum, MD (8), Gwy (3)
Scaly-breasted Lorikeet	<i>Trichoglossus chlorolepidotus</i>	6	WLA
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	4	BA (2), WLA (2)
Painted Button-quail	<i>Turnix varia</i>	3	BA (1), AM (1), WLA (1)
Little Button-quail	<i>Turnix velox</i>	36	BA (13), AM (2), WLA (21)
Barn Owl	<i>Tyto alba</i>	70	BA (38), AM (2), WLA (24), CSIRO (1), Tra, Gwy (5)
Masked Lapwing	<i>Vanellus miles</i>	5,178	BA (562), AM (7), WLA (4262), Mid, Lum, Narw (284), Tra (14), MD (48), Gwy (1)
Banded Lapwing	<i>Vanellus tricolor</i>	880	BA (226), AM (6), WLA (628), Cul (1), Lum, Narw (14), MD (5)
Silvereeye	<i>Zosterops lateralis</i>	71	BA (30), ABBBS (10), WLA (30), Mid, MD (1)
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	205	AM (88), WLA (48), Cul (4), Nar (4), MD (58), Gwy (3)
Water Rat	<i>Hydromys chrysogaster</i>	58	AM (5), WLA (38), Cul (1), MD (10), Gwy (4)
Northern Brown Bandicoot	<i>Isodon macrourus</i>	6	AM (2), WLA (4)
Western Grey Kangaroo	<i>Macropus fuliginosus</i>	382	WLA (311), CSIRO (4), MD (67)
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	1,750	AM (14), WLA (1420), CSIRO (4), Mid, Bor(55), Boo, Cul (207), Lum, Nar (18), MD (15), Gwy (17)
Common Wallaroo	<i>Macropus robustus</i>	35	WLA (19), CSIRO (3), Tra (1), MD (11), Gwy (1)
Red-necked Wallaby	<i>Macropus rufogriseus</i>	3	WLA(3), Mid
Red Kangaroo	<i>Macropus rufus</i>	833	AM (22), WLA (630), CSIRO (142), Boo, Cul (25), Lum, Nar (6), MD (3), Gwy (5)
Little Freetail Bat	<i>Mormopterus loriae</i>	7	AM (1), Cul (1), Nar (5)
Little Mastiff-bat	<i>Mormopterus planiceps</i>	31	AM (4), WLA (22), MD (4), Gwy (1)
	<i>Mormopterus sp. (big penis)</i>	29	WLA (1), MD (28)
	<i>Mormopterus sp. (little penis)</i>	58	WLA (51), MD (7)
White-striped Mastiff-bat	<i>Nyctinomus australis</i>	76	AM (50), WLA (14), MD (12)

Common Name	Scientific Name	No Records	Dataset
Lesser Long-eared Bat	<i>Nyctophilus geoffroyi</i>	127	AM (29), WLA (71), Cul (10), Nar (2), MD (10), Gwy (5)
Paucident Planigale	<i>Planigale gilesi</i>	55	AM (13), WLA (26), CSIRO (3), Cul (8), MD (5)
Narrow-nosed Planigale	<i>Planigale tenuirostris</i>	46	AM (5), WLA (21), CSIRO (5), Cul (7), Nar (6), Gwy (2)
Little Red Flying-fox	<i>Pteropus scapulatus</i>	5,719	AM (2), WLA (5716), Gwy (1)
Western Broad-nosed Bat	<i>Scotorepens balstoni</i>	45	AM (4), WLA (36), Nar (1), MD (2), Gwy (2)
Little Broad-nosed Bat	<i>Scotorepens greyii</i>	97	AM (22), WLA (50), Cul (15), MD (9), Gwy (1)
Fat-tailed Dunnart	<i>Sminthopsis crassicaudata</i>	146	AM (59), WLA (64), CSIRO (3), Cul (15), Lum, Nar (4), Tra (1)
Common Dunnart	<i>Sminthopsis murina</i>	4	AM (2), WLA (2)
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>	47	WLA (40), Boo, Cul (1), Lum, Nar (1), MD (2), Gwy (3)
Little Forest Eptesicus	<i>Vespadelus vulturnus</i>	117	AM (20), WLA (34), Cul (14), Nar (9), MD (33), Gwy (7)
Common Wombat	<i>Vombatus ursinus</i>	1	WLA

WLA = Atlas of NSW Wildlife

AM = Australian Museum

CSIRO = CSIRO dataset

BA = Birds Australia

ABBBS = Australian Bird and Bat Banding Scheme

Mid = Midkin NR Flora Fauna Survey

Bor = Boronga NR Biodiversity Survey

Boo = Boomi and Boomi West NRs Survey

Cul = Culgoa and Birrie River Floodplain Vertebrate Fauna Survey

Lum = Lumeah (Narran Lake NR) Biodiversity Survey

Nar = Vertebrate Fauna Survey of Narran River Floodplain

Narw = Narran Lake NR Waterbird Monitoring Program

Tra = Trangie Agricultural Research Centre - Faunal Biodiversity Survey

MD = Murray Darling Water Management Action Plan - Natural Resources Study

Nara = Narran Lake Amphibian Survey

Gwy = Fauna Survey for the Gwydir Watercourse

Appendix F – Waterbird Survey Data for Menindee Lakes and Macquarie Marshes

(Kingsford et al)

Menindee Lakes Data

Common Name	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1995	1996	1997	1998	1999	2000	2001	Total Individuals	Smallest Value	Year Recorded	Largest Value	Year Recorded
Australasian Shoveler			2					24	4	2		22		71		20			145	2	1985, 1992	71	1997
Australian Pelican	1574	1798	2946	276	2900	1128	134	384	969	573	1020	163	282	410	306	190	183	414	15650	134	1989	2946	1985
Australian Shelduck	178		7	4	19		7	8	5	220	20	279	2	144	114	6			1013	2	1996	279	1995
Australian White Ibis									2	1		4		2					9	1	1992	4	1995
Australian Wood Duck	76		533		100				57	257	80				25	50			1178	25	1998	533	1985
Banded Lapwing					6														6	6	1987	6	1987
Banded Stilt												82							82	82	1995	82	1995
Black Swan	52	584	12	18	166	7	7	41	33	68		1360	40	12	193	34	1	9	2637	1	2000	1360	1995
Black-tailed Native-hen			690					4	61			1743		11	4	88			2601	4	1990, 1998	1743	1995
Black-winged Stilt			1		10				45	4		1690							1750	1	1985	1690	1995
Caspian Tern			70		14					44	1	158	8		14				309	1	1993	158	1995
Darter	16	11	48		2	5	7		6	11		2	12	27		8	6	19	180	2	1987, 1995	48	1985
Egrets		3	59	2					120	22		142	4	72		4	4	30	462	2	1986	142	1995
Eurasian Coot	36	2414	207		2780			29	27	55		1655		224	14	60		84	7585	14	1998	2780	1987
Freckled Duck	2	20	25							27		3		11		2			90	2	1983, 1999	27	1992
Glossy Ibis	32											231							263	32	1983	231	1995
Great Cormorant	292	259	3	48	628	292	33	10	92	36	13	3	2	3	4	14	10	33	1775	2	1996	628	1987
Great Crested Grebe		34	11				4				1	3							53	1	1993	34	1984
Great Egret			3			1		5		3	2					20	17	2	53	1	1988	20	1999
Grey Teal	202	962	273	8	50	7	18	108	605	452	276	44923		151	2	842	28	70	48977	2	1998	44923	1995

Common Name	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1995	1996	1997	1998	1999	2000	2001	Total Individuals	Smallest Value	Year Recorded	Largest Value	Year Recorded
Gull-billed Tern								13		17						2			32	2	2000	17	1995
Hardhead	17	486					5	190	10	479		1138		110	9			5	2449	5	1989, 2001	1138	1995
Little Black Cormorant	48	3164	839	650	885	221	20	2	570	222			32	27	10	224	7	1175	8096	2	1990	3164	1984
Little Pied Cormorant	1347	36		73	625		8	3	34	104			15	53	71	116	16	12	2513	3	1990	1347	1983
Masked Lapwing		10							2	2		126							140	2	1991, 1992	126	1995
Musk Duck	1	6			8		2		10										27	1	1983	10	1991
Pacific Black Duck	6	132	47		4		35	48	353	418		472		109	6	72		72	1774	4	1987	472	1995
Pied Cormorant		907	1650	42	624	256	72	105	176	68	1465	92	106	123	4	32	218	227	6167	4	1998	1650	1985
Pink-eared Duck	11	312	449					4	197		169	13832		167		280		250	15671	4	1990	13832	1995
Purple Swamphen												709							709	709	1995	709	1995
Red-necked Avocet			144						46			2220							2410	46	1991	2220	1995
Royal Spoonbill	48		4					1	3					5					61	1	1990	48	1983
Silver Gull	340	399	148	86	138	36	7	61	127	65	55	742	84	2		12	27	2	2331	2	1997, 2001	742	1995
Small Grebes	1							12											13	1	1983	12	1990
Small Waders			5		200				13			5798		7					6023	5	1985	5798	1995
Straw-necked Ibis		6		4		1		4								0	20	3	38	1	1988	20	2000
Terns																2			2	2	1999	2	1999
Whiskered Tern	16		10		90	32					1	62				60			271	1	1993	90	1987
White-faced Heron		6			1			19	1	1		3	2				1		34	1	1987, 1991, 1992, 2000	19	1990
White-necked Heron								13	6										19	6	1991	13	1990
Yellow-billed Spoonbill	35		28	12	280		6	3	101	7	17	503	2	10		12	3	4	1023	2	1996	503	1995
Grand Total	4330	11549	8214	1223	9530	1986	365	1078	3675	3154	3120	78177	591	1751	776	2148	543	2411	134621	365	1989	78177	1995

Macquarie Marshes Data

Common Name	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total Individuals	Smallest Count	Year Recorded	Largest Count	Year Recorded	
Australasian Shoveler	312	29	32					49					4	50						476	4	1995	312	1983	
Australian Pelican	171		9	486	245	74	62			1303		8	42		150		5	3	110	2668	3	2000	1303	1992	
Australian Shelduck										21									40	61	21	1992	40	2001	
Australian White Ibis	6739	560	23	623	963	3411	667	1369	84	31	66	4	32	507		94	5	3	46	15227	3	2000	6739	1983	
Australian Wood Duck		1180	82	91		497	1751	99	140	211	399		44		200		60	13	5	4772	5	2001	1751	1989	
Black Swan	2652	88	46		264	224	214	24	42	21		5				67			21	18	3686	5	1994	2652	1983
Black-winged Stilt	624	2242	105	1960		298	390	149												5768	105	1985	2242	1984	
Brolga						49	50													99	49	1988	50	1989	
Caspian Tern							25													25	25	1989	25	1989	
Darter	15	29		151	37	49	25					2						5		5	328	2	1994	151	1986
Dusky Moorhen	15							24												39	15	1983	24	1990	
Egrets	2464	324	42	167	491		592	199		63	66	19	32	127	1010	322	100	4	54	6076	4	2000	2464	1983	
Eurasian Coot	1201		9	212	377	1269	768				33	0	4	2532					10	75	6490	4	1995	2532	1996
Freckled Duck	15																			15	15	1983	15	1983	
Glossy Ibis	5460	177	19	167	207	49	176	995		21			40		700	148				88	8247	19	1985	5460	1983
Great Cormorant	31									105										136	31	1983	105	1992	
Great Crested Grebe		118				49														167	49	1988	118	1984	
Great Egret		236				24	25	74	14				12	278	10					8	681	8	2001	278	1996
Grey Teal	16754	48881	214	4651	321	1244	3401	2639	84	2172	1165	90	348			215			101	98	82378	84	1991	48881	1984
Gull-billed Tern														50						50	50	1996	50	1996	
Hardhead	1794	2065			37	24										27			21	8	3976	8	2001	2065	1984
Little Black Cormorant	15	236		106		248	88	24								13			5	38	773	5	2000	248	1988

Common Name	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total Individuals	Smallest Count	Year Recorded	Largest Count	Year Recorded
Little Pied Cormorant		88					12	49			66				10				4	229	4	2001	88	1984
Magpie Goose														25						25	25	1996	25	1996
Masked Lapwing			19				12	1145							40					1216	12	1989	1145	1990
Musk Duck	46					174														220	46	1983	174	1988
Pacific Black Duck	6006	1239	174	197	226	323	1549	2539		339	632	5	190	304	3500	107	55	6	35	17426	5	1994	6006	1983
Pied Cormorant							25	248											10	283	10	2001	248	1990
Pink-eared Duck				60																60	60	1986	60	1986
Plumed Whistling-duck	93													50		536				679	50	1996	536	1998
Purple Swamphen	15		6							31	133								2	187	2	2001	133	1993
Royal Spoonbill		59					25			10	33	4	54	25			5		2	217	2	2001	59	1984
Silver Gull	62																			62	62	1983	62	1983
Small Grebes	15			15			50						28							108	15	1983, 1986	50	1989
Straw-necked Ibis	10155	11269		7341	4876	273	2507	4955			1198			4736		362		19	15	47706	15	2001	11269	1984
Whiskered Tern	1060	2389		303			50							506						4308	50	1989	2389	1984
White-faced Heron	31	118		15	18		163	348	14	10			2	25		27		8		779	2	1995	348	1990
White-necked Heron	46	324		334	94	24	88	248	14		199			2304	10	13	20	3	45	3766	3	2000	2304	1996
Yellow-billed Spoonbill	78	59	32	212	75		88	622	42	254	99	11	60	330	10	40	75	6	216	2309	6	2000	622	1990
Totals	55869	71710	812	17091	8231	8303	12803	15799	434	4602	4089	148	892	11849	5600	2011	330	223	922	221718	148	1994	71710	1984

APPENDIX G: Invertebrates Recorded Within the DRP

Taxa	No Records	Dataset
Phylum Platyhelminthes		
Class Temnocephalidea		
<i>Temnocephala</i> sp.	1	Bray, 1994
<i>Temnocephalidea</i> sp.	3	Bray, 1994
Phylum Nemertea		
Class Nematoda		
<i>Nematoda</i> sp.	11	Bray, 1994
Phylum Mollusca		
Class Bivalvia		
<i>Corbiculina australis</i>	4	Bray, 1994
<i>Sphaerium tasmanicum</i>	7	Bray, 1994
<i>Sphaerium</i> sp.	25	Sheldon, 1995
Class Gastropoda		
<i>Austropeplea lessoni</i>	14	Bray, 1994
<i>Austropeplea tomentosa</i>	21	Bray, 1994
<i>Ferrissia petterdi</i>	17	Bray, 1994
<i>Ferrissia</i> spp.	534	Sheldon, 1995
<i>Gyraulus meridionalis</i>	764	Bray, 1994
<i>Physastra</i> sp.	1	Bray, 1994
<i>Segnitiella victoriana</i>	88	Bray, 1994
<i>Physa</i> / <i>Isidorella</i> sp.	1,205	Bray, 1994 (1197), Sheldon, 1995 (8)
<i>Physa acuta</i>	168	Sheldon, 1995
Gastropoda sp.	1	Bray, 1994
Phylum Annelida		
Class Hirudinea		
<i>Hirudinea</i> sp.	3	Bray, 1994
Class Oligochaeta		
<i>Branchiura sowerbyi</i>	3	Bray, 1994
<i>Dero</i> sp.	2	Bray, 1994
<i>Oligochaeta</i> sp.	9,645	Bray, 1994 (9515), Sheldon, 1995 (130)
<i>Annelida</i> sp.	2	Bray, 1994
Phylum Rotifer		
Class Monogononta		
Order Ploimida		
Family Brachionidae		
<i>Brachionus urceolatus</i>		Jenkins and Briggs, 1995
<i>Brachionus novaezealandia</i>		Jenkins and Briggs, 1995
<i>Brachionus lyratus</i>		Jenkins and Briggs, 1995
<i>Brachionus angulatus</i>		Jenkins and Briggs, 1995
<i>Keratella</i> sp.		Jenkins and Briggs, 1995
Family Asplanchnidae		
<i>Asplanchna sieboldi</i>		Jenkins and Briggs, 1995
Family Lecanidae		
<i>Lecane</i> s. str. <i>papuana</i>		Jenkins and Briggs, 1995
Order Gnesiotrocha		
Family Testudinellidae		
<i>Testudinella patina</i>		Jenkins and Briggs, 1995
Phylum Arthropoda		

Taxa	No Records	Dataset
Class Arachnida		
<i>Hydracarina sp.</i>	74	Bray, 1994 (72), Sheldon, 1995 (2)
<i>Araneae sp.</i>	74	Bray, 1994
Class Crustacea		
Subclass Branchiopoda		
Order Cladocera		
Conchostraca sp.	7	Bray, 1994
Cladocera sp.	961	Bray, 1994
Suborder Anomopoda		
Family Daphniidae		
<i>Daphnia carinata</i>	ND	Jenkins and Briggs, 1995
<i>Ceriodaphnia sp.</i>	ND	Jenkins and Briggs, 1995
Family Macrothricidae		
<i>Macrothrix cf. indistincta</i>	ND	Jenkins and Briggs, 1995
Family Moinidae		
<i>Moina cf. tenuicornis</i>	ND	Jenkins and Briggs, 1995
<i>Moina cf. micrura</i>	ND	Jenkins and Briggs, 1995
<i>Moina sp.</i>	ND	Jenkins and Briggs, 1995
Family Chydoridae		
<i>Pleuroxus sp.</i>	ND	Jenkins and Briggs, 1995
<i>Alona sp.</i>	ND	Jenkins and Briggs, 1995
<i>Biapertua rigidicaudis</i>	ND	Jenkins and Briggs, 1995
<i>Leberis cf. aenigmatosa</i>	ND	Jenkins and Briggs, 1995
Order Ctenopoda		
Family Sididae		
<i>Diaphanosoma sp.</i>	ND	Jenkins and Briggs, 1995
Subclass Ostracoda		
<i>Ostracoda sp.</i>	382	Bray, 1994
Subclass Copepoda		
<i>Boeckella cf. symmetrica</i>	ND	Jenkins and Briggs, 1995
<i>Boeckella triarticulata</i>	ND	Jenkins and Briggs, 1995
Cyclopoid copepod	198	Bray, 1994
Calanoid copepod	244	Bray, 1994
Subclass Malacostraca		
Order Isopoda		
<i>Austroargathona sp.</i>	47	Bray, 1994
<i>Austroargathona picta</i>	326	Sheldon, 1995
Order Decapoda		
<i>Caradinia mccullochi</i>	153	Sheldon, 1995
<i>Parataya australiensis</i>	115	Bray, 1994 (41), Sheldon, 1995 (74)
<i>Macrobrachium cf. australiense</i>	2,216	Bray, 1994 (277), Sheldon, 1995 (1939)
<i>Cherax destructor</i>	244	Bray, 1994 (223), Sheldon, 1995 (21)
Class Insecta		
Order Collembola		
<i>Collembola sp 1</i>	529	Bray, 1994
<i>Collembola sp 2</i>	2	Bray, 1994
<i>Collembola sp 3</i>	2	Bray, 1994
<i>Collembola sp.</i>	2	Bray, 1994
Order Ephemeroptera		
Family Letophlebiidae		

Taxa	No Records	Dataset
<i>Atalophlebia cf MMBW sp 1</i>	271	Bray, 1994
<i>Atalophlebia australis</i>	7	Sheldon, 1995
Immature <i>Atalophlebia sp.</i>	22	Bray, 1994
Letophlebiidae sp.	1	Bray, 1994
Family Caenidae		
<i>Tasmanocoenis tillyardi</i>	614	Bray, 1994
<i>Tasmanocoenis arcuata</i>	410	Sheldon, 1995
Immature <i>Tasmanocoenis sp.</i>	19	Bray, 1994
Immature Caenidae	52	Bray, 1994
Family Baetidae		
<i>Cloeon sp.</i>	837	Bray, 1994 (93), Sheldon, 1995 (744)
Baetidae spp.	1	Bray, 1994
Order Odonata		
Suborder Zygoptera		
Family Gomphidae		
<i>Austrogomphus sp.</i>	6	Sheldon, 1995
Family Coenagrionidae		
<i>Ischnura aurora aurora</i>	18	Bray, 1994
<i>Ischnura heterostica</i>	19	Bray, 1994
<i>Xanthagrion erythroneurum</i>	48	Sheldon, 1995
<i>Austragrion watsoni</i>	64	Sheldon, 1995
<i>Calagrion billinghursti</i>	1	Sheldon, 1995
Immature <i>Ischnura sp.</i>	68	Bray, 1994
Immature Coenagrionidae	21	Bray, 1994
Immature Zygopteran	2	Bray, 1994
Tiny Zygoptera	201	Sheldon, 1995
Family Lestidae		
<i>Austolestes analis / leda</i>	1	Bray, 1994
Suborder Anisoptera		
Family Aeschnidae		
<i>Hemianax papuensis</i>	4	Bray, 1994
Aeschnidae sp.	1	Bray, 1994
Family Corduliidae		
<i>Hemicordulia tau</i>	18	Bray, 1994
Immature Cordullidae	4	Bray, 1994
Order Hemiptera		
Family Hydrometridae		
<i>Hydrometra sp.</i>	1	Bray, 1994
Family Gerridae		
Gerridae sp.	25	Sheldon, 1995
Gerridae sp 1	5	Bray, 1994
Gerridae sp 2	1	Bray, 1994
Family Veliidae		
<i>Microvelia oceanica</i>	24	Bray, 1994
<i>Microvelia sp.</i>	24	Sheldon, 1995
Veliidae sp 1	3	Bray, 1994
Veliidae sp 2	1	Bray, 1994
Veliidae sp 3	3	Bray, 1994
Veliidae sp 4	5	Bray, 1994
Veliidae sp 6	6	Bray, 1994

Taxa	No Records	Dataset
Family Hebridae		
<i>Hebrus sp 2</i>	2	Bray, 1994
Family Mesoveliidae		
<i>Mesovelia sp 1</i>	96	Sheldon, 1995
Mesoveliidae sp 1	5	Bray, 1994
Mesoveliidae sp 2	9	Bray, 1994
Mesoveliidae sp 4	7	Bray, 1994
Mesoveliidae sp 5	62	Bray, 1994
Mesoveliidae sp	1	Bray, 1994
Family Corixidae		
<i>Agraptocorixa sp</i>	157	Bray, 1994 (14), Sheldon, 1995 (143)
<i>Micronecta major</i>	846	Bray, 1994
<i>Micronecta spp.</i>	6,557	Sheldon, 1995
<i>Sigara sp</i>	44	Bray, 1994 (31), Sheldon, 1995 (13)
Family Naucoridae		
<i>Naucoris congreg</i>	19	Bray, 1994
<i>Naucoris sp 2</i>	22	Bray, 1994
Family Belostomatidae		
Belostomatidae sp 1	16	Bray, 1994
Belostomatidae sp 2	81	Bray, 1994
Family Notonectidae		
<i>Anisops spp.</i>	330	Bray, 1994 (147), Sheldon, 1995 (183)
Family Pleidae		
<i>Plea sp.</i>	2	Bray, 1994
Hemipteran sp.	17	Bray, 1994
Order Diptera		
Family Tipulidae		
Tipulidae sp 1	8	Bray, 1994
Tipulidae sp 2	3	Bray, 1994
Tipulidae sp 3	2	Bray, 1994
Family Simuliidae		
<i>Simulium ornatipes</i>	48	Bray, 1994
Immature Simuliidae sp	17	Bray, 1994
Family Culicidae		
<i>Culicini sp.</i>	5	Bray, 1994
Culicidae sp	7	Bray, 1994 (1), Sheldon, 1995 (6)
Family Ceratopogonidae		
<i>Bezzia sp.</i>	459	Sheldon, 1995
Family Psychodidae		
Psychodidae sp	17	Bray, 1994
Family Chironomidae		
Subfamily Tanytopodinae		
<i>Ablabesmyia sp.</i>	160	Bray, 1994 (97), Sheldon, 1995 (63)
<i>Clinotanypus sp.</i>	1	Bray, 1994
<i>Coelopynia pruinosa</i>	3	Bray, 1994
<i>Coelopynia sp.</i>	624	Sheldon, 1995
<i>Larsia sp.</i>	47	Bray, 1994
<i>Monopelopia sp.</i>	3	Bray, 1994
<i>Paramerina sp.</i>	542	Bray, 1994
<i>Procladius sp.</i>	395	Bray, 1994 (142), Sheldon, 1995 (253)

Taxa	No Records	Dataset
Tanypodinae sp	2	Bray, 1994
Subfamily Orthoclaadiinae		
<i>Corynoneura</i> sp.	81	Bray, 1994
<i>Cricotopus</i> spp.	362	Sheldon, 1995
<i>Cricotopus</i> / <i>Paratrichocladus</i> sp.	87	Bray, 1994
<i>Nanocladus</i> sp	94	Bray, 1994
<i>Parakiefferiella</i> sp.	148	Bray, 1994 (76), Sheldon, 1995 (72)
<i>Paralimnophyes</i> sp.	4	Bray, 1994
<i>Parametriconemus</i> sp.	8	Bray, 1994
<i>Rheocricotopus</i> sp.	312	Bray, 1994
<i>Thienmanniella</i> sp.	14	Bray, 1994
Immature Orthoclaadiinae sp.	5	Bray, 1994
Subfamily Chironominae		
<i>Cladotanytarsus</i> sp.	165	Bray, 1994 (31), Sheldon, 1995 (134)
<i>Paratanytarsus</i> sp.	16	Bray, 1994
<i>Rheotanytarsus</i> sp.	78	Bray, 1994
<i>Tanytarsus</i> sp.	941	Bray, 1994 (773), Sheldon, 1995 (168)
<i>Virgatanytarsus</i> sp.	1	Sheldon, 1995
Immature Tanytarsini	3	Bray, 1994
<i>Chironomus</i> sp.	942	Bray, 1994 (931), Sheldon, 1995 (11)
<i>Chironomus cloacalis</i>	30	Sheldon, 1995
<i>Cladopelma</i> sp.	233	Bray, 1994 (26), Sheldon, 1995 (207)
<i>Cryptochironomus</i> sp.	116	Bray, 1994 (48), Sheldon, 1995 (68)
<i>Stenochironomus</i> sp.	45	Sheldon, 1995
<i>Dicrotendipes</i> sp.	2,243	Bray, 1994 (311), Sheldon, 1995 (1932)
<i>Dicrotendipes conjunctus</i>	301	Sheldon, 1995
<i>Harnischia</i> sp.	72	Bray, 1994 (71), Sheldon, 1995 (1)
<i>Kiefferulus martini</i>	7	Bray, 1994 (1), Sheldon, 1995 (6)
<i>Kiefferulus</i> sp.	8,118	Bray, 1994
<i>Microchironomus</i> sp.	27	Bray, 1994
<i>Parachironomus</i> sp.	357	Bray, 1994 (156), Sheldon, 1995 (201)
<i>Paracladopelma</i> sp.	1	Bray, 1994
<i>Paratendipes</i> sp.	38	Sheldon, 1995
<i>Polypedilum nubifer</i>	142	Bray, 1994
<i>Polypedilum prasiogaster</i>	6	Bray, 1994
<i>Polypedilum</i> sp.	411	Bray, 1994 (226), Sheldon, 1995 (185)
Chironominae sp	2	Bray, 1994
Chironomid pupa	415	Bray, 1994
Tiny Chironomids	43	Sheldon, 1995
Family Ceratopogonidae		
Ceratopogoninae sp 1	41	Bray, 1994
Ceratopogoninae sp 2	251	Bray, 1994
Ceratopogoninae sp 3	2	Bray, 1994
Ceratopogoninae sp 4	4	Bray, 1994
Forcipomyiinae sp 2	3	Bray, 1994
Forcipomyiinae sp 3	1	Bray, 1994
Family Stratiomyidae		
Stratiomyidae sp 1	13	Bray, 1994
Stratiomyidae sp 2	2	Bray, 1994
Family Tabanidae		



Taxa	No Records	Dataset
Tabanidae sp	5	Bray, 1994 (3), Sheldon, 1995 (2)
Family Empididae		
Empididae sp.	140	Bray, 1994 (112), Sheldon, 1995 (28)
Family Sciomyzidae	4	Bray, 1994
Sciomyzidae sp.	16	Bray, 1994
Family Muscidae		
Muscidae sp 1	2	Bray, 1994 (1), Sheldon, 1995 (1)
Muscidae sp 2	3	Bray, 1994
Muscidae sp 3	5	Bray, 1994
Muscidae pupa	5	Bray, 1994
Famiy Ephydriidae		
Ephydriidae sp.	14	Bray, 1994
Ephydriidae pupa	7	Bray, 1994
Immature Dipteran larvae	2	Bray, 1994
Dipteran pupa	86	Bray, 1994
Order Lepidoptera		
Pyralidae MDFRC sp 7		
Pyralidae sp 2	42	Bray, 1994
Pyralidae sp 3	1	Bray, 1994
Order Trichoptera		
Family Hydroptilidae		
<i>Hellyethira simplex</i>	15	Bray, 1994
<i>Orthotrichia sp.</i>	1	Bray, 1994
Hydroptilidae pupa	1	Bray, 1994
Family Ecnomidae		
<i>Ecnomus cygnitus</i>	134	Bray, 1994
<i>Ecnomus pansus</i>	289	Bray, 1994
<i>Ecnomus turgidus</i>	43	Bray, 1994
<i>Economus sp.</i>	202	Sheldon, 1995
Immature <i>Ecnomus sp.</i>	55	Bray, 1994
Family Hydropsychidae		
<i>Cheumatopsyche sp 2</i>	4	Bray, 1994
<i>Cheumatopsyche sp.</i>	8	Sheldon, 1995
Family Leptoceridae		
<i>Oecetis sp.</i>	608	Bray, 1994 (5), Sheldon, 1995 (603)
<i>Triaenodes sp.</i>	9	Bray, 1994
<i>Triplectides australis</i>	231	Bray, 1994 (46), Sheldon, 1995 (185)
<i>Notolina spira</i>	1	Sheldon, 1995
Immature <i>Triplectides sp.</i>	3	Bray, 1994
Immature Leptoceridae sp	2	Bray, 1994
Immature Limnephiloidea	1	Bray, 1994
Order Coleoptera		
Family Carabidae		
Carabidae sp 1 (A)	4	Bray, 1994
Carabidae sp 2 (A)	7	Bray, 1994
Carabidae sp 3 (A)	1	Bray, 1994
Carabidae sp 4 (A)	1	Bray, 1994
Carabidae sp (A)	1	Bray, 1994
Carabidae sp (L)	1	Bray, 1994
Family Haliplidae		

Taxa	No Records	Dataset
<i>Haliphus sp.</i>	1	Bray, 1994
Family Dytiscidae		
<i>Allodessus bistrigatus (A)</i>	13	Bray, 1994
<i>Allodessus sp.</i>	21	Sheldon, 1995
<i>Antiporus gilberti (A)</i>	6	Bray, 1994 (4), Sheldon (2)
<i>Antiporus femoralis</i>	18	Sheldon, 1995
<i>Cybister tripunctatus (L)</i>	5	Bray, 1994
<i>Eretes sp. (L)</i>	1	Sheldon, 1995
<i>Hydaticus pulcher</i>	1	Bray, 1994
<i>Hydrovatus armstrongi (A)</i>	4	Bray, 1994
<i>Hydrovatus opacus (A)</i>	8	Bray, 1994
<i>Laccophilus sp. (A)</i>	2	Bray, 1994
<i>Limbodessus compactus (A)</i>	49	Bray, 1994
<i>Limbodessus sp. 1 (A)</i>	1	Bray, 1994
<i>Liodessus praelargus (A)</i>	5	Bray, 1994
<i>Liodessus sp.</i>	25	Bray, 1994 (23), Sheldon, 1995 (2)
<i>Megaporus sp.</i>	12	Bray, 1994 (1), Sheldon, 1995 (11)
<i>Paroster sp.</i>	31	Sheldon, 1995
<i>Platynectes decempunctatus var polygrammus (A)</i>	1	Bray, 1994
<i>Rhantus suturalis (A)</i>	9	Bray, 1994
<i>Rhantus suturalis (L)</i>	2	Bray, 1994
<i>Sternopriscus multimaculatus (A)</i>	4	Bray, 1994
Dytiscidae sp (L)	29	Bray, 1994
Family Gyrinidae		
<i>Macrogyrus sp. (L)</i>	1	Sheldon, 1995
Family Hydraenidae		
<i>Hydraena sp.</i>	29	Sheldon, 1995
<i>Hydraena sp 1 (A)</i>	47	Bray, 1994
<i>Hydraena sp 2 (A)</i>	16	Bray, 1994
<i>Ochthebius sp (A)</i>	29	Bray, 1994 (26), Sheldon, 1995 (3)
Hydraenidae sp (L)	3	Bray, 1994
Family Staphylinidae		
Staphylinidae sp 1 (A)	23	Bray, 1994
Staphylinidae sp 2 (A)	7	Bray, 1994
Staphylinidae sp 3 (A)	11	Bray, 1994
Staphylinidae sp 4 (A)	4	Bray, 1994
Staphylinidae sp 5 (A)	1	Bray, 1994
Staphylinidae sp 6 (A)	4	Bray, 1994
Staphylinidae sp 7 (A)	1	Bray, 1994
Staphylinidae sp 8 (A)	1	Bray, 1994
Staphylinidae sp 9 (A)	1	Bray, 1994
Staphylinidae sp 10 (A)	1	Bray, 1994
Staphylinidae sp 11 (A)	1	Bray, 1994
Staphylinidae sp 12 (A)	1	Bray, 1994
Staphylinidae sp (A)	4	Bray, 1994
Family Hydrophilidae		
<i>Berosus approximans (A)</i>	13	Bray, 1994
<i>Berosus discolor (A)</i>	1	Bray, 1994
<i>Berosus majusculus (A)</i>	31	Bray, 1994

Taxa	No Records	Dataset
<i>Berosus</i> sp 4 (A)	1	Bray, 1994
<i>Berosus</i> sp.	68	Bray, 1994 (67), Sheldon, 1995 (1)
<i>Enochrus</i> sp.	4	Sheldon, 1995
<i>Enochrus</i> sp 1 (A)	9	Bray, 1994
<i>Enochrus</i> sp 2 (A)	37	Bray, 1994
<i>Helochares</i> nr sp (<i>mareensis</i>) (A)	36	Bray, 1994
<i>Hydrochus</i> cf MDFRC sp 2 (A)	94	Bray, 1994
<i>Hydrophilus</i> sp (A)	1	Bray, 1994
<i>Limnoxenus zealandicus</i> (A)	7	Bray, 1994
<i>Paracymus pygmaeus</i> (A)	24	Bray, 1994
<i>Paracymus</i> sp.	27	Sheldon, 1995
<i>Spercheus</i> sp (A)	3	Bray, 1994
<i>Sternolophus marginicollis</i> (A)	2	Bray, 1994
Hydrophilidae sp (L)	67	Bray, 1994 (64), Sheldon, 1995 (3)
Family Brentidae		
Brentidae sp 1 (A)	8	Bray, 1994
Brentidae sp (L)	5	Bray, 1994
Family Curculionidae		
Curculionidae sp 1 (A)	5	Bray, 1994
Curculionidae sp 2 (A)	1	Bray, 1994
Curculionidae sp 3 (A)	1	Bray, 1994
Curculionidae sp 4 (A)	18	Bray, 1994
Curculionidae sp 5 (A)	3	Bray, 1994
Curculionidae sp 6 (A)	1	Bray, 1994
Curculionidae sp 7 (A)	1	Bray, 1994
Curculionidae sp 8 (A)	2	Bray, 1994
Curculionidae sp (L)	1	Bray, 1994
Family Chrysomelidae		
Chrysomelidae sp 1 (A)	199	Bray, 1994
Chrysomelidae sp 2 (A)	12	Bray, 1994
Chrysomelidae sp 3 (A)	26	Bray, 1994
Chrysomelidae sp 4 (A)	2	Bray, 1994
Chrysomelidae sp 5 (A)	1	Bray, 1994
Chrysomelidae sp 6 (A)	1	Bray, 1994
Chrysomelidae sp (L)	36	Bray, 1994
Family Scirtidae		
Scirtidae sp 3 (A)	1	Bray, 1994
Scirtidae sp 4 (A)	1	Bray, 1994
Scirtidae sp (L)	1	Bray, 1994
Family Elmidae		
Elmidae sp (L)	1	Bray, 1994
<i>Coxelmis</i> sp. (L)	7	Sheldon, 1995
Coleopteran sp (A)	7	Bray, 1994
Coleopteran sp (L)	2	Bray, 1994

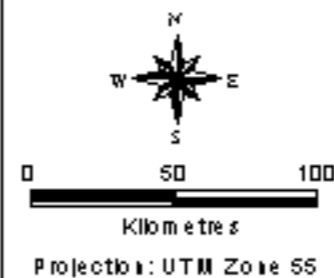
- | | |
|---------------------------------|---------------------------------|
| AA Australian Alps | OVP Old Victoria Plain |
| ARC Arnhem Coast | PCK Pine Creek |
| ARP Arnhem Plateau | PIL Pilbara |
| AWU Avon Wheatbelt | RIV Riverina |
| BBN Brigalow Belt North | SB Sydney Basin |
| BBS Brigalow Belt South | SCP South East Coastal Plain |
| BEL Ben Lomond | SEC South East Corner |
| BHC Broken Hill Complex | SEH South Eastern Highlands |
| BRT Burt Plain | SEQ South Eastern Queensland |
| CA Central Arnhem | SSD Simpson Strzelecki Dunedels |
| CAR Caruaru | STP Stony Plains |
| CHC Channel Country | STU Sturt Plateau |
| CK Central Kimberley | SWA Swan Coastal Plain |
| CMC Central Mackay Coast | TAM Tanami |
| COO Coolgardie | TCH Tasmanian Central Highlands |
| CP Cobarr Penneplain | TIM Tiwi Cobourg |
| CR Central Ranges | TMM Tasmanian Northern Midlands |
| CYP Cap York Peninsula | TNS Tasmanian Northern Slopes |
| DAB Daly Basin | TSE Tasmanian South East |
| DAC Darwin Coastal | TSR Tasmanian Southern Ranges |
| DEU Desert Uplands | TWE Tasmanian West |
| DL Dampierland | VB Victoria Bonaparte |
| DMR Dawsonport Murchison Ranges | VM Victorian Midlands |
| DRP Darling Riverine Plains | VVP Victorian Volcanic Plain |
| EIU Eneabey Uplands | WAR Warren |
| ESP Esperance Plains | WT Wet Tropics |
| EYB Eyre Yorke Block | YAL Yalgoo |
| FIN Finkle | |
| FLB Flinders Lofly Block | |
| FLI Flinders | |
| GAS Gascoyne | |
| GAW Gawler | |
| GD Gibson Desert | |
| GFU Gulf Fall and Uplands | |
| GS Geraldton Sandplains | |
| GSD Great Sandy Desert | |
| GUC Gulf Coastal | |
| GUP Gulf Plains | |
| GVD Great Victoria Desert | |
| HAM Hampton | |
| JF Jarrah Forest | |
| KAN Kanmanloo | |
| KIM King | |
| LSD Little Sandy Desert | |
| MAC MacDonnell Ranges | |
| MAL Mallee | |
| MDD Murray Darling Depression | |
| MGD Mitchell Grass Downs | |
| MII Mount Isa Inlier | |
| ML Mulga Lands | |
| MUR Murchison | |
| NAM Nandewar | |
| NCP Naracoorte Coastal Plain | |
| NET New England Tableland | |
| NK Northern Kimberley | |
| NNC NSW North Coast | |
| NSS NSW South Western Slopes | |
| NUL Nulbaror | |



- | | |
|---|---|
|  | Interim Bioregionalisation of Australia |
|  | Darling Riverine Plains Bioregion |

MAP 1

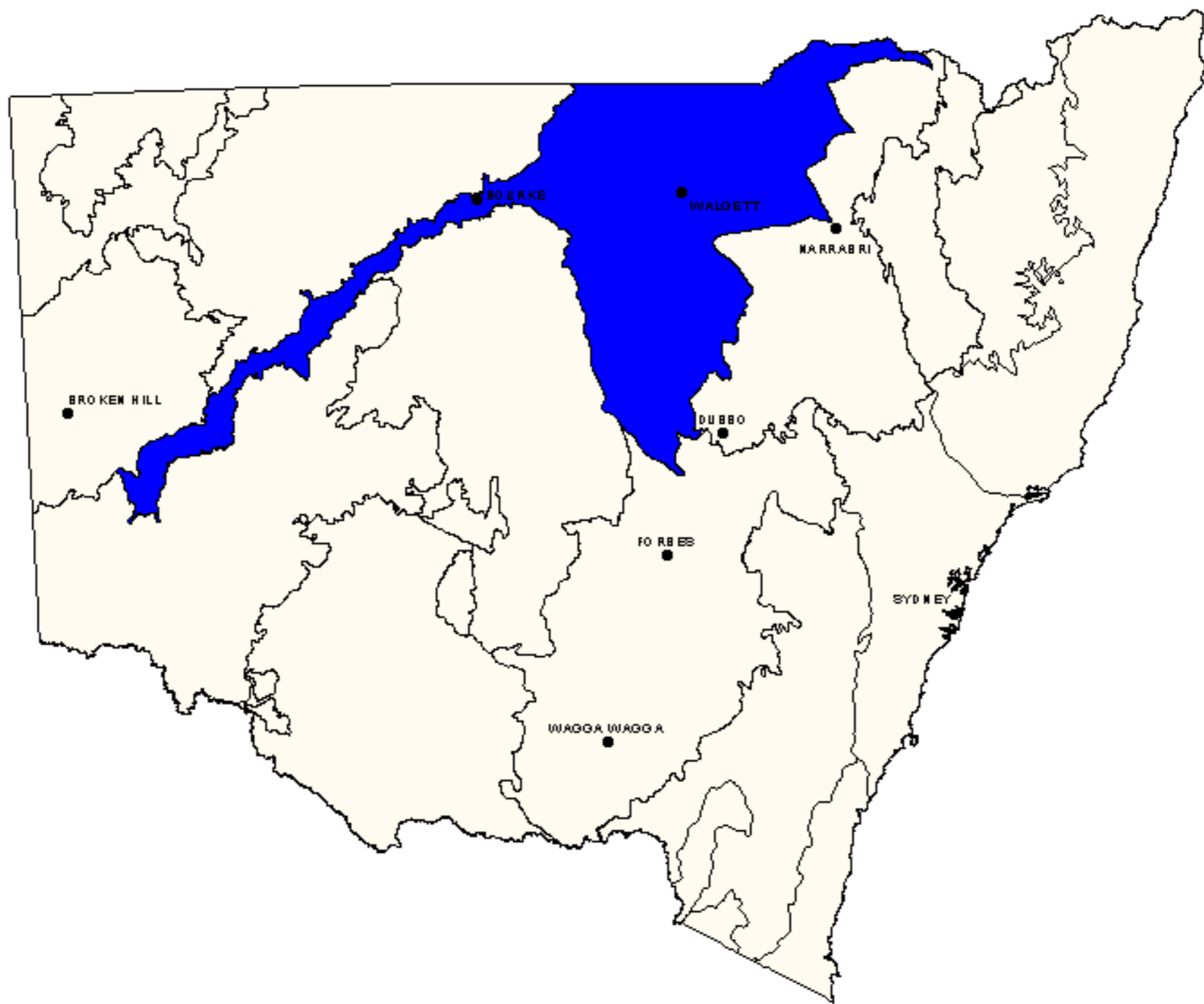
Location of Darling Riverine Plains Bioregion (IBRA)



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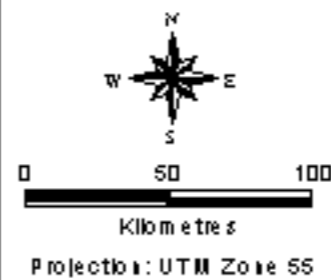


Darling Riverine Plains Bioregion



IBRA Regions in NSW

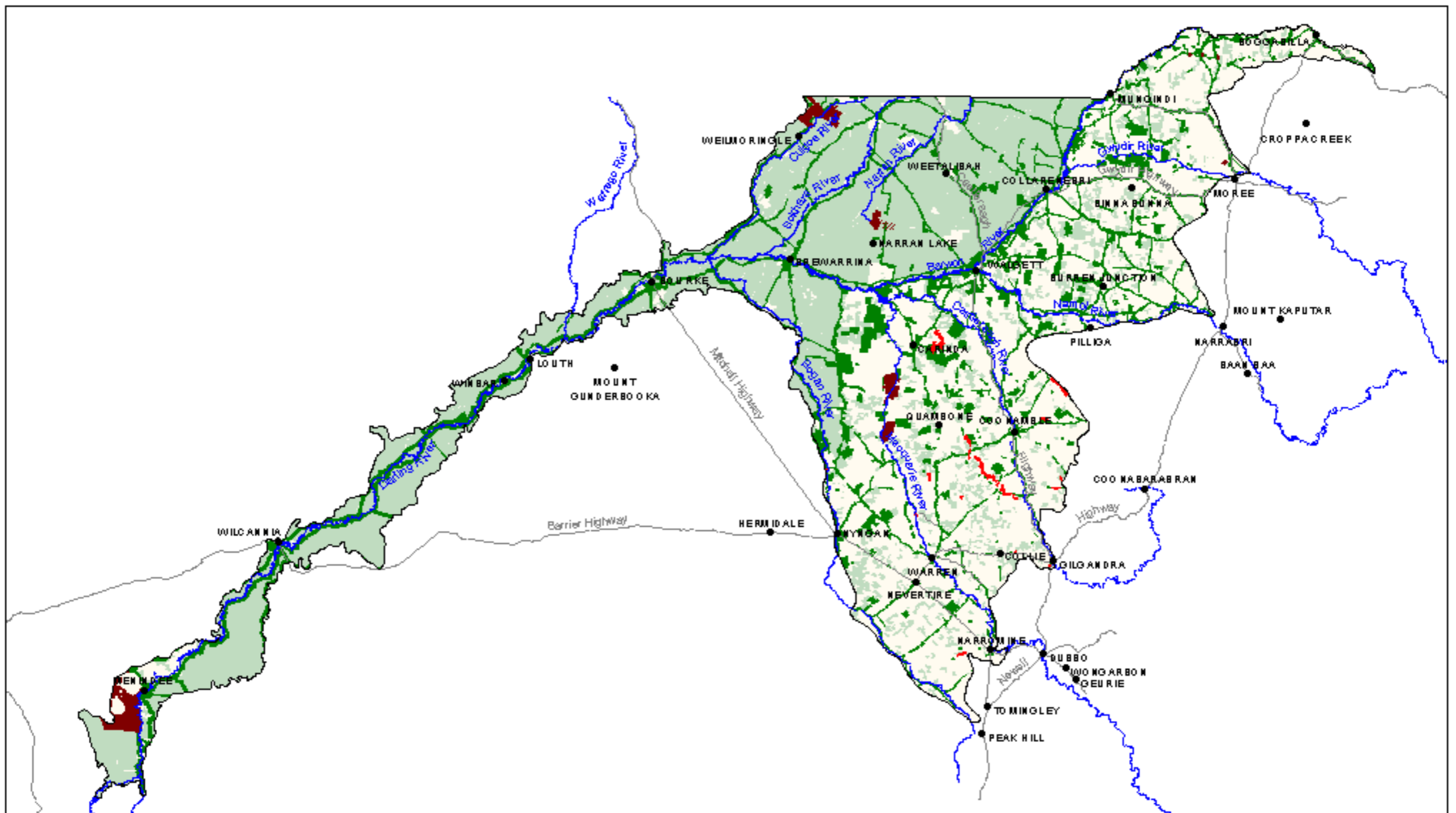
MAP 2
Darling Riverine Plains Bioregion









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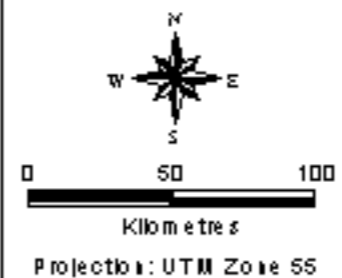


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- | | |
|---|---|
|  State Forest |  Crown Reserve |
|  NPWS Estate Gazetted |  Crown Lease |
|  NPWS Estate Ungazetted |  DRP |

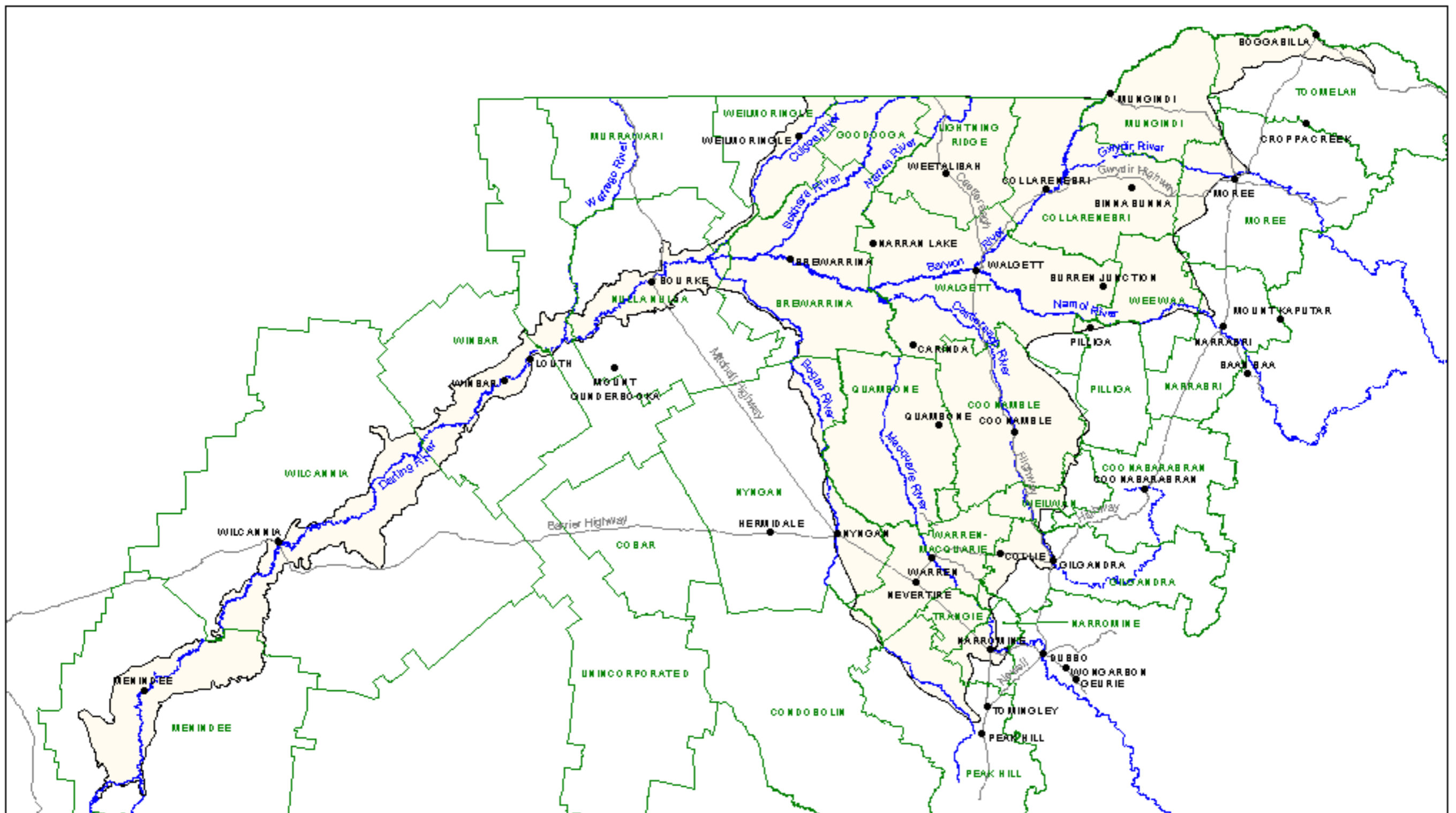
MAP 4
Land Tenure



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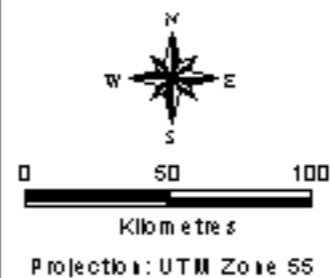


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- Aboriginal Land Council Areas
- DRP Boundary

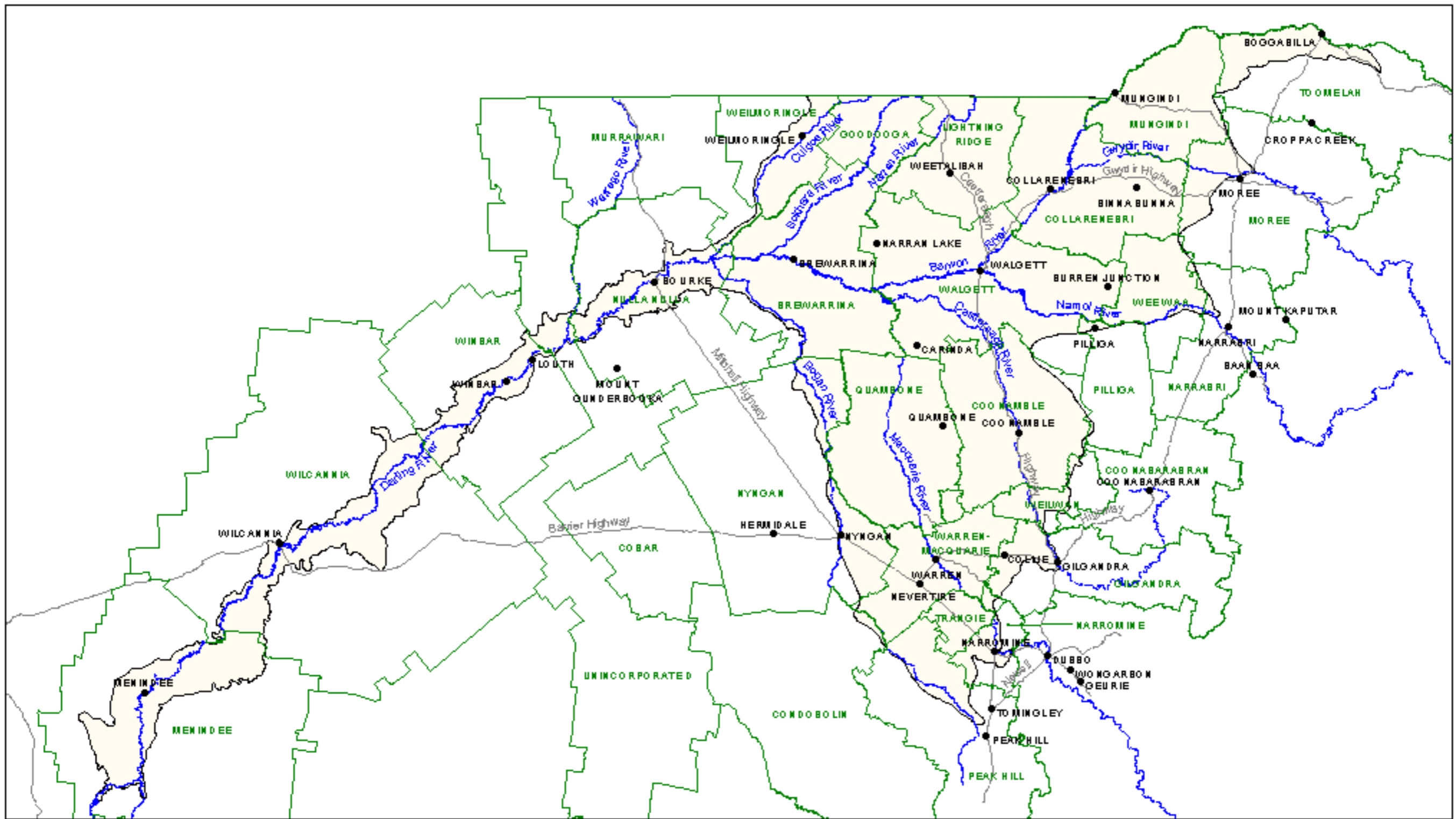
MAP 5
Aboriginal Land Council Areas



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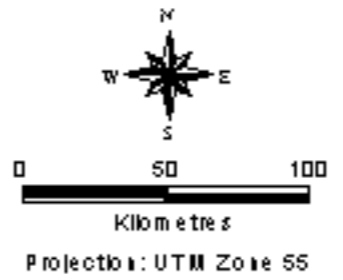


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- State Electoral Boundaries
- DRP Boundary

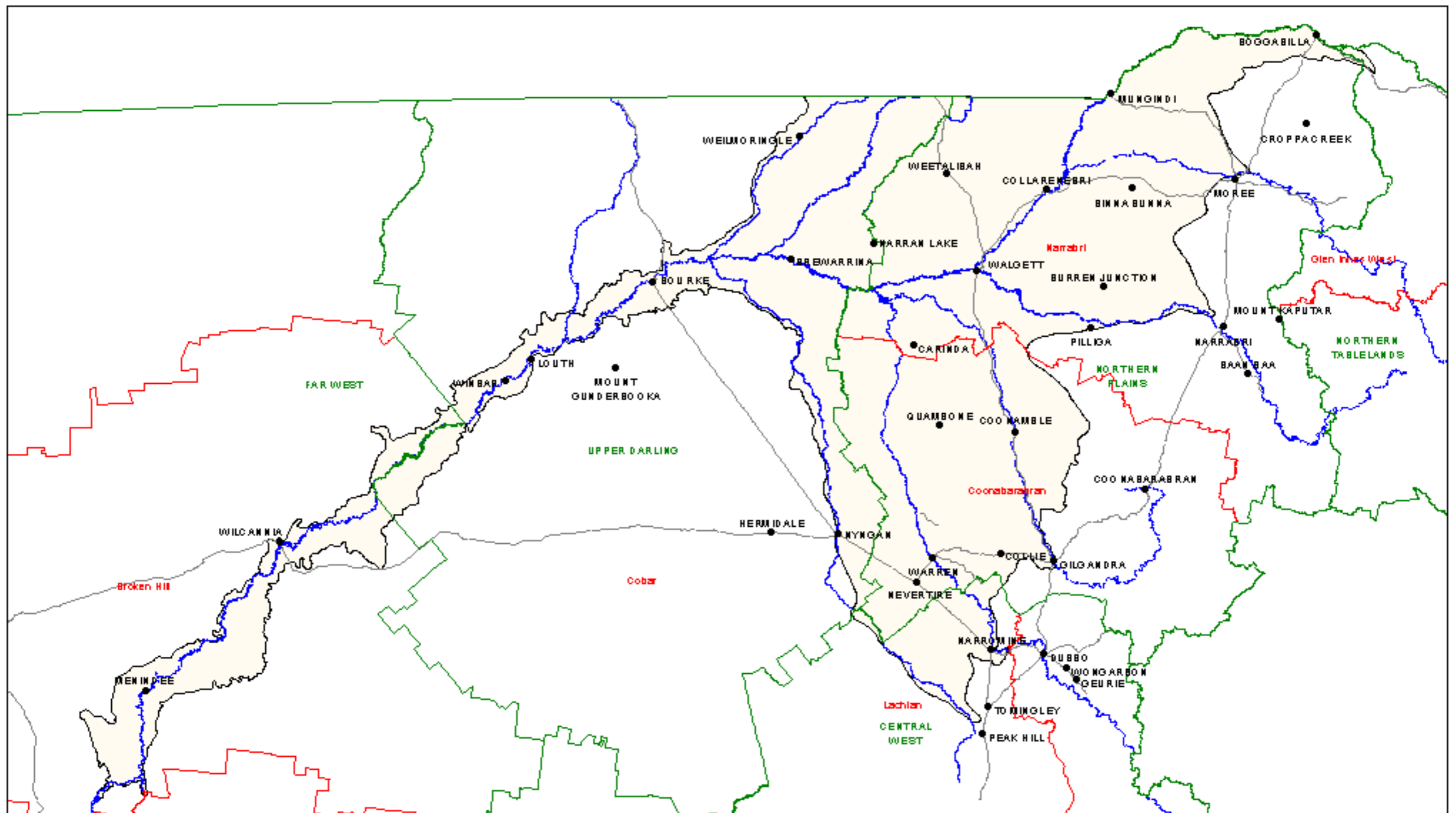
MAP 6
State Electoral Boundaries





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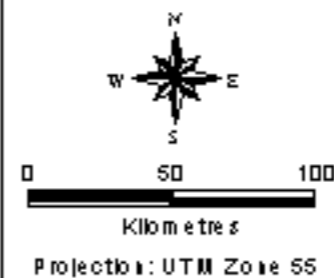


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-  NPWS Regions
-  NPWS Areas
-  DRP Boundary

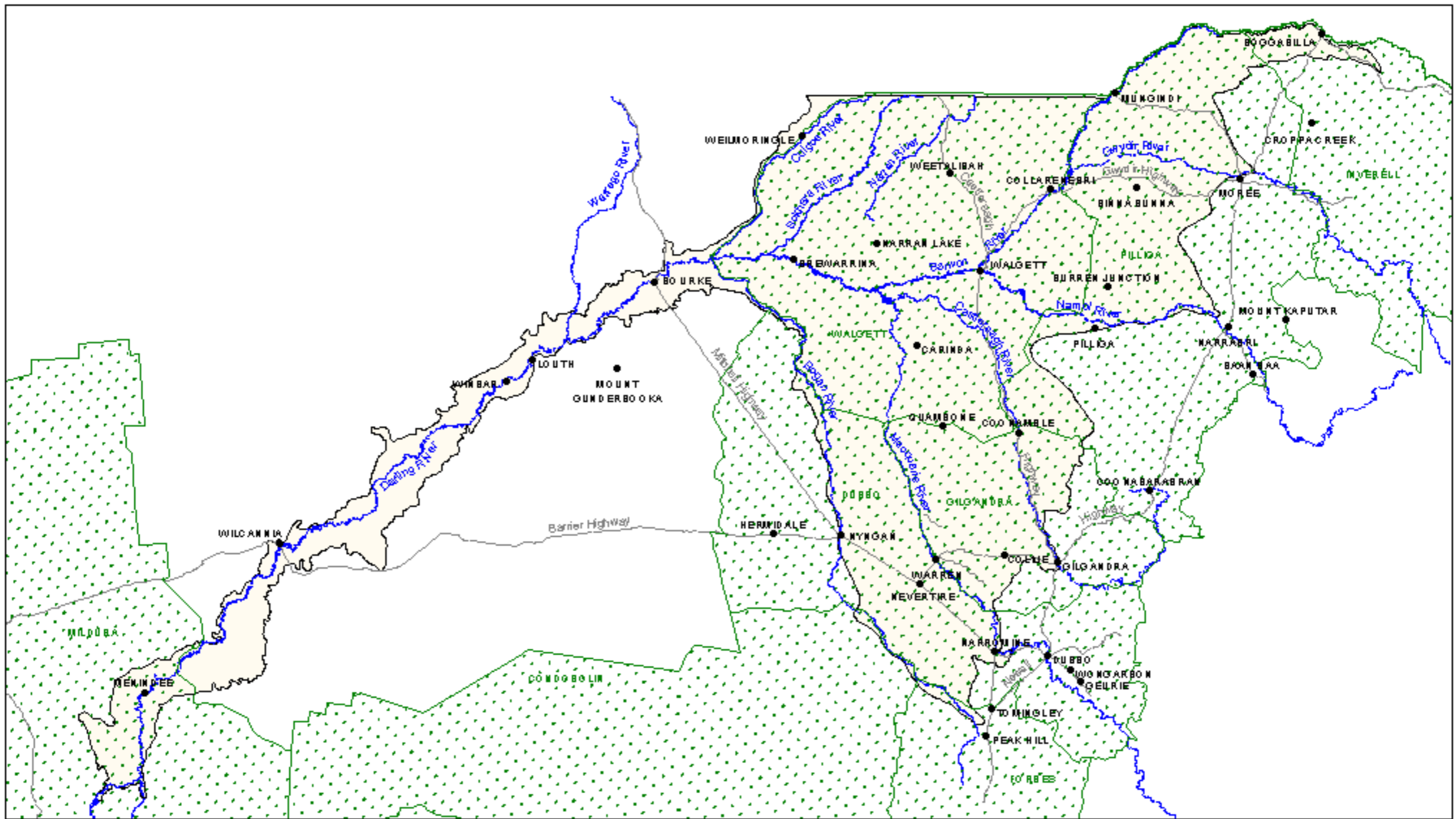
MAP 7
NPWS Regions and Areas





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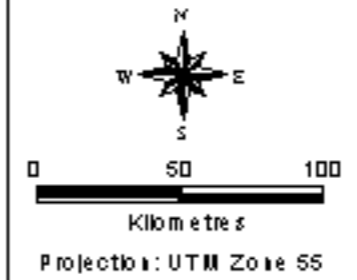


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-  State Forest Management Boundaries
-  DRP Boundary

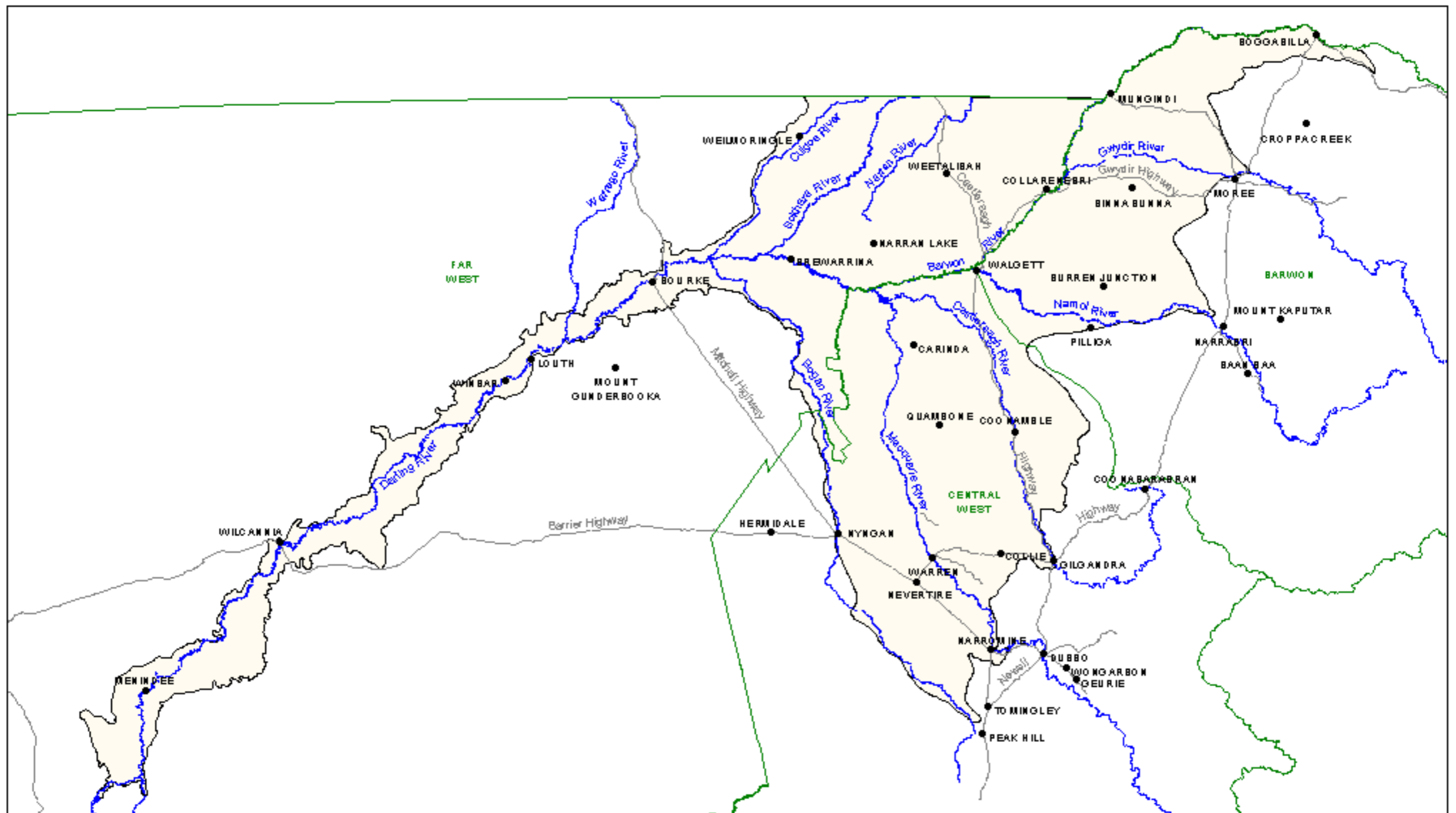
MAP 8
NSW State Forest Management Areas





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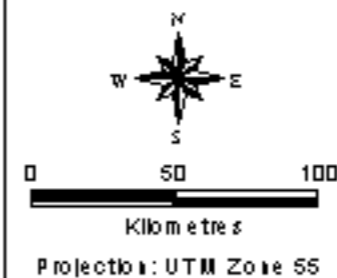


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-  DLWC Regions
-  DRP Boundary

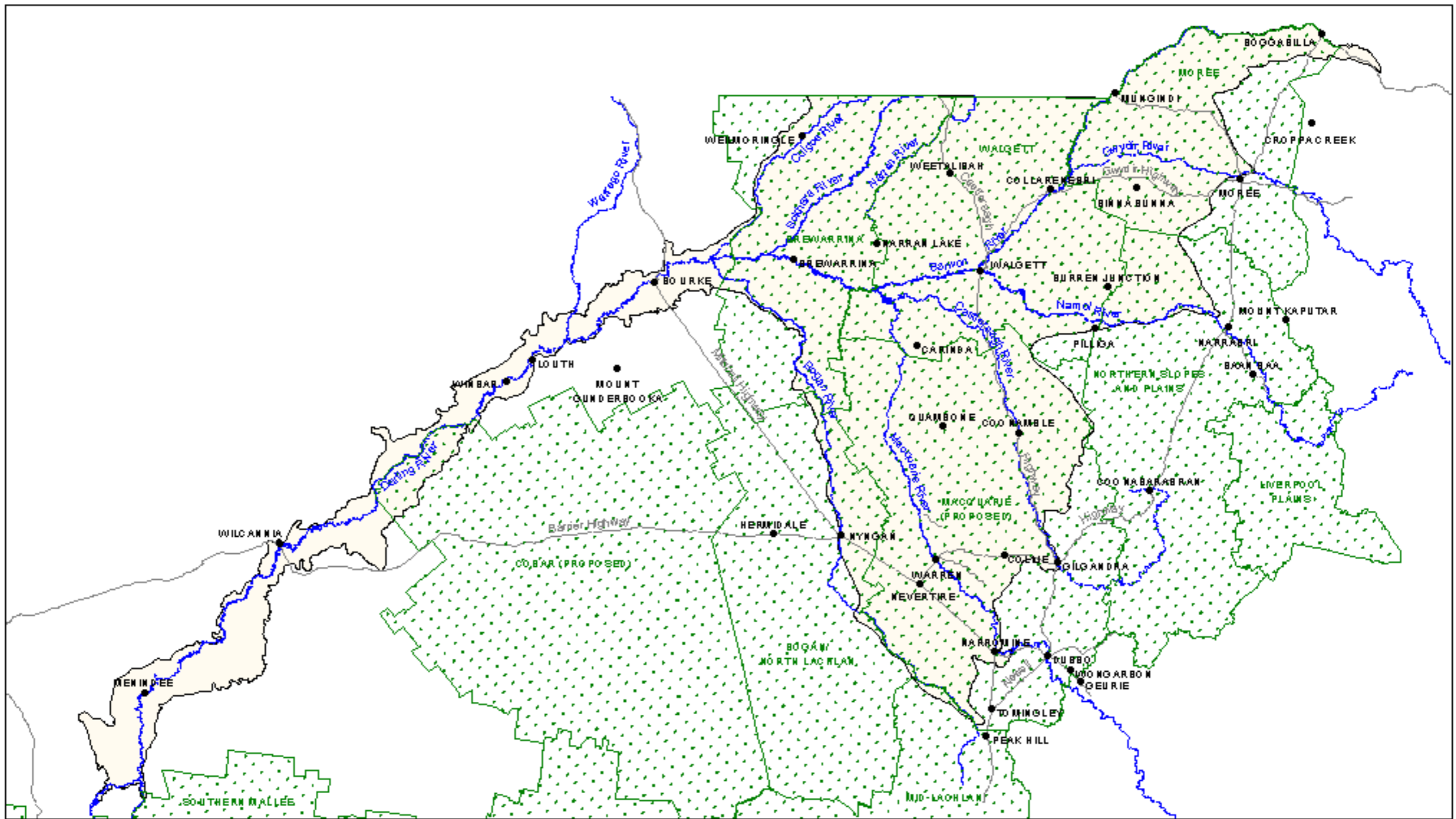
MAP 9
DLWC Regions





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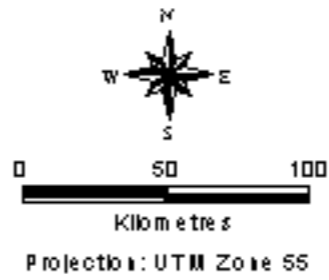


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-  Regional Vegetation Committees
-  DRP Boundary

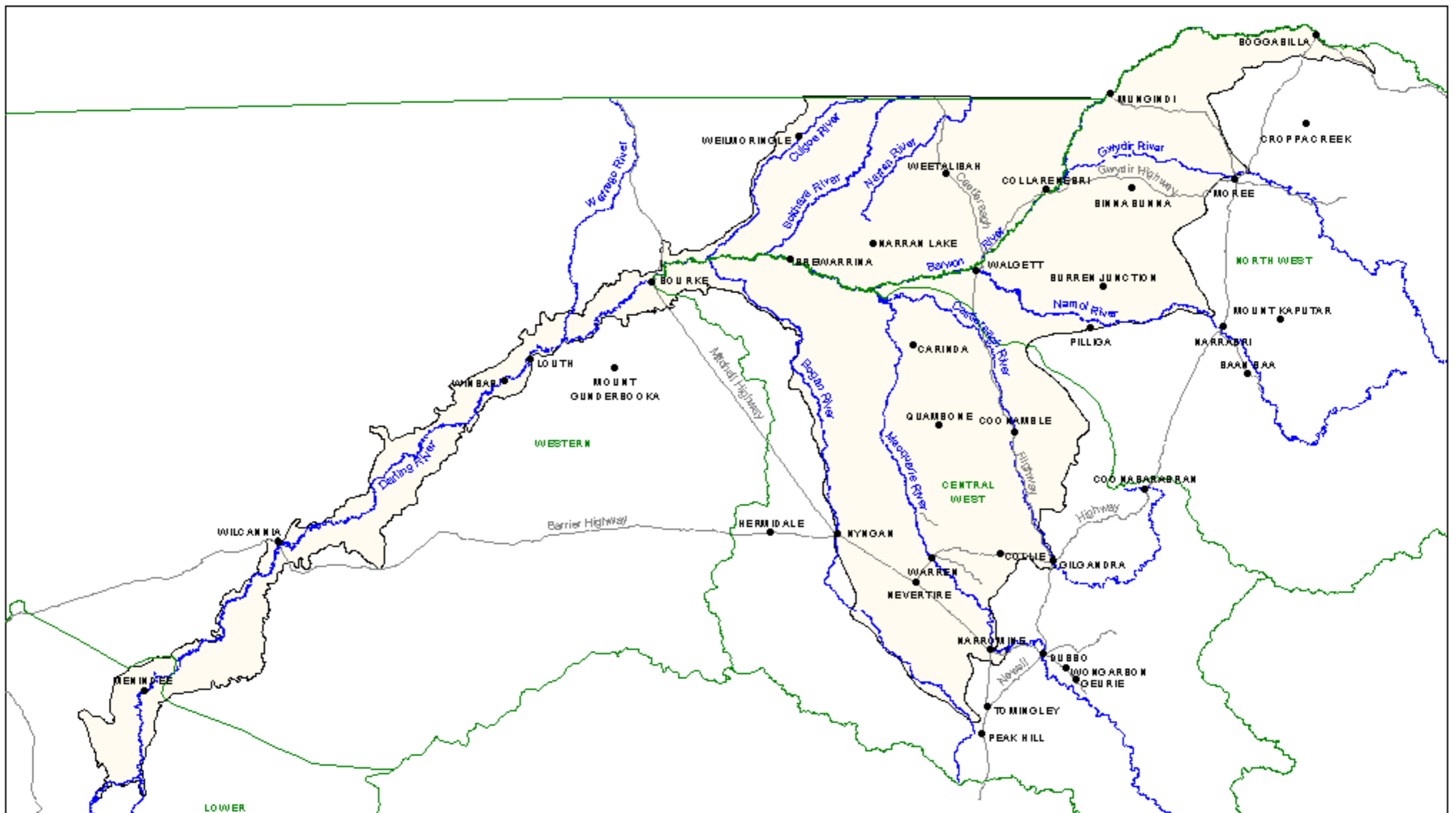
MAP 11
Regional Vegetation Committee
Boundaries





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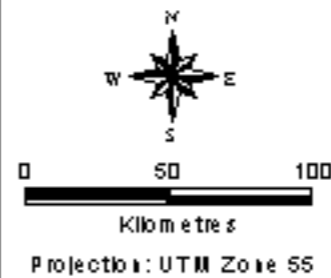


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-  Catchment Management Board Areas
-  DRP Boundary

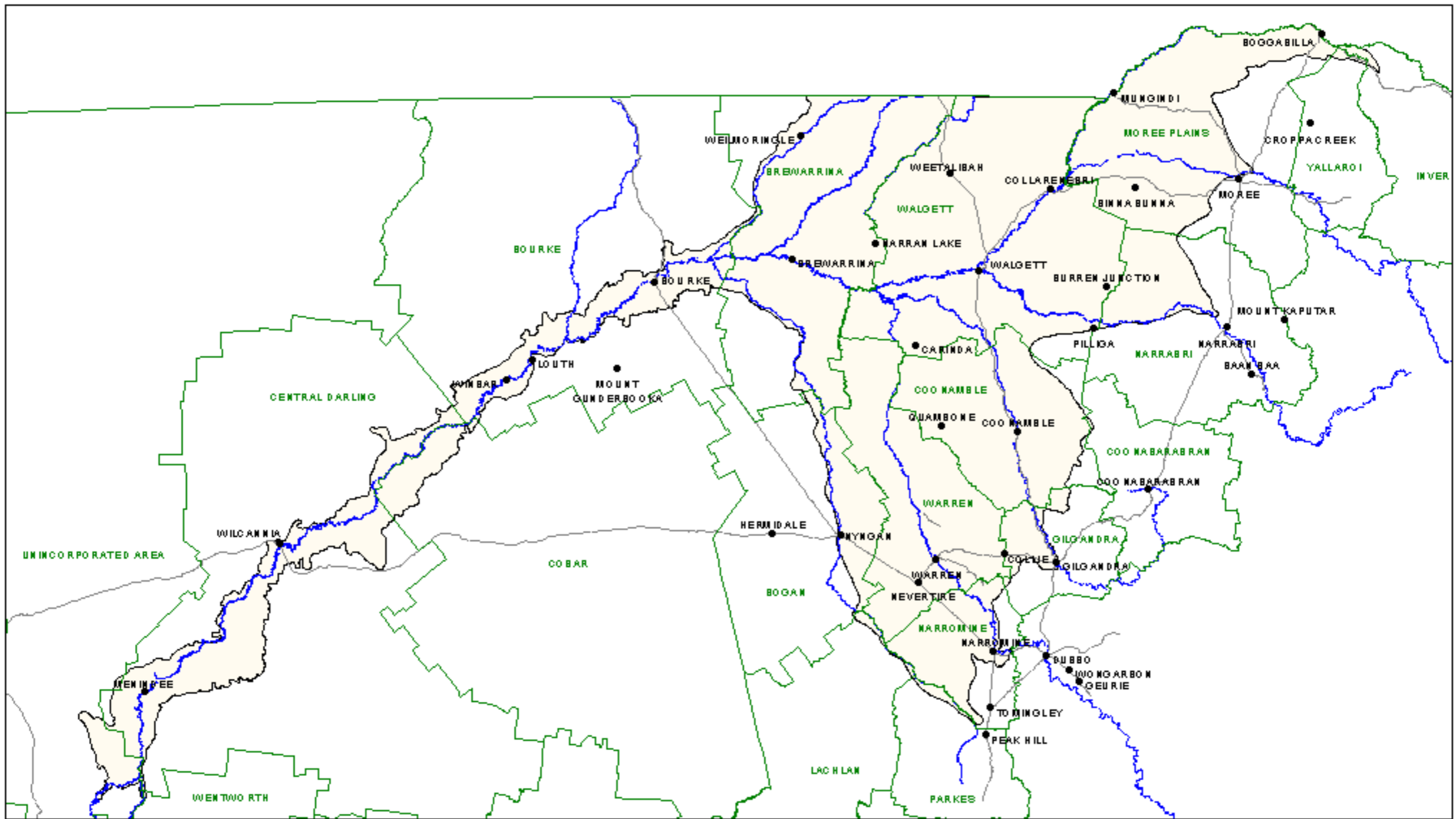
MAP 12
Catchment Management Board Areas



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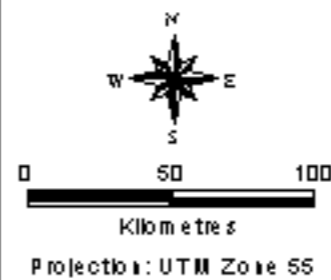


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- Local Government Areas
- DRP Boundary

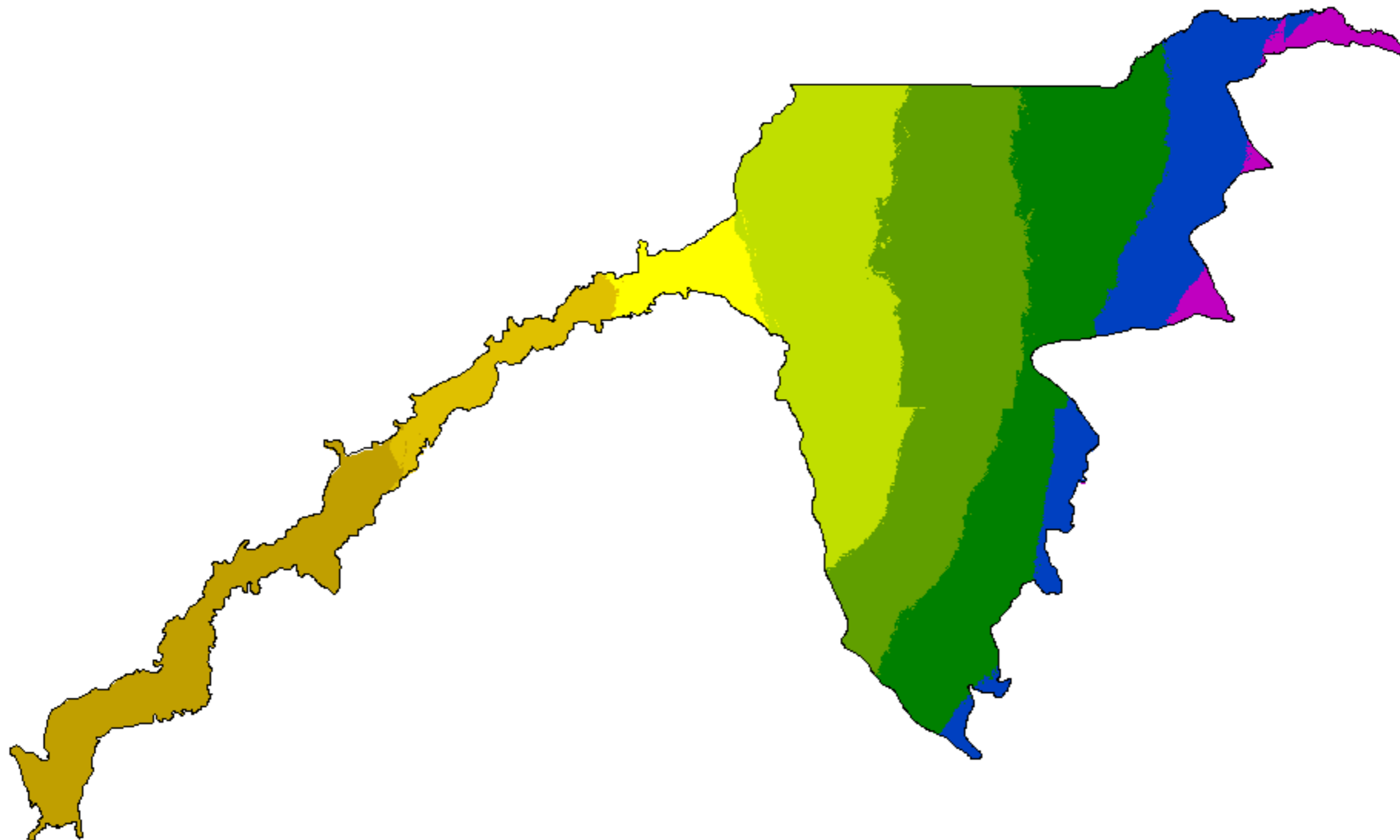
MAP 13 Local Government Areas



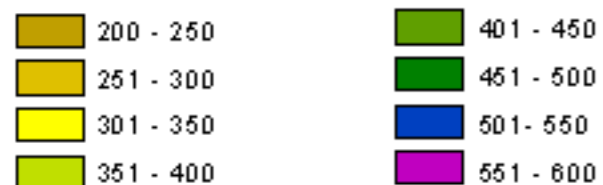
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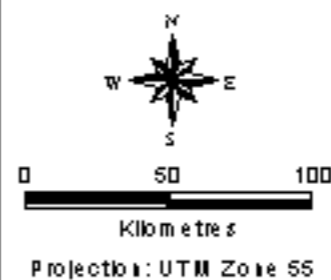
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Average Annual Precipitation (mm)



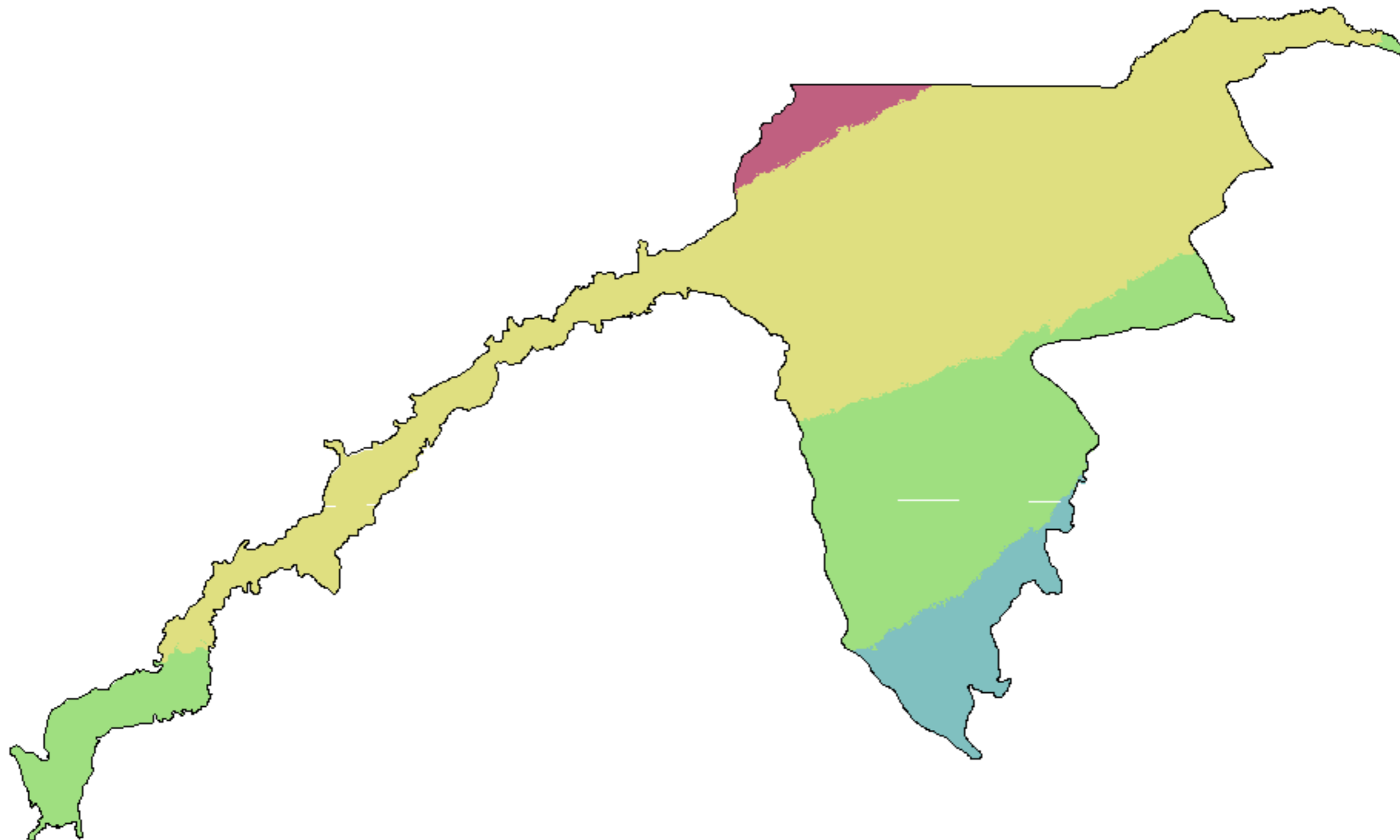
MAP 14
Average Annual Rainfall (mm)



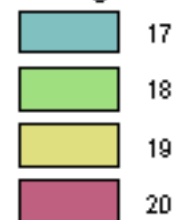
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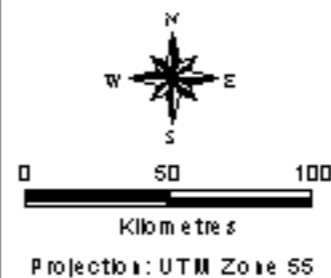
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Average Annual Temperature (C)



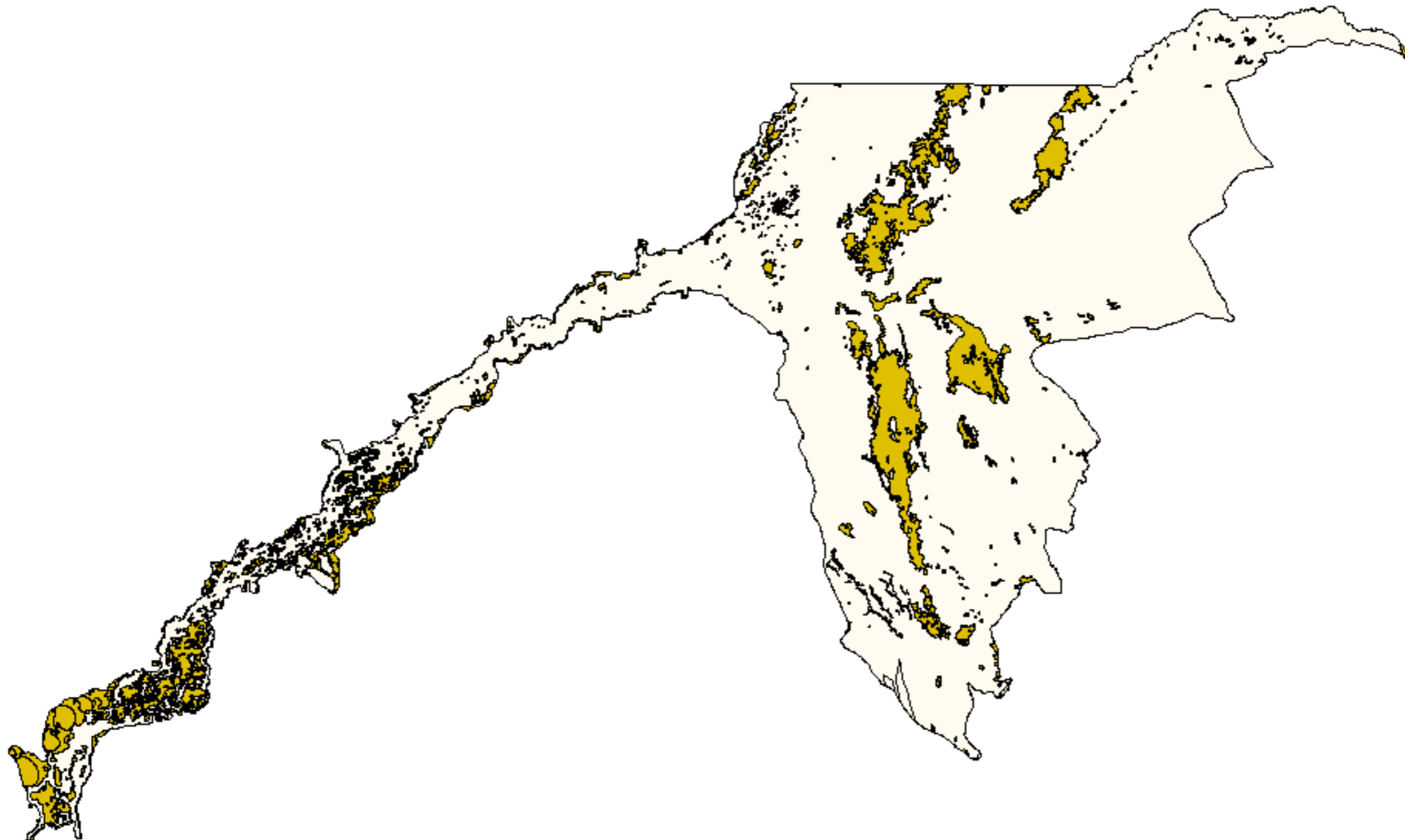
MAP 15
Average Annual Temperature



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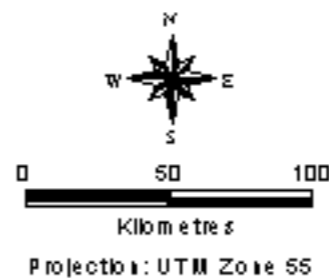
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Lithology

- Cainozoic alluvium
- Other

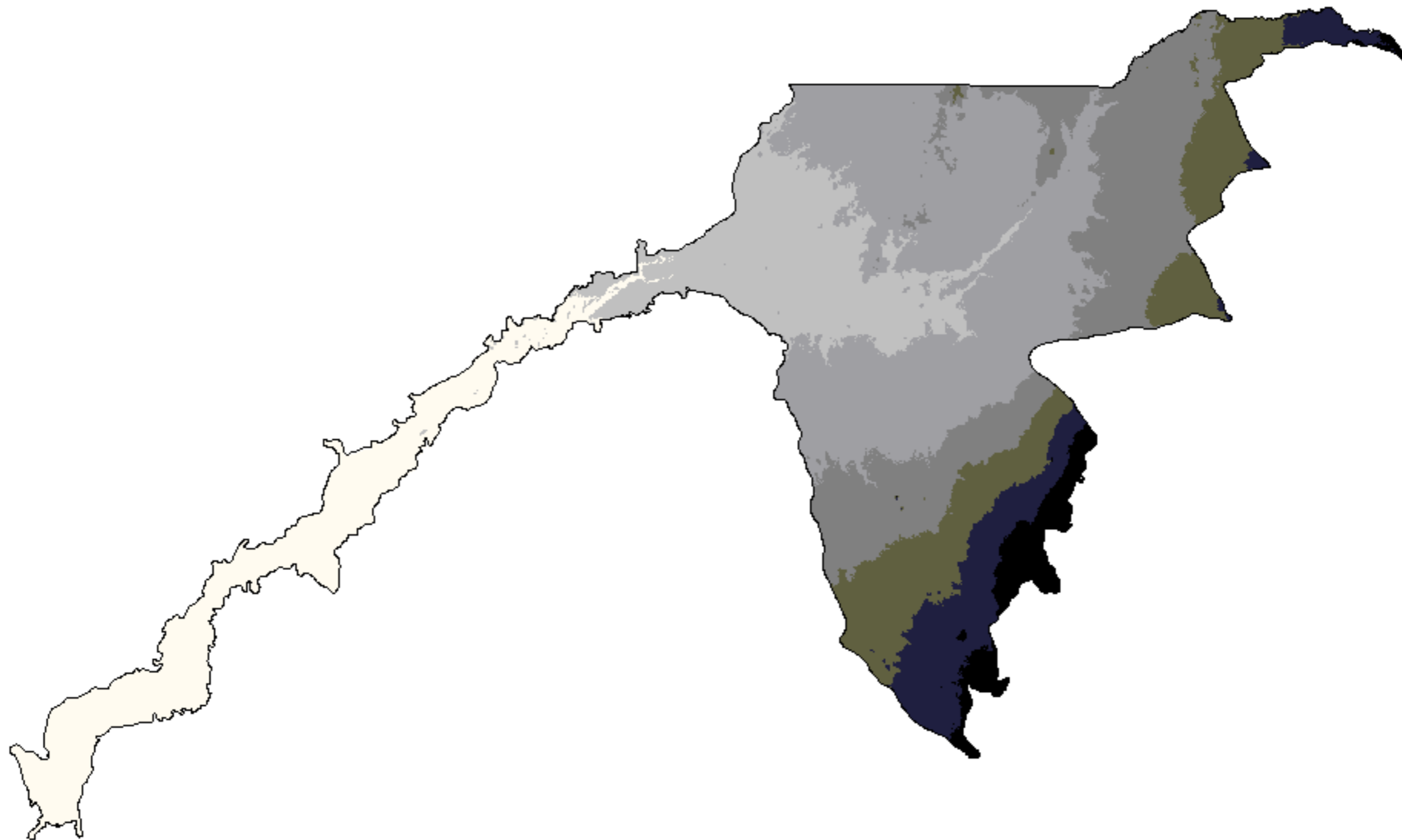
MAP 16
Lithology













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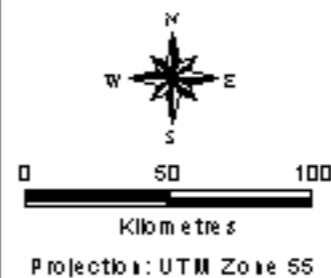


Elevation (m)

	49 - 75		176 - 200
	76 - 100		201 - 225
	101 - 125		226 - 250
	126 - 150		251 - 300
	151 - 175		No Data

MAP 17

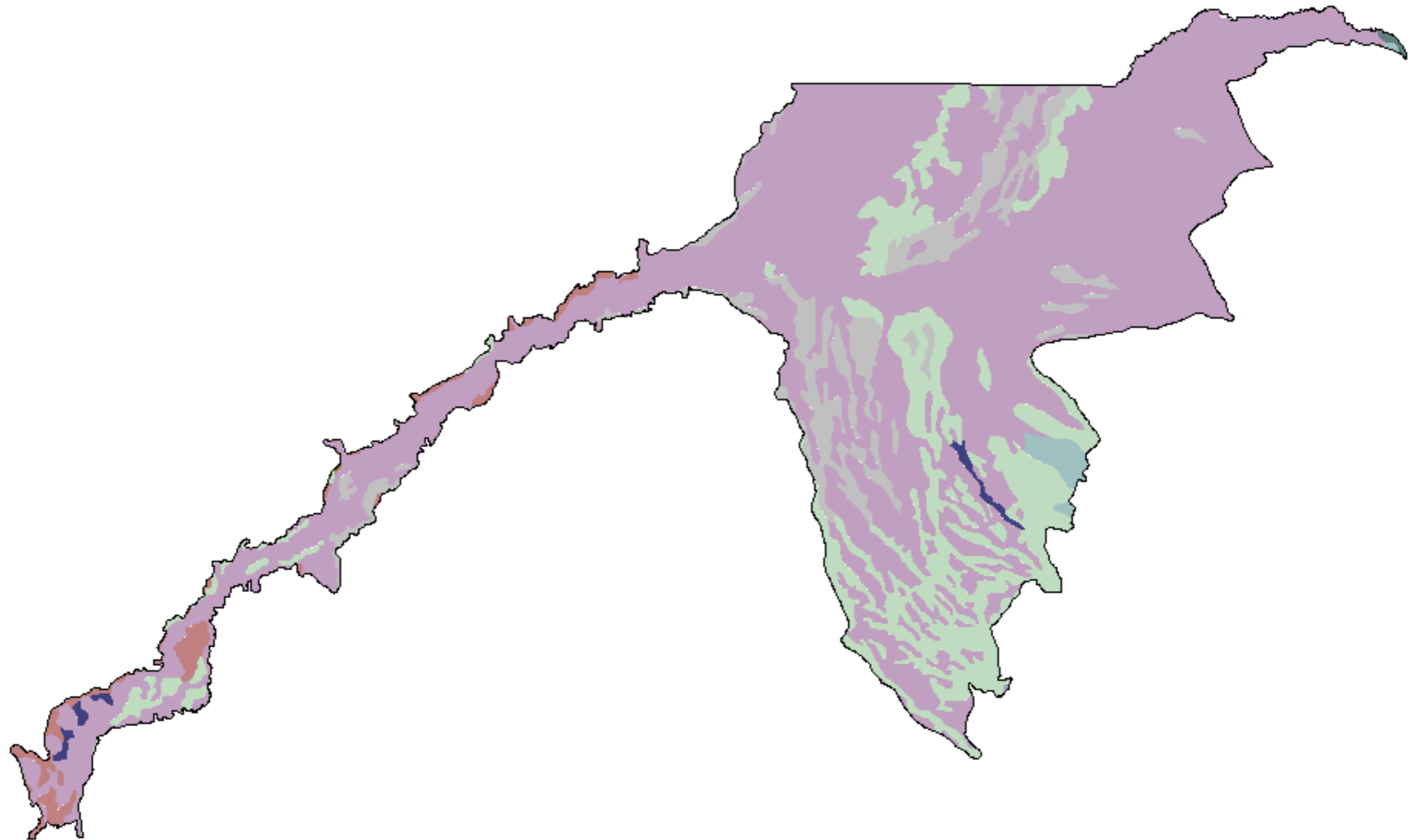
Digital Elevation Model













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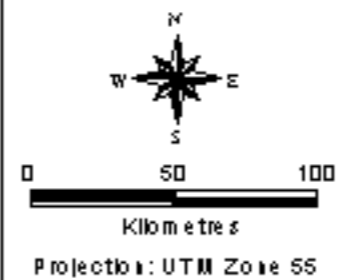
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Soil Types

	Calcareous Earths		Red Brown Earths
	Coarsely Cracking Grey & Brown Clays		Scalded Red Texture Contrast Soil
	Deep Alluvial Loams		Shallow Loams
	Deep Black Cracking Clays		Siliceous Dune Sands
	Massive Red & Yellow Earths		Yellow & Red Texture Contrast Soil

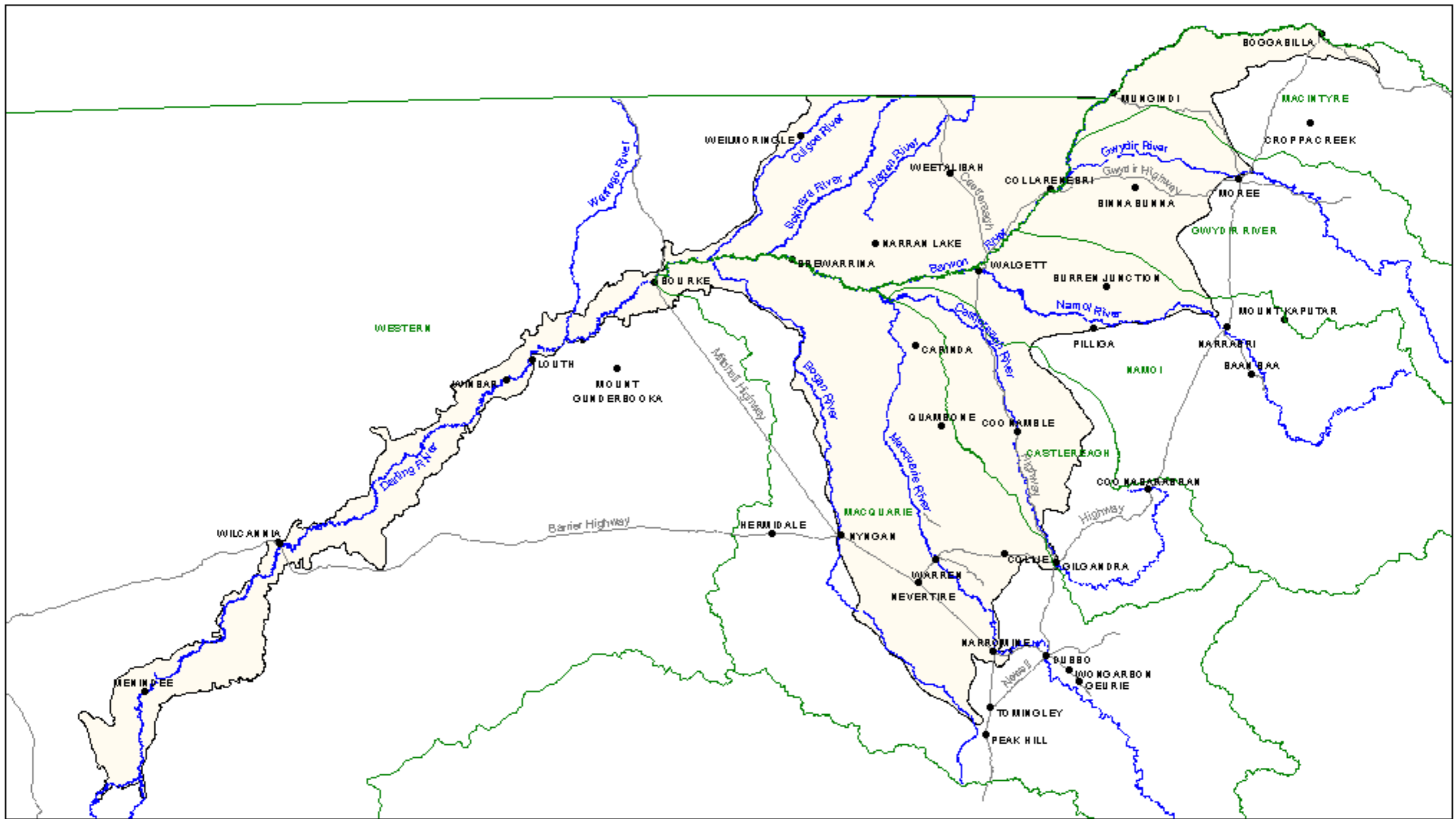
MAP 18
Soils of the DRP





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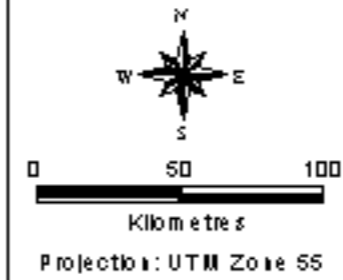
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-  Catchment Boundaries
-  DRP Boundary

MAP 19

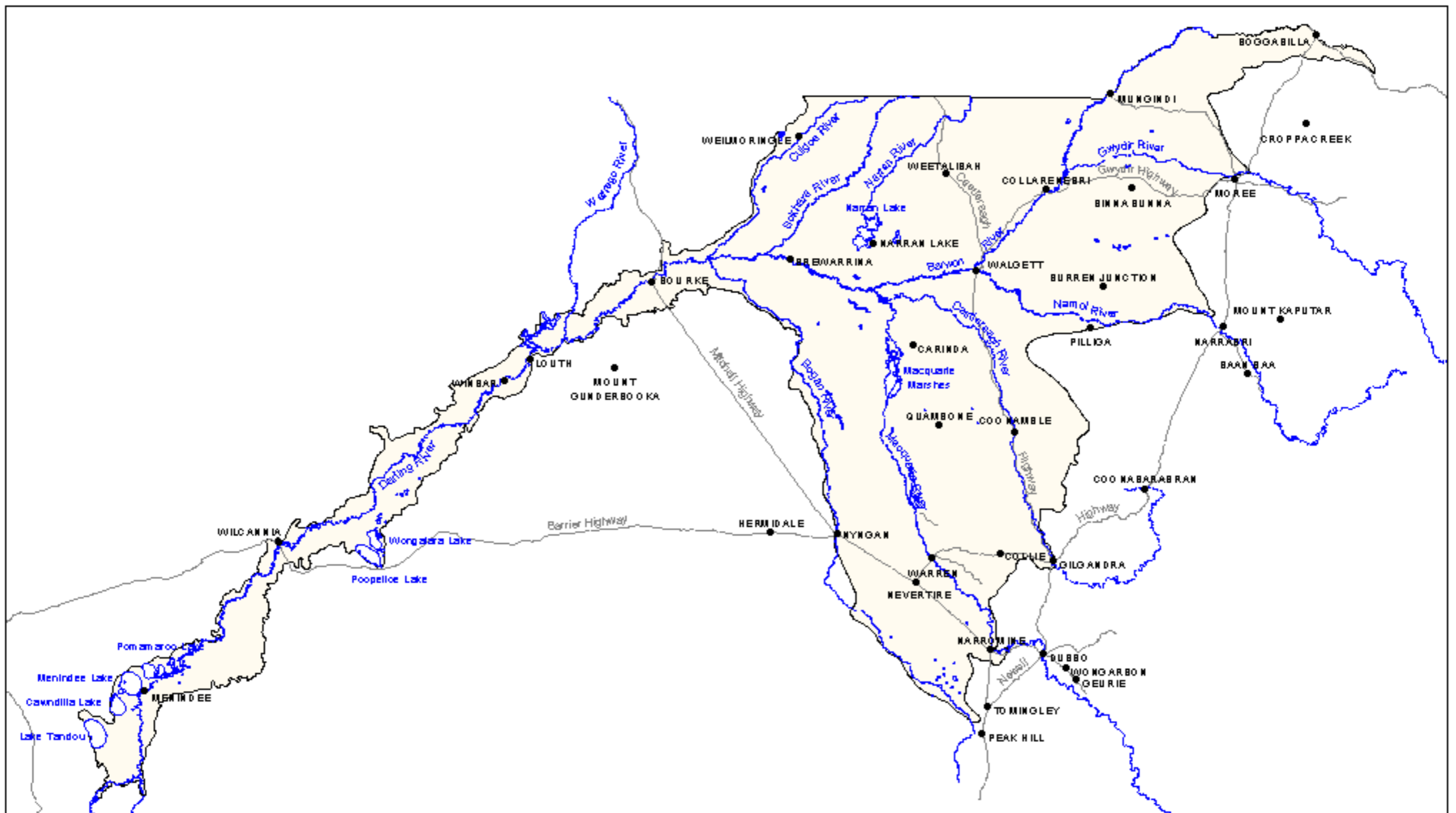
Major Rivers and Catchment Boundaries






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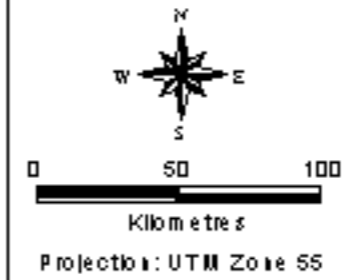


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-  Major Rivers
-  Lakes and Swamps
-  DRP Boundary

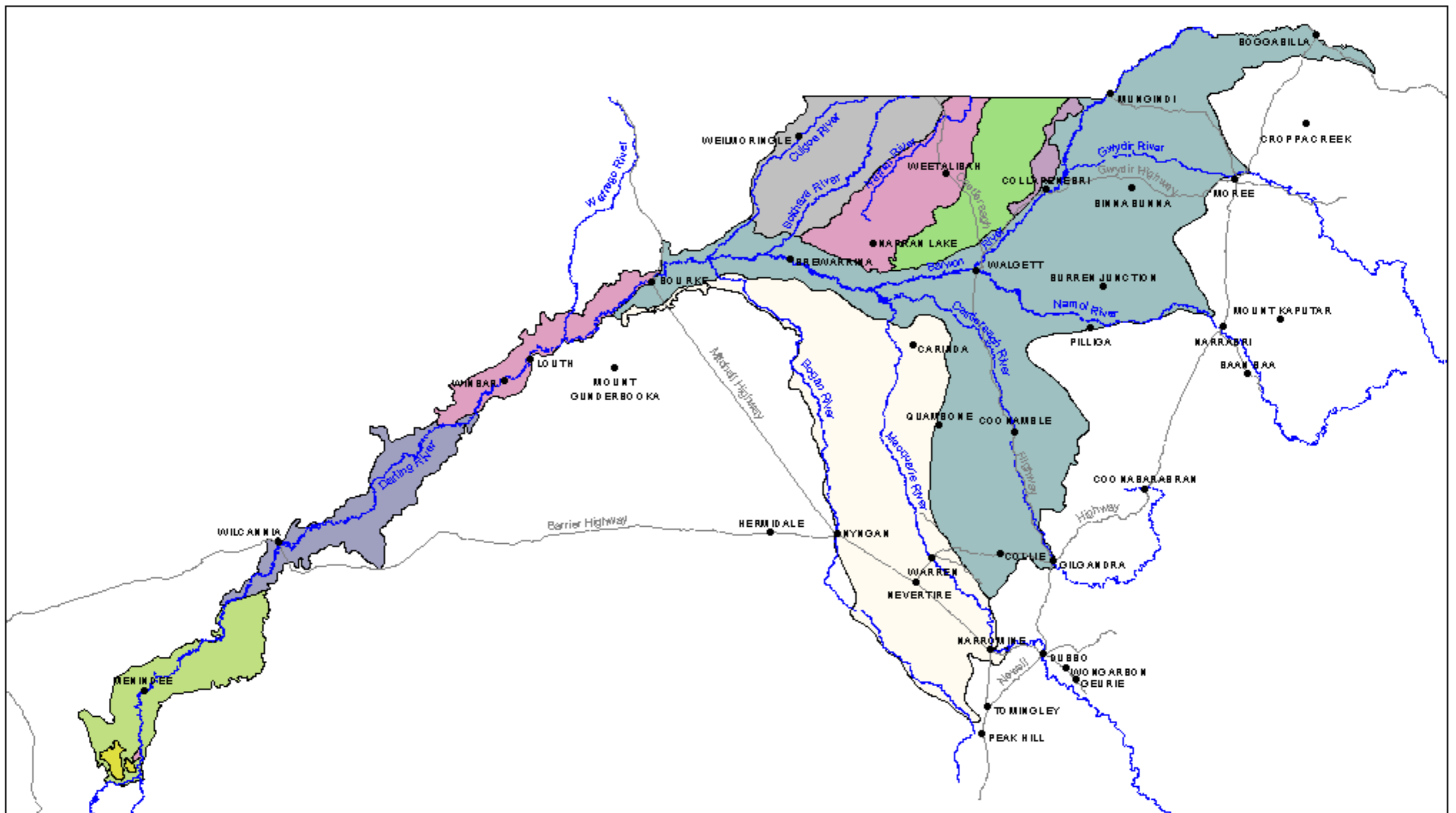
MAP 20
Major Wetlands



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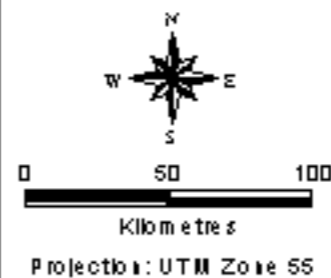
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DRP Provinces

- | | | | |
|--|------------------------------|---|------------------------|
|  | 1Aa: Bogan-Maquarie |  | 1Ba: Louth Plains |
|  | 1Ab: Castlereagh-Barwon |  | 1Bb: Wilcannia Plains |
|  | 1Ac: Culgoa-Bokhara |  | 1Ca: Menindee |
|  | 1Ad: Warrambool-Moonie |  | 5A: Murray Basin |
|  | 1Ae: Narran-Lightning Ridge |  | 5A: Murray Basin Sands |
|  | 1Af: Collarenebri Interfluve | | |

MAP 21 DRP Provinces



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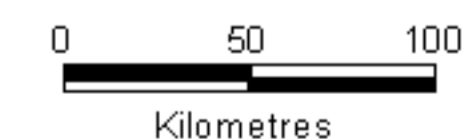
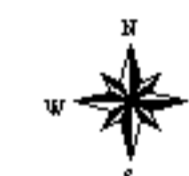
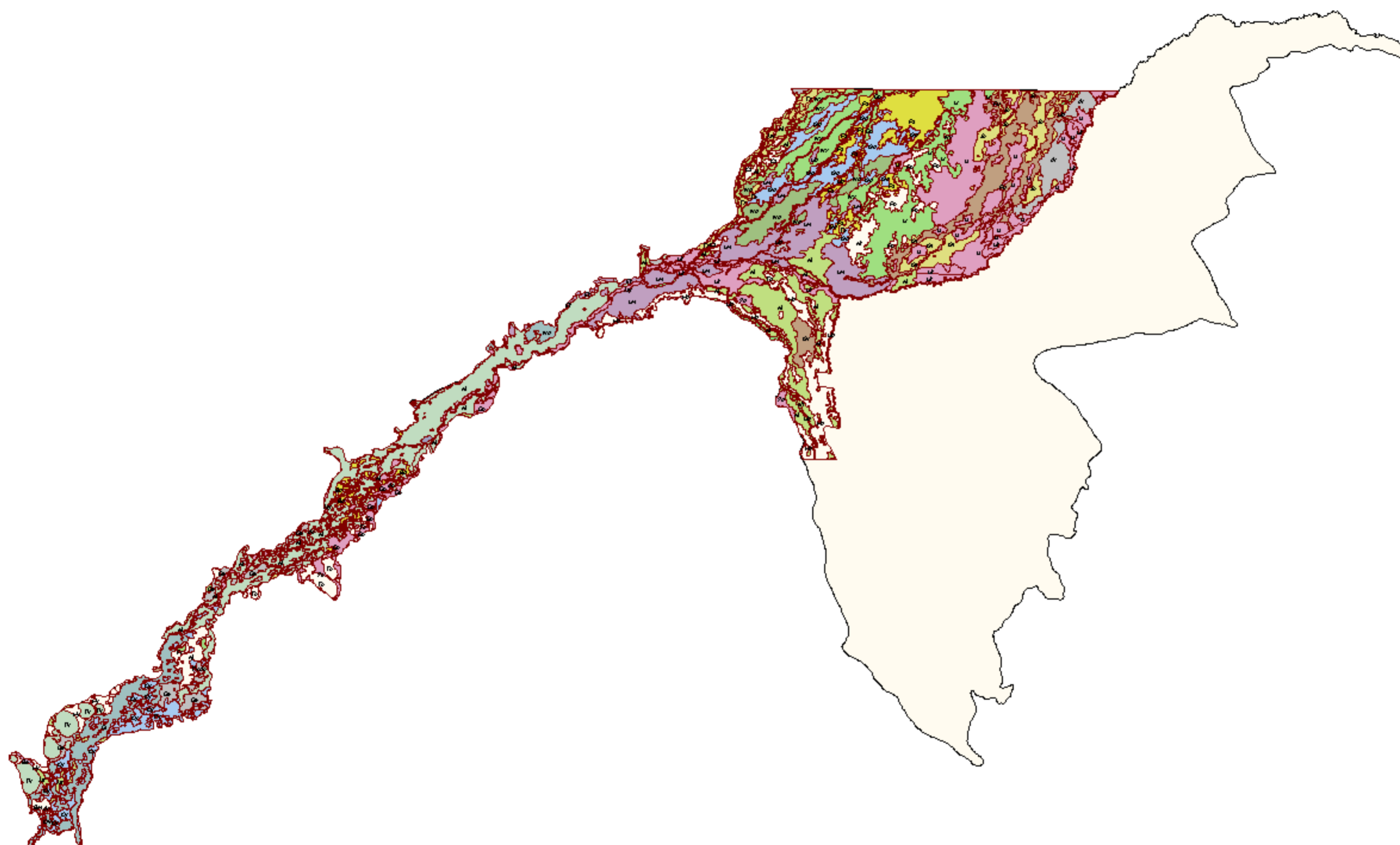


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MAP 22

Darling Riverine Plains Landsystems

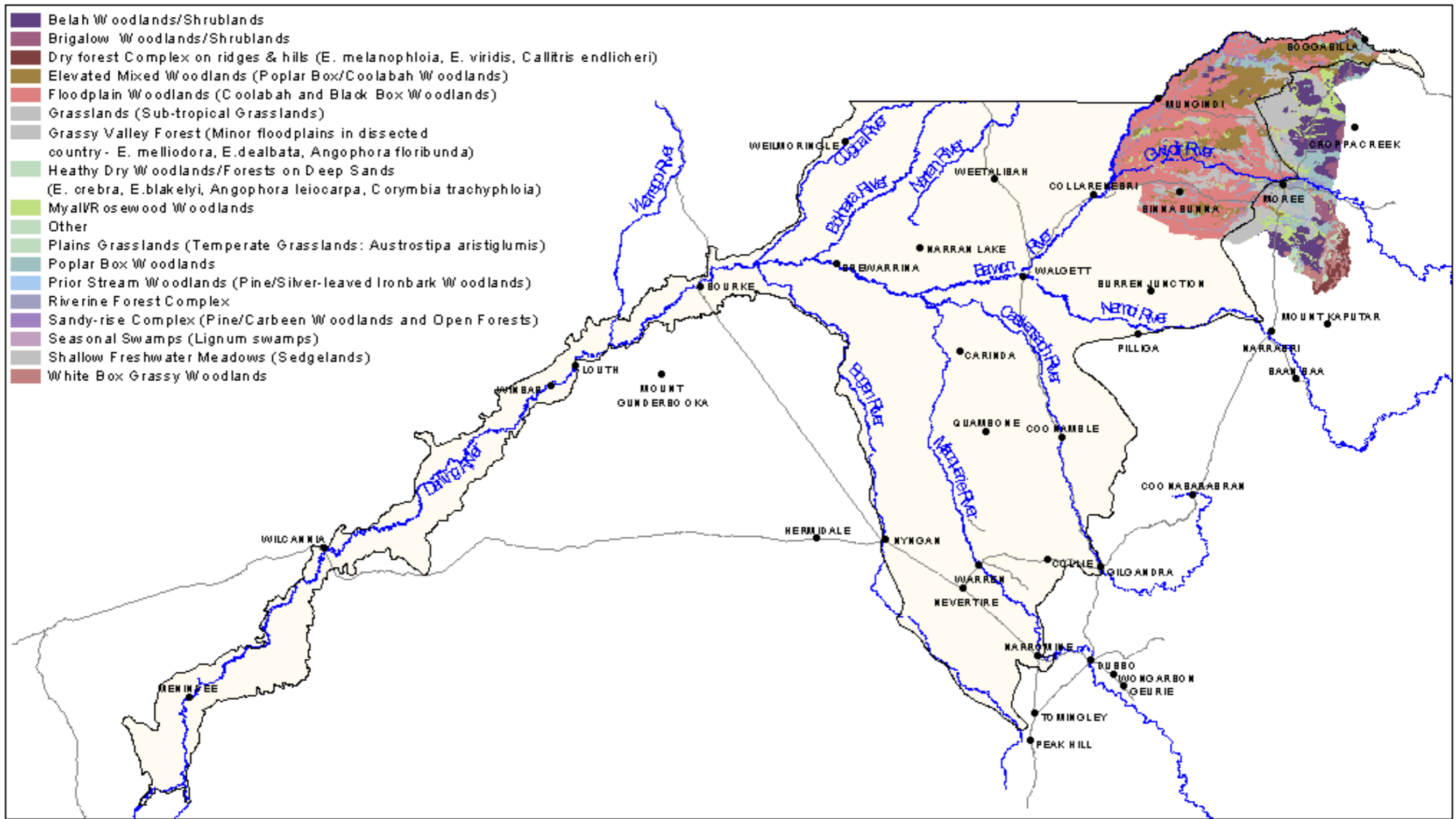
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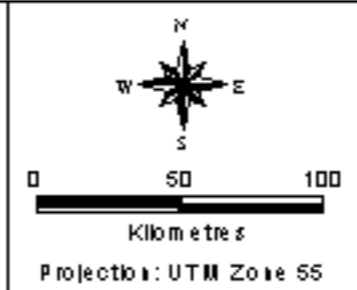
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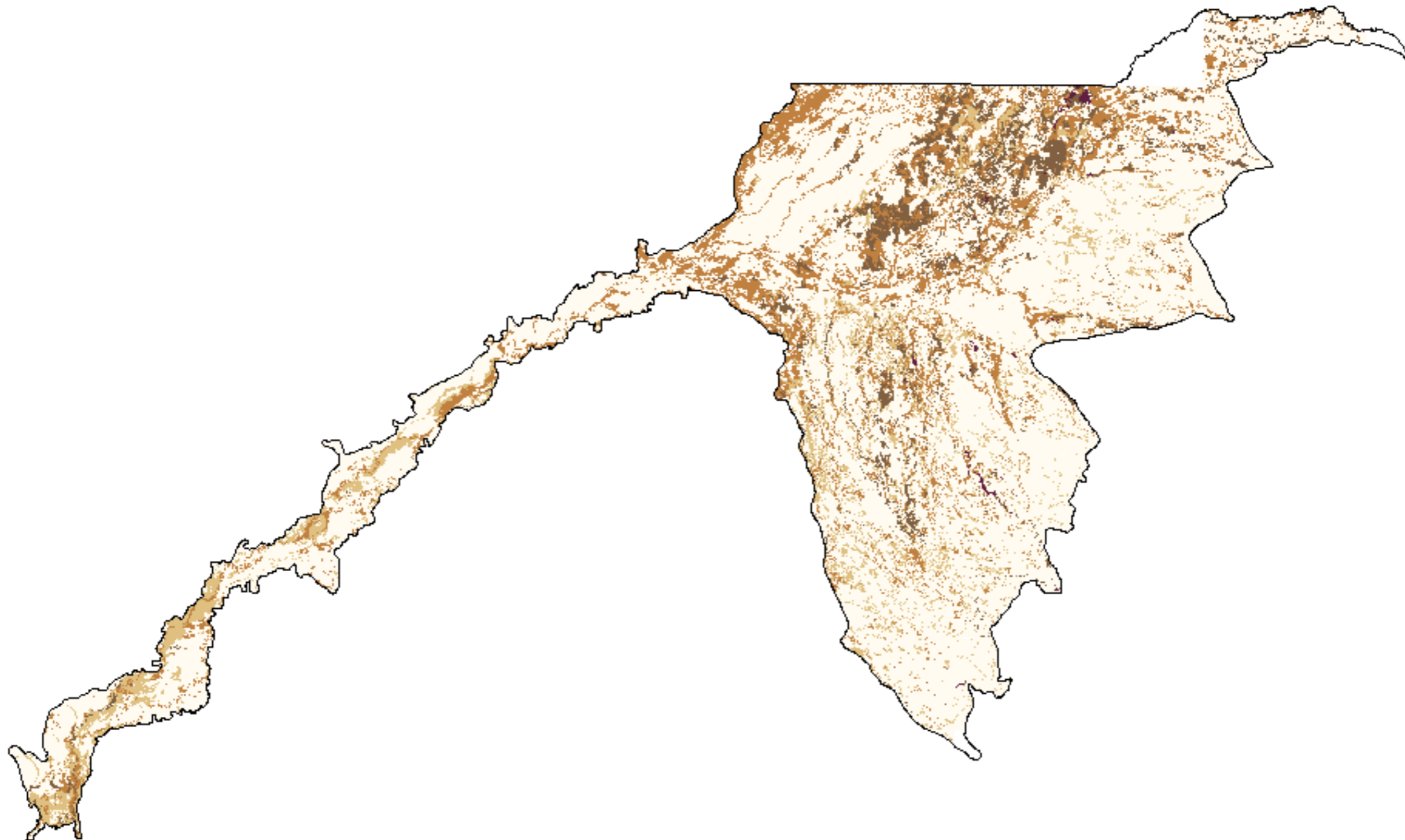
MAP 23
 Moree RVC Pre-clearing
 Vegetation Map



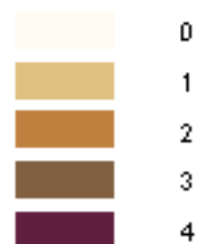
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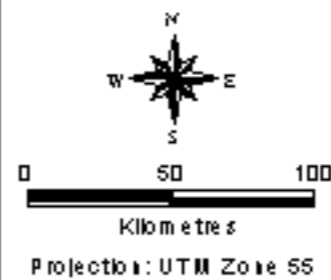
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M305 Vegetation Density



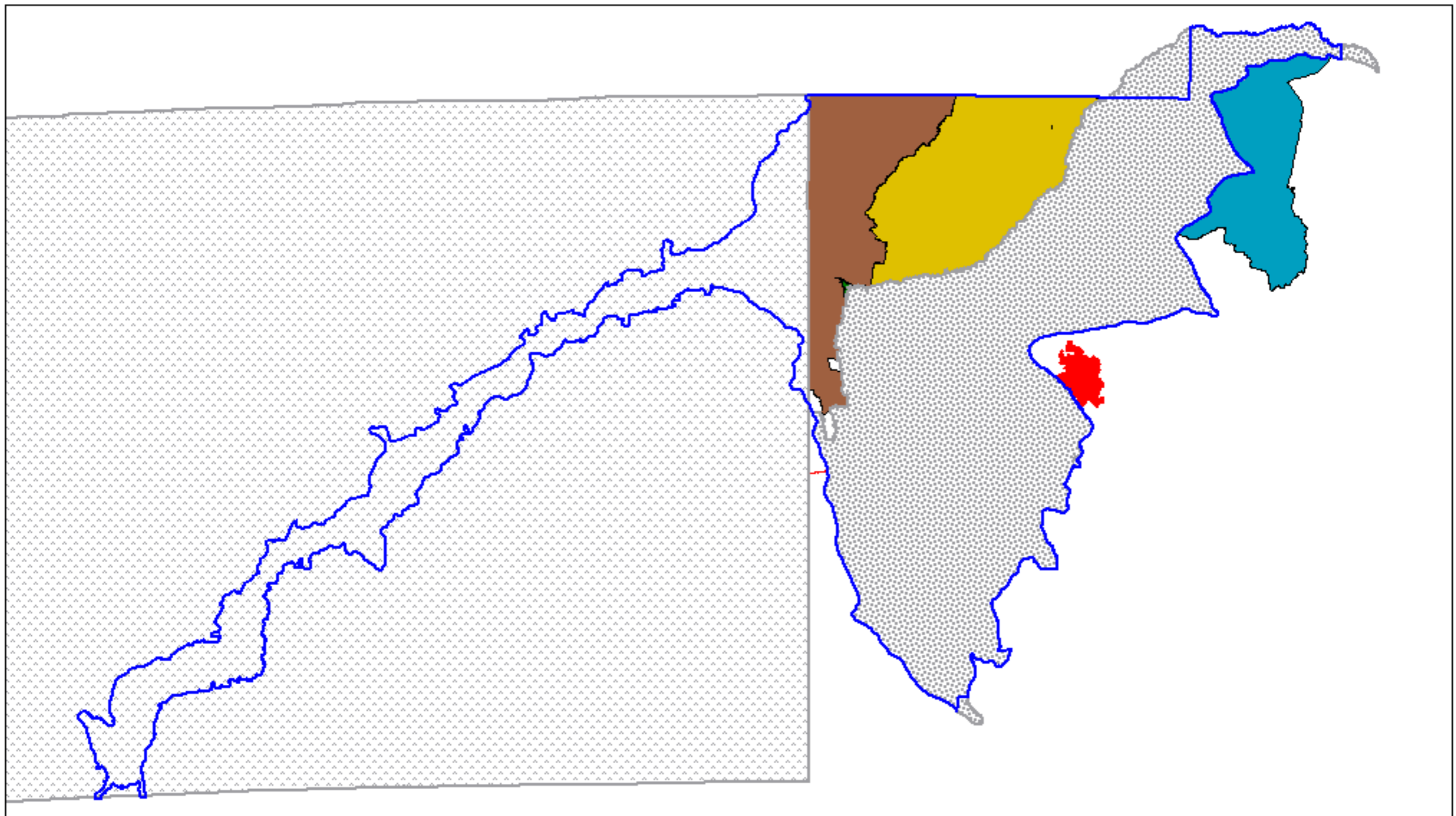
MAP 24
M305 Vegetation Density





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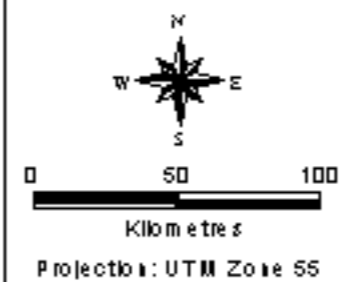


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- | | | | |
|--|----------------------|---|-----------------|
|  | State Forest |  | DLWC Brewarrina |
|  | National Parks |  | Sivertsen |
|  | DLWC Western Walgett |  | NW NSW |
|  | DLWC Eastern Walgett |  | M305 |
|  | DLWC Moree | | |

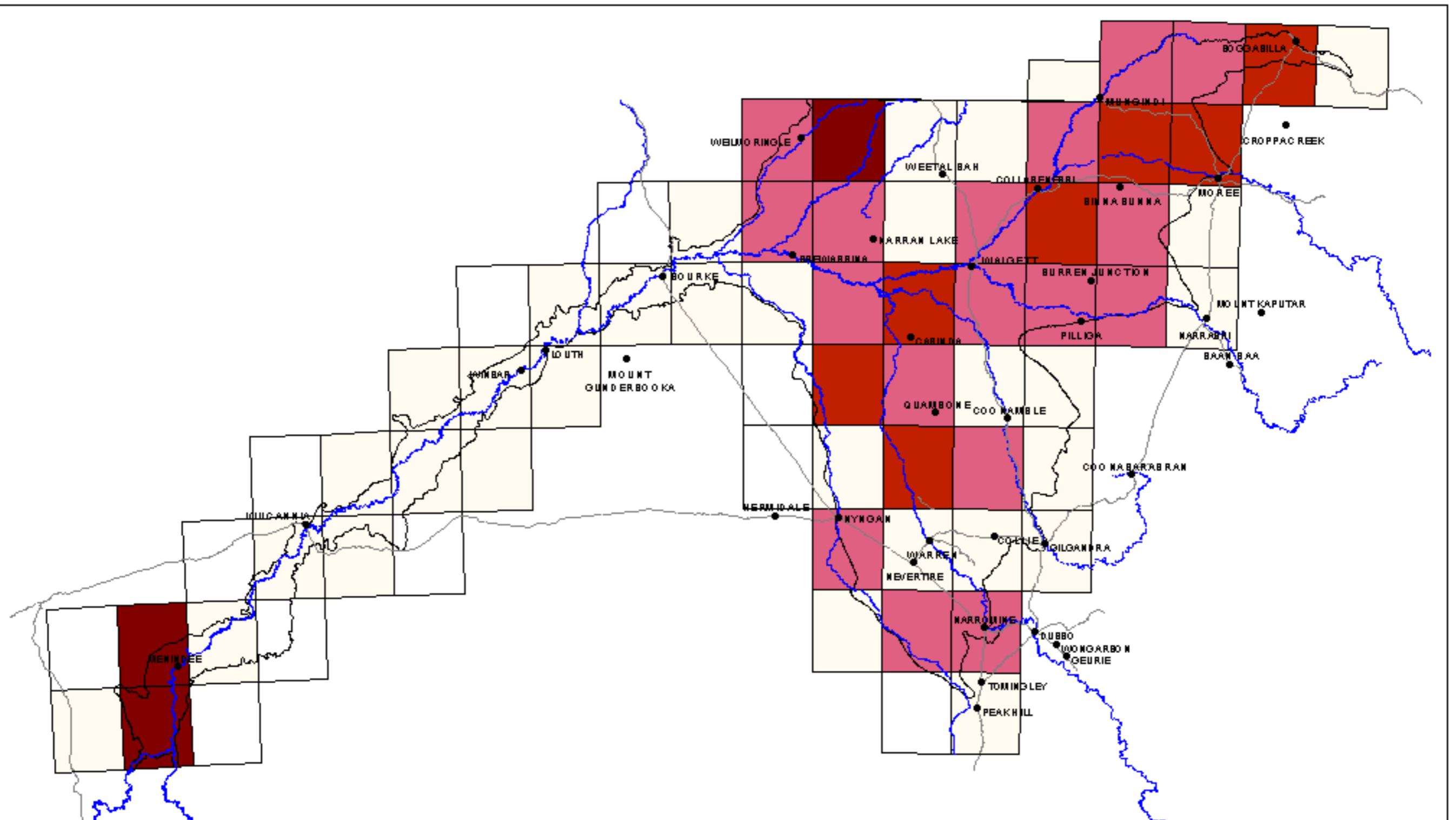
MAP 25
Extent of Vegetation Mapping
for the DRP



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Flora records per mapsheet

- 1001 - 1974
- 301 - 1000
- 126 - 300
- 1 - 125
- No records

MAP 26

Wildlife Atlas Flora Records per 1:100 000 mapsheet



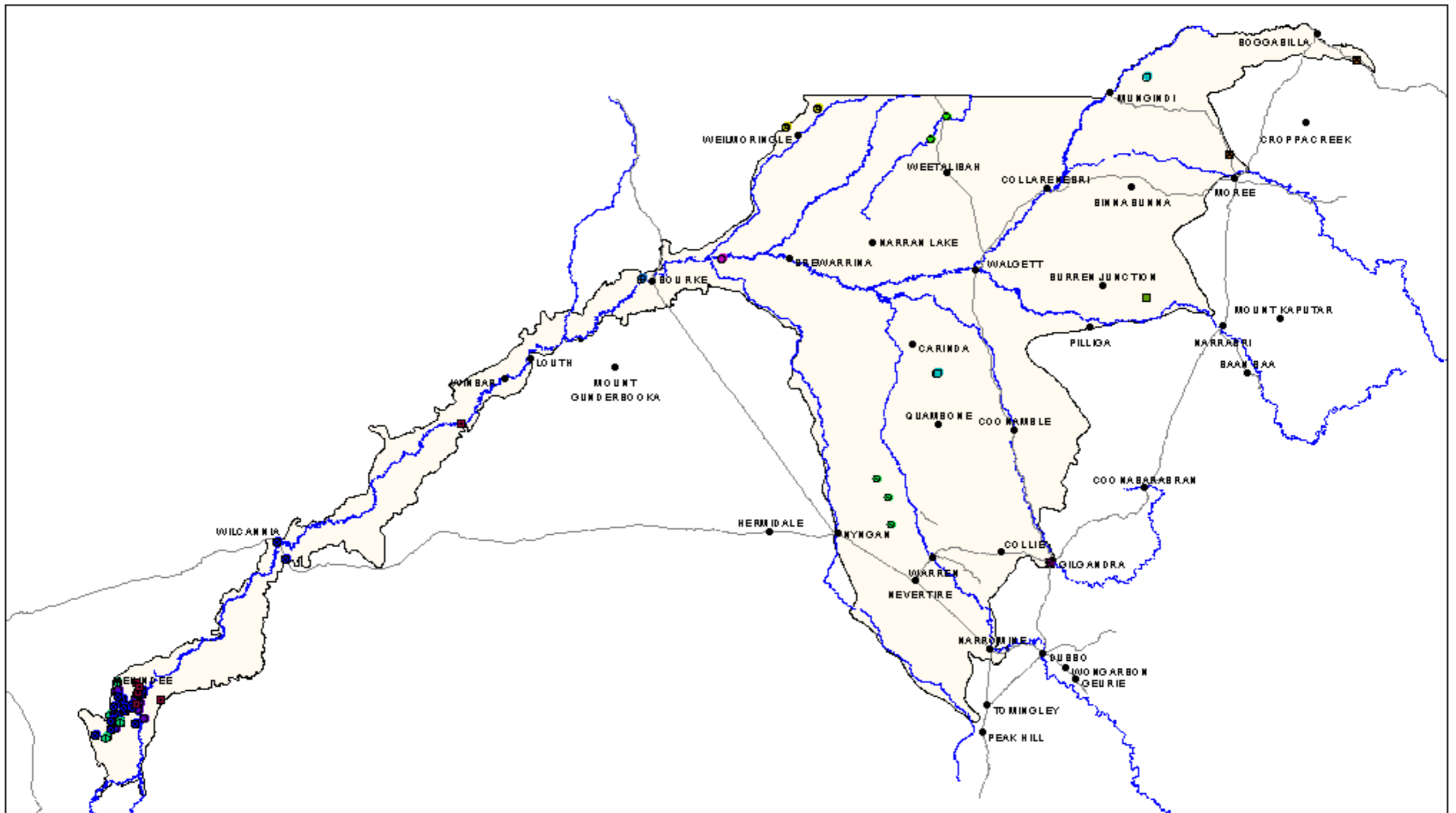
0 50 100 Kilometers

Projection: UTM Zone 55

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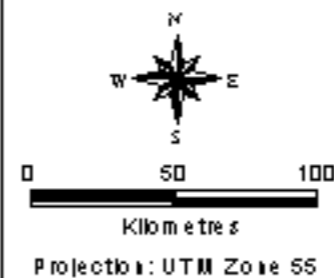




Flora Records - Threatened Species

- | | |
|---|--|
| <i>Acacia cameorum</i> | <i>Rulingia procumbens</i> |
| <i>Bothriochloa biloba</i> | <i>Sida rohlenae</i> |
| <i>Capparis loranthifolia</i>
var <i>loranthifolia</i> | <i>Sida rohlenae</i> subsp <i>rohlenae</i> |
| <i>Haloragis exalata</i> | <i>Solanum karsense</i> |
| <i>Ipomoea diamantinensis</i> | <i>Swainsona adenophylla</i> |
| <i>Phyllanthus maderaspatensis</i> | <i>Swainsona plagiotropis</i> |
| <i>Pimelea elongata</i> | <i>Swainsona pyrophila</i> |

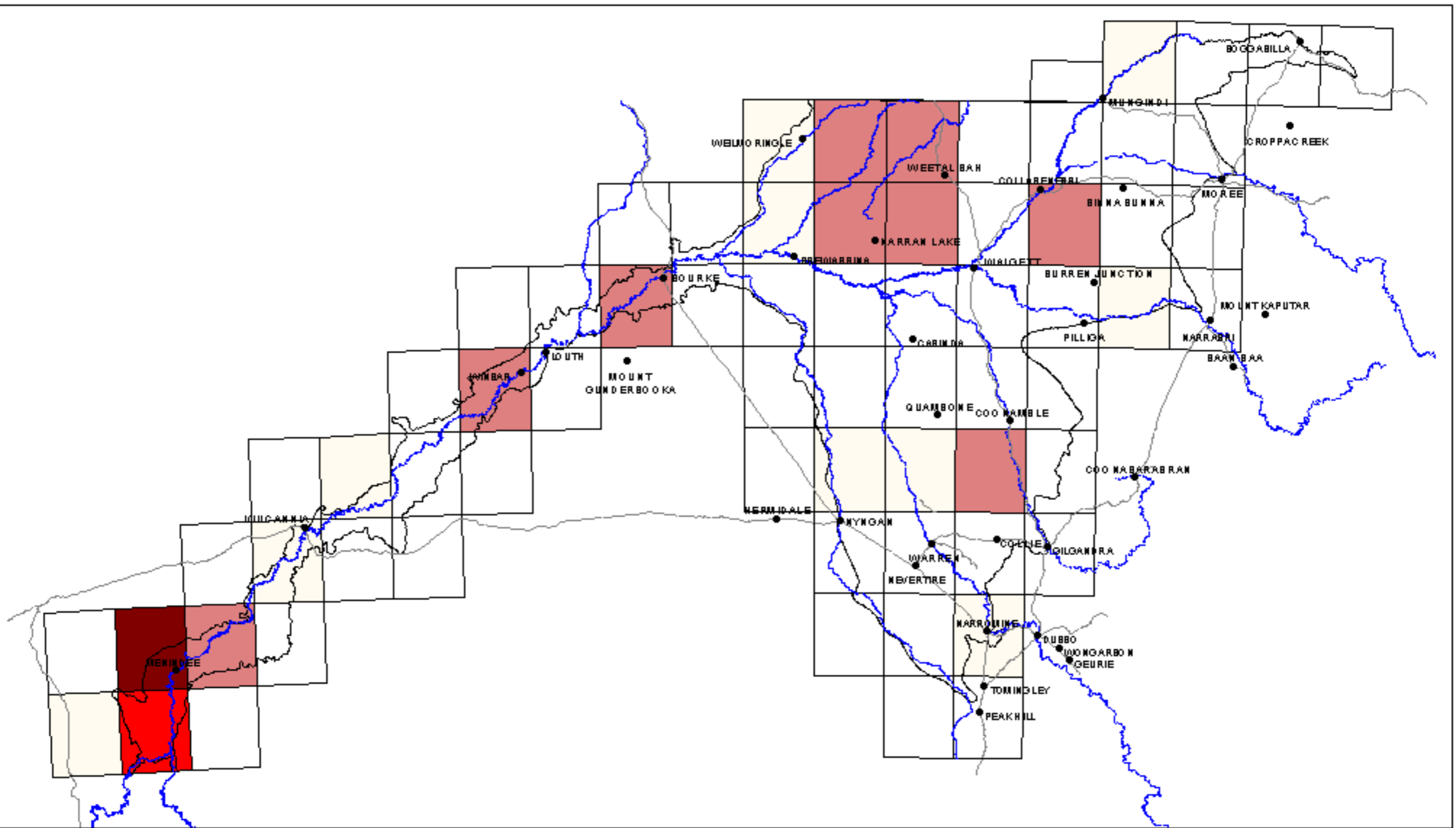
MAP 27
Post 1970 Threatened
Flora Records



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Threatened Flora records per mapsheet

- No records
- 1
- 2 - 5
- 5 - 21
- 22 - 41

MAP 28

Wildlife Atlas Threatened Flora records per 100,000 mapsheet



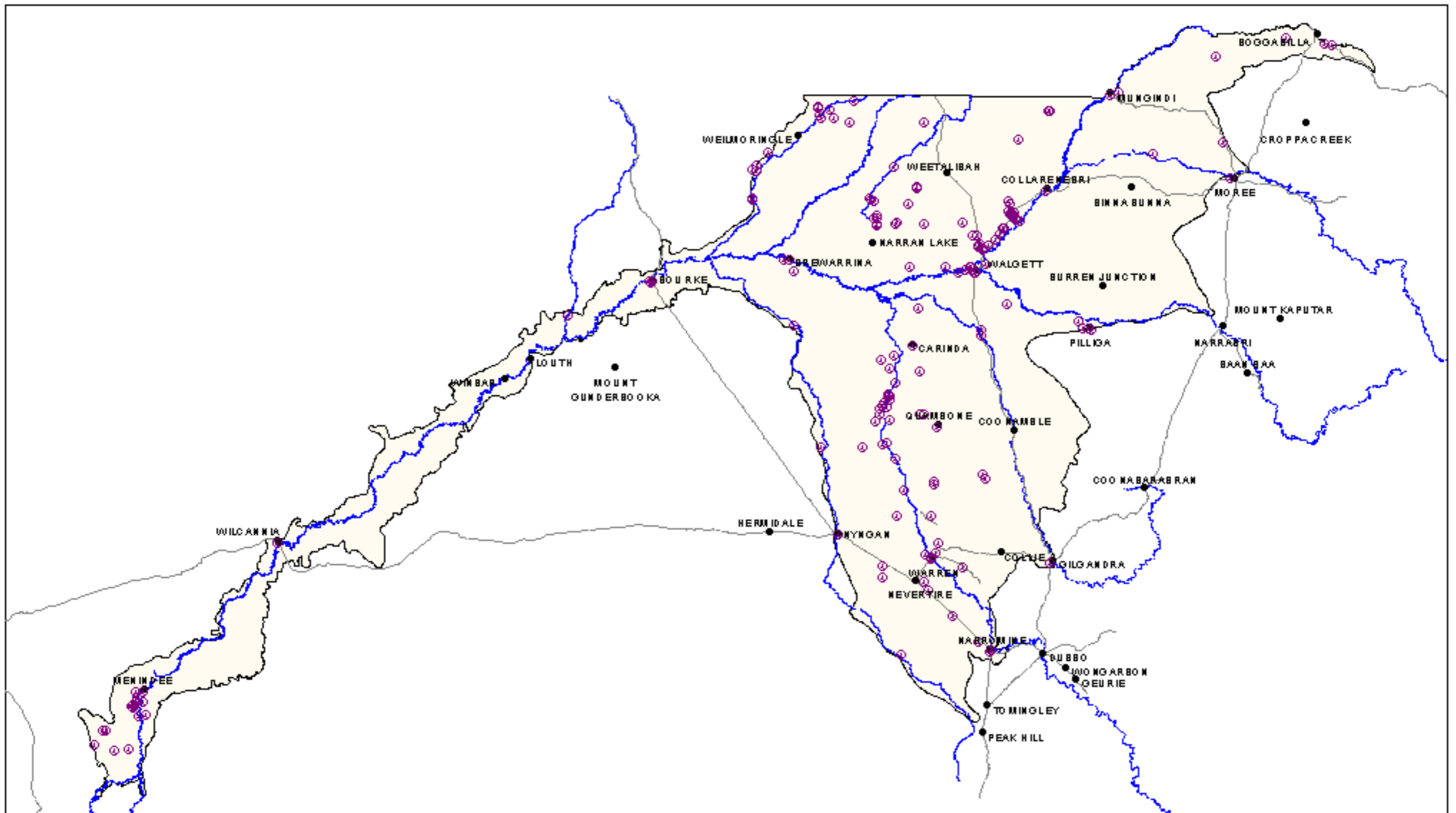
0 50 100 Kilometres

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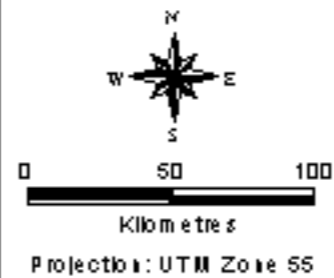
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① Amphibian Records

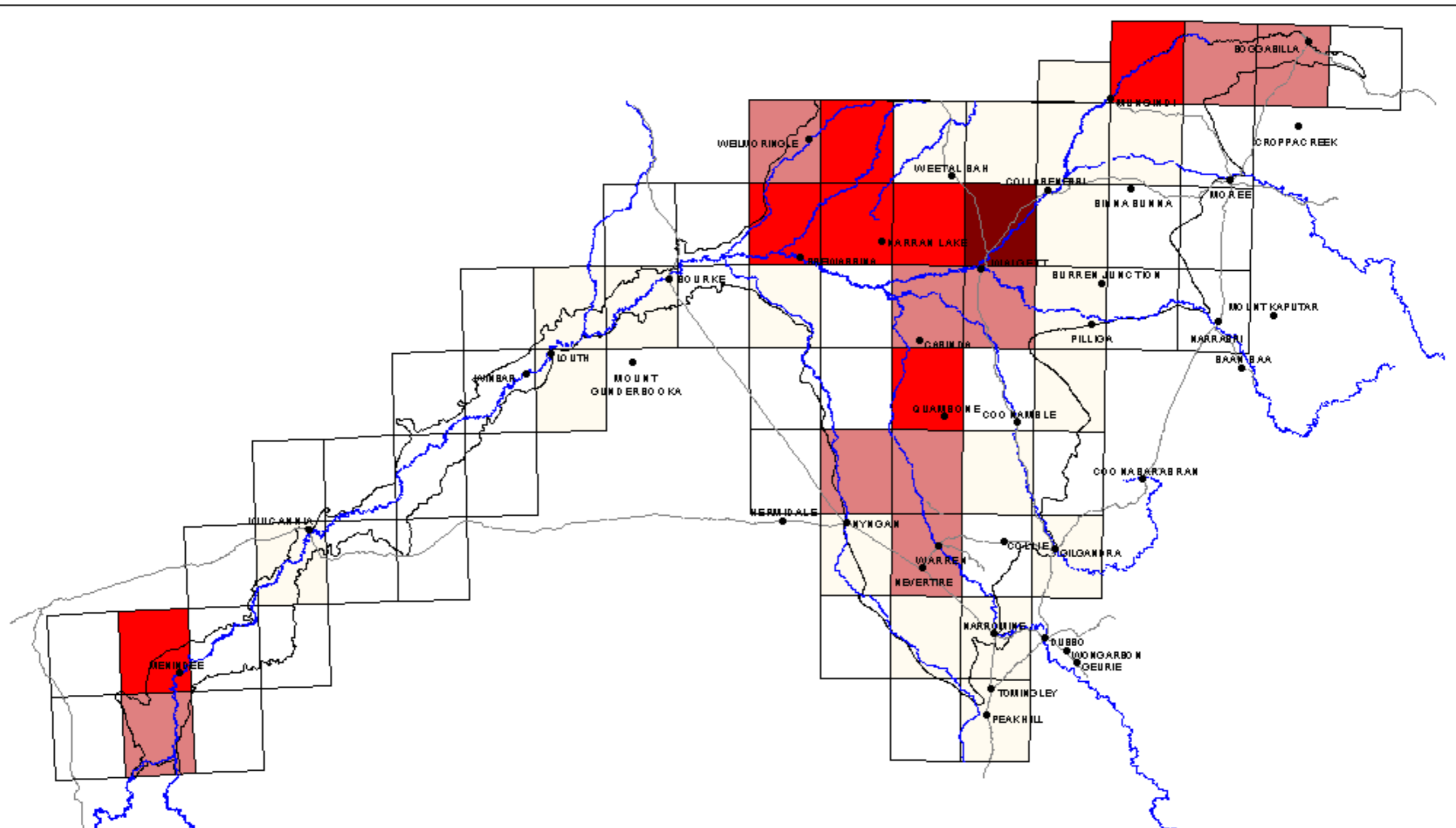
MAP 29
 Post 1970 Amphibian Records
 in the DRP



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Amphibians records per mapsheet

- No records
- 1 - 5
- 6 - 15
- 16 - 35
- 36 - 126

MAP 30

Wildlife Atlas Amphibians
records per 100,000 mapsheet



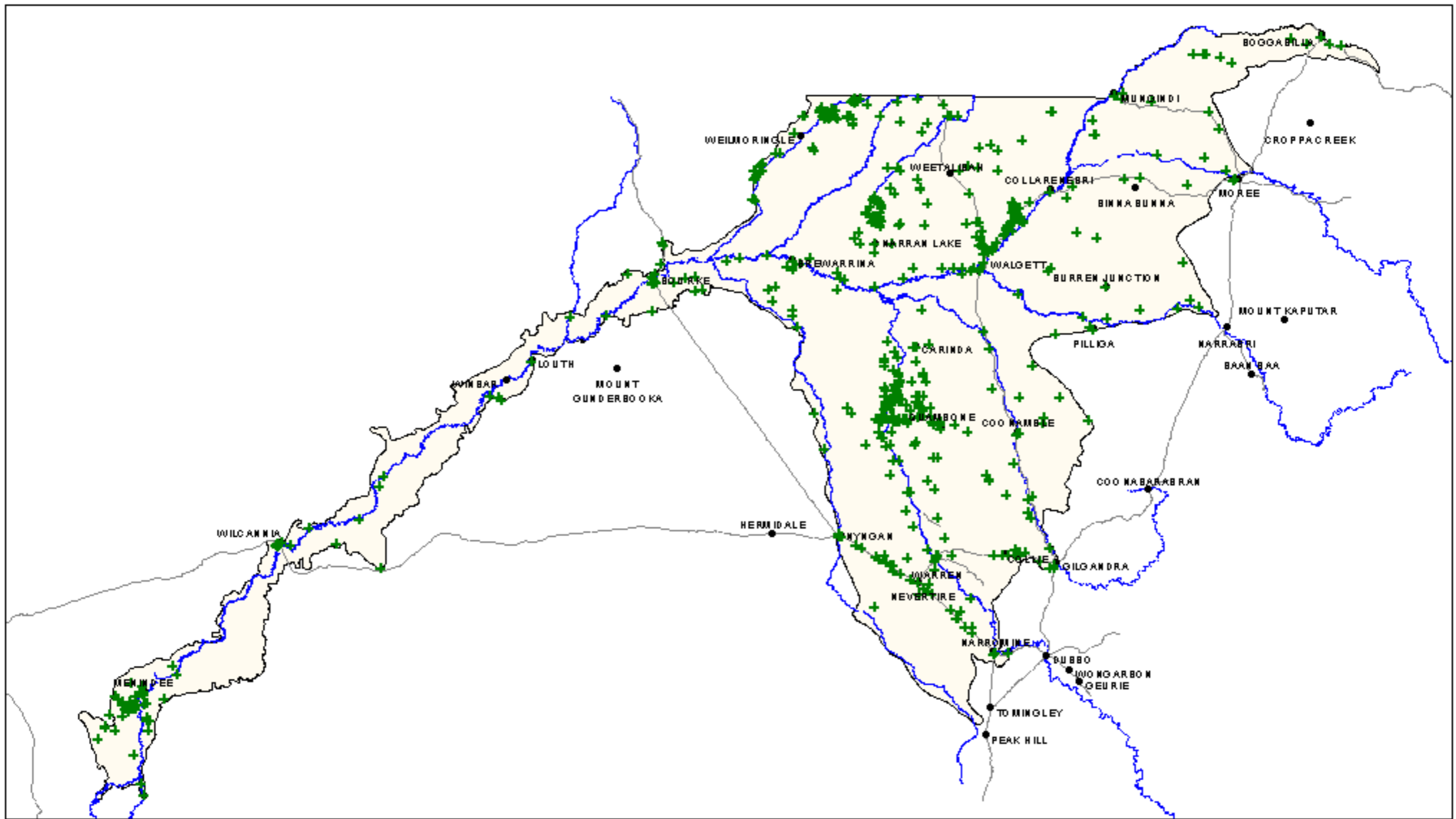
0 50 100 Kilometres

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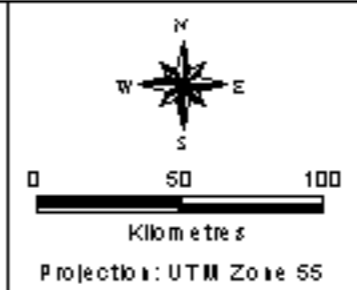
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+ Reptile Records

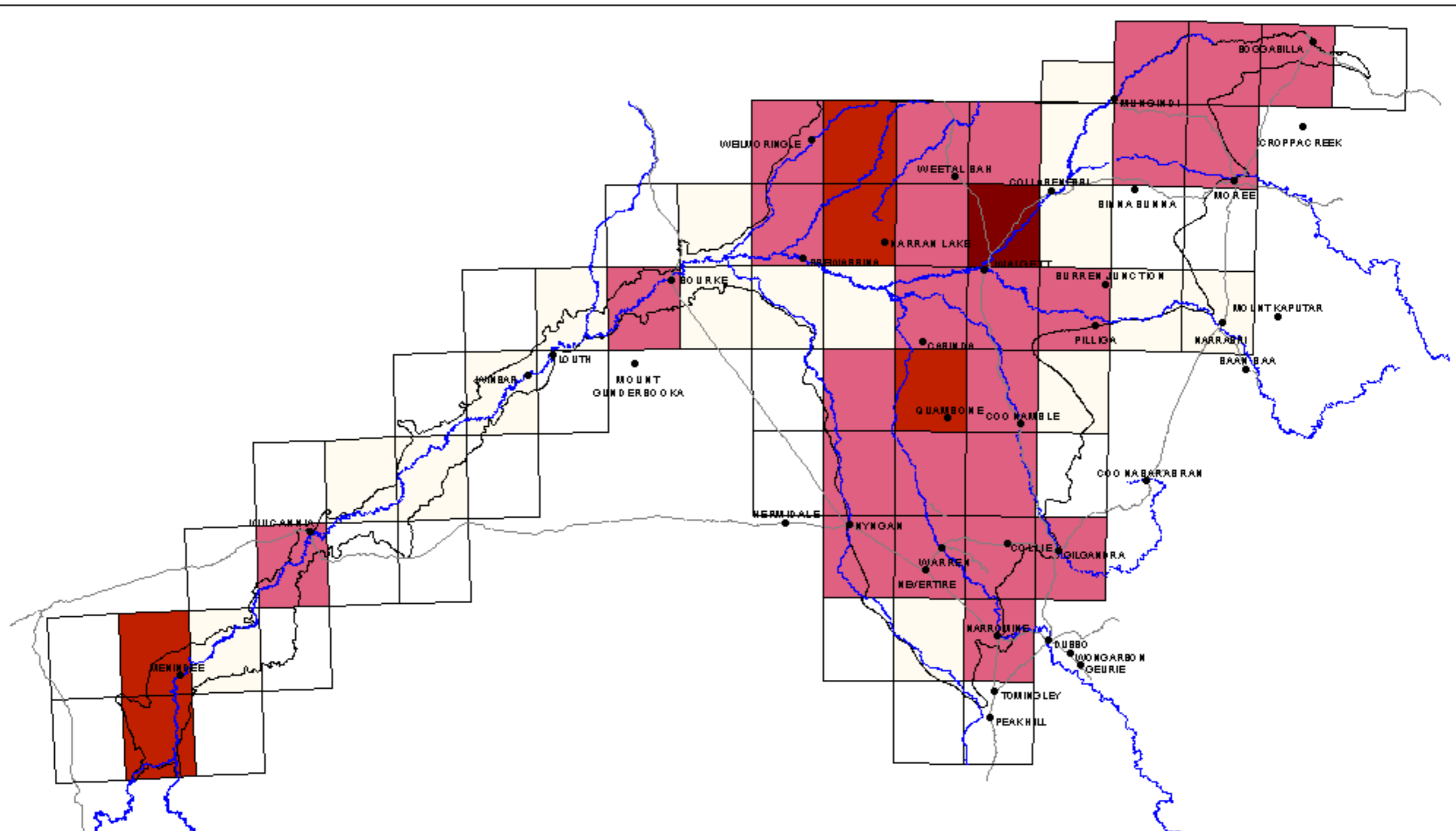
MAP 31
 Post 1970 Reptile Records
 in the DRP



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Reptiles records per mapsheet

- No Records
- 1 - 10
- 11 - 60
- 61 - 140
- 141 - 333

MAP 32

Wild life Atlas Reptiles
records per 100,000 mapsheet



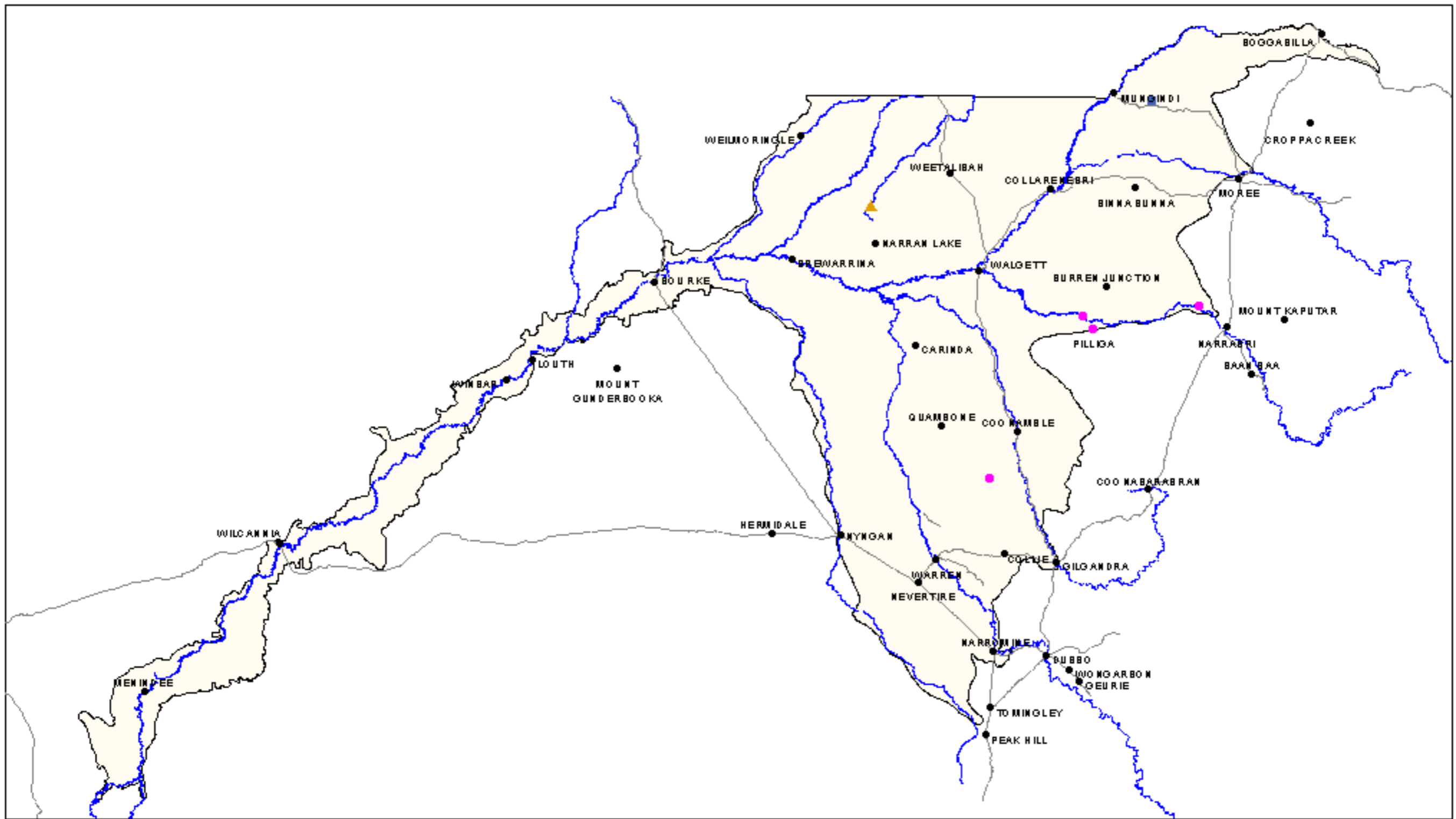
0 50 100 Kilometers

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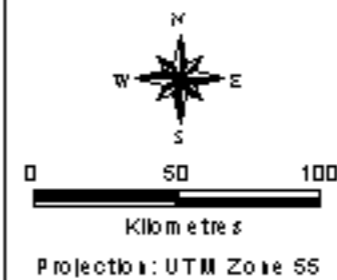




Reptile Records - Threatened Species

- Mackays Burrowing Skink
- Pale-headed Snake
- ▲ Western Blue-tongued Lizard

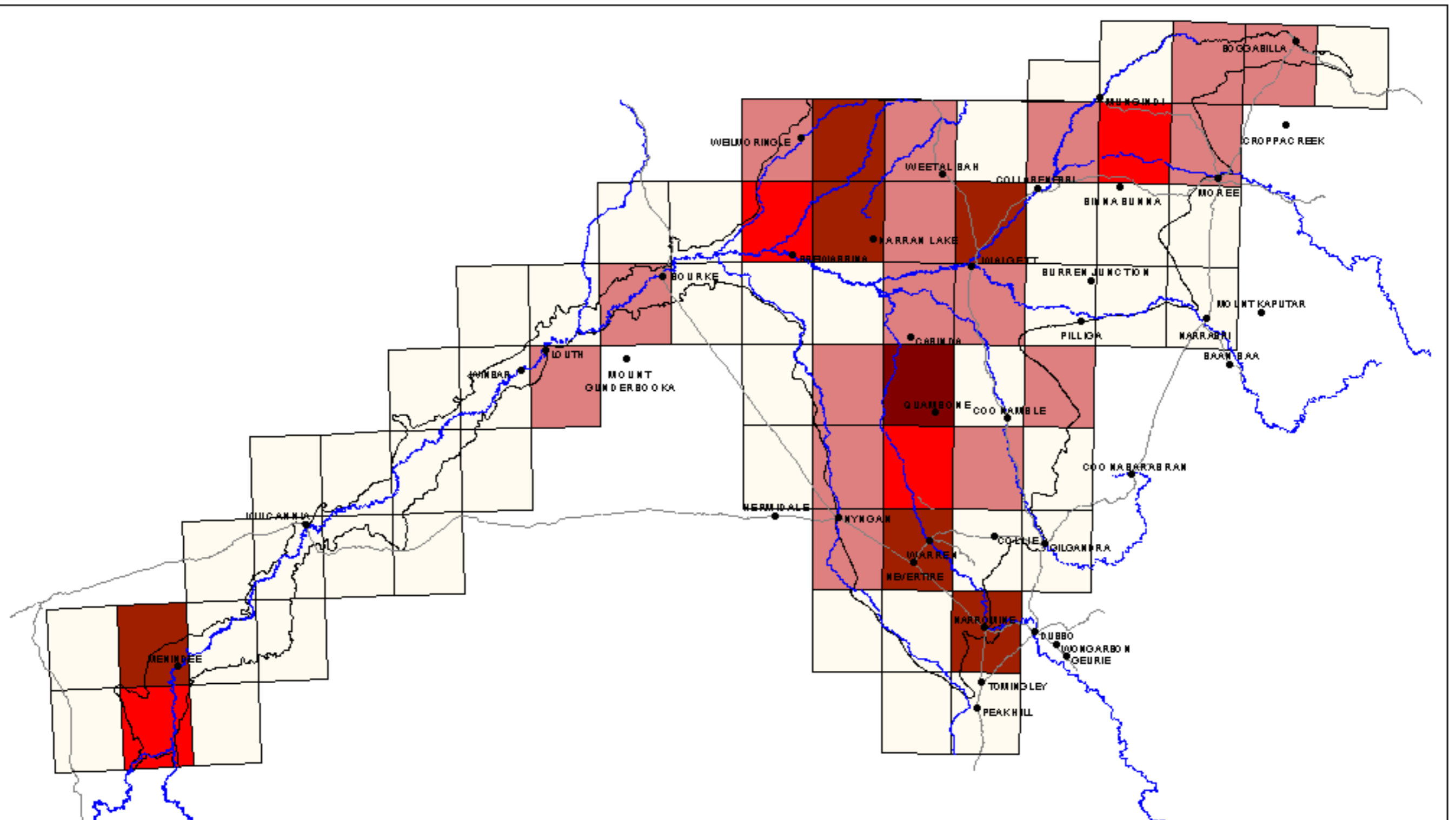
MAP 33
 Post 1970 Threatened
 Reptile Records in the DRP



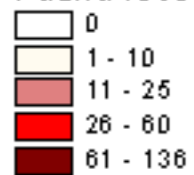
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Fauna records per mapsheet



MAP 35

Wildlife Atlas Birds
records per 100,000 mapsheet



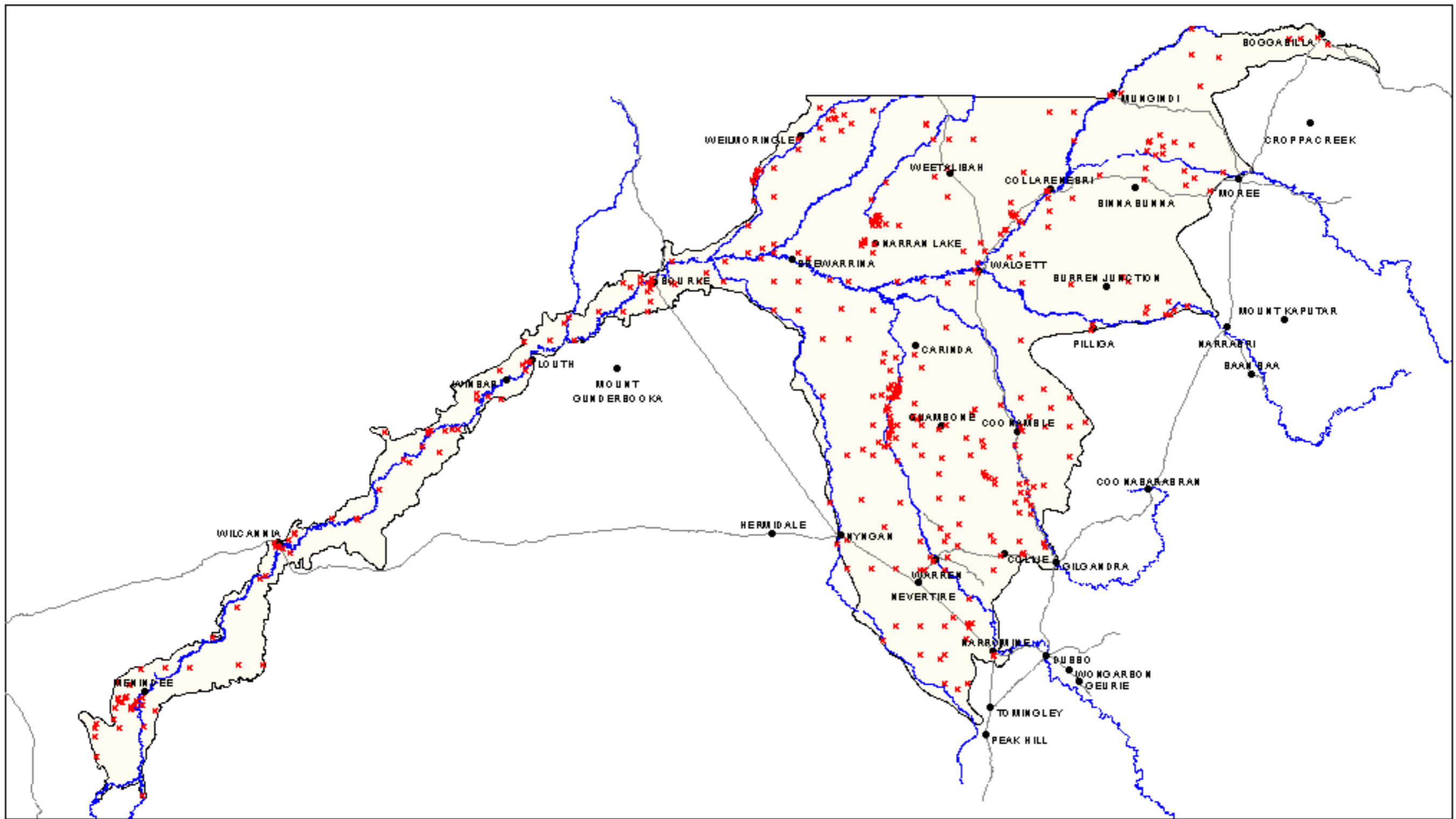
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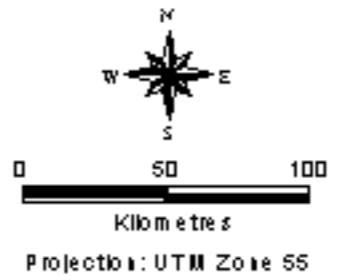


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x Bird Records - Threatened Species

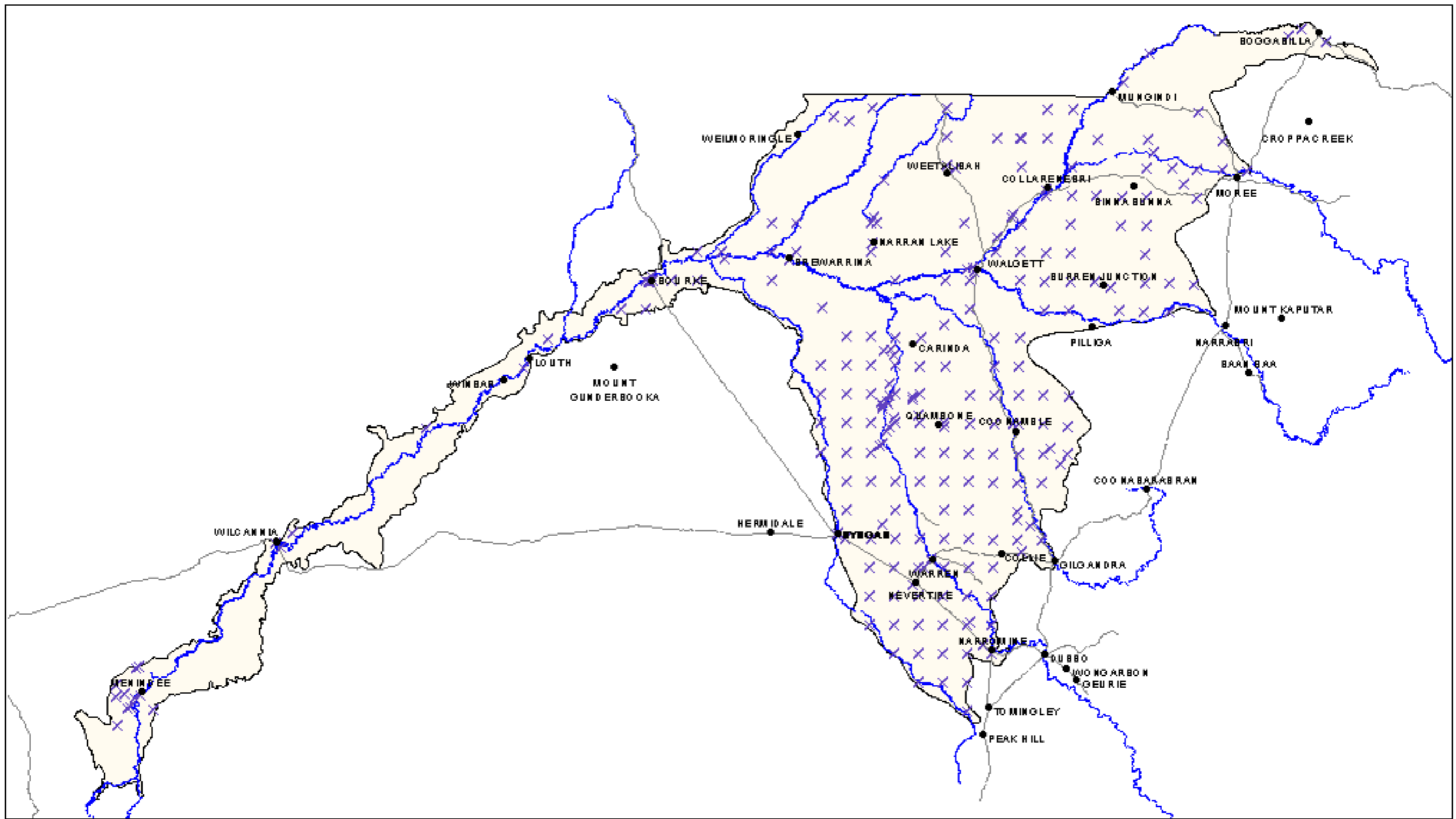
MAP 36
 Post 1970 Threatened
 Bird Records in the DRP



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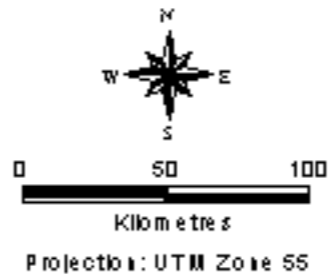


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× Feral Bird Records

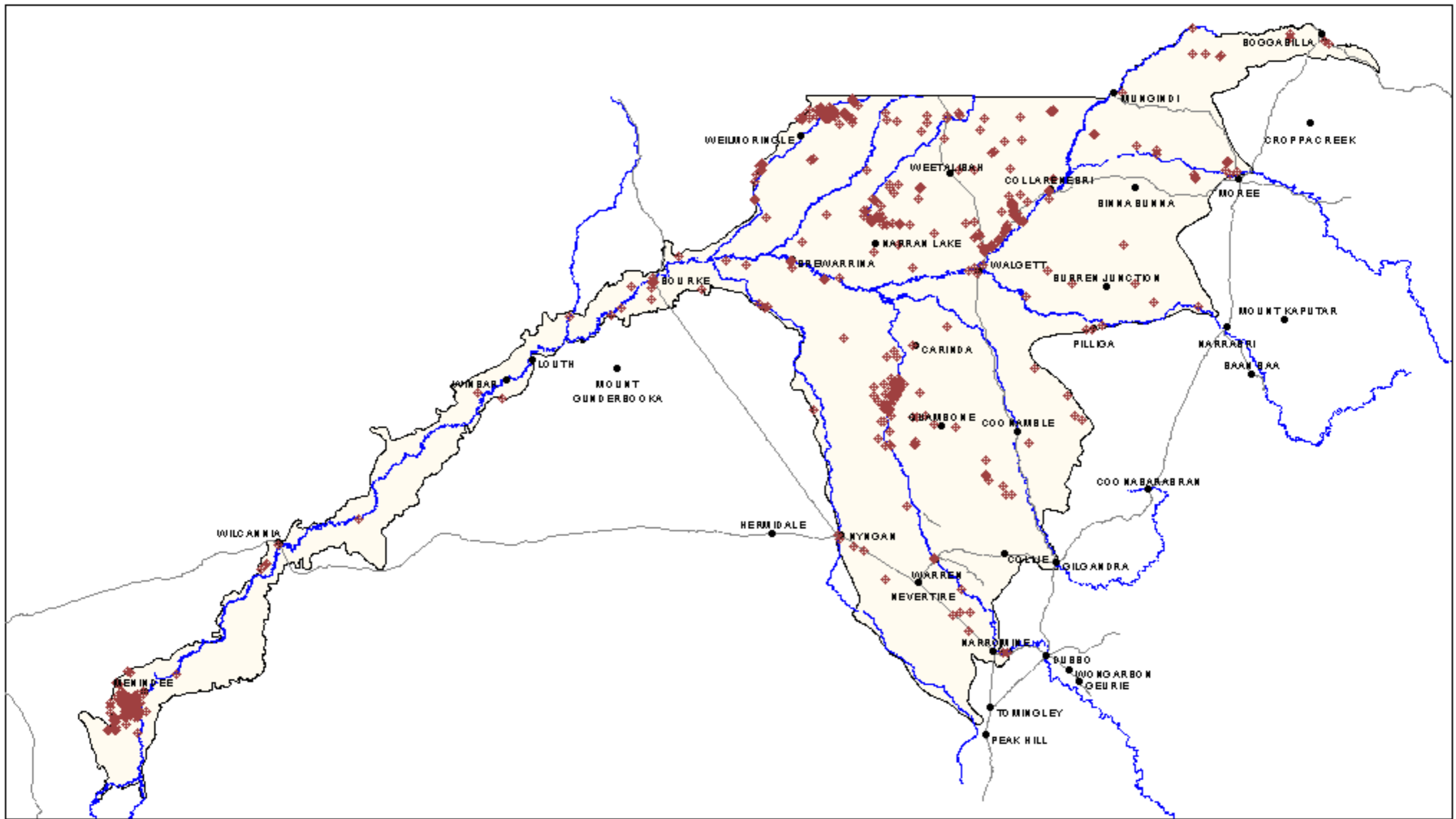
MAP 37
 Post 1970 Feral Bird Records
 in the DRP



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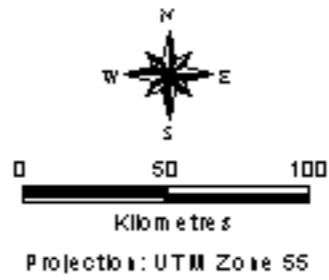


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◆ Mammal Records

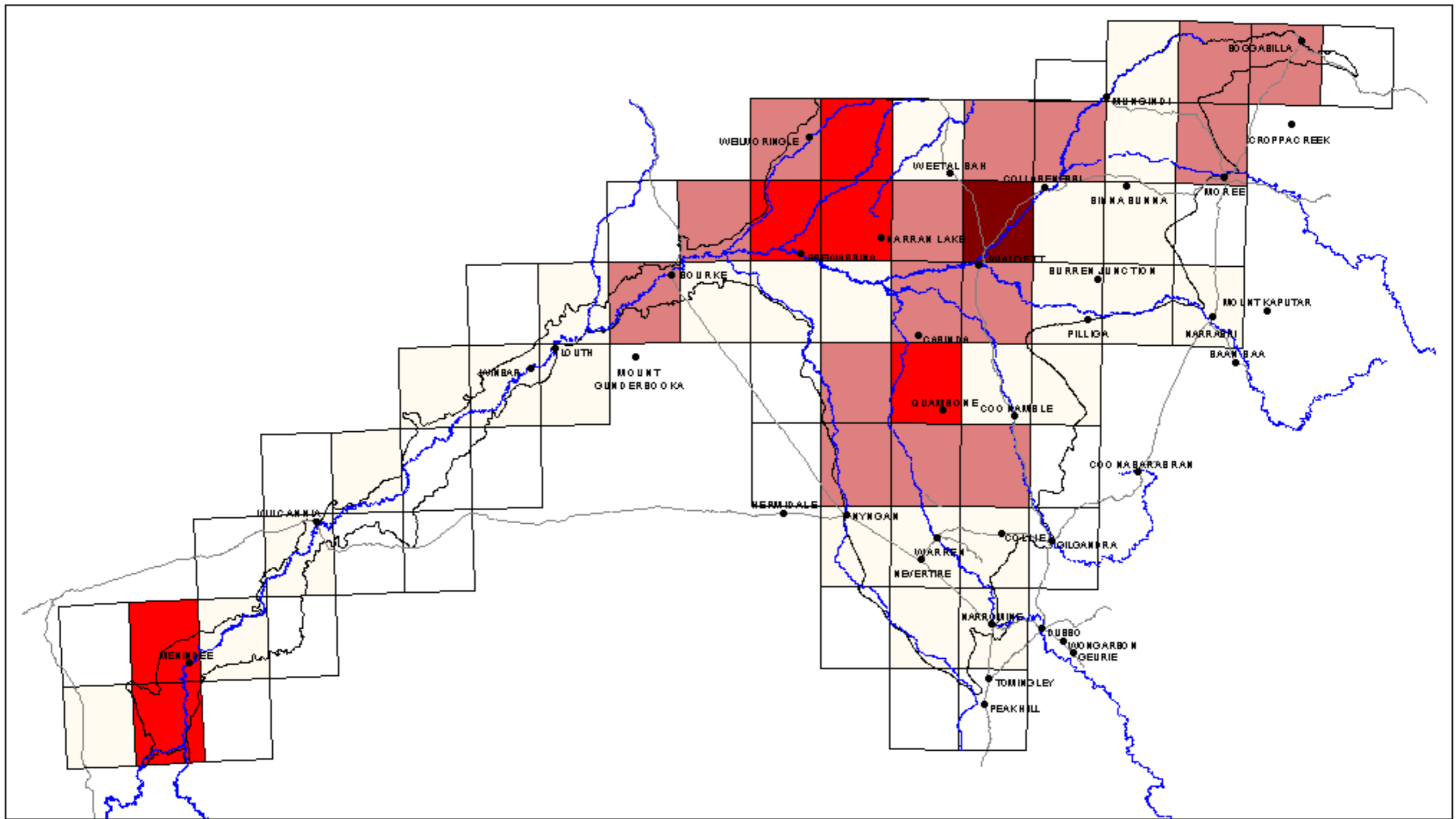
MAP 38
 Post 1970 Mammal Records
 in the DRP



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Mammals records per mapsheet

- 0
- 1 - 15
- 16 - 55
- 56 - 155
- No records

MAP 39

Wild life Atlas Mammals records per 100,000 mapsheet



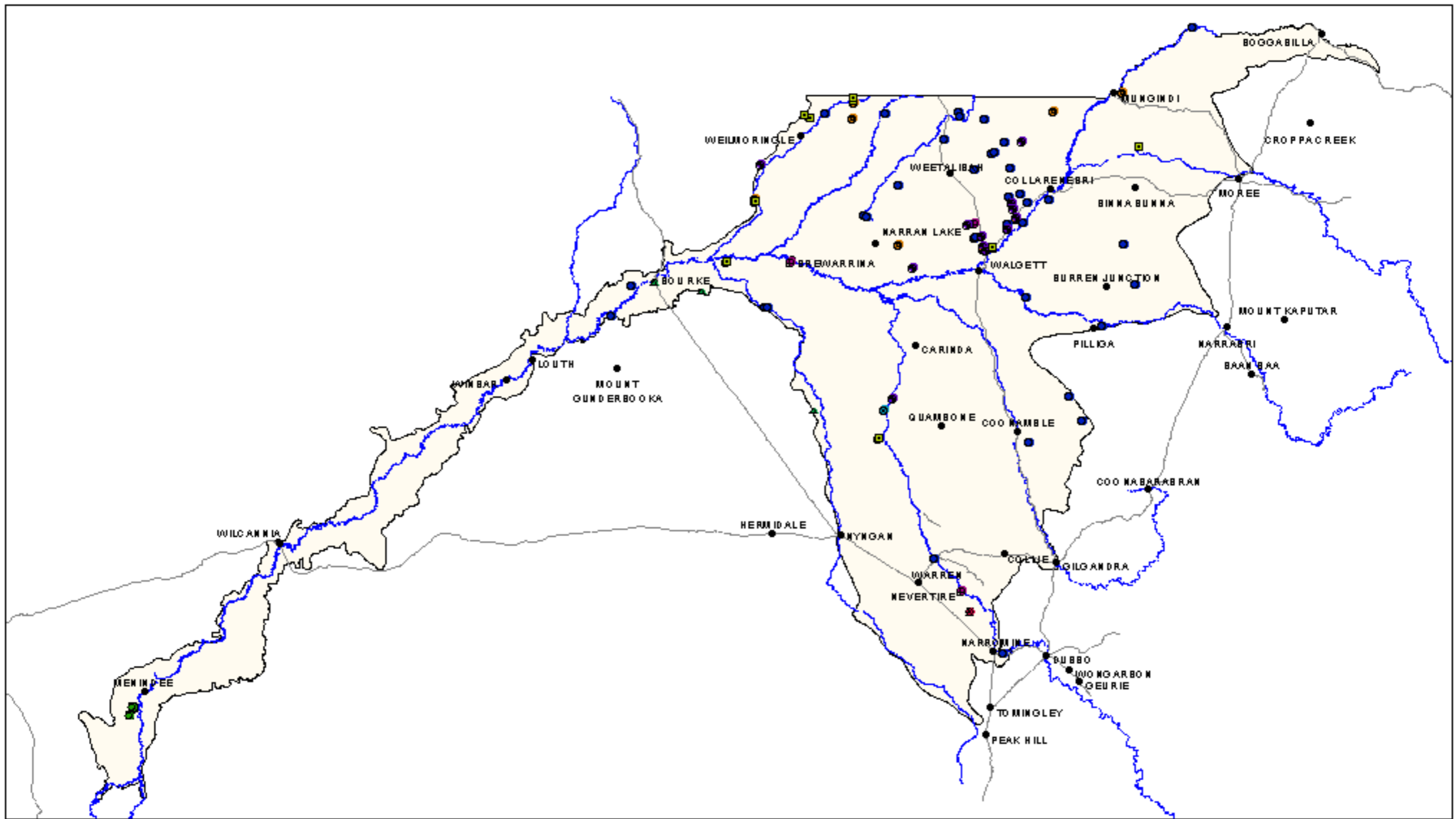
0 50 100 Kilometers

Projection: UTM Zone 55

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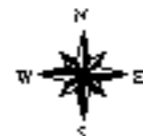
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Mammal Records - Threatened Species


■	Brush-tailed Phascogale	●	Spotted-tailed Quoll
●	Inland Forest Bat	●	Squirrel Glider
●	Koala	●	Stripe-faced Dunnart
▲	Kultarr	●	Yellow-bellied Sheath-tail-bat
■	Little Pied Bat		

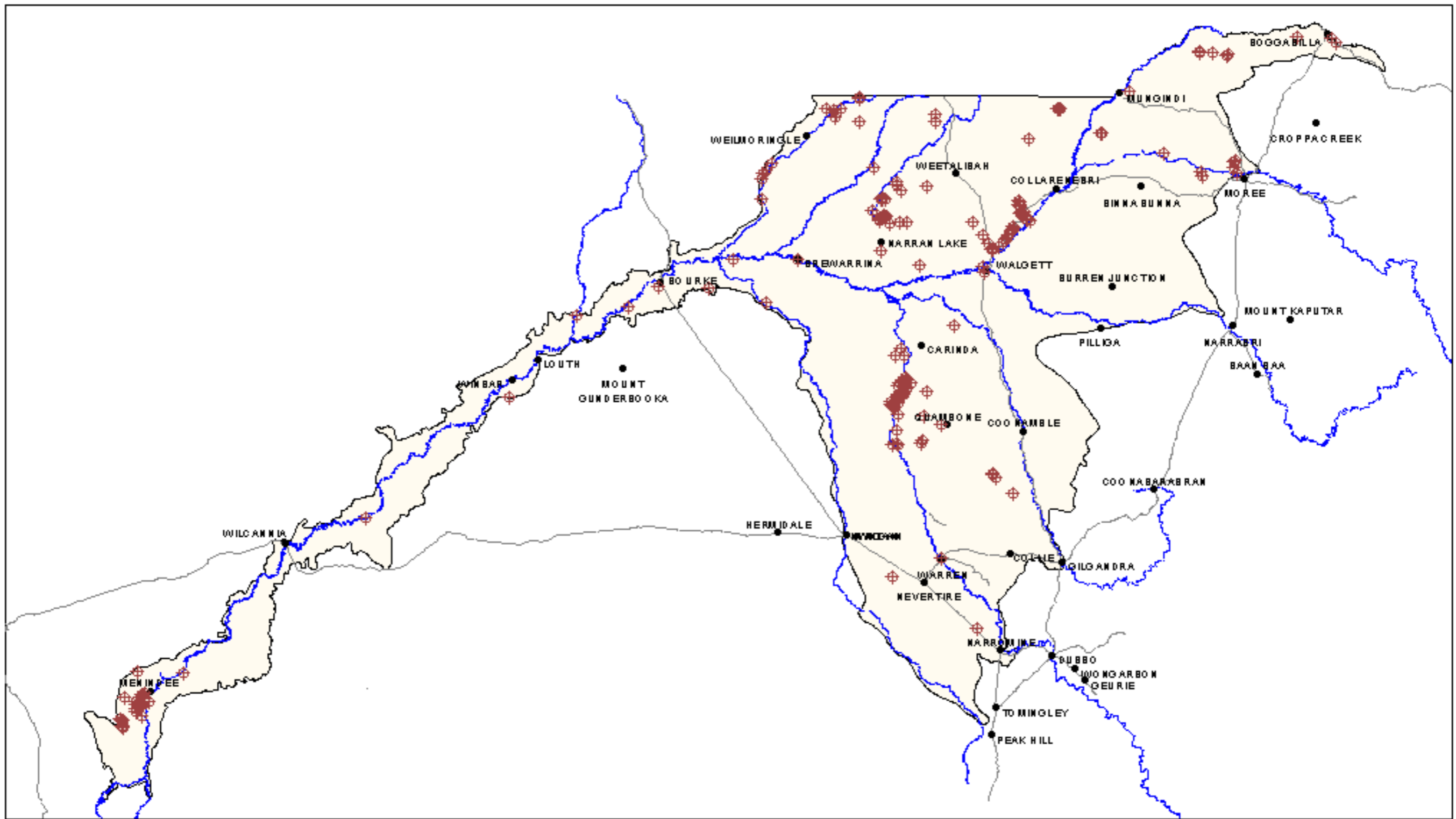
MAP 40
 Post 1970 Threatened
 Mammal Records in the DRP


 0 50 100
 Kilometres
 Projection: UTM Zone 55

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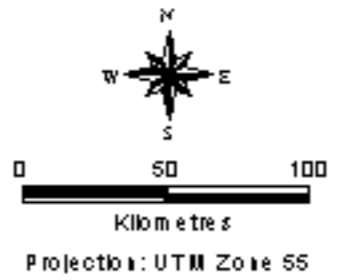
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◆ Feral Mammal Records

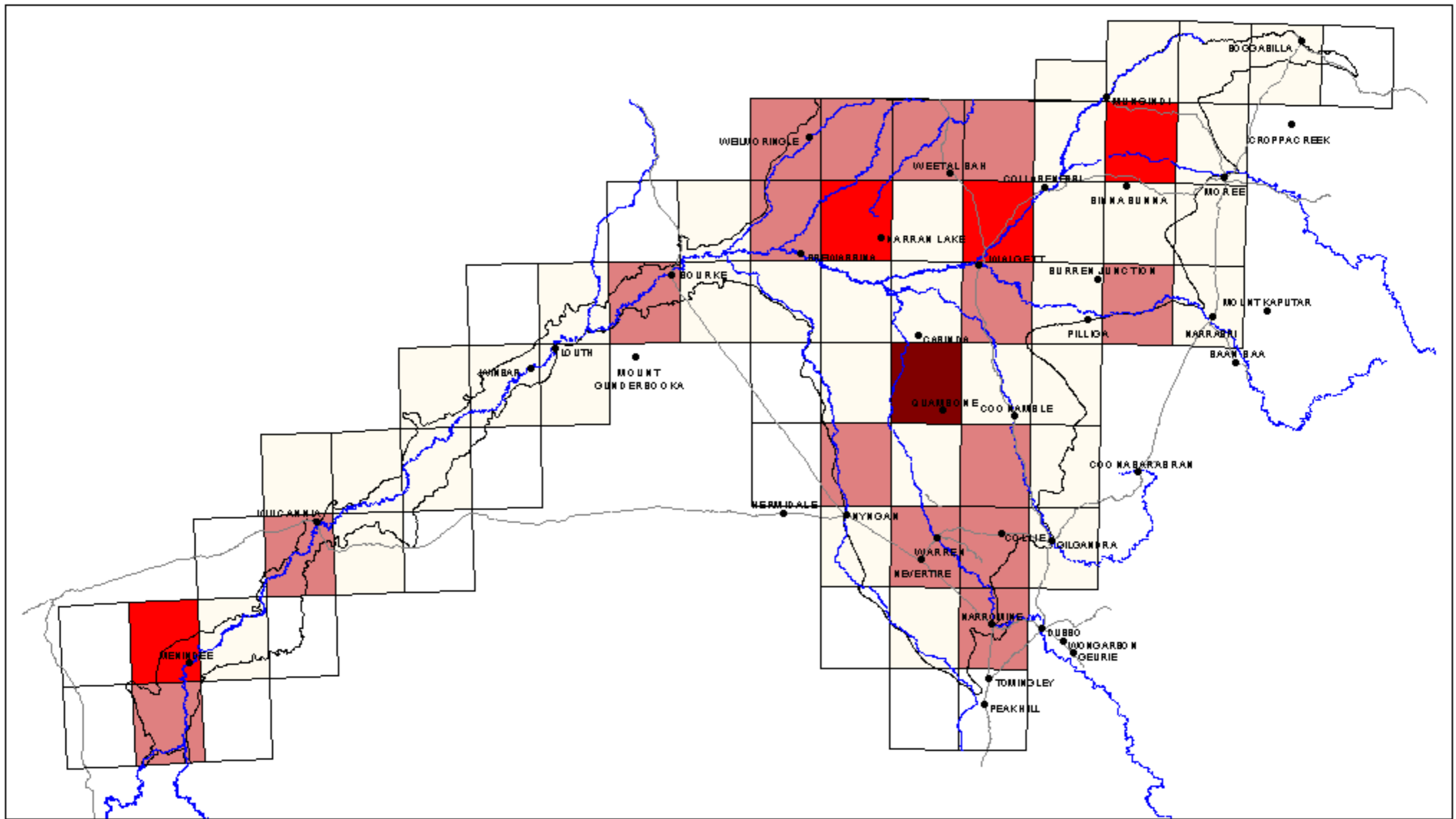
MAP 41
 Post 1970 Feral Mammal Records
 in the DRP



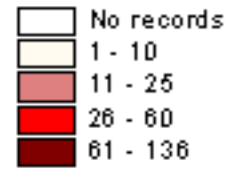
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Fauna records per mapsheet



MAP 42

Wildlife Atlas Threatened Fauna records per 100,000 mapsheet



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