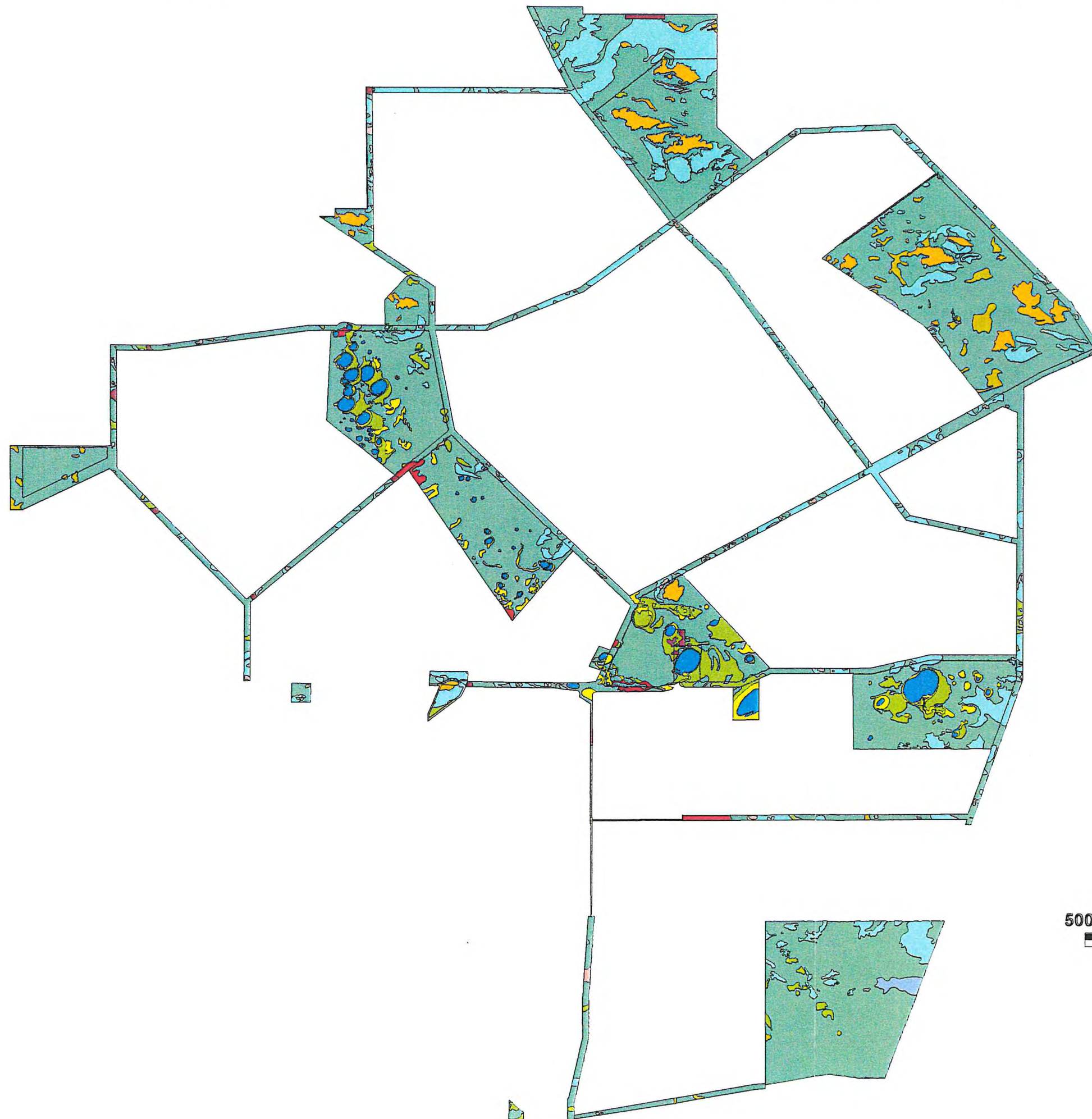


VEGETATION SURVEY OF RESERVES IN THE LAKE BRYDE RECOVERY CATCHMENT



Department of Conservation
and Land Management

Vegetation Survey of Reserves in the Lake Bryde Recovery Catchment



Legend

Veg_707_9dd.shp

- Woodland
- Shrubland
- Heathland
- Mallee complex
- Mallee/mallett complex
- Mallett stands
- Lakes
- Granite Complex
- Degraded
- Sand washaways
- Gravel Pits
- Salt Affected



5000 0 5000 10000 Meters

Prepared for the Department of
Conservation and Land Management
by Ecoscape Australia Pty Ltd, 2000.

**VEGETATION SURVEY OF
RESERVES IN THE LAKE BRYDE
RECOVERY CATCHMENT**

Prepared for:

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Prepared by:

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SUMMARY

Ecoscape (Australia) Pty Ltd was commissioned by the Department of Conservation and Land Management (CALM) to undertake a vegetation survey of the crown reserves within the Lake Bryde Recovery Catchment as part of an inventory of the natural resources of the catchment. The ephemeral chain of salt lakes comprising the Lake Bryde wetland system has been declared a Recovery Catchment by CALM. Lake Bryde is unusual in that it contains relatively fresh water in a landscape of increasing salinity.

The Lake Bryde system is approximately 320 km south east of Perth and 35 km south west of Newdegate. Vegetation surveyed within the Lake Bryde Recovery Catchment comprised approximately 18 200 ha of land on 16 crown reserves and 4 200 ha of vegetation along 19 road reserves (totalling approximately 22 400 ha) in a study area of approximately 165 000 ha.

The survey was conducted over a three week period in May 2000, using the methods of McDonald *et al.* (1998). Fifty sites consisting of nested quadrats of 100 m² and 400 m² were surveyed, as representatives of vegetation types in the catchment. Detailed information on the floristics, vertical structure and cover of the vegetation within each site was recorded, as well as information on soil and landform characteristics. The floristic and structural information obtained from the quadrats was combined with aerial photograph interpretation, field investigation and statistical analysis, in order to map the vegetation of the area, at a scale of 1:25 000. The sites were revisited in late October 2000, to obtain flowering material and confirm plant identifications.

Eight broad floristic associations were identified, which were further sub-divided into 22 floristic communities. A total of 50 vascular plant Families and 371 plant species were recorded, of which 354 were identified to at least species level.

The 22 floristic associations identified in this survey were compared with those described in Hopkins *et al.* (1996) to determine their conservation status. Four of the floristic associations identified in this study could fall into the category of “*not represented in conservation reserves*”. Six of the floristic associations identified in this study could fall into the category of “*poorly represented in conservation reserves*”.

Fifteen populations of Priority Flora, consisting of nine species, were encountered during fieldwork. One population of the Priority 1 species *Leucopogon* sp. Kau Rock was found. Priority 2 taxa found were three populations of *Persoonia brevirhachis*, and one population each of *Dryandra epimicta* and *Rinzea affinis*. Priority 3 taxa found were four populations of *Daviesia uncinata*, two populations of *Hakea brachyptera*, one population of *Stylidium neglectum* and one population of *Grevillea newbeyi*. One population of the Priority 4 species *Grevillea prostrata* was also found.

The incidence of crown death in the areas surveyed was generally low with the highest level of incidence occurring in the upper storey of low-lying salt affected areas (LG4 - 30.4% and LG10 - 46.8%).

There were significant relationships identified between some of the soil chemistry variables and the floristic associations (as determined by correlation analysis). However, a multiple regression model was obtained which accounted for 51.2% of the variation between floristic groups, based on only three variables. These were Sub-surface Soil Electrical Conductivity and pH, and Soil Group. Revision of the model through inclusion and exclusion of different variables did not improve it. This suggests that either there are other variables on which data were not collected, or the analysis at a floristic group level is not refined enough to show relationships. However, some broad patterns between floristic group and soil group, pH and salinity were apparent.

SECTION ONE: SURVEY DESCRIPTION AND RESULTS

1. INTRODUCTION

Ecoscape (Australia) Pty Ltd was commissioned by the Department of Conservation and Land Management (CALM) to undertake a vegetation survey of the Crown Reserves within the Lake Bryde Recovery Catchment as part of an inventory of the natural resources of the catchment. The ephemeral chain of salt lakes comprising the Lake Bryde wetland system has been declared a Recovery Catchment by CALM. Lake Bryde is unusual in that it contains relatively fresh water in a landscape of increasing salinity, and therefore has regional significance. Information collected in this survey will provide CALM with a range of information products to assist management of vegetation in the area, and will provide a baseline for monitoring changes to vegetation over time, especially in relation to rising water tables and salinity.

The Crown Reserves of the study area are relatively large in comparison to other parts of the wheatbelt, with 8 Reserves of over 1000 ha of land, including 2650 ha of land from the north west corner of Lake Magenta Nature Reserve, which totals 107 615 ha. These reserves form important habitat for diverse populations of flora and fauna. The WA Herbarium has records of about 800 vascular plant species from the region. Most of the road reserves within the study area are also relatively large in comparison with the rest of the wheatbelt, supporting corridors of vegetation up to 400 m in width. These road reserves form an important network of habitat between the major conservation Reserves of the area and are especially important given the fragmented or isolated nature of much of the remnant vegetation throughout agricultural areas of Western Australia.

1.1. *The Study Area*

The Lake Bryde system is approximately 320 km south east of Perth and 35 km south west of Newdegate. The study area straddles the boundary between the Shire of Kent to the south and the Shire of Lake Grace to the north, with the majority of the study area within the Shire of Kent. Vegetation surveyed within the Lake Bryde Recovery Catchment comprises approximately 18,200 ha of land on 16 crown reserves and 4,200 ha of vegetation along 19 road reserves (totalling approximately 22,400 ha) in a study area of approximately 165,000 ha (Figure 1). The Reserves surveyed are listed in Table 1, and the road reserves are listed in Table 2.

1.2. *Climate*

The climate of the area has been classified as extra-dry Mediterranean with annual rainfall of between 300-500 mm (Beard, 1981). The region experiences 7-8 dry months with a winter rainfall maximum. The Shire of Kent records average maximum temperatures between 32.2°C in January to 14.8°C in July, with average minimum temperatures ranging from 14.4°C in January to 5.3°C in July (Grein, 1994).

Figure 1: Reserves Surveyed in the Lake Bryde Recovery Catchment

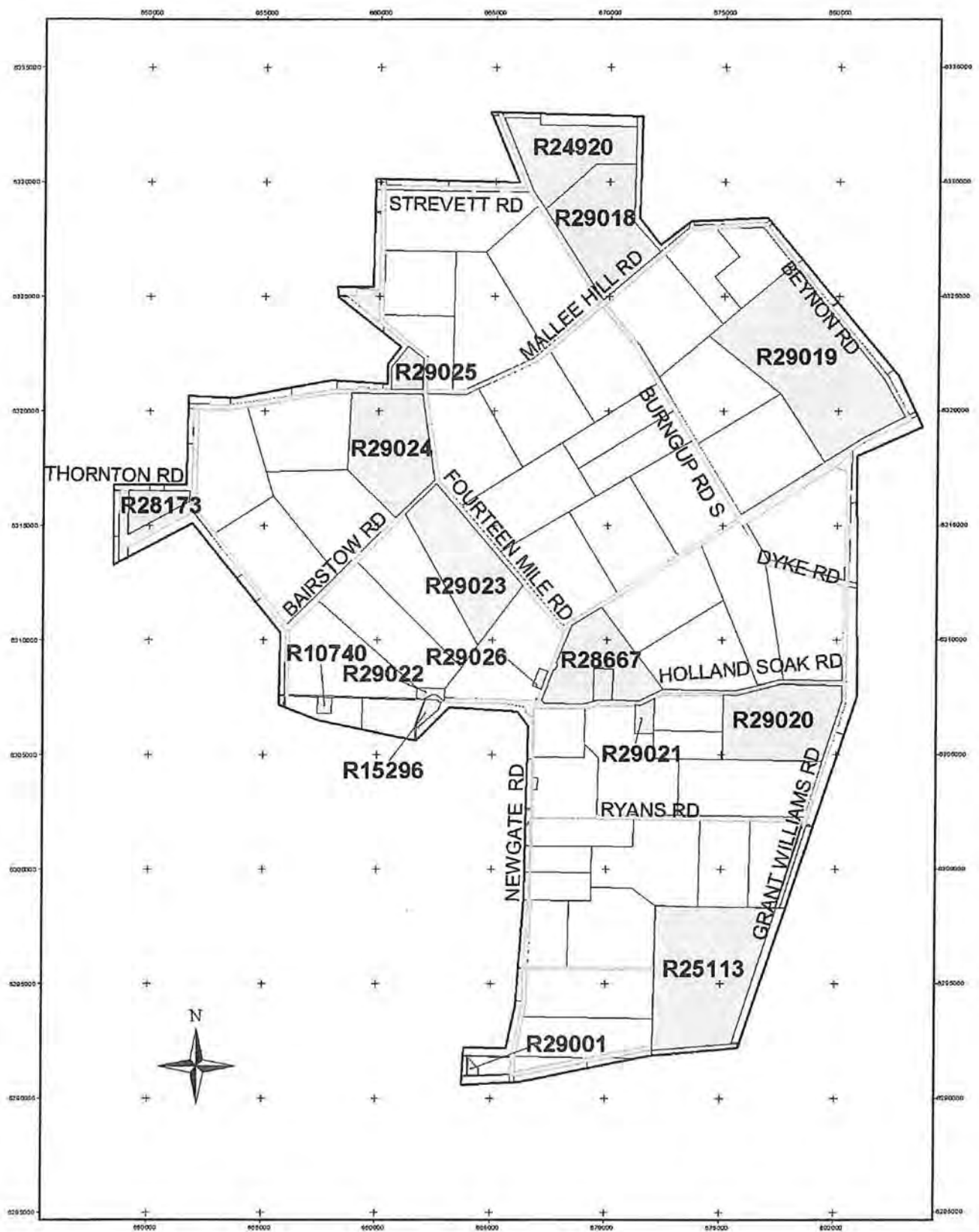


Table 1: List of Reserves Surveyed in the Lake Bryde Recovery Catchment

Reserve No.	Reserve Name	Area (ha)
24920	AgWest Experimental. Farm (Location 2566 only)	1 265
29018	Silver Wattle Nature Reserve	1 660
29019	Breakaway Ridge Nature Reserve	3 323
29020	Lake Bryde Nature Reserve	1 528
29021	Lake Bryde Nature Reserve	107
28667	Lake Bryde (Water, Picnic Ground, Conservation Flora & Fauna)	1 315
29026	Lake Janet Nature Reserve	32
29022	Hollands Rocks Nature Reserve	50
29023	Lakeland Nature Reserve	1 529
29024	Lakeland Nature Reserve	1 579
29025	Lakeland Nature Reserve	207
15296	Water Reserve	62
10740	Water Reserve	42
28173	Conservation of Flora & Fauna	331
29001	Water Reserve	26
25113	Part Lake Magenta Nature Reserve	~2 650

Table 2: Road Reserves Surveyed in the Lake Bryde Recovery Catchment.

Road Name	Area (ha)
Mallee Hill Road	502
Burngup Road South	396
Strevett Road	99
Fourteen Mile Road	430
Beynon Road	171
Pelham Road	113
Newdegate Road	560
Bairstow Road	400
North Needilup Road	175
East Road	124
Featherstone Road	47
Ryans Road	166
Zwecks Road	253
Hollands Soak Road	107
Lake Bryde Road	203
Dyke Road	103
Day Road	10
McDougalls Road	49
Grant-Williams Road	294

1.3. Geology and Geomorphology

The Lake Bryde catchment area is located on the Hyden Plateau, and is typical of the Zone of Ancient Drainage within the south-western interior of Western Australia. The landscape is comprised of gently undulating terrain with long, gentle slopes developed on the mainly granitic Archaean basement rocks of the Yilgarn Block, and broad, flat paleodrainage channels which trend north to north westerly. There are seldom any definite margins, such as breakaways, between the broad interfluves and the valleys.

The geology of the catchment area is shown in Figure 2. The area is predominantly mantled by reworked lateritic sandplain with an undulating surface and paleodrainage channels. Paleodrainage channels are comprised of either gypsiferous sand and silt in dunes adjacent to playa lakes, or ancient drainage flats with soils commonly containing calcrete nodules. Areas of quaternary alluvium and colluvium are also associated with tributary valleys leading to ancient drainage flats. In outer upland catchment positions, there are areas of outcropping granitic basement rocks (adamalite and granodiorite) which are commonly mantled by laterite. Lateritic ridges and crests are also scattered throughout the catchment.

1.4. Soils

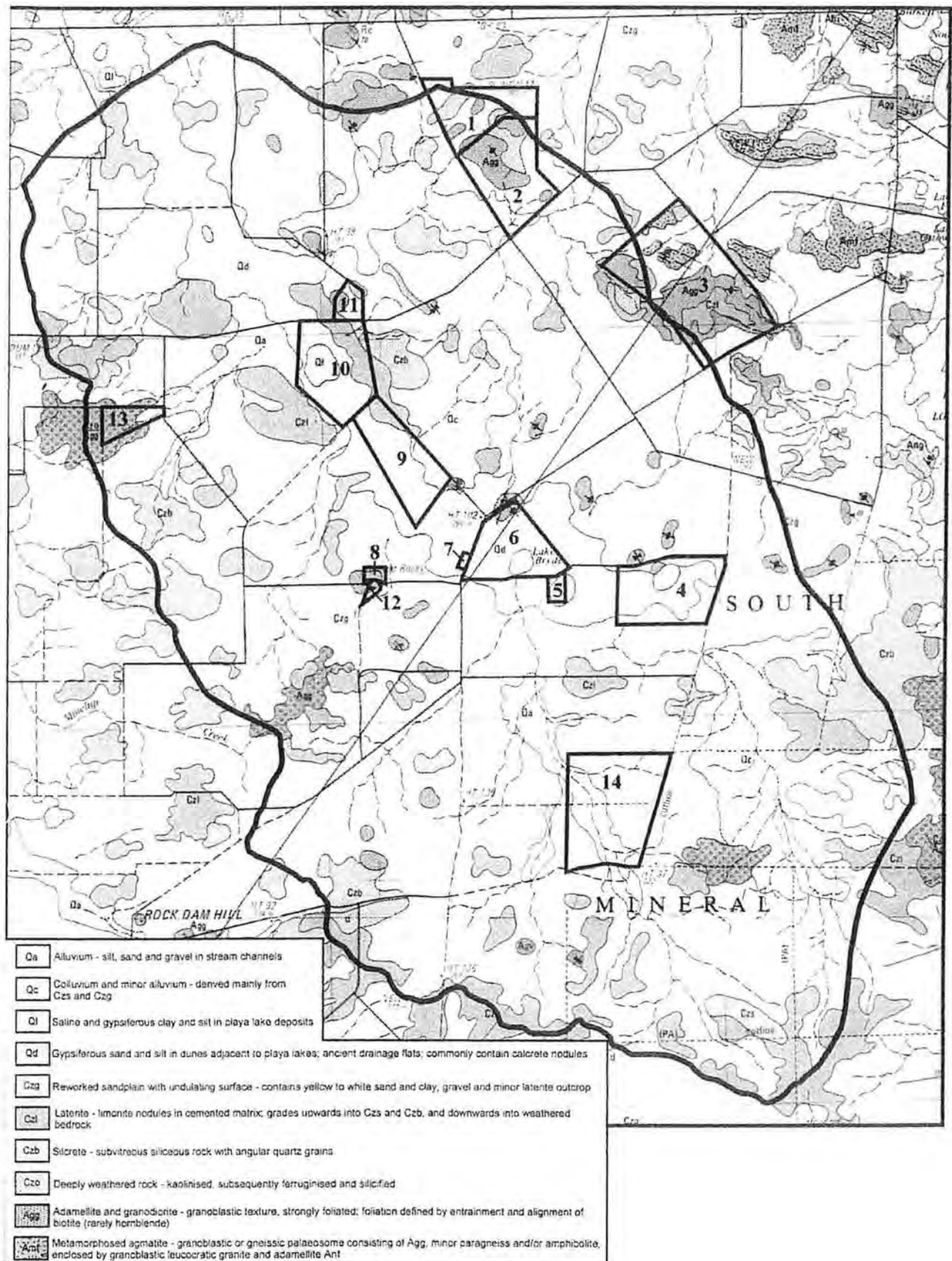
The soils of the Hyden Plateau are very variable, reflected in variations to plant structure and composition every few metres over much of the Hyden Plateau (Beard, 1981). The soils of the study area can be described according to the three major geomorphic elements of the study area: upland terrain with lateritic residuals; gently undulating slopes; and broad valley floors.

In upland areas, particularly in the north eastern portion of the study area, ancient plateau soils derived from the breakdown of early Tertiary laterite dominate the landscape. The terrain here consists of an undulating sandplain with long, gentle slopes and some abrupt erosional scarps. On erosional ridges and slopes, the predominant soils are ironstone gravels and gravelly sands. On the depositional slopes there are sandy yellow earths and yellow earthy or siliceous sands, both with some gravels present.

On gently undulating slopes within the southern and central portions of the catchment, the terrain consists of narrow ironstone gravelly ridges with gently undulating pediments and some swamps and lakes. The ridges contain ironstone gravels and gravelly sands, and main pediment slopes contain hardsetting loamy surfaced yellow duplex soils with predominantly alkaline reaction trends. The pediment slopes also contain smaller areas of gley duplex soils, brown or grey clays, and some areas of yellow duplex soils with acid rather than alkaline subsoils. In localised areas around granitic boses and tors (such as Hollands Rock) soils are shallow and often stony or gravelly. Proceeding down slope within this landscape, the soil changes progressively from yellow to red in colour, acid to alkaline in reaction, and from coarse to fine in texture.

Within the valley floors, salt accumulation becomes apparent, and there has been some re-sorting of soil material with formation of sand ridges around lake basins. The terrain consists of paleodrainage channels with salt (and some fresh water) lakes and their fringing areas with remnants of the old lateritic profile, and some rock outcrop. On the areas of riverine wash there are gypseous and saline loams as well as areas of red surfaced calcareous 'heavy soils' (local name). On rising country generally east south east of salt lakes there are 'morrell soils', (also local name) with characteristic powdery grey or brown surfaces and very high lime content. On dunes and lunettes which fringe the lakes there are various coarse, medium or fine textured soils with only slight profile development.

Figure 2: Underlying Geology of the Lake Bryde Recovery Catchment



North ↑

Scale 1:250,000

Produced by Land Assessment Pty Ltd, source Thom *et al.* (1984)

[illegible]

Scale 1:250,000

Produced by Land Assessment Pty Ltd, adapted from Agriculture WA (Overheu in progress)

Table 3: Soil Landscape Descriptions

Map Unit	Description
Newdegate. Undulating rises, in the south-eastern Zone of Ancient Drainage, with grey sandy duplex soils (shallow and deep), alkaline grey shallow duplex (sandy and loamy soils), pale deep sands and shallow gravels. Mallee-heath.	
Nw1	Level to very gently inclined, slightly incised (with coordinated drainage).
Nw2	Gently undulating to very gently inclined gravel plain. Hard setting soils such as 'moort type' soils are frequent.
Nw3	Similar landscape to Nw2 dominantly sandy soils.
Nw4	Gently undulating to undulating dissected plain to gently undulating rises, and distinct lateritic breakaway areas.
Nw5	As in landscape Nw4. Long slopes and no lateritic breakaways.
Nw6	Areas of significant rock outcrop including monadnocks, and sheet rock benches.
Sharpe. Valley floor of salt lakes and surrounding plains. Alkaline grey shallow loamy duplexes, alkaline grey shallow sandy duplexes, calcareous loamy earths, saline wet soils and salt lake soils. Mallee scrub and salmon gum-York gum woodland.	
Sh2	Level to very gently inclined plains. Dominant soils are alkaline grey shallow sandy and loamy duplex soils, grey deep sandy duplex soils, some calcareous loamy earths and saline wet soils.
Sh3	Gently undulating soil landscapes with dominantly deep sand sheets, lunettes or linear dunes occurring across the area.
Sh4	Undulating mid to upper valley slopes. Long slopes low relief gravels on upland, heavier soils on slopes and valleys.
Lagan. Salt lake chains, in the southern Zone of Ancient Drainage, with salt lake soil and calcareous loamy earths. Mallee, morrell woodland and saltbush-bluebush-samphire flats.	
La2	No specific description

1.4.1. Previous Soil Studies

Existing published soils studies covering the Lake Bryde catchment area are limited, either by their scale or the extent of the coverage. They include;

- Burvill (1945) - descriptions only, no mapping, and only for the area south of East Road (or Halls Track) through the Lake Magenta Reserve.
- Northcote *et al.* (1967) - *Atlas of Australian Soils* at a scale of 1:2 000 000.
- Stoneman (1990) - descriptions of individual soil profiles only and based on mapping from the *Atlas of Australian Soils*.
- McArthur (1991) - descriptions of individual soil profiles only and based on mapping from the *Atlas of Australian Soils*.

More recently, Agriculture Western Australia (Overheu, in progress) have commenced soil-landscape mapping for the Jerramungup area, which includes the Lake Bryde catchment. The relevant portion of the draft mapping is shown in Figure 3 with rudimentary descriptions of the mapping units in Table 3. While this mapping is associated with a number of sites located within the catchment since 1995, a considerable amount of work remains to be done to ensure mapping integrity, and to adequately describe the range of soil and landform conditions within the mapping units. This work includes updating the classifications of many of the soil profile descriptions, correlating them with other available data, and undertaking sufficient additional sites to ensure appropriate site density relative to the scale of mapping.

1.5. Wetlands and Hydrology

Lake Bryde and surrounding wetlands are part of a chain of salt lakes that run north-west to Merredin and then turn south-west and run into the Avon River. The system is located at the top of the Lockhart sub-catchment of the Swan-Avon system. The lakes of the study area are part of the Lake Grace fork, one of the three main forks in the Kondinin/Lake Grace district. The lakes occupy broad, flat-floored valleys, which represent the channels of ancient northerly flowing rivers. A number of salt lake chains of similar origin and orientation are found adjacent to the study area, including the Lake Magenta/Lake Lockhart chain to the east (Thom *et al.*, 1984). Drainage is sluggish due to low slope gradients.

1.5.1. Salinity

Lake Bryde (within Reserve 28667) and East Lake Bryde (within Reserve 29020) are unusual in that they are less saline than most other lakes in the associated salt lake chain (Watkins and McNee, 1987). The lakes are at the top of the wetland chain that runs north-west from the north-west corner of the Lake Magenta Nature Reserve. Limited groundwater monitoring indicates that Lake Bryde and East Lake Bryde are perched above the groundwater with impervious beds consisting of fine silt and clay (Mansell, 1995). The salinity of Lake Bryde when full is approximately 200 mS/m, increasing to 2000 mS/m when almost empty. The groundwater beneath Lake Bryde is hypersaline at 4000-6000 mS/m (Mansell, 1995).

Lake Bryde's catchment has been cleared of more than 70% of its native vegetation. Ogden and Froend (1999) state that the salinity of the lake will probably increase in the future due to clearing, and vegetation at lower elevations is likely to deteriorate from waterlogging and increasing soil salinity. Based on studies of the vegetation communities and soil and water salinity respectively, Mansell (1995) and Breheny (1995) concluded that the salinity of Lake Bryde is increasing.

1.6. Vegetation

The study area lies within the Roe Botanical District within the South West Botanical Province (Beard, 1981). Within the Roe District, the study area is part of the southern region of the Hyden Vegetation System on the Hyden Plateau, close to the border with the Chidrup Vegetation System on the Ongerup Plateau (Beard, 1981). The Hyden system was described generally by Beard (1981) as kwongan (scrub-heath and thicket) on sandplains, mallee on slopes over most of the system, mallee with patches of woodland on upper valley soils, woodland on lower valley soils and in saline areas a mosaic of woodland, shrubland and samphire. The vegetation characteristically forms a mosaic of vegetation types, with plant cover frequently varying in structure and composition every few metres due to the highly variable soil types, a situation which often complicates vegetation mapping (Beard, 1981).

1.6.1. Previous Vegetation Studies

Beard (1976) mapped the major vegetation types of the study area as:

- Mixed woodland of *Eucalyptus salmonophloia* (salmon gum), *E. longicornis* (red morrel), *E. salubris* (gimlet) and *E. kondininensis* (Kondinin blackbutt);
- Woodland of *E. salmonophloia*;
- Mallee of *E. eremophila* (sand mallee) and *E. oleosa* (giant mallee) on lateritic soil;
- Paperbark scrub of *Melaleuca parviflora*;
- Scrub of *M. thyoides* (boree);
- Scrub heath of mixed Proteaceae and Myrtaceae.

Mattiske Consulting (1999) mapped 19 plant communities according to the Muir (1977) classification at 1:25 000 below the 300 m contour on the Lakeland, Lake Janet and Lake Bryde Nature Reserve. The communities consisted of 6 Woodland formations, 6 Mallee formations, 6 Shrubland formations and 1 Herbaceous formation. The majority of their study area was dominated by mallee formations of *Eucalyptus vergrandis*, *E. calycogona* var. *calycogona* and *E. occidentalis* over scrub on sand and mallee formations of *E. hypoclamydea* subsp. *ecdysiastes*, *E. phenax* and *E. sporadica* over low heath over low sedges in sand. Open woodland of *E. kondininensis* and thickets of *Melaleuca* species were prominent in areas surrounding lakes.

Ogden and Froend (1999) surveyed Lake Bryde's wetland vegetation as part of the SAP monitoring program. Four permanent transects were established at Lake Bryde to survey terrestrial vegetation to below the high water mark. Data on vegetation and physico-chemical parameters is being collected from these transects on a triennial basis.

1.6.2. Flora

Within the approximate bounds of the study area, defined by 33°5'S, 33°35'S, 118°30'E and 119°5'E, the Western Australian Herbarium (as at 11 June 1999) has records of approximately 800 species, including eight Rare, ten Priority 1, twenty Priority 2, eighteen Priority 3, and four Priority 4 taxa. In their flora survey of land below the 300 m contour within the Lakeland, Lake Bryde and Lake Janet Nature Reserves, Mattiske Consulting (1999) identified 214 vascular plants in 124 genera and 50 families, including 3 Priority species. The study area also contains a Threatened Ecological Community (TEC) as one of the few remaining freshwater wetlands in the wheatbelt area.

1.7. Fauna

The Lake Bryde wetland system has been nominated as a wetland of outstanding ornithological importance under the Ramsar Convention. McKenzie (1973) carried out a fauna survey in the Lake Bryde Flora and Fauna Reserve system, encompassing six of the reserves in the present study. McKenzie (1973) confirmed the presence of seven mammal species (including four introduced species), 67 bird species, 27 reptile species and 2 amphibian species. Indirect evidence was found of a further two mammal species (including one introduced species), two bird species and one species of frog. McKenzie (1973) also surveyed the fauna of the entire Lake Magenta Nature Reserve, but the findings may not apply to the study area as only a small proportion of the Lake Magenta reserve lies within the study area.

2. OBJECTIVES

The general objective of the survey was to describe the vegetation of reserves, including road reserves, within the Lake Bryde Recovery Catchment. The specific objectives of the survey were to:

- Collate existing data on soils and vegetation;
- Describe and characterise vegetation units and map their occurrence and distribution at a scale of 1:25 000;
- Compile an inventory of the vascular flora;
- Determine and document the presence of rare or threatened plant taxa;
- Identify species and communities of significance;
- Analyse the relationships between soil, landform and vegetation characteristics;
- Record and assess vegetation vigour and health, particularly in relation to rising water tables and salinity.

A particular emphasis of the survey was to collect detailed vegetation and site data that is compatible with other datasets, so the methodology of McDonald *et al.* (1998) was adopted for all data collected in this survey.

Vegetation, soil and site data collected in this survey will assist CALM with management and monitoring of vegetation and other biotic elements within the study area, and will in future enable an assessment of habitat for a variety of fauna species. Information on vigour and health of vegetation will provide a baseline to monitor changes over time, particularly in relation to rising water tables and salinity.

3. METHODS

3.1. Data Collection

All vegetation and soil data collected followed the methods of McDonald *et al.* (1998). The use of these methods ensured that the data collected as part of this study is compatible with previous studies. Both these methods have been used to assess the nature conservation and other values of Reserves in other parts of Western Australia.

Data was collected through field assessment of 16 Reserves and 19 Road Reserves, and recorded on standard data sheets (refer to Appendix 1). Data management is discussed below.

3.2. Data Storage and Database Structure

A Microsoft® Access 97® relational database was used as the prime means of storing all survey data and a single ESRI® ArcView® 3.2 project containing multiple themes was created as the main interface through which spatial data can be queried. Photos were stored digitally on Kodak® Photo CD®, and were hotlinked to relevant ESRI® ArcView® themes.

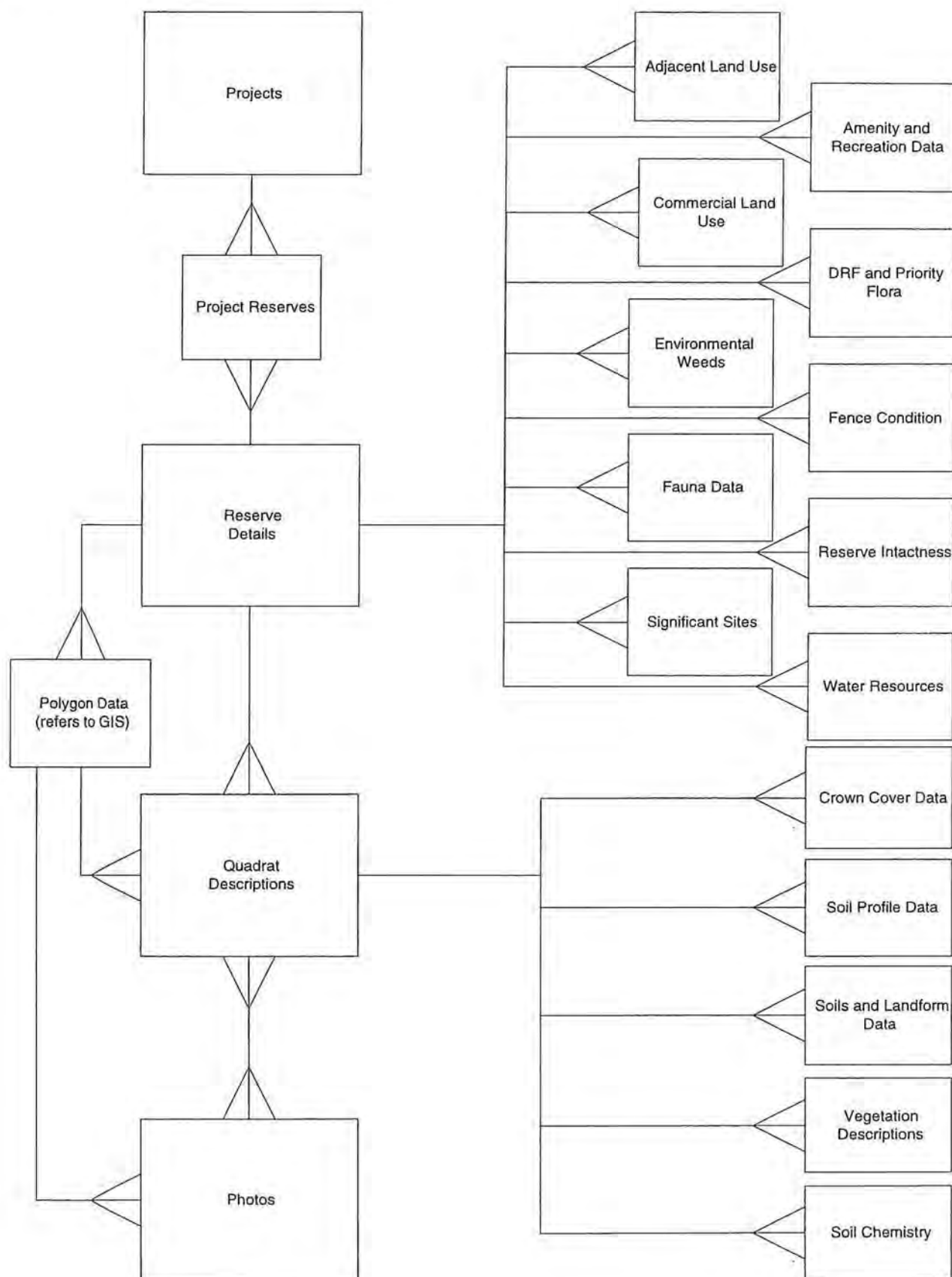
Survey data was entered into the database in the following tables:

- Projects (provides bibliographical information on this (and other) projects);
- Codes (provides the codes for all types of data recorded);
- Polygon Data (provides the corresponding Polygon Identification Numbers for each Reserve);
- Quadrat Descriptions (location and characteristics within Quadrats);
- Vegetation Descriptions (floristic and structural formation data within Quadrats);
- Crown Cover Data (data relating to vegetation cover within Quadrats);
- Soil Profile Data (data relating to soil horizons within Quadrats);
- Soils and Landform Data (data relating landform and soil surface conditions within Quadrats);
- Reserve Details (data on soils and geology within Reserves);
- DRF and Priority Flora (significant flora recorded within Reserves).

Each table was linked via common fields, and each field in each table was linked to a separate Access table in which data codes were defined. The relationship between each table is shown in Figure 4.

The database was constructed as a normalised database, using codes rather than English descriptions. Appendix 2 provides the code descriptions (also found in the database).

Figure 4: Relational Structure of Database.



3.3. Reserves

The structural vegetation groups of 16 reserves and 19 road reserves within the Lake Bryde Recovery Catchment was surveyed and mapped at the whole reserve scale of 1:25 000 (refer to Tables 1 and 2 for lists of reserves and road reserves). In addition, areas of reserves which were degraded, salt affected, eroded or used as gravel pits were also mapped.

3.3.1. Structural Vegetation Associations

- For each Reserve, including road reserves, the occurrence and distribution of structural vegetation units were mapped, as well as areas of vegetation showing significant proportions of stress or death. Gravel pits and scrapes devoid of significant vegetation were also mapped. The vegetation was classified into groups that could be easily distinguished both in the field and on aerial photographs.

In some Reserves, it was possible to distinguish between pure stands of mallet, pure stands of mallee and mixed stands of mallee and mallet on aerial photographs. Where this occurred, these vegetation types were mapped separately. However, it was usually difficult to distinguish these vegetation types, and in these instances they were mapped together as mallee/mallet complex.

3.3.1.1. Reserve Mapping

Where possible, tracks within Reserves and the boundaries of Reserves were traversed by car during fieldwork and broad vegetation types mapped onto aerial photos in the field. Together with the location of quadrats where the vegetation type was known, these maps formed reference points for mapping vegetation that could not be accessed during fieldwork. Vegetation mapping of Reserves was refined using stereographic interpretation of aerial photos, using the appearance and topographic position of areas of known vegetation types as a guide.

3.3.1.2. Road Reserves

All road reserves to be surveyed were traversed by car during fieldwork, and vegetation types mapped onto reproductions of aerial photographs, noting reference points such as dams and fencelines in relation to vegetation types. These maps were then refined using stereographic interpretation of aerial photos, and checking vegetation communities noted in the field against reference points to ensure accurate boundaries.

3.4. Quadrats

Fifty quadrats were surveyed to enable detailed assessment of vegetation and soil characteristics in areas representative of each broad vegetation type identified. Sixteen sites previously set up by Mattiske Consulting (1999) in areas below the 300 m contour in Lakelands, Lake Bryde and Lake Janet Nature Reserves were resurveyed by Ecoscape.

Survey sites consisted of two quadrats of 100m² (10 m x 10 m) and 400 m² (20 m x 20 m), with the 100 m² quadrat nested within a corner of the 400 m² quadrat. Wherever possible, quadrats were aligned north-south and east-west, with the north west corner as the common corner between the two quadrats. Any variations from this orientation were noted. The common corner was marked with a galvanised steel star picket with a stamped aluminium plate to identify the site number. The corners of the 100 m² quadrat were marked with galvanised fence droppers. A transect was established that diagonally intersected both

nested quadrats, with its origin in the north-west corner. The location of survey quadrats were included on the vegetation association maps.

3.4.1. Quadrat Location

Quadrats set up by Mattiske Consulting (1999) consisted of 11 permanent quadrats located in areas where a community was dominant and 5 permanent marker pegs located in areas considered to be a variation or degraded form of a larger or more mature community (Mattiske Consulting, 1999).

The locations of the remaining 34 sites were selected by Ecoscape to represent the vegetation types (e.g. woodland, mallee, heath) present within the study area. The number of sample sites within each vegetation type were chosen to broadly reflect the areal extent of the vegetation type. Sites were placed within Reserves, in homogeneous areas subjectively considered to be representative of the vegetation type at each particular location. Replicate sites within each vegetation type sampled different geographic locations and variations in the physical environment. Site locations were also chosen to avoid vegetation boundaries and areas of local disturbance, such as roads, tracks and gravel pits.

It was not possible to relocate a number of the Mattiske Consulting sites, particularly sites that were not located adjacent to access tracks or roads. Where the sites could not be located, a replacement site was chosen to coincide with the vegetation community and corresponding photograph described for that location by Mattiske Consulting (1999). This replacement site was then pegged and tagged as for other new sites set up by Ecoscape. The original site numbers allocated by Mattiske Consulting (1999) have been recorded in the database to allow future cross-referencing.

3.4.2. Quadrat Description

The following information was recorded on a standard data form at each survey site:

- Quadrat number;
- Reserve number;
- GPS location (AGD84);
- Vegetation condition on scale of 1 (near natural) to 5 (highly disturbed);
- Underlying geology;
- Soil-landscape unit;
- Aspect;
- Abundance, size and lithology of surface coarse fragments;
- Landform element;
- Landform pattern using relief and modal slope;
- Vegetation structural formation, floristic association;
- Presence of significant numbers or occurrences of symptoms of vegetation stress including lerps, leaf miners, galls or weeping sap and a note on the plant species affected;
- Evidence/no evidence of fire, and an estimate of the number of years since the most recent fire;
- Percentage cover, depth and composition (leaves, twigs or logs) of plant litter;
- Percentage cover of bare ground;
- Any other features of ecological relevance.

A colour photograph was taken of the site from the north west corner of the quadrat looking in a south easterly direction, showing the star picket in the foreground and the general appearance of vegetation at each site. Any variations in the direction the photo was taken were also noted.

3.4.3. Vegetation Description

Within each quadrat, the floristics, vertical structure and cover of the vegetation were recorded, following the following the minimum vegetation description guidelines provided in McDonald *et al.* (1998). This information was combined for all strata to give a detailed vegetation name. Vegetation name was determined using the vegetation structural formation, height class and floristic associations in each stratum present within a quadrat.

3.4.3.1. Floristics

All vascular plant species within or overhanging the 100 m² quadrat were identified and assigned a stratum (emergent, upper, middle, lower or ground stratum) and a percentage cover class (0-5%, 5-25%, 25-50%, 50-75%, 75-95% or 95-100%). For the upper stratum only, the same data was recorded for all vascular plant species within the 400 m² quadrat that did not already occur within the 100 m² quadrat.

Plant nomenclature and taxon identification codes followed the MAX Collecting Book database produced by the Western Australian Herbarium. Duplicate voucher specimens were collected for all dominant/co-dominant species surveyed within quadrats. Voucher specimens were only collected if fertile material (buds, flowers and fruit) were available or if positive identification could be made without fertile material. These voucher specimens were mounted to Herbarium standards for lodgement at CALM Herbaria at Como and Katanning. In addition to the voucher specimens, plant specimens that did not have fertile material were collected for identification purposes. All specimens were identified at the WA Herbarium, with reference to collections and experts as required.

Where populations of Declared Rare or Priority Flora were identified from voucher specimens and not in the field, their location was estimated using the GPS readings from the quadrat that the specimen originated from.

3.4.3.2. Vertical Structure

Data on vertical structure was recorded for each survey site according to the methodology and coding of McDonald *et al.* (1998). The growth form, average height and height class were recorded for each of the dominant/co-dominant species in the tallest stratum across the 400 m² quadrat. The same information was also recorded for each of the dominant/co-dominant species in the remaining strata in the 100 m² quadrat.

3.4.3.3. Vegetation Cover

The transect was used to assess the vegetation cover of all strata (except the non-woody ground layer) using the methodology of McDonald *et al.* (1998). Crown width and the distance between plant crowns within each strata were measured along the transect, as well as an estimate of the percentage of crown width occupied by epicormic regrowth, mistletoe or dead leaves and branches. Twelve measurements were taken where possible. For some sites,

large distances between plants in some strata (e.g. very scattered mallee in heath formations or sparse middle storey under woodlands) meant that it was not possible to take 12 measurements along the transect before intercepting another vegetation type or disturbed area such as an access track.

For the non-woody ground layer, five 1 m transects were laid out within the 100 m² quadrat, and the number of centimetres that the transect intercepted ground layer foliage was recorded, according to the standard methodology in McDonald *et al.* (1998).

For each stratum, except the ground layer, the following information was calculated using the methodology of McDonald *et al.* (1998):

- Average crown width and gap;
 - Crown separation ratio;
 - Crown cover class;
 - Percentage crown cover;
- Average percentage of crown width dead or occupied by epicormic regrowth and mistletoe.

3.4.4. Soil and Landform Description

Information was collected on the soil profile, landform and soil chemistry at each survey site using the methods and coding in McDonald *et al.* (1998).

3.4.4.1. Landform Description

- At each quadrat site, the following landform data were obtained:
- Underlying geology;
- Soil-landscape unit;
- Surface coarse fragments (abundance, size and lithology);
- Landform element, using the landform element glossary of McDonald *et al.* (1998); and
- Landform pattern using relief and modal slope.

Aspect was not recorded due to very low slope gradients diminishing the relevance of this attribute in relation to influence on vegetation.

3.4.4.2. Soil Profiles

Soil profiles were taken from a point adjacent to the common corner of both quadrats but outside the quadrats. The following soil profile information was recorded for each soil horizon to a total depth of 100 cm or pan:

- Depth;
- Moist colour (Munsell);
- Field texture grade;
- Boundary distinctness;
- Coarse fragments;
- Soil water regime (permeability and drainage);
- Effervescence of carbonates (“fizz test”).

The boundary shape between soil horizons was not recorded as it is impossible to distinguish when profiles are observed from an auger sample. The alternative method of observation, a pit excavation is too time consuming and results in a significant site disturbance which is undesirable in

the immediate vicinity of a vegetation quadrat. Furthermore the item is of no relevance in relation to the system of soil classification now used for Agriculture WA soil landscape surveys (Schoknecht 1999).

3.4.4.3. Soil Chemistry

Soil samples of approximately 50 grams each were collected from the 'A' horizon or upper ten centimeters from 20 evenly spaced (gridded) points within each 100 m² quadrat. These samples were then bulked, air-dried and stored in geological sample calico bags. From the bulked soil, measurements were taken of the quantity of carbon, nitrogen, phosphorus, P(HCO₃), K(HCO₃), Ca(HCO₃), exchangeable calcium, sodium & potassium. In addition, exchangeable Mg, Al and Mn were determined due to minor additional cost and usefulness in allowing estimation of total CEC (cation exchange capacity) and possible correlations between vegetation and these soil chemical attributes.

Soil pH and electrical conductivity were determined in the laboratory since it was more efficient in terms of survey time for them to be determined from soils sampled for laboratory analysis. This was particularly so given the number of samples already required by the study brief to be analysed for other attributes.

3.5. Analysis of Floristic and Environmental Data

The aims of the data analysis were:

- To determine the range of floristic vegetation associations present; and
- To explore relationships between plant species presence and their environment (using correlation analysis).

The floristic data were arranged in a two-way table of plant species by survey sites (binary presence/absence data) and the sites were classified according to similarity in species composition using a hierarchical cluster analysis for binary data. This meant that sites with a similar plant species composition were grouped together. It did not group sites based on vegetation structural formation, so if two sites had the same species but the structure was different they would still be grouped together. It also did not weight species within different strata differently, so sites with similar overstorey species were not necessarily grouped together. The particular method of analysis used was the Czekanowski dissimilarity coefficient and UPGMA fusion method (SPSS, 1997), which follows previous floristic studies (for example, Gibson et al., 1994). The Czekanowski dissimilarity coefficient is an index in which joint absences are excluded from consideration and matches are weighted double (SPSS, 1997). The resultant dendograms were then used to arrange the species and sites in a two-way table, in order to visually identify floristic associations.

A correlation analysis (Spearman non-parametric) was run to explore relationships between soil chemistry data and topography and floristic associations. Non-parametric methods were chosen as the samples were not truly independent.

For analyses of soil pH and conductivity, the data collected was split into two types –surface and subsurface. This is because several measurements were made of these variables at different depths on the soil profile for each site, and the analyses could not account for these multiple measurements. It was not appropriate to average the data over the whole of the soil profile, and so only the surface readings (annotated as surface) and the very deepest readings (annotated as subsurface) were used.

3.6. Map Production and Survey Themes

The following section describes the methods used in the preparation of vegetation association maps for Reserves and adjoining road reserves.

3.6.1. Metadata

Each spatial dataset used had information on the following core metadata elements provided. These follow the ANZLIC metadata guidelines:

- Title;
- Custodian;
- Description (abstract);
- Date currency;
- Access (stored data format);
- Projection;
- Datum;
- Data quality (lineage, positional accuracy, attribute accuracy, completeness); and
- Metadata date.

A brief written summary was provided for each dataset. The summary contained information about how it was created, any limitations, and any other information that will assist third parties to assess the dataset.

3.6.2. Broad Vegetation Types Map

Broad vegetation types (including degraded areas) were provided as single ESRI® ArcView® 3.2 shapefiles (polygon themes). Each polygon was attributed with a unique polygon identifier, Reserve number, land district, lot number, class/type/value, area (ha) and perimeter (m) value. All themes were stored in decimal degrees (4 decimal places). Quadrat locations were also included with this map.

Each occurrence of the same vegetation unit within a Reserve was mapped as a separate polygon. However, as not every vegetation unit was surveyed in each Reserve, each polygon was attributed with features that corresponded to that vegetation unit from elsewhere within the Recovery Catchment. For each vegetation polygon mapped, the following information was recorded:

- Polygon Number;
- Reserve Number;
- Land District;
- Location Number;
- Lot Number;
- The area of the polygon (ha), and the percentage of the Reserve's area the polygon occupies;
- For degraded or modified vegetation polygons, a name describing the unit in terms of the likely original vegetation and type of degradation;
- For all remaining vegetation polygons, a site identifier (quadrat number) and a vegetation name; and
- A brief comment, where appropriate.

3.7. Timing of Survey

The field investigations were undertaken over a three week period, from the 8th May to the 27th May 2000, inclusive. A repeat survey of all 50 sites was undertaken from the 30th

October until the 9th November, 2000, to obtain more flowering material for vouchers, and to identify annuals which were absent during the winter survey.

4. RESULTS

4.1. Vegetation

4.1.1. Structural Vegetation Units

Broad structural vegetation units were mapped at a scale of 1:25,000, based on aerial photograph interpretation and field (refer to map folder). The structural vegetation units mapped were:

- Woodland;
- Shrubland;
- Heathland;
- Mallee complex;
- Mallee/mallett complex;
- Lakes;
- Granite complex;
- Degraded areas;
- Salt affected areas;
- Sand washaways; and
- Gravel pits.

4.1.2. Floristic Associations

As a result of the floristic analysis, 22 floristic associations were identified. These associations were based on floristic similarity between sites, ie. sites were grouped according to the presence of similar plant species (Figure 5). A description of each association, along with the structural formations and soil types present are presented in Table 5.

4.1.3. Floristics

In total, 371 vascular plant species were identified from 50 Families. Complete flora species lists are provided in Appendix 3. Section 2 provides detailed vegetation descriptions for each quadrat surveyed.

Table 6 is a presence/absence table that illustrates the distribution of plant species across the survey quadrats. A species is present if a * is shown. The species have been arranged according to the floristic association in which they occur.

There were 119 species restricted to single quadrats, whereas some species were common in many quadrats. The most common species were *Melaleuca lateriflora* subsp. *lateriflora* (40% of quadrats), *Melaleuca uncinata* and *Lepidosperma brunonianum* (36% of quadrats), *Templetonia sulcata* (30% of quadrats), *Gahnia lanigera* (28% of quadrats), *Melaleuca carri* ms', *Melaleuca acuminata* and *Santalum acuminatum* (26% of quadrats), and *Neurachne alopecuroidea*, *Melaleuca adnata*, *Exocarpus aphyllus* and *Calytrix leschenaultii* (24% of quadrats).

4.1.4. Priority Flora

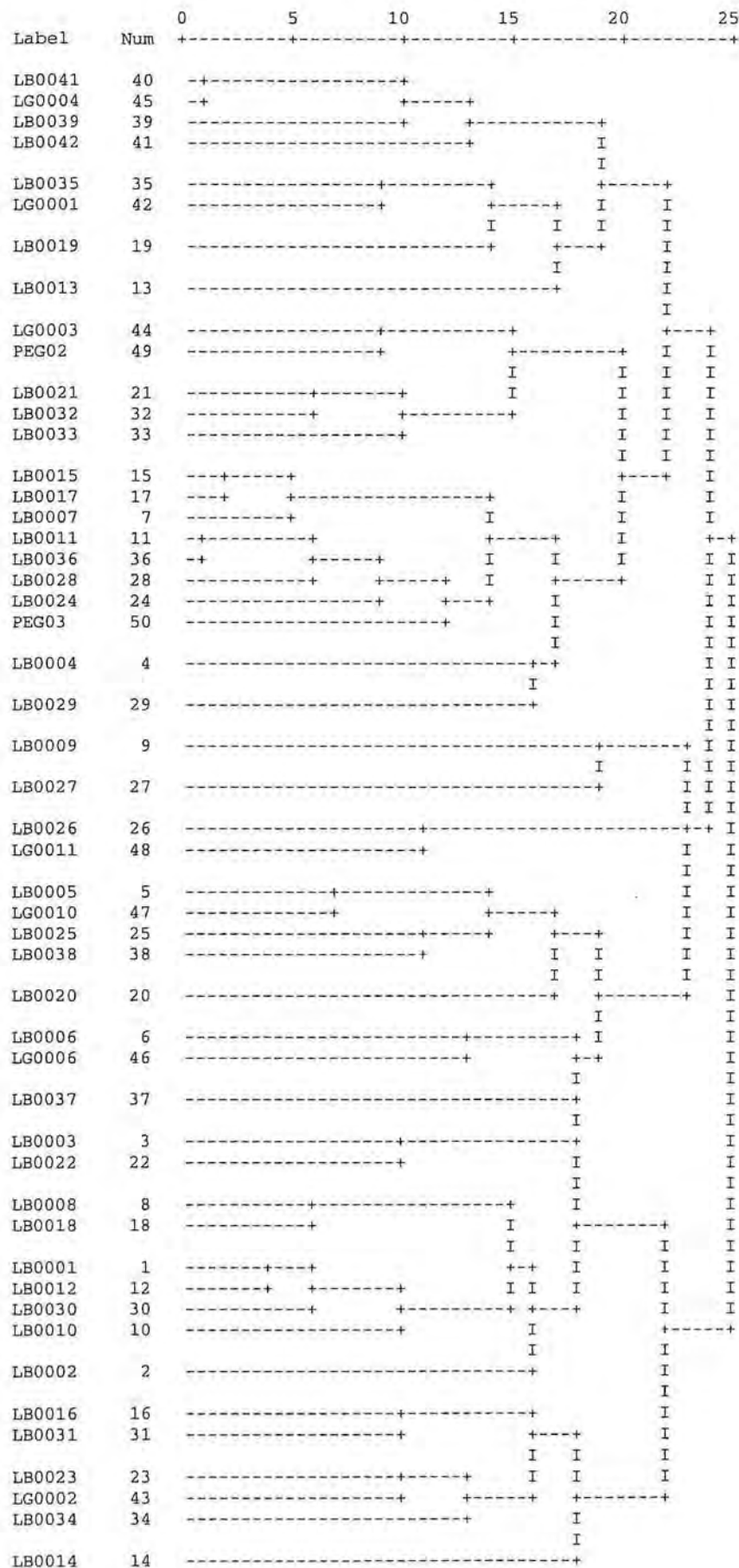
A total of fifteen populations of Priority Flora, consisting of nine species, were encountered during fieldwork. One population of the Priority 1 species *Leucopogon* sp. Kau Rock was found. Priority 1 species are taxa which are known from one or a few populations (generally less than five) which are under threat. The Priority 2 taxa

found were three populations of *Persoonia brevirhachis*, and one population each of *Dryandra epimicta* and *Rinzea affinis*. Priority 2 taxa are known from one or a few populations, at least some of which are not believed to be under immediate threat. The Priority 3 taxa found were four populations of *Daviesia uncinata*, two populations of *Hakea brachyptera*, one population of *Stylidium neglectum* and one population of *Grevillea newbeyi*. Priority 3 taxa are known from several populations, at least some of which are not believed to be under threat. One population of the Priority 4 species *Grevillea prostrata* was also found. Priority 4 species are taxa which are considered to have been adequately surveyed, and whilst rare, and are not currently threatened by any identifiable factors.

4.1.5. Vegetation Stress

Sixty eight percent of the 50 quadrats surveyed had less than 5% crown death, and only four sites had greater than 25% crown death. These latter sites are LB24 (29.2% in the mid-storey), LB36 (40.8% in the mid-storey), LG4 (30.4% in the upper storey) and LG10 (46.8% in the upper storey). Both the latter sites occur in low altitude lake areas.

Figure 5: Hierarchical Clustering of Quadrats based on Floristic Similarity



Floristic Association 1A

LB041 LG004	Low-lying shrublands of <i>Melaleuca</i> species with or without forest of <i>Eucalyptus kondininensis</i> over salt-tolerant chenopod shrubland.			
LB039 LB042	LB41 (Mattiske site) had <i>Eucalyptus kondininensis</i> and <i>E. occidentalis</i> occurring as seedlings (poorly chosen site as it is disturbed and in an ecotone).			
Soils:	Alkaline grey shallow sandy duplex, calcareous loamy earth or grey non-cracking clay			
Structural Units:	Tall closed forest	Tall to very tall shrubland	Mid-high sparse heath	Low to mid-high grassland
	Mid-high open forest	Mid-high to tall open shrubland	Dwarf heathland	Mid-high open grassland
		Tall isolated emergent shrubs	Dwarf to low open heath	Dwarf to Low forbland
		Tall isolated clumps	Low to mid-high chenopod shrubland	
Trees:	Shrubs:		Herbs:	
<i>Eucalyptus kondininensis</i>	<i>Acacia erinacea</i>	<i>Melaleuca lateriflora</i> subsp. <i>lateriflora</i>	<i>Austrostipa drummondii</i>	
	<i>Atriplex paludosa</i>	<i>Melaleuca pauperiflora</i>	<i>Austrostipa juncifolia</i>	
	<i>Atriplex paludosa</i> subsp. <i>baudinii</i>	<i>Melaleuca thyoides</i>	<i>Austrostipa puberula</i>	
	<i>Atriplex vesicaria</i>	<i>Melaleuca uncinata</i>	<i>Austrostipa pycnostachya</i>	
	<i>Disphysma crassifolium</i> subsp. <i>clavellatum</i>	<i>Olearia muelleri</i>		
	<i>Halosarcia pergranulata</i> subsp. <i>pergranulata</i>	<i>Rhagodia drummondii</i>		
	<i>Halosarcia syncarpa</i>	<i>Rhagodia priesii</i> subsp. <i>priesii</i>		
	<i>Lawrenciella squamata</i>	<i>Sclerolaena diacantha</i>		
	<i>Melaleuca acuminata</i>	<i>Templetonia sulcata</i>		
	<i>Melaleuca adnata</i>	<i>Threlkeldia diffusa</i>		

Floristic Association 1B Description

LB035 LG001 LB019	Shrubland of <i>Melaleuca</i> species (commonly <i>M. lateriflora</i> subsp. <i>lateriflora</i> , <i>M. brophyi</i> ms, <i>M. uncinata</i>) with vines of <i>Cassytha melantha</i> over sedgeland of <i>Gahnia</i> sp.L (K.R. Newbey 7888).			
Soils:	Alkaline grey shallow to deep sandy duplex			
Structural Units:	Very tall open mallee forest Low open woodland	Tall closed shrubland Tall open shrubland Tall shrubland	Low to tall sparse heathland Vines	Mid-high to tall sedgeland Tall sparse sedgeland Low sparse forbland Low sparse grassland Mid-high grassland
Trees: <i>Eucalyptus calycogona</i> var <i>calycogona</i> <i>Eucalyptus occidentalis</i> <i>Eucalyptus suggrandis</i> subsp. <i>alipes</i>	Shrubs: <i>Cassytha melantha</i> <i>Exocarpus aphyllus</i> <i>Grevillea oligantha</i> <i>Melaleuca brophyi</i> ms <i>Melaleuca lateralis</i> <i>Melaleuca lateriflora</i> subsp. <i>lateriflora</i> <i>Melaleuca laxiflora</i>		Herbs: <i>Aira</i> sp. <i>Austrodanthonia acerosa</i> <i>Austrodanthonia caespitosa</i> <i>Austrostipa drummondii</i> <i>Chenopod</i> sp. <i>Gahnia</i> sp.L (K.R. Newbey 7888) <i>Lobelia</i> sp. <i>Mesembryanthemum crystallinum</i> <i>Schoenus</i> sp. <i>Spergularia salina</i>	

Floristic Association 1C			
LB013	Tall shrubland of <i>Allocasuarina campestris</i> and <i>Thryptomene cuspidata</i> with mixed <i>Melaleuca</i> species (<i>M. lateriflora</i> subsp. <i>lateriflora</i> , <i>M. elliptica</i> , <i>M. laxiflora</i>) over grassland of <i>Spartochloa scirpoidea</i> and forbland of <i>Stylidium neglectum</i> and <i>Borya sphaerocephala</i> .		
Soils:	Alkaline grey shallow to deep sandy duplex		
Structural Units:	Tall shrubland	Low heathland	Low/ to mid-high to tall sparse sedgeland Low sparse forbland Low to tall sparse grassland
Trees:	Shrubs: <i>Allocasuarina campestris</i> <i>Melaleuca depauperata</i> <i>Melaleuca elliptica</i> <i>Melaleuca lateriflora</i> subsp. <i>lateriflora</i> <i>Melaleuca laxiflora</i>	<i>Melaleuca spicigera</i> <i>Melaleuca uncinata</i> <i>Mirbelia microphylla</i> <i>Santalum acuminatum</i> <i>Thryptomene cuspidata</i>	Herbs: <i>Austrodanthonia caespitosa</i> <i>Borya sphaerocephala</i> <i>Lepidobolus preissianus</i> <i>Lepidosperma</i> sp. A2 "Island Flat" (Keighery 7000) <i>Lepidosperma gracile</i> <i>Spartochloa scirpoidea</i> <i>Stackhousia mongyna</i> <i>Stylidium neglectum</i>

Floristic Association 2A			
LG003 Peg 2	Open mallee forest of <i>Eucalyptus perangusta</i> , <i>E. phenax</i> and <i>E. suggrandis</i> subsp. <i>alipes</i> over shrubland of <i>Melaleuca depauperata</i> and <i>M. lateriflora</i> subsp. <i>lateriflora</i> over heathland of <i>Acacia viscifolia</i> , <i>Templetonia sulcata</i> and <i>Hibbertia gracilipes</i> over sedgeland of <i>Gahnia lanigera</i> and <i>Lepidosperma brunonianum</i> .		
Soils:	Calcareous loamy earth or alkaline grey shallow sandy duplex		
Structural Units:	Tall to very tall open mallee forest	Mid-high to tall shrubland	Dwarf to low to mid-high heathland Mid-high sparse sedgeland Low to mid-high open sedgeland Low open grassland
Trees: <i>Eucalyptus calycogona</i> <i>Eucalyptus perangusta</i> <i>Eucalyptus phenax</i> <i>Eucalyptus suggrandis</i> subsp. <i>alipes</i>	Shrubs: <i>Acacia erinacea</i> <i>Acacia viscifolia</i> <i>Astroloma compactum</i> <i>Astroloma epacridis</i> var <i>Baeckea crispiflora</i> <i>Calytrix leschenaultii</i> <i>Chamelaucium ciliatum</i> <i>Cryptandra minutifolia</i> <i>Cryptandra nutans</i> <i>Daviesia gracilis</i> <i>Dodonaea bursariifolia</i> <i>Dodonaea pinifolia</i> var 1 <i>Grevillea disjuncta</i> <i>Grevillea oligantha</i>	<i>Hakea newbeyana</i> <i>Hibbertia gracilipes</i> <i>Leucopogon minutifolius</i> <i>Melaleuca depauperata</i> <i>Melaleuca lateriflora</i> subsp. <i>lateriflora</i> <i>Melaleuca laxiflora</i> <i>Melaleuca pauperiflora</i> <i>Melaleuca subtrigona</i> <i>Melaleuca uncinata</i> <i>Olearia muelleri</i> <i>Olearia ramosissima</i> <i>Phebalium tuberculatum</i> <i>Templetonia sulcata</i> <i>Westringia rigida</i>	Herbs: <i>Desmocladius asper</i> <i>Gahnia lanigera</i> <i>Lepidosperma brunonianum</i> <i>Neurachne alopecuroidea</i>

Floristic Association 2B				
LB021 LB032 LB033	Very tall open mallee forest or woodland of <i>Eucalyptus eremophila</i> and <i>E. flocktoniae</i> over shrubland of <i>Melaleuca uncinata</i> and <i>Santalum acuminatum</i> over heathland of <i>Melaleuca coroncarpa</i> and <i>Melaleuca societatis</i> ms over heath of <i>Boronia inornata</i> subsp. <i>leptophylla</i> , <i>Daviesia benthamii</i> subsp. <i>acanthoclona</i> , <i>Dodonaea bursariifolia</i> , <i>Grevillea huegelii</i> , <i>Grevillea oligantha</i> , <i>Melaleuca lateriflora</i> subsp. <i>lateriflora</i> , <i>Olearia ramosissima</i> , <i>Pultenaea conferta</i> , <i>Templetonia sulcata</i> and <i>Westringia rigida</i> over sparse sedgeland of <i>Gahnia lanigera</i> and <i>Lepidosperma brunonianum</i> .			
Soils:	Alkaline grey shallow sandy duplex or yellow loamy earth			
Structural Units:	Very tall mallee woodland Very tall open mallee forest	Mid-high to tall shrubland Tall open shrubland	Dwarf to low to mid-high open heath Low to mid-high to tall heathland	Mid-high sparse sedgeland Low to mid-high sedgeland Low to mid-high forbland Low grassland
Trees:	Shrubs:		Herbs:	
<i>Eucalyptus eremophila</i> <i>Eucalyptus flocktoniae</i> <i>Eucalyptus phenax</i> <i>Eucalyptus pileata</i> <i>Eucalyptus scyphocalyx</i>	<i>Acacia bidentata</i> <i>Acacia brachyclada</i> <i>Acacia lasiocarpa</i> <i>Baeckea</i> sp. Burngup <i>Boronia inornata</i> subsp. <i>leptophylla</i> <i>Coopernookia strophilata</i> <i>Cryptandra minutifolia</i> <i>Daviesia benthamii</i> subsp. <i>acanthoclona</i> <i>Daviesia scoparia</i> <i>Dodonaea bursariifolia</i> <i>Dodonaea pinifolia</i> var 1 <i>Exocarpus aphyllus</i> <i>Grevillea huegelii</i> <i>Grevillea oligantha</i> <i>Grevillea prostrata</i> <i>Hakea commutata</i> <i>Hakea corymbosa</i> <i>Hakea newbeyana</i> <i>Melaleuca adnata</i>		<i>Melaleuca coroncarpa</i> <i>Melaleuca lateriflora</i> subsp. <i>lateriflora</i> <i>Melaleuca pauperiflora</i> <i>Melaleuca sapientes</i> ms <i>Melaleuca societatis</i> ms <i>Melaleuca spicigera</i> <i>Melaleuca uncinata</i> <i>Microcorys glabra</i> <i>Olearia ramosissima</i> <i>Ozothamnus lepidophyllus</i> <i>Phebalium tuberculatum</i> <i>Pultenaea conferta</i> <i>Santalum acuminatum</i> <i>Spyridium cordatum</i> <i>Spyridium microcephalum</i> <i>Styphelia intertexta</i> <i>Templetonia sulcata</i> <i>Westringia rigida</i>	

Floristic Association 3A				
LB007 LB011 LB015 LB017 LB024 LB028 LB036 Peg 3	Mixed mallee forest, generally of <i>Eucalyptus eremophila</i> and open forest of <i>Eucalyptus urna</i> over shrubland of mixed <i>Melaleuca</i> species (<i>M. acuminata</i> , <i>M. lateriflora</i> subsp. <i>lateriflora</i> , <i>M. coronicarpa</i> and <i>M. adnata</i> over heathland of <i>Exocarpus aphyllus</i> , <i>Olearia muelleri</i> and <i>Templetonia sulcata</i> . Includes mallet communities with similar understorey to mallee communities.			
Soils:	Generally grey shallow loamy duplex (may be alkaline), also grey non-cracking clay and yellow/brown shallow sandy duplex			
Structural Units:	Tall to very tall mallee woodland Very tall open mallee forest Mid-high to tall open forest	Mid-high to tall shrubland Tall closed shrubland Mid-high to tall sparse shrubland Vines	Dwarf to low to mid-high open heath Dwarf to low to mid-high closed heathland Mid-high to tall heathland Dwarf to low to mid-high sparse heath Dwarf open chenopod shrubland	Low sedgeland Low to mid-high sparse sedgeland Low to tall open forbland Low to mid-high open grassland Low to mid-high sparse grassland
Trees:	Shrubs:			Herbs:
<i>Eucalyptus annulata</i> <i>Eucalyptus calcygona</i> <i>Eucalyptus eremophila</i> <i>Eucalyptus flocktoniae</i> <i>Eucalyptus pileata</i> <i>Eucalyptus phenax</i> <i>Eucalyptus salubris</i> mallet <i>Eucalyptus salmonophloia</i> <i>Eucalyptus urna</i>	<i>Acacia bidentata</i> <i>Acacia glaucoptera</i> <i>Acacia merrallii</i> <i>Boronia inornata</i> subsp. <i>leptophylla</i> <i>Cassitya melantha</i> <i>Daviesia benthamii</i> subsp. <i>acanthoclona</i> <i>Exocarpus aphyllus</i> <i>Grevillea beardiana</i> <i>Grevillea huegelii</i> <i>Hakea commutata</i> <i>Hibbertia gracilipes</i> <i>Melaleuca acuminata</i> <i>Melaleuca adnata</i>			<i>Melaleuca brophyi</i> ms <i>Melaleuca carrii</i> ms <i>Melaleuca coronicarpa</i> <i>Melaleuca lateriflora</i> subsp. <i>lateriflora</i> <i>Melaleuca pauperiflora</i> <i>Melaleuca sapientes</i> ms <i>Melaleuca subfalcata</i> <i>Melaleuca uncinata</i> <i>Melaleuca undulata</i> <i>Microcybe multiflora</i> subsp. <i>baccharoides</i> <i>Olearia muelleri</i> <i>Templetonia sulcata</i> <i>Threlkeldia diffusa</i>
				<i>Austrodanthonia acerosa</i> <i>Austrostipa juncifolia</i> <i>Austrostipa drummondii</i> <i>Austrostipa pycnostachya</i> <i>Austrostipa trichophylla</i> <i>Dianella revoluta</i> <i>Gahnia lanigera</i> <i>Lepidosperma brunonianum</i> <i>Lepidosperma pruinum</i> <i>Lepidosperma</i> sp (LG1.7) <i>Wilsonia humilis</i>

Floristic Association 3B				
LB004	Low open forest of <i>Eucalyptus annulata</i> mallet over shrubland of <i>Melaleuca acuminata</i> over heath of <i>Melaleuca adnata</i> and <i>Melaleuca ?lateralis</i> .			
Soils:	Brown loamy earth			
Structural Units:	Low open forest	Tall open shrubland	Mid-high open heath Low open heath Low sparse chenopod shrubland	Mid-high sparse sedgeland Low sparse grassland
Trees:	Shrubs:			Herbs:
<i>Eucalyptus annulata</i> mallet	<i>Hakea commutata</i> <i>Melaleuca acuminata</i> <i>Melaleuca adnata</i> <i>Melaleuca ?lateralis</i>			<i>Melaleuca societatis</i> ms <i>Melaleuca</i> sp.2 <i>Melaleuca ?torquata</i> <i>Rhagodia priesii</i> subsp. <i>priesii</i>
				<i>Austrostipa pycnostachya</i> <i>Lepidosperma pruinum</i>

Floristic Association 3C			
LB029	Low closed forest of <i>Eucalyptus platypus</i> subsp. <i>platypus</i> mallet		
Soils:	Brown loamy earth		
Structural Units:	Low closed forest	Tall sparse shrubland	
Trees:	<i>Eucalyptus platypus</i> subsp. <i>platypus</i> mallet	Shrubs: <i>Melaleuca acuminata</i> <i>Melaleuca adnata</i> <i>Melaleuca coroncarpa</i>	Herbs: <i>Melaleuca</i> sp.6 <i>Melaleuca undulata</i>

Floristic Association 4A			
LB009	Tall open forest of <i>Eucalyptus occidentalis</i> over shrubland of <i>Melaleuca acuminata</i>		
Soils:	Alkaline grey shallow loamy duplex		
Structural Units:	Tall open forest	Tall open shrubland	Low sparse heath
Trees:	<i>Eucalyptus occidentalis</i>	Shrubs: <i>Melaleuca acuminata</i> <i>Pimelea argentea</i>	Herbs: <i>Austrodanthonia acerosa</i> <i>Austrostipa trichophylla</i>

Floristic Association 4B			
LB027	Tall closed forest of <i>Eucalyptus occidentalis</i> over low woodland of <i>Melaleuca strobophylla</i> over shrubland of <i>Olearia dampieri</i> subsp. <i>eremicola</i> over sedges, rushes and forbs.		
Soils:	Pale deep sand		
Structural Units:	Tall closed forest	Tall shrubland	Tall open heath
	Low woodland	Mid-high shrubland	Mid-high to tall sparse rushland Low to mid-high sparse sedgeland Low to mid-high sparse forland Mid-high sparse grassland
Trees:	<i>Eucalyptus occidentalis</i> <i>Melaleuca strobophylla</i>	Shrubs: <i>Baeckea</i> sp. Burngup <i>Beaufortia schaueri</i> <i>Comesperma integerrimum</i> <i>Exocarpus aphyllus</i>	Herbs: <i>Olearia dampieri</i> subsp. <i>eremicola</i> <i>Pimelea argentea</i> <i>Santalum acuminatum</i> <i>Verticordia densiflora</i> <i>Austrostipa puberula</i> <i>Centaurium erythraeae</i> <i>Centipeda cunninghamii</i> <i>Desmocladius asper</i> <i>Dianella brevicaulis</i> <i>Hypochaeris</i> sp. <i>Juncus radula</i> <i>Lomandra micrantha</i> subsp. <i>micrantha</i> <i>Lomandra micrantha</i> subsp. <i>teretifolia</i> <i>Neurachne alopecuroidea</i> <i>Pseudognaphallium luteoalbum</i> <i>Tetraria capillaris</i> <i>Vellereophyton dealbatum</i>

Floristic Association 5				
LB026	Chenopod shrubland of <i>Atriplex paludosa</i> subsp. <i>baudinii</i> , <i>Rhagodia preissii</i> subsp. <i>preissii</i> and <i>Enchylaena tomentosa</i> over rushland of <i>Lomandra effusa</i> over			
LG011	forbland of <i>Vittadinia gracilis</i> .			
Soils:	Calcareous loamy earth			
Structural Units:	Tall open forest	Low to mid-high open shrubland Low to dwarf open chenopod shrubland Low to mid-high sparse chenopod shrubland	Low open heath Mid-high to low sparse heath	Low sparse forbland Low forbland Low to mid-high to tall sparse grassland Mid-high to tall open rushland Mid-high sparse sedgeland
Trees: <i>Eucalyptus kondininensis</i> <i>Eucalyptus salmonophloia</i> <i>Eucalyptus urna</i>	Shrubs: <i>Acacia erinacea</i> <i>Atriplex paludosa</i> subsp. <i>baudinii</i> <i>Enchylaena tomentosa</i> <i>Eremophila decipiens</i> <i>Olearia dampieri</i> subsp. <i>eremicola</i> <i>Olearia muelleri</i>	<i>Ozothamnus lepidophyllus</i> <i>Pittosporum phylliraeiodes</i> var <i>microcarpa</i> <i>Rhagodia preissii</i> subsp. <i>preissii</i> <i>Scaevola spinescens</i> <i>Templetonia sulcata</i>	Herbs: <i>Austrostipa drummondii</i> <i>Austrostipa</i> ? <i>puberula</i> <i>Austrodanthonia acerosa</i> <i>Austrodanthonia caespitosa</i> <i>Lepidosperma brunonianum</i> <i>Lepidium rotundum</i> <i>Lomandra effusa</i> <i>Ptilotus holosericeus</i> <i>Stackhousia muricata</i> <i>Vittadinia gracilis</i>	

Floristic Association 6A				
LB005	LB038	Tall shrubland of <i>Leptospermum erubescens</i> and <i>Melaleuca carriei</i> ms over heath of <i>Chamelaucium ciliatum</i> over rushland of <i>Lomandra effusa</i> , sedgeland <i>Gahnia lanigera</i> and <i>Lepidosperma brunonianum</i> , forbland of <i>Helichrysum leucosideum</i> .		
LG010	LB025			
Soils:		Generally alkaline grey sandy duplex, can be deep or shallow and yellow/brown		
Structural Units:	Tall open forest	Mid-high to tall open shrubland	Dwarf to low to mid-high open heath	Low to mid-high rushland
	Extremely tall open mallee forest	Mid-high sparse shrubland	Low sparse heath	Mid-high open rushland
	Very tall open mallee forest	Mid-high to tall shrubland	Dwarf to low to mid-high heath	Low to mid-high sedgeland
	Very tall mallee woodland		Low to mid-high heathland	Low to mid-high open sedgeland
			Vines	Low forbland
				Low to mid-high grassland
				Low open grassland
Trees:		Shrubs:	Herbs:	
<i>Eucalyptus capillosa</i> subsp. <i>polyclada</i>		<i>Acacia acutata</i>	<i>Aira cupaniana</i>	
<i>Eucalyptus perangusta</i>		<i>Acacia erinacea</i>	<i>Austrostipa drummondii</i>	
<i>Eucalyptus phenax</i>		<i>Acacia hemiteles</i>	<i>Austrostipa juncifolia</i>	
<i>Eucalyptus salmonophloia</i>		<i>Acacia lasiocarpa</i>	<i>Austrostipa puberula</i>	
<i>Eucalyptus scyphocalyx</i>		<i>Astroloma compactum</i>	<i>Desmocladus asper</i>	
<i>Eucalyptus sporadica</i> subsp. <i>sporadica</i> ms		<i>Baeckea crispiflora</i>	<i>Dicrastylis corymbosa</i>	
		<i>Calytrix breviseta</i> subsp. <i>stipulosa</i>	<i>Gahnia lanigera</i>	
		<i>Calytrix leschenaultii</i>	<i>Gahnia</i> sp.L (K.R. Newbey 7888)	
		<i>Cassutha melantha</i>	<i>Helichrysum leucosideum</i>	
		<i>Conostephium roei</i>	<i>Lepidosperma brunonianum</i>	
		<i>Dodonaea bursariifolia</i>	<i>Lepidosperma pruinatum</i>	
		<i>Dodonaea pinifolia</i> var 1	<i>Lepidosperma</i> sp.A2 "Island Flat" (Keighery 7000)	
		<i>Grevillea disjuncta</i>	<i>Lomandra effusa</i>	
		<i>Grevillea huegelii</i>	<i>Lomandra micrantha</i> subsp. <i>teretifolia</i>	
		<i>Jacksonia racemosa</i>	<i>Loxocarya cinerea</i>	
		<i>Leptomeria preissiana</i>	<i>Neurachne alopecuroidea</i>	
		<i>Leptospermum erubescens</i>	<i>Poaceae</i> sp.	
		<i>Leucopogon concinnus</i>	<i>Ptilotus drummondii</i> var <i>minor</i>	
			<i>Ursinia anthemoides</i>	
			<i>Waitzia acuminata</i>	

Floristic Association 6B				
LB020	Tall open mallee forest of <i>Eucalyptus perangusta</i> over heathland of <i>Acacia acutata</i> and <i>Calytrix leschenaultii</i> over sedgeland of <i>Desmocladius asper</i> .			
Soils:	Alkaline grey deep sandy duplex			
Structural Units:	Tall open mallee forest	Mid-high to tall sparse shrubland	Low to mid-high heathland	Dwarf to low open sedgeland Low open forbland
Trees: <i>Eucalyptus perangusta</i>	Shrubs: <i>Acacia acutata</i> <i>Calytrix leschenaultii</i> <i>Acacia leptospermoides</i> subsp. <i>leptospermoides</i> <i>Grevillea newbeyi</i> <i>Hakea corymbosa</i> <i>Hakea ?lissocarpa</i>	<i>Hakea obliqua</i> subsp. <i>parviflora</i> <i>Leptospermum erubescens</i> <i>Melaleuca carriei</i> ms <i>Olearia dampieri</i> subsp. <i>eremicola</i> <i>Santalum acuminatum</i> <i>Verticordia endlicheriana</i> var <i>major</i>	Herbs: <i>Burnettia nigricans</i> <i>Desmocladius asper</i> <i>Lepidobolus preissianus</i> <i>Lepidosperma brunonianum</i> <i>Stylidium repens</i>	

Floristic Association 6C				
LB006 LG006	Tall shrubland of <i>Leptospermum erubescens</i> over sparse heath of <i>Calytrix leschenaultii</i> over grassland of <i>Austrostipa drummondii</i> and <i>Neurachne alopecuroidea</i> over sedgeland of <i>Lepidobolus preissianus</i> subsp. <i>preissianus</i>			
Soils:	Brown deep sand or yellow/brown shallow sandy duplex			
Structural Units:	Low open forest	Tall sparse shrubland Tall open shrubland Low open chenopod shrubland	Low to mid-high sparse heath Vines	Low to mid-high tall open grassland Low to tall open sedgeland Mid-high open rushland Mid-high open sedgeland
Trees: <i>Allocasuarina huegeliana</i>	Shrubs: <i>Acacia chaemeleon</i> <i>Acacia saligna</i> <i>Alyxia buxifolia</i> <i>Baeckea crispiflora</i> <i>Billardiera lehmanniana</i> <i>Calytrix leschenaultii</i>	<i>Dodonaea pinifolia</i> var 2 <i>Eremaea pauciflora</i> <i>Leptospermum erubescens</i> <i>Melaleuca elliptica</i> <i>Rhagodia drummondii</i> <i>Santalum acuminatum</i>	Herbs: <i>Aira cupaniana</i> <i>Austroanthonia caespitosa</i> <i>Austrostipa drummondii</i> <i>Borya sphaerocephala</i> <i>Dampiera lavendulacea</i> <i>Desmocladius asper</i> <i>Drosera macrantha</i> subsp. <i>macrantha</i> <i>Lepidobolus preissianus</i> subsp. <i>preissianus</i> <i>Lepidosperma brunonianum</i> <i>Lepidosperma gracile</i> <i>Lepidosperma</i> sp.A2 "Island Flat" (Keighery 7000) <i>Lepidosperma</i> sp (LG1.7) <i>Lomandra micrantha</i> subsp. <i>micrantha</i> <i>Neurachne alopecuroidea</i>	

Floristic Association 6D				
LB037	Mid-high open forest of <i>Eucalyptus suggrandis</i> subsp. <i>alipes</i> over mixed shrubland over chenopod shrubland of <i>Rhagodia drummondii</i> .			
Soils:	Yellow/brown deep sandy duplex			
Structural Units:	Mid-high open forest	Mid-high to very tall sparse shrubland Low to mid-high open shrubland Low open chenopod shrubland Dwarf isolated chenopod shrubs	Low open heath	Mid-high isolated sedges Low to mid-high isolated grasses Low isolated forbs
Trees: <i>Eucalyptus suggrandis</i> subsp. <i>alipes</i>	Shrubs: <i>Acacia chamaeleon</i> <i>Calytrix leschenaultii</i> <i>Disphysma crassifolium</i> subsp. <i>clavellatum</i> <i>Eremophila decipiens</i>		<i>Melaleuca lateriflora</i> subsp. <i>lateriflora</i> <i>Melaleuca acuminata</i> <i>Rhagodia drummondii</i> <i>Santalum acuminatum</i>	Herbs: <i>Austrostipa puberula</i> <i>Austrostipa pycnostachya</i> <i>Lepidosperma brunonianum</i> <i>Lepidosperma</i> sp (LG1.7) <i>Vittadinia gracilis</i> <i>Waitzia acuminata</i>

Floristic Association 7A				
LB003 LB022	Tall sparse shrubland of <i>Leptospermum erubescens</i> over heath of <i>Eremaea pauciflora</i> , <i>Hakea corymbosa</i> and <i>H. obliqua</i> subsp. <i>parviflora</i> , <i>H. brachyptera</i> , <i>Isopogon buxifolius</i> , <i>Lysinema ciliatum</i> , <i>Verticordia acerosa</i> , <i>Leucopogon constephioides</i> var 2, <i>Persoonia striata</i> and <i>Jacksonia racemosa</i> over forbland of <i>Stylidium repens</i> and grassland of <i>Neurachne alopecuroidea</i> .			
Soils:	Pale deep sand or grey deep sandy duplex			
Structural Units:	Low isolated emergent trees	Tall sparse shrubland Tall isolated emergent shrubs	Mid-high to tall sparse heath Dwarf to low to mid-high heathland	Dwarf to low to mid-high sparse sedgeland Low to mid-high sparse forbland Low sparse grassland
Trees: <i>Banksia prionotes</i>	Shrubs: <i>Acacia multispicata</i> <i>Acacia ?squamata</i> <i>Allocasuarina microstachya</i> <i>Andersonia sprengelioides</i> <i>Andersonia aff sprengelioides</i> <i>Baeckea preissiana</i> <i>Baeckea aff preissiana</i> <i>Banksia media</i> <i>Banksia violacea</i> <i>Calectasia grandiflora</i> sp. wheatbelt (A. Coates 4315) <i>Calytrix leschenaultii</i> <i>Chorizema aciculare</i> subsp. <i>aciculare</i> <i>Conostephium roei</i> <i>Cryptandra nutans</i> <i>Daviesia incrassata</i> subsp. <i>teres</i> <i>Daviesia lancifolia</i> <i>Dryandra epimicta</i> <i>Dryandra pteridifolia</i> <i>Eremaea pauciflora</i> <i>Hakea corymbosa</i> <i>Hakea cygna</i> subsp. <i>cygna</i> <i>Hakea lissocarpha</i> <i>Hakea obliqua</i> subsp. <i>parviflora</i> <i>Hakea brachyptera</i> <i>Hakea trifurcata</i> <i>Hibbertia gracilipes</i> <i>Isopogon buxifolius</i> <i>Jacksonia racemosa</i> <i>Lechenaultia brevifolia</i> <i>Leptospermum erubescens</i> <i>Leucopogon concinnus</i> <i>Leucopogon constephioides</i> var 2 <i>Leucopogon tamminensis</i> var <i>australis</i> <i>Lysinema ciliatum</i> <i>Melaleuca depauperata</i> <i>Melaleuca tuberculata</i> var <i>macrophylla</i> <i>Persoonia striata</i> <i>Petrophile brevifolia</i> <i>Petrophile ericifolia</i> subsp. <i>ericifolia</i> <i>Petrophile rigida</i> <i>Petrophile squamata</i> subsp. <i>squamata</i> <i>Petrophile seminuda</i> <i>Synaphea spinulosa</i> subsp. <i>spinulosa</i> <i>Verticordia acerosa</i> <i>Verticordia grandiflora</i> Herbs: <i>Amphipogon turbinatus</i> <i>Argentipallium niveum</i> <i>Chamaexeros serra</i> <i>Conostylis petrophiloides</i> <i>Desmocladius parthenicus</i> ms <i>Drosera</i> sp.1 <i>Hypolaena caespitosa</i> <i>Laxmannia palaeece</i> <i>Lepidobolus chaetocephalus</i> <i>Lepidobolus preissianus</i> <i>Lepidosperma carphoides</i> <i>Lepidosperma pruinsum</i> <i>Loxocarya cinerea</i> <i>Lyginia imberbis</i> <i>Schoenus pleiostemoneus</i> <i>Schoenus</i> sp.A1 Boorabin (K. Wilson 2581) <i>Schoenus subflavus</i> <i>Stylidium repens</i>			

Floristic Association 7B			
LB008 LB018	Heathland of <i>Hakea cygna</i> var <i>cygna</i> , <i>Hakea incrassata</i> , <i>Melaleuca tuberculata</i> var <i>macrophylla</i> , <i>Persoonia coriacea</i> , <i>Allocasuarina microstachya</i> , <i>Astroloma serratifolium</i> , <i>Baeckea crispiflora</i> , <i>Gompholobium hendersonii</i> , <i>Leucopogon dielsianus</i> , <i>Melaleuca lecanantha</i> , <i>Verticordia picta</i> and <i>Verticordia roei</i> subsp. <i>roei</i> over low sparse sedgeland of <i>Schoenus pleiostemoneus</i> , <i>Mesmolaena pseudostygia</i> and <i>Lepidobolus preissianus</i> and low sparse forbland of <i>Conostylis argentea</i> .		
Soils:	Loamy gravel or yellow/brown deep sandy duplex		
Structural Units:	Very tall sparse emergent shrubs	Tall sparse emergent heath Dwarf to low to mid-high heathland	Low sparse sedgeland Low open sedgeland Low sparse forbland Low to dwarf open forbland Low open grassland
Trees:	Shrubs: <i>Acacia lineolata</i> subsp. <i>lineolata</i> <i>Acacia mimica</i> subsp. <i>mimica</i> <i>Allocasuarina campestris</i> <i>Allocasuarina microstachya</i> <i>Andersonia</i> aff <i>sprengelioides</i> <i>Astroloma serratifolium</i> <i>Baeckea crispiflora</i> <i>Beaufortia micrantha</i> <i>Beaufortia micrantha</i> var <i>puberula</i> <i>Calectasia grandiflora</i> sp. wheatbelt (A. Coates 4315) <i>Calothamnus quadrifidus</i> <i>Calytrix breviseta</i> subsp. <i>stipulosa</i> <i>Calytrix leschenaultii</i> <i>Choretrum glomeratum</i> var <i>chrysanthum</i> , <i>Cryptandra nutans</i> <i>Daviesia lancifolia</i> <i>Daviesia uncinata</i> <i>Grevillea biformis</i> <i>Grevillea uncinulata</i> subsp. <i>uncinulata</i> <i>Gompholobium hendersonii</i> <i>Hakea cygna</i> subsp. <i>cygna</i> <i>Hakea incrassata</i>	<i>Hakea strumosa</i> <i>Hemigenia</i> sp. <i>Isopogon teretifolius</i> <i>Jacksonia racemosa</i> <i>Leucopogon dielsianus</i> <i>Leucopogon</i> sp. Wheatbelt (S. Murray 257) <i>Melaleuca carrii</i> ms <i>Melaleuca glaberrima</i> <i>Melaleuca lecanantha</i> <i>Melaleuca platycalyx</i> <i>Melaleuca tuberculata</i> var <i>macrophylla</i> <i>Mirbelia trichocalyx</i> <i>Persoonia brevihachis</i> <i>Persoonia coriacea</i> <i>Petrophile seminuda</i> <i>Psammomoya choretroides</i> <i>Synaphea spinulosa</i> subsp. <i>spinulosa</i> <i>Verticordia chrysanthella</i> <i>Verticordia chrysantha</i> <i>Verticordia picta</i> <i>Verticordia roei</i> subsp. <i>roei</i>	Herbs: <i>Anarthria polyphylla</i> <i>Austrodanthonia caespitosa</i> <i>Chamaexeros serra</i> <i>Conostylis argentea</i> <i>Dampiera lavendulacea</i> <i>Drosera</i> sp.2 <i>Gahnia lanigera</i> <i>Lepidobolus preissianus</i> <i>Lepidosperma</i> sp.(LG1.7) <i>Mesmolaena pseudostygia</i> <i>Neurachne alopecuroidea</i> <i>Schoenus pleiostemoneus</i> <i>Schoenus</i> sp.A1 Boorabin (K. Wilson 2581) <i>Stylidium repens</i>

Floristic Association 7C				
LB001	Tall shrubland of <i>Grevillea cagiana</i> over heath of <i>Hakea cygna</i> subsp. <i>cygna</i> , <i>Hakea pandanica</i> subsp. <i>crassifolia</i> , <i>Allocasuarina microstachya</i> , <i>Dryandra cirsioides</i> , <i>D. erythrocephala</i> var <i>erythrocephala</i> , <i>D. pteridifolia</i> , <i>Isopogon teretifolius</i> , <i>Melaleuca tuberculata</i> var <i>macrophylla</i> , <i>Banksia violacea</i> , <i>Beaufortia micrantha</i> , <i>Daviesia uncinata</i> , <i>Hibbertia gracilipes</i> , <i>Jacksonia racemosa</i> , <i>Leucopogon</i> sp. Wheatbelt (S. Murray 257), <i>Lysinema ciliatum</i> , <i>Persoonia striata</i> and <i>Petrophile glauca</i> over low open forland of <i>Conostylis petrophiloides</i> .			
LB010				
LB012				
LB030				
Soils:	Generally sandy duplex, may be grey and shallow or yellow/brown and deep, also shallow gravel			
Structural Units:	Tall open mallee woodland	Tall sparse shrubland	Dwarf to low to mid-high heathland	Low open rushland
	Tall sparse emergent mallees	Tall sparse emergent shrubs	Tall sparse heath	Dwarf to low to mid-high open sedgeland
	Very tall to tall open mallee woodland	Tall open shrubland	Vines	Low sparse sedgeland
		Tall open grasslands		Low open forland
				Low sparse forland
Trees:	Shrubs:			Herbs:
<i>Eucalyptus albida</i>	<i>Acacia chrysocephala</i>	<i>Dryandra ferruginea</i>	<i>Melaleuca carriei</i> ms	<i>Chamaexeros serra</i>
<i>Eucalyptus tetragona</i>	<i>Acacia pyconcephala</i>	<i>Dryandra erythrocephala</i> var <i>erythrocephala</i>	<i>Melaleuca glaberrima</i>	<i>Conostylis argentea</i>
<i>Eucalyptus sporadica</i> ms	<i>Adenanthos flavidiflorus</i>	<i>Dryandra pteridifolia</i>	<i>Melaleuca pungens</i> var 1	<i>Dampiera juncea</i>
	<i>Agonis spathulata</i>	<i>Eremaea pauciflora</i>	<i>Melaleuca tuberculata</i> var <i>macrophylla</i>	<i>Desmodium virgatus</i> ms
	<i>Allocasuarina humilis</i>	<i>Gastrolobium spinosum</i>	<i>Nemcia punctata</i>	<i>Drosera androscea</i>
	<i>Allocasuarina pinaster</i>	<i>Gompholobium hendersonii</i>	<i>Persoonia brevifolia</i>	<i>Drosera barbigera</i>
	<i>Allocasuarina thuyoides</i>	<i>Gompholobium marginatum</i>	<i>Persoonia coriacea</i>	<i>Drosera</i> sp.3
	<i>Andersonia</i> aff <i>spengeloides</i>	<i>Grevillea cagiana</i>	<i>Persoonia quinqueveneris</i>	<i>Gahnia lanigera</i>
	<i>Astroloma serratifolium</i>	<i>Hakea cygna</i> subsp. <i>cygna</i>	<i>Persoonia striata</i>	<i>Laxmannia palaeacea</i>
	<i>Banksia violacea</i>	<i>Hakea brownii</i>	<i>Petrophile brevifolia</i>	<i>Lepidobolus chaetocephalus</i>
	<i>Beaufortia micrantha</i>	<i>Hakea incrassata</i>	<i>Petrophile circinate</i>	<i>Lepidosperma brunonianum</i>
	<i>Baeckea crispiflora</i>	<i>Hakea ? lissocarpa</i>	<i>Petrophile glauca</i>	<i>Lomandra mucronata</i>
	<i>Baeckea preissiana</i>	<i>Hakea pandanica</i> subsp. <i>crassifolia</i>	<i>Petrophile merrallii</i>	<i>Mesomelaena preissii</i>
	<i>Beaufortia micrantha</i> var <i>micrantha</i>	<i>Hemigenia</i> sp.	<i>Petrophile seminuda</i>	<i>Mesomelaena pseudostygia</i>
	<i>Beaufortia micrantha</i> var <i>puberula</i>	<i>Hibbertia exasperata</i>	<i>Psammomoya choretoides</i>	<i>Schoenus pleiostemoneus</i>
	<i>Beaufortia schaueri</i>	<i>Hibbertia gracilipes</i>	<i>Pultenaea vestita</i>	<i>Schoenus</i> sp.A1 Boorabin (K. Wilson 2581)
	<i>Callitris roei</i>	<i>Isopogon buxifolius</i>	<i>Rinzea affinis</i>	
	<i>Calytrix leschenaultii</i>	<i>Isopogon teretifolius</i>	<i>Stachystemon polyandrus</i>	
	<i>Calytrix simplex</i> subsp. <i>suboppositifolia</i>	<i>Isopogon villosus</i>	<i>Synaphea</i> cf <i>tripartita</i>	
	<i>Choretrum glomeratum</i> var <i>chrysanthum</i>	<i>Jacksonia racemosa</i>	<i>Thysanotus patersonii</i>	
	<i>Conostephium roei</i>	<i>Lambertia ilicifolia</i>	<i>Verticordia chrysantha</i>	
	<i>Cryptandra nutans</i>	<i>Leptomeria pauciflora</i>	<i>Verticordia chrysanthella</i>	
	<i>Daviesia audax</i>	<i>Leptospermum inelegans</i>	<i>Verticordia grandiflora</i>	
	<i>Daviesia lancifolia</i>	<i>Leptospermum spinescens</i>	<i>Verticordia habrantha</i>	
	<i>Daviesia uncinata</i>	<i>Leucopogon dielsianus</i>	<i>Verticordia picta</i>	
	<i>Dryandra cirsioides</i>	<i>Leucopogon</i> sp. Wheatbelt (S. Murray 257)	<i>Verticordia roei</i> subsp. <i>roei</i>	
	<i>Dryandra cuneata</i>	<i>Leucopogon tamminensis</i> var <i>australis</i>	<i>Verticordia serrata</i> var <i>serrata</i>	
		<i>Lysinema ciliatum</i>	<i>Verticordia tumida</i> subsp. <i>therogona</i>	
			<i>Xanthorrhoea nana</i>	

Floristic Association 7D			
LB002	Heathland of <i>Hakea cygna</i> subsp. <i>cygna</i> , <i>Acacia multispicata</i> , <i>Verticordia roei</i> subsp. <i>roei</i> over sedgeland of <i>Schoenus clandestinus</i> .		
Soils:	Yellow/brown shallow sandy duplex		
Structural Units:	Low to dwarf to mid-high to tall heathland Low forbland Low to mid-high sedgeland		
Trees:	Shrubs:		Herbs:
	<i>Acacia multispicata</i>	<i>Leptospermum inegans</i>	<i>Chamaexeros macranthera</i>
	<i>Allocasuarina microstachya</i>	<i>Leucopogon dielsianus</i>	<i>Chamaexeros serra</i>
	<i>Baeckea crispiflora</i>	<i>Melaleuca carriei</i> ms	<i>Lepidosperma brunonianum</i>
	<i>Baeckea preissiana</i>	<i>Melaleuca platycalyx</i>	<i>Lepidosperma</i> sp.A2 "Island Flat"
	<i>Choretrum glomeratum</i> var <i>chrysanthum</i>	<i>Melaleuca subtrigona</i>	(Keighery 7000)
	<i>Dodonaea divaricata</i>	<i>Persoonia striata</i>	<i>Mesmolaena preissii</i>
	<i>Dodonaea pinifolia</i> var 2	<i>Petrophile brevifolia</i>	<i>Mesmolaena pseudostygia</i>
	<i>Dryandra cirsioides</i>	<i>Phebalium microphyllum</i>	<i>Platysace trachymenioides</i>
	<i>Grevillea dolichopoda</i>	<i>Santalum acuminatum</i>	<i>Schoenus clandestinus</i>
	<i>Grevillea teretifolia</i>	<i>Synaphea</i> sp. Jilakin Flat Rock Rd	
	<i>Hakea cygna</i> var <i>cygna</i>	<i>Verticordia acerosa</i>	
	<i>Hakea incrassata</i>	<i>Verticordia roei</i> subsp. <i>roei</i>	
	<i>Isopogon teretifolius</i>	<i>Verticordia tumida</i> subsp. <i>therogona</i>	
	<i>Leptospermum erubescens</i>	<i>Verticordia roei</i> subsp. <i>roei</i>	

Floristic Association 8A				
LB016 LB031	Very tall mallee woodland of <i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i> and <i>Eucalyptus uncinata</i> over shrubland of <i>Allocasuarina acutivalvis</i> , <i>Hakea subsulcata</i> , <i>Isopogon buxifolius</i> , <i>Santalum acuminatum</i> and <i>Callitris roei</i> over heathland of <i>Beaufortia schaueri</i> , <i>Hakea lissocarpha</i> , <i>Melaleuca tuberculata</i> var <i>macrophylla</i> over low sparse sedgeland of <i>Lepidosperma brunonianum</i> and vines of <i>Cassytha melantha</i> .			
Soils:	Loamy gravel			
Structural	Very tall open mallee forest	Tall open shrubland	Mid-high to tall open heath	Low sparse sedgeland
Units:	Very tall mallee woodland	Mid-high to tall shrubland Vines	Dwarf to low to mid-high heathland	
Trees:	Shrubs:			Herbs:
<i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i>	<i>Acacia chrysocephala</i>	<i>Hakea pandanica</i> subsp. <i>crassifolia</i>	<i>Gahnia lanigera</i>	
<i>Eucalyptus pileata</i>	<i>Acacia leptospermoides</i> subsp. <i>leptospermoides</i>	<i>Hakea subsulcata</i>	<i>Lepidosperma brunonianum</i>	
<i>Eucalyptus uncinata</i>	<i>Allocasuarina acutivalvis</i>	<i>Hibbertia exasperata</i>		
	<i>Allocasuarina spinosissima</i>	<i>Isopogon buxifolius</i>		
	<i>Astroloma serratifolium</i>	<i>Leptospermum spinescens</i>		
	<i>Banksia violacea</i>	<i>Leucopogon constephiodes</i> var 1		
	<i>Beaufortia micrantha</i> var <i>puberula</i>	<i>Lysinema ciliatum</i>		
	<i>Beaufortia schaueri</i>	<i>Melaleuca carriei</i> ms		
	<i>Beyeria brevifolia</i> var <i>brevipes</i>	<i>Melaleuca laxiflora</i>		
	<i>Callitris roei</i>	<i>Melaleuca pungens</i> var 2		
	<i>Cassytha melantha</i>	<i>Melaleuca spicigera</i>		
	<i>Cryptandra minutifolia</i>	<i>Melaleuca tuberculata</i> var <i>macrophylla</i>		
	<i>Daviesia uniflora</i>	<i>Melaleuca uncinata</i>		
	<i>Dodonaea bursariifolia</i>	<i>Nemcia cruciata</i> ms		
	<i>Dryandra cirsioides</i>	<i>Nemcia punctata</i>		
	<i>Dryandra cuneata</i>	<i>Petrophile glauca</i>		
	<i>Dryandra erythrocephala</i> var <i>erythrocephala</i>	<i>Petrophile merrallii</i>		
	<i>Dryandra ferruginea</i> subsp. <i>ferruginea</i>	<i>Phebalium filifolium</i>		
	<i>Gastrolobium revolutum</i>	<i>Phebalium microphyllum</i>		
	<i>Hakea horrida</i>	<i>Phebalium tuberosum</i>		
	<i>Hakea lissocarpha</i>	<i>Santalum acuminatum</i>		
	<i>Hakea newbeyana</i>	<i>Spyridium microcephalum</i>		
		<i>Verticordia chrysantha</i>		

Floristic Association 8B				
LB023 LB034 LG002	Tall mallee woodland of <i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i> and <i>E. scyphocalyx</i> over shrubland of <i>Callitris roei</i> and <i>Melaleuca uncinata</i> over heathland of <i>Exocarpus aphyllus</i> , <i>Melaleuca carrii</i> ms, <i>Melaleuca tuberculata</i> var <i>macrophylla</i> , <i>Hakea erecta</i> , <i>H. newbeyana</i> , <i>Isopogon buxifolius</i> , <i>Beyeria brevifolia</i> var <i>brevipes</i> , <i>Calytrix leschenaultii</i> , <i>Cryptandra minutifolia</i> , <i>Daviesia decurrens</i> , <i>Grevillea disjuncta</i> , <i>Lasiopetalum rosmarinifolium</i> , <i>Leucopogon constephioides</i> var 2, <i>L. minutifolius</i> , <i>Nemcia punctata</i> and <i>Hibbertia gracilipes</i> over sedgeland of <i>Loxocarya cinerea</i> , <i>Lepidosperma brunonianum</i> and <i>Gahnia lanigera</i> .			
Soils:	Generally alkaline grey deep sandy duplex with some shallow gravel			
Structural Units:	Tall to very tall mallee woodland Very tall open mallee forest	Tall sparse shrubland Mid-high shrubland Tall open shrubland	Mid-high to tall sparse heathland Dwarf to low to mid-high heathland Dwarf to low to mid-high open heath	Low sparse rushland Low to mid-high sparse sedgeland Low sedgeland Low sparse forbland Mid-high forbland
Trees:	Shrubs:	Herbs:		
<i>Eucalyptus phaenophylla</i> subsp. <i>phaenophylla</i> <i>Eucalyptus phenax</i> <i>Eucalyptus scyphocalyx</i> <i>Eucalyptus sporadica</i> ms	<i>Acacia leptospermoides</i> subsp. <i>leptospermoides</i> <i>Acacia multispicata</i> <i>Allocasuarina microstachya</i> <i>Allocasuarina spinosissima</i> <i>Andersonia</i> aff <i>sprengelioides</i> <i>Astroloma serratifolium</i> <i>Baeckea</i> aff <i>preissiana</i> <i>Banksia media</i> <i>Beaufortia micrantha</i> <i>Beyeria brevifolia</i> var <i>brevipes</i> <i>Brachyloma</i> sp. <i>Callitris roei</i> <i>Callitris tuberculata</i> <i>Calytrix leschenaultii</i> <i>Cooperookia strophilota</i> <i>Cryptandra minutifolia</i> <i>Cryptandra nutans</i> <i>Darwinia inconspicua</i> <i>Daviesia decurrens</i> <i>Daviesia lancifolia</i> <i>Dodonaea bursariifolia</i> <i>Dryandra cirsioides</i> <i>Exocarpus aphyllus</i> <i>Grevillea disjuncta</i> <i>Grevillea oligantha</i> <i>Hakea corymbosa</i> <i>Hakea erecta</i> <i>Hakea laurina</i> <i>Hakea newbeyana</i> <i>Hakea nitida</i> <i>Hakea lissocarpha</i>	<i>Hibbertia exasperata</i> <i>Hibbertia gracilipes</i> <i>Isopogon buxifolius</i> <i>Isopogon teretifolius</i> <i>Jacksonia racemosa</i> <i>Lasiopetalum rosmarinifolium</i> <i>Leptomeria pachyclada</i> <i>Leptomeria preissiana</i> <i>Leptospermum erubescens</i> <i>Leptospermum nitens</i> <i>Leptospermum spinescens</i> <i>Leucopogon constephioides</i> var 2 <i>Leucopogon cuneifolius</i> <i>Leucopogon minutifolius</i> <i>Phebalium tuberculosum</i> <i>Melaleuca carrii</i> ms <i>Melaleuca depauperata</i> <i>Melaleuca eleuterostachya</i> <i>Melaleuca haplantha</i> <i>Melaleuca tuberculata</i> var <i>macrophylla</i> <i>Melaleuca uncinata</i> <i>Myrtaceae</i> sp.1 <i>Nemcia punctata</i> <i>Persoonia brevihachis</i> <i>Phebalium microphyllum</i> <i>Pultenaea verruculosa</i> var <i>brachyphylla</i> <i>Spyridium cordatum</i> <i>Templetonia sulcata</i> <i>Verticordia chrysantha</i> <i>Verticordia roei</i> subsp. <i>roei</i> <i>Westringia rigida</i>		
		<i>Conostylis argentea</i> <i>Conostylis petrophiloides</i> <i>Gahnia lanigera</i> <i>Gahnia</i> sp.L (K.R. Newbey 7888) <i>Lepidobolus chaetocephalus</i> <i>Lepidosperma brunonianum</i> <i>Lepidosperma</i> sp.A2 "Island Flat" (Keighery 7000) <i>Lomandra mucronata</i> <i>Loxocarya cinerea</i> <i>Platysace trachymenioides</i> <i>Stylidium repens</i>		

Floristic Association 8C				
LB014	Mid-high open forest of <i>Eucalyptus argyphea</i> mallet over shrubland of <i>Beyeria brevipes</i> var <i>brevipes</i> over mixed heath.			
Soils:	Loamy gravel			
Structural Units:	Mid-high open forest	Tall to very tall open shrubland	Low to mid-high sparse heath	Mid-high sparse sedgeland
Trees:	Shrubs:			
<i>Eucalyptus argyphea</i> mallet	<i>Acacia chamaeleon</i>			
<i>Eucalyptus phenax</i>	<i>Beyeria brevipes</i> var <i>brevipes</i>			
	<i>Dodonaea bursariifolia</i>			
	<i>Hakea laurina</i>			
	<i>Hakea lissocarpa</i>			
	<i>Hakea multilineata</i>			
	<i>Hakea newbeyana</i>			
	<i>Isopogon buxifolius</i>			
	<i>Leptomeria preissiana</i>			
	Herbs:			
	<i>Melaleuca uncinata</i>			
	<i>Melaleuca</i> sp.8			
	<i>Melaleuca subfalcata</i>			
	<i>Persoonia quinquenervis</i>			
	<i>Phebalium filifolium</i>			
	<i>Santalum acuminatum</i>			
	<i>Trymalium elachophyllum</i>			
	<i>Westringia cephalantha</i>			
	<i>Lepidosperma</i> sp.A2 "Island Flat" (Keighery 7000)			

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FLORISTIC GROUP	1A				1B			1C	2A			2B			3A								3B	3C	4A	4B	5		6A				6B	6C		6D	7A		7B		7C				7D	8A		8B			8C
	LB	LG	LB	LB	LB	LG	LB	LB	LG	Peg	LB	LB	LB	LB	LB	LB	LB	Peg	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB	LB							
SPECIES	41	4	39	42	35	1	19	13	3	2	21	32	33	15	17	7	11	36	28	24	3	4	29	9	27	26	11	5	10	25	38	20	6	6	37	3	22	8	18	1	12	30	10	2	16	31	23	2	34	14	
Hakea multilineata																																																*			
Leptomeria preissiana																												*																				*			*
Melaleuca sp.8																																																*			*
Melaleuca subfalcata																	*												*																			*			*
Phebalium filifolium																																												*				*			*
Trymalium elachophyllum																																																*			*
Westringia cephalantha																																																*			*

4.2. Soils and Landforms

Table 7 provides a summary of the soil classification and key soil characteristics at each quadrat. The quadrats were placed in six different soil types, reflecting the variation present within the Lake Bryde Recovery Catchment. Similarly, a range of landform elements and landform patterns were sampled (Table 7). The soil chemistry data collected is presented in the accompanying Access database.

4.3. Relationships between Vegetation Associations and the Environment

One of the aims of this study was to discern relationships between environmental variables and plant species distribution. Therefore, a correlation analysis was used to explore these relationships, where they exist. It was also desirable to use the same types of data in the analysis as the Salinity Action Plan group. Discussions with Neil Gibson revealed that only integer data can be used in correlation analysis, thereby limiting the range of variables used in the analyses to soil chemistry data and topography. However, on the basis of these variables alone, some relationships became evident. Table 8 provides a summary of the significant relationships evident between individual vegetation associations and the soil chemistry variables used, and Table 9 provides the mean (standard deviation) for each significant variable for each vegetation association.

There was no discernible significant relationship between topography (contour height) and vegetation association ($p=0.216$), which was not surprising given the low level of variation in topography between the sites surveyed.

4.4. Gravel Pits

Within the 15,796.1 ha of Reserves surveyed in the Lake Bryde Recovery Catchment, 0.03% of the area had been cleared for gravel pits. In contrast, 1.9% of the 4,439.9 ha of Road Reserves surveyed have been cleared for gravel pits.

Table 7: Soil Classification and Key Soil Characteristics of Quadrats

Quadrat	WA Soil Group	Landform Element	Landform Pattern	Soil Landscape	Surface Texture	Depth to Clay (cm)	Site Drainage	Subsoil			
								Salinity	Gravel	Calcareous	pH
LB 001	Grey shallow sandy duplex (with gravel)	Hillcrest	Pediment	Nw2	S	15	W	N	C	N	< 6.5
LB 002	Yellow brown shallow sandy duplex (with gravel)	Hillslope	Pediment	Nw2	S	45	MW	N	M/H	N	6.5-8.0
LB 003	Pale deep sand	Plain	Sand Plain	Nw1	S	> 100	W	N	N	N	6.5-8.0
LB 004	Brown loamy earth	Plain	Alluvial Plain	Nw2	CL	10	I	H/S	V	N	> 8.0
LB 005	Alkaline grey shallow sandy duplex	Valley Flat	Plain	Nw1	LS	15	MW	S/M	V _(K)	S-M	> 8.0
LB 006	Yellow brown shallow sandy duplex	Hillslope	Pediment	Nw6	LS	25	MW	N	F	N	6.5-8.0
LB 007	Alkaline grey shallow loamy duplex	Valley Flat	Pediment	Ne5	ZCL	12	I	H	N	N	> 8.0
LB 008	Loamy gravel (shallow)	Hillslope	Rises	Nw5	LS	> 40	W	N	M	N	6.5-8.0
LB 009	Alkaline grey shallow loamy duplex	Simple Slope	Pediment	Nw6	ZCL	20	I	N	F	N	> 8.0
LB 010	Shallow gravel	Hillslope	Rises	Nw4	LS	> 25	W	N	A	N	< 6.5
LB 011	Grey shallow loamy duplex	Hillcrest	Pediment	Nw6	LS	30	I	H/E	N	N	6.5-8.0
LB 012	Shallow gravel	Hillslope	Pediment	Nw2	LS	> 25	W	N	M	N	< 6.5
LB 013	Brown loamy earth	Hillcrest	Rises	Nw6	SL	70	W	N	V	N	> 8.0
LB 014	Loamy gravel (shallow)	Hillcrest	Plain	Nw5	LS	> 25	MW	N	M	N	6.5-8.0
LB 015	Alkaline grey shallow loamy duplex	Simple Slope	Pediment	Nw5	CL	10	I	M/H	V	N	> 8.0
LB 016	Loamy gravel (shallow)	Hillcrest	Rises	Nw1	SL	> 45	W	N	C	N	6.5-8.0
LB 017	Grey non-cracking clay	Simple Slope	Pediment	Nw4	CL	10	I	E	N	N	6.5-8.0
LB 018	Yellow brown deep sandy duplex (with gravel)	Simple Slope	Pediment	Nw6	S	65	W	N	M	N	6.5-8.0
LB 019	Alkaline grey deep sandy duplex	Berm	Stagnant Alluvial Plain	Sh3	S	45	MW	M	N	N	> 8.0
LB 020	Alkaline grey deep sandy duplex	Plain	Stagnant Alluvial Plain	Sh3	S	45	MW	S	N	N	> 8.0
LB 021	Alkaline grey shallow sandy duplex	Plain	Stagnant Alluvial Plain	Sh2	CS	15	MW	H	C _(K)	M	> 8.0

Quadrat	WA Soil Group	Landform Element	Landform Pattern	Soil Landscape	Surface Texture	Depth to Clay (cm)	Site Drainage	Subsoil			
								Salinity	Gravel	Calcareous	pH
LB 022	Grey deep sandy duplex	Plain	Sand Plain	Sh2	S	> 70	MW	N	C	N	< 6.5
LB 023	Shallow gravel	Hillcrest	Pediment	Nw6	S	> 25	MW	N	M	N	< 6.5
LB 024	Alkaline grey shallow loamy duplex (or calcareous loamy earth)	Simple Slope	Stagnant Alluvial Plain	Sh2	SCL	10	MW	M	C _(K)	S	> 8.0
LB 025	Yellow brown deep sandy duplex (with gravel)	Plain	Stagnant Alluvial Plain	Sh3	S	50	I	M	M	N	> 8.0
LB 026	Calcareous loamy earth	Lunette	Stagnant Alluvial Plain	Sh3	L	25	MW	E	M _(K)	H	> 8.0
LB 027	Pale deep sand (over alkaline grey clay)	Beach	Stagnant Alluvial Plain	Sh3	S	90	MW	M	N	N	> 8.0
LB 028	Yellow brown shallow sandy duplex (with gravel)	Hillslope	Pediment	Nw4	LS	40	MW	M	N	N	> 8.0
LB 029	Brown loamy earth	Hillslope	Pediment	Nw4	CL	10	I	M-H	N	N	< 6.5
LB 030	Yellow brown deep sandy duplex (with gravel)	Simple Slope	Pediment	Nw2	LS	> 50	MW	N	F-M	N	6.5-8.0
LB 031	Loamy gravel (shallow)	Hillslope	Rises	Nw2	SL	> 30	W	N	M	N	< 6.5
LB 032	Yellow loamy earth	Simple Slope	Pediment	Nw2	SL	40	MW	E	F	N	> 8.0
LB 033	Alkaline grey shallow sandy duplex	Plain	Plain	Nw2	LS	5	P	E	V	S	> 8.0
LB 034	Alkaline grey deep sandy duplex	Simple Slope	Pediment	Nw4	LS	40	MW	M	M	S	> 8.0
LB 035	Alkaline grey shallow sandy duplex	Drainage Depression	Stagnant Alluvial Plain	La2	S	15	P	E	N	S	> 8.0
LB 036	Alkaline grey shallow sandy duplex	Plain	Plain	La2	CS	20	I	M-H	C _(K)	H	> 8.0
LB 037	Yellow brown deep sandy duplex	Valley Flat	Stagnant Alluvial Plain	La2	S	55	MW	M	N	N	6.5-8.0
LB 038	Grey deep sandy duplex	Backplain	Stagnant Alluvial Plain	La2	S	50	MW	M	N	N	< 6.5
LB 039	Grey non-cracking clay	Backplain	Stagnant Alluvial Plain	La2	LMC	0	P	E	N	N	< 6.5
LB 041	Alkaline grey shallow sandy duplex	Beach	Stagnant Alluvial Plain	La2	S	20	P	E	N	N	> 8.0
LB 042	Grey non-cracking clay	Backplain	Stagnant Alluvial Plain	Sh3	ZC	0	P	E	N	M	> 8.0

Quadrat	WA Soil Group	Landform Element	Landform Pattern	Soil Landscape	Surface Texture	Depth to Clay (cm)	Site Drainage	Subsoil			
								Salinity	Gravel	Calcareous	pH
LG1	Alkaline grey shallow sandy duplex	Valley Flat	Stagnant Alluvial Plain	La2	S	5	I	E	N	S	> 8.0
LG2	Alkaline grey deep sandy duplex	Footslope	Pediment	Sh4	CS	35	MW	M-H	V _(K)	M	> 8.0
LG3	Calcareous loamy earth	Footslope	Pediment	Sh4	SL	30	MW	M	M _(K)	M	> 8.0
LG4	Calcareous loamy earth	Valley Flat	Stagnant Alluvial Plain	La2	CL	20	I	E	V _(K)	M	> 8.0
LG6	Brown deep sand	Backplain	Stagnant Alluvial Plain	La2	S	> 100	R	N	N	N	6.5 - 8.0
LG10	Alkaline grey deep sandy duplex	Simple Slope	Stagnant Alluvial Plain	La2	LS	35	MW	H	N	H	> 8.0
LG11	Calcareous loamy earth	Plain	Stagnant Alluvial Plain	Sh3	L	30	MW	S	C _(K)	S	> 8.0
Peg 2	Alkaline grey shallow sandy duplex	Valley Flat	Stagnant Alluvial Plain	La2	S	12	MW	H	M _(K)	H	> 8.0
Peg 3	Alkaline grey shallow loamy duplex	Plain	Stagnant Alluvial Plain	La2	SL	15	MW	M	F _(K)	H	> 8.0

1. Surface Texture Grade: Sand; LS = Loamy sand; CS = Clayey sand; L = Loam; SL = Sandy loam; CL = Clay loam; ZCL = Silty clay loam; SCL = Sandy clay loam; ZC = Silty clay; LMC = Light to medium clay.
2. Drainage: P = Poor; I = Imperfect; MW = Moderately well; W = Well; R = Rapid.
3. Salinity: N = Nil (0 - 20 EC 1.5 mS/m); S = Slight (20 - 40 EC 1.5 mS/m); M = Moderate (40 - 80 EC 1.5 mS/m); H = High (80 - 160 EC 1.5 mS/m); E = Extreme (> 160 EC 1.5 mS/m).
4. Gravel: N = Nil; V = Very few (< 2%); F = Few (2 - 10%); C = Common (10 - 20%); M = Many (20 - 50%); A = Abundant (50 - 90%); All ironstone, otherwise (K) = calcrete nodules
5. Calcareous: N = Non calcareous; S = Slightly calcareous; M = Moderately calcareous; H = Highly calcareous; V = Very highly calcareous.

Table 8 provides a summary of the significant relationships evident between individual vegetation associations and the soil chemistry variables used, based on correlation analysis. Table 9 provides the mean (standard deviation) for each significant variable for each vegetation association.

Although there were several independent variables that were significantly correlated with the dependent variable of Floristic Group, there was also a large amount of correlation between independent variables. Therefore, a step-wise multiple regression was run to determine which environmental factor/s explained most of the variation seen in floristic communities. Several models were tested, and the model which explained the most variation was that which excluded all variables except Sub-surface Electrical Conductivity, Sub-surface pH and soil group. Table 10 shows a summary of the regression model and the ANOVA to test for the significance of the relationship between the independent and dependent variables. Investigation of the normality of the data and collinearity diagnostics indicated that the regression assumptions were not seriously violated.

Table 8: Summary of Significant Relationships Between Floristic Associations and Environmental Variables.

Relationship is statistically significant if $p < 0.05$.

Independent Variable	<i>p</i>
Altitude (ASL)	0.023
Sub-surface Electrical Conductivity	<0.001
Surface Electrical Conductivity	<0.001
Underlying Geology	0.010
Landform Pattern	0.013
Magnesium	<0.001
Manganese	<0.001
Phosphorous Bicarbonate	0.007
Sub-surface pH	0.008
Surface pH	<0.001
Potassium Bicarbonate	<0.001
Potassium	0.001
Sodium	<0.001
Soil Group	<0.001
Total Phosphorous	0.027

Table 9: Mean (Standard Deviation) of Significant Environmental Variables for Each Vegetation Association.
Environmental variables which best describe floristic communities are highlighted.

Floristic Group	Altitude m ASL	Sub-surf EC	Surf EC	Mg	Mn	P(HCO ₃)	Sub-surf pH	Surf pH	K(HCO ₃)	K	Na	TP
1A	295.0 (0.0)	480.0 (293.3)	85.8 (98.6)	5.2 (3.3)	No data	4.3 (2.9)	7.85 (1.5)	7.5 (0.7)	581.0 (418.5)	1.8 (1.4)	3.1 (2.4)	99.5 (51.3)
1B	293.3 (2.9)	171.7 (97.5)	76.7 (107.2)	1.1 (0.8)	No data	1.3 (0.6)	8.2 (1.0)	6.8 (0.4)	65.3 (19.7)	0.1 (0.03)	0.4 (0.2)	26.7 (7.8)
1C	380.0 (0.0)	8.0 (0.0)	8.0 (0.0)	1.0 (0.0)	0.03 (0.0)	1.0 (0.0)	8.2 (0.0)	6.3 (0.0)	98.0 (0.0)	0.3 (0.0)	0.4 (0.0)	51.0 (0.0)
2A	292.5 (3.5)	81.5 (54.5)	2.5 (0.7)	0.4 (0.2)	0.03 (0.0)	1.0 (0.0)	9.4 (0.3)	6.2 (0.3)	37.0 (19.8)	0.1 (0.05)	0.03 (0.01)	33.0 (5.7)
2B	313.3 (11.6)	180.0 (45.8)	4.0 (2.0)	1.3 (0.5)	No data	1.0 (0.0)	9.1 (0.4)	6.6 (0.2)	105.7 (64.6)	0.3 (0.2)	0.1 (0.07)	30.7 (9.1)
3A	327.5 (28.2)	115.3 (62.2)	22.9 (19.7)	3.9 (1.8)	0.01 (0.0)	3.1 (2.9)	8.6 (0.9)	7.0 (0.5)	198.3 (144.8)	0.5 (0.4)	0.6 (0.4)	58.3 (28.9)
3B	310.0 (0.0)	28.0 (0.0)	90.0 (0.0)	6.7 (0.0)	No data	3.0 (0.0)	8.2 (0.0)	6.8 (0.0)	180.0 (0.0)	0.4 (0.0)	1.7 (0.0)	90.0 (0.0)
3C	340.0 (0.0)	140.0 (0.0)	53.0 (0.0)	6.1 (0.0)	0.05 (0.0)	3.0 (0.0)	5.1 (0.0)	6.3 (0.0)	130.0 (0.0)	0.2 (0.0)	0.5 (0.0)	70.0 (0.0)
4A	320.0 (0.0)	6.0 (0.0)	19.0 (0.0)	5.1 (0.0)	0.05 (0.0)	5.0 (0.0)	8.3 (0.0)	6.3 (0.0)	700.0 (0.0)	1.8 (0.0)	0.8 (0.0)	130.0 (0.0)
4B	295.0 (0.0)	52.0 (0.0)	7.0 (0.0)	0.3 (0.0)	No data	2.0 (0.0)	9.2 (0.0)	6.8 (0.0)	35.0 (0.0)	0.09 (0.0)	0.2 (0.0)	27.0 (0.0)
5	295.0 (0.0)	140.0 (155.6)	14.0 (1.4)	3.2 (1.0)	0.03 (0.0)	11.0 (2.8)	9.0 (0.1)	6.6 (0.7)	395.0 (83.4)	1.0 (0.2)	0.4 (0.2)	111.0 (26.9)
6A	300.0 (10.0)	79.8 (40.8)	4.3 (3.2)	0.7 (0.7)	0.04 (0.01)	1.5 (1.0)	8.4 (1.5)	6.4 (0.3)	64.5 (49.2)	0.2 (0.1)	0.1 (0.1)	41.5 (17.6)
6B	300.0 (0.0)	25.0 (0.0)	30. (0.0)	0.2 (0.0)	0.01 (0.0)	1.0 (0.0)	8.1 (0.0)	6.3 (0.0)	27.0 (0.0)	0.07 (0.0)	0.03 (0.0)	21.0 (0.0)
6C	307.5 (17.7)	4.5 (0.7)	4.5 (0.7)	0.5 (0.04)	0.07 (0.05)	1.0 (0.0)	6.7 (0.4)	5.8 (0.0)	46.5 (27.6)	0.1 (0.07)	0.08 (0.03)	42.5 (5.0)
6D	295.0 (0.0)	60.0 (0.0)	2.0 (0.0)	0.1 (0.0)	0.01 (0.0)	1.0 (0.0)	6.5 (0.0)	6.1 (0.0)	8.0 (0.0)	0.02 (0.0)	0.01 (0.0)	30.0 (0.0)
7A	302.5 (3.5)	2.0 (1.4)	1.5 (0.7)	0.1 (0.01)	0.01 (0.0)	1.0 (0.0)	6.0 (0.0)	6.2 (0.07)	12.0 (5.7)	0.03 (0.01)	0.02 (0.0)	23.0 (7.1)
7B	317.5 (17.7)	4.5 (2.1)	2.0 (0.0)	0.5 (0.2)	0.01 (0.0)	1.0 (0.0)	6.7 (0.2)	6.4 (0.0)	62.5 (10.6)	0.2 (0.03)	0.05 (0.01)	32.0 (4.2)
7C	331.3 (22.5)	2.8 (0.5)	2.0 (0.0)	0.5 (0.2)	0.01 (0.0)	1.0 (0.0)	6.3 (0.3)	6.2 (0.1)	35.0 (13.9)	0.09 (0.03)	0.04 (0.01)	25.0 (4.8)
7D	305.0 (0.0)	3.0 (0.0)	2.0 (0.0)	0.2 (0.0)	0.02 (0.0)	1.0 (0.0)	6.9 (0.0)	6.3 (0.0)	23.0 (0.0)	0.06 (0.0)	0.02 (0.0)	26.0 (0.0)
8A	330.0 (28.3)	7.0 (4.2)	4.0 (2.8)	1.1 (0.9)	0.01 (0.0)	1.0 (0.0)	6.7 (0.6)	6.4 (0.4)	76.0 (52.3)	0.2 (0.1)	0.1 (0.1)	35.0 (5.7)
8B	311.7 (25.7)	51.3 (43.7)	2.7 (1.2)	0.3 (0.08)	0.01 (0.0)	1.0 (0.0)	8.4 (1.9)	6.2 (0.06)	26.0 (9.5)	0.07 (0.03)	0.04 (0.03)	22.7 (5.5)
8C	380.0 (0.0)	8.0 (0.0)	11.0 (0.0)	3.7 (0.0)	No data	2.0 (0.0)	7.98 (0.0)	6.6 (0.0)	493.0 (0.0)	1.3 (0.0)	0.8 (0.0)	73.0 (0.0)

Soil groups were not included in the above table, as they can not be averaged.

Table 10: Summary of Multiple Regression Model.**Model Summary^d**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.573 ^a	.328	.314	5.4892	.328	22.954	1	47	.000	1.142
2	.668 ^b	.446	.422	5.0367	.118	9.826	1	46	.003	
3	.736 ^c	.542	.512	4.6311	.096	9.410	1	45	.004	

a. Predictors: (Constant), ECSUBSUR

b. Predictors: (Constant), ECSUBSUR, PHSUBSUR

c. Predictors: (Constant), ECSUBSUR, PHSUBSUR, soil

d. Dependent Variable: VEGASS

ANOVA^d

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	691.641	1	691.641	22.954	.000 ^a
	Residual	1416.195	47	30.132		
	Total	2107.837	48			
2	Regression	940.905	2	470.453	18.545	.000 ^b
	Residual	1166.932	46	25.368		
	Total	2107.837	48			
3	Regression	1142.715	3	380.905	17.760	.000 ^c
	Residual	965.121	45	21.447		
	Total	2107.837	48			

a. Predictors: (Constant), ECSUBSUR

b. Predictors: (Constant), ECSUBSUR, PHSUBSUR

c. Predictors: (Constant), ECSUBSUR, PHSUBSUR, soil

d. Dependent Variable: VEGASS

The above regression model demonstrates that Sub-surface Electrical Conductivity, Sub-surface pH and soil group together can account for 51.2% of the variation between floristic groups, and the relationship is highly significant ($\alpha < 0.005$ from ANOVA). When determining the best model, the soil chemistry data were eliminated, as they did not improve the model (i.e. the model described a lower percentage of variation). Other variables considered included underlying geology and landform pattern, but these were also eliminated.

5. DISCUSSION

The objectives of this study were achieved in that the vegetation and soils data collected enabled floristic vegetation associations to be identified and broad structural vegetation communities to be mapped. These data then allowed for significant vegetation communities and flora to be identified and the relationships between environmental parameters and vegetation to be explored. Areas within the catchment that are salt-affected and areas with significant plant stress evident were also identified. The following discussion centres on each of these objectives.

5.1. Conservation Status of Vegetation Associations

The 11 vegetation associations identified in this survey were compared with those described in Hopkins *et al.* (1996) to determine their conservation status.

Four of the vegetation associations identified in the Lake Bryde study could fall into the category of “*not represented in conservation reserves*”. These correspond most closely with the following vegetation groups as described in Hopkins *et al.* (1996):

- *Mosaic: Shrublands; mallee scrub; tall E. eremophila / Medium woodland; Gimlet (Si-11a/Mi-06o)* – our floristic association type 3A;
- *Medium woodland; mallet (Mi-04c) and Low forest; Moort (Lc-05b)* – our floristic association type 3c; and
- *Shrublands; Allocasuarina campestris scrub (Sc-04b) and Low woodland; Allocasuarina huegeliana (Li-11b)* – our floristic association types 1C and 7B.

It is clear that further investigation is required into the plant communities of the wheatbelt, given that the above communities were identified in nature reserves in this study, but have not been recognised as being reserved in Hopkins *et al.* (1996).

Six of the vegetation associations identified in the Lake Bryde study could fall into the category of “*poorly represented in conservation reserves*”. These correspond most closely with the following vegetation groups as described in Hopkins *et al.* (1996):

- *Mosaic: Shrublands; mallee scrub; tall E. eremophila / Medium woodland; Salmon gum and Red mallee (Si-11a/Mi-06n)* – our vegetation association type 3A;
- *Shrublands; Allocasuarina campestris thicket (Sc-04a)* – our floristic associations type 1C and 7B;
- *Succulent steppe; Tea-tree thicket over samphire (SC-02b)* – our floristic association type 1A;
- *Shrublands; Dryandra heath (Zc-02a)* – our floristic association type 7C;
- *Medium woodland; Salmon gum (Mi-05d)* – our floristic association type 5.

The conservation status of the *poorly conserved* floristic associations identified above, is as follows (from Hopkins *et al.* (1996)):

Vegetation Association No. Hopkins <i>et al.</i> (1996)	Vegetation Association No. Ecoscape (this study)	Area in IUCN (I)-(IV) Reserves (ha)	%	Area in CALM Conservation Reserves (ha)	%
Si-11a/Mi-06n	3A	10,101	2.6	21,091	5.4
Sc-04a	1C, 7B	16,185	2.6	17,660	2.8
SC-02b	1B	345	3.6	657	6.9
Zc-02a	7C	3,119	5.2	3898	6.4
Mi-05d	5	11,551	1.3	23,441	2.6

Given that the plant communities above are considered to be poorly reserved, opportunity exists to expand their reservation status.

5.2. Priority Flora

Nine species of priority flora were encountered during fieldwork, in fifteen populations. It should be noted that five of these occurred in vegetation associations that have been identified above as being poorly conserved, as follows:

- *Leucopogon* sp. Kau Rock (M.A. Burgman 1126) (P1) – occurred in floristic association type 6A;
- *Persoonia brevirhachis* (P2) – occurred in floristic association types 7B, 7C and 8B, two of which are poorly conserved;
- *Rinzea affinis* (P2) – occurred in floristic association type 7C, which is poorly conserved;
- *Dryandra epimicta* (P2) - occurred in floristic association type 7A;
- *Hakea brachyptera* (P3) - occurred in floristic association type 7A;
- *Stylidium neglectum* (P3) - occurred in floristic association type 1C, which is poorly conserved;
- *Grevillea newbeyi* (P3) - occurred in floristic association type 6B;
- *Daviesia uncinata* (P3) - occurred in floristic association types 7B and 7C, both of which are poorly conserved; and
- *Grevillea prostrata* (P4) - occurred in floristic association type 2B.

As stated earlier though, these plants were located in nature reserves and so the conservation status of plant communities may need reviewing as more vegetation data becomes available.

5.3. Vegetation Stress

The incidence of crown death in the areas surveyed was generally low with the highest level of incidence occurring in the upper storey of low-lying salt affected areas (LG4 - 30.4% and LG10 - 46.8%). It should be noted that in some instances crown death may be a natural process, and not indicative of land degradation. For example, sites LB24 and LB36 had crown death of 29.2% and 40.8% respectively in the mid-storey. However, both these sites had a mid-storey of predominately *Melaleuca* spp. which naturally senesce and become lignified with time. Therefore, when investigating plant stress other factors such as topography and soil salinity should be considered.

5.4. Priority Fauna

Although a fauna survey was not undertaken as part of this study, it is worth noting several sightings of the endangered mallee fowl (*Leipoa ocellata*), as follows:

- Reserve 29019 – two pairs sighted;
- Reserves 29018 and 24920 – three pairs sighted; and
- Reserve 25113 – two pairs sighted.

5.5. Use of Environmental Factors for Determining Floristic Patterns

Although there were significant relationships identified between some of the soil chemistry variables and the floristic associations, the regression analysis indicated that the environmental variables that do most to describe the variation between floristic groups were sub-surface salinity and pH and soil group. The various soil chemistry variables measured during this survey contribute to soil group classification, and so it is not surprising that the chemical variables were eliminated during the regression analysis.

Based on a combination of field observations and the data analysis, broad relationships between some of the floristic types and the soils can be made, as follows:

- *Eucalyptus tetragona* (Tallerack) and *Hakea* species occur commonly in higher parts of the landscape with areas of well drained gravelly soils;
- *E. salmonophloia* (Salmon gum) commonly occurs within areas of calcareous soils in lower landscape positions;
- *E. eremophila* (Tall Sand Mallee) is commonly associated with saline soil conditions;
- *Banksia* species are commonly associated with well to rapidly drained sandy soils (either pale deep sands or grey deep sandy surfaced duplex types);
- Mallee complexes are commonly associated with shallow gravelly soils or deep sandy surfaced duplex soils (better drained positions);
- Mallet woodland is associated with loamy earths (gradational texture profile trend);
- Heath communities are generally found in areas of low soil electrical conductivity and slightly acidic soil;
- Chenopod shrublands are generally in areas of high soil electrical conductivity and slightly alkaline soils; and
- Low lying shrub land is commonly associated with sandy surfaced 'gley' duplex soils.

When appraising the value of using environmental variables to predict the occurrence of floristic communities, consideration also needs to be given to whether or not those communities would be distinguishable in the field. The level of discrimination between floristic associations used in this study ensured that communities are recognisable in the field. Had a finer level of discrimination been used, the communities may not be as easily distinguishable in the field, but the predictive value of environmental variables may have been greater. Therefore, there is a trade-off at some level between the ability to distinguish communities in the field, and the level of discrimination used to determine floristic associations and their relationships to environmental parameters. However, it is recommended that the data collected as part of this study be further analysed on a finer level of discrimination. For example, it may be useful to run a multiple regression using species as the dependent variable instead of floristic groups. This could be particularly useful for determining species groups for revegetation programmes.

5.6. Appraisal of Methods

This study followed the methods of McDonald (1998). These methods while designed for agricultural lands worked well overall, and provided data that were less subjective than other methods such as Muir (1977). The methods of McDonald (1998) also provided a greater degree of actual data rather than just estimates, which is useful for data analysis purposes. Data sheets were designed for this study which included (as much as possible) any codes required for recording, to enable field data collection to be as efficient as possible.

There were some specific elements of the methods used that may require revision for future surveys. These are discussed below.

5.6.1. Crown Cover Measurements

The method of McDonald *et al.* (1998) treats all plants within a stratum as a single species for the measurement of Crown Cover. Furthermore, the method is applied to every stratum except for the non-woody ground layer. This method posed some problems for the field staff. For the overstorey, the method failed if the overstorey was sparse as there were large distances between trees. For the understorey strata, the method may provide overestimates of crown cover. This is particularly so for the large variety of Western Australian shrubs which have a sparse but wide canopy, as well as any plant with a mallee growth form. We suggest that an alternative method of measuring crown cover be used for future surveys, such as simple visual estimation.

Where the above method could not be applied, visual estimations were of crown cover were made, using the methods of McDonald *et al.* (1998).

5.6.2. Landform Data

Some of the required data were not collected at all, or the method used varied from that specified, as detailed below:

- *Boundary Shape* - not recorded as it is impossible to distinguish when profiles are observed from an auger sample. The alternative method of observation, a pit excavation is too time consuming and results in a significant site disturbance which is undesirable in the immediate vicinity of a vegetation quadrat. Furthermore the item is of no relevance in relation to the system of soil classification now used for Agriculture WA soil landscape surveys (WA Soil Groups - Schoknecht 1999); and
- *Field pH and Soil Electrical Conductivity* - these attributes were not determined in the field since it was more efficient in terms of survey time for them to be determined from soils sampled for laboratory analysis. This was particularly so given the number of samples already required by the study brief to be analysed for other attributes

In order to ensure that the data collected as part of this study is compatible with other studies, some additional items were collected. This data was not included as part of the database, but has been provided as Microsoft Excel 97 files. The additional items were:

- *Landform Pattern* - pattern definition according to glossary in McDonald *et al.* (1998) also given, in addition to the RMS class to facilitate comparison and correlation with data collected by Agriculture WA;
- *Slope* - specific value for gradient given in addition to modal slope category to facilitate more refined sorting of data in relation to this attribute;
- *Morphological Type* - additional item recorded to facilitate comparison and correlation with data collected by Agriculture WA, and to assist further determination of relationships between vegetation and landscape position;
- *Site Drainage* - additional item recorded to assist further determination of relationships between vegetation and landscape factors. Note 'drainage' is not an item that can be recorded independently of 'permeability' for each soil layer or horizon;
- *Surface Condition* - additional item recorded to assist soil classification, particularly according to the Factual Key Nomenclature (Northcote 1967). Item also relevant to any determination of land degradation hazards (such as wind or water erosion) in relation to cleared land. While not directly relevant to the Reserve areas, it will be relevant to the total catchment soils mapping program if data from sites within reserves needs to be extrapolated to nearby farming land;
- *WA Soil Group, Other (Great Soil, Group - as referred to by Stoneman 1990) and Factual Key Notation (as used within the Atlas of Australian Soils)* - additional items determined to enable comparison of site data with results of previous soil studies affecting the area, and to assist the process of supplementing existing site;
- *Horizons* - additional item recorded to assist soil classification, particularly according to the factual Key Nomenclature (Northcote 1967);
- *Boundary Shape* - item not recorded as it is impossible to distinguish when profiles are observed from an auger sample. The alternative method of observation, a pit excavation is too time consuming and results in a significant

site disturbance which is undesirable in the immediate vicinity of a vegetation quadrat. Furthermore the item is of no relevance in relation to the system of soil classification now used for Agriculture WA soil landscape surveys (WA Soil Groups - Schoknecht 1999);

- *Mottles* - additional item recorded to assist soil classification, particularly according to the factual Key Nomenclature (Northcote 1967);
- *Soil Water Status* - additional item recorded to assist interpretation of site drainage and seasonal watertable levels (possibly perched) in relation to salinity risk assessment and edaphic influences on vegetation;
- *Consistence* - additional item recorded to assist possible interpretation of vegetation differences, as it affects plant rooting conditions;
- *Structure (pedality and fabric)* - additional items recorded to assist soil classification, particularly according to the Factual Key Nomenclature (Northcote 1967). It is recognised however that this item is difficult to determine with reliability when profiles are observed from an auger sample;
- *Water Repellence* - additional item recorded to assist any determination of land degradation hazards (such as wind or water erosion) in relation to cleared land. While not directly relevant to the Reserve areas, it will be relevant to the total catchment soil mapping program if data from sites within reserves need to be extrapolated to nearby farming land; and
- *Exchangeable Mg, Al and Mn* - additional items determined due to minor additional cost and usefulness in allowing estimation of total CEC (cation exchange capacity) and possible correlations between vegetation and these soil chemical attributes.

Future surveys could consider the usefulness of collecting the additional data above, for comparison with other databases.

5.6.3. Scale of Mapping

The vegetation maps produced as part of this study are at a scale of 1:25,000, but the mapped vegetation complexes do not reflect the finer level of detail obtained from the floristic association analyses. This would require further aerial photography interpretation, and preferably field verification. The time period over which this study was undertaken and the limited number of sites surveyed precluded a more detailed mapping regime with a high degree of confidence associated with boundaries between vegetation complexes.

Another factor to consider when mapping vegetation is the presence of ecotones and disturbed areas (such as fire scars). The numerous ecotones present within the catchment added a degree of difficulty in discerning the boundaries of vegetation communities. Similarly, old fire scars may not be obvious in the field, potentially leading to misleading floristic association classification, depending on the successional stage of the area. It was useful in this study to have access to old aerial photographs which showed fire scars, as these were not readily recognisable in the field.

5.6.4. Site Disturbance

The method used for collecting soil for chemical analysis within a quadrat required 16 samples of soil. This represented a significant site disturbance, and in many cases was the *only* form of site disturbance. If an alternative method of soil collection can be used, such as sampling outside the quadrat and spacing samples much further

apart, we would recommend it. This would also reduce the amount of trampling occurring within quadrats.

5.6.5. Resurveying Mattiske Sites

The method used by Mattiske is quite different from that used in this study (McDonald *et al.*, 1998). Therefore, it was not possible to simply *fill in the gaps* of missing data from the Mattiske surveys. The sites were completely resurveyed to ensure data consistency and compatibility.

The Mattiske sites were also quite difficult to relocate. This is most likely because at the time the Mattiske surveys were undertaken, the United States had a *Selective Availability* policy in place which increased the error of GPS readings up to distances of approximately 200m. As a result the maps showing the location of Mattiske plots (and which vegetation units they fell into) did not always match the quadrat descriptions. Subsequently, two sites were not found, and new sites were established in their place. Care was taken to ensure that the new sites were in the same vegetation types as the sites that couldn't be found, based on the quadrat descriptions (not the vegetation maps). Similarly, five of the existing Mattiske sites no longer had any identification present, and so were given new site names. The database contains both *old* and *new* site names to enable cross-referencing.

Another problem encountered when trying to compare the results of the previous Mattiske survey with the current survey relates to the inclusion of plants outside of the survey quadrats. During the current survey, it was noted that species that had been recorded as occurring within the Mattiske survey quadrat were actually situated well away from the quadrat. This created differences in the vegetation descriptions between the two studies. Similarly, the current study has collected approximately 75% more species than the previous Mattiske survey.

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APPENDIX ONE: EXAMPLE DATA SHEETS

AKE E

FIELD A SH

Date		Reserve #		Reserve Name		Quadrat #		Collectors		&		Fire	Y	N	Years since	
MAP REFERENCE		Datum	AGD84	Type	L Zone	Easting		Northing		Accuracy		Time (mins)				
Aspect	N	S	E	W	NW	NE	SW	SE	WNW	NNW	WSW	SSW	ENE	NNE	ESE	SSE
Film #		Photo #		Bearing												

in 400m quadrat	
Litter Type	Litter Depth (cm)
Le=leaves	
Tw=twigs	% Litter cover
Lo=logs	%Cover Bare Ground

Plant Name (all vascular plants)

Species Code

Voucher #

Quadrat

Stratum

% cover

Stress

dom/co-dom in tallest stratum in 20x20m
& dom/co-dom in remaining strata in 10x10m

Growth Form

Av. Height (m)

was it recorded in the 100m or 400m quadrat?

0=emergent
(trees above tallest to 5% crown cover)

1=upper stratum
(tallest layer, crowns overlap to 20x crown size)

2=middle strata
(between upper & 1m in height)
2A=upper middle
2B=lower middle

3=lower stratum
(up to 1m tall)

4=ground stratum
(non-woody)

(Daubenmire)

1=0-5% cover

2=5-25%

3=25-50%

4=50-75%

5=75-95%

6=95-100%

all vascular in all strata in 100m
(all species in ground layer)

M=miner

L=lerp

G=gall

S=sap

record for all observed in 400m

T=tree

M=tree mallee

S=shrub

Y=mallee shrub

Z=heath shrub

C=chenopod shrub

G=tussock grass

H=hummock grass

D=sod grass

V=sedge

R=rush

F=forb

E=fern

O=moss

L=vine

A=cycad

P=palm

X=Xanthorrhoea

N=lichen

W=liverwort

in 400m quadrat

Veg Condition	Cause
1=near natural, minor weed invasion	
2=slightly disturbed	
3=moderately disturbed	
4=very disturbed	
5=highly disturbed, significant weed invasion	

UPPER STRATUM - TRANSECT

Crown Width (m) along transect

1	5	9
2	6	10
3	7	11
4	8	12

Crown Gap (m) along transect

1	5	9
2	6	10
3	7	11
4	8	12

%Crown Width Dead (m) along transect

1	5	9
2	6	10
3	7	11
4	8	12

UPPER MIDDLE STRATUM - TRANSECT

Crown Width (m)

1	5	9
2	6	10
3	7	11
4	8	12

Crown Gap (m)

1	5	9
2	6	10
3	7	11
4	8	12

%Crown Width Dead (m)

1	5	9
2	6	10
3	7	11
4	8	12

LOWER MIDDLE STRATUM - TRANSECT

Crown Width (m) along transect

1	5	9
2	6	10
3	7	11
4	8	12

Crown Gap (m)

1	5	9
2	6	10
3	7	11
4	8	12

%Crown Width Dead (m)

1	5	9
2	6	10
3	7	11
4	8	12

GROUND STRATUM (in 100m quadrat)

Intercepted foliage (along 5x1m transects in 100m quadrat)

cm/m	cm/m	cm/m	cm/m	cm/m
1	2	3	4	5

COMMENTS

[illegible][illegible]

APPENDIX TWO: DATABASE CODE DESCRIPTIONS

Database Table	Field	Code	Description
Cover	Cover Class	D	closed or dense (crowns touching/overlapping)
Cover	Cover Class	I	isolated plants (trees>100m apart, shrubs 25m apart)
Cover	Cover Class	L	isolated clumps (clump of 2-4 plants >200m apart)
Cover	Cover Class	M	mid-dense (crowns touching/slightly separated)
Cover	Cover Class	S	sparse (crowns clearly separated)
Cover	Cover Class	V	very sparse (crowns well separated)
Project	Project Code	W1/00	Vegetation Survey of the Lake Bryde Recovery Catchment
Quadrat	Collector	WENP	Patricia Wenham
Quadrat	Geology	Agg	Adamellite and granodiorite - granoblastic texture, strongly foliated; foliation defined by entrainment and alignment of biotite (rarely hornblende)
Quadrat	Geology	Amf	Metamorphosed agmatite - granoblastic or gneissic palaeosome consisting of Agg, minor paragneiss and/or amphibolite, enclosed by granoblastic leucocratic granite and adamellite Anf (granoblastic gneiss or granofels)
Quadrat	Geology	Cza	Alluvium - silt and sand in broad valley flats; extensively reworked by present drainage
Quadrat	Geology	Czb	Silcrete - subvitreous siliceous rock with angular quartz grains
Quadrat	Geology	Czg	Reworked sandplain with undulating surface - contains yellow to white sand and clay, gravel and minor laterite outcrop
Quadrat	Geology	Czl	Laterite - limonite nodules in cemented matrix; Grades upwards into Czb and Czs (sandplain) and downwards into weathered bedrock
Quadrat	Geology	Czo	Deeply weathered rock - kaolinised, subsequently ferruginised & silicified
Quadrat	Geology	Czs	Reworked sandplain - yellow & white sand; contains locally abundant limonite pebbles
Quadrat	Geology	Qa	Alluvium - silt, sand and gravel in stream channels
Quadrat	Geology	Qc	Colluvium and minor alluvium - Derived mainly from Czs (sandplain) and Czg
Quadrat	Geology	Qd	Gypsiferous sand & silt in dunes adjacent to playa lakes; ancient drainage flats; commonly contain calcrete nodules
Quadrat	Geology	Ql	Saline & gypsiferous clay and silt in playa lake deposits
Quadrat	Vegetation Condition	1	near natural, minor weed invasion
Quadrat	Vegetation Condition	2	slightly disturbed
Quadrat	Vegetation Condition	3	moderately disturbed
Quadrat	Vegetation Condition	4	very disturbed
Quadrat	Vegetation Condition	5	highly disturbed, signif. weed invasion
Quadrat	Type of Litter	Ba	bark
Quadrat	Type of Litter	Le	leaves
Quadrat	Type of Litter	Lo	logs
Quadrat	Type of Litter	Tw	twigs

Database Table	Field	Code	Description
Soil Chemistry	Collector Code	WELM	Martin Wells
Soil Chemistry	Aluminium Method Code	a	extracted in 1M NH ₄ Cl, pH=7.0, Method S22.0
Soil Chemistry	Aluminium Method Code	b	extracted in 0.1M BaCl ₂ , Method S21
Soil Chemistry	Aluminium Method Code	c	extracted in 1M NH ₄ Cl, pH=8.5, Method S22.1
Soil Chemistry	Calcium Method Code	a	extracted in 1M NH ₄ Cl, pH=7.0, Method S22.0
Soil Chemistry	Calcium Method Code	b	extracted in 0.1M BaCl ₂ , Method S21
Soil Chemistry	Calcium Method Code	c	extracted in 1M NH ₄ Cl, pH=8.5, Method S22.1
Soil Chemistry	Magnesium Method Code	a	extracted in 1M NH ₄ Cl, pH=7.0, Method S22.0
Soil Chemistry	Magnesium Method Code	b	extracted in 0.1M BaCl ₂ , Method S21
Soil Chemistry	Magnesium Method Code	c	extracted in 1M NH ₄ Cl, pH=8.5, Method S22.1
Soil Chemistry	Manganese Method Code	a	extracted in 1M NH ₄ Cl, pH=7.0, Method S22.0
Soil Chemistry	Manganese Method Code	b	extracted in 0.1M BaCl ₂ , Method S21
Soil Chemistry	Manganese Method Code	c	extracted in 1M NH ₄ Cl, pH=8.5, Method S22.1
Soil Chemistry	Potassium Method Code	a	extracted in 1M NH ₄ Cl, pH=7.0, Method S22.0
Soil Chemistry	Potassium Method Code	b	extracted in 0.1M BaCl ₂ , Method S21
Soil Chemistry	Potassium Method Code	c	extracted in 1M NH ₄ Cl, pH=8.5, Method S22.1
Soil Chemistry	Sodium Method Code	a	extracted in 1M NH ₄ Cl, pH=7.0, Method S22.0
Soil Chemistry	Sodium Method Code	b	extracted in 0.1M BaCl ₂ , Method S21
Soil Chemistry	Sodium Method Code	c	extracted in 1M NH ₄ Cl, pH=8.5, Method S22.1
Soil Landforms	Landform Element	BEA	beach
Soil Landforms	Landform Element	BER	berm
Soil Landforms	Landform Element	BKP	backplain
Soil Landforms	Landform Element	DDE	drainage depression
Soil Landforms	Landform Element	FOO	footslope
Soil Landforms	Landform Element	HCR	hillcrest
Soil Landforms	Landform Element	HSL	hillslope
Soil Landforms	Landform Element	LUN	lunette
Soil Landforms	Landform Element	PLA	plain
Soil Landforms	Landform Element	S	simple slope
Soil Landforms	Landform Element	VLF	valley flat
Soil Landforms	Landform Modal Slope	GE	gently inclined
Soil Landforms	Landform Modal Slope	LE	level
Soil Landforms	Landform Modal Slope	VG	very gently inclined
Soil Landforms	Landform Morphology	C	crest
Soil Landforms	Landform Morphology	S	simple slope
Soil Landforms	Landform Morphology	M	mid-slope
Soil Landforms	Landform Morphology	F	flat
Soil Landforms	Landform Morphology	U	upper slope
Soil Landforms	Landform Morphology	L	lower slope
Soil Landforms	Landform Morphology	R	ridge
Soil Landforms	Landform Morphology	V	open depression (vale)
Soil Landforms	Landform Pattern	ALP	alluvial plain
Soil Landforms	Landform Pattern	PED	pediment
Soil Landforms	Landform Pattern	PLA	plain
Soil Landforms	Landform Pattern	RIS	rises
Soil Landforms	Landform Pattern	SAN	sand plain
Soil Landforms	Landform Pattern	STA	stagnant alluvial plain

Database Table	Field	Code	Description
Soil Landforms	Landform Relief	R	very low (9-30m)
Soil Landforms	Landform Relief	P	extremely low (<9m)
Soil Landforms	Landform Slope Class	GE	gently inclined
Soil Landforms	Landform Slope Class	LE	level
Soil Landforms	Landform Slope Class	VG	very gently inclined
Soil Landforms	Soil Landscape	Nw1	Newdegate – level to very gently inclined, slightly incised (with coordinated drainage).
Soil Landforms	Soil Landscape	Nw2	Newdegate - gently undulating to very gently inclined gravel plain. Hard setting soils such as 'moort type' soils are frequent.
Soil Landforms	Soil Landscape	Nw4	Newdegate - gently undulating to undulating dissected plain to gently undulating rises, and distinct lateritic breakaway areas.
Soil Landforms	Soil Landscape	Nw5	Newdegate -gently undulating to undulating dissected plain to gently undulating rises, with long slopes and no lateritic breakaways.
Soil Landforms	Soil Landscape	Nw6	Newdegate - areas of significant rock outcrop including monadnocks and sheet rock benches.
Soil Landforms	Soil Landscape	La2	Lagan -Type 2 undefined. General - salt lake chains in the southern Zone of Ancient Drainage, with salt lake soil and calcareous loamy earths. Mallee, morrel woodland and saltbush-bluebush-samphire flats.
Soil Landforms	Soil Landscape	Sh2	Sharpe - level to very gently inclined plains. Dominant soils are alkaline grey shallow sandy and loamy duplex soils, grey deep sandy duplex soils, some calcareous loamy earths and saline wet soils.
Soil Landforms	Soil Landscape	Sh3	Sharpe - gently undulating soil landscapes within dominantly deep sand sheets, lunettes or linear dunes occurring across the area.
Soil Landforms	Soil Landscape	Sh4	Sharpe - undulating mid to upper valley slopes. Long slopes low relief gravels on upland, heavier soils on slopes and valleys.
Soil Landforms	Soil Supergroup	100	wet or water logged soils
Soil Landforms	Soil Supergroup	200	rocky or stony soils
Soil Landforms	Soil Supergroup	300	ironstone gravelly soils
Soil Landforms	Soil Supergroup	400	sandy duplexes
Soil Landforms	Soil Supergroup	420	shallow sands
Soil Landforms	Soil Supergroup	440	deep sands
Soil Landforms	Soil Supergroup	460	sandy earths
Soil Landforms	Soil Supergroup	500	loamy duplexes
Soil Landforms	Soil Supergroup	520	shallow loams
Soil Landforms	Soil Supergroup	540	loamy earths
Soil Landforms	Soil Supergroup	600	cracking clays
Soil Landforms	Soil Supergroup	620	non-cracking clays
Soil Landforms	Surface Boulder Abundance	A	abundant, 50-90%
Soil Landforms	Surface Boulder Abundance	C	common, 10-20%
Soil Landforms	Surface Boulder Abundance	F	few, 2-10%
Soil Landforms	Surface Boulder Abundance	M	many, 20-50%
Soil Landforms	Surface Boulder Abundance	N	no coarse fragments, 0%
Soil Landforms	Surface Boulder Abundance	T	very abundant, >90%
Soil Landforms	Surface Boulder Abundance	V	very few, <2%
Soil Landforms	Surface Boulder Lithology	CC	charcoal
Soil Landforms	Surface Boulder Lithology	GC	gravel, ferric smooth-faced
Soil Landforms	Surface Boulder Lithology	GF	gravel, ferric rough-faced
Soil Landforms	Surface Boulder Lithology	GR	granulite
Soil Landforms	Surface Boulder Lithology	IS	ironstone

Database Table	Field	Code	Description
Soil Landforms	Surface Boulder Lithology	KC	calcrete
Soil Landforms	Surface Boulder Lithology	M	same as substrate material
Soil Landforms	Surface Boulder Lithology	OT	other
Soil Landforms	Surface Boulder Lithology	OW	opalised wood
Soil Landforms	Surface Boulder Lithology	PU	pumice
Soil Landforms	Surface Boulder Lithology	QZ	quartz
Soil Landforms	Surface Boulder Lithology	R	same as rock outcrop
Soil Landforms	Surface Boulder Lithology	SS	shells
Soil Landforms	Surface Drainage	0	very poorly drained
Soil Landforms	Surface Drainage	1	poorly drained
Soil Landforms	Surface Drainage	2	imperfectly drained
Soil Landforms	Surface Drainage	3	moderately well drained
Soil Landforms	Surface Drainage	4	well drained
Soil Landforms	Surface Drainage	5	rapidly drained
Soil Landforms	Surface Gravel Abundance	A	abundant, 50-90%
Soil Landforms	Surface Gravel Abundance	C	common, 10-20%
Soil Landforms	Surface Gravel Abundance	F	few, 2-10%
Soil Landforms	Surface Gravel Abundance	M	many, 20-50%
Soil Landforms	Surface Gravel Abundance	N	no coarse fragments, 0%
Soil Landforms	Surface Gravel Abundance	T	very abundant, >90%
Soil Landforms	Surface Gravel Abundance	V	very few, <2%
Soil Landforms	Surface Gravel Lithology	CC	charcoal
Soil Landforms	Surface Gravel Lithology	GC	gravel, ferric smooth-faced
Soil Landforms	Surface Gravel Lithology	GF	gravel, ferric rough-faced
Soil Landforms	Surface Gravel Lithology	GR	granulite
Soil Landforms	Surface Gravel Lithology	IS	ironstone
Soil Landforms	Surface Gravel Lithology	KC	calcrete
Soil Landforms	Surface Gravel Lithology	M	same as substrate material
Soil Landforms	Surface Gravel Lithology	OT	other
Soil Landforms	Surface Gravel Lithology	OW	opalised wood
Soil Landforms	Surface Gravel Lithology	PU	pumice
Soil Landforms	Surface Gravel Lithology	QZ	quartz
Soil Landforms	Surface Gravel Lithology	R	same as rock outcrop
Soil Landforms	Surface Gravel Lithology	SS	shells
Soil Landforms	Surface Segregation Abundance	A	abundant, >50%
Soil Landforms	Surface Segregation Abundance	C	common, 10-20%
Soil Landforms	Surface Segregation Abundance	F	few, 2-10%
Soil Landforms	Surface Segregation Abundance	M	many, 20-50%
Soil Landforms	Surface Segregation Abundance	N	no segregations
Soil Landforms	Surface Segregation Abundance	V	very few, <2%
Soil Landforms	Surface Segregation Form	C	concretions
Soil Landforms	Surface Segregation Form	F	fragments
Soil Landforms	Surface Segregation Form	L	laminae
Soil Landforms	Surface Segregation Form	N	nodules
Soil Landforms	Surface Segregation Form	R	root linings
Soil Landforms	Surface Segregation Form	S	soft segregations
Soil Landforms	Surface Segregation Form	T	tubules
Soil Landforms	Surface Segregation Form	V	veins
Soil Landforms	Surface Segregation Form	X	crystals
Soil Landforms	Surface Segregation Nature	E	earthy
Soil Landforms	Surface Segregation Nature	F	ferruginous
Soil Landforms	Surface Segregation Nature	G	ferruginous- organic
Soil Landforms	Surface Segregation Nature	H	organic (Humified)
Soil Landforms	Surface Segregation Nature	K	calcerous
Soil Landforms	Surface Segregation Nature	L	argillaceous

Database Table	Field	Code	Description
Soil Landforms	Surface Segregation Nature	M	manganiferous
Soil Landforms	Surface Segregation Nature	N	ferromanganiferous
Soil Landforms	Surface Segregation Nature	O	other
Soil Landforms	Surface Segregation Nature	S	sulphurous
Soil Landforms	Surface Segregation Nature	U	unidentified
Soil Landforms	Surface Segregation Nature	Y	gypseous
Soil Landforms	Surface Segregation Nature	Z	saline (visible salt)
Soil Landforms	Surface Segregation Size	C	Coarse (6-20mm)
Soil Landforms	Surface Segregation Size	E	Extremely coarse (>60mm)
Soil Landforms	Surface Segregation Size	F	Fine (<2mm)
Soil Landforms	Surface Segregation Size	L	Very coarse, large (20-60mm)
Soil Landforms	Surface Segregation Size	M	Medium (2-6mm)
Soil Landforms	Surface Stone Abundance	A	abundant, 50-90%
Soil Landforms	Surface Stone Abundance	C	common, 10-20%
Soil Landforms	Surface Stone Abundance	F	few, 2-10%
Soil Landforms	Surface Stone Abundance	M	many, 20-50%
Soil Landforms	Surface Stone Abundance	N	no coarse fragments, 0%
Soil Landforms	Surface Stone Abundance	T	very abundant, >90%
Soil Landforms	Surface Stone Abundance	V	very few, <2%
Soil Landforms	Surface Stone Lithology	CC	charcoal
Soil Landforms	Surface Stone Lithology	GC	gravel, ferric smooth-faced
Soil Landforms	Surface Stone Lithology	GF	gravel, ferric rough-faced
Soil Landforms	Surface Stone Lithology	GR	granulite
Soil Landforms	Surface Stone Lithology	IS	ironstone
Soil Landforms	Surface Stone Lithology	KC	calcrete
Soil Landforms	Surface Stone Lithology	M	same as substrate material
Soil Landforms	Surface Stone Lithology	OT	other
Soil Landforms	Surface Stone Lithology	OW	opalised wood
Soil Landforms	Surface Stone Lithology	PU	pumice
Soil Landforms	Surface Stone Lithology	QZ	quartz
Soil Landforms	Surface Stone Lithology	R	same as rock outcrop
Soil Landforms	Surface Stone Lithology	SS	shells
Soil Profile	Carbonates	H	highly calcareous, moderately visible
Soil Profile	Carbonates	M	moderately calcareous, audible and slightly visible
Soil Profile	Carbonates	N	non-calcareous, no fizz
Soil Profile	Carbonates	S	slightly calcareous, lightly audible but not visible
Soil Profile	Carbonates	V	very highly calcareous, strong visible fizz
Soil Profile	Coarse Fragments Abundance	A	abundant, 50-90%
Soil Profile	Coarse Fragments Abundance	C	common, 10-20%
Soil Profile	Coarse Fragments Abundance	F	few, 2-10%
Soil Profile	Coarse Fragments Abundance	M	many, 20-50%
Soil Profile	Coarse Fragments Abundance	N	no coarse fragments, 0%
Soil Profile	Coarse Fragments Abundance	T	very abundant, >90%
Soil Profile	Coarse Fragments Abundance	V	very few, <2%
Soil Profile	Coarse Fragments Lithology	GC	gravel, ferric smooth-faced
Soil Profile	Coarse Fragments Lithology	GF	gravel, ferric rough-faced
Soil Profile	Coarse Fragments Lithology	GN	granite
Soil Profile	Coarse Fragments Lithology	GR	granulite
Soil Profile	Coarse Fragments Lithology	IS	ironstone
Soil Profile	Coarse Fragments Lithology	KC	calcrete
Soil Profile	Coarse Fragments Lithology	M	same as substrate
Soil Profile	Coarse Fragments Lithology	OT	other
Soil Profile	Coarse Fragments Lithology	QZ	quartz
Soil Profile	Coarse Fragments Lithology	UC	unconsolidated

Database Table	Field	Code	Description
Soil Profile	Coarse Fragments Size	1	2-6mm
Soil Profile	Coarse Fragments Size	2	6-20mm
Soil Profile	Coarse Fragments Size	3	20-60mm
Soil Profile	Coarse Fragments Size	4	60-200mm
Soil Profile	Coarse Fragments Size	5	200-600mm
Soil Profile	Coarse Fragments Size	6	600mm-2m
Soil Profile	Coarse Fragments Size	7	>2m
Soil Profile	Coarse Fragments Shape	A	angular
Soil Profile	Coarse Fragments Shape	S	subangular
Soil Profile	Coarse Fragments Shape	U	subrounded
Soil Profile	Field Texture Grade	CL	Clay loam
Soil Profile	Field Texture Grade	CS	Clayey sand, ribbon 5-15mm
Soil Profile	Field Texture Grade	HC	Heavy clay
Soil Profile	Field Texture Grade	L	Loam
Soil Profile	Field Texture Grade	LC	Light clay
Soil Profile	Field Texture Grade	LMC	Light medium clay
Soil Profile	Field Texture Grade	LS	Loamy sand, ribbon 5mm
Soil Profile	Field Texture Grade	MC	Medium clay
Soil Profile	Field Texture Grade	S	Sand, no ribbon
Soil Profile	Field Texture Grade	SC	Sandy clay
Soil Profile	Field Texture Grade	SCL	Sandy clay loam
Soil Profile	Field Texture Grade	SCL	Sandy clay loam
Soil Profile	Field Texture Grade	SL	Sandy loam, ribbon 15-25mm
Soil Profile	Field Texture Grade	ZC	Silty clay
Soil Profile	Field Texture Grade	ZCL	Silty clay loam
Soil Profile	Field Texture Grade	ZL	Silt loam
Soil Profile	Horizon	A	First horizon
Soil Profile	Horizon	B	Second horizon
Soil Profile	Horizon	C	Third horizon
Soil Profile	Horizon	D	Fourth horizon
Soil Profile	Horizon Boundary Distinctness	A	abrupt (5-20mm)
Soil Profile	Horizon Boundary Distinctness	C	clear (20-50mm)
Soil Profile	Horizon Boundary Distinctness	D	diffuse (>100m)
Soil Profile	Horizon Boundary Distinctness	G	gradual (50-100mm)
Soil Profile	Horizon Boundary Distinctness	S	sharp (<5mm)
Soil Profile	Horizon Boundary Shape	B	broken
Soil Profile	Horizon Boundary Shape	I	irregular
Soil Profile	Horizon Boundary Shape	S	smooth
Soil Profile	Horizon Boundary Shape	T	tongued
Soil Profile	Horizon Boundary Shape	W	wavy
Soil Profile	Layer	1	Layer One
Soil Profile	Layer	2	Layer Two
Soil Profile	Layer	3	Layer Three
Soil Profile	Layer	4	Layer Four
Soil Profile	Layer	5	Layer Five
Soil Profile	Segregation Abundance	A	abundant, >50%
Soil Profile	Segregation Abundance	C	common, 10-20%
Soil Profile	Segregation Abundance	F	few, 2-10%
Soil Profile	Segregation Abundance	M	many, 20-50%
Soil Profile	Segregation Abundance	N	no segregations
Soil Profile	Segregation Abundance	V	very few, <2%
Soil Profile	Segregation Form	C	concretions
Soil Profile	Segregation Form	F	fragments
Soil Profile	Segregation Form	L	laminae
Soil Profile	Segregation Form	N	nodules
Soil Profile	Segregation Form	R	root linings
Soil Profile	Segregation Form	S	soft segregations

Database Table	Field	Code	Description
Soil Profile	Segregation Form	T	tubules
Soil Profile	Segregation Form	V	veins
Soil Profile	Segregation Form	X	crystals
Soil Profile	Segregation Nature	A	aluminous
Soil Profile	Segregation Nature	E	earthy
Soil Profile	Segregation Nature	F	ferruginous
Soil Profile	Segregation Nature	G	ferruginous- organic
Soil Profile	Segregation Nature	H	organic (Humified)
Soil Profile	Segregation Nature	K	calcerous
Soil Profile	Segregation Nature	L	argillaceous
Soil Profile	Segregation Nature	M	manganiferous
Soil Profile	Segregation Nature	N	ferromanganiferous
Soil Profile	Segregation Nature	O	other
Soil Profile	Segregation Nature	S	sulphurous
Soil Profile	Segregation Nature	U	unidentified
Soil Profile	Segregation Nature	Y	gypseous
Soil Profile	Segregation Nature	Z	saline (visible salt)
Soil Profile	Segregation Size	C	Coarse (6-20mm)
Soil Profile	Segregation Size	E	Extremely coarse (>60mm)
Soil Profile	Segregation Size	F	Fine (<2mm)
Soil Profile	Segregation Size	L	Very coarse, large (20-60mm)
Soil Profile	Segregation Size	M	Medium (2-6mm)
Soil Profile	Soil Drainage	0	very poorly drained
Soil Profile	Soil Drainage	1	poorly drained
Soil Profile	Soil Drainage	2	imperfectly drained
Soil Profile	Soil Drainage	3	moderately well drained
Soil Profile	Soil Drainage	4	well drained
Soil Profile	Soil Drainage	5	rapidly drained
Soil Profile	Soil Permeability	1	very slow
Soil Profile	Soil Permeability	2	slow
Soil Profile	Soil Permeability	3	moderately slow
Soil Profile	Soil Permeability	4	moderate
Soil Profile	Soil Permeability	5	moderately rapid
Soil Profile	Soil Permeability	6	rapid
Soil Profile	Soil Permeability	7	very rapid
Soil Profile	Soil Permeability	M	moderate
Soil Profile	Soil Permeability	R	rapid
Soil Profile	Soil Permeability	S	slow
Soil Profile	Structure	G	single grain (apedal)
Soil Profile	Structure	M	moderately pedal
Soil Profile	Structure	S	strongly pedal
Soil Profile	Structure	V	massive (apedal)
Soil Profile	Structure	W	weakly pedal
Soil Profile	Type of Soil Observation	A	auger boring
Soil Profile	Type of Soil Observation	C	relatively undisturbed soil core
Soil Profile	Type of Soil Observation	D	dual auger and pit
Soil Profile	Type of Soil Observation	E	existing vertical exposure
Soil Profile	Type of Soil Observation	P	soil pit
Vegetation	Cover	1	0-5% cover
Vegetation	Cover	2	5-25% cover
Vegetation	Cover	3	25-50% cover
Vegetation	Cover	4	50-75% cover
Vegetation	Cover	5	75-95% cover
Vegetation	Cover	6	95-100% cover
Vegetation	Growth Form	A	cycad
Vegetation	Growth Form	C	chenopod shrub
Vegetation	Growth Form	D	sod grass

Database Table	Field	Code	Description
Vegetation	Growth Form	E	fern
Vegetation	Growth Form	F	forb
Vegetation	Growth Form	G	tussock grass
Vegetation	Growth Form	H	hummock grass
Vegetation	Growth Form	L	vine
Vegetation	Growth Form	M	tree mallee
Vegetation	Growth Form	N	lichen
Vegetation	Growth Form	O	moss
Vegetation	Growth Form	P	palm
Vegetation	Growth Form	R	rush
Vegetation	Growth Form	S	shrub
Vegetation	Growth Form	T	tree
Vegetation	Growth Form	V	sedge
Vegetation	Growth Form	W	liverwort
Vegetation	Growth Form	X	Xanthorrhoea
Vegetation	Growth Form	Y	mallee shrub
Vegetation	Growth Form	Z	heath shrub
Vegetation	Height Class	1	<0.25m
Vegetation	Height Class	2	0.26-0.5m
Vegetation	Height Class	3	0.51-1m
Vegetation	Height Class	4	1.01-3m
Vegetation	Height Class	5	3.01-6m
Vegetation	Height Class	6	6.01-12m
Vegetation	Height Class	7	12.01-20m
Vegetation	Height Class	8	20.01-35m
Vegetation	Height Class	9	>35.01m
Vegetation	Height Class Name	Dwarf	T4, M1, S1, Y1, Z1, C1
Vegetation	Height Class Name	Extremely tall	T9, M6, S6, Y6, Z6, C6, H5, G5, F5, R5, V5, E5, D3, X3, N3, W3
Vegetation	Height Class Name	Low	T5, M2, S2, Y2, Z2, C2, H1, G1, F1, R1, V1, E1, D1, X1, N1, W1
Vegetation	Height Class Name	Mid-high	T6, M3, S3, Y3, Z3, C3, H2, G2, F2, R2, V2, E2
Vegetation	Height Class Name	Tall	T7, M4, S4, Y4, Z4, C4, H3, G3, F3, R3, V3, E3, D2, X2, N2, W2
Vegetation	Height Class Name	Very tall	T8, M5, S5, Y5, Z5, C5, H4, G4, F4, R4, V4, E4
Vegetation	Stratum	0	emergent, trees above tallest dominant stratum, up to 5% of total crown cover
Vegetation	Stratum	1	upper, tallest dominant stratum, av. distance between crowns overlapping to 20 times crown size
Vegetation	Stratum	2	middle, all layers between upper layer & 1m in height
Vegetation	Stratum	3	lower stratum, all vegetation up to 1m tall
Vegetation	Stratum	4	non-woody ground stratum
Vegetation	Stratum	2A	middle (upper)
Vegetation	Stratum	2B	middle (lower)
Vegetation	Stress	L	lerp
Vegetation	Stress	G	Gall
Vegetation	Stress	M	miner
Vegetation	Stress	S	sap

APPENDIX THREE: FLORA LIST

FAMILY NAME	SPECIES NAME	COMMON NAME[†]
CUPRESSACEAE	<i>Callitris roei</i> <i>Callitris tuberculata</i>	Roe's Cypress Pine
POACEAE	<i>Aira</i> sp. * <i>Aira cupaniana</i> <i>Amphipogon turbinatus</i> <i>Austrodanthonia acerosa</i> <i>Austrodanthonia caespitosa</i> <i>Austrostipa drummondii</i> <i>Austrostipa juncifolia</i> <i>Austrostipa puberula</i> <i>Austrostipa pycnostachya</i> <i>Austrostipa trichophylla</i> <i>Neurachne alopecuroidea</i> <i>Poaceae</i> sp. <i>Spartochloa scirpoidea</i>	Silvery Hairgrass Common Wallaby Grass Cottony Speargrass Foxtail Mulga Grass
CYPERACEAE	<i>Gahnia lanigera</i> <i>Gahnia</i> sp. L(K.R. Newbey 7888) <i>Lepidosperma brunonianum</i> <i>Lepidosperma carphoides</i> <i>Lepidosperma gracile</i> <i>Lepidosperma pruinosum</i> <i>Lepidosperma</i> sp (LG1.7) <i>Lepidosperma</i> sp.A2 "Island Flat" (Keighery 7000) <i>Mesomelaena preissii</i> <i>Mesomelaena pseudostygia</i> <i>Schoenus clandestinus</i> <i>Schoenus pleiostemoneus</i> <i>Schoenus</i> sp. <i>Schoenus</i> sp.A1 Boorabin (K. Wilson 2581) <i>Schoenus subflavus</i> <i>Tetraria capillaris</i>	Little Sedge Black Rapier Sedge Slender Sword Sedge Yellow Bog-rush Hair Sedge
RESTIONACEAE	<i>Anarthria polyphylla</i> <i>Desmocladius asper</i> <i>Desmocladius parthenicus</i> ms <i>Desmocladius virgatus</i> ms <i>Hypolaena caespitosa</i> <i>Lepidobolus chaetocephalus</i> <i>Lepidobolus preissianus</i> <i>Lepidobolus preissianus</i> subsp <i>preissianus</i> <i>Loxocarya cinerea</i> <i>Lyginia imberbis</i>	 Bristle-headed Chaff Rush
JUNCACEAE	<i>Juncus radula</i>	

[†] Common names sourced from Bennett, 1991.

* Denotes introduced species.

FAMILY NAME	SPECIES NAME	COMMON NAME [†]
DASYPOGONACEAE	<i>Calectasia grandiflora</i> sp. wheatbelt (A. Coates 4315)	Blue Tinsel Lily
	<i>Chamaexeros macranthera</i>	
	<i>Chamaexeros serra</i>	Little Fringe-leaf
	<i>Lomandra effusa</i>	Scented Matrush
	<i>Lomandra micrantha</i> subsp <i>micrantha</i>	Small-flower Mat-rush
	<i>Lomandra micrantha</i> subsp <i>teretifolia</i>	Small-flower Mat-rush
	<i>Lomandra mucronata</i>	
XANTHORRHOEACEAE	<i>Xanthorrhoea nana</i>	Dwarf Grasstree
PHORMIACEAE	<i>Dianella brevicaulis</i>	
	<i>Dianella revoluta</i>	Blueberry Lily
ANTHERICACEAE	<i>Laxmannia palaecea</i>	
	<i>Thysanotus patersonii</i>	Twining Fringe Lily
BORYACEAE	<i>Borya sphaerocephala</i>	Pincushions
HAEMODORACEAE	<i>Conostylis argentea</i>	
	<i>Conostylis petrophiloides</i>	
ORCHIDACEAE	<i>Burnettia nigricans</i>	Red Beak Orchid
CASUARINACEAE	<i>Allocasuarina acutivalvis</i>	
	<i>Allocasuarina campestris</i>	
	<i>Allocasuarina huegeliana</i>	Rock Sheoak
	<i>Allocasuarina humilis</i>	Dwarf Sheoak
	<i>Allocasuarina microstachya</i>	
	<i>Allocasuarina pinaster</i>	Compass Bush
	<i>Allocasuarina spinosissima</i>	
	<i>Allocasuarina thuyoides</i>	Horned Sheoak
PROTEACEAE	<i>Adenanthos flavidiflorus</i>	
	<i>Banksia media</i>	Southern Plains Banksia
	<i>Banksia prionotes</i>	Acorn Banksia
	<i>Banksia violacea</i>	Violet Banksia
	<i>Dryandra cirsioides</i>	
	<i>Dryandra cuneata</i>	Wedge-leaved Dryandra
	<i>Dryandra epimicta</i>	
	<i>Dryandra erythrocephala</i> var <i>erythrocephala</i>	
	<i>Dryandra ferruginea</i>	
	<i>Dryandra ferruginea</i> subsp <i>ferruginea</i>	
	<i>Dryandra pteridifolia</i>	Tangled Honeypot
	<i>Grevillea beardiana</i>	Red Combs
	<i>Grevillea biformis</i>	
	<i>Grevillea cagiana</i>	Red Toothbrushes
	<i>Grevillea disjuncta</i>	
	<i>Grevillea dolichopoda</i>	
	<i>Grevillea huegelii</i>	
	<i>Grevillea newbeyi</i>	
	<i>Grevillea oligantha</i>	
	<i>Grevillea prostrata</i>	Pallarup Grevillea
	<i>Grevillea teretifolia</i>	Round Leaf Grevillea
	<i>Grevillea uncinulata</i> subsp <i>uncinulata</i>	Hook-leaf Grevillea

[†] Common names sourced from Bennett, 1991.

FAMILY NAME	SPECIES NAME	COMMON NAME [†]
PROTEACEAE (cont.)	<i>Hakea brachyptera</i>	Short-winged Hakea
	<i>Hakea brownii</i>	
	<i>Hakea commutata</i>	
	<i>Hakea corymbosa</i>	Cauliflower Hakea
	<i>Hakea cygna</i> var <i>cygna</i>	Swan Fruit Hakea
	<i>Hakea erecta</i>	
	<i>Hakea horrida</i>	
	<i>Hakea incrassata</i>	Marble Hakea
	<i>Hakea laurina</i>	Pincushion Hakea
	<i>Hakea lissocarpa</i>	Honey Bush
	<i>Hakea multilineata</i>	Grass Leaf Hakea
	<i>Hakea newbeyana</i>	
	<i>Hakea nitida</i>	Frog Hakea
	<i>Hakea obliqua</i> subsp <i>parviflora</i>	Needles and Corks
	<i>Hakea pandanica</i> subsp <i>crassifolia</i>	
	<i>Hakea strumosa</i>	
	<i>Hakea subsulcata</i>	
	<i>Hakea trifurcata</i>	Two-leaf Hakea
	<i>Isopogon buxifolius</i>	
	<i>Isopogon teretifolius</i>	Nodding Coneflower
	<i>Isopogon villosus</i>	
	<i>Lambertia ilicifolia</i>	Holly-leaved Honeysuckle
	<i>Persoonia brevihachis</i>	
	<i>Persoonia coriacea</i>	Leathery-leaf Persoonia
	<i>Persoonia quinquenervis</i>	Kauberry
	<i>Persoonia striata</i>	
	<i>Petrophile brevifolia</i>	
	<i>Petrophile circinata</i>	
	<i>Petrophile ericifolia</i> subsp <i>ericifolia</i>	
	<i>Petrophile glauca</i>	
	<i>Petrophile merrallii</i>	
	<i>Petrophile rigida</i>	
	<i>Petrophile seminuda</i>	
	<i>Petrophile squamata</i> subsp <i>squamata</i>	
	<i>Synaphea</i> cf <i>tripartita</i>	
	<i>Synaphea</i> sp. Jilakin Flat Rock Rd	
	<i>Synaphea spinulosa</i> subsp <i>spinulosa</i>	
SANTALACEAE	<i>Choretrum glomeratum</i> var <i>chrysanthum</i>	Common Sour Bush
	<i>Exocarpus aphyllus</i>	Leafless Ballart
	<i>Leptomeria pachyclada</i>	
	<i>Leptomeria pauciflora</i>	Sparse-flowered Currant Bush
	<i>Leptomeria preissiana</i>	
CHENOPODIACEAE	<i>Santalum acuminatum</i>	Quandong
	<i>Atriplex paludosa</i> subsp <i>baudinii</i>	Marsh Saltbush
	<i>Atriplex vesicaria</i>	Bladder Saltbush
	<i>Enchylaena tomentosa</i>	Barrier Saltbush
	<i>Halosarcia pergranulata</i> subsp <i>pergranulata</i>	Blackseed Samphire
	<i>Halosarcia syncarpa</i>	
	<i>Rhagodia drummondii</i>	
	<i>Rhagodia priesii</i> subsp <i>priesii</i>	
	<i>Sclerolaena diacantha</i>	Grey Copperburr

[†] Common names sourced from Bennett, 1991.

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FAMILY NAME	SPECIES NAME	COMMON NAME [†]
PAPILIONACEAE (cont.)	<i>Daviesia lancifolia</i>	
	<i>Daviesia scoparia</i>	
	<i>Daviesia uncinata</i>	
	<i>Daviesia uniflora</i>	
	<i>Gastrolobium revolutum</i>	
	<i>Gastrolobium spinosum</i>	Prickly Poison
	<i>Gompholobium hendersonii</i>	
	<i>Gompholobium marginatum</i>	
	<i>Jacksonia racemosa</i>	
	<i>Mirbelia microphylla</i>	
	<i>Mirbelia trichocalyx</i>	
	<i>Nemcia cruciata</i> ms	
	<i>Nemcia punctata</i>	
	<i>Pultenaea conferta</i>	
	<i>Pultenaea verruculosa</i> var <i>brachyphylla</i>	
	<i>Pultenaea vestita</i>	
	<i>Templetonia sulcata</i>	Centipede Bush
RUTACEAE	<i>Boronia inornata</i> subsp <i>leptophylla</i>	Desert Boronia
	<i>Microcybe multiflora</i> subsp <i>baccharoides</i>	
	<i>Phebalium filifolium</i>	Slender Phebalium
	<i>Phebalium lepidotum</i>	
	<i>Phebalium microphyllum</i>	
	<i>Phebalium tuberculosum</i>	
POLYGALACEAE	<i>Comesperma integerrimum</i>	
EUPHORBIACEAE	<i>Beyeria brevifolia</i> var <i>brevipes</i>	
	<i>Stachystemon polyandrus</i>	
CELASTRACEAE	<i>Psammomoya choretroides</i>	
STACKHOUSIACEAE	<i>Stackhousia monogyna</i>	
	<i>Stackhousia muricata</i>	
SAPINDACEAE	<i>Dodonaea bursariifolia</i>	
	<i>Dodonea divaricata</i>	
	<i>Dodonaea pinifolia</i> var 1	
	<i>Dodonaea pinifolia</i> var 2	
RHAMNACEAE	<i>Cryptandra minutifolia</i>	
	<i>Cryptandra nutans</i>	
	<i>Spyridium cordatum</i>	
	<i>Spyridium microcephalum</i>	Small-headed Spyridium
	<i>Trymalium elachophyllum</i>	
MALVACEAE	<i>Lawrencia squamata</i>	
STERCULIACEAE	<i>Lasiopetalum rosmarinifolium</i>	
DILLENACEAE	<i>Hibbertia exasperata</i>	
	<i>Hibbertia gracilipes</i>	
THYMELAEACEAE	<i>Pimelea argentea</i>	Silvery-leaved Pimelea

[†] Common names sourced from Bennett, 1991.

FAMILY NAME	SPECIES NAME	COMMON NAME [†]
MYRTACEAE	<i>Agonis spathulata</i>	
	<i>Baeckea crispiflora</i>	
	<i>Baeckea preissiana</i>	
	<i>Baeckea aff preissiana</i>	
	<i>Beaufortia micrantha</i>	Little Bottlebrush
	<i>Beaufortia micrantha</i> var <i>micrantha</i>	Little Bottlebrush
	<i>Beaufortia micrantha</i> var <i>puberula</i>	Little Bottlebrush
	<i>Beaufortia schaueri</i>	Pink Bottlebrush
	<i>Calothamnus quadrifidus</i>	One-sided Bottlebrush
	<i>Calytrix breviseta</i> subsp <i>stipulosa</i>	
	<i>Calytrix leschenaultii</i>	
	<i>Calytrix simplex</i> subsp <i>suboppositifolia</i>	
	<i>Chamelaucium ciliatum</i>	
	<i>Darwinia inconspicua</i>	
	<i>Eremaea pauciflora</i>	
	<i>Eucalyptus albida</i>	White-leaved Mallee
	<i>Eucalyptus annulata</i>	Open-fruited Mallee
	<i>Eucalyptus argyphaea</i>	Silver Mallet
	<i>Eucalyptus calycogona</i>	Red or Gooseberry Mallee
	<i>Eucalyptus calycogona</i> var <i>calycogona</i>	Red or Gooseberry Mallee
	<i>Eucalyptus capillosa</i> subsp <i>polyclada</i>	Mallee Wandoo
	<i>Eucalyptus eremophila</i>	Tall Sand Mallee
	<i>Eucalyptus flocktoniae</i>	Merrit
	<i>Eucalyptus kondininensis</i>	Kondinin Blackbutt
	<i>Eucalyptus occidentalis</i>	Flat-topped Yate
	<i>Eucalyptus perangusta</i>	
	<i>Eucalyptus phaenophylla</i> subsp <i>phaenophylla</i>	
	<i>Eucalyptus phenax</i>	
	<i>Eucalyptus pileata</i>	Capped Mallee
	<i>Eucalyptus platypus</i> subsp <i>platypus</i>	Moort
	<i>Eucalyptus salmonophloia</i>	Salmon Gum
	<i>Eucalyptus salubris</i>	Gimlet
	<i>Eucalyptus scyphocalyx</i>	Goblet Mallee
	<i>Eucalyptus sporadica</i> ms	
	<i>Eucalyptus sporadica</i> subsp <i>sporadica</i> ms	
	<i>Eucalyptus suggrandis</i> subsp <i>alipes</i>	
	<i>Eucalyptus tetragona</i>	Tallerack
	<i>Eucalyptus uncinata</i>	Hook-leaved Mallee
	<i>Eucalyptus urna</i>	
	<i>Leptospermum erubescens</i>	Roadside Tea Tree
	<i>Leptospermum inelegans</i>	
	<i>Leptospermum nitens</i>	
	<i>Leptospermum spinescens</i>	
	<i>Melaleuca acuminata</i>	
	<i>Melaleuca adnata</i>	
	<i>Melaleuca brophyi</i> ms	
	<i>Melaleuca carrii</i> ms	
	<i>Melaleuca coronicarpa</i>	
	<i>Melaleuca depauperata</i>	
	<i>Melaleuca eleuterostachya</i>	
	<i>Melaleuca elliptica</i>	Granite Bottlebrush
	<i>Melaleuca glaberrima</i>	
	<i>Melaleuca haplantha</i>	
	<i>Melaleuca lateralis</i>	

[†] Common names sourced from Bennett, 1991.

FAMILY NAME	SPECIES NAME	COMMON NAME [†]
MYRTACEAE (cont.)	<i>Melaleuca lateriflora</i> subsp <i>lateriflora</i>	Gorada
	<i>Melaleuca laxiflora</i>	
	<i>Melaleuca lecanantha</i>	
	<i>Melaleuca pauperiflora</i>	Boree
	<i>Melaleuca platycalyx</i>	
	<i>Melaleuca pungens</i> var 1	
	<i>Melaleuca pungens</i> var 2	
	<i>Melaleuca sapientes</i> ms	
	<i>Melaleuca societatis</i> ms	
	<i>Melaleuca</i> sp.2	
	<i>Melaleuca</i> sp.3	
	<i>Melaleuca</i> sp.6	
	<i>Melaleuca</i> sp.8	
	<i>Melaleuca spicigera</i>	
	<i>Melaleuca strobophylla</i>	
	<i>Melaleuca subfalcata</i>	
	<i>Melaleuca subtrigona</i>	
	<i>Melaleuca thyoides</i>	
	<i>Melaleuca ?torquata</i>	
	<i>Melaleuca tuberculata</i> var <i>macrophylla</i>	
	<i>Melaleuca uncinata</i>	Broom Bush
	<i>Melaleuca undulata</i>	Hidden Honey-myrtle
	<i>Myrtaceae</i> sp.1	
	<i>Rinzia affinis</i>	
	<i>Thryptomene cuspidata</i>	
	<i>Verticordia acerosa</i>	
	<i>Verticordia chrysantha</i>	
	<i>Verticordia chrysanthella</i>	
	<i>Verticordia densiflora</i>	Compacted Featherflower
	<i>Verticordia endlicheriana</i> var <i>major</i>	
	<i>Verticordia grandiflora</i>	Claw Featherflower
	<i>Verticordia habrantha</i>	Hidden Featherflower
	<i>Verticordia picta</i>	Painted Featherflower
	<i>Verticordia roei</i> subsp <i>roei</i>	Roe's Featherflower
	<i>Verticordia serrata</i> var. <i>serrata</i>	
	<i>Verticordia tumida</i> subsp <i>therogona</i>	
APIACEAE	<i>Platysace trachymenioides</i>	
EPACRIDACEAE	<i>Andersonia aff sprengelioides</i>	
	<i>Andersonia sprengelioides</i>	
	<i>Astroloma compactum</i>	
	<i>Astroloma epacridis</i> var	
	<i>Astroloma serratifolium</i>	Kondrung
	<i>Brachyloma</i> sp.	
	<i>Conostephium roei</i>	
	<i>Leucopogon concinnus</i>	
	<i>Leucopogon constephiodes</i> var 1	
	<i>Leucopogon constephioides</i> var 2	
	<i>Leucopogon cuneifolius</i>	
	<i>Leucopogon dielsianus</i>	
	<i>Leucopogon minutifolius</i>	
	<i>Leucopogon</i> sp. Wheatbelt (S. Murray 257)	
	<i>Leucopogon</i> sp. Kau Rock (M.A. Burgman 1126)	

[†] Common names sourced from Bennett, 1991.

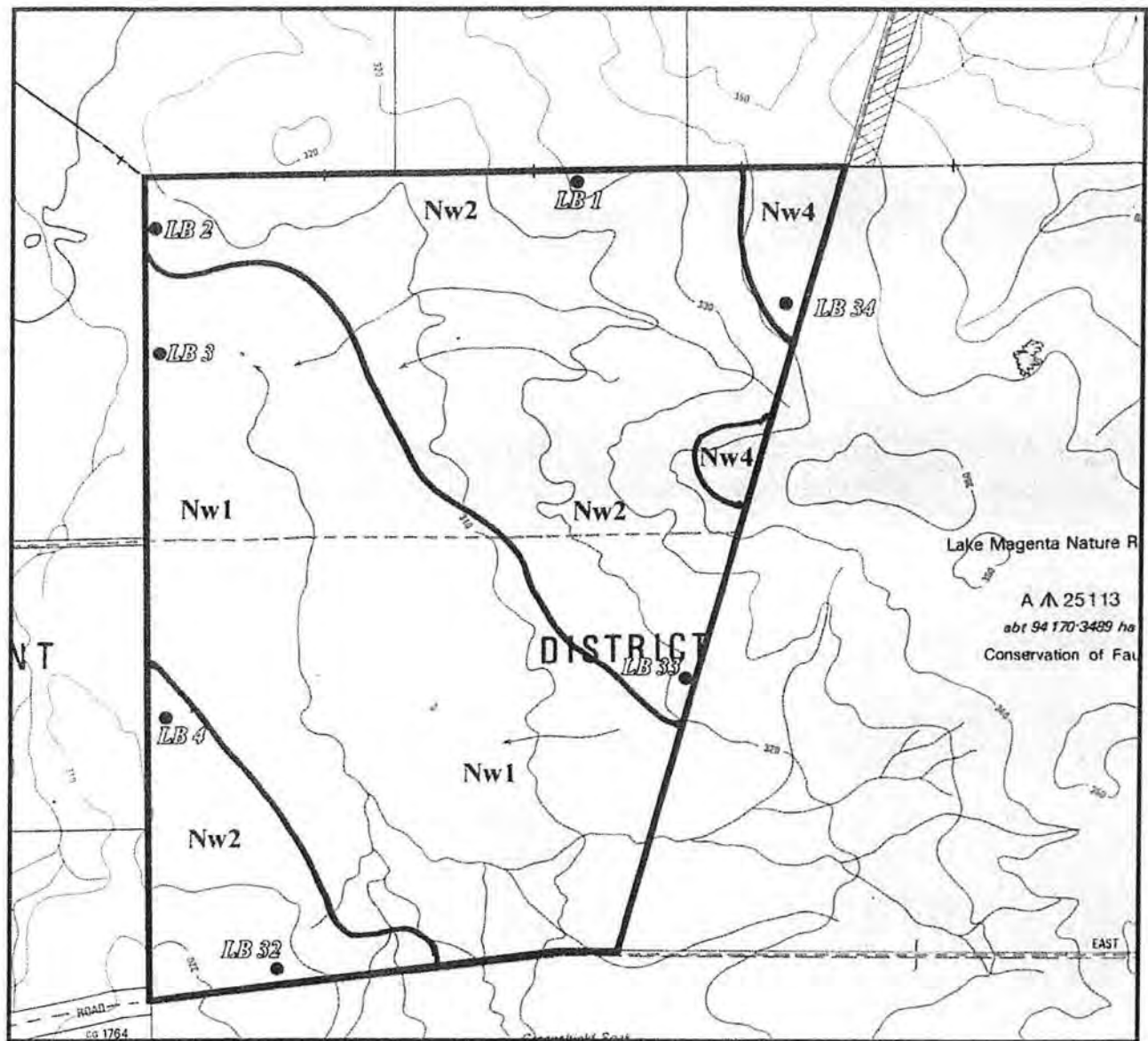
FAMILY NAME	SPECIES NAME	COMMON NAME [†]
EPACRIDACEAE (cont.)	<i>Leucopogon tamminensis</i> var <i>australis</i> <i>Lysinema ciliatum</i> <i>Styphelia intertexta</i>	Curry Flower
GENTIANACEAE	* <i>Centaurium erythraea</i>	Common Centaury
APOCYNACEAE	<i>Alyxia buxifolia</i>	Dysentery Bush
CONVOLVULACEAE	<i>Wilsonia humilis</i>	Silky Wilsonia
CHLOANTHACEAE	<i>Dicrastylis corymbosa</i>	
LAMIACEAE	<i>Hemigenia</i> sp. <i>Microcorys glabra</i> <i>Westringia cephalantha</i> <i>Westringia rigida</i>	Stiff Westringia
MYOPORACEAE	<i>Eremophila decipiens</i>	Slender Fuchsia
LOBELIACEAE	<i>Lobelia</i> sp.	
GOODENIACEAE	<i>Cooperhooia strophilata</i> <i>Dampiera lavendulacea</i> <i>Dampiera juncea</i> <i>Lechenaultia brevifolia</i> <i>Scaevola spinescens</i>	Rush-like Dampiera Currant Bush
STYLIDIACEAE	<i>Stylidium neglectum</i> <i>Stylidium repens</i>	Neglected Stylidium Matted Triggerplant
ASTERACEAE	<i>Argentipallium niveum</i> <i>Centipeda cunninghamii</i> <i>Helichrysum leucosideum</i> * <i>Hypochaeris</i> sp. <i>Olearia dampieri</i> subsp <i>eremicola</i> <i>Olearia muelleri</i> <i>Olearia ramosissima</i> <i>Ozothamnus lepidophyllus</i> * <i>Pseudognaphallium luteoalbum</i> <i>Ursinia anthemoides</i> * <i>Vellereophyton dealbatum</i> <i>Vittadinia gracilis</i> <i>Waitzia acuminata</i>	Common Sneezewood Goldfields Daisy Much-branched Daisy Bush Jersey Cudweed Ursinia White Cudweed Fuzzweed Orange Immortelle

[†] Common names sourced from Bennett, 1991.

* Denotes introduced species.

SECTION TWO: QUADRAT DESCRIPTIONS

Reserve 25113 - (Part) Lake Magenta Nature Reserve



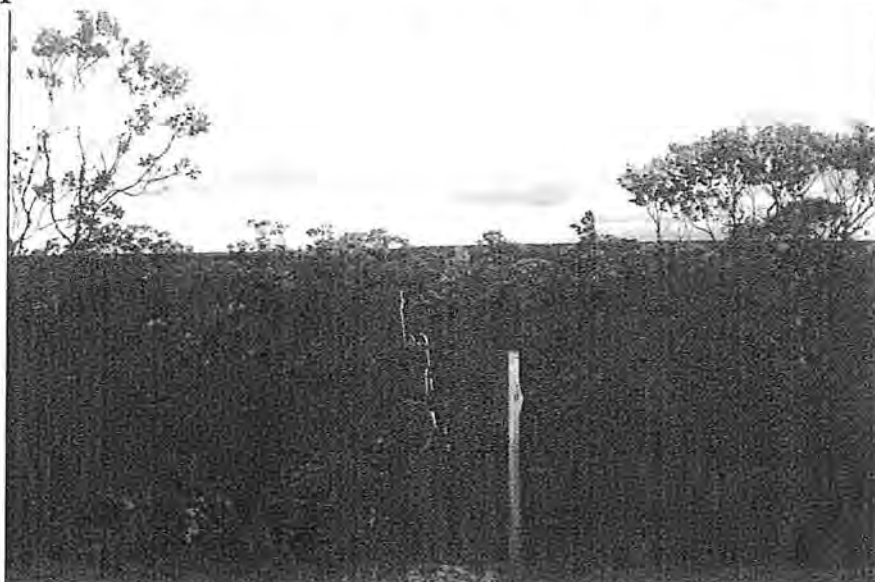
North ↑

Scale 1:50,000

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Reserve 25113 - Lake Magenta Nature Reserve

Quadrat LB01



Tall sparse emergent mallees of *Eucalyptus tetragona* over tall sparse shrubland of *Grevillea cagiana* over mid-high heathland of *Hakea cygna* subsp. *cygna*, *H. pandanocarpa* subsp. *crassifolia*, *Allocasuarina pinaster*, *Conostephium roei*, *Dryandra cuneata*, *D. erythrocephala* var *erythrocephala*, *Eremaea pauciflora*, *Isopogon teretifolius*, *Lysinema ciliatum* and *Leptospermum inelegans* and low heathland of *Acacia pyconcephala*, *Adenanthos flavidiflorus*, *Agonis spathulata*, *Allocasuarina humilis*, *Baeckea preissiana*, *Banksia violacea*, *Beaufortia micrantha*, *Choretrum glomeratum* var *chrysanthum*, *Daviesia audax*, *D. uncinata*, *Dryandra ferruginea*, *D. pteridifolia*, *Gompholobium hendersonii*, *Lambertia ilicifolia*, *Leptospermum spinescens*, *Petrophile brevifolia*, *P. glauca*, *P. merrallii*, *Stachystemon polyandrus*, *Verticordia chrysantha* and *V. tumida* subsp. *therogona* and dwarf heathland of *Andersonia* aff *sprengelioides*, *Calectasia grandiflora* sp. wheatbelt (A Coates 4315), *Daviesia lancifolia*, *Dryandra cirsioides*, *Hibbertia gracilipes*, *Isopogon villosus*, *Leptomeria pauciflora*, *Leucopogon* sp. Wheatbelt (S. Murray 257), *Petrophile circinate* and *Rinzea affinis* over low sparse forbland of *Chamaexeros serra*, *Conostylis petrophiloides*, *Dampiera juncea*, *Drosera androscea* and *Laxmannia palaeacea* and low sparse sedgeland of *Schoenus* sp. A1 Boorabin (K Wilson 2581).

Quadrat LB02



Tall heathland of *Leptospermum erubescens* and mid-high heathland of *Hakea cygna* subsp. *cygna*, *H. incrassata*, *Acacia multispicata*, *Verticordia roei* subsp *roei*, *Isopogon teretifolius*, *Leptospermum inelegans*, *Melaleuca carriei* ms, *M. platycalyx*, *Phebalium microphyllum* and *Santalum acuminatum* and low heathland of *Allocasuarina microstachya*, *Baeckea crispiflora*, *B. preissiana*, *Dodonaea divaricata*, *D. pinifolia* var 2, *Dryandra cirsioides*, *Grevillea dolichopoda*, *Grevillea teretifolia*, *Leucopogon dielsianus*, *Melaleuca subtrigona*, *Petrophile brevifolia*, *Synaphea* sp. Jilakin Flat Rock Rd, *Verticordia acerosa*, *V. roei* subsp. *roei* and *V. tumida* subsp. *therogona* and dwarf heathland of *Choretrum glomeratum* var *chrysanthum* and *Persoonia striata* over low forbland of *Platysace trachymenioides* over mid-high sedgeland of *Lepidosperma brunonianum*, *Lepidosperma* sp. A2 "Island Flat" (Keighery 7000), *Mesmolaena pseudostygia* and *M. preissii* and low sedgeland of *Schoenus clandestinus* and low forbland of *Chamaexeros macranthera* and *C. serra*.

Reserve 25113 - Lake Magenta Nature Reserve

Quadrat LB03



Low isolated emergent trees of *Banksia prionotes* over tall sparse shrubland of *Leptospermum erubescens* and mid-high to tall sparse heath of *Eremaea pauciflora*, *Hakea corymbosa* and *H. obliqua* subsp. *parviflora* over mid-high heathland of *Daviesia incrassata* subsp. *teres*, *Hakea brachyptera*, *Isopogon buxifolius*, *Lysinema ciliatum*, *Melaleuca tuberculata* var *macrophylla* and *Verticordia acerosa* and low heathland of *Andersonia sprengelioides*, *Baeckea* aff *preissiana*, *Hibbertia gracilipes*, *Leucopogon constephioides* var 2, *Persoonia striata* and *Petrophile rigida* and dwarf heathland of *Conostephium roei*, *Jacksonia racemosa* and *Lechenaultia brevifolia* over mid-high sparse sedgeland of *Hypolaena caespitosa*, *Lepidosperma pruinosum* and *Lyginia imberbis* and low sparse sedgeland of *Loxocarya cinerea* and dwarf sparse sedgeland of *Desmocladius parthenicus* ms and low sparse forbland of *Drosera* sp.1 and *Stylidium repens* and low sparse grassland of *Neurachne alopecuroidea*.

Quadrat LB04



Low open forest of *Eucalyptus annulata* mallet over tall open shrubland of *Melaleuca acuminata* shrubland over mid-high open heath of *Melaleuca adnata*, *M. ?lateralis*, *M. ?torquata*, *M. societatis* ms and *Melaleuca* sp.2 and low open heath of *Hakea commutata* and low sparse chenopod shrubland of *Rhagodia priessii* subsp. *priessii* over mid-high sparse sedgeland of *Lepidosperma pruinosum* and low sparse grassland of *Austrostipa pycnostachya*.

Reserve 25113 - Lake Magenta Nature Reserve**Quadrat LB32**

Very tall open mallee forest of *Eucalyptus scyphocalyx*, *E. eremophila* and *E. flocktoniae* over tall open shrubland of *Melaleuca sapientes* ms and *Santalum acuminatum* over tall heathland of *Melaleuca coronicarpa* and *Melaleuca societatis* ms over mid-high shrubland of *Melaleuca lateriflora* subsp. *lateriflora* and *Melaleuca uncinata* over mid-high to dwarf open heath of *Daviesia benthamii* subsp. *acanthoclona*, *Boronia inornata* subsp. *leptophylla*, *Baeckea* sp. Burngup, *Dodonaea bursariifolia*, *Grevillea huegelii*, *Grevillea oligantha*, *Hakea newbeyana*, *Melaleuca adnata*, *Pultenaea conferta*, *Spyridium cordatum*, *Spyridium microcephalum*, *Templetonia sulcata* and *Westringia rigida* over mid-high to low sedgeland of *Gahnia lanigera* and *Lepidosperma brunonianum*, mid-high forbland of *Dianella brevicaulis* and low grassland of *Neurachne alopecuroides*.

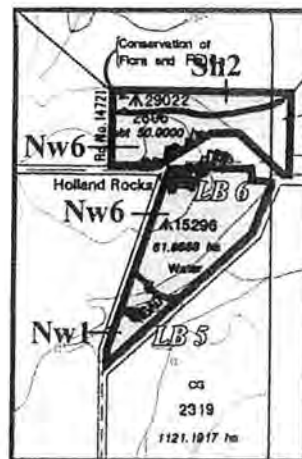
Quadrat LB33

Very tall open mallee forest of *Eucalyptus eremophila* and *E. pileata* with *E. flocktoniae* over mid-high to tall shrubland of *Melaleuca lateriflora* subsp. *lateriflora*, *Melaleuca pauperiflora* and *Melaleuca societatis* ms and mid-high heathland of *Exocarpus aphyllus* over mid-high open heath of *Boronia inornata* subsp. *leptophylla*, *Daviesia benthamii* subsp. *acanthoclona* and *Melaleuca coronicarpa*, and low open heath of *Grevillea huegelii*, *Grevillea oligantha*, *Grevillea prostrata*, *Hakea commutata*, *Microcorys glabra*, *Styphelia intertexta*, *Templetonia sulcata*, and dwarf open heath of *Acacia brachyclada*, *Coopermookia strophiolata*, *Olearia ramosissima*, *Ozothamnus lepidophyllus* and *Pultenaea conferta*.

Reserve 25113 - Lake Magenta Nature Reserve**Quadrat LB34**

Low open forest of *Eucalyptus annulata* mallet over tall open shrubland of *Melaleuca acuminata* shrubland over mid-high open heath of *Melaleuca adnata*, *Melaleuca ?lateralis*, *Melaleuca ?torquata*, *Melaleuca societatis* ms and *Melaleuca* sp.2 and low open heath of *Hakea commutata* and low sparse chenopod shrubland of *Rhagodia priesii* subsp. *priesii* over mid-high sparse sedgeland of *Lepidosperma pruinsum* and low sparse grassland of *Austrostipa pycnostachya*.

**Reserve 29022 – Hollands Rock Nature Reserve and
Reserve 15296 – Water Reserve**



North ↑

Scale 1:50,000

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Reserve 29022 – Hollands Rock Nature Reserve & Reserve 15296 Water Reserve

Quadrat LB05



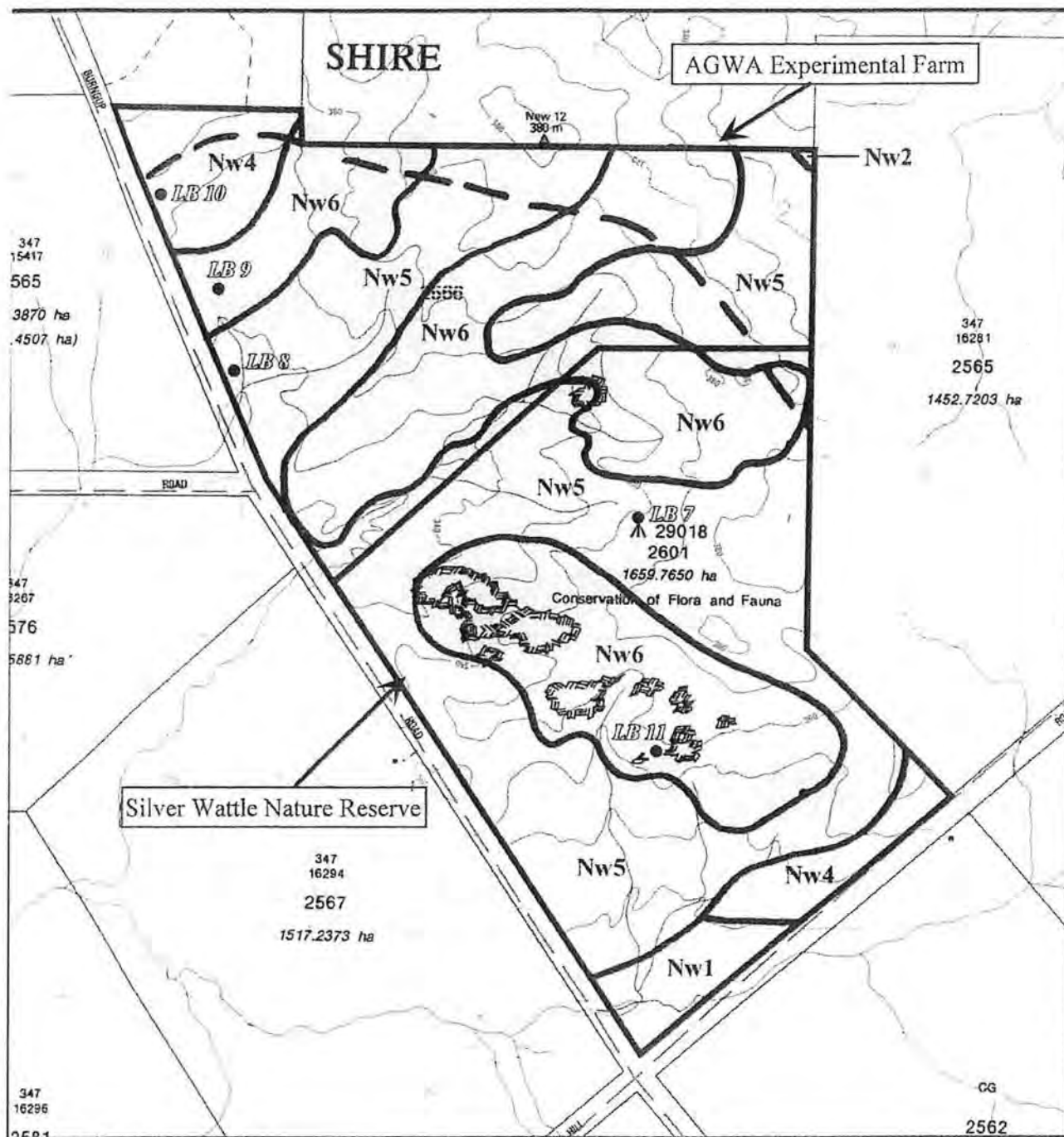
Tall open forest of *Eucalyptus salmonophloia* over tall open shrubland of *Pimelea argentea* and *Olearia dampieri* subsp. *eremicola* and mid-high open shrubland of *Dodonaea pinifolia* var 1 and mid-high open heath of *Leptomeria preissiana* over mid-high sparse shrubland of *Melaleuca carriei* ms and *Senna artemisioides* subsp. *filifolia* and low sparse heath of *Grevillea huegelii* and *Acacia lasiocarpa* over mid-high rushland of *Lomandra effusa* and mid-high sedgeland of *Gahnia lanigera* and *Lepidosperma brunonianum* and mid-high grassland of *Austrostipa drummondii* and *Austrostipa puberula* and low sedgeland of *Lepidosperma pruinatum* and *Ptilotus drummondii* var *minor* and low grassland of *Aira cupaniana* and *Neurachne alopecuroides* and low forbland of *Helichrysum leucosideum* and *Ursinia anthemoides*.

Quadrat LB06



Low open forest of *Allocasuarina huegeliana* over tall sparse shrubland of *Leptospermum erubescens*, *Melaleuca elliptica*, *Baeckea crispiflora* and *Santalum acuminatum* over low sparse heath of *Dodonaea pinifolia* var 2 and *Calytrix leschenaultii* over tall open grassland of *Austrostipa drummondii* and low open grassland of *Austrodanthonia caespitosa*, *Neurachne alopecuroides* and *Aira cupaniana* and tall open sedgeland of *Lepidosperma brunonianum* and *Lepidosperma gracile* and low open sedgeland of *Lepidobolus preissianus* subsp. *preissianus* and *Lepidosperma* sp (LG1.7) and low open forbland of *Borya sphaerocephala*, *Drosera macrantha* subsp. *macrantha* and *Dampiera lavendulacea*.

**Reserve 24920 – Agriculture WA Experimental Farm and
Reserve 29018 – Silver Wattle Nature Reserve**



North ↑

Scale 1:50,000

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Reserve 29018 – Silver Wattle Nature Reserve

Quadrat LB07



Very tall open mallee forest of *Eucalyptus flocktoniae*, *E. eremophila*, *E. calycogona* and *E. pileata* over tall heathland of *Melaleuca lateriflora* subsp. *lateriflora* and *Hakea commutata* over mid-high closed heathland of *Melaleuca carriei* ms, *Melaleuca coronicarpa*, *Melaleuca adnata*, *Melaleuca sapientes* ms, *Melaleuca subfalcata*, *Daviesia benthamii* subsp. *acanthoclona*, *Exocarpus aphyllus*, *Grevillea beardiana* and low closed heathland of *Acacia merrallii* and *Grevillea huegelii* and dwarf closed heathland of *Acacia glaucoptera*.

Quadrat LB11



Mid-high open forest of *Eucalyptus salubris* mallet over tall sparse shrubland of *Melaleuca lateriflora* subsp. *lateriflora* and *M. pauperiflora* and tall open heath of *Melaleuca coronicarpa*, *M. adnata* and *Exocarpus aphyllus* over low sparse heath of *Olearia muelleri* and *Templetonia sulcata* over mid-high sparse sedgeland of *Lepidosperma brunonianum* and low open forbland of *Wilsonia humilis* and low to mid-high open grassland of *Austrostipa trichophylla* and *Austroanthonia acerosa*.

Reserve 24920 – Agriculture WA Experimental Farm

Quadrat LB08



Very tall sparse emergent shrubs *Allocasuarina campestris* and tall sparse emergent heath shrubs of *Hakea cygna* subsp. *cygna* and *Grevillea biformis* over mid-high heathland of *Hakea incrassata*, *Melaleuca platycalyx*, *Melaleuca tuberculata* var *macrophylla* and *Persoonia coriacea* and low heathland of *Acacia mimica* subsp *mimica*, *Allocasuarina microstachya*, *Astroloma serratifolium*, *Baeckea crispiflora*, *Beaufortia micrantha*, *B. micrantha* var *puberula*, *Calectasia grandiflora* sp. wheatbelt (A. Coates 4315), *Calytrix breviseta* subsp. *stipulosa*, *Cryptandra nutans*, *Daviesia uncinata*, *Gompholobium hendersonii*, *Grevillea uncinulata* subsp. *uncinulata*, *Isopogon teretifolius*, *Leucopogon dielsianus*, *Leucopogon* sp. Wheatbelt (S. Murray 257), *Melaleuca glaberrima*, *M. lecanantha*, *Mirbelia trichocalyx*, *Persoonia brevihachis*, *Petrophile seminuda*, *Psammomoya choretroides*, *Verticordia chrysanthella*, *Verticordia picta* and *Verticordia roei* subsp. *roei* over low sparse sedgeland of *Schoenus pleiostemoneus*, *Schoenus* sp.A1 Boorabin (K. Wilson 2581), *Gahnia lanigera*, *Mesmolaena pseudostygia* and *Lepidobolus preissianus* and low sparse forbland of *Conostylis argentea*, *Chamaexeros serra* and *Drosera* sp.2.

Quadrat LB09



Tall open forest of *Eucalyptus occidentalis* over tall open shrubland of *Melaleuca acuminata* over low sparse heath of *Pimelea argentea* over low sparse grassland of *Austrostipa trichophylla*.

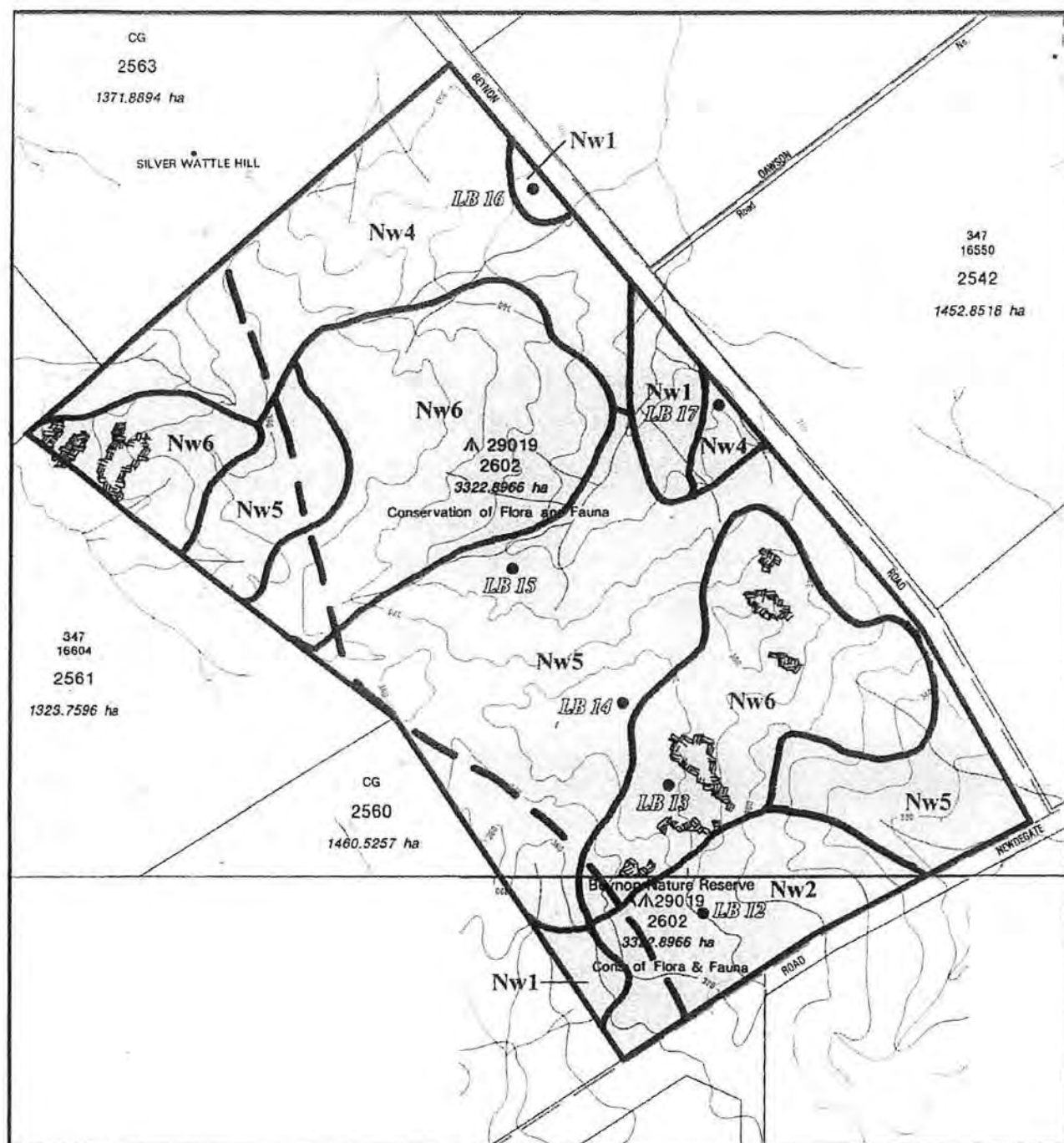
Reserve 24920 – Agriculture WA Experimental Farm

Quadrat LB10



Very tall to tall open mallee woodland of *Eucalyptus albida* and *Eucalyptus sporadica* ms over tall open shrubland of *Hakea cygna* subsp. *cygna* and tall open heath of *Melaleuca tuberculata* var *macrophylla*, *Hakea ?lissocarpa* and *H. pandanica* subsp. *crassifolia* over mid-high heathland of *Allocasuarina thuyoides*, *Banksia violacea*, *Dryandra cirsioides*, *D. erythrocephala* var *erythrocephala*, *Hakea brownii*, *H. incrassata*, *Leptospermum inegans*, *Leucopogon dielsianus*, *Melaleuca pungens* var 1, *Persoonia breviflora*, *P. coriacea*, *P. quinquenervis*, *Verticordia chrysanthella*, *V. habrantha* and *V. serrata* var *serrata* and low heathland of *Adenanthos flavidiflorus*, *Allocasuarina microstachya*, *Baeckea preissiana*, *B. crispiflora*, *Beaufortia micrantha*, *B. micrantha* var *micrantha*, *Calectasia grandiflora* sp. wheatbelt (A. Coates 4315), *Calytrix leschenaultii*, *Dryandra pteridifolia*, *Hemigenia* sp., *Hibbertia exasperata*, *H. gracilipes*, *Jacksonia racemosa*, *Leucopogon* sp. Wheatbelt (S. Murray 257), *Lysinema ciliatum*, *Persoonia striata*, *Petrophile glauca*, *Psammomoya choretroides*, *Verticordia chrysantha* and *V. picta* and dwarf heathland of *Acacia chrysocephala* and *Melaleuca glaberrima* and tall open grasstrees of *Xanthorrhoea nana* over low open rushland of *Lomandra mucronata* and mid-high open sedgeland of *Lepidosperma brunonianum*, *Desmocladius virgatus* ms and *Mesomelaena preissii* and low open forbland of *Conostylis argentea*, *C. petrophiloides*, *Drosera barbigera* and *Laxmannia palaeacea* and vines of *Thysanotus patersonii*.

Reserve 29019 – Breakaway Ridge Nature Reserve



North ↑
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Reserve 29019 – Breakaway Ridge Nature Reserve

Quadrat LB12



Tall open mallee woodland of *Eucalyptus albida* and *E. tetragona* over tall sparse shrubland of *Allocasuarina pinaster*, *Grevillea cagiana* and *Callitris roei* and tall sparse heath of *Dryandra cuneata*, *Hakea cygna* subsp. *cygna*, *Hakea pandanica* subsp. *crassifolia*, *Isopogon buxifolius* and *Melaleuca pungens* var 1 over mid-high heathland of *Allocasuarina microstachya*, *Beaufortia schaueri*, *Dryandra cirsioides*, *D. erythrocephala* var *erythrocephala*, *D. ferruginea*, *Isopogon teretifolius*, *I. villosus*, *Melaleuca tuberculata* var *macrophylla* and *Pultenaea vestita* and low heathland of *Astroloma serratifolium*, *Baeckea preissiana*, *Banksia violacea*, *Beaufortia micrantha*, *B. micrantha* var *puberula*, *Calytrix simplex* subsp. *suboppositifolia*, *Daviesia uncinata*, *Dryandra pteridifolia*, *Gastrolobium spinosum*, *Gompholobium marginatum*, *Hemigenia* sp., *Hibbertia gracilipes*, *Jacksonia racemosa*, *Leucopogon* sp. Wheatbelt (S. Murray 257), *L. tamminensis* var *australis*, *Lysinema ciliatum*, *Melaleuca carriei* ms, *Persoonia striata*, *Petrophile glauca*, *Synaphea* cf *?tripartita* and *Verticordia grandiflora* over low open rushland of *Lomandra mucronata* and low open sedgeland of *Gahnia lanigera*, *Mesomelaena pseudostygia* and *Schoenus* sp.A1 Boorabin (K. Wilson 2581) and low open forbland of *Conostylis petrophiloides* and *Dampiera juncea*.

Quadrat LB13



Tall shrubland of *Allocasuarina campestris*, *Thryptomene cuspidata*, *Santalum acuminatum*, *Melaleuca depauperata*, *M. elliptica*, *M. lateriflora* subsp. *lateriflora*, *M. laxiflora* and *M. uncinata* over low heathland of *Melaleuca spicigera* and *Mirbelia microphylla* over tall sparse sedgeland of *Lepidosperma* sp.A2 "Island Flat" (Keighery 7000) and mid-high sparse sedgeland of *Lepidosperma gracile* and low sparse sedgeland of *Lepidobolus preissianus* and low sparse forbland of *Borya sphaerocephala*, *Stackhousia mongyna* and *Stylidium neglectum* and tall sparse grassland of *Spartochloa scirpoidea* and low sparse grassland of *Austrodanthonia caespitosa*.

Reserve 29019 – Breakaway Ridge Nature Reserve

Quadrat LB14



Mid-high open forest of *Eucalyptus argyrypha* mallet and *E. phenax* over very tall open shrubland of *Hakea laurina* and tall open shrubland of *Beyeria brevipes* var *brevipes*, *Hakea multilineata*, *Hakea newbeyana*, *Acacia chamaeleon*, *Leptomeria preissiana*, *Melaleuca uncinata*, *Melaleuca* sp.8 and *Santalum acuminatum* over mid-high sparse heath of *Hakea lissocarpa*, *Isopogon buxifolius*, *Melaleuca subfalcata*, *Persoonia quinquenervis* and *Trymalium elachophyllum* and low sparse heath of *Dodonaea bursariifolia*, *Phebalium filifolium* and *Westringia cephalantha* over mid-high sparse sedgeland of *Lepidosperma* sp.A2 "Island Flat" (Keighery 7000).

Quadrat LB15



Very tall to tall mallee woodland of *Eucalyptus eremophila*, *E. calcygona* and *E. pileata* over tall to mid-high shrubland of *Melaleuca uncinata*, *Melaleuca acuminata* and *Melaleuca lateriflora* subsp. *lateriflora* and tall heathland of *Exocarpus aphyllus* over mid-high open heath of *Melaleuca coronicarpa* and *Melaleuca adnata* and low open heath of *Hakea commutata* and *Olearia muelleri* and dwarf open heath of *Acacia bidentata* and *Acacia glaucoptera*, over low sedgeland of *Lepidosperma pruinosum* and vines of *Cassytha melantha*.

Reserve 29019 – Breakaway Ridge Nature Reserve

Quadrat LB16



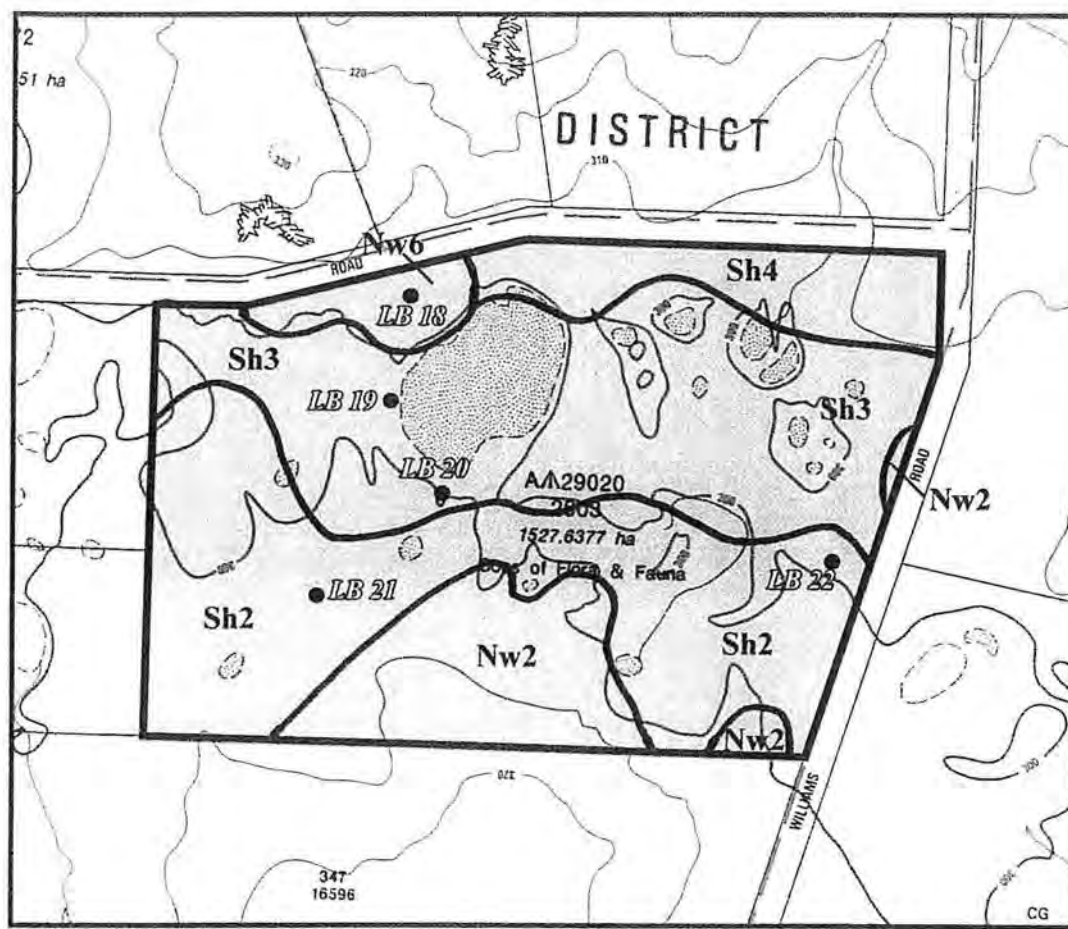
Very tall open mallee forest of *Eucalyptus pileata*, *E. phaenophylla* subsp. *phaenophylla* and *E. uncinata* over tall open shrubland of *Allocasuarina acutivalvis*, *Hakea newbeyana*, *H. subsulcata*, *Isopogon buxifolius*, *Melaleuca laxiflora*, *M. uncinata* and *Santalum acuminatum* and tall open heath of *Hakea horrida* and mid-high open heath of *Hibbertia exasperata* over mid-high shrubland of *Callitris roei* and mid-high heathland of *Beaufortia schaueri*, *Cryptandra minutifolia*, *Gastrolobium revolutum*, *Melaleuca carriei* ms, *M. spicigera*, *Nemcia punctata*, *Phebalium microphyllum* and *Spyridium microcephalum* and low heathland of *Acacia leptospermoides* subsp. *leptospermoides*, *Beyeria brevifolia* var *brevipes*, *Dodonaea bursariifolia*, *Hakea lissocarpa*, *Melaleuca tuberculata* var *macrophylla* and *Phebalium filifolium* over low sparse sedgeland of *Lepidosperma brunonianum* and vines of *Cassytha melantha*.

Quadrat LB17



Very tall open mallee forest of *Eucalyptus flocktoniae*, *E. calcygona*, *E. eremophila* and *E. pileata* over mid-high shrubland of *Melaleuca uncinata* and *M. acuminata* and tall to mid-high heathland of *Melaleuca adnata*, *M. undulata* and *Exocarpus aphyllus* over mid-high open heath of *Hakea commutata*, *Melaleuca brophyi* ms and *Melaleuca coronicarpa* over low open heath of *Boronia inornata* subsp. *leptophylla*, *Hibbertia gracilipes*, *Microcybe multiflora* subsp. *baccharoides* and *Olearia muelleri* and dwarf open heath of *Acacia merrallii*.

Reserve 29020 – Lake Bryde Nature Reserve



North ↑

Scale 1:50,000

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Reserve 29020 – Lake Bryde Nature Reserve

Quadrat LB18



Mid-high heathland of *Melaleuca tuberculata* var *macrophylla*, *Verticordia roei* subsp. *roei*, *V. chrysantha*, *Acacia lineolata* subsp. *lineolata*, *Calytrix leschenaultii*, *Daviesia lancifolia* and *Hakea cygna* subsp. *cygna* and low heathland of *Allocasuarina microstachya*, *Andersonia* aff *sprengelioides*, *Baeckea crispiflora*, *Calothamnus quadrifidus*, *Choretrum glomeratum* var *chrysanthum*, *Gompholobium hendersonii*, *Hakea incrassata*, *H. strumosa*, *Melaleuca carriei* ms, *M. lecanantha*, *Persoonia coriacea* and *Verticordia picta* and dwarf heathland of *Astroloma serratifolium*, *Cryptandra nutans*, *Hemigenia* sp., *Jacksonia racemosa*, *Leucopogon dielsianus* and *Synaphea spinulosa* subsp. *spinulosa* over low open sedgeland of *Anarthria polyphylla*, *Lepidobolus preissianus*, *Lepidosperma* sp (LG1.7), *Mesomelaena pseudostygia* and *Schoenus pleiostemoneus* and low to dwarf open forbland of *Conostylis argentea*, *Dampiera lavendulacea* and *Stylidium repens* and low open grassland of *Austrodanthonia caespitosa* and *Neurachne alopecuroides*.

Quadrat LB19



Low open woodland of *Eucalyptus occidentalis* over tall open shrubland of *Melaleuca strobophylla*, *M. lateralis*, *M. lateriflora* subsp. *lateriflora* and *M. uncinata* over mid-high sedgeland of *Schoenus* sp. with vines of *Cassytha melanantha*.

Reserve 29020 – Lake Bryde Nature Reserve

Quadrat LB20



Tall open mallee forest of *Eucalyptus perangusta* over tall sparse shrubland of *Santalum acuminatum* and mid-high sparse shrubland of *Leptospermum erubescens* over mid-high heathland of *Grevillea newbeyi*, *Hakea corymbosa* and *Melaleuca carriei* ms and low heathland of *Acacia acutata*, *A. leptospermoides* subsp. *leptospermoides*, *Calytrix leschenaultii*, *Hakea ?lissocarpa*, *H. obliqua* subsp. *parviflora*, *Olearia dampieri* subsp. *eremicola* and *Verticordia endlicheriana* var *major* over low open sedgeland of *Lepidosperma brunonianum* and low open forbland of *Burnettia nigricans* and *Stylidium repens* and dwarf open sedgeland of *Desmodium asper* and *Lepidobolus preissianus*.

Quadrat LB21



Very tall mallee woodland of *Eucalyptus flocktoniae* and *E. phenax* over tall open shrubland of *Melaleuca uncinata* and *Santalum acuminatum* and tall heathland of *Hakea corymbosa* over mid-high to low heathland of *Acacia bidentata*, *Acacia lasiocarpa*, *Cryptandra minutifolia*, *Daviesia benthamii* subsp. *acanthoclona*, *Daviesia scoparia*, *Dodonaea bursariifolia*, *Dodonaea pinifolia* var 1, *Grevillea huegelii*, *Grevillea oligantha*, *Melaleuca lateriflora* subsp. *lateriflora*, *Melaleuca spicigera*, *Olearia ramosissima*, *Phebalium tuberosum*, *Pultenaea conferta*, *Templetonia sulcata* and *Westringia rigida* and low forbland of *Platysace trachymenioides* over mid-high sparse sedgeland of *Gahnia lanigera* and *Lepidosperma brunonianum* and mid-high forbland of *Dianella revoluta*.

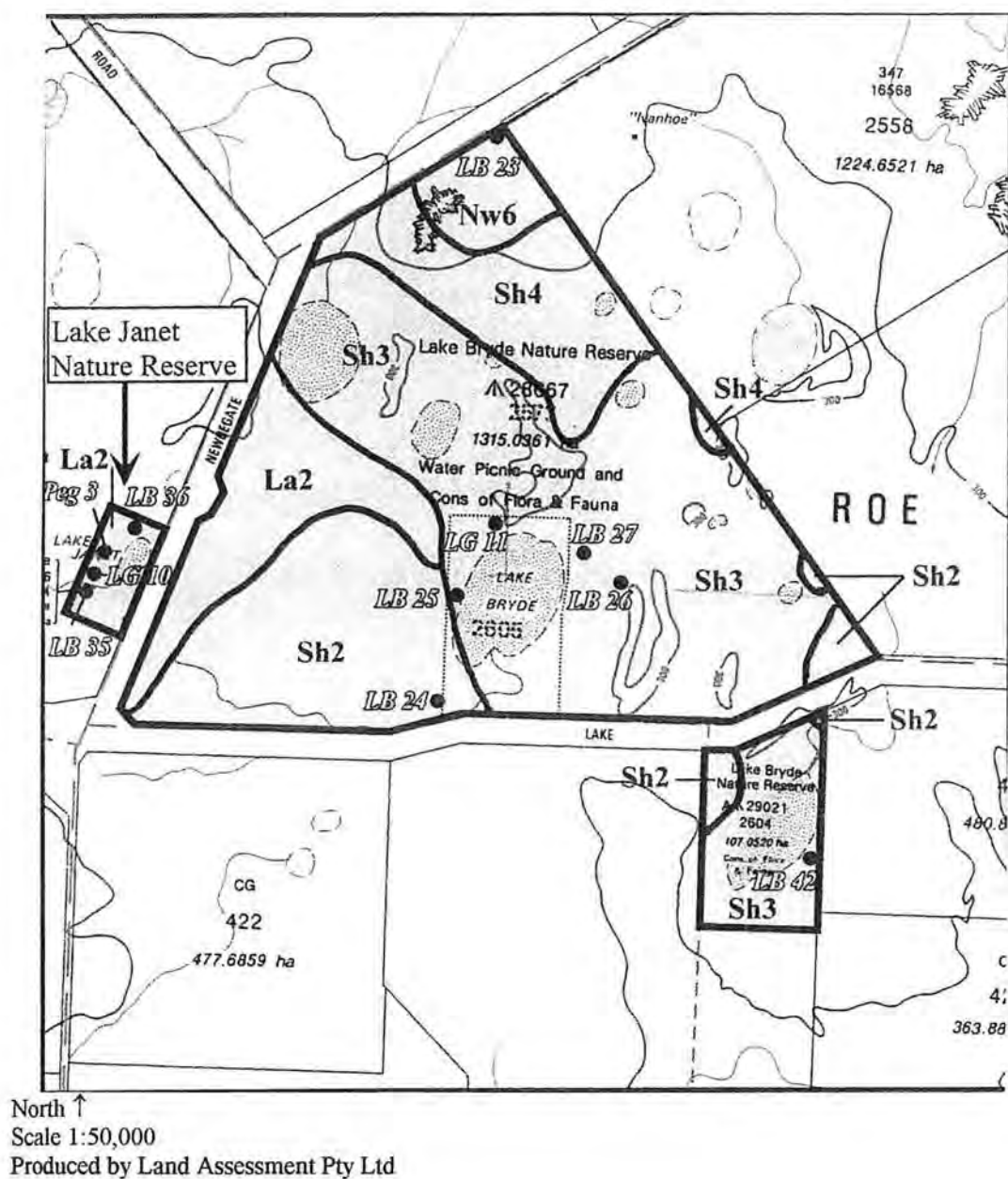
Reserve 29020 – Lake Bryde Nature Reserve

Quadrat LB22



Tall isolated emergent shrubs of *Banksia media* over mid-high heathland of *Hakea lissocarpa*, *H. trifurcata*, *Leptospermum erubescens*, *Petrophile ericifolia* subsp. *ericifolia* and *Petrophile squamata* subsp. *squamata* and low heathland of *Acacia multispicata*, *Allocasuarina microstachya*, *Andersonia* aff. *sprengelioides*, *Banksia violacea*, *Calectasia grandiflora* sp. wheatbelt (A. Coates 4315), *Chorizema aciculare* subsp. *aciculare*, *Dryandra pteridifolia*, *Eremaea pauciflora*, *Hakea brachyptera*, *H. corymbosa*, *H. cygna* subsp. *cygna*, *H. obliqua* subsp. *parviflora*, *Isopogon buxifolius*, *Lysinema ciliatum*, *Melaleuca depauperata*, *Verticordia acerosa* and *V. grandiflora* and dwarf heathland of *Acacia ?squamata*, *Baeckea preissiana*, *Calytrix leschenaultii*, *Cryptandra mutans*, *Daviesia lancifolia*, *Dryandra epimicta*, *Jacksonia racemosa*, *Leucopogon concinnus*, *L. constephioides* var 2, *L. tamminensis* var *australis*, *Persoonia striata*, *Synaphea spinulosa* subsp. *spinulosa*, *Petrophile brevifolia* and *P. seminuda* over mid-high sparse sedgeland of *Lepidobolus preissianus* and *Lepidosperma carphoides* and low sparse sedgeland of *Lepidobolus chaetocephalus*, *Schoenus pleiostemoneus*, *Schoenus* sp. A1 Boorabin (K. Wilson 2581) and *Schoenus subflavus* and mid-high sparse forbland of *Argentipallium niveum* and low sparse forbland of *Chamaexeros serra*, *Conostylis petrophiloides*, *Laxmannia palaeacea* and *Stylidium repens* and low sparse grassland of *Amphipogon turbinatus* and *Neurachne alopecuroides*.

**Reserves 29021 and 28667 – Lake Bryde Nature Reserve and
Reserve 29026 – Lake Janet Nature Reserve**



Reserve 28667 – Lake Bryde Nature Reserve

Quadrat LB23



Tall mallee woodland of *Eucalyptus phaenophylla* subsp. *phaenophylla* and *E. scyphocalyx* over tall sparse shrubland of *Leptospermum erubescens*, *L. nitens*, *L. spinescens*, *Callitris roei*, *C. tuberculata* and *Melaleuca uncinata* and tall sparse heathland of *Exocarpus aphyllus* and mid-high sparse heathland of *Leptomeria preissiana* over mid-high shrubland of *Melaleuca carrii* ms and mid-high heathland of *Melaleuca tuberculata* var *macrophylla*, *Phebalium tuberosum*, *Astroloma serratifolium*, *Hakea erecta*, *H. newbeyana*, *Isopogon buxifolius*, *I. teretifolius* and *Leptomeria pachyclada* and low heathland of *Acacia multispicata*, *Allocasuarina microstachya*, *A. spinosissima*, *Beyeria brevifolia* var *brevipes*, *Brachyloma* sp., *Calytrix leschenaultii*, *Cryptandra minutifolia*, *Dodonaea bursariifolia*, *Dryandra cirsioides*, *Grevillea disjuncta*, *Hakea lissocarpha*, *Hibbertia exasperata*, *Lasiopetalum rosmarinifolium*, *Leucopogon constephioides* var 2, *L. minutifolius*, *Melaleuca depauperata*, *Nemcia punctata*, *Persoonia brevihachis*, *Pultenaea verruculosa* var *brachyphylla*, *Verticordia chrysantha* and *Verticordia roei* subsp. *roei* and dwarf heathland of *Leucopogon cuneifolius*, *Acacia leptospermoides* subsp. *leptospermoides*, *Beaufortia micrantha* and *Hibbertia gracilipes* over low sparse rushland of *Lomandra micronata* and low sparse sedgeland of *Loxocarya cinerea*, *Lepidosperma* sp.A2 "Island Flat" (Keighery 7000) and *Gahnia lanigera* and low sparse forbland of *Conostylis argentea*.

Quadrat LB24



Mid-high open forest of *Eucalyptus urna* over tall shrubland of *Melaleuca acuminata* and *M. adnata* over low open heath of *Templetonia sulcata*, *Grevillea huegelii* and *Olearia muelleri* and dwarf open chenopod shrubland of *Threlkeldia diffusa* over sparse moss cover.

Reserve 28667 – Lake Bryde Nature Reserve

Quadrat LB25



Very tall open mallee forest of *Eucalyptus phenax*, *E. perangusta* and *E. scyphocalyx* over tall open shrubland of *Melaleuca acuminata*, *M. carrii* ms, *M. depauperata*, *M. uncinata*, *Leptospermum erubescens* and *Santalum acuminatum* and low open heathland of *Phebalium lepidotum* over mid-high open heath of *Calytrix breviseta* subsp. *stipulosa*, *Chamelaucium ciliatum*, *Grevillea disjuncta*, *Melaleuca subfalcata* and *Senna artemisioides* subsp. *artemisioides* and low open heath of *Acacia erinacea*, *Baeckea crispiflora*, *Dodonaea bursariifolia* and *Templetonia sulcata* and dwarf open heath of *Leucopogon concinnus* over mid-high open rushland of *Lomandra effusa* and mid-high open sedgeland of *Lepidosperma brunonianum* and low open sedgeland of *Desmocladus asper* and *Gahnia* sp.L (K.R. Newbey 7888) and low open forbland of *Helichrysum leucosideum* and *Waitzia acuminata* and low open grassland of *Neurachne alopecuroides* and vines of *Cassytha melantha*.

Quadrat LB26



Tall open forest of *Eucalyptus urna* and *E. kondininensis* over mid-high open shrubland of *Ozothamnus lepidophyllus* and low open shrubland of *Eremophila decipiens* and low open heath of *Templetonia sulcata* and low to dwarf open chenopod shrubland of *Atriplex paludosa* subsp. *baudinii*, *Rhagodia preissii* subsp. *preissii* and *Enchylaena tomentosa* over low sparse forbland of *Vittadinia gracilis* and low sparse grassland of *Austrodanthonia caespitosa* and mid-high open rushland of *Lomandra effusa*.

Reserve 28667 – Lake Bryde Nature Reserve

Quadrat LB27



Tall closed forest of *Eucalyptus occidentalis* over low woodland of *Melaleuca strobophylla* and tall open shrubland of *Santalum acuminatum* and tall open heath of *Exocarpus aphyllus* over mid-high shrubland of *Olearia dampieri* subsp. *eremicola*, *Pimelea argentea*, *Verticordia densiflora*, *Comesperma integerrimum*, *Beaufortia schaueri* and *Baeckea* sp. Burngup over mid-high to tall sparse rushland of *Juncus radula*, *Lomandra micrantha* subsp. *micrantha* and *Lomandra micrantha* subsp. *teretifolia* and low to mid-high sparse sedgeland of *Desmocladius asper* and *Tetraria capillaris* and low to mid-high sparse forbland of *Centaurium erythraeae*, *Centipeda cunninghamii*, *Dianella brevicaulis*, *Hypochaeris* sp., *Pseudognaphallium luteoalbum* and *Vellereophyton dealbatum* and mid-high sparse grassland of *Austrostipa puberula* and *Neurachne alopecuroides*.

Quadrat LG11



Tall open forest of *Eucalyptus salmonophloia* over mid-high to low sparse heath of *Olearia dampieri* subsp. *eremicola*, *O. muelleri*, *Scaevola spinescens*, *Acacia erinacea* and *Pittosporum phylliraeiodes* var. *microcarpa* over low to mid-high sparse chenopod shrubland of *Atriplex paludosa* subsp. *baudinii* and *Rhagodia preissii* subsp. *preissii* and *Enchylaena tomentosa* over tall open rushland of *Lomandra effusa* and mid-high sparse sedgeland of *Lepidosperma brunonianum* and *Ptilotus holosericeus* and a low forbland of *Lepidium rotundum*, *Stackhousia muricata* and *Vittadinia gracilis* and tall sparse grassland of *Austrostipa puberula* and mid-high sparse grassland of *Austrostipa drummondii* and low sparse grassland of *Austrodanthonia acerosa*.

Reserve 29021 – Lake Bryde Nature Reserve

Quadrat LB42 (Mattiske Site Peg 5)



Tall isolated emergent shrubs of *Melaleuca lateriflora* subsp. *lateriflora* and *M. uncinata* over low chenopod shrubland of *Lawrenzia squamata*, *Halosarcia syncarpa*, *H. pergranulata* subsp. *pergranulata* and *Atriplex vesicaria* over mid-high open grassland of *Austrostipa juncafolia* over low forbland of *Disphysma crassifolium* subsp. *clavellatum* over dense moss cover.

Reserve 29026 – Lake Janet Nature Reserve

Quadrat LB35 (Mattiske Site Peg 4)



Tall closed shrubland of *Melaleuca uncinata*, *M. lateriflora* subsp. *lateriflora* and *M. brophyi* ms over tall sedgeland of *Gahnia* sp. L (K.R. Newbey 7888) over low sparse grassland and forbland of *Aira* sp., *Austrodanthonia caespitosa*, *Chenopod* sp., *Lobelia* sp., *Mesembryanthemum crystallinum* and *Spergularia salina*.

Quadrat LB36 (Mattiske Site LG09)



Mid-high open forest of *Eucalyptus urna* over tall closed shrubland of *Melaleuca adnata*, *M. lateriflora* subsp. *lateriflora*, *M. acuminata*, *M. coronicarpa* and *M. pauperiflora* and closed heathland of *Exocarpus aphyllus* over mid-high open heath of *Olearia muelleri* and *Templetonia sulcata* over sparse moss cover with vines of *Cassytha melantha*.

Reserve 29026 – Lake Janet Nature Reserve

Quadrat LG10

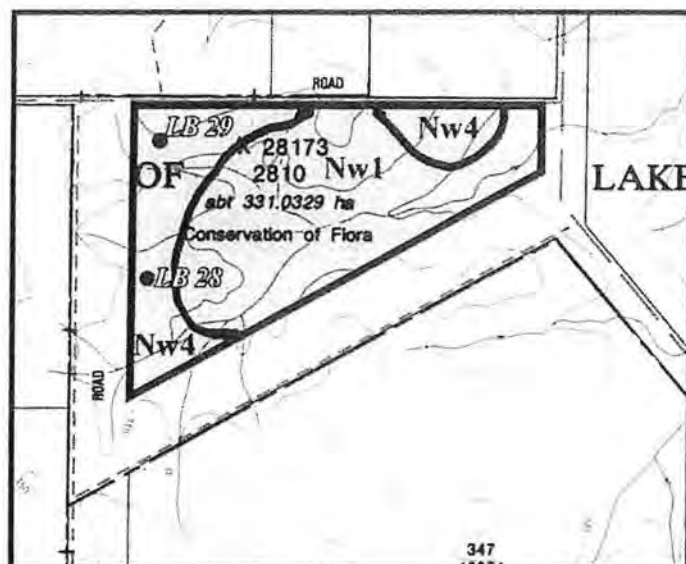


Extremely tall open mallee forest of *Eucalyptus phenax* and very tall open mallee forest of *Eucalyptus perangusta* and *Eucalyptus sporadica* subsp. *sporadica* ms over tall shrubland of *Leptospermum erubescens*, *Olearia dampieri* subsp. *eremicola* and *Melaleuca carrii* ms and mid-high shrubland of *Acacia hemiteles* and mid-high heathland of *Templetonia sulcata* and low heathland of *Pimelea argentea* over low sparse heath of *Acacia lasiocarpa*, *Calytrix leschenaultii*, *Chamelaucium ciliatum* and *Microcybe multiflora* subsp. *baccharoides* over mid-high sedgeland of *Gahnia lanigera*, *Gahnia* sp.L (K.R. Newbey 7888) and *Lepidosperma brunonianum* and mid-high grassland of *Austrostipa drummondii*, *Austrostipa juncifolia* and *Poaceae* sp. and low sedgeland of *Loxocarya cinerea* and *Desmocladius asper* and low grassland of *Neurachne alopecuroides* and low forbland of *Helichrysum leucosideum* and *Ursinia anthemoides*.

Quadrat Peg 3



Tall open forest of *Eucalyptus urna*, *E. salmonophloia* and *E. phenax* over tall sparse shrubland of *Melaleuca adnata*, *M. lateriflora* subsp. *lateriflora* and mid-high sparse shrubland of *Microcybe multiflora* subsp. *baccharoides* over mid-high sparse heath of *Exocarpus aphyllus* and low sparse heath of *Olearia muelleri* and *Templetonia sulcata* and dwarf sparse heath of *Grevillea huegelii* over mid-high to low sparse sedgeland of *Gahnia lanigera* and *Lepidosperma* sp (LG1.7) and tall open forbland of *Dianella revoluta* and low to mid-high sparse grassland of *Austrostipa juncifolia*, *Austrostipa drummondii*, *Austrostipa pycnostachya* and *Austrodanthonia acerosa*.

Reserve 28173 – Conservation of Flora and Fauna

North ↑

Scale 1:50,000

Produced by Land Assessment Pty Ltd

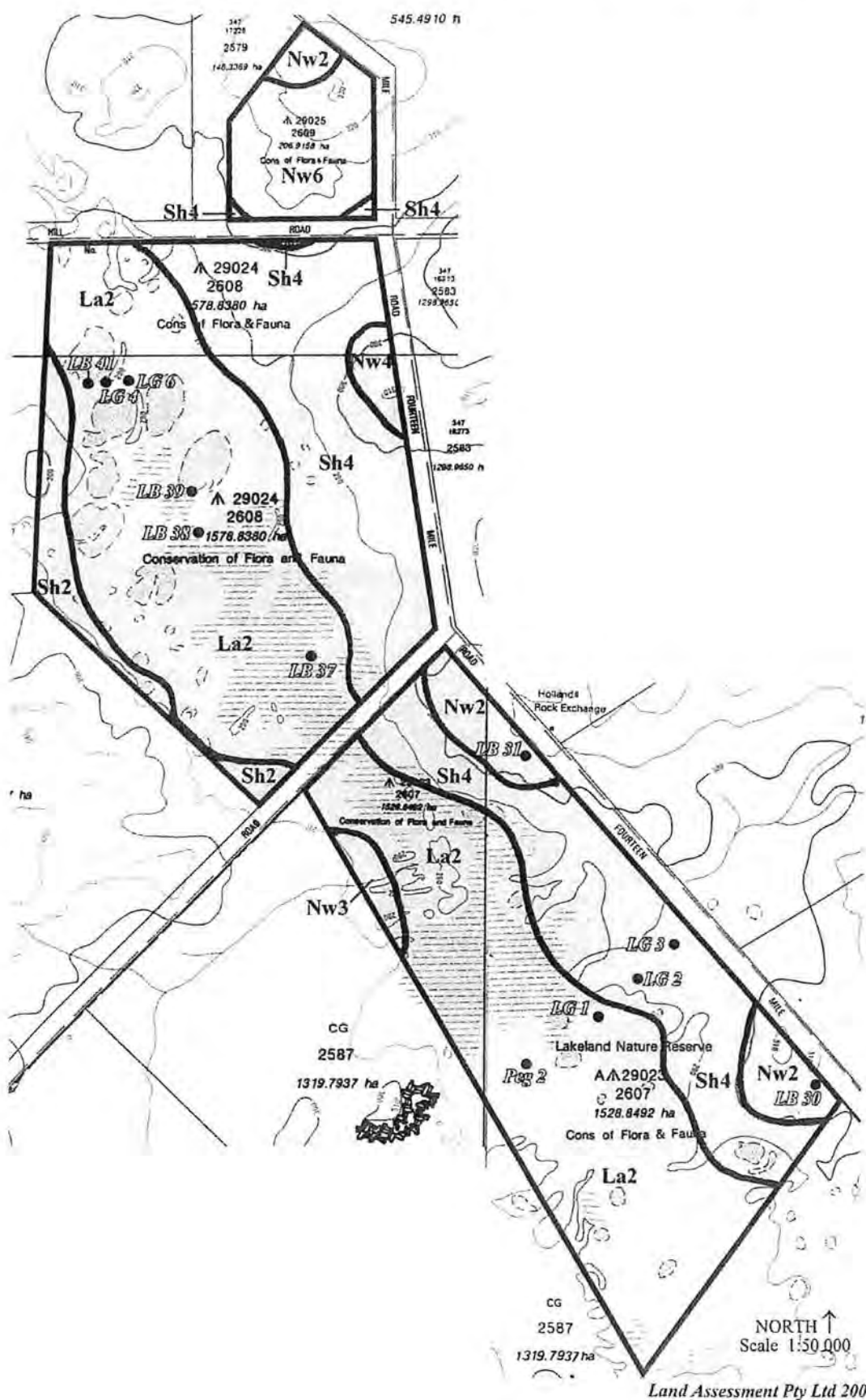
Reserve 28173 – Conservation of Fauna and Flora**Quadrat LB28**

Very tall open mallee forest of *Eucalyptus urna*, *E. eremophila*, *E. annulata* and *E. phenax* over tall shrubland of *Melaleuca pauperiflora*, *M. acuminata*, *M. adnata*, *M. coroncarpa* and *M. societatis* ms and tall heathland of *Exocarpus aphyllus* over mid-high open heath of *Olearia muelleri* and dwarf open heath of *Acacia glaucoptera*.

Quadrat LB29

Low closed forest of *Eucalyptus platypus* subsp. *platypus* mallet over tall sparse shrubland of *Melaleuca acuminata*, *M. adnata*, *M. coroncarpa*, *Melaleuca* sp.6 and *M. undulata*.

Reserves 29023, 29024 and 29025 – Lakeland Nature Reserve



North ↑
 Scale 1:50,000
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Reserve 29024 – Lakeland Nature Reserve

Quadrat LB37 (Mattiske Site Peg 1)



Mid-high open forest of *Eucalyptus suggrandis* subsp. *alipes* over very tall sparse shrubland of *Santalum acuminatum* and mid-high sparse shrubland of *Melaleuca acuminata* over mid-high open shrubland of *Acacia chamaeleon* and low open shrubland of *Melaleuca lateriflora* subsp. *lateriflora* and low open heath of *Calytrix leschenaultii* and *Eremophila decipiens* and low open chenopod shrubland of *Rhagodia drummondii* over mid-high isolated sedges of *Lepidosperma brunonianum* and *Lepidosperma* sp (LG1.7) and mid-high isolated grasses of *Austrostipa puberula* and low isolated grasses of *Austrostipa pycnostachya* and low isolated forbs of *Vittadinia gracilis* and *Waitzia acuminata* and dwarf isolated chenopod shrubs of *Disphysma crassifolium* subsp. *clavellatum*.

Quadrat LB38 (Mattiske Site LG07)



Very tall mallee woodland of *Eucalyptus capillosa* subsp. *polyclada* over tall open shrubland of *Melaleuca lateriflora* subsp. *lateriflora*, *M. depauperata*, *M. brophyi* ms, *Melaleuca acuminata*, *Leptospermum erubescens* and *Conostephium roei* over mid-high open shrubland of *Melaleuca carriei* ms and mid-high heath of *Dodonaea pinifolia* var 1 and low heath of *Acacia acutata*, *Calytrix leschenaultii*, *Chamelaucium ciliatum*, *Leucopogon* sp. Kau Rock (M.A. Burgman 1126) and dwarf heath of *Acacia erinacea*, *Astroloma compactum* and *Jacksonia racemosa* over mid-high rushland of *Lomandra micrantha* subsp. *teretifolia* and mid-high sedgeland of *Lepidosperma pruinosum* and *Lepidosperma* sp. A2 "Island Flat" (Keighery 7000) and low rushland of *Lomandra effusa* and low sedgeland of *Loxocarya cinerea* and *Gahnia lanigera* and low forbland of *Dicrastylis corymbosa*, *Helichrysum leucosideum* and *Waitzia acuminata* and low grassland of *Neurachne alopecuroides*.

Reserve 29024 – Lakeland Nature Reserve

Quadrat LB39 (Mattiske Site LG08)



Tall closed forest of *Eucalyptus kondininensis* over tall isolated clumps of *Melaleuca uncinata* and *M. lateriflora* subsp. *lateriflora* over low to dwarf open heath of *Olearia muelleri*, *Acacia erinacea* and *Templetonia sulcata* and low to dwarf chenopod shrubland of *Atriplex paludosa* subsp. *baudinii*, *Halosarcia syncarpa* and *Sclerolaena diacantha*.

Quadrat LB41 (Mattiske Site LG05)



Very tall shrubland of *Melaleuca uncinata*, *M. lateriflora* subsp. *lateriflora*, *M. pauperiflora* and *M. thyoides* over tall shrubland of *M. acuminata* over mid-high sparse heath of *Templetonia sulcata* and mid-high to dwarf chenopod shrubland of *Atriplex paludosa* subsp. *baudinii*, *Threlkeldia diffusa* and *Sclerolaena diacantha*, *Disphysma crassifolium* subsp. *clavellatum*, *Halosarcia pergranulata* subsp. *pergranulata*, *Rhagodia drummondii* over mid-high grassland of *Austrostipa drummondii*.

Reserve 29024 – Lakeland Nature Reserve

Quadrat LG04



Mid-high open forest of *Eucalyptus kondininensis* over tall to mid-high open shrubland of *Melaleuca adnata* and *Melaleuca thyoides* over tall open shrubland of *Melaleuca acuminata*, *Melaleuca lateriflora* subsp. *lateriflora* and *Melaleuca pauperiflora* over mid-high to dwarf chenopod shrubland of *Atriplex paludosa* subsp. *baudinii*, *Atriplex paludosa*, *Atriplex vesicaria*, *Disphysma crassifolium* subsp. *clavellatum*, *Halosarcia pergranulata* subsp. *pergranulata*, *Rhagodia priesii* subsp. *priesii*, *Sclerolaena diacantha* and *Threlkeldia diffusa* and dwarf heathland of *Acacia erinacea* over mid-high to low grassland of *Austrostipa drummondii*, *Austrostipa puberula* and *Austrostipa pycnostachya*.

Quadrat LG06



Very tall open shrubland of *Leptospermum erubescens* over tall open shrubland of *Acacia chaemeleon*, *A. saligna*, *Eremaea pauciflora* and *Alyxia buxifolia* over mid-high sparse heath of *Calytrix leschenaultii* over mid-high open rushland of *Lomandra micrantha* subsp. *micrantha* and mid-high open sedgeland of *Desmocladius asper*, *Lepidosperma* sp.A2 "Island Flat" (Keighery 7000) and *Lepidobolus preissianus* subsp. *preissianus* and mid-high open grassland of *Austrostipa drummondii* and low open grassland of *Neurachne alopecuroides* and low open chenopod shrubland of *Rhagodia drummondii* and vines of *Billardiera lehmanniana*.

Reserve 29023 – Lakeland Nature Reserve

Quadrat LB30



Tall sparse emergent shrubs of *Hakea pandanica* subsp. *crassifolia* and *Grevillea cagiana* over mid-high heathland of *Melaleuca tuberculata* var *macrophylla*, *Hakea cygna* subsp. *cygna*, *Allocasuarina microstachya*, *Dryandra erythrocephala* var *erythrocephala*, *Isopogon teretifolius*, *Leucopogon tamminensis* var *australis*, *Persoonia quinquenervis*, *Synaphea* cf *tripartita* and *Verticordia roei* subsp. *roei* and low heathland of *Adenanthos flavidiflorus*, *Andersonia* aff *sprengelioides*, *Baeckea preissiana*, *Banksia violacea*, *Beaufortia micrantha*, *Cryptandra nutans*, *Daviesia uncinata*, *Dryandra cirsioides*, *Eremaea pauciflora*, *Hakea incrassata*, *Hibbertia gracilipes*, *Jacksonia racemosa*, *Leucopogon* sp. Wheatbelt (S. Murray 257), *Persoonia striata*, *Petrophile glauca*, *Petrophile seminuda* and *Verticordia tumida* subsp. *therogona* and dwarf heathland of *Calectasia grandiflora* sp. wheatbelt (A Coates 4315) and *Nemcia punctata* over mid-high open sedgeland of *Mesomelaena pseudostygia* and low open sedgeland of *Schoenus pleiostemoneus* and *Gahnia lanigera* and dwarf open sedgeland of *Lepidobolus chaetocephalus* and low open forbland of *Chamaexeros serra*, *Conostylis argentea* and *Drosera* sp.3.

Quadrat LB31



Very tall mallee woodland of *Eucalyptus uncinata* and *E. phaenophylla* subsp. *phaenophylla* over tall shrubland of *Allocasuarina acutivalvis*, *Callitris roei*, *Dryandra cuneata*, *Hakea pandanica* subsp. *crassifolia*, *H. subsulcata*, *Isopogon buxifolius*, *Leptospermum spinescens*, *Melaleuca pungens* var 2 and *Santalum acuminatum* and mid-high shrubland of *Melaleuca tuberculata* var *macrophylla* over mid-high shrubland of *Beaufortia schaueri* and mid-high heathland of *Allocasuarina spinosissima*, *Astroloma serratifolium*, *Daviesia uniflora*, *Dryandra erythrocephala* var *erythrocephala*, *Hakea lissocarpa*, *Isopogon teretifolius*, *Leucopogon constephioides* var 1, *Lysinema ciliatum*, *Petrophile merrallii* and *Phebalium tuberosum* and low heathland of *Banksia violacea*, *Beaufortia micrantha* var *puberula*, *Dryandra cirsioides*, *Dryandra ferruginea* subsp. *ferruginea*, *Nemcia cruciata* ms, *Petrophile glauca* and *Verticordia chrysantha* and dwarf heathland of *Acacia chrysocephala* over sparse sedgeland of *Gahnia lanigera* and *Lepidosperma brunonianum* and vines of *Cassytha melantha*.

Reserve 29023 – Lakeland Nature Reserve

Quadrat LG01



Very tall open mallee forest of *Eucalyptus suggrandis* subsp. *alipes* and *Eucalyptus calycogona* var *calycogona* over tall shrubland of *Melaleuca brophyi* ms, *M. pauperiflora*, *M. laxiflora*, *M. lateriflora* subsp. *lateriflora* and *M. uncinata* and mid-high *Grevillea oligantha* over sparse heathland of low *Exocarpus aphyllus* and tall *Melaleuca* sp.3 over tall sparse sedgeland of *Gahnia* sp. L (K.R. Newbey 7888) and mid-high grassland of *Austrodanthonia acerosa* and *Austrostipa drummondii* with vines of *Cassytha melantha*.

Quadrat LG02



Very tall mallee woodland of *Eucalyptus phaenophylla* subsp. *phaenophylla* over tall open shrubland of *Melaleuca uncinata* and *Hakea erecta* over mid-high heathland of *Melaleuca carrei* ms, *M. tuberculata* var *macrophylla*, Myrtaceae sp.1, *Isopogon buxifolius*, *Leucopogon minutifolius*, *Cryptandra minutifolia* and *Calytrix leschenaultii* and low heathland of *Melaleuca haplantha*, *Daviesia lancifolia*, *D. decurrens*, *Andersonia* aff *sprengelioides*, *Grevillea disjuncta*, *Nemcia punctata*, *Hibbertia gracilipes*, *Jacksonia racemosa*, *Lasiopetalum rosmarinifolium*, *Leucopogon constephioides* var 2 and *Westringia rigida* and mid-high forbland of *Platysace trachymenioides* over mid-high sparse sedgeland of *Gahnia* sp.L (K.R. Newbey 7888) and *Lepidosperma brunonianum* and low sparse sedgeland of *Loxocarya cinerea* and *Lepidobolus chaetocephalus* and low sparse forbland of *Stylidium repens* and *Conostylis petrophiloides*.

Reserve 29023 – Lakeland Nature Reserve

Quadrat LG03



Very tall open mallee forest of *Eucalyptus phenax* and *Eucalyptus suggrandis* subsp. *alipes* and tall open mallee forest of *Eucalyptus perangusta* over tall shrubland of *Melaleuca uncinata* and *M. depauperata* and mid-high shrubland of *Grevillea oligantha*, *Melaleuca lateriflora* subsp. *lateriflora* and *M. subtrigona* and mid-high heathland of *Templetonia sulcata* and *Westringia rigida* over mid-high shrubland of *Dodonaea bursariifolia* and *Melaleuca laxiflora* and mid-high heathland of *Daviesia gracilis* and low heathland of *Acacia viscifolia*, *Baeckea crispiflora*, *Cryptandra nutans*, *Grevillea disjuncta*, *Hibbertia gracilipes*, *Olearia ramosissima* and *Phebalium tuberosum* and dwarf heathland of *Astroloma compactum* over mid-high sparse sedgeland of *Gahnia lanigera* and *Lepidosperma brunonianum*.

Quadrat Peg 2



Very tall open mallee forest of *Eucalyptus suggrandis* subsp. *alipes*, *E. calycogona*, *E. phenax* and *E. perangusta* over tall shrubland of *Melaleuca lateriflora* subsp. *lateriflora*, *Melaleuca pauperiflora* and *Hakea newbeyana* and mid-high shrubland of *Melaleuca depauperata* over mid-high heathland of *Chamelaucium ciliatum*, *Dodonaea pinifolia* var 1, *Hibbertia gracilipes* and *Templetonia sulcata* and low heathland of *Acacia viscifolia*, *Astroloma epacridis* var, *Calytrix leschenaultii*, *Cryptandra minutifolia*, *Leucopogon minutifolius* and *Olearia muelleri* and dwarf heathland of *Acacia erinacea* over mid-high open sedgeland of *Gahnia lanigera* and *Lepidosperma brunonianum* and low open sedgeland of *Desmocladus asper* and low open grassland of *Neurachne alopecuroidea*.