



East Lake Bryde Nature Reserve 29020 Vegetation and Flora Survey

BOTANICAL CONSULTANTS
REPORT
BY
ANNE (COATES) RICK
PO Box 36
NEWDEGATE WA 6355
Telephone (08) 98206048
kwongee2@bigpond.com

Prepared By:

Anne (Coates) Rick
Botanical Consultant
PO Box 36
Newdegate WA 6355
Telephone: (08) 98206048
Email kwongee2@bigpond.com

Prepared for:

Mike Fitzgerald
Conservation Officer (Lake Bryde) |
Wheatbelt Region
Department of Parks and Wildlife
Hough Street, Narrogin
PO Box 100 Narrogin WA 6312
E: mike.fitzgerald@dpaw.wa.gov.au

June 2017**Disclaimer and Limitations**

The scope of the survey may have been limited by time, budget, season, access and or other constraints. In the undertaking of this work the author has made every effort to ensure accuracy of the information provided. Data presented, maps, opinions and conclusions made in the report are done in good faith and the author is not responsible for the interpretation of this information subsequently by others.

SUMMARY

The vegetation and flora survey of East Lake Bryde Nature Reserve 29020 (1528 ha) was commissioned by the Department of Parks and Wildlife to assist with the management of the reserve. The reserve is part of the Lake Bryde Recovery Catchment which was established in 1999 as one of the Natural Biodiversity Recovery Catchments managed by the Department of Parks and Wildlife. The survey area is situated approximately 30 km SSW of the Newdegate town site in the Shire of Kent.

The ground survey of the vegetation and flora of the study area was carried out over the equivalent of 9 days during October, November and December 2016. Extra information on some of the wetlands was recorded during a one day field trip in May 2017. The work included data collection through targeted and opportunistic searches. Traverses were made through the survey area to collect data to map vegetation boundaries, describe vegetation types and examine habitat where rare flora and endangered ecological communities were likely to occur. General vegetation divisions were noted using aerial photography. Areas of interest thus delineated were examined in the field and the vegetation at selected sites (relevés) described. Relevés were chosen rather than quadrats for sampling because of the large number of site descriptions required to capture the complexity of the vegetation patterns in the reserve.

Vegetation descriptions were based on the National Vegetation Information System (NVIS). The classification system devised by Muir (1977) which was specifically designed for describing Wheatbelt vegetation was also used. Comparisons can therefore be made with surveys that have previously used the Muir classification system. The assessment of vegetation condition follows the Vegetation Condition Scale used by B.J. Keighery for the Swan Coastal Plain Survey in 1994.

Information recorded at each releve included a GPS location, vegetation classification (Muir description and NVIS), vegetation condition, an inventory of plant species, the presence of any threatened or priority species, a physical description including soils, topography and landform and a high resolution digital photograph.

Eighteen vegetation types are mapped and described in this study including five woodland, five mallee and eight shrubland communities. A total of 372 plant species were recorded including eight introduced species or weeds.

East lake Bryde Nature Reserve is an outstanding nature reserve with high conservation values. Information collected during the present survey is summarized below.

- The reserve includes a range of vegetation types from the species rich heath communities on lateritic soils on the upper slopes, to extensive mallee communities and woodlands and *Melaleuca* shrublands on the lower slopes and valley floor. The vegetation is mainly in excellent condition.
- 18 wetlands are documented in this report including closed depressions with *Eucalyptus occidentalis* woodlands, *Eucalyptus kondininensis* woodlands or *Melaleuca* shrublands, a

salt lake with gypsum, 3 freshwater lakes including East Lake Bryde and only one lake that appears to be affected by secondary salinisation.

- Three Declared Rare Flora were recorded including *Acacia auratiflora* (2 new populations), *Duma horrida* subsp. *abdita* (2 new populations, 1 already recorded) and *Calectasia pignattiana* (1 new population, 1 already recorded)
- 14 priority species were recorded during the survey.
- Critically endangered woodlands “Eucalypt Woodlands of the WA Wheatbelt” are present including *Eucalyptus salmonophloia*, *Eucalyptus kondininensis*, *Eucalyptus occidentalis* and *Eucalyptus urna* woodlands.
- The threatened ecological community. “Unwooded freshwater wetlands of the southern wheatbelt of WA, dominated by *Duma horrida* subsp. *abdita* and *Tecticornia verrucosa* across the lake floor” occurs on East Lake Bryde. *Tecticornia verrucosa* was not recorded at the site of the new *Duma horrida* subsp. *abdita* population covering a small freshwater lake in the NW section of the reserve however this species has been described as an annual or short-lived perennial and maybe recorded at this location during future surveys.
- The reserve is an important part of the wildlife corridor connecting reserves and other remnant vegetation in the catchment. A mallee fowl nest, brush tailed wallabies and Carnaby’s cockatoos were observed during the survey. The salmon gums (nesting sites) and heath areas (feeding grounds) provide ideal habitat for the Carnaby’s cockatoos.

ACKNOWLEDGEMENTS

I would like to thank the following for their assistance with the project.

- Western Australian Herbarium staff and other Botanists in helping to identify specimens collected in the East Lake Bryde Nature Reserve. Access to the WA Herbarium collections was essential for carrying out the survey.
- Mike Fitzgerald (Department of Parks and Wildlife) for his valuable assistance in this project.
- Peter White (Department of Parks and Wildlife) for his assistance with the identification of *Eucalypts* and *Melaleuca* species

Contents

SUMMARY	3
ACKNOWLEDGEMENTS.....	4
1.0 INTRODUCTION.....	7
1.1 Survey Objectives.....	7
1.2 Background Information	7
1.3 East Lake Bryde Nature Reserve	9
1.4 East Lake Bryde	10
1.5 Geology, landform and soils	10
2.0 METHOD	12
2.1 Field Survey	12
2.3 PRIMER Analysis.....	16
3.0 VEGETATION SURVEY	17
3.1 Previous surveys in the Lake Bryde Recover Catchment.....	17
3.2 Present Survey - Vegetation Types	19
3.3 PRIMER analysis	20
3.4 Vegetation Condition	21
3.5 Threatened Ecological Communities	25
4.0 FLORA SURVEY	27
4.1 Taxonomy.....	27
4.2 Flora of the Study Area	27
4.3 Threatened and Priority Flora	28
4.3.1 Threatened Flora.....	29
4.3.2 Priority Flora.....	31
4.3.3 Other flora of significance.....	31
5.0 WETLANDS.....	33
6.0 FAUNA	34
7.0 CONSERVATION SIGNIFICANCE.....	36
8.0 SURVEY LIMITATIONS.....	36
9.0 REFERENCES.....	37

Appendix 1: Recording sheet

Appendix 2: Ecoscape (2000) quadrat descriptions

Appendix 3: Vegetation structure at releves and photographs

Appendix 4: Vegetation descriptions

Appendix 5: Plant Species List

Appendix 6: Priority Conservation Codes for WA Flora

Appendix 7: Wetlands

LIST OF FIGURES

Figure 1: Reserves in the Lake Bryde Recovery Catchment

Figure 2: 1:50,000 topographical map (Landgate 2013)

Figure 3: 1:250,000 Geological series map

Figure 4: Vegetation map of East Lake Bryde (Watkins and McNee 1987)

Figure 5: Dendrogram of the releve group classification

Figure 6: Location of new populations of *Acacia auratiflora*

Figure 7: Location of wetlands

LIST OF TABLES

Table 1: Muir (1977) System of Vegetation Classification

Table 2: NVIS structural Formation Terminology

Table 3: Vegetation Condition Scale (Keighery 1994)

Table 4: Vegetation Types in the East Lake Bryde Nature Reserve

Table 5: Minimum Condition for Critically Endangered Wheatbelt woodlands

Table 6: The number of species and genera represented within the major families in the study area.

Table 7: Location of *Acacia auratiflora* plants

Table 8: Priority flora

Table 9: Wetlands

1.0 INTRODUCTION

1.1 Survey Objectives

The vegetation and flora survey of East Lake Bryde Nature Reserve 29020 was commissioned by the Department of Parks and Wildlife to assist with the management of the reserve. The objectives of the survey include:

- the description and mapping of vegetation types
- the assessment and mapping of the condition of the vegetation
- a list of plant species recorded during the survey.
- a report on Threatened, Priority and other significant flora.
- a report on Threatened Ecological Communities in the area

1.2 Background Information

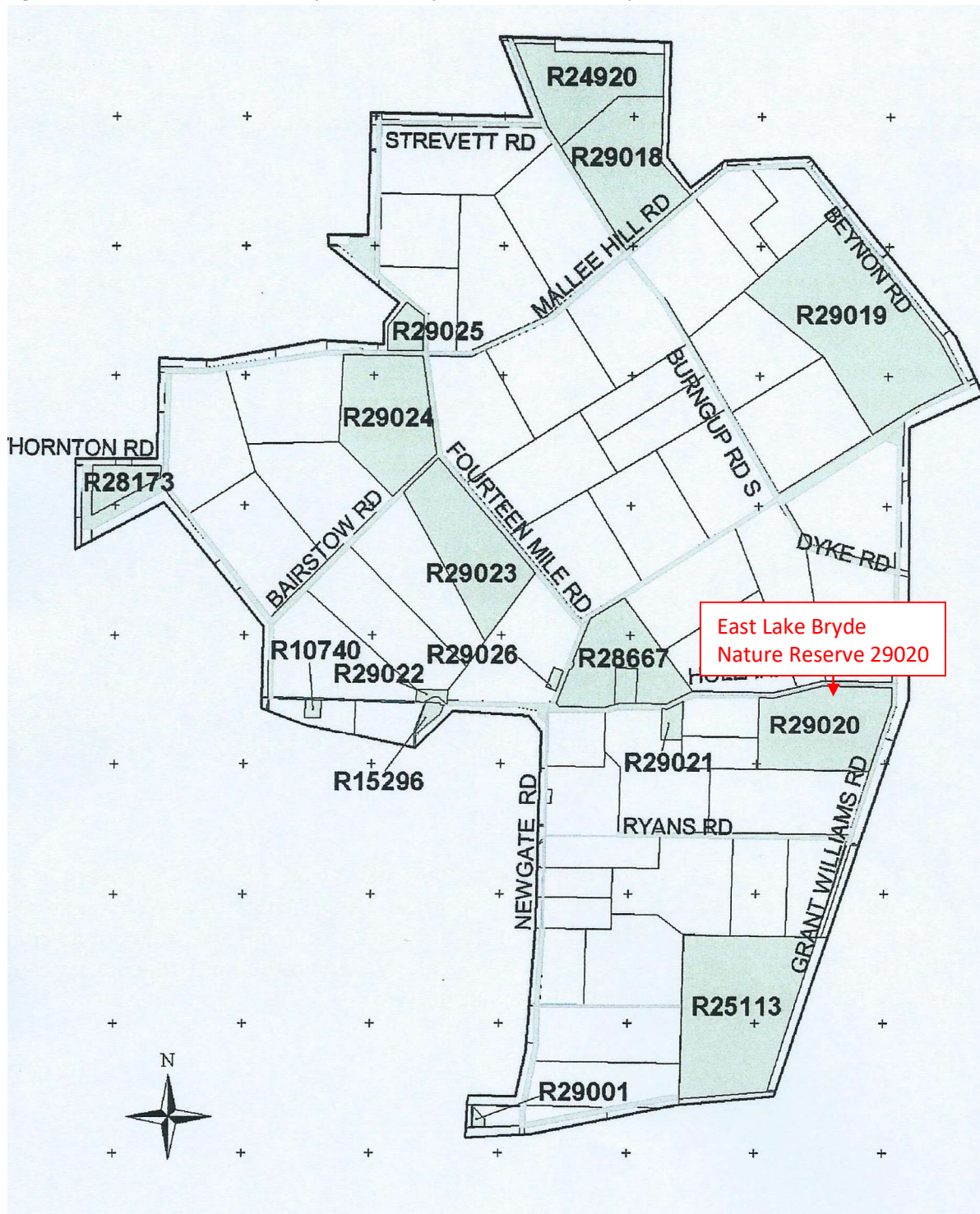
The Interim Biogeographical Regionalisation of Australia Version 7 (2012) divides Western Australia into 23 IBRA Bioregions which are subdivided into 53 IBRA sub regions. IBRA regions are large geographically distinct areas of similar climate, geology, landform, vegetation and fauna communities. The boundaries of the IBRA regions are broadly comparable with the earlier Beard's phytogeographic regions made up of Botanical districts and sub districts. East Lake Bryde Nature Reserve 29020 is situated in the Western Mallee IBRA sub region.

The Western Mallee is a sparsely populated sub region with an area of about 47,000 square kilometres. The sub region is largely cleared for agriculture with about 31% of the sub region's native vegetation remaining. These areas are under environmental stress from threats such as rising salinity (especially valley floor woodlands), vegetation fragmentation, weeds, fire and feral animals. Areas low on the landscape e.g. salt lakes are also at risk from excess nutrient run off. Around 10% of the sub region is held within nature reserves for conservation purposes covering about 25% of the remaining native vegetation (Shepperd et al 2002). The trends are for decline or rapid decline in vegetation associations and many ecosystems are unknown.

The Lake Bryde Recovery catchment was established in 1999 as one of the Natural Biodiversity Recovery Catchments managed by the Department of Parks and Wildlife. Sixteen crown reserves are situated within the Recovery Catchment, twelve of these are nature reserves including part of Lake Magenta Nature Reserve 25113 (see Figure 1, Ecoscape 2001). Clearing of the Kent shire began in the 1960's and approximately 66% of the Lake Bryde catchment and 50% of the East Lake Bryde catchment are cleared (Hamilton-Brown and Blyth 2001).

The sub region is semi-arid, with a warm, dry, Mediterranean climate. It has seven to eight dry months, and a winter rainfall typically between 250 and 500 millimetres (10–19 in).

Figure 1: Reserves in the Lake Bryde Recovery Catchment (Ecoscape 2000)

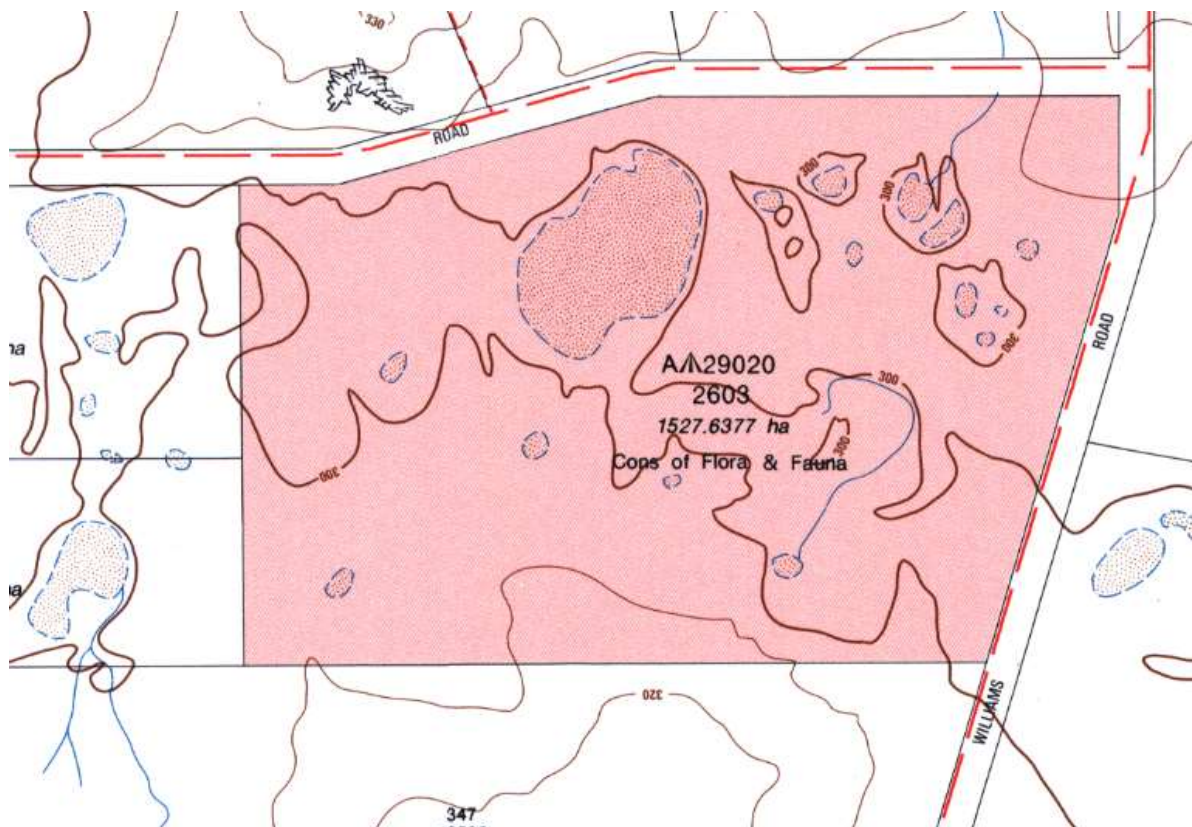


1.3 East Lake Bryde Nature Reserve

East Lake Bryde Nature Reserve is situated approximately 30 km SSW of the Newdegate town site in the Kent Shire and was set aside for the conservation of flora and fauna. The reserve is approximately 1528 ha in size and is surrounded by cleared farmland except a small area on the south eastern boundary and adjacent road reserve vegetation on Grant Williams Rd (Eastern boundary) and Lake Bryde Road (Northern boundary). The highest points on the reserve are on the northern and southern boundaries at 310 m above sea level. The terrain is gently sloping to the valley floor at 300m in the central areas of the reserve. Water flow is from the south east corner to the north western corner of the reserve (Figure 2). Wetlands in the North East section of the reserve also receive water from areas north of the reserve.

Eighteen wetlands have been identified by the Department of Parks and ranging from East Lake Bryde (fresh, 85ha), a salt lake with gypsiferous soils to small, closed depressions.

Figure 2: From South West WA 1:50,000 scale topographical maps (Landgate 2013)



1.4 East Lake Bryde

Lake Bryde and East Lake Bryde are two freshwater lakes that are part of the Lake Bryde wetland system situated at the headwaters of the Lockhart sub-catchment of the Swan Avon System. Low salinity wetlands are unusual in this area and this makes Lake Bryde and East lake Bryde of regional importance for conservation (Cale 2007). Most freshwater lakes in the wheatbelt are suffering secondary salinisation and excessive inundation as a result of large scale clearing of their catchments. The Lake Bryde Wetland System has been nominated as a lake of outstanding ornithological importance (Hamilton-Brown and Blyth 2001). East lake Bryde has an area of approximately 95ha. Surface drainage enters the lake from the south (Watkins and McNee 1987).

In a wetland survey of the Lake Bryde Recovery Catchment carried out after floods in 2006 only four wetlands including East Lake Bryde held water 12 months after the flooding and only East Lake Bryde and Yate Swamp were fresh. Three previously undescribed species of micro invertebrates were recorded during the survey including *Brachionus* sp. nov. (plicatilis complex) from East Lake Bryde. The Three freshest wetlands Lake Bryde, Yate swamp and East lake Bryde supported 67% of the invertebrate species richness (Cale 2007).

Of the 106 lakes in nature reserves of the South West of Western Australia Lakes Bryde and East Lake Bryde were found to be the only lakes with beds dominated by shrubs. This community was assessed by the WA Threatened Ecological Communities Scientific Advisory Committee on 1st September 1998 as Critically Endangered and endorsed by the Director of Nature Conservation on 6th November 1998. The Community is confined to clay and silt lake beds of lakes with intermittent inundation of fresh water and defined as follows.

“Unwooded freshwater wetlands of the southern wheatbelt of WA, dominated by *Duma horrida* subsp. *abdita* and *Tecticornia verrucosa* across the lake floor” (Hamilton-Brown and Blyth 2001).

1.5 Geology, landform and soils

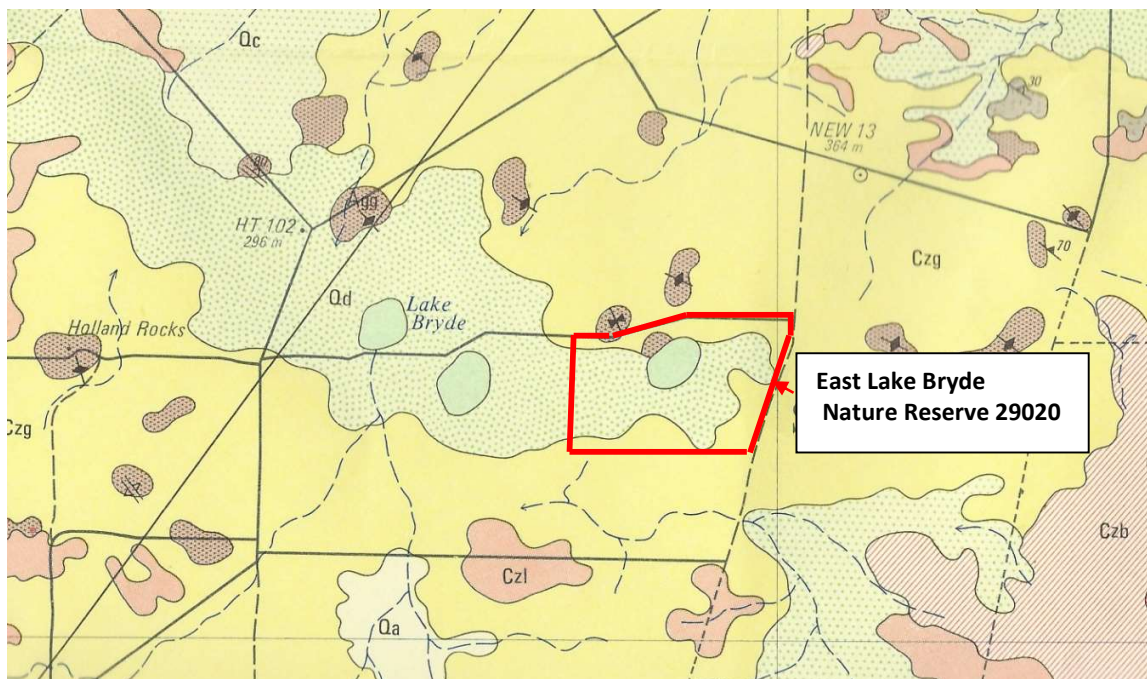
The Lake Bryde Recovery Catchment lies on the Yilgarn Craton, an ancient and relatively stable area of granites and gneiss. Although mainly igneous rocks underlie the district, major valleys have been in filled by sediments that form the extensive salt lake system. These extensive salt lake chains grade north-west to join the Avon Catchment and eventually the Swan River. They have very low gradient and the whole system only flows after exceptionally high rainfall such as the flooding in 2006. Weathering of rock types, faulting and geological uplift have influenced the topography and soil types of the region (Sawkins 2011). Vegetation and associated soils form complex mosaics in the landscape and in most areas the soils vary over short distances and intergrade soils such as sand over gravel over clay are common, as are duplex sandy gravel soils. The landscape is subdued and comprised of gently undulating terrain with long, gentle slopes.

Map units covering the East Lake Bryde Nature Reserve from the 1:250 000 Geological series – Newdegate sheet (Thom el al 1984) include:

- Qd Aeolian and alluvial deposits of silt and sand in sheets and dunes, gypsiferous near playa lakes; Ancient drainage flats; commonly contain calcrete nodules.
- Agg adamellite and granodiorite – granoblastic texture, strongly foliated; foliation defined by entrainment and alignment of biotite (rarely hornblende)
- Czg Reworked sandplain with undulating surface – contains yellow to white sand and clay, gravel and minor laterite outcrop.

In the salt lake country soil particles are sorted and transported by alluvial processes (movement by water) and aeolian processes (movement by wind). Stabilized dunes of quartz sand (Qd) occur on the eastern and south eastern sides of playa lakes. The dunes are considered to have formed during a more arid period, 15000 to 20000 years ago under the influence of prevailing west-north westerly to north westerly winds. Areas of aeolian silt and sand, with numerous small claypans and irregular meandering channels, are often included in this unit. Laterite on upper slopes and duplex soils supporting eucalypts tend to dominate in areas less favourable to laterite development. These include fertile soils, alkaline soils and situations with restricted water movement through the soil, such as winter waterlogging, heavy textured and poorly structured soils (Sawkins 2011).

Figure 3: From 1:250 000 Geological series Newdegate map sheet (1984)



2.0 METHOD

2.1 Field Survey

The ground survey of the vegetation and flora of the study area was carried out over the equivalent of 9 days during October, November and December 2016. Extra information on some of the wetlands was recorded during a one day field trip in May 2017. The work included data collection through targeted and opportunistic searches. Traverses were made through the survey area to collect data to map vegetation boundaries, describe vegetation types and examine habitat where rare flora and endangered ecological communities were likely to occur.

General vegetation divisions were noted using aerial photography. Areas of interest thus delineated were examined in the field and the vegetation at selected sites (relevés) described. The relevés were approximately 30m in diameter except where vegetation typical of the vegetation type being described covered smaller areas e.g. narrow ridge. This releve size was thought to be optimum for including all taller shrubs, mallee and trees that were considered to be characteristic of the vegetation types encountered. Relevés were chosen rather than quadrats for sampling because of the large number of site descriptions required to capture the complexity of the vegetation patterns. Due to time limitations and constraints collecting data from a large number of quadrats was not feasible.

Because of time limitations some areas were not covered in detail in the ground survey and mapping was carried out by extrapolation of known vegetation types using the aerial photographs. A GPS was used in the field to mark the approximate centre of relevés, vegetation boundaries, location of rare flora and other sites of interest e.g. photo points.

Vegetation type descriptions were based on the National Vegetation Information System (NVIS) (ESCAVI 2003) Table 2. Descriptions using the classification system devised by Muir (1977, Table 1) which was specifically designed for describing Wheatbelt vegetation are also included. Comparisons can therefore be made with surveys that have previously used the Muir classification system. The condition of the vegetation described follows the Vegetation Condition Scale modified from Trudgen 1991 by B.J. Keighery for the Swan Coastal Plain Survey 1994 (Table 3).

Information recorded at each releve included:

- GPS location at the centre of the releve
- Vegetation classification - Muir description (1977) and NVIS (2003)
- Vegetation condition
- Inventory of plant species
- Any threatened, priority species or other species of interest
- Physical description including soils, topography and landform.
- A high resolution digital photograph

An example of the record sheet used in the field is presented in Appendix 1. The plant inventory in relevés was comprehensive but very small plants or those that would have been inconspicuous at the time of survey would not have been included. This is in contrast to quadrat work where every species in the quadrat is included. The emphasis was on frequently occurring and characteristic species. As the same person carried out all field work it is expected that the method of data collection was consistent.

Specimens of plant species encountered were collected and identified using keys and by comparison with specimens at the Western Australian Herbarium. Plant specimens of interest will be lodged in the WA Herbarium. Experts involved in revising particular genera were consulted wherever possible to ensure accuracy with plant identifications. Searches for Threatened, Priority and other significant flora were made during the traverses walked through the survey area.

Table 1: Muir System of Vegetation Classification

LIFE FORM/ HEIGHT CLASS	CANOPY COVER			
	DENSE 70-100% d	MID-DENSE 30-70% c	SPARSE 10-30% i	VERY SPARSE 2-10% r
T Trees > 30m M Trees 15-30m LA Trees 5-15m LB Trees < 5m	Dense Tall Forest Dense Forest Dense Low Forest A Dense Low Forest B	Tall Forest Forest Low Forest A Low Forest B	Tall Woodland Woodland Low Woodland A Low Woodland B	Open Tall Woodland Open Woodland Open Low Woodland A Open Low Woodland B
KT Mallee tree form KS Mallee shrub form	Dense Tree Mallee Dense Shrub Mallee	Tree Mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee
S Shrubs > 2m SA Shrubs 1.5-2.0m SB Shrubs 1.0-1.5m SC Shrubs 0.5-1.0m SD Shrubs 0.0-0.5m	Dense Thicket Dense Heath A Dense Heath B Dense Low Heath C Dense Low Heath D	Thicket Heath A Heath B Low Heath C Low Heath D	Scrub Low Scrub A Low Scrub B Dwarf Scrub C Dwarf Scrub D	Open Scrub Open Low Scrub A Open Low Scrub B Open Dwarf Scrub C Open Dwarf Scrub D
P Mat plants H Hummock Grass GT Bunch grass > 0.5m GL Bunch grass < 0.5m J Herbaceous spp.	Dense Mat plants Dense Hum. Grass Dense Tall Grass Dense Low Grass Dense Herbs	Mat plants Mid-Dense Hum. Grass Tall Grass Low Grass Herbs	Open Mat plants Hummock Grass Open Tall Grass Open Low Grass Open Herbs	Very Open Mat plants Open Hummock Grass Very Open Tall Grass Very Open Low Grass Very Open Herbs
VT Sedges > 0.5m VL Sedges < 0.5m	Dense Tall Sedges Dense Low Sedges	Tall Sedges Low Sedges	Open Tall Sedges Open Low Sedges	Very Open Tall Sedges Very Open Low Sedges
X Ferns Mosses, liverwort	Dense Ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

Table 2: NVIS structural Formation Terminology (ESCAVI 2003)

		Cover Characteristics						
	Foliage cover *	70-100	30-70	10-30	<10	≈0	0-5	unknown
	Crown cover **	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
	% Cover ***	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
	Cover code	d	c	i	r	bi	bc	unknown
		Structural Formation Classes						
Growth Form	Height Ranges (m)							
tree, palm	<10, 10-30, >30	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	trees
tree mallee	<3, <10, 10-30	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clumps of mallee trees	mallee trees
shrub, cycad, grass-tree, tree-fern	<1, 1-2, >2	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs	shrubs
mallee shrub	<3, <10, 10-30	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clumps of mallee shrubs	mallee shrubs
heath shrub	<1, 1-2, >2	closed heathland	heathland	open heathland	sparse heathland	isolated heath shrubs	isolated clumps of heath shrubs	heath shrubs
chenopod shrub	<1, 1-2, >2	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clumps of chenopod shrubs	chenopod shrubs
samphire shrub	<0.5, >0.5	closed samphire shrubland	samphire shrubland	open samphire shrubland	sparse samphire shrubland	isolated samphire shrubs	isolated clumps of samphire shrubs	samphire shrubs
hummock grass	<2, >2	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses	hummock grasses
tussock grass	<0.5, >0.5	closed tussock grassland	tussock grassland	open tussock grassland	sparse tussock grassland	isolated tussock grasses	isolated clumps of tussock grasses	tussock grasses
other grass	<0.5, >0.5	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of grasses	other grasses
sedge	<0.5, >0.5	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges	sedges
rush	<0.5, >0.5	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes	rushes
forb	<0.5, >0.5	closed forbland	forbland	open forbland	sparse forbland	isolated forbs	isolated clumps of forbs	forbs
fern	<1, 1-2, >2	closed fernland	fermland	open fernland	sparse fernland	isolated ferns	isolated clumps of ferns	ferns
bryophyte	<0.5	closed bryophyteland	bryophyteland	open bryophyteland	sparse bryophyteland	isolated bryophytes	isolated clumps of bryophytes	bryophytes
lichen	<0.5	closed lichenland	lichenland	open lichenland	sparse lichenland	isolated lichens	isolated clumps of lichens	lichens
vine	<10, 10-30, >30	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines	vines
aquatic	0-0.5, <1	closed aquatic bed	aquatic bed	open aquatic bed	sparse aquatics	isolated aquatics	isolated clumps of aquatics	aquatics
seagrass	0-0.5, <1	closed seagrass bed	seagrassbed	open seagrassbed	sparse seagrassbed	isolated seagrasses	isolated clumps of seagrasses	seagrasses

Table 3: Vegetation Condition Scale

<p>Table 3 : Vegetation Condition Scale Modified from Trudgen 1991 by B.J. Keighery for the Swan Coastal Plain Survey 1993</p>
<p>1 = Pristine Pristine or nearly so, no obvious signs of disturbance</p>
<p>2 = Excellent Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. For example damage to trees caused by fire, the presence of non - aggressive weeds and occasional vehicle tracks.</p>
<p>3 = Very Good Vegetation structure altered, obvious signs of disturbance. For example disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.</p>
<p>4 = Good Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate to it. For example disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.</p>
<p>5 = Degraded Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds, partial clearing, dieback and grazing.</p>
<p>6 = Completely degraded The structure of the vegetation is no longer intact, and the area is completely or almost completely without native species. These areas are often described as ‘parkland cleared’ with the flora composing weed or crop species with isolated native trees or shrubs.</p>

2.3 PRIMER Analysis

The multivariate statistics package used to analyse the species information for each releve was PRIMER v6 (Clarke & Gorley, 2006). Relevés were classified according to similarities in species composition (presence/absence data) using the Bray-Curtis Similarity Coefficient. The results of the Cluster classification were illustrated in a dendrogram. A SIMPROF test (similarity profile) was used in conjunction with cluster to test the significance of divisions displayed in the dendrogram. A SIMPROF test was carried out at each node of the dendrogram. The data set without the annuals, geophytes and introduced weeds was used in the analysis.

Data quality

Some taxonomic issues arose after the completion of plant identification work that was carried out at the WA Herbarium.

Melaleuca “uncinata” group - *Melaleuca hamata*/*Melaleuca scalena*/*Melaleuca atroviridis*. Only one of the voucher specimens collected during the survey was identified as *Melaleuca atroviridis*. This specimen was collected on the edge of East Lake Bryde near the water channel in the south of the lake. Voucher specimens were not collected at all relevés and it is expected that this species occurs at other sites on lake beds and at the edge of lakes but was recorded as *Melaleuca scalena*. Differentiating between *Melaleuca hamata* and *Melaleuca scalena* was difficult when flowering material was not available and therefore all specimens were assigned to *Melaleuca scalena*.

Eucalyptus captiosa/*Eucalyptus incrassata*/*Eucalyptus* sp. Lake Magenta also posed difficulties. Because of the generally smaller buds and fruits mallees in this group were identified as *Eucalyptus captiosa* however, in some collections, fruits were smooth and more cupular in shape as for *Eucalyptus* sp Magenta. For consistency with data analysis all mallees in this group were assigned to *Eucalyptus captiosa*

Because of the difficulty of identifying some of the *Lepidosperma* collections species 1 and species 2 were used.

Databases

The following data sets were accumulated in EXCEL spread sheets and are available on the CD with the report.

- All species recorded at relevés including weeds, annuals and geophytes.
- Site descriptions including GPS location, soils, topography, landform and drainage.

.

3.0 VEGETATION SURVEY

3.1 Previous surveys in the Lake Bryde Recover Catchment

The survey area is situated in the Western Mallee Interim Biogeographical Regionalisation of Australia (IBRA) sub region and Beard's Hyden Vegetation System which is a subdivision of the Roe Botanical District.

Beard (1976) describes the vegetation of the Hyden vegetation system with its gently undulating landscape as follows. On upper slopes are remnants of ancient laterites giving rise to soils of deep yellow sand or sand over gravel on which the typical formation is scrub heath with *Eucalyptus tetragona* (now *Eucalyptus pleurocarpa*) occasional and Proteaceae dominant.

In mid slope and occupying the largest proportion of the area are yellow earths developed on granite and carrying mallee. Beard describes *Eucalyptus eremophila* and *E. oleosa* as generally dominant with areas of *E. redunca* and *E. uncinata* occurring frequently with them. In the adjacent Chidnup system Beard describes the mallee as two recognizable associations, the *E. eremophila* – *oleosa* (lateritic soils) and *E. redunca* – *E. uncinata* (sand over clay, valleys and lower ground) with the 2 associations merging together. Taxonomic changes in the genus *Eucalyptus* have been considerable since Beard's descriptions. The mallee most similar to *Eucalyptus eremophila* that occurs on laterite in the Lake Bryde area is *Eucalyptus sporadica*. The *Eucalyptus oleosa* group has been split into many species. Mallees with similar bud and fruit morphology to *Eucalyptus oleosa* that also occur in the Lake Bryde area include *Eucalyptus rigidula* and *Eucalyptus horistes*. The *Eucalyptus* species from the "*Eucalyptus eremophila*" group occurring in the Lake Bryde catchment is *Eucalyptus tenera* and it typically occurs in Mallee over *Melaleuca* on duplex soils of sand over clay. *Eucalyptus uncinata* and *Eucalyptus phaenophylla* (*Eucalyptus redunca* group) both occur most commonly on lateritic soils but especially *Eucalyptus phaenophylla* has been recorded on sandy soils over clay in the recovery catchment.

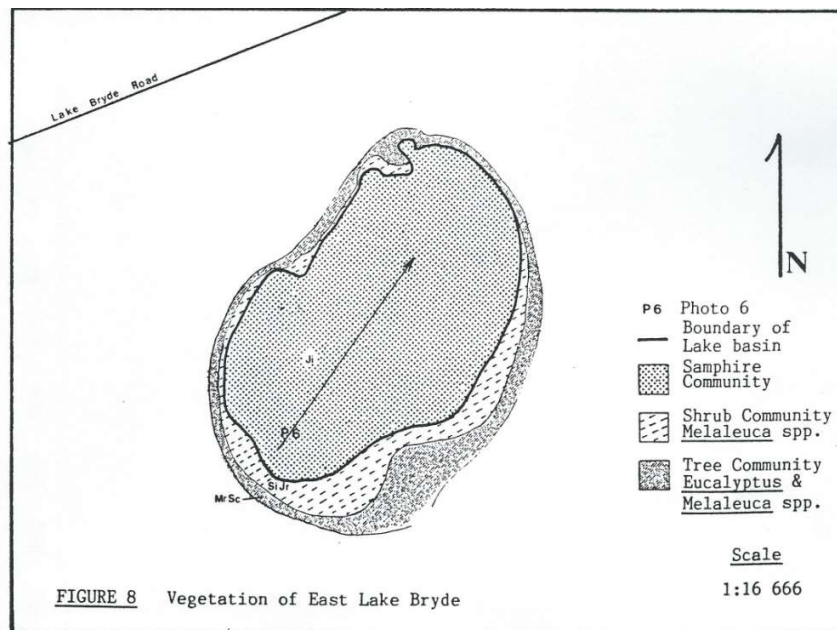
Beard describes the valleys as having red loams on which patches of eucalypt woodland appear and on the lowest ground there are salt flats and playa lakes. Bare granite outcrops appear in any section of the landscape. Around the salt lakes is an irregular stand of boree (*Melaleuca* species) including *Melaleuca thyoides*, *M. lateriflora*, *M. hamulosa*, further out the boree is joined by trees of *E. kondininensis*: next *M. pauperiflora* and *E. salmonophloia* and *E. longicornis* come in.

Beard (1976) has mapped the East Lake Bryde NR at a scale of 1:250 000. The map units covering the nature reserve include:

- eMi mixed woodland in lakes country *E. salmonophloia*, *E. longicornis*, *E. salubris*, *E. kondininensis*
- eSi Mallee on lateritic soil *Eucalyptus eremophila* – *E. oleosa* association

Watkins and McNee (1987) mapped the vegetation on Lake Bryde and East Lake Bryde. The vegetation on East Lake Bryde was described as similar to Lake Bryde with *Muehlenbeckia declina* (now *Duma horrid* subsp. *abdita*) dominant on the Lake basin. *Melaleuca halmaturorum* and *Melaleuca* sp occur in a wide band around the edge of the lake.

Figure 4



Lake Bryde East

Ji	Disphyma crassifolium Muehlenbeckia declina Halosarcia aff. pergranulata
SiJr	Disphyma crassifolium Lawrenzia squamata Melaleuca halmaturorum Melaleuca sp.3G Melaleuca lateriflora
MrSc	Eucalyptus occidentalis Melaleuca lateriflora

In 2000 Ecoscape conducted a vegetation survey of Reserves in the Lake Bryde Recovery Catchment. This survey included 5 quadrats situated in the East Lake Bryde Nature Reserve. Details from the report can be found in Appendix 2. The quadrats include LB18 (Lateritic heath), EB19 (*Eucalyptus occidentalis* woodland), EB20 (*Eucalyptus perangusta* over shrubland), EB21 (Mallee over *Melaleuca scalena*) and EB22 (very sparse mallee over heath- *Banksia media*)

3.2 Present Survey - Vegetation Types

The vegetation types mapped and described in the present study are outlined in Table 4. Descriptions of the vegetation structure (with photographs) recorded at relevés can be found in Appendix 3. Muir (1977) and NVIS vegetation descriptions are included. Detailed vegetation descriptions can be found in Appendix 4. Data sets (EXCEL spread sheets) with species recorded at each relevé and habitat descriptions are available on CD.

Vegetation and associated soils form complex mosaics in the landscape. The vegetation can vary over short distances and vegetation types often merge into each other, intergrades or transition areas are common especially between mallee associations. In this situation species typical of adjacent vegetation types occur jointly. There is still a trend towards heath and other vegetation associated with lateritic soils on higher slopes and those associated with duplex soils (sandy soils over clay) and heavier soils on mid slopes and valleys. What defines a new vegetation type and what is viewed as a transition area is subjective and to a large degree will depend on the scale of mapping undertaken. Variation in vegetation can also be related to changes in topography, geology e.g. presence of granite rock and hydrology (drainage). There is a good relationship between species (e.g. Proteaceae on laterite), size and diversity of understorey plants and soil properties. The understorey becomes more diverse as depth to clay increases and soils are better drained (Sawkins 2011).

In East Lake Bryde Nature Reserve species rich heath with *Eucalyptus pleurocarpa* present on well drained areas occur on upper slopes in the north and south of the reserve. *Banksia prionotes* open woodland and *Eremaea* Heath are found on deep sandy soils over laterite. Mallee over *Melaleuca scalena* (laterite) occurs on intergrade soils of gravelly soils over laterite over clay and very sparse mallee over heathland grows on mid-slopes on sandy soils over laterite.

On the gentle mid slopes to the lower slopes/valley floor mallee associations are extensive including Mallee over *Melaleuca scalena* on sandy soils over clay, Mallee over *Melaleuca adnata* on shallow duplex soils of sandy loam over clay, and Mallee over low *Melaleuca* shrubland on deeper sandy duplex soils with some laterite. *Eucalyptus perangusta* over shrubland grows on deeper sandy soils adjacent to lakes on dunes and low ridges. Several species of mallee are present in each vegetation type but there is a tendency for *Eucalyptus captiosa*, *Eucalyptus uncinata* and *Eucalyptus phaenophylla* to occur on upper slopes with gravel soils and *Eucalyptus tenera*, *Eucalyptus calycogona*, *Eucalyptus suggrandis* and *Eucalyptus phenax* on lower slopes on duplex and heavier soils.

On lower slopes/valley floor *Eucalyptus kondininensis* woodland occurs on elevated areas adjacent to lakes and in depressions. *Eucalyptus salmonophloia* woodland occurs on loam soils and clay and *Eucalyptus occidentalis* grows on the margin of freshwater lakes and in winter wet depressions. *Eucalyptus urna* open forest is found adjacent to

salmon gum woodlands on sandy loam dunes and a small area of *Allocasuarina huegeliana* open forest occurs on sandy soils.

Melaleuca shrublands are found on poorly drained areas on clay soils on lake beds and depressions. Two salt lakes, one with gypsum, have areas of samphire (*Tecticornia*) shrublands. Degraded areas of *Melaleuca* shrublands that have been affected by waterlogging and salt occur on one lake only. The *Duma horrida* subsp. *abdita* Threatened Ecological Community occurs on east Lake Bryde and one of the small lakes in the SW corner although *Tecticornia verrucosa* was not found on this small lake at the time of survey. A small lake/depression in the South West corner was covered by isolated *Melaleuca* shrubs and grasses and herbs.

Detailed vegetation descriptions are available in Appendix 3. The following definitions are used. Very sparse (2-10% canopy cover), sparse (10-30% canopy cover), mid dense (30-70% canopy cover) and dense (70-100% canopy cover) to describe cover. Growth forms are from NVIS (ESCAVI 2003) including Rush which is defined as including the monocotyledon families Juncaceae, Typhaceae, Liliaceae, Iridaceae, Xyridaceae and the genus *Lomandra* i.e. "graminoid" or grass-like genera.

3.3 PRIMER analysis

The data set used for the analysis excluded annuals, geophytes and weeds. The SIMPROF test indicates those divisions which are statistically significant (black lines). The results are displayed by the dendrogram in Figure 5. Ninety six releves were selected for the vegetation analysis. Some releves recorded during the survey were not included as they were thought to represent transition zones not typical of the vegetation types or were in areas believed to be influenced by edge affect (a number of species present considered to be characteristic of adjacent areas/vegetation types)

Differences between the Vegetation classification based on characteristic species and vegetation structure and the classification based on the analysis of floristic composition data i.e. presence/absence of species at each releve are discussed below.

1. The multivariate analysis grouped releves in the lateritic heathland and lateritic heathland with *Eucalyptus pleurocarpa* together. Mallee heath with *Eucalyptus pleurocarpa* is extensive in areas of remnant vegetation with gravelly soils over ironstone in the region and has therefore been mapped separately wherever possible in the present survey.
2. Releves in the *Eremaea* heathland and *Banksias* prionotes open woodland were also grouped together with no significant difference found in their species composition found. *Banksia prionotes* is at the end of its distribution (eastern) and was mapped where possible in the present survey. Vegetation boundaries were difficult to distinguish on the aerial photography however the open woodland occurs on the ridge tops.

3. The species composition of Relevés 67 and 79 was found to be significantly different from other relevés in the *Eremaea pauciflora* heathland. There was a very sparse stratum of shrub mallee including *Eucalyptus captiosa*, *Eucalyptus dissimulata* and *Eucalyptus perangusta* in these relevés. They were however considered similar enough to be included in the *Eremaea pauciflora* vegetation type with *Eremaea pauciflora* dominant in all relevés.
4. The Mallee over low *Melaleuca* shrubland includes four groups with significantly different species composition. One group is equivalent to the Mallee over *Melaleuca subtrigona* (EMsu map unit) vegetation type which occurs in the North West corner of the reserve. The other three groups are mapped together as Mallee over *Melaleuca carrii*. It was not possible to map these groups separately from aerial photography or to distinguish easily between them in the field and they have therefore been mapped as one unit.
5. Rélevé 70 (*Eucalyptus kondininensis* woodland) has been grouped with the Mallee over *Melaleuca scalena* vegetation type as it has an understorey of isolated shrubs and shrub mallee including *Eucalyptus phenax* and *Melaleuca scalena*. It is however obviously *Eucalyptus kondininensis* woodland.
6. *Melaleuca* shrubland -*Melaleuca scalena* (Ms map unit) has been grouped with the mallee over *Melaleuca adnata* vegetation type. Despite the similarity in species composition the shrublands are distinct in the field and on the aerial photography and only have isolated shrub mallee present.
7. The species composition of the *Eucalyptus occidentalis* woodlands with a *Melaleuca* understorey, the *Eucalyptus kondininensis* woodlands and the *Melaleuca shrublands* was not found to be significantly different. The difference between these vegetation types in the field and on the aerial photography was obvious and mapping the extent of the woodlands was important as they are part of the Critically Endangered Wheatbelt woodlands.
8. The *Duma horrida* communities were grouped with the samphire shrublands and the degraded *Melaleuca* areas. All communities are distinct.

3.4 Vegetation Condition

Most of the reserve is in excellent to pristine condition with very little disturbance and only the occasional non-aggressive weed species present such as **Ursinia anthemoides*. Weeds were more common on the western and southern boundaries adjacent to farmland and on the small lake in the south western corner of the reserve. Weed species recorded include *Cotula bipinnata*, *Ursinia anthemoides*, *Spergularia rubra*, *Avellinia michelii*, *Bromus rubens*, *Pentameris airoides*, *Rostraria cristata* and *Vulpia muralis*.

Vegetation on the lakebed of wetland 097 has been affected by waterlogging and salinity with samphire in central areas and areas of degraded *Melaleuca* shrubland adjacent. Few *Melaleuca* seedlings were seen in these degraded areas compared to areas of *Melaleuca* shrubland regenerating on slightly elevated areas on the edge of the lake.

Table 4 - Vegetation Types - East lake Bryde Nature Reserve

Vegetation Type	Map Unit	Soils/topography	Landform	relevés	Rare Flora
Woodland Formations					
<i>Eucalyptus salmonophloia</i> (salmon gum woodland)	Es	Loamy soils over clay. Gentle slope to flat terrain	Valley floor adjacent to lakes and drainage line in NW corner	19, 25, 32,	<i>Acacia auratiflora</i> T
<i>Eucalyptus urna</i> open forest	Eu	Sandy loam ridge. Flat to gentle slope	Valley floor, lower slopes	16, 62,	
<i>Eucalyptus kondininensis</i> (Kondinin blackbutt) woodland	Ek	Sandy loam adjacent to lakes, well drained	Valley floor, higher ground adjacent to lakes	18, 70, 71, 73, 89	
	Ek r regeneration				
<i>Eucalyptus occidentalis</i> (flat-topped yate) Woodland	Eo	Sandy loam over clay. Gentle slope to flat terrain. Winter wet soils	Lower slopes, edge of lakes and closed depressions, drainage lines	3, 6, 7, 12, 28, 29, 30, 34, 49, 52, 56, 57, 76, 80	
	Eo r regeneration				
<i>Allocasuarina huegeliana</i> open forest	Ah	Deep grey sandy soils - ridge	Lower slopes	24	
Mallee Formations					
Mallee over <i>Melaleuca scalena</i> - laterite	Ems/L	Sandy loam with laterite over clay	Upper to mid slope	10, 42, 43	<i>Grevillea newbeyi</i> P3
Mallee over <i>Melaleuca scalena</i>	EMs	Sandy loam over clay - duplex soils 30cm to clay	Mid to lower slopes	15, 41, 47, 54, 63, 65, 84, 92	<i>Acacia undosa</i> P3, <i>Acacia auratiflora</i> T, <i>Astroloma chloranthum</i> P2
Mallee over <i>Melaleuca adnata</i>	EMa	Shallow sandy loam soils over clay	Mid to lower slopes	38, 77, 83, 86, 88, 90	<i>Acacia auratiflora</i> <i>Acacia undosa</i> P3,
Mallee over <i>Melaleuca</i> low shrubland	EM (EMc- <i>Melaleuca carrii</i>)	Deeper sandy soils over clay ?laterite	Mid to lower slopes well drained	22, 46, 69, 91, 96, 60, 68, 75, 85	<i>Calectasia obtusa</i> P3
	EM (EMsu- <i>Melaleuca subtrigona</i>)	Sandy loam soils over clay ?laterite	Mid to lower slopes	66, 93	<i>Calectasia obtusa</i> P3, <i>Melaleuca sculponeata</i> P3
<i>Eucalyptus perangusta</i> over shrubland	Ep	Sandy soils	Lower slopes, usually adjacent to lakes	4, 8, 14, 20, 21	<i>Acacia auratiflora</i> T

Shrubland Formations - Kwongan /Heath					
Mixed lateritic heathland	H	Sandy gravels	Upper slopes	64, 78, 81, 82	<i>Banksia xylothemelia</i> P3
	Epl/H <i>Eucalyptus pleurocarpa</i>	Sandy gravels over ironstone	Upper slopes better drained areas 50+cm to clay	9, 44, 45	<i>Banksia xylothemelia</i> P3, <i>Daviesia uncinata</i> P3
<i>Banksia prionotes</i> open woodland	Bp	Deep sandy soils over laterite	Upper slopes Ridge top	1, 50, 51	<i>Calectasia pignattiana</i> T, <i>Drosera grieviei</i> P1, <i>Rinzia affinis</i> P4
<i>Eremaea pauciflora</i> heathland	Er	Deep sandy soils pale then yellow over laterite, flat to gently sloping terrain	Upper and mid slopes well drained	2, 35, 36,67,79	<i>Calectasia pignattiana</i> T, <i>Rinzia affinis</i> P4, <i>Drosera grieviei</i> P1
Very Sparse mallee over heathland	ES	sandy soils over laterite	Mid slopes	13, 37, 48, 53	<i>Hakea brachyptera</i> P3, <i>Grevillea newbeyi</i> P3 <i>Banksia epimicta</i> P2
Shrubland Formations					
<i>Melaleuca</i> shrubland	M	Clay, poorly drained	Lower slopes, lakebed	11, 23, 26, 33, 55, 59, 72, 74, 94, 95	
	M r (regeneration)				
	Ms (Melaleuca scalena)	Clay poorly drained	Lower slopes	39, 87	
	Md (degraded)	Clay poorly drained.	Lower slopes	58, 61	
<i>Duma horrida</i> subsp. <i>abdita</i> shrubland	Dh	Silt and clay	Fresh water lake - Lakebed	27, 31	<i>Duma horrida</i> subsp. <i>abdita</i> T
Samphire (<i>Tecticornia</i>) shrubland	Te	Clay soils. Gypsum at one lake	Salt lake	5 (gypsum), 17	<i>Haegiela tatei</i> P4
Isolated shrubs over grasses/forbs	G	Poorly drained clay soils	Small lake	40	

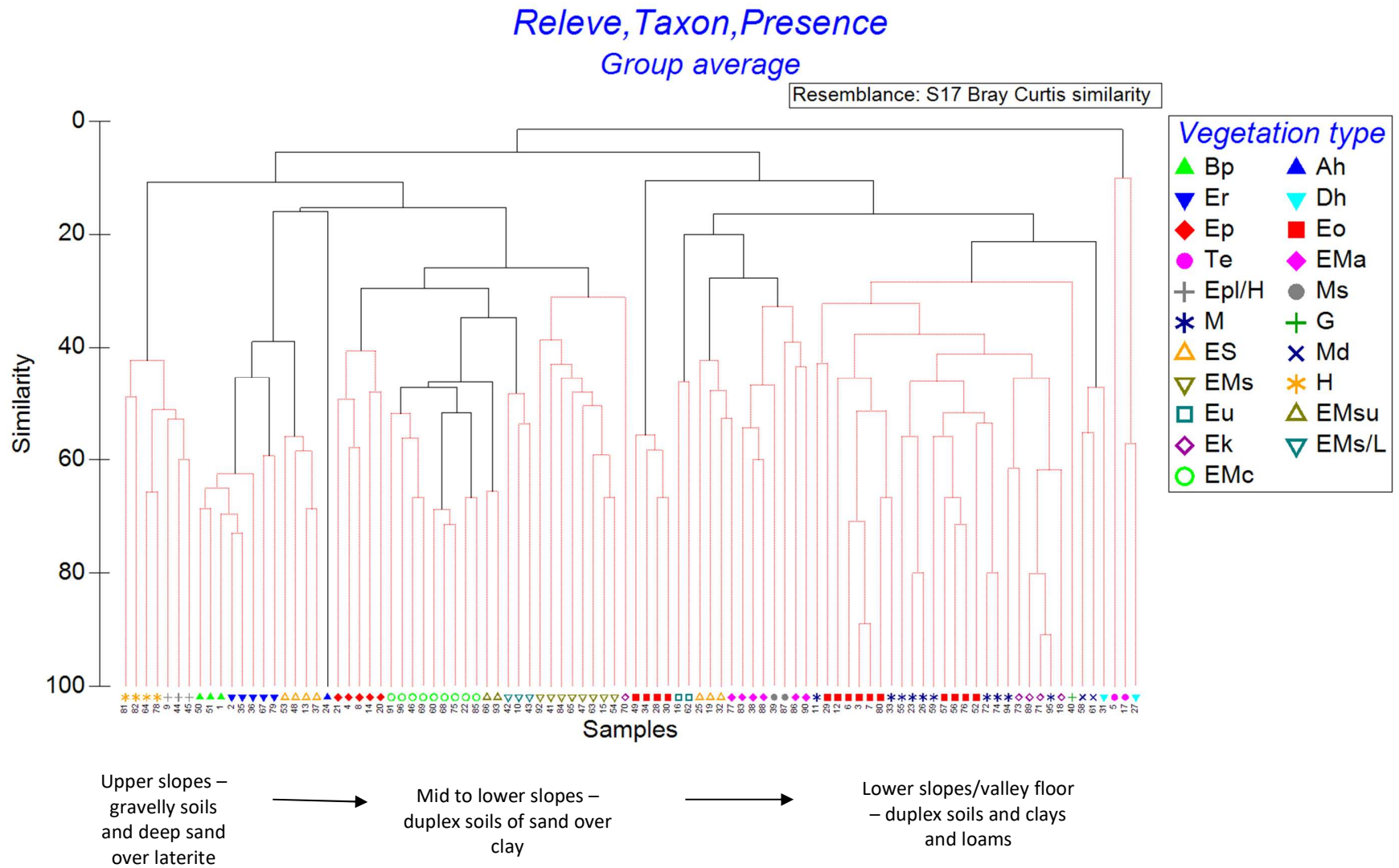


Figure 5: Dendrogram of the releve group classification

3.5 Threatened Ecological Communities

In Western Australia, the Minister for Environment may list an ecological community as being threatened if the community is presumed to be totally destroyed or at risk of becoming totally destroyed. As of May 2014, 376 ecological communities in WA have been entered into the threatened ecological community database. The WA Minister for Environment has endorsed 69 of these and the remaining 307 are allocated to one of five priority categories. Ecological communities with insufficient information available to be considered a threatened ecological community, or which are rare but not currently threatened, are placed on the Priority list and referred to as Priority Ecological Communities. 25 of these threatened ecological communities are also listed under the Commonwealth's Environment Protection and Biodiversity Conservation Act 1999.

The following Threatened Ecological community occurs on East Lake Bryde.

Unwooded freshwater wetlands of the southern wheatbelt of WA, dominated by *Duma horrida* subsp. *abdita* and *Tecticornia verrucosa* across the lake floor.

Duma horrida subsp. *abdita* was also found on a small lake in the northern section of the reserve (wetland 088) although *Tecticornia verrucosa* was not found at the time of survey. *Tecticornia verrucosa* can be an elusive species and has been described as an annual or short-lived perennial and may not always be present in the community at any one time. One plant and a seedling of *Duma horrida* subsp. *abdita* was also recorded on wetland 097 in the NW section of the reserve. This wetland appears to be affected by salt and waterlogging in some areas and dead *Melaleuca* shrubs were recorded at the site with no seedling regeneration. *Melaleuca* regeneration was occurring in areas on the edge of the lake on higher ground.

The following ecological community is recorded ~ 35 km South East of East Lake Bryde Nature Reserve. The level of gypsum at this site was 5% at 0 and 50cms.

The 'Vulnerable' threatened ecological community – 'Herblands and Bunch grasslands on gypsum lunette dunes alongside saline playa lakes'.

The priority ecological community below is situated in the Lake Grace salt lake chain ~ 46 km SW of East Lake Bryde Nature Reserve.

Priority 2: Ecological Community - Gypsum Dunes (Lake Chinocup) *Eucalyptus* aff. *incrassata* mallee over low scrub on gypsum dunes.

Critically Endangered - Eucalypt Woodlands of the WA Wheatbelt

The Threatened Ecological Community "Eucalypt Woodlands of the Western Australian Wheatbelt" has been listed under the Commonwealth's Environment Protection and Biodiversity Conservation Act 1999 as Critically Endangered. Western Australia has listed this threatened community as a Priority 3 (iii) Ecological Community. Red Morrell Woodland of the

Wheatbelt (a component of the Eucalypt Woodlands of the WA Wheatbelt EPBC listed TEC) has been listed as Priority 1.

East lake Bryde Nature Reserve includes woodlands of *Eucalyptus salmonophloia*, *Eucalyptus kondininensis*, *Eucalyptus occidentalis* and *Eucalyptus urna* which meet key diagnostic characteristics for the Critically Endangered - Eucalypt Woodlands of the WA Wheatbelt. These are as follows.

- They occur in the Western Mallee IBRA sub region.
- The structure of these woodlands is over 10% canopy cover with usually a maximum of 40%. The canopy cover can be higher in certain circumstances e.g. mallet form can be more densely spaced.
- Key species of the tree canopy are characteristic species of Eucalypt woodlands of the Wheatbelt.
- Native understorey is present but is of variable composition.

Table 5 is taken from the Approved Conservation Advice for Eucalypt Woodlands of the Western Australian Wheatbelt (Nov 2015). The condition of the Woodlands in the present survey is excellent.

Table 5

Minimum condition for patches of the WA Wheatbelt Woodlands ecological community. For each category, both the weed cover and mature tree presence criteria must apply plus one of either patch size or patch width, depending on whether the patch is a roadside remnant or not.

Cover of exotic plants (weeds) AND	Mature trees ¹ AND	Minimum patch size (non-roadside patches) ² OR	Minimum patch width (roadsides only) ³
<i>Category A: Patches likely to correspond to a condition of Pristine / Excellent / Very good (Keighery, 1994) or a High RCV (RCC, 2014).</i>			
Exotic plant species account for 0 to 30% of total vegetation cover in the understorey layers (i.e. below the tree canopy).	Mature trees may be present or absent.	2 hectares or more	5 metres or more
<i>Category B: Patches likely to correspond to a condition of Good (Keighery, 1994) or a Medium-High RCV (RCC, 2014), AND retains important habitat features.</i>			
Exotic plant species account for more than 30, to 50% of total vegetation cover in the understorey layers (i.e. below the tree canopy)	Mature trees are present with at least 5 trees per 0.5 ha.	2 hectares or more	5 metres or more
<i>Category C: Patches likely to correspond to a condition of Good (Keighery, 1994) or a Medium-High RCV (RCC, 2014).</i>			
Exotic plant species account for more than 30, to 50% of total vegetation cover in the understorey layers (i.e. below the tree canopy).	Mature trees either absent or <u>less than</u> 5 trees per 0.5 ha are present.	5 hectares or more	5 metres or more
<i>Category D: Patches likely to correspond to a condition of Degraded to Good (Keighery, 1994) or a Medium-Low to Medium-High RCV (RCC, 2014) BUT retains important habitat features.</i>			
Exotic plant species account for more than 50 to 70% of total vegetation cover in the understorey layers (i.e. below the tree canopy).	Mature trees are present with at least 5 trees per 0.5 ha.	5 hectares or more	5 metres or more

4.0 FLORA SURVEY

4.1 Taxonomy

Identifications with the name followed by “?” are uncertain due to a lack of flowering or fruiting material or to confusion in the current taxonomy of the group concerned. The nomenclature follows that of the Census of Western Australian Plants and Animals (The WA Herbarium data base). MAX V3 was used for the plant species list and plant labels for the WA Herbarium.

4.2 Flora of the Study Area.

A total of 372 plant species are recorded in Appendix 5 as occurring in the study area, 8 are introduced or weed species.

Due to the time and seasonal constraints, Appendix 5 only represents part of the flora of the area. The spring is the best time of year for a flora survey and will provide the most comprehensive species list however further survey work at different times of the year will increase our knowledge of the flora of East Lake Bryde Nature Reserve.

The families with the largest representatives of genera and species are listed in Table 6. The families Myrtaceae, Proteaceae, Fabaceae, Asteraceae, Ericaceae and Chenopodiaceae were the most strongly represented in the flora of the study area. The high number of Myrtaceae is expected given the extensive mallee, woodlands and *Melaleuca* shrublands present in the reserve and species rich heath areas on laterite include high numbers of Proteaceae.

Table 6: The number of species and genera represented within the major families in the study area.

Family	No. species	No. Genera	Introduced Weeds
Myrtaceae (<i>Melaleuca, Eucalyptus</i>)	79	17	0
Proteaceae (<i>Banksias Grevilleas</i> etc)	48	8	0
Fabaceae (<i>Acacia, peas</i>)	37	13	0
Asteraceae (daisies)	27	21	2
Ericaceae	13	6	0
Chenopodiaceae	13	6	0
Cyperaceae	13	4	0

4.3 Threatened and Priority Flora

Department of Parks and Wildlife Conservation Codes

The Department of Parks and Wildlife classifies Threatened and Priority Flora into categories which reflect their conservation status. These categories are listed below:

T Threatened Species

Published as Specially Protected under the *Wildlife Conservation Act 1950* and listed under Schedules 1 to 4 of the Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria. These categories include Critically Endangered, Endangered, Vulnerable and Presumed extinct species.

P Priority Species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Flora lists under Priority 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These species require further monitoring.

Details of codes can be found in Appendix 6.

The Department of Parks and Wildlife supplied information on Threatened and Priority flora known to occur in the Lake Bryde Recovery Catchment. Information was included from the Threatened (Declared Rare) Flora database (DEFL), the WA Herbarium Specimen database (waherb) and the Declared Rare and Priority Flora List (this list is searched using place names) and information from Rick (2011). This information has been updated using NatureMap (<https://naturemap.dpaw.wa.gov.au/>) and FloraBase (<http://florabase.dpaw.wa.gov.au/>)

4.3.1 Threatened Flora

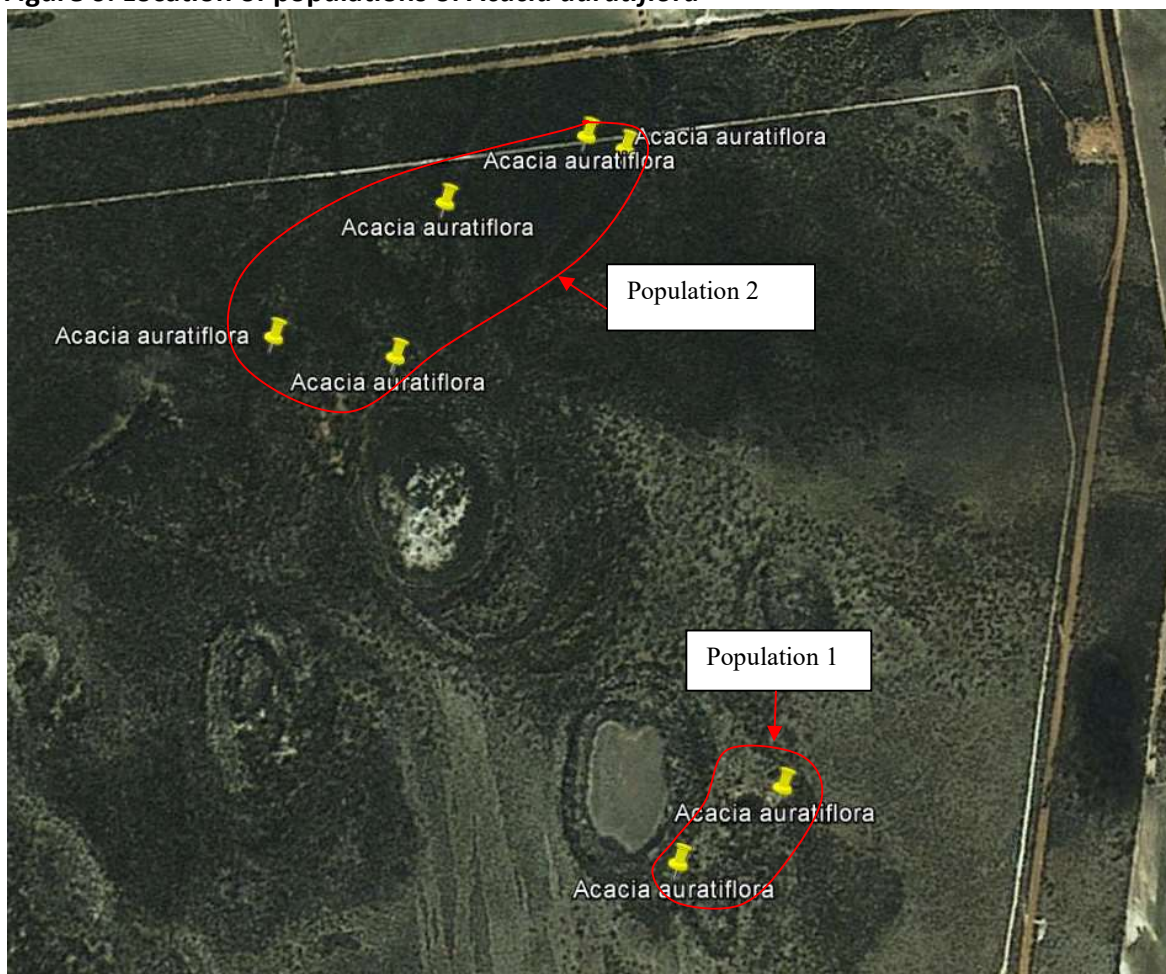
Acacia auratiflora

Two new populations of *Acacia auratiflora* were found during the present survey. Plants within 500m of each other were considered to be part of the same population (Guidelines from the Threatened and Priority Flora Report Form Field Manual Department of Parks and Wildlife 2010). The coordinates of plants recorded during the survey area are presented in Table 7.

Table 7:

Population	WP	Coordinates	Vegetation type	No Plants counted	Voucher
1	15 (releve 4)	33° 21' 47.8" 118° 55' 46.7"	Ep	14	7249
1	31 (releve 8)	33° 21' 43.4" 118° 55' 56.6"	Ep	51	
2	179 (releve 32)	33° 21' 15.8" 118° 55' 31.06"	Es	11	7521
2	615	33° 21' 4.59" 118° 55' 49.6"	EMa	3	7803
2	617	33° 21' 3.5" 118° 55' 46.9"	Ems	2	
2	635	33° 21' 6.6" 118° 55' 35.97"	Ems	20	7812
2	646	33° 21' 13.6" 118° 55' 22.45"	EMs	3	

Figure 6: Location of populations of *Acacia auratiflora*





Acacia auratiflora

Calectasia pignattiana

Calectasia pignattiana has already been recorded in the *Banksia prionotes* open woodland and *Eremaea pauciflora* heathland near the eastern boundary of the East Lake Bryde Nature Reserve. A new population was recorded during the present survey at releve 35 near the southern boundary in *Eremaea pauciflora* heathland. Only 3 plants were recorded.



Calectasia pignattiana

Duma horrida* subsp. *abdita

Duma horrida subsp. *abdita* is part of the Threatened Ecological Community covering East Lake Bryde. Two new populations were found during the present survey at releve 31 – wetland 088 (~200 plants) and Releve 58 on wetland 097 (1 adult plant and 1 seedling).



Duma horrida* subsp. *abdita

4.3.2 Priority Flora

Fourteen priority species were recorded during the present survey. Information on the localities at which these species were recorded, growth form and habitat information is presented in Table 8.

4.3.3 Other flora of significance

Gompholobium tomentosum has not previously been recorded for the Kent Shire. *Opercularia rubioides* P3 and *Synaphea boyaginensis* P2 were recorded on Nature Map within a 3 km radius of the centre of the reserve. These two species were not recorded during the present survey.

Table 8: Priority flora recorded in East lake Bryde Nature Reserve

Taxa	Cons code	Habitat	Releve/ WP	Growth form
<i>Drosera grievei</i> Voucher 7203, 7534	P1	<i>Banksia prionotes</i> open woodland <i>Eremaea pauciflora</i> Heath- deep sandy soils – upper slopes	1, 35	Fibrous-rooted perennial herb to 3 cms, flowers white in September
<i>Astroloma chloranthum</i> Voucher 7431, 7672	P2	Mallee over <i>Melaleuca scalena</i> on sand over clay. Mid to lower slopes on duplex soils of sand over clay.	54, 63, 65, 84, 92	Low spreading, dome shaped shrub to 15cm, flowers green in May to July
<i>Banksia epimicta</i> Voucher 7280	P2	Very Open shrub mallee over heathland on sandy soils over laterite	13, 37, 48, 53, 66, 67,	Prostrate, spreading, non-lignotuberous shrub
<i>Acacia undosa</i> Voucher 7574	P3	Mallee over <i>Melaleuca adnata</i> Mallee over <i>Melaleuca scalena</i> on duplex soils of sand over clay	38, 41, WP399, WP417	Spreading shrub to 1.5m yellow flowers in July to September
<i>Banksia xylothemelia</i>	P3	Heath (Laterite) common on lateritic soils	9, 45, 64, 81, 82	Sprawling, lignotuberous shrub to 1m, flowers yellow in September to October
<i>Bossiaea spinosa</i>	P3	Mallee over <i>Melaleuca carrii</i> on duplex sandy soils over clay	Near releve 84	Low shrub to 0.5m, flowers yellow, orange, red in August to October
<i>Calectasia obtusa</i> Voucher 7746	P3	Mallee over <i>Melaleuca carrii</i> Mallee over <i>Melaleuca subtrigona</i> on duplex sandy soils over clay	46, 66, 69	Erect low herb to 0.4m, with aerial roots, flower blue in August-September
<i>Daviesia uncinata</i> Voucher 7638	P3	Heath laterite – <i>Eucalyptus pleurocarpa</i> . Lateritic soils	44	Intricate, many-stemmed shrub to 70cm, flowers yellow, brown December-January
<i>Gnephosis multiflora</i> Voucher 7624a	P3	<i>Melaleuca</i> shrubland sandy soils over clay	WP247	Erect annual herb to 4 cm, flowers yellow in November
<i>Grevillea newbeyi</i> Voucher 7637, 7754	P3	Mallee over <i>Melaleuca scalena</i> (laterite) <i>Eremaea pauciflora</i> heathland. Sandy soils over laterite	43 WP441	Bushy, intricately branched, spreading shrub to 1.5m, flowers pink, red, cream in January, June, September to November
<i>Hakea brachyptera</i> Voucher 7301	P3	Very Open shrub mallee over heath (<i>Banksia media</i>) on sandy soils over laterite	13, 37, 53, WP203, WP205, WP307, WP594	Low intricately branched shrub to 1.2m, flowers white
<i>Melaleuca sculponeata</i> Voucher 7745	P3	Mallee over <i>Melaleuca subtrigona</i> on duplex sandy soils over clay with some laterite	66	Rounded shrub , flowers white in October
<i>Haegiela tatei</i> Voucher 7267	P4	Samphire shrubland on gypsum over clay	5	Ascending to erect annual herb to 8 cm , flowers white, yellow
<i>Rinzia affinis</i> Voucher 7216, 7531	P4	<i>Banksia prionotes</i> open woodland <i>Eremaea pauciflora</i> Heath on deep sandy soils	1,2,35, 36, 50, 51,	Rounded or erect shrub to 0.5m flowers white, occasionally pink July to November

5.0 WETLANDS

The Department of Parks and Wildlife has identified 18 wetlands in the East Lake Bryde Nature Reserve. Photographs and field notes recorded for these wetlands are presented in Appendix 7. Figure 6 shows the location of these wetlands in the reserve. A brief assessment of the wetlands is summarized in Table 9. A small, closed depression with *Eucalyptus occidentalis* woodland is also situated at releve 49 just south of the central firebreak and near the eastern boundary.

Table 9: Wetlands in East Lake Bryde Nature Reserve

Wetland No.	Description	Vegetation	Condition	Releve/ map unit
081	Closed depression, fresh water, clay soils	Isolated <i>Melaleuca</i> shrubs over grasses and herbs. <i>Melaleuca</i> shrubs regenerating at edges.	Grass weeds Very Good	40 G
082	Closed depression, clay soils, winter wet	<i>Eucalyptus occidentalis</i> trees and <i>Melaleuca</i> shrubs regenerating	Excellent	
083	East lake Bryde, freshwater lake, silt and clay	<i>Duma horrida</i> subsp. <i>abdita</i> / <i>Tecticornia verrucosa</i> shrubland	Excellent	26 M 27 Du 55 M
084	Closed depression, clay soils, winter wet	<i>Eucalyptus occidentalis</i> woodland. <i>Melaleuca</i> shrubs and <i>Eucalyptus occidentalis</i> regeneration on edges and in adjacent areas	Excellent	28 Eo
085	Closed depression, clay soils, winter wet	<i>Eucalyptus occidentalis</i> woodland. <i>Melaleuca</i> shrubs and <i>Eucalyptus occidentalis</i> regeneration on edges and in adjacent areas	Excellent	34 Eo
086	Playa, salt, gypsiferous soils over clay	Samphire shrubland. <i>Melaleuca</i> shrubland adjacent	Excellent	5 Te
087	Closed depression, clay soils, winter wet	<i>Eucalyptus occidentalis</i> trees and <i>Melaleuca</i> shrubs regenerating	Excellent	29 Eo r 30 Eo r
088	Small lake, fresh water, clay and silt	<i>Duma horrida</i> subsp. <i>abdita</i> shrubland. <i>Melaleuca</i> shrubland northern section	Excellent	31 Dh
089	Closed depression sandy soils over clay	Small area of <i>Eucalyptus occidentalis</i> woodland. Mostly Mallee over <i>Melaleuca</i> regeneration	Excellent	
090	Closed depression, clay soils, winter wet	<i>Eucalyptus occidentalis</i> woodland	Excellent	52 Eo
091	Closed depression, inflow from drainage line to the south. Shallow sandy soils over clay, poorly drained	<i>Melaleuca</i> shrubland	Excellent	11 M
097	Lake, secondary salinization? Clay soils	Samphire shrubland central, degraded <i>Melaleuca</i> shrublands adjacent in the northern half (waterlogging, salinity?) <i>Melaleuca</i> shrubs and Trees (<i>Eucalyptus kondininensis</i> ?) regenerating in adjacent areas in the south	Very good	17 Te 58 Md 59 M r 61 Md
100	Closed depression, shallow sandy soils over clay	<i>Eucalyptus kondininensis</i> Woodland	Excellent	89 Ek r
101	Closed depression, shallow sandy	<i>Eucalyptus kondininensis</i>	Excellent	71 Ek r

	soils over clay	Woodland		
111	Closed depression, clay soils poorly drained	<i>Melaleuca</i> shrubland	Excellent	95 M
118	Closed depression, clay soils poorly drained	<i>Melaleuca</i> shrubland. <i>Melaleuca</i> regenerating at the edges.	Excellent	33 M
121	Closed depression, sandy soils over clay	<i>Melaleuca</i> shrubland, Mallee over <i>Melaleuca</i> at the elevated edges	Excellent	94 M
303	Closed depression, clay soils, winter wet	<i>Eucalyptus occidentalis</i> woodland. <i>Melaleuca</i> shrubs and <i>Eucalyptus occidentalis</i> regeneration on edges and in adjacent areas	Excellent	80 Eo

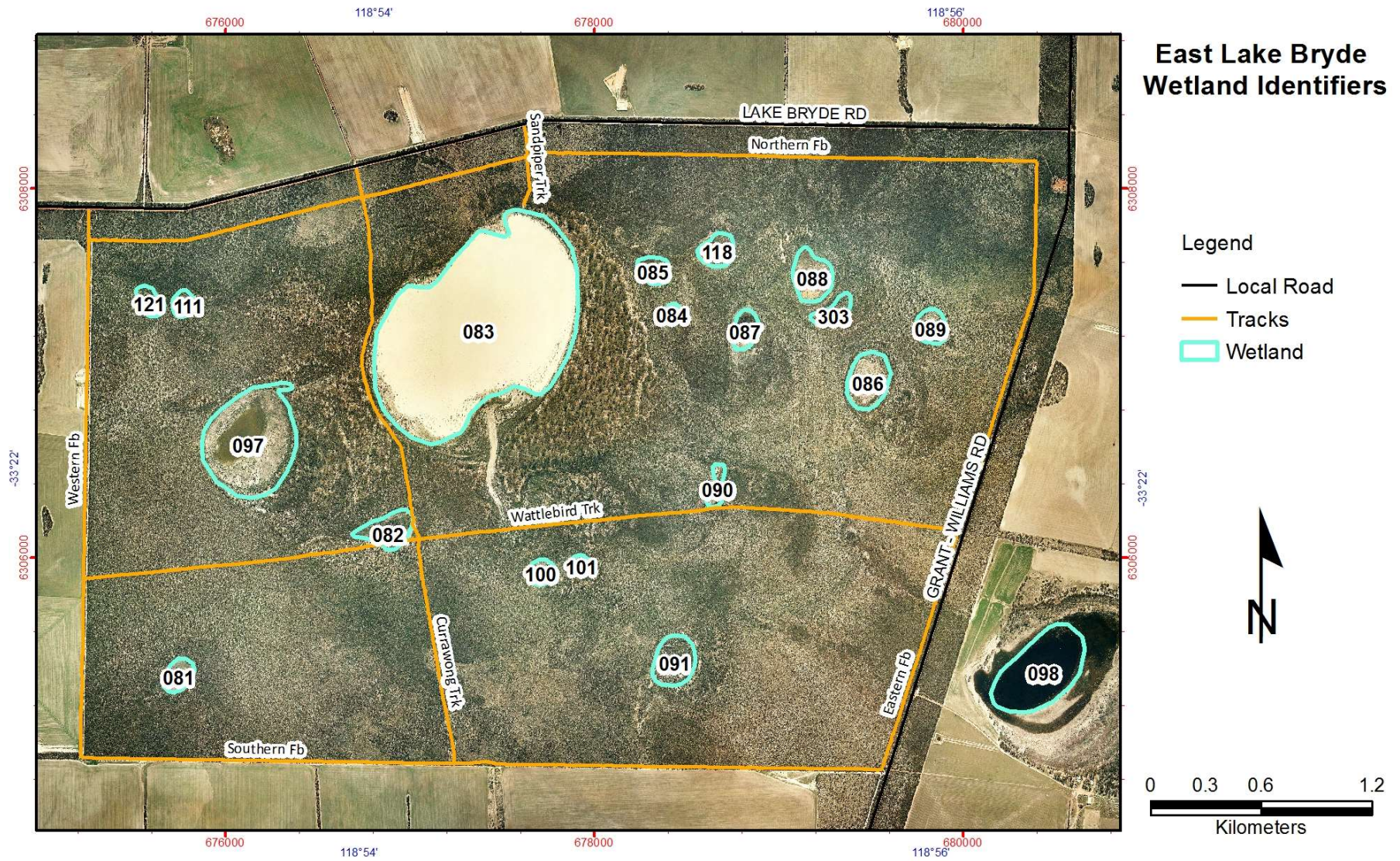
6.0 FAUNA

A fauna survey was not part of the present project however the following rare fauna were observed during the vegetation and flora survey. A Mallee fowl nest was found near the northern boundary at WP 650 (33° 21' 3.056" 118° 55' 23.822"), Carnaby's cockatoos were frequently seen in the salmon gum woodlands and Brush Tailed Wallabies were sighted twice during the survey.



Mallee fowl nest near the northern boundary

Figure 7: Location of wetlands in the East Lake Bryde Nature Reserve 29020



7.0 CONSERVATION SIGNIFICANCE

East lake Bryde Nature Reserve 29020 is an outstanding nature reserve with high conservation values. Some of these values are summarized below.

- The reserve includes a range of vegetation types from the Heath communities on lateritic soils on the upper slopes, extensive mallee communities and woodlands and *Melaleuca* shrublands on the lower slopes and valley floor. The vegetation is mainly in excellent condition.
- 18 wetlands are documented in this report including closed depressions with *Eucalyptus occidentalis* woodlands, *Eucalyptus kondininensis* woodlands or *Melaleuca* shrublands, a salt lake with gypsum, 3 freshwater lakes including East Lake Bryde and only one lake that appears to be affected by secondary salinisation.
- Three Declared Rare Flora were recorded during the present survey including *Acacia auratiflora* (2 new populations), *Duma horrida* subsp. *abdita* (2 new populations, 1 already recorded) and *Calectasia pignattiana* (1 new population, 1 already recorded)
- 14 priority species were recorded during the survey.
- Critically endangered woodlands “Eucalypt Woodlands of the WA Wheatbelt” are present including *Eucalyptus salmonophloia* , *Eucalyptus kondininensis*, *Eucalyptus occidentalis* and *Eucalyptus urna* woodlands.
- The threatened ecological community. “Unwooded freshwater wetlands of the southern wheatbelt of WA, dominated by *Duma horrida* subsp. *abdita* and *Tecticornia verrucosa* across the lake floor” occurs on East Lake Bryde. *Tecticornia verrucosa* was not recorded at the site of the new *Duma horrida* subsp. *abdita* population covering a small freshwater lake in the NW section of the reserve however this species has been described as an annual or short-lived perennial and maybe recorded at this location during future surveys.
- The reserve is an important part of the wildlife corridor connecting reserves and other remnant vegetation in the catchment. A mallee fowl nest, brush tailed wallabies and Carnaby’s cockatoos were observed during the survey. The salmon gums (nesting sites) and heath areas (feeding grounds) provide ideal habitat for the Carnaby’s cockatoos.

8.0 SURVEY LIMITATIONS

Due to the time and seasonal constraints, Appendix 4 only represents part of the flora of the area. The spring was the best time of year for the flora survey and will provide the most comprehensive species list however further survey work at different times of the year will increase our knowledge of the flora of the East Lake Bryde Nature Reserve. Some plant species will flower at other times of the year, some species do not flower every year and some species are not identifiable or even visible except for short periods of time. Fieldwork which covers only 10 days of the year cannot be expected to exclude the possibility that there are still rare flora that have not as yet been located.

Further quadrat work is needed to confirm the releve groups identified in the present survey and to increase the species list for the reserve especially those inconspicuous, small species, annuals and geophytes that may have been missed during the present survey.

9.0 REFERENCES

- Beard, J.S. (1976). The Vegetation of the Newdegate and Bremer Bay Areas, Vegetation survey of Western Australia, 1:250,000 series. Vegmap Publications, Perth Western Australia
- Cale, D. J. (2006). Wetland Survey of the Lake Bryde Natural Diversity Recovery Catchment: Waterbirds, Aquatic Invertebrates and Water chemistry. Department of Parks and Wildlife
- Clarke KR and Gorley RH (2006) "PRIMER v6". PRIMER-E Ltd
- Commonwealth of Australia (2012). Interim Biogeographical Regionalisation for Australia (IBRA) Version 7. Department of the Environment, Canberra
- Department of Parks and Wildlife (2007-) NatureMap: Mapping Western Australia's Biodiversity. Department of Parks and Wildlife. <http://naturemap.dpaw.wa.gov.au/>
- Department of Parks and Wildlife (2010). Threatened and Priority Flora Report Form - Field Manual. Department of Parks and Wildlife, WA
- Department of Parks and Wildlife (2016a). Priority Ecological Communities for Western Australia Version 26, 30 November 2016. Department of Parks and Wildlife, WA
- Department of Parks and Wildlife (2016b). List of threatened ecological communities endorsed by the Minister for the Environment, 6 October 2016, Department of Parks and Wildlife, WA
- Ecoscope (2001). Vegetation Survey of Reserves in the Lake Bryde Recovery Catchment
- Executive Steering Committee for Australian Vegetation Information ESCAVI (2003). Australian Vegetation Attribute Manual: National Vegetation Information System, Version 6.0. Department of Environment and Heritage, Canberra
- Keighery, BJ. (1994) Bushland Plant Survey. A guide to plant community survey for the community. Wildflower Society of WA (Inc) Western Australia
- Hamilton-Brown, S. and Blyth, J. (2001) Unwooded freshwater wetlands of the southern Wheatbelt of Western Australia, dominated by *Muehlenbeckia horrida* subsp *abdit*a and *Tecticornia verrucosa* across the lake floor. Interim recovery plan 92.
- McKenzie NL, May JE, and McKenna S (2002) Bioregional Summary of the 2002 Biodiversity Audit for Western Australia. Department of Conservation and Land Management, WA
- Muir, B. (1977) Vegetation and Habitat of Bendering Reserve" Part 2 of Biological Survey of the Western Australian Wheatbelt. Recordings of the Western Australian Museum Suppl. No. 3

Sawkins, D. (2011). Landscapes and soils of the Lake Grace District. Bulletin 4825
Department of Agriculture and Food, WA

Shepperd, D.P. Beeston G.R. and Hopkins, A.J.M. (2002). Native Vegetation in Western
Australia. Extent type and Status. Resource management Technical Report 249 Department
of Agriculture. South Perth, Western Australia

Western Australian Herbarium (1998-). FloraBase – the Western Australian Flora.
Department of Parks and Wildlife. <http://florabase.dpaw.wa.gov.au/>

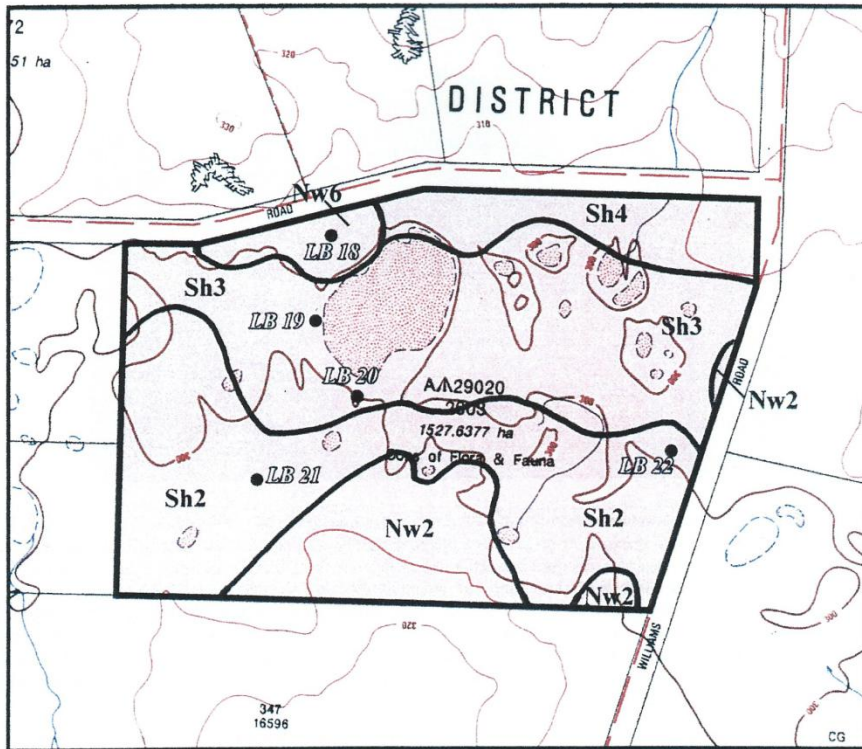
Watkins, D. and McNee, S. (1987) A survey of wetlands in and adjacent to Dunn Rock and
Lake Bryde Nature Reserves.

Appendix 1

Field Releve Sheet

Appendix 2
Quadrat Descriptions
Ecoscape (2000)

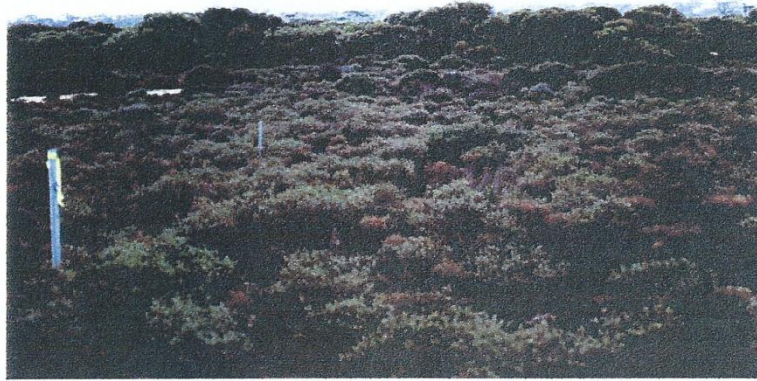
Reserve 29020 – Lake Bryde Nature Reserve



North ↑
Scale 1:50,000
Produced by Land Assessment Pty Ltd

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 alopecuroidea*.

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 melantha*.

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 carrii* ms and low heathland of *Acacia acutata*, *A. leptospermoides* subsp. *leptospermoides*, *Calytrix leschenaultii*, *Hakea ?lissocarpha*, *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 *Styliidium repens* and dwarf open sedgeland of *Desmodcladus 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 tuberculosum*, *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 lissocarpha*, *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 nutans*, *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 palaecea* and *Stylidium repens* and low sparse grassland of *Amphipogon turbinatus* and *Neurachne alopecuroidea*.

Appendix 3

Vegetation structure at releves and photographs

Releve 19 *Eucalyptus salmonophloia* (salmon gum) woodland Es

Muir Woodland over Scrub over Dwarf Scrub D (isolated shrubs to 1.5m, sedges and herbs)

NVIS U1+^tree\7\i;M1^shrub\4\i;M2^shrub\3\bi;G1^shrub,sedge,forb,grass\1\i



Releve 26 *Eucalyptus salmonophloia* (salmon gum) woodland Es

Muir Woodland over Open Scrub over Open Dwarf Scrub D (isolated shrubs to 1.0m, herbs)

NVIS U1+^tree\7\i;M1^shrub\4\i;M2^shrub\2\bi;G1^shrub,forb\1\r



Releve 32 *Eucalyptus salmonophloia* (salmon gum) woodland Es

Muir Woodland over Open Shrub Mallee Over Open Scrub (isolated shrubs to 1.0m, sedges)

NVIS U1+^tree\7\i;M1^mallee shrub\6\i;M2^shrub\4\r;G1^shrub,sedge\2\bi



Releve 16 *Eucalyptus urna* Open Forest Eu

Muir Low Forest A over Scrub over isolated shrubs to 0.5m

NVIS U1+^tree\6\c;M1^shrub\4\i;G1^shrub\1\bi



Releve 62 *Eucalyptus urna* Open Forest **Eu**

Muir Low Forest A over thicket over isolated shrubs to 0.5m

NVIS U1+\^tree\6\c;M1\^shrub\4\c;G1\^shrub\1\bi



Releve 18 *Eucalyptus kondininensis* (Kondinin blackbutt) woodland **Ek**

Muir Low Woodland A over Open Scrub over Dwarf Scrub C

NVIS U1+\^tree\6\i;M1\^shrub\4\r;G1\^shrub\2\i



Releve 70 *Eucalyptus kondininensis* (Kondinin blackbutt) woodland Ek

Muir Low Woodland A over isolated shrub mallee, shrubs and sedges

NVIS U1+\^tree\6\i;M1\^shrub mallee\6\bi;M2\^shrub\3\bi;G1\^sedge\1\bi



Releve 73 *Eucalyptus kondininensis* (Kondinin blackbutt) woodland Ek

Muir Low Woodland A over Heath A

NVIS U1+\^tree\7\i;M1\^shrub\3\c



Releve 71 *Eucalyptus kondininensis* woodland – regenerating Ek r

Muir Low Forest B over Low Scrub A over isolated shrubs to 0.5m

NVIS U1+^{tree}6;c;M1^{shrub}3\i;G1^{shrub}1\bi



Releve 89 *Eucalyptus kondininensis* woodland – regenerating Ek r

Muir Low Forest B over Open Scrub over Open Low Scrub B over isolated shrubs to 0.5m

NVIS U1+^{tree}6;c;M1^{shrub}3\i;G1^{shrub}1\bi



Releve 22 *Eucalyptus occidentalis* woodland – sparse understorey Eo

Muir Low Woodland A over isolated shrubs to 0.5m

NVIS U1+^{tree}\7\c; G1^{shrub}\1\bi



Releve 30 *Eucalyptus occidentalis* woodland - sparse understorey Eo

Muir Low Woodland A (adjacent regeneration Low Forest B)

NVIS U1+^{tree}\7\i (adjacent regeneration U1+^{tree}\6\c)



Releve 34 *Eucalyptus occidentalis* woodland – sparse understorey Eo

Muir Low Forest A over Scrub

NVIS U1+^tree\7\c;M1^shrub\4\i



Releve 49 *Eucalyptus occidentalis* woodland – sparse understorey Eo

Muir Low Forest A over isolated shrubs

NVIS U1+^tree\7\c;M1^shrub\4\bi



Releve 3 *Eucalyptus occidentalis* woodland – *Melaleuca* understorey Eo

Muir Low Woodland A over isolated shrub mallee over Open Scrub over Open Dwarf Scrub C over isolated sedge

NVIS U1+^tree\7|i;M1^shrub mallee\5|bi;M2^shrub\4|r;G1^shrub,sedge\2\r



Releve 6 *Eucalyptus occidentalis* woodland – *Melaleuca* understorey Eo

Muir Low Woodland A over Heath A over isolated shrubs to 1.0m over Very Open Tall sedge

NVIS U1+^tree\6|i;M1^shrub\3|c;G1^sedge,shrub\2\r



Releve 7 *Eucalyptus occidentalis* woodland – *Melaleuca* understorey Eo

Muir Low Woodland A over Thicket over isolated shrubs to 0.5m over Very Open Tall sedge

NVIS U1+^tree\7\i;M1^shrub\4\c;G1^sedge,shrub\2\r



Releve12 *Eucalyptus occidentalis* woodland – *Melaleuca* understorey Eo

Muir Low Woodland A over isolated shrub mallee over Scrub over isolated shrubs to 0.5m, sedges, grasses

NVIS U1+^tree\7\i;M1^mallee shrub\6\bi\M2^shrub\4\i;G1^shrub,sedge,grass\1\bi



Releve 52 *Eucalyptus occidentalis* woodland — *Melaleuca* understorey Eo

Muir Low Woodland A over Heath A (edge)

NVIS U1+^tree\7|i;M1^shrub\3\c (edge)



Releve 56 *Eucalyptus occidentalis* woodland – *Melaleuca* understorey Eo

Muir Low Forest A (patchy) over Scrub over isolated shrubs to 0.5m

NVIS U1+^tree\7\c;M1^shrub\4|i;G1^shrub\1\bi



Releve 76 *Eucalyptus occidentalis* woodland – *Melaleuca* understorey Eo

Muir Low Woodland A over Heath A

NVIS U1+^tree\7\i;M1^shrub\3\c



Releve 80 *Eucalyptus occidentalis* woodland – *Melaleuca* understorey Eo

Muir Low Woodland A over Open Scrub over Low Heath C

NVIS U1+^tree\7\i;M1^shrub\4\r;G1^shrub,forb\2\c



Releve 29 *Eucalyptus occidentalis* woodland (regeneration) Eo r

Muir Low Forest A over isolated shrubs to 1.0m

NVIS U1+^tree\6\c; G1^shrub\2\bi



Releve 57 *Eucalyptus occidentalis* woodland (regeneration) Eo r

Muir Isolated trees over Low Heath D

NVIS U1+^tree\6\bi; G1^shrub\1\c



Releve 57a *Eucalyptus occidentalis* woodland (adjacent regeneration) Eo r

Muir Low Forest B over Low Heath C

NVIS U1+^tree\6\c;G1^shrub\2\c



Adjacent Releve 57

Releve 24 *Allocasuarina huegeliana* open forest Ah

Muir Low Forest A over Isolated shrubs to 3m over Low Heath C over Open Herbs (isolated grasses)

NVIS U1+^tree\6\c;M1^shrub\4\bi;G1^shrub\2\c;G2\forb,grass\1\i



Releve 10 **Mallee over *Melaleuca scalena* (laterite)** **EMs/L**

Muir Shrub Mallee over Low Scrub A over isolated shrubs 1m over Open Dwarf Scrub D

NVIS M1+^mallee shrub\6\c;M2^shrub\3\i; G1^shrub\2\bi;G2^shrub\1\r



Releve 42 **Mallee over *Melaleuca scalena* (laterite)** **EMs/L**

Muir Shrub Mallee over Low Scrub A over Open Dwarf Scrub C over Very Open Low Sedges

NVIS M1+^mallee shrub\6\c;M2^shrub\3\i; G1^shrub\2\r;G2^sedge\1\r



Releve 43 **Mallee over *Melaleuca scalena* (laterite)** **EMs/L**

Muir Shrub Mallee over Low Scrub A over Open Dwarf Scrub D (isolated sedges, herbs)

NVIS M1+^mallee shrub\6\c;M2^shrub\3\i; G1^shrub,sedge,forb\1\r



Releve 15 **Mallee over *Melaleuca scalena*** **EMs**

Muir Shrub Mallee over Heath A over Very Open Low Sedges (isolated shrubs 0.5m, herbs)

NVIS M1+^mallee shrub\6\c;M2^shrub\3\c; G1^sedge,shrub,forb\1\r



Releve 41 *Mallee over Melaleuca scalena* EMs

Muir Shrub Mallee over Heath A (isolated shrubs 0.5m, sedges, herbs)

NVIS M1+^mallee shrub\6\c;M2^shrub\3\c; G1^shrub\2\bi;G1^shrub,sedge,forb\1\bi



Releve 47 *Mallee over Melaleuca scalena* EMs

Muir Shrub Mallee over Heath B over isolated shrubs 1m over Open Dwarf Scrub D

NVIS M1+^mallee shrub\6\c;M2^shrub\3\c; G1^shrub\2\bi;G2^shrub\1\r



Releve 54 Mallee over *Melaleuca scalena* EMs

Muir Open Shrub Mallee over Heath A over Open Dwarf Scrub D (isolated sedge, herb)

NVIS M1+^mallee shrub\6\i;M2^shrub\3\c; G1^shrub,sedge\1\r



Releve 63 Mallee over *Melaleuca scalena* EMs

Muir Shrub Mallee over Heath A (isolated shrubs 0.5m, sedge, herb, grass)

NVIS M1+^mallee shrub\6\c;M2^shrub\3\c; G1^shrub,sedge,forb,grass\1\bi



Releve 65 Mallee over *Melaleuca scalena* EMs

Muir Shrub Mallee over Thicket (isolated shrubs to 0.5, sedge, herb)

NVIS M1+^\^mallee shrub\6\c;M2^\^shrub\4\c; G1^\^shrub,sedge,forb\1\bi



Releve 84 Mallee over *Melaleuca scalena* EMs

Muir Shrub Mallee over Thicket over Open Dwarf Scrub D (isolated sedges, herbs)

NVIS M1+^\^mallee shrub\6\c;M2^\^shrub\4\c; G1^\^shrub,sedge,forb\1\r



Releve 92 **Mallee over *Melaleuca scalena*** **EMs**

Muir Open Shrub Mallee/Open Tree Mallee over isolated shrubs to 1.5m over Open Tall Sedges over Open Dwarf Scrub D (isolated herbs)

NVIS M1+[^]mallee shrub\6\i;M2[^]shrub\3\bi; G1[^]sedge\2\i;G2[^]shrub,forb\1\r



Releve 38 **Mallee over *Melaleuca adnata*** **EMa**

Muir Open Shrub Mallee over Heath B (isolated shrubs 0.5m)

NVIS M1+[^]mallee shrub\6\i;M2[^]shrub\3\c; G1[^]shrub\1\bi



Releve 77 *Mallee over Melaleuca adnata* EMa

Muir Shrub Mallee over Low Scrub B (isolated trees, shrubs to 1m, sedges, grass)

NVIS U1\^tree\7\bi\M1+\^mallee shrub\6\c;M2\^shrub\3\i; G1\^shrub,sedge,forb,grass\1\bi



Releve 83 *Mallee over Melaleuca adnata* EMa

Muir Open Shrub Mallee over Heath A (isolated shrubs to 0.5m)

NVIS M1\^mallee shrub\6\i;M2+\^shrub\3\c; G1\^shrub \1\bi



Releve 86 Mallee over *Melaleuca adnata* EMa

Muir Shrub Mallee over Heath A (isolated shrubs to 0.5m, sedges, grass)

NVIS M1+^\^mallee shrub\6\c;M2^\^shrub\3\c; G1^\^shrub,sedge,grass \1\bi



Releve 88 Mallee over *Melaleuca adnata* EMa

Muir Open Shrub Mallee over Heath B (isolated shrubs to 0.5m)

NVIS M1+^\^mallee shrub\6\c;M2^\^shrub\3\c; G1^\^shrub\1\bi



Releve 90 Mallee over *Melaleuca adnata* EMa

Muir Shrub Mallee over Open Dwarf Scrub C (isolated shrubs to 0.5m, sedges, herbs)

NVIS M1+^\^mallee shrub\6\c;G1^\^shrub\2\r; G2^\^shrub,sedge,herb\1\bi



Releve 46 Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*)

EMc

Muir Shrub Mallee over Low Scrub B over Low Heath D (isolated sedges, herbs)

NVIS M1+^\^mallee shrub\6\c;M2^\^shrub\3\i;G1^\^shrub,sedge,rush,forb\1\c



Releve 69 **Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*)** **EMc**

Muir Open Shrub Mallee over Open Low Scrub A over Low Heath C over Open Dwarf Scrub D
(isolated sedges, herbs)

NVIS M1+^mallee shrub\6\i;M2^shrub\3\r;G1^shrub\2\c;G2^ shrub,sedge,forb\1\r



Releve 91 **Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*)** **EMc**

Muir Open Shrub Mallee over Open Low Scrub A over Low Heath C over Open Dwarf Scrub D
(isolated sedges)

NVIS M1+^mallee shrub\6\i;M2^shrub\3\r;G1^shrub\2\c;G2^ shrub,sedge\1\r



Releve 96 Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*) EMc

Muir Shrub Mallee over Open Low Scrub B over Low Heath C over Open Dwarf Scrub D (isolated sedges, herbs)

NVIS M1+^mallee shrub\6\c;M2^shrub\3\r;G1^shrub\2\c;G2^ shrub,sedge,forb\1\r



Releve 60 Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*) EMc

Muir Open Shrub Mallee over Low Scrub A over Low Heath C over Very Open Low sedges (isolated shrubs to 0.5)

NVIS M1+^mallee shrub\6\j;M2^shrub\3\j;G1^shrub\2\c;G2^ sedge,shrub\1\r



Releve 68 Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*) EMc

Muir Open Shrub Mallee over Open Low Scrub A over Low Heath C over Dwarf Scrub D (isolated sedge,grass)

NVIS M1+^mallee shrub\6\i;M2^shrub\3\r;G1^shrub\2\c;G2^shrub,sedge,grass\1\r



Releve 75 Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*) EMc

Muir Shrub Mallee over Isolated shrubs to 2m over Low Heath C over Open Dwarf Scrub D over Very Open Low Sedges

NVIS M1+^mallee shrub\6\c;M2^shrub\3\bi;G1^shrub\2\c;G2^shrub,sedge\1\i



Releve 22 Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*) EMc

Muir Open Shrub Mallee over Isolated shrubs 2m+ over Heath B over Open Dwarf Scrub D (isolated sedges,herbs)

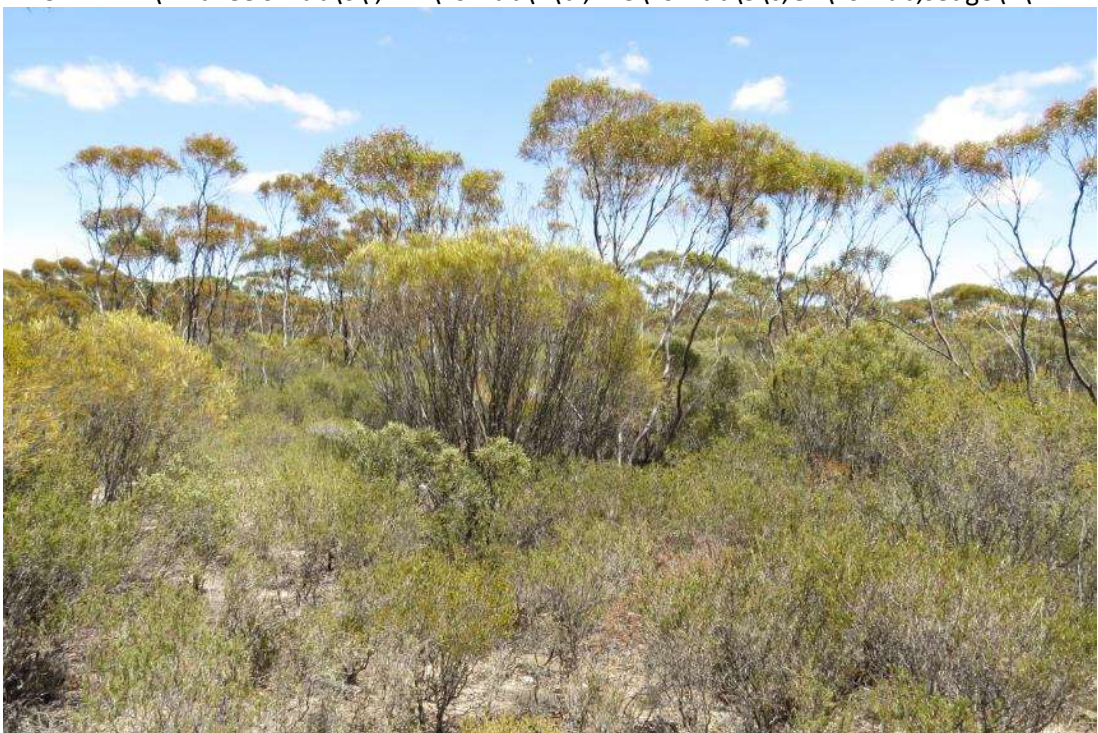
NVIS M1+^mallee shrub\6\j; M2^shrub\4\bi; M3^shrub\3\c;G1^shrub,sedge\1\r



Releve 85 Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*) EMc

Muir Open Shrub Mallee over Isolated shrubs 2m+ over Heath B over Open Dwarf Scrub D (isolated sedges,herbs)

NVIS M1+^mallee shrub\6\j; M2^shrub\4\bi; M3^shrub\3\c;G1^shrub,sedge\1\r



Releve 46 Mallee over *Melaleuca* low shrubland (*Melaleuca subtrigona*) **EMsu**

Muir Very Open Shrub Mallee over Open Low Scrub A over Low Heath C over Open Dwarf Scrub D over Very Open Low Sedges (isolated herbs, grass)

NVIS M1\^mallee shrub\6\r;M2\^shrub\3\r; G1\^shrub\2\c;G2\^ shrub,sedge,forb,grass\1\r



Releve 93 Mallee over *Melaleuca* low shrubland (*Melaleuca subtrigona*) **EMsu**

Muir Open Shrub Mallee over Open Low Scrub B over Low Heath C over Open Dwarf Scrub D (isolated sedge, grass)

NVIS M1+\^mallee shrub\6\i;M2\^shrub\3\r; G1\^shrub\2\c;G2\^ shrub,sedge,grass\1\r



Releve 4 *Eucalyptus perangusta* over mixed shrubland **Ep**

Muir Open Shrub Mallee over Open Low Scrub A over Dwarf Scrub C over Very Open Tall Sedges over Open Dwarf Scrub D (isolated shrubs herbs, grass)

NVIS M1+^mallee shrub\6\i;M2^shrub\3\r; G1^shrub,sedge\2\i;G2^ shrub,forb,grass\1\r



Releve 8 *Eucalyptus perangusta* over mixed shrubland **Ep**

Muir Shrub Mallee over isolated shrubs to 1.5m over Low Heath C over Very Open Low Sedges (isolated shrubs 0.5m, grass)

NVIS M1+^mallee shrub\6\c;M2^shrub\3\bi; G1^shrub\2\c;G2^ sedge,shrub,grass\1\r



Releve 14 *Eucalyptus perangusta* over mixed shrubland **Ep**

Muir Open Shrub Mallee over Heath B over Open Dwarf Scrub D over Very Open Low Sedges (isolated herbs, grasses)

NVIS M1+^mallee shrub\6\i;M2^shrub\3\c; G1^shrub,sedge,forb,grass\1\r



Releve 20 *Eucalyptus perangusta* over mixed shrubland **Ep**

Muir Open Shrub Mallee over Heath B over (isolated shrubs to 0.5m, sedges, herbs)

NVIS M1+^mallee shrub\6\i;M2^shrub\3\c; G1^shrub,sedge,forb\1\bi



Releve 21 *Eucalyptus perangusta* over mixed shrubland **Ep**

Muir Shrub Mallee over Heath B over (isolated shrubs to 0.5m, sedges, herbs)

NVIS M1+[^]mallee shrub\6\c;M2[^]shrub\3\c; G1[^]shrub,sedge,forb\1\bi



Releve 1 *Banksia prionotes* open woodland **Bp**

Muir Open Low Woodland B over Open Low Scrub A over Low Heath C over Dwarf Scrub D over Very Open Low Sedges (isolated herbs and grasses)

NVIS U1[^]tree\6\r;M1[^]shrub\3\r;G1+[^]heath shrub\2\c;G2[^]heath shrub,sedge,forb,grass\1\i



Releve 50 *Banksia prionotes* open woodland **Bp**

Muir Open Low Woodland B over Open Scrub over Low Heath C over Open Dwarf Scrub D over isolated Low Sedges, herbs, grass

NVIS U1\^tree\6\r;M1\^shrub\4\r;G1+\^heath shrub\2\c;G2\^heath shrub,sedge,forb,grass\1\r



Releve 51 *Banksia prionotes* open woodland **Bp**

Muir Open Low Woodland B over Open Low Scrub A over Low Heath C over Open Dwarf Scrub D over isolated Low Sedges, herbs, grass

NVIS U1\^tree\6\r;M1\^shrub\3\r;G1+\^heath shrub\2\c;G2\^ shrub,sedge,forb,rush,grass\1\r



Releve 2 *Eremaea pauciflora* heathland Er

Muir Open Scrub over Low Scrub B over Low Heath C over Open Dwarf Scrub D over isolated sedges, herbs, grass

NVIS M1\^shrub\4\r;M2\^ shrub\3\i;G1+\^heath shrub\2\c;G2\^heath shrub, sedge, forb, grass\1\r



Releve 35 *Eremaea pauciflora* heathland Er

Muir Open Scrub over Low Scrub A over Low Heath C over Dwarf Scrub D over isolated sedges, herbs, grass

NVIS M1\^shrub\4\r;M2\^ shrub\3\i;G1+\^heath shrub\2\c;G2\^heath shrub, sedge, forb, grass\1\i



Releve 36 *Eremaea pauciflora* heathland **Er**

Muir Open Scrub over Open Low Scrub A over Low Heath C over Open Dwarf Scrub D over isolated sedges, herbs, grass

NVIS M1\^shrub\4\r;M2\^shrub\3\r;G1+\^heath shrub\2\c;G2\^heath shrub, sedge, rush, forb, grass\1\r



Releve 67 *Eremaea pauciflora* heathland **Er**

Muir Very Open Shrub Mallee over isolated shrubs over 2m over Low Heath C over Open Dwarf Scrub D over Very Open Low Sedges (isolated herbs, grass)

NVIS M1\^mallee shrub\6\r;M2\^shrub\4\bi;G1+\^ heath shrub\2\c;G2\^ heath shrub, sedge, rush, forb, grass\1\i



Releve 79 *Eremaea pauciflora* heathland **Er**

Muir Very Open Shrub Mallee over isolated shrubs over 2m over Low Heath C over Dwarf Scrub D over Very Open Low Sedges (isolated herbs, grass)

NVIS M1\^mallee shrub\6\r;M2\^shrub\4\bi;G1+\^ heath shrub\2\c;G2\^ heath shrub, sedge, rush, forb, grass\1\i



Releve 13 *Very sparse mallee over mixed heathland* **ES**

Muir Very Open Shrub Mallee over isolated shrubs over 2m over Open Low Scrub A over Dwarf Scrub C over Dwarf Scrub D over isolated sedges, herbs, grass

NVIS M1\^mallee shrub\6\r;M2\^shrub\2\r;G1+\^ heath shrub\2\i;G2\^ heath shrub, sedge, rush, forb, grass\1\i



Releve 37 **Very Sparse mallee over mixed heathland** **ES**

Muir Very Open Shrub Mallee over isolated shrubs over 2m over Dwarf Scrub C over Dwarf Scrub D (isolated sedges, herbs, grass)

NVIS M1\^mallee shrub\6\r;M2\^shrub\4\bi;G1+\^heath shrub\2\i;G2\^ heath shrub, sedge, rush, forb, grass\1\i



Releve 48 **Very sparse mallee over mixed heathland** **ES**

Muir Open Low Scrub A over Open Dwarf Scrub C over Low Heath D over Very Open Low Sedges (isolated herbs, grass)

NVIS M1\^ shrub\4\bi;M2\^shrub\3\r;G1\^heath shrub\2\r;G2+\^heath shrub, sedge, forb, rush, grass\1\c



Releve 53 **Very sparse mallee over mixed heathland** **ES**

Muir Very Open Shrub Mallee over isolated shrubs over 2m over Low Heath C over Dwarf Scrub D (isolated sedges, herbs, grass)

NVIS M1\^mallee shrub\6\r;M2\^shrub\4\bi;G1+\^heath shrub\2\c;G2\^ heath shrub, sedge, forb, grass\1|i



Releve 64 **Mixed heathland (laterite)** **H**

Muir isolated shrubs 1.5 to 2m+ over Low Heath C over Dwarf Scrub D over Open Low Sedges (isolated herbs, grass)

NVIS M1\^shrub\3\bi;G1+\^ heath shrub\2\c;G2\^ heath shrub, sedge, forb, grass\1|i



Releve 78 **Mixed heathland (laterite)** **H**

Muir Open Low Scrub B over Low Heath D (isolated sedges, herbs, grass)

NVIS M1\^shrub\3\r;G1+\^ heath shrub, sedge, forb, rush, grass\1\c



Releve 81 **Mixed heathland (laterite)** **H**

Muir isolated shrubs 1.5 to 2m+ over Low Heath C over Dwarf Scrub D (isolated sedges, herbs, grass)

NVIS M1\^shrub\4\bi;G1+\^ heath shrub\2\c;G2\^ heath shrub, sedge, forb, grass\1\i



Releve 82 **Mixed heathland (laterite)** **H**

Muir isolated shrubs 1.5 to 2m+ over Low Heath C over Dwarf Scrub D (isolated sedges, herbs, grass)

NVIS M1\^shrub\4\bi;G1+\^ heath shrub\2\c;G2\^ heath shrub, sedge, forb, rush, grass\1\i



Releve 9 **Mixed heathland (laterite) - *Eucalyptus pleurocarpa*** **Epl/H**

Muir Very Open Shrub Mallee over Open Low Scrub A over Low Heath C over Open Dwarf Scrub D (isolated sedges, herbs, grass)

NVIS M1\^mallee shrub\6\r;M2\^shrub\3\r;G1+\^ heath shrub\2\c;G2\^ heath shrub, sedge, forb, grass\1\r



Releve 44 **Mixed heathland (laterite) - *Eucalyptus pleurocarpa*** **Epl/H**

Muir Isolated Shrub Mallee over isolated shrubs to 2m over Low Heath C over Dwarf Scrub D (isolated sedges, herbs, grass)

NVIS M1\^mallee shrub\6\bi;M2\^shrub\3\bi;G1+\^ heath shrub\2\c;G2\^ heath shrub, sedge, forb, grass\1\i



Releve 45 **Mixed heathland (laterite) - *Eucalyptus pleurocarpa*** **Epl/H**

Muir Isolated Shrub Mallee over isolated shrubs to 1.5m over Low Heath C over Dwarf Scrub D over Very Open Low Sedges (isolated herbs, grass)

NVIS M1\^mallee shrub\6\bi;M2\^shrub\3\bi;G1+\^ heath shrub\2\c;G2\^ heath shrub, sedge, forb, grass\1\i



Releve 39 *Melaleuca* shrubland - *Melaleuca scalena* Ms

Muir Heath A (isolated shrub mallee, shrubs 0.5m, sedges)

NVIS M1\^mallee shrub\6\bi;M2+\3c;G1\^shrub,sedge\1\bi



Releve 87 *Melaleuca* shrubland - *Melaleuca scalena* Ms

Muir Heath B (isolated trees of *Eucalyptus salmonophloia*, shrubs 0.5m, sedges)

NVIS U1\^tree\7\bi; M1+\^shrub\3\c;G1\^shrub,sedge\1\bi



Releve 11 *Melaleuca* shrubland M

Muir Thicket (isolated shrubs 0.5m, herbs, grasses)

NVIS M1+^shrub\4\c;G1^shrub,sedge,forb,grass\1\bi



Releve 23 *Melaleuca* shrubland M

Muir Thicket (isolated shrubs 0.5m, herbs)

NVIS M1+^shrub\4\c;G1^shrub,forb\1\bi



Releve 26 *Melaleuca* shrubland M

Muir Thicket over Dwarf Scrub D (isolated herbs)

NVIS M1+^shrub\4\c;G1^shrub,forb\1\i



Releve 33 *Melaleuca* shrubland M

Muir Thicket (isolated shrubs, herbs)

NVIS M1+^shrub\4\c;G1^shrub,forb\1\bi



Releve 55 *Melaleuca* shrubland M

Muir Thicket over Open Dwarf Scrub D (isolated trees of *Eucalyptus occidentalis*)

NVIS U1\^tree\7\bi;M1+\^shrub\4\c;G1\^shrub\1\r



Releve 59 *Melaleuca* shrubland (regeneration) M r

Muir Heath B (isolated shrubs to 2m, sedges)

NVIS M1+\^shrub\3\c;G1\^sedge\1\bi



Releve 72 *Melaleuca* shrubland

M

Muir Thicket (dead trees of *Eucalyptus occidentalis*)

NVIS M1+^shrub\4\c



Releve 74 *Melaleuca* shrubland

M

Muir Thicket (dead trees)

NVIS M1+^shrub\4\c



Releve 94 *Melaleuca shrubland*

Ms

Muir Very Open Shrub Mallee over Heath A

NVIS M1\^mallee shrub\6\r;M2+\^shrub\3\c



Releve 95 *Melaleuca shrubland*

M

Muir Thicket (isolated trees of *Eucalyptus kondininensis*, isolated shrub mallee)

NVIS U1\^tree,\6\bi;M1+\^shrub\4\c



Releve 58 **Melaleuca shrubland - degraded**

Md

Muir Dwarf Scrub C over Open Dwarf Scrub D (isolated live shrubs to 2m, herbs, sedge)

NVIS M1\^shrub\3\bi\G1+\^samphireshrub,shrub\2\i;G2\^shrub, forb,sedge\1\r



Releve 61 **Melaleuca shrubland - degraded**

Md

Muir Dwarf Scrub D (isolated live shrubs to 2m+, isolated shrubs to 1.0m, herbs)

NVIS M1\^shrub\4\bi\G1+\^samphire shrub,shrub,forb\1\i



Releve 40 **Isolated *Melaleuca* shrubs over open grassland**

Muir Low Heath C (edge lake) isolated shrubs, shrub mallee over Open Low Grass over Very Open Herbs (middle lake)

NVIS M1\^shrub, shrub mallee\5\bi;G1+\^grass,forb,shrub\1\i



Releve 27 ***Duma* shrubland**

Dh

Muir Dwarf Scrub D (isolated herbs)

NVIS G1+\^shrub,forb\1\i



Releve31 *Duma* shrubland Dh

Muir Dwarf Scrub D (isolated trees of *Eucalyptus occidentalis*, isolated shrubs 2m+)

NVIS U1\^tree\6\bi;M1\^shrub\4\bi\G1+\^shrub\2\i



Releve 5 *Samphire (Tecticornia)* shrubland Te

Muir Low Heath D (isolated herbs, grasses)

NVIS G1+\^shrub,forb,grass\1\c



20

Releve 17 *Samphire (Tecticornia) shrubland*

Te

Muir Low Heath D

NVIS G1+^shrub \1\c



Appendix 3

Vegetation Descriptions

Eucalyptus salmonophloia (salmon gum) woodland Es

Relevés 19, 25, 32

Landform Valley floor near lakes

Soils, topography Gentle slope to flat terrain, loamy soils over clay

Condition Excellent

Vegetation Description

Upper stratum Sparse *Eucalyptus salmonophloia* trees dominant

Mid stratum Sparse shrub mallee including *Eucalyptus phenax*, *Eucalyptus calycogona* and *Eucalyptus flocktoniae* at releve 32

Mid stratum Sparse to very sparse shrubs over 2m in height including *Acacia microbotrya*, *Santalum acuminatum*, *Melaleuca acuminata*, *Melaleuca lateriflora*, *Alyxia buxifolia* and *Callitris roei*

Mid stratum Isolated shrubs to 1.0m and 1.5m including *Melaleuca adnata*, *Exocarpos aphyllus*, *Acacia saligna* subsp. *lindleyi*, *Atriplex paludosa*, *Hakea lissocarpha*, *Hakea commutata*, *Hakea newbeyana*, *Acacia verriculum*, *Hakea lissocarpha* and *Dodonaea viscosa*

Ground Sparse shrubs to 0.5m including *Templetonia rossii*, *Olearia muelleri*, *Acacia erinacea*, *Rhagodia preissii*, *Olearia* sp. *Eremicola*, *Grevillea huegelii*, *Senna artemisioides* subsp. *x artemisioides*, *Disphyma crassifolium* and *Clematis delicata*

Isolated sedges including *Gahnia ancistrophylla*, *Lepidosperma sanguinolentum*

Perennial herbs with sedge like leaves/rush including *Lomandra effusa* and *Dianella revoluta*

Isolated herbs/forbs including *Carpobrotus modestus*, *Calandrinia eremaea*, *Crassula exerta*, *Brachyscome pusilla*, *Waitzia acuminata* and *Gnephosis tenuissima*

Isolated grasses *Neurachne alopecuroidea* and *Austrostipa elegantissima*

Comments Salmon gum woodland covers areas to the east of larger lakes and occurs along the drainage line in the NW of the reserve. The area represented by releve 32 is relatively small in area and has an understory of mallee. *Acacia auratiflora* DRF is present at this site. Carnaby's cockatoos were sighted in larger areas.



Releve 19



Releve 32 *Eucalyptus salmonophloia* with mallee understorey

Eucalyptus urna open forest

Eu

Relevés 16, 62

Landform Valley floor, dune/ridge

Soils, topography Well drained, sandy loam soils, flat at top and gentle slope

Condition Excellent

Vegetation Description

Upper stratum Mid dense *Eucalyptus urna* trees to 10m in height dominant

Mid stratum Sparse to mid dense shrubs to 3m including *Melaleuca pauperiflora*, *Melaleuca lanceolata*, *Melaleuca acuminata* and *Melaleuca adnata*

Ground Isolated shrubs to 0.5m including *Templetonia rossii*, *Olearia muelleri*, *Acacia erinacea*, *Grevillea huegelii* and *Microcybe multiflora*

Comments Relatively small area on dunes adjacent to areas of *Eucalyptus salmonophloia* and *Eucalyptus kondininensis*



Releve 16

Eucalyptus kondininensis (Kondinin blackbutt) woodland - Mature Ek

Releves 18, 70, 73 mature woodland

Landform Valley floor, adjacent to and on edges of lakes and depressions

Soils, topography sandy loam over clay, slightly elevated well drained areas

Condition Excellent

Vegetation Description (mature)

Upper stratum Sparse *Eucalyptus kondininensis* trees to 15m dominant

Mid stratum Mid dense to very sparse, occasionally isolated shrubs 1.5 to 3m including *Melaleuca acuminata*, *Melaleuca lateriflora*, *Melaleuca pauperiflora*, *Melaleuca thyoidea*, *Melaleuca adnata*, *Melaleuca depauperata*, *Melaleuca ?scalena* and *Santalum acuminatum*

Ground In some areas a sparse stratum of low shrubs to 1m occur including *Melaleuca acuminata*, *Melaleuca adnata*, *Melaleuca thyoidea*, *Rhagodia preissii*, *Acacia erinacea*, *Exocarpos aphyllus*, *Senna artemisioides* subsp. x *artemisioides*

Isolated sedge *Gahnia ancistrophylla*

Comments Common in the reserve but usually covering only small areas



Releve 18

Eucalyptus kondininensis (Kondinin blackbutt) woodland – Regeneration

Ek r

Releves 71, 89

Vegetation Description (regeneration)

Upper stratum	Mid dense <i>Eucalyptus kondininensis</i> trees to 5m dominant. Dead trees present
Mid stratum	Sparse to very sparse shrubs to 2m including <i>Melaleuca acuminata</i> (mid dense in some areas), <i>Melaleuca lateriflora</i> , <i>Melaleuca thyoides</i> , <i>Melaleuca strobophylla</i>
Ground	Isolated shrubs to 0.5m including <i>Rhagodia preissii</i> and <i>Acacia erinacea</i>
Comments	In depressions and on the edge of lakes regenerating after the floods in 2006



Releve 71

***Eucalyptus occidentalis* (flat-topped yate) woodland – sparse understorey** Eo

Releves 28, 30, 34, 49

Landform Valley floor, depressions, winter wet

Soils, topography sandy loam over clay soils, flat to gentle slope

Condition Excellent

Vegetation Description

Upper stratum Mid dense *Eucalyptus occidentalis* trees to 15m dominant

Lower stratum Usually Isolated shrubs and forbs/herbs including *Melaleuca acuminata*,
Melaleuca strophylla , *Rhagodia preissii*, *Gnephosis tenuissima*

Comments Open forest with very sparse to no understorey.



Releve 49

Eucalyptus occidentalis (flat-topped yate) woodland – *Melaleuca* understorey Eo

Releves 3, 6, 7, 12, 52, 56, 76

Vegetation Description 1

Upper stratum	Sparse <i>Eucalyptus occidentalis</i> trees 8 to 15m dominant
Mid stratum	Mid dense to sparse, occasionally very sparse shrubs usually over 2m including <i>Melaleuca acuminata</i> , <i>Melaleuca lateriflora</i> , <i>Melaleuca strobophylla</i> , <i>Melaleuca scalena</i> , <i>Callistemon phoeniceus</i> , <i>Melaleuca brophyi</i> , <i>Melaleuca depauperata</i> , <i>Santalum acuminatum</i> , <i>Melaleuca adnata</i>
Ground	Very sparse to isolated sedges of <i>Gahnia trifida</i> Isolated shrubs to 0.5m including <i>Rhagodia preissii</i> , <i>Templetonia rossii</i> , <i>Disphyma crassifolium</i> , <i>Acacia erinacea</i>



Releve 12

***Eucalyptus occidentalis* (flat-topped yate) woodland – regeneration** Eo r

Releves 29, 30 adjacent, 57, 80 adjacent

Vegetation Description regeneration

Upper stratum Mid dense *Eucalyptus occidentalis* trees to 6m dominant

Ground Mid dense stratum of shrubs to 0.5m at releve 57 and 1.0m at 80a including *Melaleuca acuminata*, *Melaleuca strobophylla*, *Melaleuca lateriflora*, *Melaleuca scalena*, *Rhagodia preissii*

Comments Isolated mature trees may be present in some areas



Adjacent Releve 80

Allocasuarina huegeliana open forest

Ah

Releves	24
Landform	Valley floor, sandy ridge
Soils, topography	sandy soils, gentle to moderate slope
Condition	Excellent, some weed

Vegetation Description

Upper stratum	Mid dense <i>Allocasuarina huegeliana</i> trees to 8m dominant
Mid stratum	Isolated shrubs to 3m including <i>Acacia saligna</i> subsp. <i>lindleyi</i> and <i>Pittosporum angustifolium</i>
Ground 1	Sparse shrubs to 1.0m including <i>Olearia</i> sp <i>Eremicola</i> , <i>Pimelea argentea</i> , <i>Rhagodia preissii</i> , <i>Calytris leschenaultii</i> , <i>Tetrapora preissiana</i> , <i>Verticordia ?densiflora</i> , <i>Billardiera lehmanniana</i>
Ground 2	Sparse herbs/forbs including <i>Waitzia acuminata</i> (frequent), <i>Brachyscome pusilla</i> , <i>Podotheca angustifolia</i> , <i>Gnephosis tenuissima</i> , <i>Senecio glossanthus</i> , <i>Crassula colorata</i> , <i>Trachymene ornata</i> , <i>Trachymene pilosa</i> and * <i>Ursinia anthemoides</i> . Isolated grasses including <i>Neurachne alopecuroides</i> , <i>Austrostipa trichophylla</i> and * <i>Pentameris airoides</i> . Isolated sedges including <i>Chordifex sphacelatus</i>
Comments	Only one relatively small area was recorded along a sandy ridge adjacent to <i>Eucalyptus salmonophloia</i> woodland



Allocasuarina open forest at releve 24

Mallee over *Melaleuca scalena* – laterite

EMs/L

Releves	10, 42, 43
Landform	upper slopes
Soils, topography	sandy gravels over clay, gentle slope
Condition	Excellent

Vegetation Description

Stratum 1	Mid dense shrub mallee to 5m including <i>Eucalyptus uncinata</i> , <i>Eucalyptus phaenophylla</i> , <i>Eucalyptus dissimulata</i> , <i>Eucalyptus</i> sp. Southern Wheatbelt
Stratum 2	Sparse shrubs to 2m including <i>Melaleuca scalena</i> (prominent), <i>Santalum acuminatum</i> , <i>Daviesia nematophylla</i>
Stratum 3	Very sparse shrubs to 0.5m (1.0m) including <i>Templetonia rossii</i> , <i>Hakea lissocarpha</i> , <i>Bertya dimerostigma</i> , <i>Verticordia chrysantha</i> , <i>Leptomeria preissiana</i> , <i>Melaleuca carrii</i> , <i>Beyeria sulcata</i> , <i>Rinzia communis</i> , <i>Westringia rigida</i> , <i>Calytrix leschenaultii</i> , <i>Dodonaea bursariifolia</i> , <i>Phebalium</i> species. Very sparse to isolated sedges including <i>Lepidosperma sanguinolentum</i> , <i>Desmocladus quiricanus</i> and <i>Gahnia ancistrophylla</i> . Isolated rushes including <i>Lomandra mucronata</i> and <i>Dianella revoluta</i>
Comments.	This vegetation type merges with Mallee over <i>Melaleuca scalena</i> on mid to lower slopes. <i>Grevillea newbeyi</i> P3 was recorded



Releve 42

Mallee over *Melaleuca scalena*

EMs

Releves 15, 41, 47, 54, 63, 65, 84, 92

Landform mid to lower slopes

Soils, topography duplex sandy soils over clay, flat to gentle slope

Condition Excellent

Vegetation Description

Stratum 1 Mid dense to sparse shrub mallee to 6m including *Eucalyptus flocktoniae*, *Eucalyptus phenax*, *Eucalyptus perangusta*, *Eucalyptus suggrandis*, *Eucalyptus* sp. Southern Wheatbelt, *Eucalyptus phaenophylla*,

Stratum 2 Mid dense shrubs to 1.5 or 2m including *Melaleuca scalena* (prominent), *Santalum acuminatum*, *Melaleuca depauperata*, *Melaleuca laxiflora*, *Melaleuca lateriflora*,

Stratum 3 Isolated to very sparse shrubs to 0.1 or 0.5m including *Templetonia rossii*, *Dodonaea bursariifolia*, *Trymalium elachophyllum*, *Daviesia nematophylla*, *Bertya dimerostigma*, *Westringia rigida*, *Cryptandra minutifolia*, *Ozothamnus lepidophyllus*, *Phebalium* species, *Grevillea oligantha*, *Rinzia communis*, *Bertya sulcata*, **Astroloma chloranthum P2**, **Acacia undosa P3**

Very sparse to isolated sedges including *Gahnia ancistrophylla*, *Lepidosperma sanguinolentum*, *Lepidosperma* species,

Isolated rushes *Lomandra effusa*, *Dianella revoluta*

Comments This Vegetation type is extensive in the reserve and as mapped includes small areas of mallee with very sparse understory eg releve 92



Releve 63 *Mallee over Melaleuca scalena*



Releve 38 *Mallee over Melaleuca adnata*

Mallee over *Melaleuca adnata*

EMa

Releves	38, 77, 83, 86, 88, 90
Landform	mid to lower slopes
Soils, topography	heavier shallow duplex soils of sandy loam over clay, flat to gentle slope
Condition	Excellent

Vegetation Description

Stratum 1	Mid dense to sparse shrub mallee to 6m including <i>Eucalyptus calycogona</i> , <i>Eucalyptus tenera</i> , <i>Eucalyptus pileata</i> , <i>Eucalyptus flocktoniae</i> , <i>Eucalyptus suggrandis</i>
Stratum 2	Mid dense to occasionally sparse shrubs to 1.5 or 2m including <i>Melaleuca adnata</i> , <i>Melaleuca marginata</i> , <i>Melaleuca sapientes</i> , <i>Melaleuca lateriflora</i> , <i>Melaleuca acuminata</i> , <i>Melaleuca scalena</i> , <i>Daviesia benthhamii</i> , <i>Exocarpos aphyllus</i> , <i>Melaleuca pauperiflora</i> , <i>Melaleuca laxiflora</i> , <i>Acacia undosa</i> P3
Stratum 3	Isolated shrubs to 0.1m or 0.5m including <i>Templetonia rossii</i> , <i>Dodonaea bursariifolia</i> , <i>Microcybe multiflora</i> , <i>Olearia muelleri</i> , <i>Hakea commutata</i> , <i>Acacia erinacea</i> , <i>Hibbertia gracilipes</i> , <i>Cryptandra minutifolia</i> , <i>Ozothamnus lepidophyllus</i> Isolated sedges including <i>Gahnia ancistrophylla</i> , <i>Lepidosperma</i> species, Isolated rush <i>Dianella revoluta</i> Isolated grasses <i>Neurachne alopecuroidea</i> , <i>Austrostipa elegantissima</i>
Comments	This vegetation type as mapped includes areas with a very sparse understorey e.g. releve 90 which cover only small areas

Mallee over *Melaleuca* low shrubland - *Melaleuca carrii*

EMc

Relevés	46, 69, 91, 96/ 60, 68, 75/ 22, 85
Landform	Mid to lower slopes
Soils, topography	duplex sandy soils over clay (scattered proteaceae indicate some laterite)
Condition	Excellent

Vegetation Description

Stratum 1	Mid dense to sparse shrub mallee including <i>Eucalyptus dissimulata</i> , <i>Eucalyptus captiosa</i> , <i>Eucalyptus perangusta</i> , <i>Eucalyptus phaenophylla</i> , <i>Eucalyptus phenax</i> , <i>Eucalyptus</i> sp. Southern Wheatbelt
Stratum 2	Sparse to very sparse shrubs to 2m including <i>Melaleuca scalena</i> , <i>Hakea corymbosa</i> , <i>Leptospermum erubescens</i> , <i>Santalum acuminatum</i> , <i>Melaleuca depauperata</i> , <i>Hakea lissocarpha</i> , <i>Daviesia nematophylla</i> , <i>Melaleuca brophyi</i> (Releve 22, 85)
Stratum 3	Mid dense shrubs usually to 0.1m (1.5m at relevés 22, 85 and 0.5m at releve 46) including <i>Melaleuca carrii</i> (prominent), <i>Melaleuca subtigona</i> (occasionally frequent), <i>Isopogon</i> sp. Fitzgerald River, <i>Gastrolobium punctatum</i> , <i>Grevillea oligantha</i> , <i>Templetonia rossii</i> , <i>Olearia</i> sp. Eremicola
Stratum 4	<p>Sparse to isolated shrubs to 0.5m including <i>Calytrix leschenaultii</i>, <i>Bertya dimerostigma</i>, <i>Cryptandra minutifolia</i>, <i>Grevillea dolichopoda</i>, <i>Lasiopetalum rosmarinifolium</i>, <i>Prostanthera serpyllifolia</i> subsp. <i>microphylla</i>, <i>Verticordia acerosa</i> var. <i>preissii</i>, <i>Westringia rigida</i>, <i>Daviesia lancifolia</i>, <i>Rinzia communis</i>, <i>Leucopogon obtusatus</i></p> <p>Very sparse to isolated sedges including <i>Gahnia ancistrophylla</i>, <i>Desmoclada quiricanus</i>, <i>Lepidosperma sanguinolentum</i>, <i>Lepidobolus preissianus</i>,</p> <p>Isolated rushes including <i>Lomandra mucronata</i>, <i>Dianella revoluta</i>, <i>Lomandra effusa</i>, <i>Lomandra micrantha</i> subsp. <i>teretifolia</i>, <i>Calectasia obtusa</i> P3</p> <p>Isolated herbs including <i>Argentipallium niveum</i>,</p> <p>Isolated grass <i>Neurachne alopecuroidea</i></p>
Comments	This mallee vegetation type is extensive in the reserve and is the most variable. It merges with <i>Eucalyptus perangusta</i> over shrubland which occurs on deeper sandy soils around wet lands and Mallee over <i>Melaleuca scalena</i> (duplex soils of sand over clay)



Releve69 Mallee over *Melaleuca carrii*



Releve93 Mallee over *Melaleuca subtrigona*

Mallee over *Melaleuca* low shrubland - *Melaleuca subtrigona*

EMsu

Releves 66, 93

Landform Mid to upper slopes

Soils, topography duplex sandy soils over clay (some laterite)

Condition Excellent

Vegetation Description

Stratum 1 Very sparse to sparse shrub mallee including *Eucalyptus captiosa*, *Eucalyptus dissimulata*, *Eucalyptus perangusta*

Stratum 2 Very sparse shrubs to 1.5 or 2m including *Hakea corymbosa*, *Isopogon* sp. Fitzgerald River, *Santalum acuminatum*, *Melaleuca scalena*, *Leptospermum erubescens*, *Melaleuca depauperata*

Stratum 3 Mid dense shrubs including *Melaleuca subtrigona* (prominent), *Melaleuca carrii*, *Kunzia preissiana*, *Petrophile squamata*, *Templetonia rossii*

Stratum 4 Very sparse stratum of shrubs to 0.5m including *Daviesia lancifolia*, *Gastrolobium punctatum*, *Calytrix lescheuaultii*, *Rinzia communis*, *Leucopogon obtusatus*, *Grevillea dolichopoda*, *Verticordia acerosa* var. *preissii*, *Persoonia striata*,

Very sparse to isolated sedges including *Gahnia ancistrophylla*, *Desmoclada quiricanus*, *Anarthria polyphylla*,

Isolated rushes including *Lomandra mucronata*, *Lomandra micrantha* subsp. *teretifolia*

Isolated grass *Neurachne alopecuroidea*

Comments. This vegetation type occurs mainly in the NW corner of the reserve adjacent to lateritic heath areas and is part of the Mallee over low *Melaleuca* shrubland complex

Eucalyptus perangusta over shrubland

Ep

Relevés 4, 8, 14, 20, 21

Landform Lower slopes/valley floor including ridges or dunes adjacent to lakes

Soils, topography deeper sandy soils over clay, sandy areas and ridges

Condition Excellent

Vegetation Description

Stratum 1 Sparse to mid dense shrub mallee including *Eucalyptus perangusta* (an indicator species), *Eucalyptus phenax* and *Eucalyptus dissimulata*

Stratum 2 Sometimes sparse shrubs to 1.5m or 2m present including *Leptospermum erubescens*, *Santalum acuminatum*, *Hakea corymbosa*,

Stratum 3 Mid dense shrubs to 1.5m or 1.0m including *Melaleuca brophyi*, *Leptospermum erubescens* and *Melaleuca subtrigona* as characteristic species. Other species recorded include *Melaleuca carrii*, *Grevillea dolichopoda*, *Olearea* sp Eremicola, *Isopogon* sp. Fitzgerald River, *Melaleuca laxiflora*,

Stratum 4 Isolated to very sparse shrubs to 0.5m including *Calytrix leschenaultii*, *Rhagodia preissii*, *Daviesia lancifolia*, *Westringia rigida*

Very sparse to isolated sedges including *Gahnia ancistrophylla*, *Gahnia trifida*, *Desmoclada quiricanus*, *Leptospermum carphoides*, *Lepidospermum* species, *Lepidospermum sanguinolentum*, *Lepidobolus preissianus*,

Isolated rushes including *Lomandra micrantha* subsp. *teretifolia*, *Lomandra effusa*, *Dianella revoluta*

Isolated forbs including *Brachyscome pusilla*, *Podotheca acgustifolia*, *Calandrinia eremaea*, *Waitzia acuminata*

Isolated grass *Neurachne alopecuroidea*

Comments. Variable vegetation type characterised by *Eucalyptus perangusta*, *Melaleuca brophyi*, *Melaleuca subtrigona* and *Leptospermum erubescens*. Either of these understorey species may become prominent over short distances. ***Acacia auratiflora* T** was found at relevés 4 and 8.



Releve 14 *Eucalyptus perangusta* over shrubland



Releve 4 *Eucalyptus perangusta* over shrubland

Banksia prionotes open woodland

Bp

Releves 1, 50, 51

Landform Upper slopes, deep sandy ridge tops

Soils, topography Deep yellow sand over laterite at depth, flat to gentle slope

Condition Excellent

Vegetation Description

Upper stratum Sparse to very sparse *Banksia prionotes* trees to 5m

Mid stratum Very sparse shrubs 1.5 to 2m+ including *Leptospermum erubescens*, *Petrophile ericifolia*, *Callitris roei*, *Banksia obovata*, *Hakea obliqua*, *Hakea pandanocarpa*, *Hakea corymbosa*

Ground (dominant) Mid dense shrubs to 1.0m including *Eremaea pauciflora* (frequent), *Banksia violacea*, *Isopogon* sp. Fitzgerald River, *Hakea prostrata*, *Lysinema ciliatum*, *Leptospermum spinescens*, *Petrophile squamata*

Ground 2 Sparse to very sparse shrubs to 0.5m including *Calytrix leschenaultii*, *Conostephium roei*, *Banksia pteridifolia*, *Petrophile brevifolia*, *Tetrapora preissiana*, *Persoonia striata*, *Hibbertia gracilipes*, *Petrophile helicophylla*, ***Rinzia affinis* P4**

Very sparse to isolated sedges including *Chordifex sphacelatus*, *Hypolaena fastigiata*, *Lepidobolus preissianus*, *Lepidosperma carphoides*, *Desmocladus quiricanus*, *Schoenus* aff. *subfacicularis*

Isolated rushes including *Lomandra mucronata*, *Laxmannia paleacea*, *Conostylis petrophiloides*, *Anigozanthos humilis*

Isolated forbs including *Stylidium piliferum*, ***Drosera grievae* P1**, ***Calectasia pignattiana* T**, *Argentipallium niveum*, *Lechenaultia biloba*

Isolated grasses including *Neurachne alopecuroidea*

Comments Covers small areas on deep sandy ridge tops amongst the *Eremaea pauciflora* heathland. The area delineated on the map is only an estimate as the vegetation boundary was not easily observed on the aerial photography

Eremaea pauciflora heathland

Er

Relevés 2, 35, 36, 67, 79

Landform Upper slopes, deep sandy soils

Soils, topography Deep yellow sand over laterite at depth, flat to gentle slope

Condition Excellent

Vegetation Description

- Stratum 1 Very sparse shrubs over 2m including *Hakea pandanocarpa* subsp. *crassifolia*, *Hakea obliqua* subsp. *parviflora*, *Callitris roei*, *Hakea corymbosa*
- Stratum 2 Very sparse to sparse shrubs 1.5 to 2m including *Leptospermum erubescens*, *Petrophile ericifolia*, *Banksia obovata*, *Isopogon* sp. Fitzgerald River, *Leptospermum inelegans*, *Petrophile squamata*
- Stratum 3 (dominant) Mid dense shrubs to 1.0m including *Eremaea pauciflora* (frequent), *Banksia violacea*, *Hakea prostrata*, *Lysinema ciliatum*, *Leptospermum spinescens*, *Banksia erythrocephala*, ***Grevillea newbeyi* P3**
- Stratum 4 Sparse to very sparse shrubs to 0.5m including *Calytrix leschenaultii*, *Conostephium roei*, *Banksia pteridifolia*, *Petrophile brevifolia*, *Tetrapora preissiana*, *Persoonia striata*, *Hibbertia gracilipes*, *Petrophile helicophylla*, ***Rinzia affinis* P4**, *Hakea lissocarpha*, *Davesia lancifolia*, *Leucopogon tamminensis*, *Melaleuca subtigona*, *Verticordia densa*,
- Isolated sedges including *Chordifex sphacelatus*, *Lepidobolus preissianus*, *Lepidosperma carphoides*, *Desmocladius quiricanus*, *Mesomelaena preissii*, *Desmoclada parthenicus*, *Schoenus* aff. *subfacicularis*,
- Isolated rushes including *Lomandra mucronata*, *Lomandra effusa*
- Isolated herbs/forbs including *Conostylis petrophiloides*, *Anigozanthos humilis*, *Stylidium piliferum*, ***Drosera grievae* P1**, ***Calectasia pignattiana* T**, *Argentipallium niveum*, *Lechenaultia biloba*, *Chamaexeros serra*, *Patersonia occidentalis*, **Ursinia anthemoides*
- Isolated grass *Neurachne alopecuroidea*
- Comments** Sparse shrub mallee were recorded at relevés 67 and 79 including *Eucalyptus captiosa*, *Eucalyptus dissimulate* and *Eucalyptus perangusta*. These relevés form a separate group in the species analysis however *Eremaea pauciflora* is also an indicator species at these sites



Banksia prionotes open woodland at releve 50



Eremaea pauciflora heathland at Releve 35

Very sparse mallee over heathland

ES

Releves 13, 37, 48, 53

Landform Mid to lower slopes

Soils, topography sandy soils over laterite, flat to gentle slope

Condition Excellent

Vegetation Description

Stratum 1 Very sparse mallee shrubs to 6m usually present including *Eucalyptus captiosa*, *Eucalyptus dissimulata* and *Eucalyptus perangusta*

Stratum 2 Isolated shrubs over 2m including *Banksia media* (indicator species), *Santalum acuminatum*, *Callitris roei*, *Hakea obliqua* subsp. *parviflora*

Stratum 3 Very sparse shrubs 1.5 to 2m are sometimes present including *Leptospermum erubescens*, *Grevillea wittweri*, *Hakea corymbosa*, *Petrophile squamata*, *Kunzea preissiana*

Ground 1 Sparse to mid dense shrubs to 1.0m including *Calytrix leschenaultia*, ***Hakea brachyptera* P3**, *Melaleuca carrii*, *Eremaea pauciflora*, *Acacia uncinella*, *Isopogon* sp. Fitzgerald River, *Petrophile squamata*

Ground 2 Sparse to mid dense shrubs to 0.5m including *Melaleuca subtigona*, ***Banksia epimicta* P2**, *Verticordia acerosa* var. *preissii*, *Persoonia striata*, *Daviesia lancifolia*, *Gastrolobium punctatum*, *Hakea lissocarpha*, *Tetrapora preissiana*, *Melaleuca apodocephala*, *Ericomyrtus serpyllifolia*, *Petrophile brevifolia*, *Jacksonia racemosa*

Very sparse to isolated sedges including *Mesomelaena preissii*, *Chordifex sphacelatus*, *Lepidobolus preissianus*, *Desmocladius quiricanus*, *Desmocladius parthenicus*, *Desmocladius myriocladus*, *Lepidosperma sanguinolentum*, *Lepidosperma* species

Isolated rushes including *Conostylis petrophiloides*, *Lomandra mucronata*, *Lomandra micrantha* subsp. *teretifolia*, *Chamaexeros serra*, *Laxmannia palacea*, *Chamaescilla spiralis*

Isolated herbs/forbs including, *Podotheca angustifolia*, *Argentipallium niveum*, *Stylidium piliferum*, *Stackhousia pubescens*, *Glischrocaryon roei*, **Ursinia anthemoides*

Isolated grass *Neurachne alopecuroidea*

Comments This vegetation type occurs on mid to lower slopes and merges with *Eremaea pauciflora* heathland in places. *Banksia media* is an indicator species



Releve 37



Releve 53

Mixed lateritic heathland

H

Relevés	64, 78, 81, 82
Landform	Upper slopes
Soils, topography	sandy soils with gravel over laterite (ironstone in places), flat to gentle slope
Condition	Excellent
Vegetation Description	Mixed lateritic heathland
Stratum 1	Very sparse to Isolated shrubs over 1.5m to 2m+ including <i>Hakea cygna</i> , <i>Callitris roei</i> , <i>Allocasuarina acutivalvis</i> , <i>Allocasuarina corniculata</i> , <i>Allocasuarina campestris</i> , <i>Leptospermum ?nitens</i> , <i>Acacia uncinella</i> , <i>Banksia erythrocephala</i> , <i>Melaleuca scalena</i>
Ground 1 (dominant)	Mid dense shrubs to 1.0m including <i>Melaleuca tuberculata</i> , <i>Verticordia roei</i> , <i>Verticordia chrysantha</i> , <i>Melaleuca rigidifolia</i> , <i>Petrophile seminuda</i> , <i>Beaufortia puberula</i> , <i>Isopogon teretifolia</i> , <i>Hakea strumosa</i> ,
Ground 2	Sparse shrubs to 0.5m including <i>Verticordia picta</i> , <i>Allocasuarina microstachya</i> , <i>Beaufortia micrantha</i> , <i>Hakea incrassata</i> , <i>Banksia xylothemelia P3</i> , <i>Jacksonia racemosa</i> , <i>Calytrix leschenaultia</i> , <i>Ericomyrtus serpyllifolia</i> , <i>Tetrapora preissiana</i> , <i>Orianthera flaviflora</i> , <i>Synaphea ?spinulosa</i> , <i>Persoonia coriacea</i> , <i>Comesperma scoparia</i> , <i>Dampiera lavandulacea</i> , <i>Astroloma serratifolium</i> , <i>Calothamnus quadrifidus</i> , <i>Baeckea latens</i> , <i>Verticordia eriocephala</i> , <i>Verticordia densiflora</i> , <i>Xanthorrhoea nana</i> , <i>Petrophile glauca</i> , <i>Leucopogon dielsianus</i>
	Sparse to isolated sedges including <i>Mesomelaena preissii</i> , <i>Lepidobolus preissianus</i> , <i>Lepidosperma sanguinolentum</i> , <i>Leptospermum</i> species, <i>Gahnia ancistrophylla</i>
	Isolated rushes including <i>Tricoryne tenella</i> , <i>Laxmannia palacea</i> , <i>Chamaescilla corymbosa</i> , <i>Haemodorum discolor</i>
	Isolated forbs including <i>Stylidium leptophyllum</i>
	Isolated grass <i>Neurachne alopecuroidea</i>
Comments	This vegetation type occurs on the upper slopes of the reserve in the northern and southern sections.



Releve 64 Mixed lateritic heathland



Releve 44 Mixed lateritic heathland with *Eucalyptus pleurocarpa*

Relevés 9, 44, 45

Vegetation Description

Stratum 1	Very sparse to isolated <i>Eucalyptus pleurocarpa</i> shrub mallee, <i>Eucalyptus captiosa</i> occasional
Stratum 1	Very sparse to Isolated shrubs over to 2m including <i>Grevillea cagiana</i> , <i>Hakea cygna</i> , <i>Callitris roei</i> , <i>Santalum acuminatum</i> , <i>Gastrolobium spinosum</i> , <i>Banksia pallida</i> , <i>Hakea pandanocarpa</i> , <i>Banksia erythrocephala</i> ,
Ground 1	Mid dense shrubs to 1.0m including <i>Melaleuca tuberculata</i> , <i>Verticordia roei</i> , <i>Verticordia chrysantha</i> , <i>Grevillea teretifolia</i> , <i>Isopogon teretifolia</i> , <i>Eremaea pauciflora</i>
Ground 2	<p>Sparse shrubs to 0.5m including <i>Verticordia picta</i>, <i>Allocasuarina microstachya</i>, <i>Beaufortia micrantha</i>, <i>Hakea incrassata</i>, <i>Banksia xylothemelia</i> P3, <i>Jacksonia racemosa</i>, <i>Calytrix leschenaultia</i>, <i>Ericomyrtus serpyllifolia</i>, <i>Tetrapora preissiana</i>, <i>Comesperma scoparia</i>, <i>Baekkea latens</i>, <i>Petrophile glauca</i>, <i>Leucopogon dielsianus</i>, <i>Daviesia lancifolia</i>, <i>Banksia pteridifolia</i>, <i>Persoonia striata</i>, <i>Lysinema ciliatum</i>, <i>Verticordia grandiflora</i>, <i>Banksia rufa</i>, <i>Micromyrtus triptycha</i>, <i>Daviesia uncinata</i> P3, <i>Mirbelia trichocalyx</i></p> <p>Sparse to isolated sedges including <i>Mesomelaena preissii</i>, <i>Lepidobolus preissianus</i>, <i>Lepidosperma sanguinolentum</i>, <i>Leptospermum</i> species, <i>Chordifex sphacelatus</i></p> <p>Isolated herbs/forbs including <i>Laxmannia palacea</i>, <i>Chamaescilla spiralis</i>, <i>Chamaexeros serra</i>, <i>Stylidium leptophyllum</i></p> <p>Isolated grass <i>Neurachne alopecuroidea</i></p>
Comments	<i>Eucalyptus pleurocarpa</i> occurs on better drained areas ie deeper gravel soils to clay and is extensive in other remnant vegetation with lateritic soils on upper slopes in the catchment

Melaleuca shrubland

M

Relevés	11, 23, 26, 33, 55, 72, 74, 94, 95
Landform	Lake bed, closed depressions, drainage lines, edge of larger lakes
Soils, topography	Silt and sandy soils over clay, clay soils, poorly drained
Condition	Excellent

Vegetation Description

Stratum 1 Isolated trees including *Eucalyptus occidentalis* and *Eucalyptus kondininensis*

Stratum 2 Mid dense shrubs to 5m including *Melaleuca lateriflora*, *Melaleuca acuminata*, *Melaleuca strobophylla*, *Melaleuca pauperiflora*, *Melaleuca atroviridis*, *Melaleuca halmaturorum*, *Melaleuca scalena* (releve 94)

Stratum 3 Isolated shrubs to 0.5m including *Rhagodia preissii*, *Disphyma crassifolium*, *Maireana brevifolia*, *Maireana oppositifolia*, *Dodonaea bursariifolia*

Isolated forbs including *Calandrinia calyptrata*, *Carpobrotus modestus*, *Crassula colorata*, *Lawrencia glomerata*, *Apium annuum*, *Angianthus preissianus*.

Isolated rush *Bulbine semibarbata*



Releve 23 *Melaleuca* shrubland

Melaleuca shrubland - *Melaleuca scalena*

Ms

Releves	39, 87
Landform	Lower slopes
Soils, topography	clay and loam soils, poorly drained
Condition	Excellent

Vegetation Description

Stratum 1	Isolated trees and mallee including <i>Eucalyptus salmonophloia</i> , <i>Eucalyptus calycogona</i> , <i>Eucalyptus suggrandis</i> subsp. <i>promiscua</i> , <i>Eucalyptus phenax</i>
Stratum 2	Mid dense shrubs to 1.5 or 2m including <i>Melaleuca scalena</i> (prominent), <i>Melaleuca lateriflora</i> , <i>Melaleuca depauperata</i> , <i>Melaleuca laxiflora</i> , <i>Melaleuca spicigera</i> , <i>Daviesia benthamii</i> , <i>Melaleuca acuminata</i>
Stratum 3	Isolated shrubs to 0.5m including <i>Dodonaea bursariifolia</i> , <i>Olearia muelleri</i> , <i>Hibbertia gracilipes</i> , <i>Templetonia rossii</i> Isolated sedges <i>Gahnia ancistrophylla</i> , <i>Lepidosperma sanguinolentum</i> . Isolated rush <i>Lomandra effusa</i>



Releve 39

Melaleuca shrubland - regeneration

M r

Releve	59
Landform	edge of the lake bed or depression
Soils, topography	Shallow sandy soils over clay, clay, poorly drained
Condition	Excellent, regeneration

Vegetation Description

Stratum 1	Mid dense shrubs to 1.0m or 1.5m including <i>Melaleuca acuminata</i> (often prominent), <i>Melaleuca lateriflora</i> , <i>Melaleuca pauperiflora</i> , <i>Melaleuca strobophylla</i> , <i>Melaleuca scalena</i> , <i>Melaleuca depauperata</i>
Comments	Areas regenerating after the 2006 floods



Releve 59 *Melaleuca* shrubs regenerating at the edge of a lake

Melaleuca shrubland – degraded

Md

Releves	58, 61
Landform	Lake bed
Soils, topography	clay, poorly drained
Condition	Very Good - water logging, salt affected?, dead <i>Melaleuca</i> shrubs, few live shrubs, no <i>Melaleuca</i> seedlings recorded

Vegetation Description

Stratum 1	Isolated live shrubs including <i>Melaleuca acuminata</i> , <i>Melaleuca lateriflora</i> , <i>Melaleuca halmaturorum</i> , <i>Melaleuca strobophylla</i> , <i>Melaleuca ?scalena</i> ,
Stratum 2	Sparse shrubs to 1.0m including <i>Tecticornia indica</i> subsp. <i>bidens</i> , <i>Tecticornia lepidosperma</i> , <i>Lawrencia squamata</i> , <i>Maireana brevifolia</i> , <i>Rhagodia preissii</i> , <i>Duma horrida</i> subsp. <i>abdita</i> T (releve 58)
Stratum 3	Very sparse shrubs to 0.5m including <i>Disphyma crassifolium</i> , <i>Eutaxia empetrifolia</i> , <i>Acacia erinacea</i> , <i>Scaevola argentea</i> , <i>Dodonaea bursariifolia</i> , <i>Teucrium sessiliflorum</i> , <i>Acacia acanthoclada</i> Isolated forbs including <i>Vittadenia gracilis</i> , <i>Isotoma scapigera</i> , <i>Angianthus tomentosus</i> . Isolated sedges including <i>Gahnia trifida</i>
Comments	Degraded (salt affected?) <i>Melaleuca</i> shrubland between the samphire shrubland and the regenerating <i>Melaleuca</i> shrubland at the edge of the lake



Releve 58 degraded *Melaleuca* shrubland - salt affected?

Isolated shrubs over grasses/forbs

G

Releve	40
Landform	depression (fresh)
Soils, topography	clay, poorly drained
Condition	Very Good - weeds present—isolated shrubs in the middle of the depression. Regenerating <i>Melaleuca</i> shrubs on the edge, dead trees at the edge

Vegetation Description

Stratum 1	Isolated shrub mallee and shrubs including <i>Eucalyptus phenax</i> , <i>Melaleuca acuminata</i> , <i>Melaleuca lateriflora</i> , <i>Acacia verriculum</i> . Mid dense shrubs to 1.0m regenerating at the edge including <i>Acacia acuminata</i>
Stratum 2	Isolated shrubs to 0.5m including <i>Dodonaea bursariifolia</i> , <i>Chenopodium desertorum</i> subsp. <i>microphyllum</i> Sparse to mid dense patchy stratum of grasses including * <i>Bromus rubens</i> and <i>Austrostipa trochophylla</i> Sparse to very sparse forbs including <i>Vittadenia gracilis</i> , <i>Angianthus tomentosus</i>
Comments	Most forbs/herbs and grasses were past flowering at the time of survey. September/October survey could increase the species list considerably.



Releve 40

Duma horrida shrubland

Dh

Releve	27
Landform	Lake bed
Soils, topography	clay, poorly drained
Condition	Excellent

Vegetation Description

Stratum 1	Sparse shrubs to 1.0m form a patchy stratum including <i>Duma horrida</i> subsp. <i>abdita</i> T , <i>Tecticornia verrucosa</i> , <i>Disphyma crassifolium</i>
Stratum 2	Isolated forbs including <i>Isotoma scapigera</i> , <i>Crassula exerta</i> , <i>*Mesembryanthemum nodiflorum</i>
Comments	Threatened Ecological Community



Releve 27 – East lake Bryde

Duma horrida shrubland

Dh

Releve	31
Landform	Lake bed (fresh)
Soils, topography	clay, poorly drained
Condition	Excellent

Vegetation Description

Stratum 1	Isolated trees of <i>Eucalyptus occidentalis</i> , isolated shrubs over 2m including <i>Melaleuca strobophylla</i> , <i>Melaleuca pauperiflora</i>
Stratum 2	Sparse shrubs to 1.0m including <i>Duma horrida</i> subsp. <i>abdita</i> T, <i>Tecticornia pergranulata</i> , <i>Tecticornia indica</i> subsp. <i>bidens</i> , <i>Disphyma crassifolium</i> , <i>Maireana brevifolia</i> , <i>Rhagodia preissii</i> , <i>Acacia acanthoclada</i> , <i>Enchylaena lanata</i> , <i>Wilsonia rotundifolia</i> Isolated forbs including <i>Vittadenia gracilis</i>
Comments	<i>Duma horrida</i> subsp. <i>abdita</i> DRF dominant on the lake bed. No <i>Tecticornia verrucosa</i> was recorded at the time of survey



Releve 31

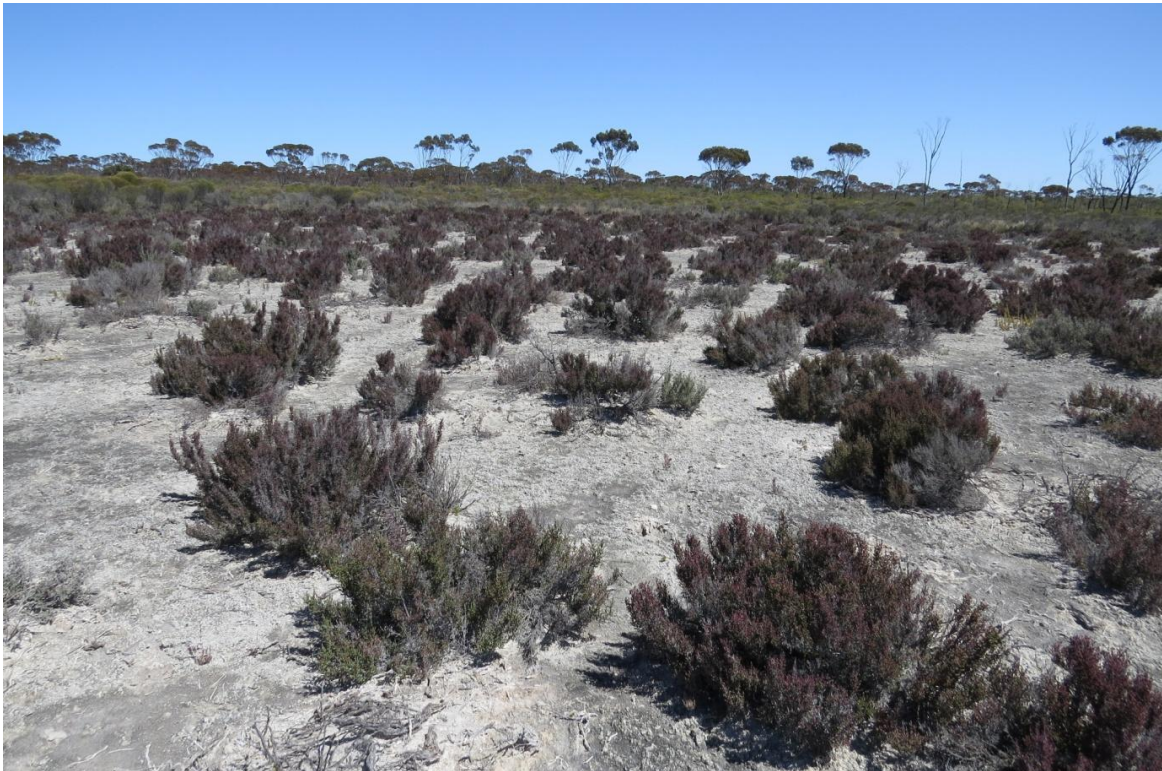
Samphire (*Tecticornia*) shrubland

Te

Releve	5, 17
Landform	Lake bed
Soils, topography	clay, poorly drained salt lake with gypsum (5) and lake bed saline clay (17)
Condition	Excellent

Vegetation Description

Stratum 1	Mid dense shrubs to 0.5m including <i>Tecticornia syncarpa</i> , <i>Tecticornia pergranulata</i> , <i>Tecticornia moniliformis</i> , <i>Maireana oppositifolia</i> , <i>Lawrenzia glomerata</i> ,
Stratum 2 (gypsum)	Isolated forbs including <i>Isotoma scapigera</i> , <i>Hydrocotyle medicaginoides</i> , <i>Haegiela tatei</i> P4 , <i>Brachyscome eyrensis</i> , <i>Senecio quadridentatus</i> Isolated rush <i>Lomandra micrantha</i> subsp. <i>teretifolia</i> Isolated grass including <i>Austrostipa juncifolia</i> ,



Releve 5 small salt lake with gypsum

Appendix 5
Plant Species List

Family Name	Species Name * Introduced species	Cons. code
Aizoaceae	<i>Carpobrotus modestus</i>	
	<i>Disphyma crassifolium</i>	
	* <i>Mesembryanthemum nodiflorum</i>	
Amaranthaceae	<i>Ptilotus humilis</i>	
Anarthriaceae	<i>Anarthria polyphylla</i>	
Apiaceae	<i>Apium annuum</i>	
	<i>Platysace ?trachymenioides</i>	
	<i>Platysace deflexa</i>	
Apocynaceae	<i>Alyxia buxifolia</i>	
Araliaceae	<i>Hydrocotyle medicaginoïdes</i>	
	<i>Trachymene ornata</i>	
	<i>Trachymene pilosa</i>	
Asparagaceae	<i>Chamaescilla corymbosa</i>	
	<i>Chamaescilla spiralis</i>	
	<i>Chamaexeros serra</i>	
	<i>Laxmannia paleacea</i>	
	<i>Lomandra effusa</i>	
	<i>Lomandra micrantha</i> subsp. <i>teretifolia</i>	
	<i>Lomandra mucronata</i>	
Asparagaceae	<i>Thysanotus manglesianus</i>	
Asphodelaceae	<i>Bulbine semibarbata</i>	
Asteraceae	* <i>Cotula bipinnata</i>	
	? <i>Chrysocephalum apiculatum</i>	
	<i>Angianthus preissianus</i>	
	<i>Angianthus tomentosus</i>	
	<i>Argentipallium niveum</i>	
	<i>Brachyscome eyrensis</i>	
	<i>Brachyscome pusilla</i>	
	<i>Gnephosis acicularis</i>	
	<i>Gnephosis multiflora</i>	P3
	<i>Gnephosis tenuissima</i>	
	<i>Haegiela tatei</i>	P4
<i>Olearia muelleri</i>		
<i>Olearia muricata</i>		

	<i>Olearia ramosissima</i>	
	<i>Olearia</i> sp. Eremicola (Diels & Pritzel s.n. PERTH 00449628)	
	<i>Ozothamnus lepidophyllus</i>	
	<i>Podolepis aristata</i> subsp. <i>aristata</i>	
	<i>Podolepis capillaris</i>	
	<i>Podolepis lessonii</i>	
	<i>Podotheca angustifolia</i>	
	<i>Pogonolepis stricta</i>	
	<i>Pterochaeta paniculata</i>	
	<i>Senecio glossanthus</i>	
	<i>Senecio quadridentatus</i>	
	* <i>Ursinia anthemoides</i>	
	<i>Vittadinia gracilis</i>	
	<i>Waitzia acuminata</i>	
	<i>Waitzia acuminata</i> var. <i>albicans</i>	
Boraginaceae	<i>Halgania anagaloides</i> var. Southern (A.E. Orchard 1609)	
Campanulaceae	<i>Isotoma scapigera</i>	
	<i>Lobelia ?rarifolia</i>	
Caryophyllaceae	* <i>Spergularia rubra</i>	
Casuarinaceae	<i>Allocasuarina acuaria</i>	
	<i>Allocasuarina acutivalvis</i>	
	<i>Allocasuarina campestris</i>	
	<i>Allocasuarina corniculata</i>	
	<i>Allocasuarina huegeliana</i>	
	<i>Allocasuarina microstachya</i>	
	<i>Allocasuarina pinaster</i>	
Celastraceae	<i>Psammomoya choretroides</i>	
	<i>Stackhousia pubescens</i>	
Chenopodiaceae	<i>Atriplex paludosa</i>	
	<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i>	
	<i>Enchylaena lanata</i>	
	<i>Maireana brevifolia</i>	
	<i>Maireana oppositifolia</i>	
	<i>Rhagodia drummondii</i>	
	<i>Rhagodia preissii</i>	
	<i>Tecticornia indica</i> subsp. <i>bidens</i>	
	<i>Tecticornia lepidosperma</i>	
	<i>Tecticornia moniliformis</i>	

	<i>Tecticornia pergranulata</i>	
	<i>Tecticornia syncarpa</i>	
	<i>Tecticornia verrucosa</i>	
Convolvulaceae	<i>Wilsonia humilis</i>	
	<i>Wilsonia rotundifolia</i>	
Crassulaceae	<i>Crassula colorata</i> var. <i>acuminata</i>	
	<i>Crassula exserta</i>	
Cupressaceae	<i>Callitris preissii</i>	
	<i>Callitris roei</i>	
Cyperaceae	<i>Gahnia ancistrophylla</i>	
	<i>Gahnia trifida</i>	
	<i>Lepidosperma ?tenue</i>	
	<i>Lepidosperma carphoides</i>	
	<i>Lepidosperma sanguinolentum</i>	
	<i>Lepidosperma</i> sp. 1	
	<i>Lepidosperma</i> sp. 2	
	<i>Lepidosperma tenue</i>	
	<i>Mesomelaena preissii</i>	
	<i>Schoenus</i> aff. <i>subfascicularis</i>	
	<i>Schoenus pleiostemoneus</i>	
	<i>Schoenus</i> sp. A1 Boorabbin (K.L. Wilson 2581)	ecoscape
	<i>Schoenus subflavus</i>	ecoscape
Dasypogonaceae	<i>Calectasia obtusa</i>	P3
	<i>Calectasia pignattiana</i>	T
Dilleniaceae	<i>Hibbertia gracilipes</i>	
Droseraceae	<i>Drosera grievii</i>	P1
Ericaceae	<i>Andersonia lehmanniana</i>	
	<i>Astroloma chloranthum</i>	P2
	<i>Astroloma serratifolium</i>	
	<i>Coleanthera myrtoides</i>	
	<i>Conostephium roei</i>	
	<i>Leucopogon concinnus</i>	
	<i>Leucopogon cuneifolius</i>	
	<i>Leucopogon dielsianus</i>	
	<i>Leucopogon obtusatus</i>	
	<i>Leucopogon</i> sp. Frank Hann (K.R. Newbey 11499)	
	<i>Leucopogon</i> sp. Newdegate (M. Hislop 3585)	

	<i>Leucopogon tamminensis</i> var. <i>australis</i>	
	<i>Lysinema ciliatum</i>	
Euphorbiaceae	<i>Bertya dimerostigma</i>	
	<i>Beyeria sulcata</i>	
Fabaceae	<i>Acacia ?brachyclada</i>	
	<i>Acacia acanthoclada</i>	
	<i>Acacia auratiflora</i>	T
	<i>Acacia bidentata</i>	
	<i>Acacia chamaeleon</i>	
	<i>Acacia cupularis</i>	
	<i>Acacia eremophila</i>	
	<i>Acacia lasiocarpa</i>	ecoscape
	<i>Acacia leptospermoides</i> subsp. <i>leptospermoides</i>	ecoscape
	<i>Acacia merrallii</i>	
	<i>Acacia microbotrya</i>	
	<i>Acacia pycnocephala</i>	
	<i>Acacia saligna</i> subsp. <i>lindleyi</i> ms	
	<i>Acacia uncinella</i>	
	<i>Acacia undosa</i>	3
	<i>Acacia verriculum</i>	
	<i>Bossiaea spinosa</i>	3
	<i>Chorizema aciculare</i>	
	<i>Daviesia audax</i>	
	<i>Daviesia benthamii</i>	
	<i>Daviesia incrassata</i>	
	<i>Daviesia lancifolia</i>	
	<i>Daviesia nematophylla</i>	
	<i>Daviesia uncinata</i>	3
	<i>Dillwynia divaricata</i>	
	<i>Dillwynia uncinata</i>	
	<i>Eutaxia empetrifolia</i>	
	<i>Gastrolobium punctatum</i>	
	<i>Gastrolobium spinosum</i>	
	<i>Gompholobium hendersonii</i>	ecoscape
	<i>Gompholobium tomentosum</i>	range extension
	<i>Gompholobium viscidulum</i>	
	<i>Jacksonia furcellata</i>	
	<i>Jacksonia racemosa</i>	
	<i>Mirbelia trichocalyx</i>	
	<i>Pultenaea purpurea</i>	
	<i>Senna artemisioides</i> subsp. x <i>artemisioides</i>	
	<i>Templetonia rossii</i>	

Goodeniaceae	<i>Cooperhookia strophiolata</i>	
	<i>Dampiera lavandulacea</i>	
	<i>Dampiera linearis</i>	
	<i>Goodenia coerulea</i>	
	<i>Goodenia concinna</i>	
	<i>Goodenia glareicola</i>	
	<i>Lechenaultia biloba</i>	
	<i>Scaevola argentea</i>	
	<i>Scaevola spinescens</i>	
Haemodoraceae	<i>Anigozanthos humilis</i>	
	<i>Conostylis argentea</i>	ecoscape
	<i>Conostylis petrophiloides</i>	
	<i>Haemodorum discolor</i>	
Haloragaceae	<i>Glischrocaryon roei</i>	
Hemerocallidaceae	<i>Dianella revoluta</i>	
	<i>Tricoryne tenella</i>	
Iridaceae	<i>Patersonia occidentalis</i> var. <i>occidentalis</i>	
Lamiaceae	<i>Dicrastylis corymbosa</i>	
	<i>Hemigenia ?canescens</i>	
	<i>Microcorys exserta</i>	
	<i>Prostanthera serpyllifolia</i> subsp. <i>microphylla</i>	
	<i>Teucrium sessiliflorum</i>	
	<i>Westringia cephalantha</i>	
	<i>Westringia rigida</i>	
Lauraceae	<i>Cassytha glabella</i>	
	<i>Cassytha melantha</i>	
Loganiaceae	<i>Orianthera flaviflora</i>	
Malvaceae	<i>Lasiopetalum rosmarinifolium</i>	
	<i>Lawrencia diffusa</i>	
	<i>Lawrencia glomerata</i>	
	<i>Lawrencia squamata</i>	
	<i>Lysiosepalum hexandrum</i>	
Myrtaceae	<i>Baekkea latens</i>	
	<i>Beaufortia micrantha</i>	

	<i>Beaufortia puberula</i>	
	<i>Beaufortia schaueri</i>	
	<i>Callistemon phoeniceus</i>	
	<i>Calythamnus quadrifidus</i>	
	<i>Calytrix leschenaultii</i>	
	<i>Calytrix species</i>	
	<i>Chamelaucium ciliatum</i>	
	<i>Chamelaucium megalopetalum</i>	
	<i>Darwinia</i> sp. Lake Cobham (K. Newbey 3262)	
	<i>Eremaea pauciflora</i>	
	<i>Ericomyrtus serpyllifolia</i>	
	<i>Eucalyptus albida</i>	
	<i>Eucalyptus calycogona</i>	
	<i>Eucalyptus captiosa</i>	
	<i>Eucalyptus dissimulata</i>	
	<i>Eucalyptus flocktoniae</i>	
	<i>Eucalyptus kondininensis</i>	
	<i>Eucalyptus occidentalis</i>	
	<i>Eucalyptus perangusta</i>	
	<i>Eucalyptus phaenophylla</i>	
	<i>Eucalyptus phenax</i>	
	<i>Eucalyptus pileata</i>	
	<i>Eucalyptus pleurocarpa</i>	
	<i>Eucalyptus salmonophloia</i>	
	<i>Eucalyptus</i> sp. Southern Wheatbelt (D. Nicolle & M. French DN 5507)	
	<i>Eucalyptus sporadica</i>	
	<i>Eucalyptus suggrandis</i> subsp. <i>promiscua</i>	
	<i>Eucalyptus tenera</i>	
	<i>Eucalyptus uncinata</i>	
	<i>Eucalyptus urna</i>	
	<i>Kunzea preissiana</i>	
	<i>Leptospermum ?nitens</i>	
	<i>Leptospermum erubescens</i>	
	<i>Leptospermum inelegans</i>	
	<i>Leptospermum spinescens</i>	
	<i>Melaleuca acuminata</i>	
	<i>Melaleuca adnata</i>	
	<i>Melaleuca apodocephala</i>	
	<i>Melaleuca atroviridis</i>	
	<i>Melaleuca brophyi</i>	
	<i>Melaleuca carrii</i>	
	<i>Melaleuca ?cuticularis</i>	
	<i>Melaleuca depauperata</i>	
	<i>Melaleuca eleuterostachya</i>	

	<i>Melaleuca glaberrima</i>	
	<i>Melaleuca halmaturorum</i>	
	<i>Melaleuca hamulosa</i>	
	<i>Melaleuca lanceolata</i>	
	<i>Melaleuca lateriflora</i>	
	<i>Melaleuca laxiflora</i>	
	<i>Melaleuca lecanantha</i>	
	<i>Melaleuca marginata</i>	
	<i>Melaleuca pauperiflora</i>	
	<i>Melaleuca platycalyx</i>	
	<i>Melaleuca rigidifolia</i>	
	<i>Melaleuca sapientes</i>	
	<i>Melaleuca scalena</i>	
	<i>Melaleuca sculponeata</i>	P3
	<i>Melaleuca societatis</i>	
	<i>Melaleuca spicigera</i>	
	<i>Melaleuca strobophylla</i>	
	<i>Melaleuca subfalcata</i>	
	<i>Melaleuca subtrigona</i>	
	<i>Melaleuca tuberculata</i> var. <i>tuberculata</i>	
	<i>Micromyrtus triptycha</i>	
	<i>Rinzia affinis</i>	P4
	<i>Rinzia communis</i>	
	<i>Tetrapora preissiana</i>	
	<i>Verticordia acerosa</i> var. <i>preissii</i>	
	<i>Verticordia chrysantha</i>	
	<i>Verticordia densiflora</i>	
	<i>Verticordia eriocephala</i>	
	<i>Verticordia grandiflora</i>	
	<i>Verticordia picta</i>	
	<i>Verticordia plumosa</i> var. <i>brachyphylla</i>	
	<i>Verticordia roei</i>	
	<i>Verticordia tumida</i>	
Orchidaceae	<i>Pyrorchis nigricans</i>	
Pittosporaceae	<i>Billardiera lehmanniana</i>	
	<i>Pittosporum angustifolium</i>	
Poaceae	* <i>Avellinia michelii</i>	
	* <i>Bromus rubens</i>	
	* <i>Pentameris airoides</i>	
	* <i>Rostraria cristata</i>	
	* <i>Vulpia muralis</i>	

	<i>Amphipogon turbinatus</i>	
	<i>Austrostipa elegantissima</i>	
	<i>Austrostipa juncifolia</i>	
	<i>Austrostipa pycnostachya</i>	
	<i>Austrostipa trichophylla</i>	
	<i>Neurachne alopecuroidea</i>	
	<i>Rytidosperma caespitosum</i>	
Polygalaceae	<i>Comesperma calymega</i>	
	<i>Comesperma scoparium</i>	
	<i>Comesperma spinosum</i>	
	<i>Duma horrida</i> subsp. <i>abditata</i>	T
Portulacaceae	<i>Calandrinia calyptrata</i>	
	<i>Calandrinia eremaea</i>	
	<i>Calandrinia granulifera</i>	
Proteaceae	<i>Banksia epimicta</i>	P2
	<i>Banksia erythrocephala</i>	
	<i>Banksia media</i>	
	<i>Banksia obovata</i>	
	<i>Banksia pallida</i>	
	<i>Banksia prionotes</i>	
	<i>Banksia pteridifolia</i>	
	<i>Banksia rufa</i>	
	<i>Banksia violacea</i>	
	<i>Banksia xylothemelia</i>	P3
	<i>Conospermum ephedroides</i>	
	<i>Grevillea cagiana</i>	
	<i>Grevillea dolichopoda</i>	
	<i>Grevillea eriostachya</i>	
	<i>Grevillea eryngioides</i>	
	<i>Grevillea huegelii</i>	
	<i>Grevillea newbeyi</i>	P3
	<i>Grevillea oligantha</i>	
	<i>Grevillea shuttleworthiana</i>	
	<i>Grevillea teretifolia</i>	
	<i>Grevillea wittweri</i>	
	<i>Hakea brachyptera</i>	P3
	<i>Hakea commutata</i>	
	<i>Hakea corymbosa</i>	
	<i>Hakea cygna</i>	
	<i>Hakea horrida</i>	
	<i>Hakea incrassata</i>	

	<i>Hakea lissocarpa</i>	
	<i>Hakea marginata</i>	
	<i>Hakea newbeyana</i>	
	<i>Hakea nitida</i>	
	<i>Hakea obliqua</i> subsp. <i>parviflora</i>	
	<i>Hakea pandanicarpa</i> subsp. <i>crassifolia</i>	
	<i>Hakea prostrata</i>	
	<i>Hakea strumosa</i>	
	<i>Hakea subsulcata</i>	
	<i>Hakea trifurcata</i>	
	<i>Isopogon</i> sp. Fitzgerald River (D.B. Foreman 813)	
	<i>Isopogon teretifolius</i>	
	<i>Persoonia coriacea</i>	
	<i>Persoonia striata</i>	
	<i>Petrophile ericifolia</i>	
	<i>Petrophile glauca</i>	
	<i>Petrophile helicophylla</i>	
	<i>Petrophile seminuda</i>	
	<i>Petrophile squamata</i>	
	<i>Synaphea</i> ? <i>spinulosa</i>	
	<i>Synaphea</i> species	
Ranunculaceae	<i>Clematis delicata</i>	
Restionaceae	<i>Chordifex sphaelatus</i>	
	<i>Desmocladius asper</i>	
	<i>Desmocladius myriocladus</i>	
	<i>Desmocladius parthenicus</i>	
	<i>Desmocladius quiricanus</i>	
	<i>Hypolaena fastigiata</i>	
	<i>Lepidobolus preissianus</i>	
Rhamnaceae	<i>Cryptandra minutifolia</i>	
	<i>Cryptandra nutans</i>	
	<i>Spyridium cordatum</i>	
	<i>Trymalium elachophyllum</i>	
Rubiaceae	<i>Opercularia vaginata</i>	
Rutaceae	<i>Boronia coerulescens</i>	
	<i>Boronia crassifolia</i>	
	<i>Microcybe multiflora</i>	
	<i>Phebalium filifolium</i>	
	<i>Phebalium lepidotum</i>	

	<i>Phebalium microphyllum</i>	
	<i>Phebalium tuberculosum</i>	
Santalaceae	<i>Choretrum glomeratum</i>	ecoscape
	<i>Exocarpos aphyllus</i>	
	<i>Exocarpos sparteus</i>	
	<i>Leptomeria preissiana</i>	
	<i>Santalum acuminatum</i>	
	<i>Santalum murrayanum</i>	
Sapindaceae	<i>Dodonaea bursariifolia</i>	
	<i>Dodonaea ?caespitosa</i>	
	<i>Dodonaea pinifolia</i>	
	<i>Dodonaea ptarmicaefolia</i>	
	<i>Dodonaea viscosa</i>	
Scrophulariaceae	<i>Eremophila decipiens</i>	
Stylidiaceae	<i>Stylidium leptophyllum</i>	
	<i>Stylidium piliferum</i>	
	<i>Stylidium repens</i>	ecoscape
Thymelaeaceae	<i>Pimelea argentea</i>	
	<i>Pimelea brachyphylla</i>	
	<i>Pimelea cracens</i>	
	<i>Pimelea imbricata</i> var. <i>piligera</i>	
Xanthorrhoeaceae	<i>Xanthorrhoea nana</i>	

Appendix 6

Department of Parks and Wildlife

CONSERVATION CODES

For the Western Australian Flora and Fauna



CONSERVATION CODES

For Western Australian Flora and Fauna

Specially protected fauna or flora are species* which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.

Categories of specially protected fauna and flora are:

T Threatened species

Published as Specially Protected under the *Wildlife Conservation Act 1950*, and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

Threatened fauna is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act.

Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EN Endangered species

Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

VU Vulnerable species

Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EX Presumed extinct species

Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.

IA Migratory birds protected under an international agreement

Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.



CD Conservation dependent fauna

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.

OS Other specially protected fauna

Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

1 Priority 1: Poorly-known species

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

2 Priority 2: Poorly-known species

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

3 Priority 3: Poorly-known species

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Appendix 7

Wetlands

East Lake Bryde Nature Reserve - Wetlands

081 Closed depression, small lake, fresh water? Releve 40

Vegetation description - Isolated shrub mallee and shrubs in the middle of the lake including *Eucalyptus phenax*, *Melaleuca acuminata*, *Melaleuca lateriflora* and *Acacia verriculum*.

Isolated shrubs to 0.5m including *Dodonaea bursariifolia* and *Chenopodium desertorum* subsp *microphyllum*

Sparse to Isolated herbs/forbs including *Vittadenia gracilis*, *Angianthus tomentosus*

Mid dense to sparse (patchy stratum) of grasses including **Bromus rubens* and *Austrostipa trichophylla*.

Melaleuca shrubs are regenerating at the edges. Dead trees present at the edges

Herbs and grasses were past flowering at the time of survey. September/October survey could increase species list considerably.

Soils, topography - clay, poorly drained

Vegetation Condition- Very Good condition -grass weeds, dead trees



Wet land 081 – central area



Melaleuca shrubs to 1.0m regenerating at the edge of wetland 081 including *Acacia acuminata* with patches of isolated shrubs to 2m



Photograph of wetland 081 taken from the western side

082 Closed depression WP 74

Vegetation Description – site very variable

Regenerating *Eucalyptus occidentalis* and *Melaleuca* shrubs

Eucalyptus occidentalis – isolated seedlings in central areas, dead trees, trees to 10m, numerous seedlings at the edge

Melaleuca shrubs – dead shrubs, isolated shrubs to 4m including *Melaleuca strobophylla* and *Melaleuca lateriflora*

Area *Melaleuca lateriflora* mid dense shrubs to 0.5m (regeneration), 1.5m and 4m in places

Melaleuca acuminata shrubs to 1.0m regenerating at the edge

Soils and topography - Sandy loam over clay, poorly drained



Wetland 082 *Eucalyptus occidentalis* and *Melaleuca* shrubs – mature and regenerating



Melaleuca shrubs and young trees of *Eucalyptus occidentalis* in wetland 082



Eucalyptus occidentalis and *Melaleuca acuminata* regeneration at the edge of wetland 082

083 East lake Bryde – fresh water lake releves 26, 27 and 55

Vegagation description - *Duma horrida* subsp. *abdita* /*Tecticornia verrucosa* shrubland across the lake bed – Threatened Ecological Community. *Melaleuca* shrublands at the edges of the lake and *Eucalyptus occidentalis* trees adjacent

Soils - silt and clay

Species recorded include *Eucalyptus occidentalis*, *Melaleuca strobophylla*, *M. pauperiflora*, *M. lateriflora*, *M. atroviridis*, *M. acuminata*, *Disphyma crassifolia*, *Maireana brevifolia*, *Rhagodia preissii*, *Carpobrotus modestus*, *Crassula exerta*, *Tecticornia verrucosa*, *Tecticornia pergranulata*, *Crassula exerta*, *Isotoma scapigera*, **Mesembryanthemum nodiflorum*



Duma horrida subsp. *abdita* /*Tecticornia verrucosa* shrubland



Melaleuca shrubs at the edge of East Lake Bryde

121 not included patchy sparse to very sparse *Disphyma crassifolium*



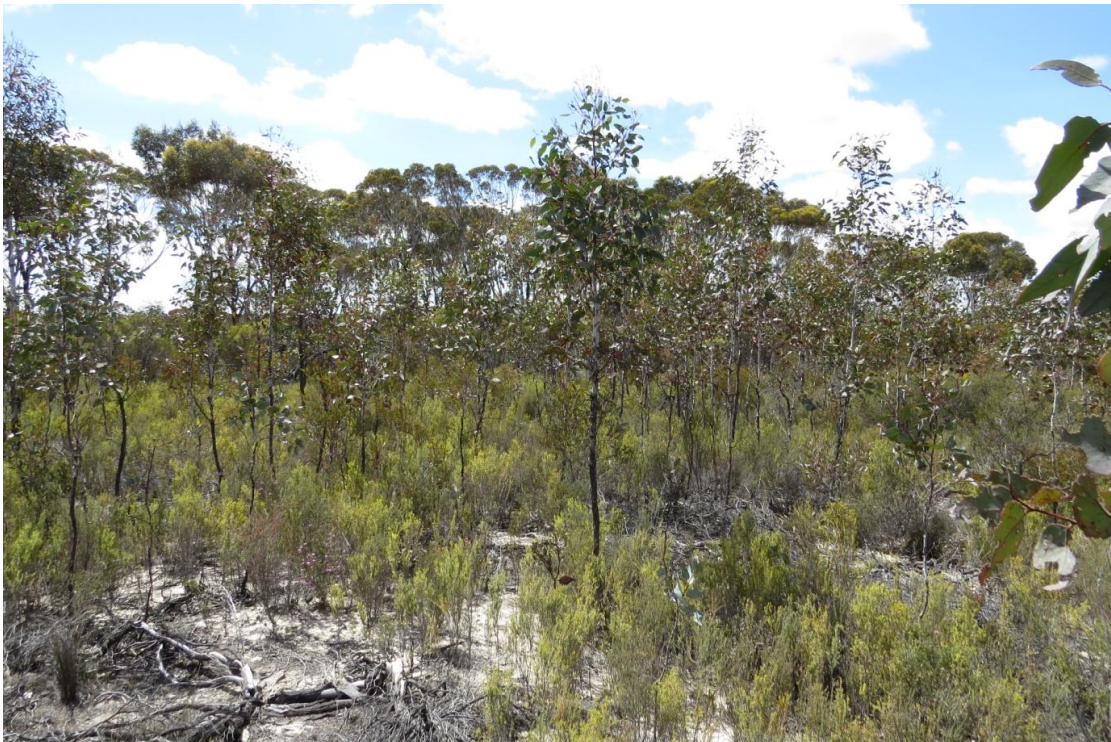
Patchy narrow band of *Eucalyptus occidentalis* woodland adjacent to *Melaleuca* shrubland at the southern end of East Lake Bryde

084 Closed depression- winter wet - Releve 28

Vegatation description - *Eucalyptus occidentalis* trees to 14m over scattered shrubs including *Rhagodia preissii*. *Eucalyptus occidentalis* and *Melaleuca* regeneration adjacent
Soils – clay soils



Eucalyptus occidentalis woodland with regeneration adjacent (north)



Adjacent regeneration with trees to 5m and shrubs to 1.0m with *Melaleuca acuminata* prominent in the understorey

085 Closed depression - winter wet – Releve 34

Vegatation description - *Eucalyptus occidentalis* trees to 12m with a sparse understorey of *Melaleuca strobophylla*. *Eucalyptus occidentalis* and *Melaleuca* regeneration adjacent

Soils – clay soils



Eucalyptus occidentalis over sparse *Melaleuca strobophylla* to 4m at releve 34

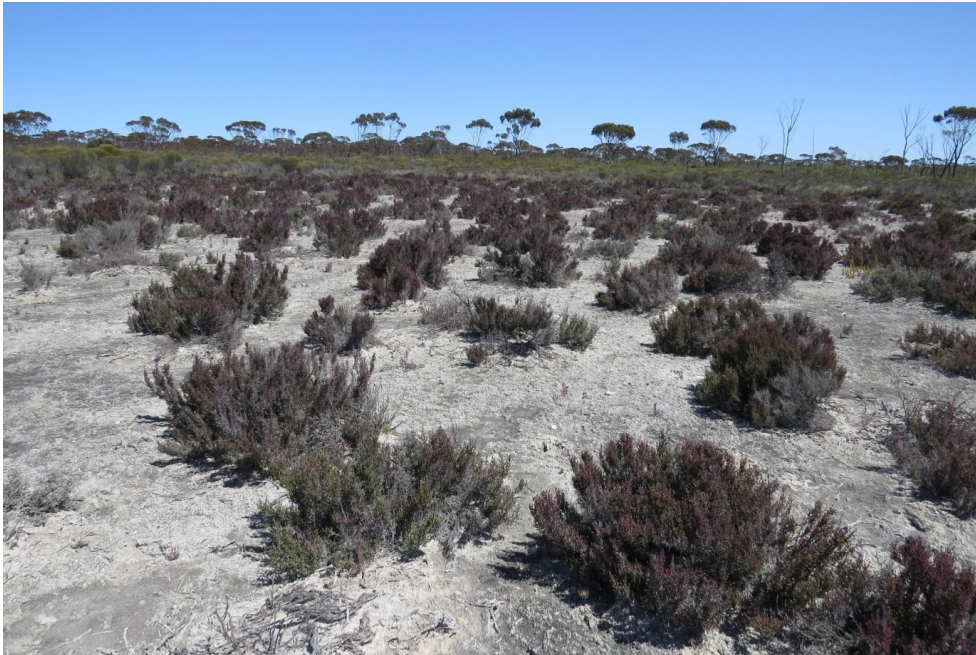


Adjacent regeneration (south) with *Eucalyptus occidentalis* seedlings and *Melaleuca* shrubs including *M. acuminata*

086 salt lake (playa)- gypsum – releve 5

Vegagation description – Samphire shrubs 0.5m. Species recorded include *Tecticornia syncarpa*, *Tecticornia moniliformis*, *Maireana oppositifolia*, *Lawrenzia glomerata*, *Isotoma scapigera*, *Hydrocotyle medicaginooides*, *Senecio quadridentatus*, *Brachyscome eyrensis*, *Lomandra micrantha* subsp. *teretifolia*, *Atrorostipa juncifolia*, *Haegieta tatei* P4. *Melaleuca* shrubland adjacent

Soils – gypsum over clay soils



Samphire shrubland at releve 5



Melaleuca shrublands at the eastern edge of the salt lake. Shrubs usually over 2ms including *Melaleuca lateriflora* and *Melaleuca scalena*. Isolated shrubs of *Rhagodia preissii*, *Carpobrotus modestus* and *Maireana oppositifolia* also occur

087 Closed depression - winter wet – Relevés 29, 30

Vegagation description- Regenerating *Eucalyptus occidentalis* trees to 6m over isolated *Melaleuca acuminata*, *Maireana brevifolia* and *Acacia cupularis* shrubs. Patch of trees to 12m at releve 30

Soils – clay soils



Regenerating *Eucalyptus occidentalis* trees at releve 29



Patch of *Eucalyptus occidentalis* mature trees on the edge of the depression – regenerating trees adjacent

088 Small lake - fresh – Releve 31

Vegagetation description- Shrubland with *Duma horrida* subsp. *abdita* dominant. Other species recorded on the lake bed include *Tecticornia pergranulata*, *Tecticornia indica* subsp. *bidens*, *Disphyma crassifolium*, *Rhagodia preissii*, *Acacia acanthoclada*, *Maireana brevifolia*, *Wilsonia rotundifolia*, *Enchylaena lanata*, *Vittadenia gracilis*, isolated *Eucalyptus occidentalis* trees, isolated *Melaleuca strobophylla* and *Melaleuca pauperiflora* shrubs over 2m.

In the northern section *Melaleuca* shrubs to 1.0m are regenerating including *Melaleuca pauperiflora* and *Melaleuca lateriflora*

Soils – silt and clay soils



Duma horrida subsp. *abdita* shrubland on wetland 088



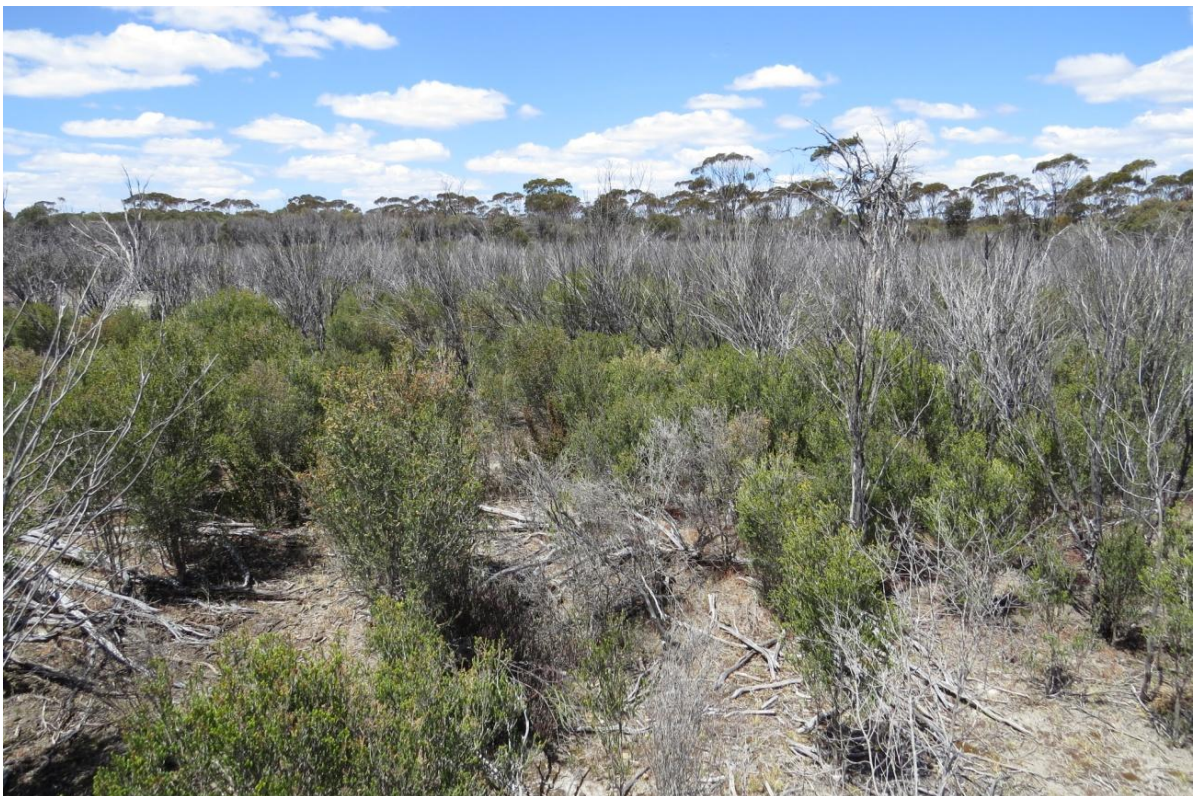
Adjacent to wetland 088 to the SW - very sparse *Eucalyptus occidentalis* trees to 12m over mid dense shrubs to 2.5m including *Melaleuca strobophylla*, *Melaleuca acuminata* and *Melaleuca ?scalena*



Eucalyptus occidentalis regenerating at the southern edge of wetland 088



Isolated *Eucalyptus occidentalis* and *Melaleuca* shrubs on the lake bed (wetland 088)



Melaleuca shrubs regenerating in the northern section of the lake (wetland)008

Vegatation description- small area of young *Eucalyptus occidentalis* trees over sparse shrubs to 1.5m including *Melaleuca thyoides* (prominent), *Melaleuca acuminata*, *Melaleuca depauperata*, *Melaleuca lateriflora*. *Eucalyptus phenax* shrub mallee also recorded.

Most of the area is covered by regenerating shrub mallee and *Melaleuca* shrubs to 1.5m including *Eucalyptus phenax*, *Melaleuca thyoides*, *Melaleuca lateriflora*, *Melaleuca acuminata*, *Melaleuca depauperata*, *Melaleuca ?scalena* and *Callistemon phoeniceus*

Soils –sandy soils over clay



Eucalyptus occidentalis trees to 8m



Shrub mallee and *Melaleuca* shrubs regenerating on wetland 089



At the edge of the closed depression wetland 089 in the northern section – *Melaleuca* shrubs to 1.0m were regenerating on the flat terrain of the depression including *Melaleuca thyoides*, *Melaleuca depauperata* and *Melaleuca ?scalena*. *Gahnia trifida* was also recorded. On the adjacent slope of the depression *Melaleuca* shrubs to 2m with very sparse mallee are found

090 Closed depression – winter wet- Releve 52

Vegetation description- *Eucalyptus occidentalis* trees to 18m over *Melaleuca acuminata*, *Melaleuca strobophylla* and *Melaleuca depauperata* to 2m at Releve 52 on the edge of the depression. Other species recorded include *Callistemon phoeniceus*, *Angianthus tomentosus*. *Eucalyptus occidentalis* trees to 18m over isolated shrubs only in central areas.

Soils – clay soils



Eucalyptus occidentalis trees over *Melaleuca* shrubs at releve 52



Eucalyptus occidentalis trees over isolated shrubs in central areas.

091 Closed depression – poorly drained – releve 11

Vegagation description - Mid dense shrubs to 3m including *Melaleuca lateriflora*, *Melaleuca pauperiflora*, *Melaleuca acuminata* and *Melaleuca halmaturorum*. Ground layer of isolated herbs/forbs, grasses and shrubs to 0.5m were also recorded including *Maireana oppositifolia*, *Rhagodia preissii*, *Maireana brevifolia*, *Lawrenxia glomerata*, *Calandrinia calyptrata*, *Crassula colorata* var. *acuminata*, *Angianthus preissianus*, *Apium annuum*, *Bulbine semibarbata*, *Rytidosperma caepitosum*

Soils – clay soils



Melaleuca shrubland at releve 11, wetland 091

097 lake – some secondary salinization –Releves 17, 58, 59, 61

Vegagetation description

1. Samphire (*Tecticornia*) shrubland in the centre of the lake including *Tecticornia syncarpa*, *Tecticornia pergranulata*, *Disphyma crassifolium* – Revele 17
2. Degraded *Melaleuca* shrubland - waterlogging, salt - Isolated *Melaleuca* shrubs including *Melaleuca strobophylla*, *Melaleuca acuminata*, *Melaleuca halmaturorum*, *Melaleuca lateriflora* and *Melaleuca scalena*. Other species recorded include *Duma horrida* subsp. *abdita* (2 plants), *Tecticornia indica* subsp. *bidens*, *Tecticornia lepidosperma*, *Lawrencia squamata*, *Rhagodia preissii*, *Maireana brevifolia*, *Disphyma crassifolium*, *Eutaxia empetrifolia*, *Acacia erinacea*, *Ecaevola argentea*, *Acacia acanthoclada*, *Vittadenia gracilis*, *Isotoma scapigera*, *Angianthus tomentosus*, *Gahnia trifida* – Releves 58, 61
3. *Melaleuca* shrubs regenerating at the edges of the lake including *Melaleuca acuminata*, *Melaleuca lateriflora*, *Melaleuca pauperiflora*, *Melaleuca strobophylla*, *Melaleuca ?scalena* –Releve 59
4. Areas of dead trees with very few seedlings – eastern section
5. Areas of tree regeneration in the southern section of the lake (*Eucalyptus kondininensis*? – no buds or fruits found)

Soils – silt and clay soils



Samphire (*Tecticornia*) shrubland at releve 17



WP 90 (eastern side of the lake) dead trees and isolated tree seedlings to 2m – no bud and fruits. Isolated shrubs to 5m including *Melaleuca strobophylla* and *Melaleuca pauperiflora*, sparse shrubs to 1.0m (*Melaleucas* regenerating) including *Melaleuca lateriflora*, *Melaleuca thuyoides*, *Rhagodia preissii*, *Maireana brevifolia*, *Lawrenca squamata* and sparse shrubs to 0.5m including *Tecticornia indica* subsp. *bidens*, *Tecticornia ?pergranulata*, *Disphyma crassifolium* and *Wilsonia rotundifolia*,



WP 360 North Eastern corner of the lake near the samphire flat. Dead *Melaleuca* shrubs over samphire with no *Melaleuca* seedlings recorded.



Releve 58 - *Duma horrida* subsp. *abdit*a site – Degraded *Melaleuca* shrubland



Releve 61 – Degraded *Melaleuca* shrubland



Near Releve 59. Regenerating *Melaleuca* shrubland at the edge of the lake (northern area)



View from NW corner of the lake showing *Melaleuca* shrubs (*Melaleuca acuminata* prominent) regenerating and some tree seedlings (*Eucalyptus occidentalis*?) at the edge of the lake



View from western shore over southern section of the lake – Isolated trees and Melaleuca regeneration at the edge. Trees regenerating on the lake bed (*Eucalyptus kondininensis*?)



WP 373 southern section of lake regenerating *Eucalyptus Kondininensis* ? (no bud or fruits). Sparse *Melaleuca* shrubs over 2m including *Melaleuca strobophylla*, *Melaleuca thyooides*, *Melaleuca lateriflora* and *Melaleuca pauperiflora*. Isolated shrubs to 0.5m including *Disphyma crassifolium*, *Acacia erinacea*, *Rhagodia preissii* and *Acacia merrallii*



WP703 -edge of eastern shore – Regeneration -Mid dense *Melaleuca* shrubs to 1.0m and *Eucalyptus kondininensis* dead trees and regeneration. Species recorded include *Disphyma crassifolium*, *Melaleuca pauperiflora*, *Melaleuca lateriflora*, *Melaleuca strobophylla* and *Melaleuca thyoides*



WP 704 eastern edge of the lake with *Eucalyptus kondininensis* seedlings/dead trees and *Melaleuca* shrubs on higher ground near the samphire shrubland

100 Closed Depression – releve 89

Vegatation description – Regeneration - *Eucalyptus kondininensis* trees to 5m over sparse shrubs to 2m of *Melaleuca strobophylla*, *Melaleuca acuminata* (mid dense at edges), *Melaleuca lateriflora*, *Melaleuca thyoides*. Isolated shrubs to 0.5m including *Rhagodia preissii*, *Acacia erinacea*
Soils – sandy loam over clay soils



Eucalyptus kondininensis at releve 89 wetland 100



Eucalyptus kondininensis near releve 89 wetland 100

101 Closed Depression – releve 71

Vegagetation description – Regeneration - *Eucalyptus kondininensis* trees to 4m over sparse shrubs to 2m including *Melaleuca acuminata*, *Melaleuca strobophylla*, *Melaleuca lateriflora* and *Rhagodia preissii*. Dead trees to 15m

Soils – sandy loam over clay soils



Eucalyptus kondininensis and *Melaleuca* shrubs at releve 71 wetland 101



Eucalyptus kondininensis and *Melaleuca* shrubs at releve 71 wetland 101

111 Closed depression – poorly drained – releve 95

Vegagation description- Melaleuca shrubland with shrubs to 2.5m including *Melaleuca acuminata*, *Melaleuca lateriflora* and *Melaleuca strobophylla* (5m). Isolated trees of *Eucalyptus kondininensis*, isolated shrub mallee *Eucalyptus phenax* and isolated shrubs to 0.5m including *Rhagodia preissii*
Soils – clay soils



Melaleuca shrubland at releve 95



Melaleuca shrubland near releve 95

118 Closed depression – poorly drained – releve 33

Vegatation description- *Melaleuca* shrubs to 3m including *Melaleuca lateriflora*, *Melaleuca ?scalena* and *Melaleuca acuminata*. Other species recorded include *Disphyma crassifolium*, *Maireana brevifolia*, *Dodonaea bursariifolia* and *Calandrinia calyptrata*

Soils – clay soils



Melaleuca shrubland at releve 33



WP 685 *Melaleuca acuminata* shrubs and *Eucalyptus occidentalis* trees regenerating at the southern edge of the depression



View over the depression taken from the northern edge (lateritic ridge) wetland 118 with *Melaleuca acuminata* regenerating at the edge.

121 Closed depression – releve 94

Vegagitation description – Very sparse shrub mallee of *Eucalyptus phenax* over mid dense *Melaleuca* shrubs to 2m including *Melaleuca ?scalena*, *Melaleuca lateriflora*, *Melaleuca laxiflora*, *Melaleuca depauperata*, *Melaleuca adnata* and *Melaleuca acuminata*. Density of mallee increases at the edges of the depression

Soils – sandy loam over clay soils



Wetland 121

303 Closed depression – winter wet – releve 80

Vegagation description – Sparse *Eucalyptus occidentalis* trees to 14m in central areas over very sparse shrubs to 3m including *Melaleuca strobophylla* and *Melaleuca lateriflora*. Ground layer of mid dense *Melaleuca* shrubs 1.0m (regeneration) including *Melaleuca acuminata*, *Melaleuca strobophylla*, *Melaleuca lateriflora* and *Melaleuca ?scalena*. *Dodonaea bursariifolia* and *Rhagodia preissii* were also recorded

Soils – clay soils

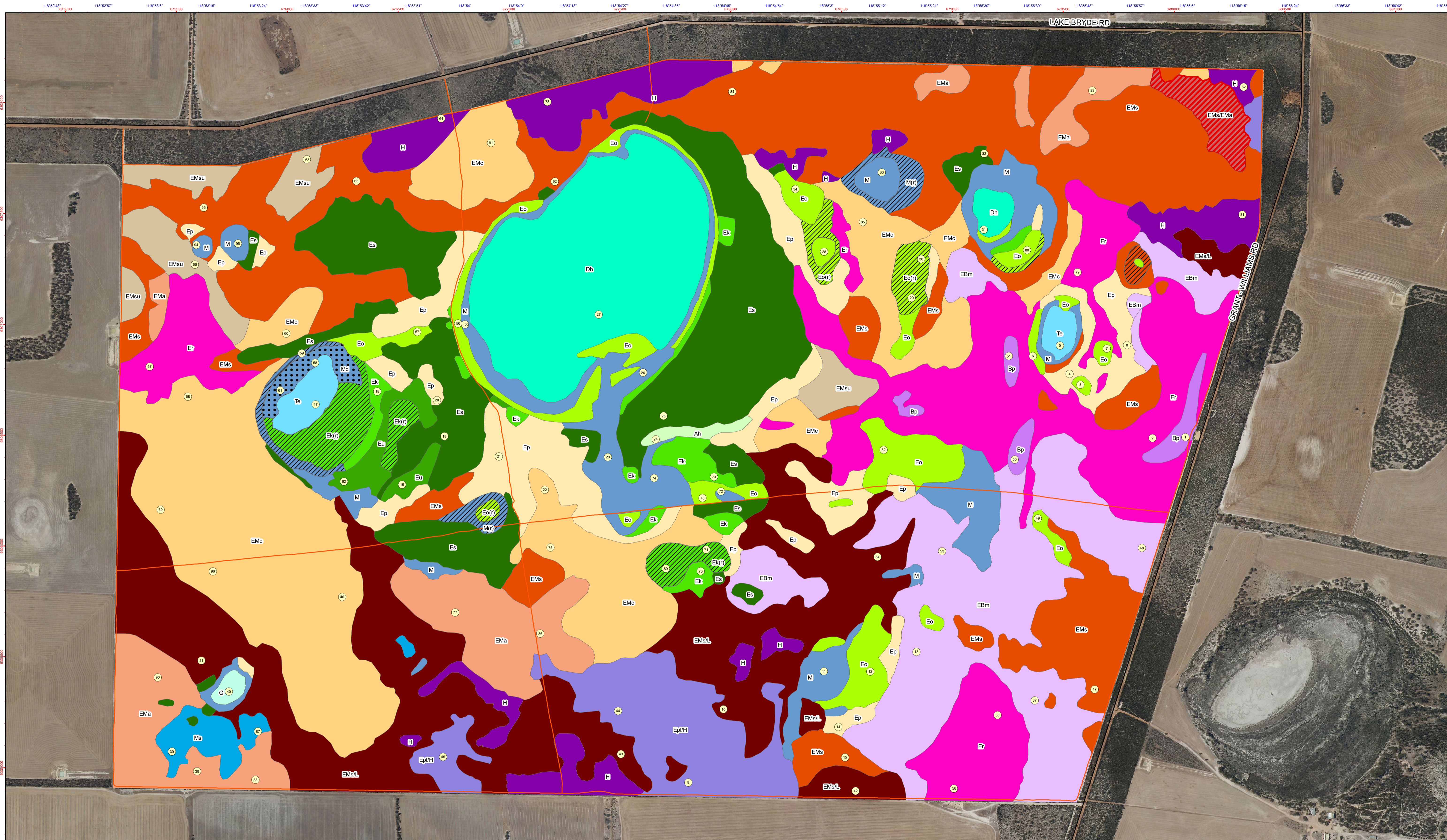


Eucalyptus occidentalis woodland at releve 80



Regeneration at the edge of the depression - *Eucalyptus occidentalis* trees to 3m over mid dense *Melaleuca acuminata* shrubs 1.0m

Vegetation formations - East Lake Bryde



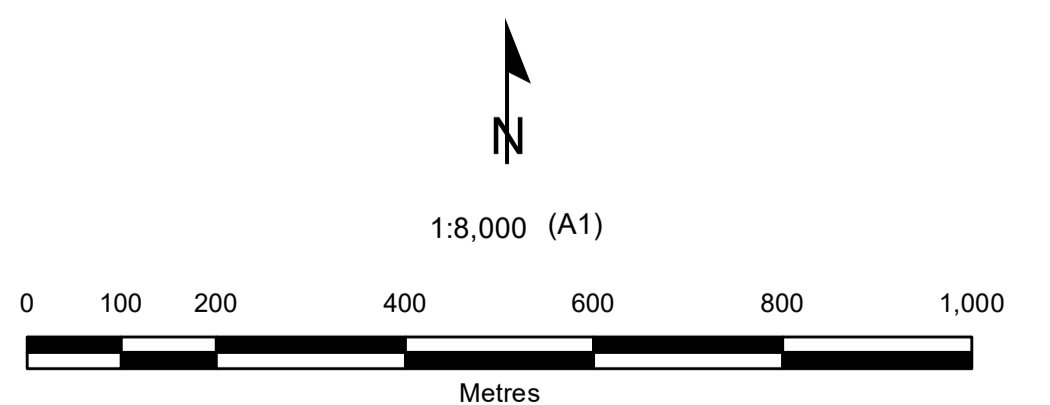
Legend

- Relieves
 - Local Road
 - Tracks
- Woodland Formations**
- Eucalyptus salmonophloia (salmon gum) woodland
 - Eucalyptus urna open forest
 - Eucalyptus kondininensis (Kondinin blackbutt) woodland
 - Eucalyptus kondininensis (Kondinin blackbutt) woodland (Regeneration)
 - Eucalyptus occidentalis (flat-topped yate) Woodland
 - Eucalyptus occidentalis (flat-topped yate) Woodland (Regeneration)
 - Allocasuarina huegeliana open forest

- Mallee Formations**
- Mallee over Melaleuca scalena - laterite
 - Mallee over Melaleuca scalena
 - Mallee over Melaleuca scalena (Regeneration)
 - Mallee over Melaleuca adnata
 - Mallee over Melaleuca scalena/adnata
 - Mallee over Melaleuca low shrubland - Melaleuca carrii
 - Mallee over Melaleuca low shrubland - Melaleuca subtrigona
 - Eucalyptus perangusta over shrubland

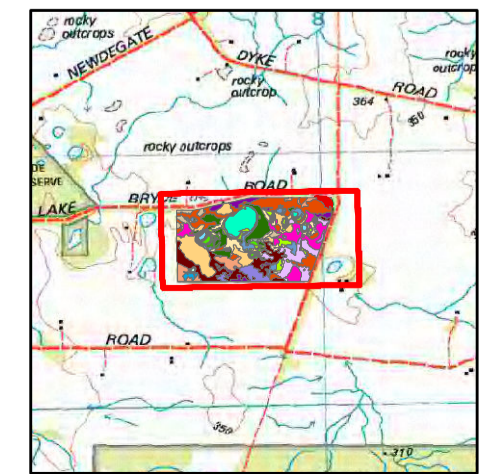
- Shrubland (kwongan/heath) Formations**
- Mixed lateritic heathland
 - Mixed lateritic heathland - Eucalyptus pleurocarpa
 - Banksia prionotes open woodland
 - Eremaea pauciflora heathland
 - Very sparse mallee over heathland

- Shrubland (other) Formations**
- Melaleuca shrubland
 - Melaleuca shrubland (Regeneration)
 - Melaleuca shrubland - Melaleuca scalena
 - Melaleuca shrubland - degraded
 - Duma horrida subsp. abdita shrubland
 - Sampire (Tecticornia) shrubland
 - Isolated shrubs over grasses/forbs

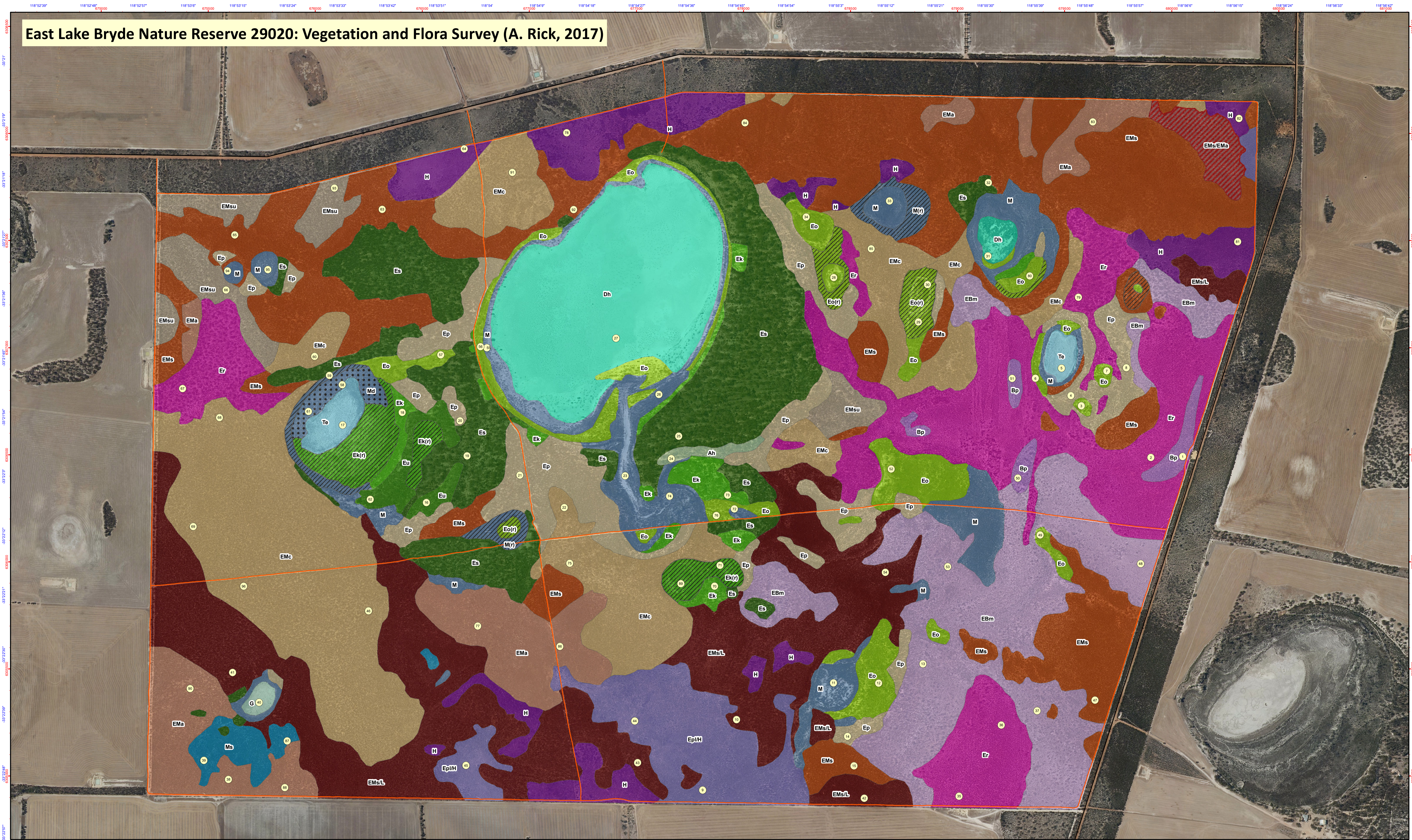


Produced by Mike Fitzgerald,
Department of
Biodiversity, Conservation and Attractions

Job Ref: Lake Bryde Catchment, Produced at 3:23pm, on Jan 24, 2018

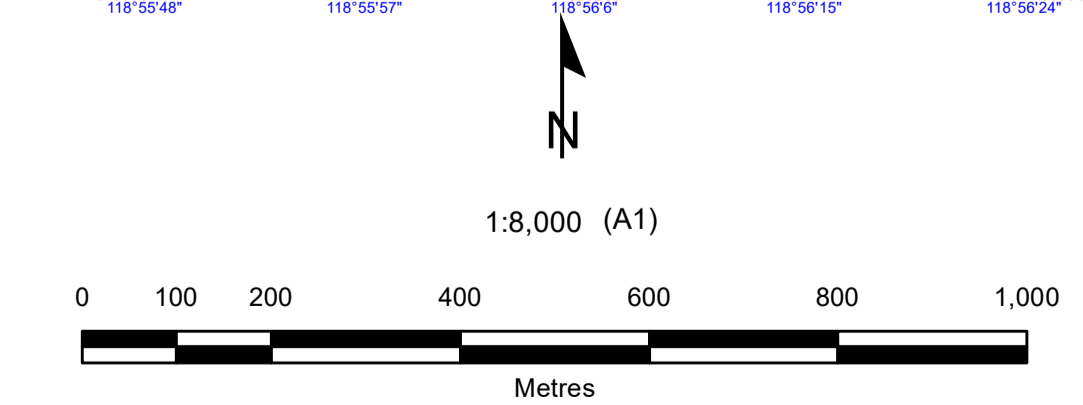


East Lake Bryde Nature Reserve 29020: Vegetation and Flora Survey (A. Rick, 2017)



Legend

- Reliefs
 - Local Road
 - Tracks
- | | | | |
|---|--|--|---|
| Woodland Formations <ul style="list-style-type: none"> ■ Eucalyptus salmonophloia (salmon gum) woodland ■ Eucalyptus urna open forest ■ Eucalyptus kondininensis (Kondinin blackbutt) woodland ■ Eucalyptus kondininensis (Kondinin blackbutt) woodland (Regeneration) ■ Eucalyptus occidentalis (flat-topped yate) Woodland ■ Eucalyptus occidentalis (flat-topped yate) Woodland (Regeneration) ■ Allocasuarina huegeliana open forest | Mallee Formations <ul style="list-style-type: none"> ■ Mallee over Melaleuca scalena - laterite ■ Mallee over Melaleuca scalena ■ Mallee over Melaleuca scalena (Regeneration) ■ Mallee over Melaleuca adnata ■ Mallee over Melaleuca scalena/adnata ■ Mallee over Melaleuca low shrubland - Melaleuca carrii ■ Mallee over Melaleuca low shrubland - Melaleuca subtrigona ■ Eucalyptus perangusta over shrubland | Shrubland (kwongan/heath) Formations <ul style="list-style-type: none"> ■ Mixed lateritic heathland ■ Mixed lateritic heathland - Eucalyptus pleurocarpa ■ Banksia prionotes open woodland ■ Eremaea pauciflora heathland ■ Very sparse mallee over heathland | Shrubland (other) Formations <ul style="list-style-type: none"> ■ Melaleuca shrubland ■ Melaleuca shrubland (Regeneration) ■ Melaleuca shrubland - Melaleuca scalena ■ Melaleuca shrubland - degraded ■ Duma horrida subsp. abdita shrubland ■ Sapphire (Tecticornia) shrubland ■ Isolated shrubs over grasses/forbs |
|---|--|--|---|



Produced by Mike Fitzgerald,
Department of
Biodiversity, Conservation and Attractions
Job Ref: Lake Bryde Catchment. Produced at 3:23pm, on Jan 24, 2018

