Lake Bryde Conservation Park 48436
Vegetation and Flora Survey

BOTANICAL CONSULTANTS
REPORT
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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 the Lake Bryde Conservation Park 48436 (1315ha) was commissioned by the Parks and Wildlife Service of the Department of Biodiversity, Conservation and Attractions to assist with the management of the area. The Conservation Park 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. The survey area is situated approximately 32 km SW 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 8 days during October, November 2017. Survey 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 (releves) described. Releves 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 type descriptions were based on the National Vegetation Information System (NVIS). Descriptions are to Level 6 (Sub-Association). Descriptions using the classification system devised by Muir (1977) 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 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.

Twenty vegetation types are mapped and described in this study including 5 woodland, 5 mallee, 9 shrubland and 1 Herbland community. A total of 342 plant species were recorded during the present survey including 26 introduced species or weeds.

Lake Bryde Conservation Park has high conservation values. Information collected during the present survey is summarized below.

- The Conservation Park includes a range of vegetation types from the heath communities on lateritic soils on the upper slopes, granite rock flora, extensive mallee communities and woodlands and *Melaleuca* shrublands on the lower slopes and valley floor.

- The Conservation Park includes a number of wetlands including the yate (*Eucalyptus occidentalis*) swamp, closed depressions with *Eucalyptus kondininensis* woodlands or

Melaleuca shrublands, salt lakes (two recorded with gypsum) and Lake Bryde a freshwater lake.

- A relatively high diversity of vascular plant species occurs in the Lake Bryde Conservation Park with 368 plant species recorded in Appendix 6.
- The Declared Rare Flora *Duma horrida* subsp. *abdita* covers Lake Bryde.
- 11 priority species were recorded for the Conservation Park during the present survey.
- Lake Bryde Conservation Park 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. A small area of *Eucalyptus longicornis* (red morrel) woodland (priority 1) also occurs in the southern section of the Park.
- 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 floo**r"** occurs on Lake Bryde.
- The reserve is an important part of the wildlife corridor connecting reserves and other remnant vegetation in the catchment. 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 Lake Bryde Conservation Park 48436. Especially Mike Hislop (*Leucopogon*), Greg Keighery, Frank Obbens (*Calandrinia*) and Juliet Wege (*Stylidium*). Access to the WA Herbarium collections was essential for carrying out the survey.
- Mike Fitzgerald (Department of Biodiversity, Conservation and Attractions) for his valuable assistance in this project including GIS work (digitizing the vegetation map) and comments and edits to the draft report.
- Peter White (Department of Biodiversity, Conservation and Attractions) comments and edits on the draft report.
- Brett Beecham (Department of Biodiversity, Conservation and Attractions) for comments on the draft report.

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Excel file Plant species at releves no annuals, geophytes, weeds – used in Primer analysis.

1.0 INTRODUCTION

1.1 Survey Objectives

The vegetation and flora survey of Lake Bryde Conservation Park 48436 was commissioned by the Parks and Wildlife Service of the Department of Biodiversity, Conservation and Attractions to assist with the management of the park. 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

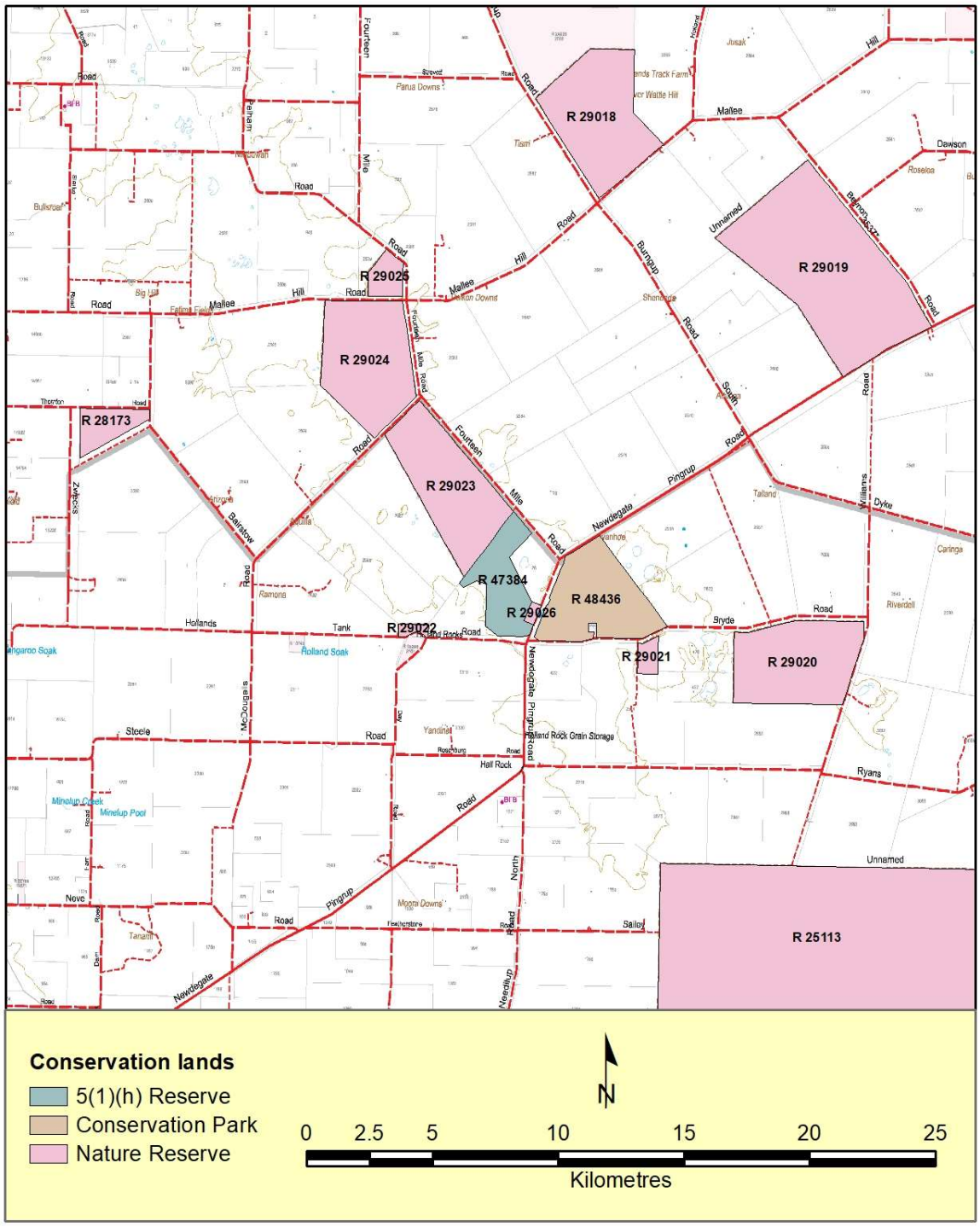
The Interim Biogeographical Regionalisation of Australia Version 7 (2012) divides Western Australia into 23 IBRA Bioregions which are subdivided into 53 IBRA sub regions. IBRA regions are large geographically distinct areas of similar climate, geology, landform, vegetation and fauna communities. The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

The catchment, is about 400 kilometres south-east of Perth, covers 140,000 hectares, and includes the Lakeland Nature Reserves, Lake Bryde and East Lake Bryde. Clearing of the Kent shire began in the 1960's and approximately 66% of the Lake Bryde catchment is cleared (Hamilton-Brown and Blyth 2001). Increased runoff from upper slope areas, secondary salinisation and increase waterlogging adversely impact on the biodiversity values provided by the catchment. The goal for the catchment is to slow the rate of decline of biodiversity across valley floor assemblages and to conserve specific high value biodiversity assets (DBCA 2018).

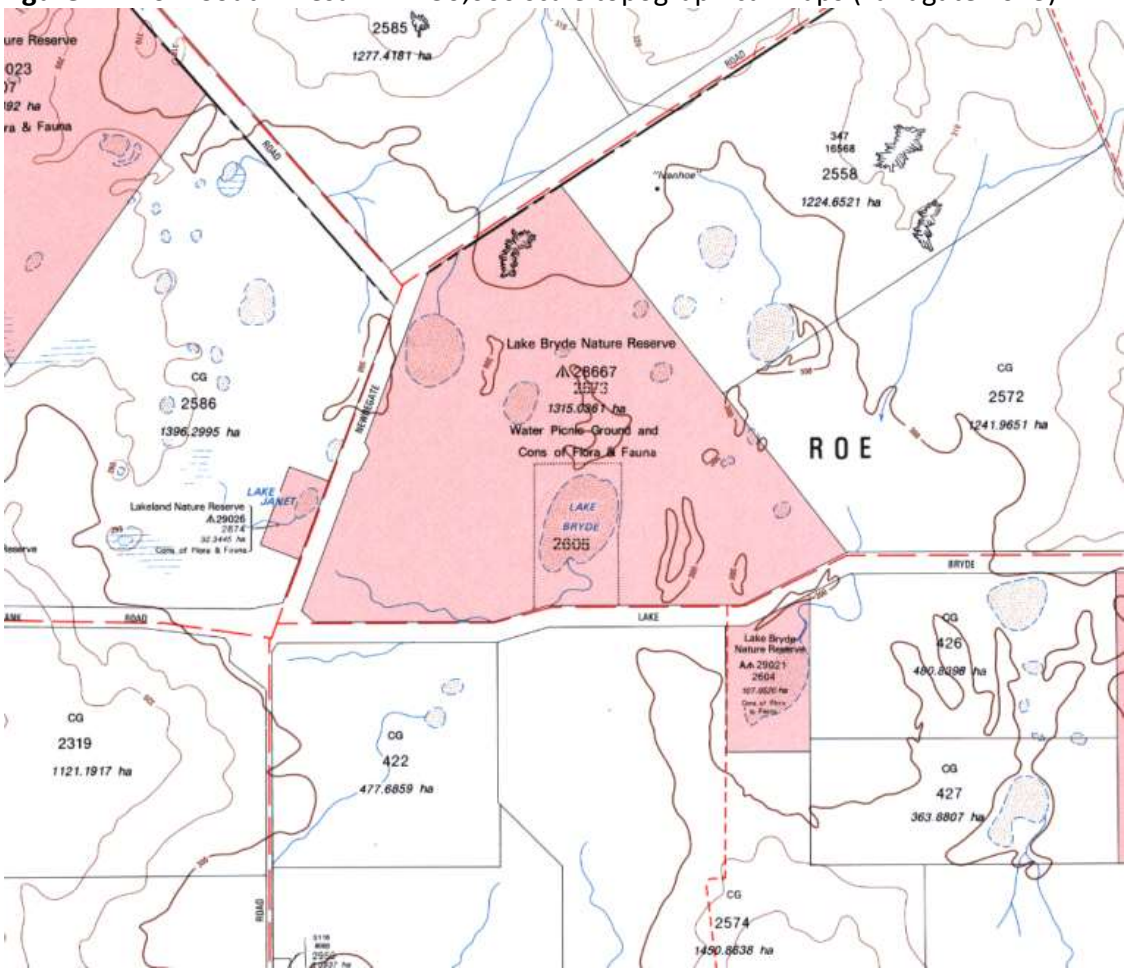
Figure 1: Reserves in the Lake Bryde Recovery Catchment



1.3 Lake Bryde Conservation Park

The Lake Bryde Conservation Park 48436 is situated approximately 32 km SW of the Newdegate town site in the Kent Shire. Previously the area was known as the Lake Bryde Nature Reserve 28667 set aside for water, picnic ground and conservation of flora and fauna. The Conservation Park is bounded by the Newdegate-Pingrup road to the north and west and the Lake Bryde road to the south. The Conservation Park is approximately 1315 ha in size and is surrounded by cleared farmland except for Lake Janet Nature Reserve 29026 (32ha) on the west side of the Newdegate Pingrup Road and Lake Bryde Nature Reserve 29021 (107ha) on the south side of Lake Bryde Road. The Park is relatively flat with the highest points on the northern boundary and sandy ridges within the park at 300 m above sea level. The area includes Lake Bryde a freshwater lake, salt lakes and small closed depressions. The wooded, yate swamp dominated by *Eucalyptus occidentalis* and *Melaleuca strobophylla* is situated in the north western section of the park. In the south west a shallow waterway has been constructed to protect large areas from waterlogging by moving water through the valley floor system into a series of termination lakes in the Lakeland Nature Reserves.

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



1.4 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 an area of outstanding ornithological importance (Hamilton-Brown and Blyth 2001).

In a wetland survey of the Lake Bryde Recovery Catchment carried out after floods in 2006 Lake Bryde was a major source of the recorded biodiversity. A total of 140 invertebrate species have been identified for this wetland. Lake Bryde was also the most important wetland for both water bird richness and abundance. The 3 freshest wetlands Lake Bryde, Yate swamp and East Lake Bryde supported 67% of the invertebrate species richness (Cale 2007).

Ogden and Froend (1998) state that the salinity of Lake Bryde will probably increase in the future due to clearing, and vegetation at lower elevations is likely to deteriorate from water-logging and increasing soil salinity.

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 horrid*a subsp. *abdita* and *Tecticornia verrucosa* across the lake floor" (Hamilton-Brown and Blyth 2001).

A photographic history of Lake Bryde is presented in Appendix 8.

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 Lake Bryde Conservation Park 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 occurs 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). Ecoscape (2001) include soil-landscape mapping units developed by the Department of Agriculture and Food and outlined in Table 1.

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

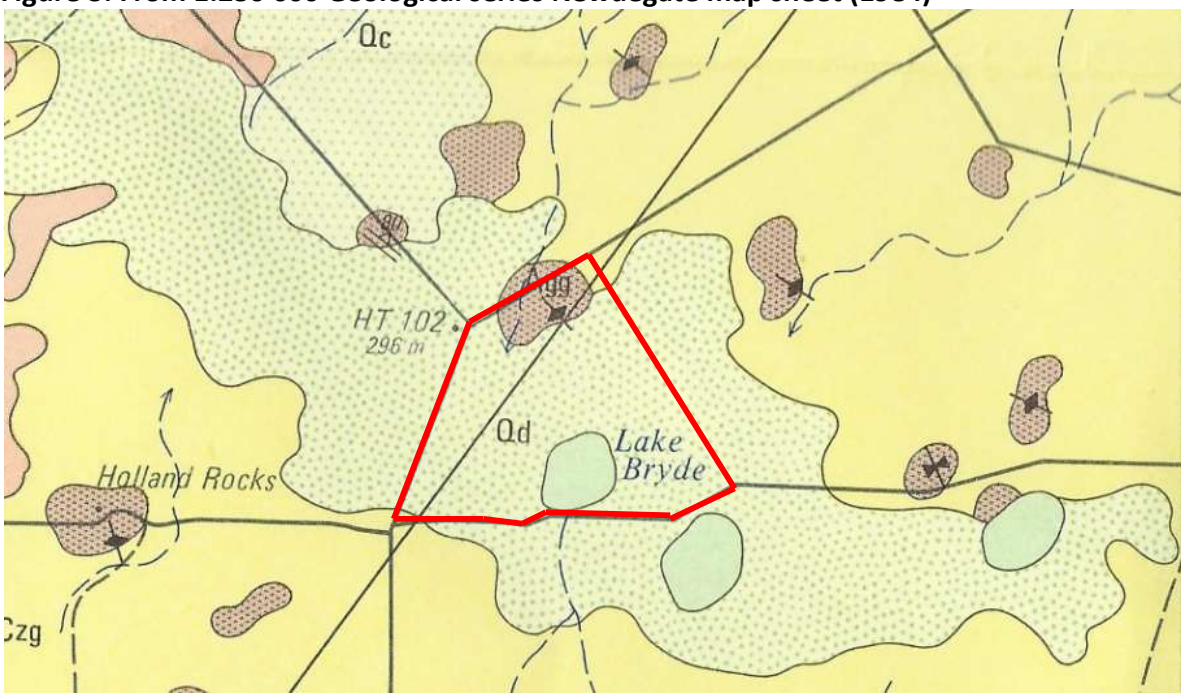
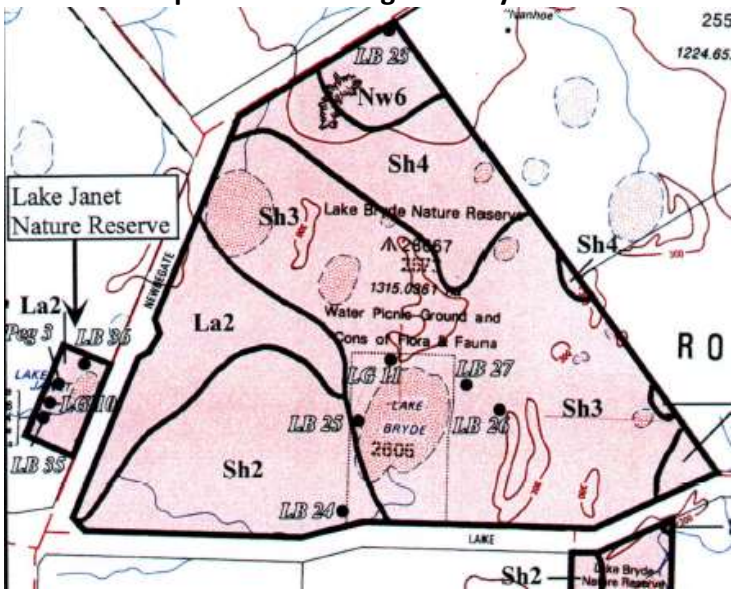


Table 1: Soil Landscape Descriptions (Ecoscape 2001)

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

Figure 4: Soil Landscape units covering Lake Bryde Conservation Park



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 8 days during October and November 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 (releves) described. The releves 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. Releves 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 releves, 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 are to Level 6 (Sub-Association). 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 releves 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 2: 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	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
M Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
LA Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
LB Trees < 5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
KT Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
KS Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
S Shrubs > 2m	Dense Thicket	Thicket	Scrub	Open Scrub
SA Shrubs 1.5-2.0m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
SB Shrubs 1.0-1.5m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
SC Shrubs 0.5-1.0m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
SD Shrubs 0.0-0.5m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
P Mat plants	Dense Mat plants	Mat plants	Open Mat plants	Very Open Mat plants
H Hummock Grass	Dense Hum. Grass	Mid-Dense Hum.	Hummock Grass	Open Hummock Grass
GT Bunch grass > 0.5m	Dense Tall Grass	Grass	Open Tall Grass	Very Open Tall Grass
GL Bunch grass < 0.5m	Dense Low Grass	Tall Grass	Open Low Grass	Very Open Low Grass
J Herbaceous spp.	Dense Herbs	Low Grass	Open Herbs	Very Open Herbs
		Herbs		
VT Sedges > 0.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
VL Sedges < 0.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
X Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
Mosses, liverwort	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

Table 3: 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
Growth Form	**Height Ranges (m)**	**Structural Formation Classes**						
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	fernland	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 4: Vegetation Condition Scale

Table 3 : Vegetation Condition Scale Modified from Trudgen 1991 by B.J. Keighery for the Swan Coastal Plain Survey 1993
1 = Pristine Pristine or nearly so, no obvious signs of disturbance
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.
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.
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.
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.
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.

2.3 PRIMER Analysis

The multivariate statistics package used to analyse the species information for each releve was PRIMER v6 (Clarke & Gorley, 2006). Releves were classified according to similarities in species composition (presence/absence data) using the Bray-Curtis Similarity Coefficient. The results of the Cluster classification are 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.* Differentiating between *Melaleuca hamata* and *Melaleuca scalena* was difficult when flowering material was not available and therefore all specimens were assigned to *Melaleuca scalena*.

The identification of some of the *Hibbertia* species where flowering material was not available was also difficult and the specimens collected have been assigned to *Hibbertia exasperata* complex or *Hibbertia gracilipes* complex.

Because of the difficulty of identifying some of the *Lepidosperma* collections a range of specimens were assigned to the *Lepidosperma* sp. Bandalup Scabrid complex but will need to be re assessed at a future date.

Databases

The following data sets were accumulated in EXCEL spread sheets.

- All species recorded at releves including weeds, annuals and geophytes.
- Plant species at releves no annuals, geophytes, weeds – used in Primer analysis.
- Site descriptions including GPS location, soils, topography, landform and drainage.

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3.0 VEGETATION SURVEY

3.1 Previous surveys in the Lake Bryde Recovery 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. 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. 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.

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. k*ondininensis*: next M. *pauperiflora* and *E. salmonophloia* and *E. longicornis* come in.

Beard (1976) has mapped the Lake Bryde Conservation Park at a scale of 1:250 000. The map units covering the Conservation Park 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. The following communities were recorded.

- Ji - samphire community covering the lake including *Muehlenbeckia declina* (now *Duma horrida* subsp. *abdita*)
- Jr - samphire community covering the lake including *Tecticornia verrucosa*, *Wilsonia humilis, Halosarcia lepidosperma* (now *Tecticornia lepidosperma*) and *Disphyma crassifolium.*

- ScSAc - fringing vegetation of shrub community with *Melaleuca* species including *Melaleuca lateriflora*, *Melaleuca halmaturorum* and *Melaleuca* sp.3G.
- MrSr - fringing tree community of *Eucalyptus* and *Melaleuca* species including *Eucalyptus occidentalis* and *Melaleuca lateriflora.*

Mattiske (1999) has mapped the vegetation of low lying areas (below 300ms) of the Lakelands Nature Reserves, Reserve 29026 (Lake Janet Nature Reserve) and part of the Lake Bryde Conservation Park. One quadrat LG 11 (*Eucalyptus salmonophloia* woodland) detailed in the report is situated in the Conservation Park. The vegetation map covering the study area is presented in Appendix 2 along with descriptions of the vegetation formations mapped. Those formations relevant to the Conservation Park are listed below.

Woodland Formations

1.1 Open Woodland of *Eucalyptus kondininensis* over Scrub over Open Dwarf C in loamy sand on the rises above salt lakes

1.3 Low Woodland of *Eucalyptus occidentalis*, *Eucalyptus kondininensis* over Scrub over Very Open Low Sedges in sand

1.4 Very Open Woodland of *Eucalyptus flocktoniae* (now *Eucalyptus urna*), *Eucalyptus phenax* over Dense Thicket in loamy sand

1.6 Open Woodland of Eucalyptus *salmonophloia* over Low Heath C over Open Herbs in loamy clay

Mallee Formations

2.4 Open Tree mallee of *Eucalyptus hypoclamydea, Eucalyptus phenax, Eucalyptus sporadica* over Low Heath D over Low Sedges in sandy soils

2.5 Dense Shrub Mallee of *Eucalyptus capillosa* subsp. *polyclada* over Open Dwarf Scrub D over Open Herbs

Shrubland Formations

3.1 Thicket of *Melaleuca adnata, Melaleuca halmaturorum, Melaleuca lateriflora, Melaleuca uncinata* over Open Dwarf Scrub D in sandy soils

3.2 Dense Thicket of *Melaleuca uncinata, Melaleuca lateriflora* over Dense Herbs in loamy sands

3.4 Dwarf Scrub D or Open Dwarf Scrub D of *Halosarcia pergranulata, Halosarcia syncarpa, Tecticornia verrucosa* over Very Open Herbs in clay soils

In 2000 Ecoscape conducted a vegetation survey of Reserves in the Lake Bryde Recovery Catchment. This survey included 6 quadrats situated in the Lake Bryde Conservation Park including LG 11 which was resurveyed. Details from the report can be found in Appendix 3.

In 2005 17 permanent vegetation monitoring transects were established by Mattiske Consulting Pty Ltd in the Lake Bryde and Lakelands area to monitor the environmental

impacts of the surface water management engineering project. Data on vegetation status and condition was collected in 2005 and 2009 (Mattiske 2010). Three of these transects were established in the Lake Bryde Conservation Park (MT8, MT9 and MT10).

All transects in the Conservation Park showed a decline in health of mallee species. MT8 and MT 9 showed an increase in the number of *Melaleuc*a shrubs and their overall health improved. Along MT10 the number of living *Melaleuca* plants increased but the overall health of the plants declined significantly. An increase in *Tecticornia* species was recorded for all three transects and all recorded the weed species *Mesembryanthemum nodiflorum in 2009. DBCA personnel have continued the monitoring of these transects.

3.2 Present Survey - Vegetation Types

The vegetation types mapped and described in the present study are outlined in Table 5. Descriptions of the vegetation structure (with photographs) recorded at releves can be found in Appendix 4. Muir (1977) and NVIS (to level 6 Sub-Association) vegetation descriptions are included. Detailed vegetation descriptions can be found in Appendix 5. The species are listed in order of prominence and the first 5 species in each layer/sub-strata can be used for NVIS descriptions to level 6. Data sets (EXCEL spread sheets) with species recorded at each releve and habitat descriptions are also available.

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/shrublands, and other vegetation associated with lateritic soils to occur on higher slopes and those associated with duplex soils (sandy soils over clay) and heavier soils to occur on mid slopes and in 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 the Lake Bryde Conservation Park species rich heath occur on the upper slopes in the north of the park. *Banksia prionotes* open woodland and *Eremaea* heathland are found on deep sandy soils over laterite. Mallee over *Melaleuca scalena* (laterite) occurs on intergrade soils of gravely soils over laterite over clay also to the north. Areas of granite pavement carry Shrublands with Herblands adjacent to exposed rock.

On the gentle mid slopes to the lower slopes/valley floor mallee associations are extensive including Mallee over *Melaleuca scalena* and Mixed mallee on sandy soils over clay, Mallee over *Melaleuca acuminata* on shallow duplex soils of sandy loam over clay

and Mallee over low *Melaleuca* shrubland on deeper sandy duplex soils with some laterite.

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 the freshwater Lake Bryde and in a winter wet depression (yate swamp). *Eucalyptus urna* open forest is found adjacent to salmon gum woodlands on sandy loam dunes and a small area of *Eucalyptus longicornis* woodland occurs on loam soils in the south of the park.

Melaleuca shrublands are found on poorly drained areas on clay soils on lake beds and in depressions. Salt lakes, two with gypsum, have areas of samphire (*Tecticornia)* shrublands. The *Duma horrida* subsp. *abdita* Threatened Ecological Community occurs on Lake Bryde.

Detailed vegetation descriptions are available in Appendix 5. 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. Seventy seven 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. Releves in the *Eremaea* heathland and *Banksias prionotes* open woodland were grouped together with no significant difference found in their species composition. *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.

2. The Mallee over low *Melaleuca* shrubland and Mixed Mallee were grouped together in the analysis with no significant difference shown in species composition. These vegetation types were mapped separately wherever possible however they tend to transition into each other, and boundaries are sometimes difficult to detect on the aerial photography.

3. Releve 73 (Mixed Mallee) is grouped with the Mallee over *Melaleuca scalena* releves indicating that this area is probably a transition site.

4. Releve 7 a *Eucalyptus salmonophloia* woodland site is grouped with the Mallee over *Melaleuca acuminata* releves. This releve is located in a drainage line and here the *Eucalyptus salmonophloia* trees have an understorey of *Melaleuca* shrubs. This releve therefore differs in species composition from the more typical salmon gum woodland areas.

5. Releve 31 (Mallee over *Melaleuca acuminata*) and Releve 5 (*Melaleuca* shrubland) are grouped together. Both these areas are depressions where the vegetation is regenerating and have been included in order to document all wetlands in the Conservation Park.

3.4 Vegetation Condition

Large areas of the Conservation Park are in excellent to pristine condition with very little disturbance and only the occasional non-aggressive weed species present. Weeds were more common in vegetation near the boundaries of the Conservation Park especially adjacent to farmland. Some weed invasion has occurred on the granite in the northern section of the study area.

Low lying areas in the south western section of the reserve near the surface water drain show heath decline primarily associated with an increased period of waterlogging and subsequent recharge of groundwater resulting in rising groundwater levels. This has been described by Mattiske (2010).

Areas on the edge of the Yate (*Eucalyptus occidentalis*) swamp where trees are regenerating are in “Very Good” condition due to weed invasion and the effects of past waterlogging.

26 introduced or weed species were recorded during the present survey.

3.5 Vegetation Map

The mallee vegetation types can vary over short distances and often merge into each other with intergrades or transition areas common. Vegetation boundaries were often difficult to distinguish on the aerial photography and therefore some areas have been mapped as Mallee Mosaic Mx. The boundaries of the vegetation types within the granite complex were also difficult to distinguish and these areas have been mapped as Granite

Mosaic Gx. Known vegetation types are marked on the map at specific sites within the mosaic.

Table 5 - Vegetation Types - Lake Bryde Conservation Park

Vegetation Type	Map Unit	Soils/topography	Landform	releves	Rare Flora
Woodland Formations					
Eucalyptus salmonophloia (salmon gum) woodland	Es	Loamy soils over clay. Gentle slope to flat terrain	Valley floor adjacent to lakes and in drainage lines	7, 26, 58	
Eucalyptus urna open forest	Eu	Sandy loam ridge. Flat to gentle slope	Valley floor, lower slopes	20, 33, 65	
Eucalyptus longicornis (red morrel) woodland	El	Loam soils, flat to gentle slope	Valley floor, lower slopes	69	
Eucalyptus kondininensis (Kondinin blackbutt) woodland	Ek	Sandy loam, well drained. Flat to gentle slope	Valley floor, higher ground adjacent to lakes, depressions	12, 14, 15, 17, 43, 44, 51, 53, 59, 63	
	Ek r regeneration				
Eucalyptus occidentalis (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	28, 29, 30, 60, 71	
	Eo r regeneration				
Mallee Formations					
Mallee over *Melaleuca scalena* - laterite	EMs/L	Sandy loam with laterite over clay	Upper to mid slope	10, 37	*Grevillea newbeyi* P3 *Spyridium mucronatum* subsp. *recurvum* P3
Mallee over *Melaleuca scalena*	EMs	Sandy loam over clay - duplex soils ~30cm to clay	Mid to lower slopes	4, 11, 35, 67, 68	*Spyridium mucronatum* subsp. *recurvum* P3 Astroloma chloranthum P2
Mallee over *Melaleuca acuminata*	EMac	Shallow sandy loam soils over clay	Mid to lower slopes. Usually near lakes and drainage lines	8, 31, 42	
Mallee over *Melaleuca l*ow shrubland	EM (EMc- *Melaleuca carrii*)	Deeper sandy soils over clay ?laterite	Mid to lower slopes well drained	25, 70	Calectasia obtusa P3 Astroloma chloranthum P2
	EM	Sandy loam soils over clay ?laterite	Mid to lower slopes	41, 48, 50	*Dampiera orchardii* P2

	(EMsu- *Melaleuca subtrigona*				
Mixed Mallee	E (EMd- Melaleuca depauperata)	Sandy loam over clay - duplex soils	Mid to lower slopes	24, 32, 66, 73	Astroloma chloranthum P2 Melaleuca sculponeata P3
	E (E- sparse understorey)	Sandy loam over clay - duplex soils	Mid to lower slopes	13, 19, 52	
Shrubland Formations - Kwongan /Heath					
Mixed lateritic heathland	H	Sandy gravels	Upper slopes	36, 39	Banksia xylothemelia P3 Daviesia uncinata P3 *Drosera thylax* P2 *Persoonia brevirhachis* P3
Allocasuarina spinossisima shrubland	As	Sandy gravel	Upper slopes	3,38	*Drosera thylax* P2
Banksia prionotes open woodland	Bp	Deep sandy soils over laterite	Upper slopes Ridge top	47	*Grevillea newbeyi* P3
Eremaea pauciflora heathland	Er	Deep sandy soils pale then yellow over laterite, flat to gently sloping terrain	Upper and mid slopes well drained	34, 40, 49	*Grevillea newbeyi* P3
Mixed sandy heathland	Hs	Sandy soils	Mid to lower slopes	61, 62, 72	*Grevillea newbeyi* P3
Shrubland Formations					
Melaleuca shrubland	M	Clay, poorly drained	Lower slopes, lakebed	5, 6, 18, 21, 23, 27, 54, 55, 56, 57, 64, 74, 76	Melaleuca sculponeata P3 *Dampiera orchardii* P2
	M r (regeneration				
Duma horrida subsp. *abdita* shrubland	Dh	Silt and clay	Fresh water lake - Lakebed	Under water at time of survey	*Duma horrida* subsp. *abdita* T
Samphire (*Tecticornia*) shrubland	Te	Clay soils. Gypsum at two lakes	Salt lake	16, 22, 45, 46, 75, 77	*Frankenia* sp. southern gypsum P3
Granite Complex					
Shrubland	Gs	Shallow sandy loam over granite	Granite outcrop	1, 9	

Herbland	Gh	Shallow sandy loam over granite	Granite outcrop	2	

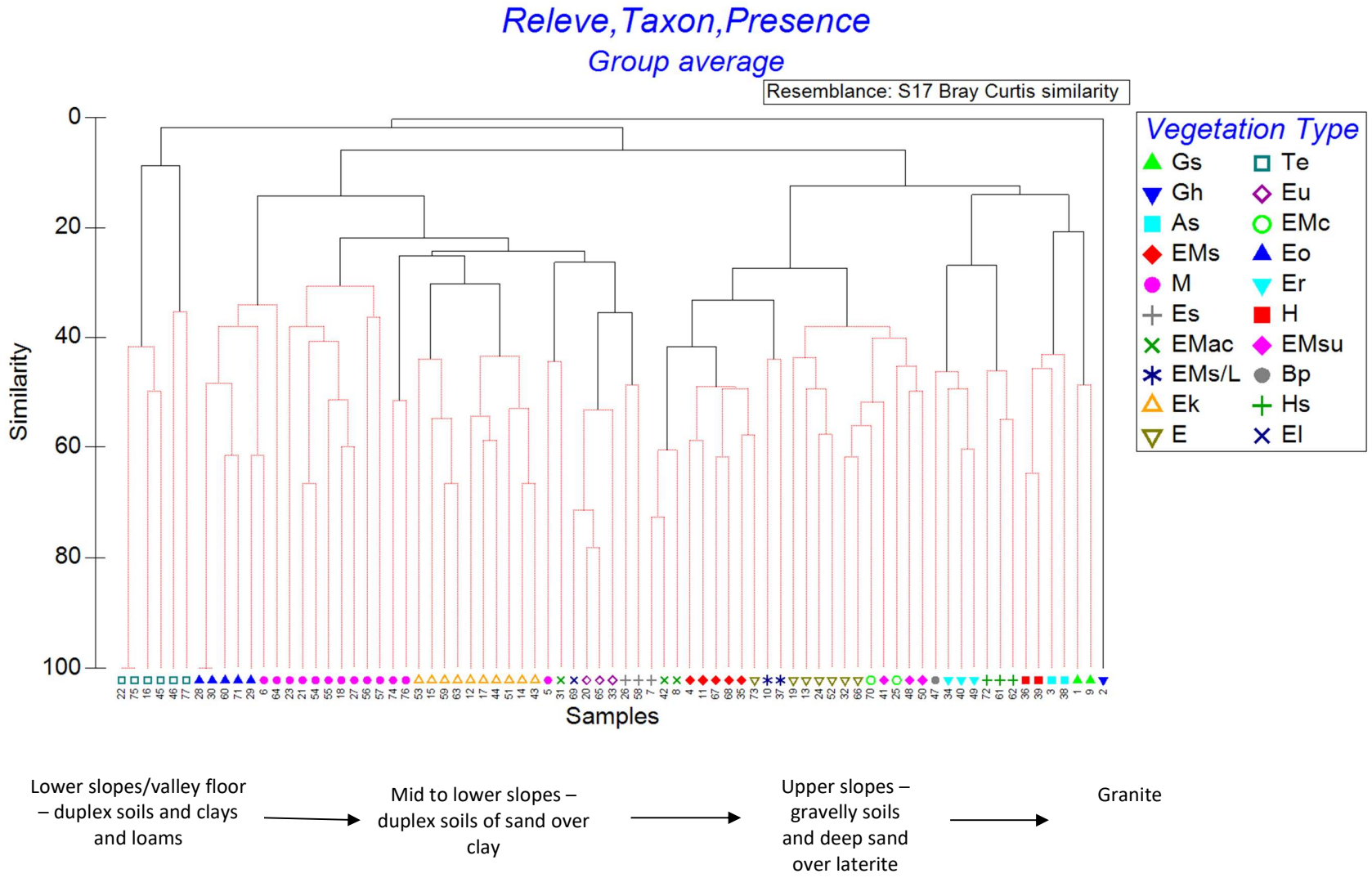


Figure 5: Dendrogram of the releve group classification

3.6 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.

State Listed Threatened Ecological Communities

The following Threatened Ecological community occurs on Lake Bryde.

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

The following ecological community is recorded ~ 43 km South East of the Lake Bryde Conservation Park. 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'.*

State Listed Priority Ecological Communities

The priority ecological community below is situated in the Lake Grace salt lake chain ~ 38 km SW of the Lake Bryde Conservation Park.

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

Commonwealth Listed Threatened Ecological Communities

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

Lake Bryde Conservation Park 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. A small area of *Eucalyptus longicornis* (red morrel) woodland (priority 1) also occurs in the southern section of the Park. Key diagnostic characteristics 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 understory is present but is of variable composition.

Table 6 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 mainly pristine to excellent.

Table 6: 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]**
***Category A:** Patches likely to correspond to a condition of Pristine / Excellent / Very good (Keighery, 1994) or a High RCV (RCC, 2014).*			
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
***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.*			
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
***Category C:** Patches likely to correspond to a condition of Good (Keighery, 1994) or a Medium-High RCV (RCC, 2014).*			
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 less than 5 trees per 0.5 ha are present.	5 hectares or more	5 metres or more
***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.*			
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 368 plant species are recorded in Appendix 6 as occurring in the study area, 26 are introduced or weed species. 342 species were recorded during the present survey. Four species are included from the Mattiske transect survey (2010) and a further 22 were recorded by DBCA personnel during further monitoring of these transects.

Due to time and seasonal constraints, Appendix 6 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 the Lake Bryde Conservation Park.

The families with the largest representatives of genera and species during the present survey are listed in Table 7. 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 Conservation Park and species rich heath areas on laterite include high numbers of Proteaceae.

Table 7: The number of species and genera represented within the major families in the study area.

Family	No. species	No. Genera	Weeds
Myrtaceae (*Melaleuca, Eucalyptus*)	65	16	0
Proteaceae (*Banksias Grevilleas* etc)	31	8	0
Fabaceae (Acacia, peas)	31	12	1
Asteraceae (daisies)	29	22	5
Chenopodiaceae	19	9	0
Ericaceae	14	7	0
Poaceae	17	13	7
Cyperaceae	16	6	0

4.3 Threatened and Priority Flora

Department of Biodiversity, Conservation and Attractions Conservation Codes

The Department of Biodiversity, Conservation and Attractions 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 Priority conservation codes can be found in Appendix 7.

The Department of Biodiversity, Conservation and Attractions 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). 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

Duma horrida* subsp. *abdita

Duma horrida subsp. *abdita* is part of the Threatened Ecological Community covering Lake Bryde. Lake Bryde was under water at the time of the survey and the TEC is monitored by DBCA personnel.

Duma horrida* subsp. *abdita

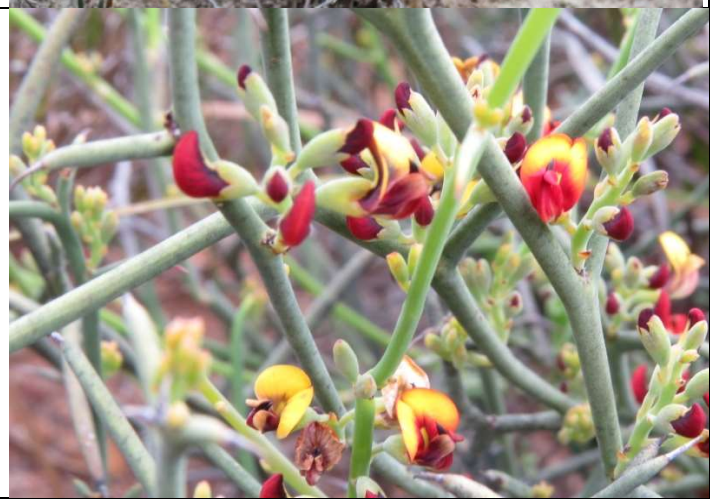
4.3.2 Priority Flora

11 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. The coordinates of the priority flora populations are available in Appendix 9.

Table 8: Priority flora recorded in the Lake Bryde Conservation Park

Taxa	Cons code	Location	Habitat	Growth form	Photograph
Astroloma chloranthum	P2	Releve 19 Releve 24 Releve 32 Releve 66 Releve 70 Releve 73 WP11 WP51 WP208 Scattered throughout mallee vegetation	Mallee over *Melaleuca scalena* Mallee over Melaleuca low shrubland Mixed Mallee Duplex sandy soils over clay. Laterite in places	Low spreading, dome shaped shrub to 15cm, flowers green in May to July	
Dampiera orchardii	P2	In the south west section of the reserve WP594 WP610 Recorded on transects	Mallee over *Melaleuca* low shrubland *Melaleuca* shrubland Duplex soils of sand over clay Some degradation of habitat due to water logging	Erect perennial, herb, 0.2-0.4 m high. Flowers mauve	

Stylidium thylax	P2	Releve 38 Releve 39	Mixed lateritic heath *Allocasuarina spinosissima* shrubland Sand and laterite. Gentle slope	Creeping perennial, herb, 0.04-0.08 m high, Inflorescence uni-flowered, pedicels glandular. Flowers white, Oct.	
Banksia xylothemelia	P3	Releve 39 and surrounds including regenerating gravel pit in the north of the conservation Park	Heath (laterite) common on lateritic soils	Sprawling, lignotuberous shrub to 1m, flowers yellow in September to October	

Calectasia obtusa	P3	WP113	Mallee over *Melaleuca* low shrubland Duplex sandy soils over clay. Laterite in places	Erect low perennial herb to 0.4m, with aerial roots, flowers blue in August-September	
Daviesia uncinata	P3	Releve 39 and surrounds including regenerating gravel pit in the northern section of the Conservation Park	Heath (laterite) common on lateritic soils	Intricate, many-stemmed shrub to 70cm, flowers yellow, red, brown December-January	

***Frankenia* sp. southern gypsum**	P3	Releve 45	Samphire (*Tecticornia*) shrublands on salt lake Gypsiferous soils over clay	Spreading to prostrate shrub. Flowers white	
Grevillea newbeyi	P3	Northern boundary near road Releve 47 Releve 49 Releve 62	Mallee over *Melaleuca scalena* /laterite *Banksia prionotes* open woodland *Eremaea pauciflora* shrubland Mixed sandy heathland Sandy gravelly soils	Bushy, intricately branched, spreading shrub to 1.5m, flowers pink, red, cream in January, June, September to November	

Melaleuca sculponeata	P3	Releve 19 Releve 57	Mixed Mallee *Melaleuca* shrubland. Duplex soils sands over clay	Rounded shrub , flowers white in October	
Persoonia brevirhachis	P3	Releve 39 and surrounds including regenerating gravel pit in the northern section of the conservation Park	Heath (laterite) common on lateritic soils	Erect, often spreading shrub, 0.3-2 m high. Flowers yellow, Aug to Oct.	

Spyridium mucronatum* subsp. *recurvum	P3	Releve 37 Releve 68 WP206	Mallee over Melaleuca scalena/laterite Mallee over Melaleuca scalena Duplex soils and laterite	Erect or spreading shrub, 0.15-0.6 m high. Flowers white-cream-yellow, Oct to Nov.	

4.3.3 Other Flora of significance

The collections of *Myriocephalus occidentalis* and *Drosera ramellosa* made during the present survey from the Lake Bryde Conservation Park are a range extension for these species. Both are associated with the granite outcrop flora. Mattiske (2010) also recorded *Melaleuca camptoclada* as a range extension for the study area. This species was not recorded during the present survey.

Drosera ramellosa

Myriocephalus occidentalis

Melaleuca camptoclada

5.0 WETLANDS

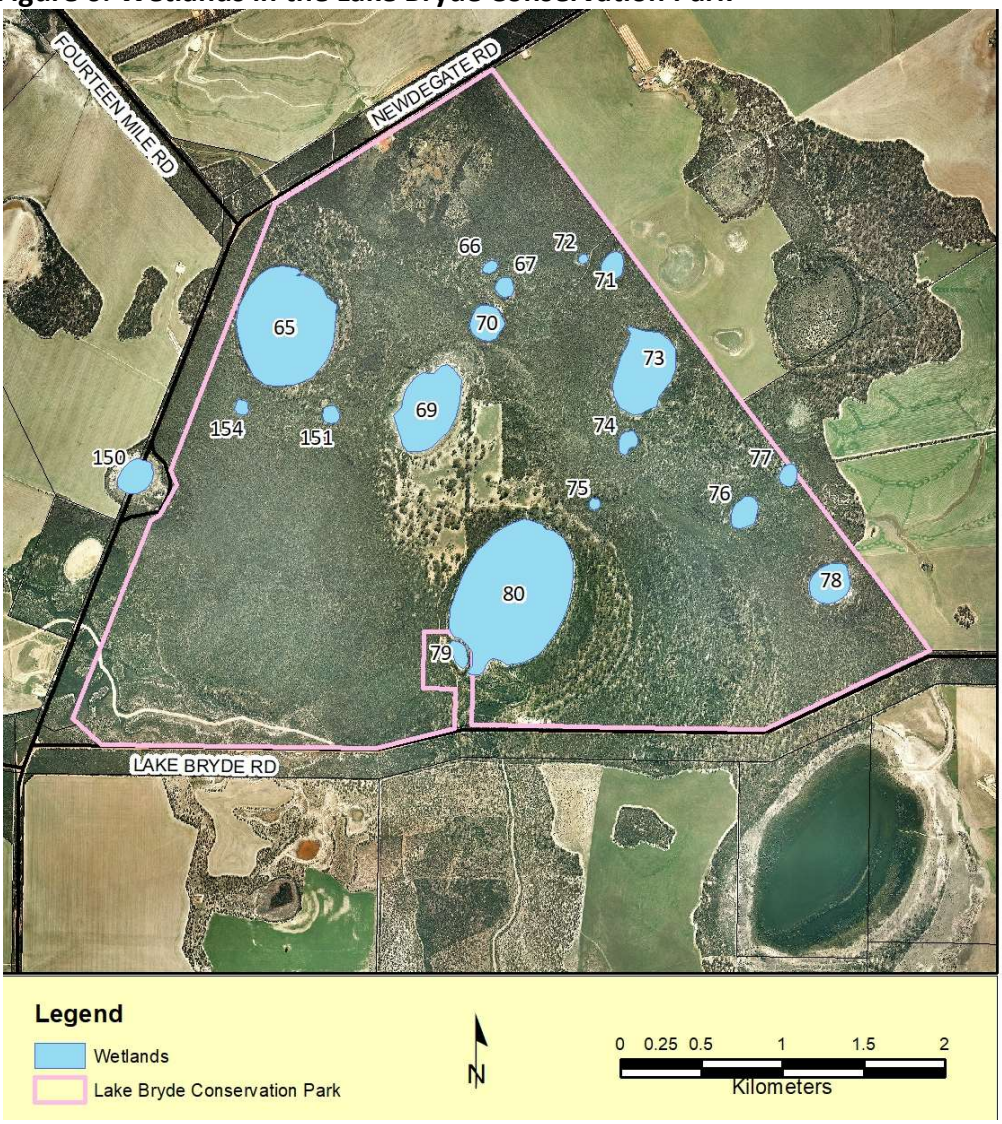
The Department of Biodiversity, Conservation and Attractions has identified 18 wetlands in the Lake Bryde Conservation Park. Photographs and field notes recorded for these wetlands are presented in Appendix 10. Figure 6 shows the location of these wetlands in the reserve. A brief assessment of the wetlands is summarized in Table 9.

Table 9: Wetlands in Lake Bryde Conservation Park

Wetland No.	Description	Vegetation	Condition	Releve/ map unit
65 Yate swamp	Closed depression, clay soils, winter wet	*Eucalyptus occidentalis* woodland and regeneration	excellent To very good	28,30 Eo 29 Eo r
66	Closed depression, sandy loam over clay soils, poor drainage	*Melaleuca* shrubland	excellent	5 M r
67	Closed depression, clay soils.	*Melaleuca* shrubland *Eucalyptus occidentalis* woodland edge	excellent	6 M Eo
69	Salt lake with shallow layer of gypsum	*Tecticornia* shrubland lakebed *Melaleuca* shrubland degraded edge *Melaleuca* shrubland edge	excellent to very good	45 Te 46 Te (Melaleuca shrubland degraded) M
70	Depression, lower slopes, sandy clay soils, poor drainage	*Eucalyptus kondininensis* woodland regeneration	excellent	44 Ek r
71	Depression, shallow sandy loam over clay, poor drainage	*Eucalyptus kondininensis* woodland regeneration *Melaleuca* shrubland regeneration edge	excellent	17 Ek r
72	Depression, clay soils, poor drainage	*Melaleuca* shrubland	excellent	18 M
73	Salt lake, clay soils, shallow sandy loam over clay at edges, poor drainage	*Tecticornia* shrubland lakebed *Melaleuca* shrubland regenerating edge. *Eucalyptus kondininensis* woodland mature and regeneration Eucalyptus urna woodland adjacent	excellent to very good	16 Te 12,14 Ek r 15 Ek M r Eu
74	Depression, shallow sandy loam over clay, poor drainage	*Eucalyptus kondininensis* woodland regeneration *Melaleuca* shrubland edge	excellent	51 Ek r M
75	Depression, clay soils, poor drainage	*Melaleuca* shrubland	excellent	M
76	Depression, under water at time of survey, clay soils	Melaleuca shrubland edge *Eucalyptus kondininensis* woodland not accessible at time of survey	excellent	55 M Ek
77	Depression, under water at time of survey	*Melaleuca* shrubland edge *Eucalyptus kondininensis* woodland adjacent	Excellent – some dead trees in lake area	54 M Ek
78	Salt lake, clay soils, loamy sand over clay at edges, poorly drained	*Tecticornia* shrubland lakebed *Melaleuca* shrubland regenerating edge. Eucalyptus urna woodland adjacent	Excellent to very good	22 Te 21 M r 20 Eu

79	Dam – not visited during survey	*Duma* shrubland Mostly dead *Eucalyptus occidentalis* trees		
80 Lake Bryde	Fresh water lake. Under water at time of survey, sandy soils over clay at edge	*Duma* shrubland – lakebed under water *Eucalyptus occidentalis* woodland edge *Melaleuca* shrubland adjacent south	very good edges and *Melaleuca* shrubland south	60, 71 Eo edge 64 M south
150	Salt lake, clay soils (thin layer gypsum and sandy loam), poor drainage	*Tecticornia* shrubland lakebed *Melaleuca* shrubland edge *Eucalyptus kondininensis* woodland adjacent	Good – dead trees, weed	77 Te M Ek
151	Low lying area, poorly drained	*Eucalyptus kondininensis* and some Eucalyptus salmonophloia regeneration	excellent	Ek
154	Depression, sandy loam over clay, poor drainage	Mallee over *Melaleuca acuminata* regeneration	excellent	31 EMac

Figure 6: Wetlands in the Lake Bryde Conservation Park



6.0 CONSERVATION SIGNIFICANCE

Lake Bryde Conservation Park has high conservation values. Some of these values are summarized below.

- The Conservation Park includes a range of vegetation types from the heath communities on lateritic soils on the upper slopes, granite rock flora, extensive mallee communities and woodlands and *Melaleuca* shrublands on the lower slopes and valley floor.

- The Conservation Park includes a number of wetlands including the yate (*Eucalyptus occidentalis*) swamp, closed depressions with *Eucalyptus kondininensis* woodlands or *Melaleuca* shrublands, salt lakes (two recorded with gypsum) and Lake Bryde a freshwater lake.

- Lake Bryde is recognised as a significant wetland at a national level through the Directory of Important Wetlands in Australia (Dept of Environment, Water, Heritage and the Arts 2010)
- Lake Bryde is an important wetland for a variety of bird species. The area is of "outstanding ornithological importance" according to the Ramsar Convention and Rains (1995)
- A relatively high diversity of vascular plant species occur in the Lake Bryde Conservation Park with 368 plant species recorded in Appendix 6.
- The Declared Rare Flora *Duma horrida* subsp. *abdita* covers Lake Bryde.

- 11 priority species are recorded for the Conservation Park.

- Lake Bryde Conservation Park 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. A small area of *Eucalyptus longicornis* (red morrel) woodland (priority 1) also occurs in the southern section of the Park.
- 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 Lake Bryde.
- The reserve is an important part of the wildlife corridor connecting reserves and other remnant vegetation in the catchment. 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.

7.0 SURVEY LIMITATIONS

Due to the time and seasonal constraints, Appendix 6 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 Lake Bryde Conservation Park. 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 8 days of the year cannot be expected to exclude the possibility that there are still rare flora that have not as yet been located.

Two of the wetlands and Lake Bryde were full of water at the time of the survey and will need to be re surveyed at a future date.

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.

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Appendix 1

Field Releve Sheet

Location/releve:

Date: | **Wp:**

Vegetation Type

Photo No's

Condition: Pristine Excellent Very Good Good Degraded **Notes:**

Aspect: N NE E SE S SW W NW | **Slope:** Flat Gentle Moderate Steep

Geology: Granite Dolerite Laterite Ironstone Quartz | **% Loose Rock:** 0-10% 10-30% 30-50% 50-100%

Soil Type and colour:

Hydrology: Good Drain Poor drain Perm wet Seasonally wet

Landform: Crest Hill Ridge Outcrop Breakaway Slope: Lower Middle Upper Valley Flat Open Depression Drainage line Closed Depression Wetland: Salt lake Fresh water lake

Vegetation Description

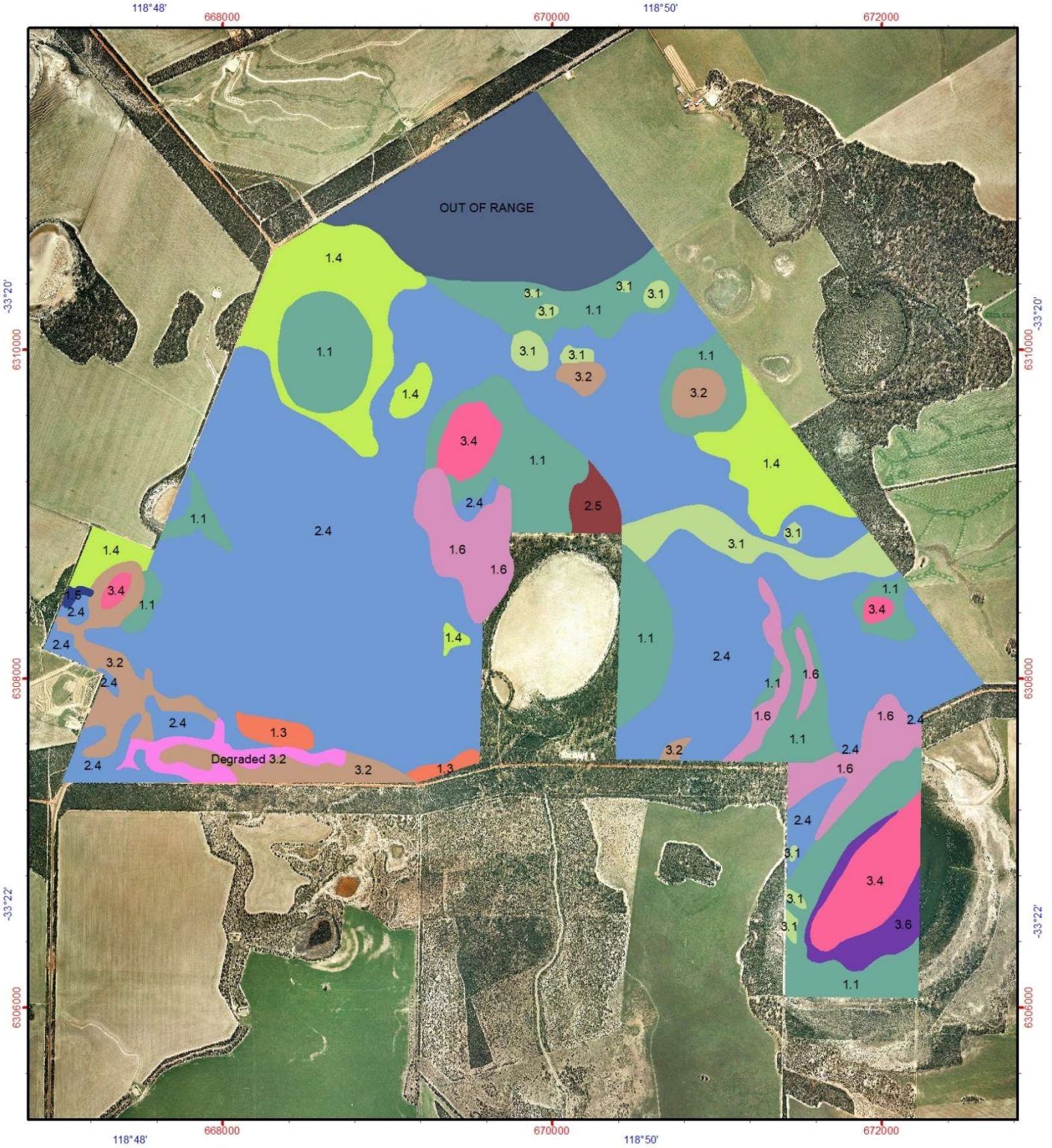
Muir

NVIS

Appendix 2

Mattiske (1999) Vegetation Map of the Lake Bryde Conservation Park

Mattiske (1999) vegetation map of Lake Bryde Conservation Park R48436



Legend

- 1.1 - Open Woodland of Eucalyptus kondininansis
- 1.3 - Low Woodland of Eucalyptus occidentalis and E. kondininensis
- 1.4 - Very Open Woodland of Eucalyptus flocktonise and E. phenax
- 1.5 - Tall Woodland of Eucalyptus flocktonise and E. phenax
- 1.6 - Open Woodland of Eucalyptus salmonophloia
- 2.4 - Open Tree Mallee of Eucalyptus hypoclamydes, E. phenax and E. sporadica
- 2.5 - Dense Shrub Mallee of Eucalyptus capillosa subsp. polyciads
- 3.1 - Thicket of Melaleuca adnais, M. helmatorum, M. lateriflora and M. uncinata
- 3.2 - Dense Thicket of Melaleuca uncinata, M. lateriflora subsp. lateriflora
- 3.4 - Dwarf Scrub D of Halosarcia pergranulata, H. syncarpa, Tecticornia verrucosa
- 3.6 - Open Scrub of Melaleuca lateriflora and M. uncinata
- Degraded 3.2 - Dense Thicket of Melaleuca uncinata, M. lateriflora subsp. lateriflora
- OUT OF RANGE

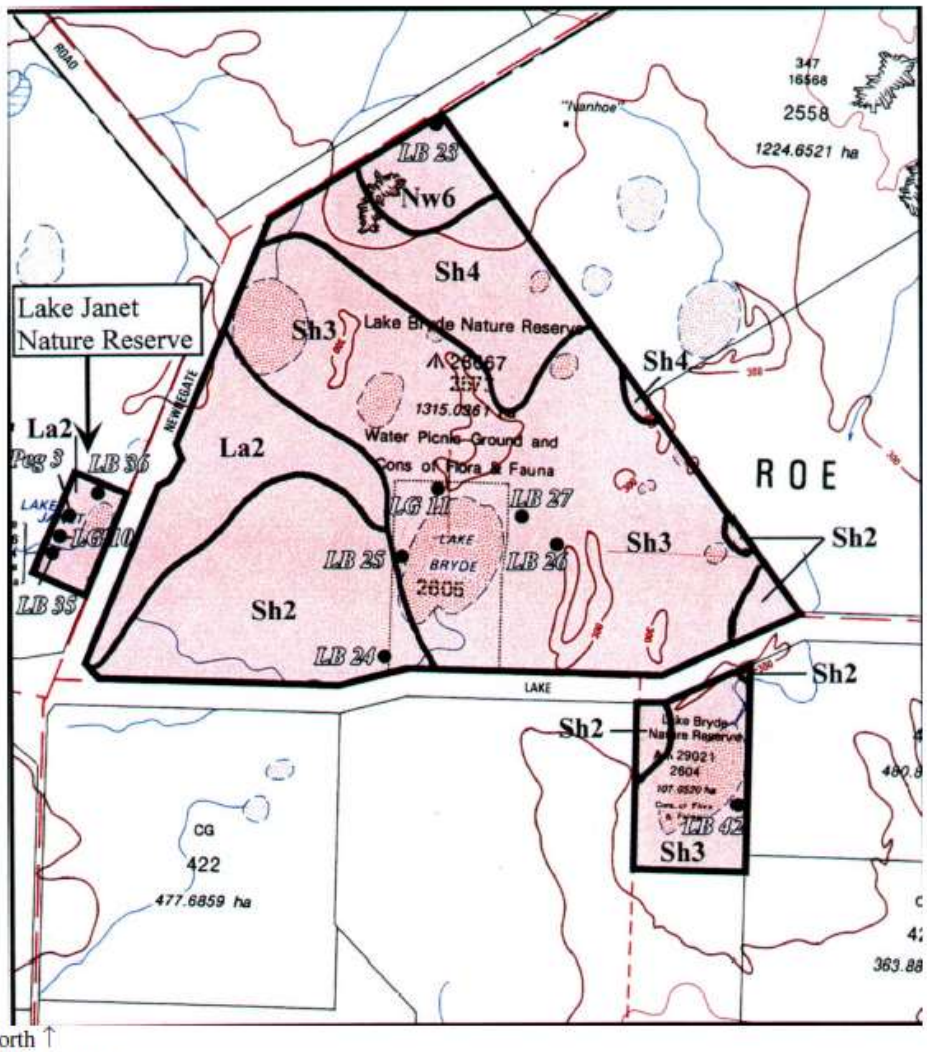
N

0 187.5 375 750 1,125 1,500
Metres

Appendix 3

Ecoscape (2001) quadrat descriptions

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



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

Reserve 28667 – Lake Bryde Nature Reserve

Quadrat LB23

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

Quadrat LB24

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

Reserve 28667 – Lake Bryde Nature Reserve

Quadrat LB25

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

Quadrat LB26

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

Reserve 28667 – Lake Bryde Nature Reserve

Quadrat LB27

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

Quadrat LG11

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

Appendix 4
Vegetation structure at releves and photographs

Releve 7 ***Eucalyptus salmonophloia*** **(salmon gum) woodland** **Es**

Muir Woodland over Scrub (isolated shrubs to 1.0m and isolated herbs)

NVIS U1+\^tree\7\i;M1^shrub\4\i;G1\^shrub,rush\2\bi

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

Muir Woodland over Open Low Scrub A over Open Dwarf Scrub D

NVIS U1+\^tree\7\i;M1^shrub\3\r;G1\^shrub\1\r

Releve 58 ***Eucalyptus salmonophloia*** **(salmon gum) woodland** **Es**

Muir Woodland over Open Dwarf Scrub C over Open Low Sedges (isolated shrubs to 4m and isolated grasses)

NVIS U1+\^tree\7\i;M1\^shrub\4\bi;G1\^shrub\2\r;G2\^sedge,grass\1\i

Releve 20 ***Eucalyptus urna*** **Open Forest** **Eu**

Muir Low Forest A over Thicket over Open Low Scrub B (isolated sedges)

NVIS U1+\^tree\7\c;M1\^shrub\4\c;M2\^shrub\3\r;G1\^sedge,shrub\1\bi

Releve 33 ***Eucalyptus urna*** **Open Forest** **Eu**

Muir Low Forest A over Thicket over Very Open Low Sedges (isolated shrubs to 0.5m)

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

Releve 65 ***Eucalyptus urna*** **Open Forest** **Eu**

Muir Low Forest A over Thicket (isolated shrubs to 0.5m and sedges)

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

Releve 69 ***Eucalyptus longicornis*** **(morrel) woodland** **El**

Muir Low Forest A over Thicket (isolated sedges and shrubs to 0.5m)

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

Releve 15 ***Eucalyptus kondininensis*** **(Kondinin blackbutt) woodland** **Ek**

Muir Low Woodland A over Thicket (scattered shrubs to 0.5m)

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

Releve 53 ***Eucalyptus kondininensis*** **(Kondinin blackbutt) woodland** **Ek**

Muir Low Woodland A over Thicket over Open Dwarf Scrub D

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

Releve 59 ***Eucalyptus kondininensis*** **(Kondinin blackbutt) woodland** **Ek**

Muir Low Forest A over Open Dwarf Scrub D (isolated shrubs to 2m)

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

Releve 63 ***Eucalyptus kondininensis*** **(Kondinin blackbutt) woodland** **Ek**

Muir Low Forest A over Dwarf Scrub C (isolated shrubs to 3m)

NVIS U1+\^tree\7\c;M1\^shrub\4\bi;G1\^shrub\2\i

Releve 12 ***Eucalyptus kondininensis*** **woodland - regenerating** **Ek r**

Muir Open Low Woodland B over Heath B (scattered shrubs to 2.5m, to 0.5m, sedges)

NVIS U1+\^tree\6\r;M1\^shrub\4\bi;M2\^shrub\3\c;G1\^shrub,sedge\1\bi

Releve 14 ***Eucalyptus kondininensis*** **woodland – regenerating** **Ek r**

Muir Low Woodland A over Heath A over Open Dwarf Scrub D

NVIS U1+\^tree\6\i;M1 \^shrub\3\c;G1\^shrub \1\r

Releve 17 ***Eucalyptus kondininensis*** **woodland – regenerating** **Ek r**

Muir Low Forest B over Heath B over Open Dwarf Scrub D

NVIS U1+\^tree\6\c;M1 \^shrub\3\c;G1\^shrub \1\r

Releve 43 ***Eucalyptus kondininensis* woodland – regenerating** **Ek r**

Muir Low Woodland A over Thicket (edge)(isolated shrubs to 0.5m)

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

Releve 44 ***Eucalyptus kondininensis* woodland – regenerating** **Ek r**

Muir Low Woodland B over Heath B (scattered sedges and shrubs to 0.5m)

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

Releve 51 ***Eucalyptus kondininensis*** **woodland – regenerating** **Ek r**

Muir Low Woodland B over Heath B (scattered shrubs to 0.5m)

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

Releve 28 ***Eucalyptus occidentalis*** **woodland – sparse understorey** **Eo**

Muir Low Forest A (isolated shrubs to 4m)

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

Releve 30 ***Eucalyptus occidentalis*** **woodland - sparse understorey** **Eo**

Muir Forest (isolated shrubs to 5m)

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

Releve 60 ***Eucalyptus occidentalis*** **woodland – adjacent Lake Bryde** **Eo**

Muir Open Woodland over Low Woodland B (scattered shrubs to 3m)

NVIS U1+\^tree\7\r;U2\^tree\6\i;M1\^shrub\4\bi

Releve 71 ***Eucalyptus occidentalis*** **woodland –adjacent LakeBryde** **Eo**

Muir Low Woodland A over Thicket (scattered shrubs to 0.5m)

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

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

Muir Low Woodland A over Open Low Woodland B (patchy)over Open Low Grass/ Open Herbs (isolated shrubs to 1.0m)

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

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

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

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

Releve 37 **Mallee over *Melaleuca scalena* (laterite)** **EMs/L**

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

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

Releve 4 **Mallee over *Melaleuca scalena*** **EMs**

Muir Shrub Mallee over Heath A over Dwarf Scrub D (isolated sedges, herbs and shrubs to 1.0m)

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

Releve 11 **Mallee over *Melaleuca scalena*** **EMs**

Muir Shrub Mallee over Thicket over Open Low Scrub B (isolated sedges, herbs and shrubs 0.5m)

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

Releve 35 Mallee over *Melaleuca scalena* EMs

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

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

Releve 67 Mallee over *Melaleuca scalena* EMs

Muir Shrub Mallee over Heath A over Very Dwarf Scrub D (isolated sedges and herbs)

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

Releve 68 **Mallee over *Melaleuca scalena*** **EMs**

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

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

Releve 8 **Mallee over *Melaleuca acuminata*** **EMac**

Muir Shrub Mallee over Scrub over Low Scrub A (isolated shrubs 0.5m, sedges)

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

Releve 31 **Mallee over *Melaleuca acuminata*** **EMac r**

Muir Shrub Mallee over Open Low Scrub B over Open Dwarf Scrub D (isolated sedges)

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

Releve 42 **Mallee over *Melaleuca acuminata*** **EMac**

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

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

Releve 25 **Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*)** **EMc**

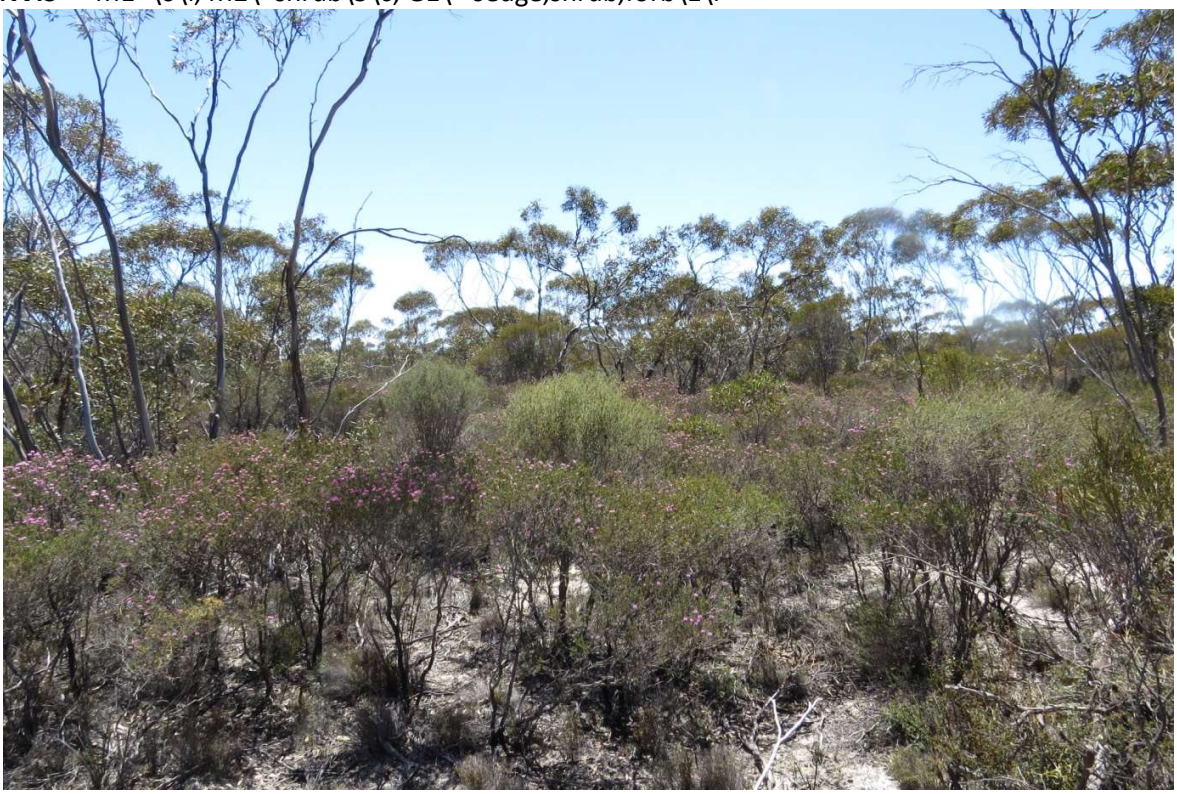
Muir Open Shrub Mallee over Heath B over Very Open Low Sedges (isolated herbs, shrubs 2.5m and 0.5m)

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

Releve 70 **Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*)** **EMc**

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

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



Releve 41 **Mallee over *Melaleuca* low shrubland (*Melaleuca subtrigona*)** **EMsu**

Muir Open Shrub Mallee over Low Heath C over Open Low Sedges (isolated herbs, shrubs 1.5m and 0.5m)

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

Releve 48 **Mallee over *Melaleuca* low shrubland (*Melaleuca subtrigona*)** **EMsu**

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

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

Releve 50 Mallee over *Melaleuca* low shrubland (*Melaleuca subtrigona*) EMsu

Muir Open Shrub Mallee over Low Heath C (isolated herbs, shrubs 2m and 0.5m, sedges)

NVIS M1+\6\i; M2\^shrub\3\bi; M3\^shrub\2\c; G1\^shrub,sedge, rush\1\bi

Releve 24 Mixed Mallee (*Melaleuca depauperata*) EMd

Muir Tree Mallee over Thicket over Open Low Sedges/Open Dwarf Scrub D (isolated herbs, grass)

NVIS M1+\6\i; M2\^shrub\4\c; G1\^sedge, shrub, rush,grass\1\i

Releve 32 Mixed Mallee (*Melaleuca depauperata*) EMd

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

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

Releve 66 Mixed Mallee (*Melaleuca depauperata*) EMd

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

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

Releve 73 Mixed Mallee (*Melaleuca depauperata*) EMd

Muir Open Shrub Mallee over Open Low Scrub A over Heath B (isolated shrubs 0.5m, herbs, sedges, grasses)

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

Releve 13 Mixed Mallee – sparse understorey E

Muir Shrub Mallee over Open Low Scrub A over Dwarf Scrub C over Open Dwarf Scrub D/Open Low Sedges (isolated herbs)

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

Releve 19 Mixed Mallee – sparse understorey E

Muir Open Shrub Mallee over Scrub over Open Dwarf Scrub C over Dwarf Scrub D/Open Low Sedges (isolated herbs and grasses)

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

Releve 52 Mixed Mallee – sparse understorey E

Muir Shrub Mallee over Dwarf Scrub D/Open Low Sedges (isolated shrubs over 2m, herbs and grasses)

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

Releve 36 Mixed heathland (laterite) H

Muir Scrub (patchy) over Low Heath C over Open Dwarf Scrub D/Very Open Low Sedges (isolated shrubs to 1.5m, herbs, grasses)

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

Releve 39 Mixed heathland (laterite) H

Muir Low Scrub C over Low Heath D (isolated shrubs to 2.5m, sedges, herbs, grasses)

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

Releve 3 ***Allocasuarina spinossisima*** **shrubland** **As**

Muir Heath A (isolated shrubs over 2m, to 1.0m, to 0.5m and sedges, herbs)

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

Releve 38 ***Allocasuarina spinossisima*** **shrubland** **As**

Muir Heath A over Low Scrub C over Open Dwarf Scrub D/Open Low Sedges (isolated herbs)

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

Releve 47 ***Banksia prionotes* open woodland** **Bp**

Muir Open Low Woodland B over Heath B over Dwarf Scrub D (isolated shrub mallee, sedges, shrubs 3m, herbs and grasses)

NVIS U1\^tree\6\r;M1\^shrub,mallee\4\bi;M2+\^shrub\3\c;G1\^shrub,sedge,grass,rush\1\i

Releve 34 ***Eremaea pauciflora* heathland** **Er**

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

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

Releve 40 ***Eremaea pauciflora*** **heathland** **Er**

Muir Very Open Shrub Mallee over Heath B over Dwarf Scrub D (isolated sedge, herb, shrub 2m+)

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

Releve 49 ***Eremaea pauciflora*** **heathland** **Er**

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

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

Releve 61 **Mixed sandy heathland** **Hs**

Muir Very Open Shrub Mallee over Heath B over Open Dwarf Scrub C over Very Open Sedges

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

Releve 62 **Mixed sandy heathland** **Hs**

Muir Open Low Scrub B over Very Open Tall Sedges over Low Heath D (isolated shrub mallee, shrubs to 3m, grasses, herbs)

NVIS M1\^mallee shrub\6\bi;M2+\^shrub\4\bi;M3\^shrubs\3\r;G1\^sedge\2\r; G2+\^shrub, grass, forb\r

Releve 72 **Mixed sandy heathland** **Hs**

Muir Open Low Scrub B over Dwarf Scrub D (isolated shrubs over 2m, sedges, grasses and forbs)

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

Releve 5 ***Melaleuca* shrubland** **M r**

Muir Heath B (isolated shrub mallee, shrubs 0.5m, grasses)

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

Releve 6 ***Melaleuca* shrubland** **M**

Muir Thicket (isolated shrubs 1.0m)

NVIS M1+\^shrub\4\c;G1\^shrub\2\bi

Releve 18 ***Melaleuca* shrubland** **M**

Muir Thicket

NVIS M1+\^shrub\4\c

Releve 21 ***Melaleuca* shrubland** **M r**

Muir Low Heath C (isolated shrub mallee)

NVIS M1\^mallee shrub\5\bi;G1+\^shrub\2\c

Releve 23 ***Melaleuca* shrubland** **M**

Muir Thicket over Open Low Grass/Open Herbs

NVIS M1+\^shrub\4\c;G1\^grass,forbs,rush\1\i

Releve 27 ***Melaleuca* shrubland** **M**

Muir Thicket (isolated shrubs to 1.5m)

NVIS M1+\^shrub\4\c;M2\^shrub \3\bi

Releve 54 ***Melaleuca* shrubland** **M**

Muir Thicket

NVIS M1+\^shrub\4\c

Releve 55 ***Melaleuca* shrubland** **M**

Muir Thicket over Dense Herbs (isolated grasses, sedges)

NVIS M1+\^shrub\4\c;G1\^forbs,sedge,grass\1\d

Releve 56 ***Melaleuca* shrubland** **M**

Muir Thicket over Open Herbs (isolated shrub mallee)

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

Releve 57 ***Melaleuca* shrubland** **M**

Muir Thicket over Herbs (isolated shrub mallee, sedges, grasses)

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

Releve 64 ***Melaleuca* shrubland** **M**

Muir Thicket over Low Scrub B over Dwarf Scrub D/Open Herbs (isolated grasses)

NVIS M1+\^shrub\4\c;M2\^shrub\3\i;G1\^shrubs,forbs,grass\1\c

Releve 74 ***Melaleuca* shrubland** **M (mallee area degraded)**

Muir Thicket Dwarf Scrub D (isolated shrub mallee, sedges, grasses and herbs)

NVIS M1\^mallee shrub\6\bi;M2+\^shrub\4\c; G1\^shrubs,sedge,forbs,grass,rush\1\i

Releve 76 ***Melaleuca* shrubland** **M**

Muir Thicket over Open Tall Grass (isolated shrubs to 1.0m and 0.5m)

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

Releve 27 *Duma* shrubland Dh

The *Duma* shrubland was under water at the time of survey. The following photographs were taken in November 2013. At that time *Tecticornia verrucosa* (purple) covered large sections of the lake with occasional live plants of *Duma horrida* subsp*. abdita.*

Releve 16 **Samphire (*Tecticornia*) shrubland** **Te**

Muir Low Heath D

NVIS G1+\^samphire shrub\1\c

Releve 22 **Samphire (*Tecticornia*) shrubland** **Te**

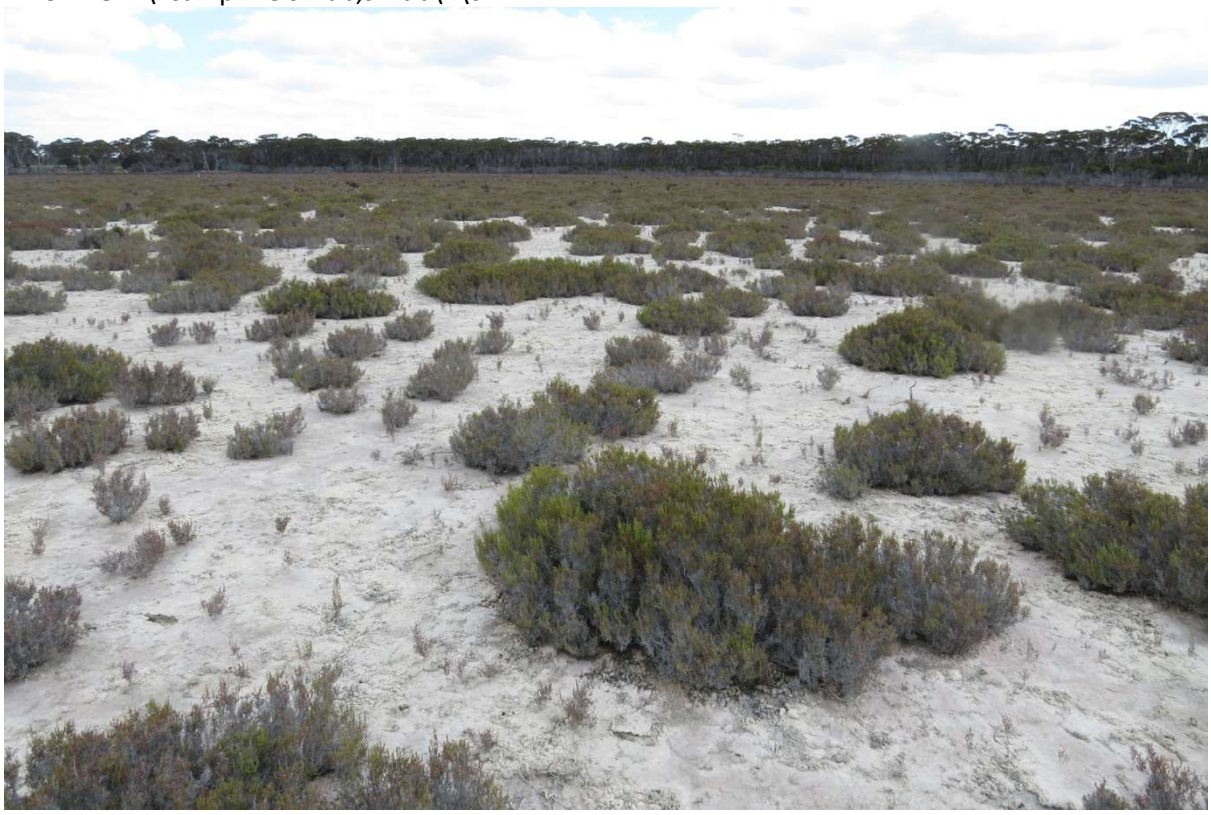
Muir Low Heath D

NVIS G1+\^samphire shrub\1\c

Releve 45 **Samphire (*Tecticornia*) shrubland** **Te**

Muir Low Heath D

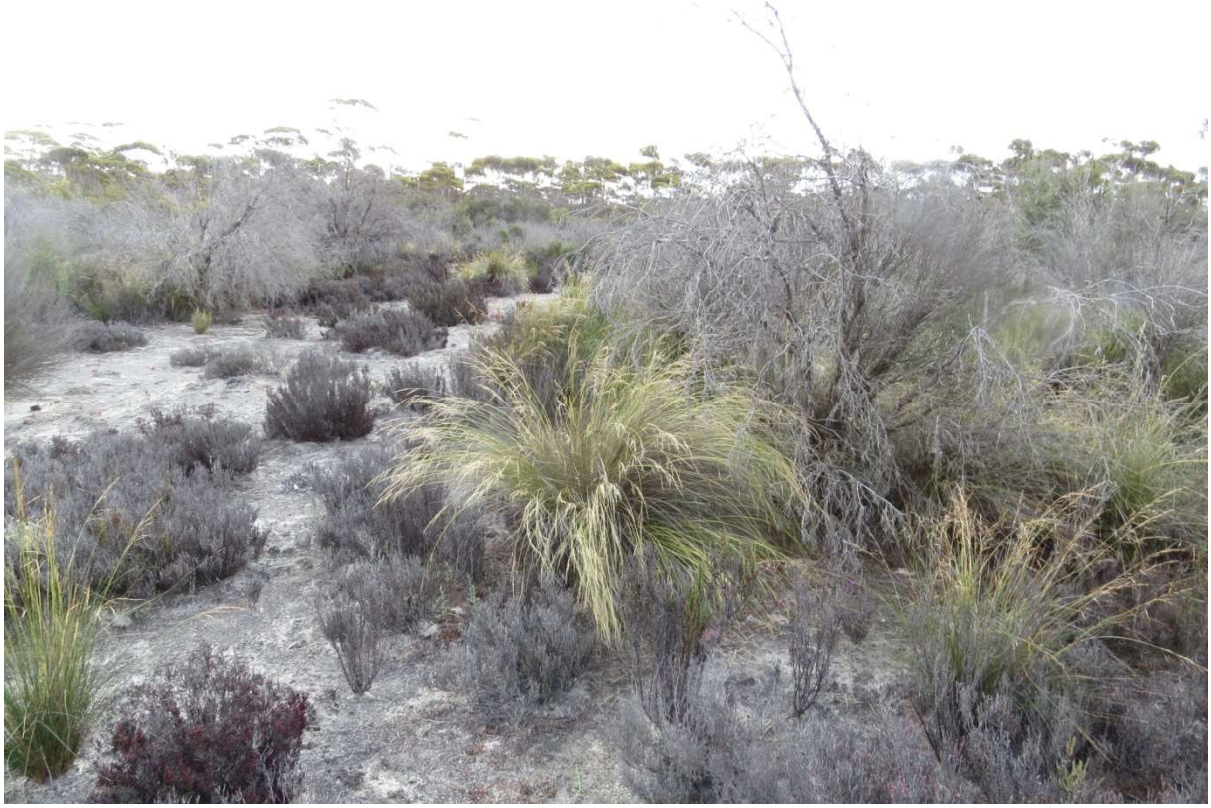
NVIS G1+\^samphire shrub,shrub\1\c



Releve 46 **Samphire (*Tecticornia*) shrubland** **Te** **(*Melaleuca* shrubland degraded)**

Muir Dwarf Scrub C (isolated shrubs to 1.0m, sedges, grasses, herbs)

NVIS G1\^shrub,grass,sedge\2\bi;G2+\^samphire shrub,shrub,forb\1\i



Releve 75 **Samphire (*Tecticornia*) shrubland** **Te** **(*Melaleuca* shrubland degraded)**

Muir Dwarf Scrub D

NVIS G1+\^samphire shrub\1\i

Releve 77 **Samphire (*Tecticornia*) shrubland** **Te**

Muir Low Heath D (isolated herbs and grasses)

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

Releve 1 **Granite Complex - Shrubland** **Gs**

Muir Scrub over Open Dwarf Scrub C over Herbs/Open Low Sedge/Open Dwarf Scrub D (isolated grasses)

NVIS M1+\^shrub\4\i;G1\^shrub\2\r;G2\^Forb,sedge,shrub,grass\1\c

Releve 9 **Granite Complex - Shrubland** **Gs**

Muir Open Scrub over Dwarf Scrub C over Dwarf Scrub D/Open Low Sedges/Very Open Herbs

NVIS M1\^shrub\4\r;G1+\^shrub\2\i;G2\^shrub,sedge,forb,rush\1\i

Releve 2 **Granite Complex - Herbalnd** **Gh**

Muir Herbs (isolated shrubs and grasses)

NVIS M1\^shrub\3\bi;G2+\^forb,grass\1\c

Appendix 5
Vegetation Descriptions

Eucalyptus salmonophloia (salmon gum) woodland Es

Releves	**7, 26, 58**
Landform	Valley floor near lakes and drainage lines
Soils, topography	Gentle slope to flat terrain, loamy soils over clay
Condition	Excellent

Vegetation Description

Upper stratum	Sparse *Eucalyptus salmonophloia* trees dominant with occasional *Eucalyptus urna* trees in places. Scattered *Eucalyptus phenax* shrub mallee are sometimes present
Mid stratum	Very sparse shrubs over 2m in height including *Acacia microbotrya, Santalum acuminatum, Melaleuca acuminata, Melaleuca lateriflora, Alyxia buxifolia, Pittosporum angustifolium* and *Santalum murrayanum*
Mid stratum	Sparse shrubs over 2m of *Melaleuca acuminata, Melaleuca depauperata, Melaleuca ?scalena, Melaleuca adnata* and *Santalum acuminatum* occur in the drainage line at releve 7
Mid stratum	Isolated to very sparse shrubs to 1.0m and 1.5m including *Exocarpos aphyllus, Templetonia rossii, Scaevola spinescens, Olearia sp. Eremicola, Dodonaea viscosa* and *Leptomeria preissiana*
Ground	Very sparse shrubs to 0.5m including *Templetonia rossii, Olearia muelleri, Acacia erinacea, Rhagodia preissii*, *Grevillea huegelii, Senna artemisioides* subsp. x *artemisioides, Chenopodium desertorum subsp. microphyllum* and *Clematis delicata* Sparse sedges in some areas including *Gahnia ancistrophylla, Lepidosperma sanguinolentum, Desmocladus asper* and *Lepidosperma species* Isolated perennial herbs with sedge like leaves/rush including *Lomandra effusa* and *Lomandra micrantha* subsp. *micrantha* Isolated grasses including *Neurachne alopecuroidea* and *Austrostipa elegantissima*

***Eucalyptus salmonophloia* woodland in a drainage line at Releve 7**

***Eucalyptus salmonophloia* woodland at Releve 7**

Eucalyptus urna open forest Eu

Releves	**20, 33, 65**
Landform	Valley floor, sandy loam ridge
Soils, topography	Well drained**,** sandy loam soils, gentle slope
Condition	Excellent

Vegetation Description

Upper stratum	Mid dense *Eucalyptus urna* trees to 10m in height dominant, scattered *Eucalyptus phenax* shrub mallee sometimes present
Mid stratum	Sparse to mid dense shrubs over 2m including *Melaleuca lanceolata, Melaleuca acuminata, Melaleuca lateriflora, Melaleuca scalena, Melaleuca thyoides, Melaleuca atroviridis, Melaleuca adnata*, *Melaleuca depauperata* and *Santalum acuminatum*
Ground	Isolated shrubs to 0.5m including *Templetonia rossii, Olearia muelleri, Acacia erinacea, Microcybe multiflora, Rhagodia preissii, Comesperma spinosum* and *Phebalium lepidotum* Isolated to very sparse sedges including *Gahnia ancistrophylla* and *Lepidosperma species*

***Eucalyptus urna* open forest at releve 20**

Eucalyptus longicornis (red morrel) woodland El

Releves	**69**
Landform	Valley floor,
Soils, topography	Gentle slope to flat terrain, loamy soils over clay
Condition	Excellent, evidence of past fire

Vegetation Description

Upper stratum	Sparse to mid dense *Eucalyptus longicornis* trees dominant with occasional *Eucalyptus urna* trees and *Eucalyptus phenax* shrub mallee
Mid stratum	Mid dense shrubs over 2m in height including *Melaleuca acuminata, Melaleuca lanceolata, Melaleuca adnata* and *Dodonaea stenozyga*
Ground	Isolated shrubs to 1.0m including *Exocarpos aphyllus, Templetonia rossii, Olearia sp. Eremicola, Olearia muelleri, Acacia erinacea, Rhagodia preissii* and *Microcybe multiflora*
	Isolated sedges including *Gahnia ancistrophylla* and *Lepidosperma species*
Comments	Morrell woodland covers a small area in the south of the reserve. Trees are small compared to mature morrel trees and some show the effect of past fire with multiple trunks

Eucalyptus kondininensis (Kondinin blackbutt) woodland - Mature Ek

Releves	**15, 53 mature woodland over *Melaleuca* shrubland**
Landform	Valley floor
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 shrubs to 4m including *Melaleuca acuminata, Melaleuca lanceolata*, *Melaleuca adnata* with occasional *Exocarpos aphyllus* and Alyxia buxifolia
Ground	Very sparse to isolated low shrubs to 0.5m including *Rhagodia preissii*, *Acacia erinacea, Disphyma crassifolium, Maireana erioclada, Microcybe multiflora, Olearia muelleri, Rhagodia crassifolia, Threlkeldia diffusa, Templetonia rossii* and *Westringia rigida* Isolated perennial herb/rush *Dianella revoluta*

***Eucalyptus kondininensis* (Kondinin blackbutt) woodland over *Melaleuca* shrubland at Releve 15**

Eucalyptus kondininensis (Kondinin blackbutt) woodland - Mature Ek

Releves	**59, 63 mature woodland**
Landform	Valley floor, adjacent to lakes
Soils, topography	sandy loam over clay, slightly elevated well drained areas
Condition	Excellent

Vegetation Description (mature)

Upper stratum	Sparse to mid dense *Eucalyptus kondininensis* trees to 12m dominant
Mid stratum	Isolated shrubs to 3m including *Melaleuca acuminata, Melaleuca adnata*, *Melaleuca atroviridis*
Ground	Very sparse to sparse stratum of low shrubs to 1m occur including *Atriplex paludosa, Carpobrotus modestus, Chenopodium desertorum* subsp. *microphyllum, Rhagodia preissii, Disphyma crassifolium, Enchylaena tomentosa, Maireana brevifolia, Rhagodia drummondii, Sclerolaena diacantha, Threlkeldia diffusa, Olearia muelleri* and *Eremophila decipiens*

***Eucalyptus kondininensis* (Kondinin blackbutt) woodland at Releve 59**

Eucalyptus kondininensis (Kondinin blackbutt) woodland – Regeneration Ek r

Releves	**12, 14, 17, 43, 44, 51**
Landform	Valley floor, depressions
Soils, topography	sandy loam over clay
Vegetation Description (regeneration)	
Upper stratum	Very sparse to mid dense *Eucalyptus kondininensis* trees to 2-10m dominant. Dead trees present and occasional mature trees to 12m
Mid stratum	Mid dense shrubs usually to 1.5m of *Melaleuca acuminata* with *Melaleuca thyoides, Melaleuca lateriflora , Melaleuca brophyi and Melaleuca lanceolata* also recorded along with *Acacia redolens* and *Exocarpos aphyllus*
Ground	Isolated to very sparse shrubs to 0.5m including *Rhagodia preissii*, *Acacia erinacea, Disphyma crassifolium, Dodonaea bursariifolia, Grevillea oligantha, Leptomeria preissiana, Tecticornia lepidosperma, Templetonia rossii* and *Acacia acanthoclada* Isolated sedges including *Lepidosperma* species
Comments	In depressions and on the edge of lakes regenerating after the floods in 2006

***Eucalyptus kondininensis* (Kondinin blackbutt) woodland – Regeneration** at Releve 17

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

Releves	**28, 30**
Landform	Valley floor, depression, 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 18m dominant
Lower stratum	Isolated shrubs including of *Melaleuca strobophylla*

Comments

30

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

Releves	**60, 71**
Landform	Valley floor, adjacent to Lake Bryde (fresh water)
Soils, topography	sandy loam over clay soils, flat to gentle slope
Condition	Excellent with some tree death due to water logging. Tree seedling also present

Vegetation Description 1

Upper stratum	Sparse to very sparse *Eucalyptus occidentalis* trees 10 to 20m dominant
Mid stratum	Mid dense to sparse shrubs to 6m including *Melaleuca strobophylla, Melaleuca lateriflora, Melaleuca lanceolata, Melaleuca thyoides*
Ground	Isolated shrubs to 0.5m including *Rhagodia preissii*, *Disphyma crassifolium, Carpobrotus modestus* and Rhagodia drummondii

60

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

Releves	**29**
Landform	Valley floor, depression, winter wet
Soils, topography	sandy loam over clay soils, flat to gentle slope
Condition	Very Good, trees regenerating but weeds also present
Vegetation Description	**regeneration**
Upper stratum	Sparse to very sparse stratum of mature trees of *Eucalyptus occidentalis* (15m) and regeneration to 4m. Dead trees present
Mid stratum	Sparse stratum of shrubs/trees to 10m including *Melaleuca strobophylla*
Ground	Sparse stratum of grasses including *Lachnagrostis filiformis*
	Sparse stratum of herbs/forbs/weeds including *Bulbine semibarbata, Centipeda cunninghamii, *Cotula bipinnata, Crassula colorata, Pseudognaphalium luteoalbum, Senecio glossanthus, *Solanum nigrum, *Spergularia diandra, *Trifolium tomentosum* and *Vittadinia gracilis*
	Isolated shrubs to 1.0m including *Disphyma crassifolium, Goodenia viscida, Maireana* brevifolia and Rhagodia *preissii*

***Eucalyptus occidentalis* (flat-topped yate) woodland – regeneration at Releve 29**

Mallee over *Melaleuca scalena* – laterite EMs/L

Releves	**10, 37**
Landform	Upper slopes
Soils, topography	Sandy gravels over clay, gentle slope
Condition	Excellent

Vegetation Description

Stratum 1	Sparse shrub mallee to 6m including *Eucalyptus* sp. Southern Wheatbelt, *Eucalyptus flocktoniae, Eucalyptus phenax, Eucalyptus suggrandis* subsp. *promiscua*
Mid stratum	Mid dense shrubs to 2m with *Melaleuca scalena* prominent. Other species recorded include *Melaleuca depauperata, Melaleuca spicigera, Daviesia nematophylla, Exocarpos aphyllus, Melaleuca adnata, Melaleuca lateriflora, Melaleuca sapientes, Santalum acuminatum, Allocasuarina acutivalvis, Beyeria sulcata, Callitris preissii, Callitris roei, Hakea newbeyana, Isopogon* sp. Fitzgerald River
Ground	Very sparse to isolated shrubs usually to 0.5m (1.0m) including *Phebalium lepidotum***,** *Trymalium elachophyllum, Westringia rigida, Dodonaea bursariifolia, Acacia acutata, Coopernookia strophiolata, Daviesia aphylla, Dillwynia uncinata, Grevillea huegelii, Hibbertia gracilipes, Leucopogon obtusatus, Leucopogon cuneifolius, Melaleuca rigidifolia, Leptomeria preissiana, Mirbelia multicaulis, Coleanthera myrtoides,* ***Spyridium mucronatum*** **subsp.** ***recurvum*** **P3,** ***Grevillea newbeyi*** **P3** Isolated sedges including *Lepidosperma sanguinolentum* and *Gahnia ancistrophylla*.

Mallee over *Melaleuca scalena* EMs

Releves	**4, 11, 35, 67, 68**
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 (occasionally tree mallee) to 8m including *Eucalyptus flocktoniae, Eucalyptus phenax, Eucalyptus perangusta, Eucalyptus suggrandis* subsp. *promiscua*, *Eucalyptus* sp. Southern Wheatbelt, *Eucalyptus phaenophylla*
Stratum 2	Mid dense shrubs, usually to 2m, with *Melaleuca scalena* (prominent) other species recorded include *Santalum acuminatum, Callitris preissii, Melaleuca depauperata, Melaleuca lateriflora, Melaleuca sapientes, Hakea newbeyana, Melaleuca adnata, Melaleuca marginata, Exocarpos aphyllus*
Stratum 3	Isolated to sparse shrubs to 0.1 or 0.5m including *Templetonia rossii, Bertya dimerostigma, Dodonaea bursariifolia, Chamelaucium ciliatum, Daviesia incrassata, Trymalium elachophyllum, Daviesia nematophylla, Westringia rigida, Cryptandra minutifolia, Phebalium lepidotum, Grevillea oligantha, Rinzia communis, Pultenaea empetrifolia, Leucopogon obtusatus, Leucopogon concinnus, Melaleuca rigidifolia, Hibbertia gracilipes, Hibbertia exasperata, Grevillea huegelii, Gastrolobium punctatum, Acacia acutata, Acacia bidentata, Acacia erinacea, Isopogon* sp. *Fitzgerald River, Melaleuca carrii, Coopernookia strophiolata,* ***Spyridium mucronatum*** **subsp.** ***recurvum*** **P3,** ***Astroloma chloranthum*** **P2** Very sparse to isolated sedges including *Gahnia ancistrophylla, Lepidosperma tenue* and *Lepidosperma* species Isolated rushes/perennial herbs including *Lomandra effusa, Lomandra micrantha* subsp. *micrantha* and *Dianella revoluta* Isolates grasses including *Neurachne alopecuroidea*
Comment	This vegetation association is extensive in the Conservation Park and merges with other Mallee vegetation types. Vegetation boundaries are sometimes difficult to map

Mallee over *Melaleuca scalena* – laterite at Releve 10

Mallee over *Melaleuca scalena* at Releve 4

Mallee over *Melaleuca acuminata* EMac

Releves	**8, 42, 31 (regeneration)**
Landform	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 shrub mallee to 8m including *Eucalyptus flocktoniae, Eucalyptus* phenax, *Eucalyptus suggrandis* subsp. *promiscua*
Stratum 2	Mid dense to sparse shrubs to 2.5m including *Melaleuca acuminata* (prominent), *Melaleuca adnata, Melaleuca scalena, Melaleuca laxiflora, Melaleuca depauperata, Santalum acuminatum*
Stratum 3	Very sparse to isolated shrubs to 0.5m including *Templetonia rossii, Grevillea oligantha, Chamelaucium ciliatum, Grevillea huegelii*
	Isolated sedges including *Lepidosperma* species
	Isolated rush/perennial herb *Lomandra effusa, Lomandra micrantha* subsp. *micrantha*
Comments	The species composition at Releve 31 was significantly different from typical Mallee over *Melaleuca acuminata* areas. This releve was situated in a depression where the vegetation was regenerating after the 2006 floods with *Melaleuca acuminata* prominent in the understorey.

Mallee over *Melaleuca acuminata* at releve 8

Mallee over *Melaleuca acuminata* - regenerating at Releve 31

Mallee over *Melaleuca* low shrubland EM

Melaleuca carrii EMc

Releves	**25, 70**
Landform	Mid to lower slopes
Soils, topography	Duplex sandy soils over clay (scattered proteaceae indicate some laterite)
Condition	Excellent

Vegetation Description

Upper Stratum	Usually sparse sometimes mid dense shrub mallee including *Eucalyptus dissimulata, Eucalyptus perangusta, Eucalyptus phaenophylla, Eucalyptus phenax, Eucalyptus* sp. Southern Wheatbelt
Mid Stratum	Mid dense shrubs usually to 1.5m including *Melaleuca carrii* (prominent), *Melaleuca subtrigona* (occasional), *Melaleuca scalena, Melaleuca brophyi* , *Melaleuca atroviridis* (south), *Hakea newbeyana, Melaleuca depauperata, Acacia chamaeleon, Acacia uncinella*
Ground	Very sparse to isolated shrubs to 0.5m including *Calytrix leschenaultii, Verticordia acerosa* var. *preissii, Daviesia lancifolia, Rinzia communis, Leucopogon obtusatus, Templetonia rossii, Coleanthera myrtoides, Daviesia incrassata, Gastrolobium punctatum, Grevillea acuaria, Hibbertia exasperata, Hibbertia gracilipes, Melaleuca lateralis, Phebalium lepidotum,* ***Astroloma chloranthum*** **P2,** ***Dampiera orchardii*** **(south western section),** ***Calectasia obtusa*** **P3** Sparse to Very sparse sedges including *Gahnia ancistrophylla, Lepidosperma* species*, Desmocladus myriocladus, Lepidosperma sanguinolentum* Isolated rushes/perennial herbs including *Lomandra mucronata, Dianella revoluta,* Isolated herbs/forbs including *Argentipallium niveum* Isolated grass *Neurachne alopecuroidea*
Comments	This vegetation type only covered small areas in the Lake Bryde Conservation Park and is more extensive in the East Lake Bryde Nature Reserve.

Mallee over *Melaleuca* low shrubland EM

Melaleuca subtrigona EMsu

Releves **41, 48, 50**

Landform Mid to lower slopes

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

Condition Excellent

Vegetation Description

Stratum 1 Sparse shrub mallee including *Eucalyptus dissimulata, Eucalyptus perangusta, Eucalyptus phenax, Eucalyptus sporadica, Eucalyptus olivina*

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

Stratum 3 Mid dense shrubs to 1.0m including *Melaleuca subtrigona* (prominent), *Melaleuca carrii, Eremaea pauciflora*

Stratum 4 Very sparse to isolated shrubs to 0.5m including *Calytrix leschenaultii, Chamelaucium ciliatum, Verticordia acerosa* var. *preissii, Grevillea acuaria, Hibbertia exasperata, Leucopogon concinnus, Gastrolobium punctatum, Templetonia rossii, Prostanthera serpyllifolia* subsp. *microphylla, Rinzia communis, Westringia rigida, Leucopogon* sp. *Coujinup, Leucopogon* sp. Frank Hann*, Tetrapora preissiana, Verticordia plumosa, Olearia ciliata, Platysace trachymenioides*

Very sparse to isolated sedges including *Gahnia ancistrophylla, Lepidosperma sanguinolentum, Lepidosperma* species*, Tetraria* sp. Mt Madden*, Desmocladus lateriflorus, Desmocladus myriocladus, Lepidosperma* sp. P1 small head*, Schoenus racemosus*

Isolated herbs/forbs including *Argentipallium niveum*

Isolated rushes/perennial herbs including *Lomandra mucronata, Lomandra effusa, Lomandra rupestris, Dianella revoluta*

Comments This vegetation type only covers small areas in the Conservation Park and tends to occur adjacent to areas of the *Eremaea* heathland.

Mallee over *Melaleuca* low shrubland with *Melaleuca carrii* prominent at Releve 70

Mallee over *Melaleuca* low shrubland with *Melaleuca subtrigona* prominent at Releve 50

Mixed Mallee E
Melaleuca depauperata EMd

Releves **24, 32, 66, 73**

Landform Mid to lower slopes

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

Condition Excellent

Vegetation Description

Upper Stratum Mid dense to sparse shrub mallee (occasionally tree mallee) to 9m including *Eucalyptus phenax, Eucalyptus perangusta, Eucalyptus* sp. Southern Wheatbelt,

Mid Stratum Mid dense shrubs, usually to 2m, with *Melaleuca depauperata* (prominent) other species recorded include *Santalum acuminatum, Callitris roei, Melaleuca scalena, Hakea newbeyana, Melaleuca adnata, Melaleuca acuminata*

Ground Isolated to sparse shrubs to 0.1 or 0.5m including *Templetonia rossii, Dodonaea bursariifolia, Chamelaucium ciliatum, Daviesia incrassata, Trymalium elachophyllum, Daviesia nematophylla, Bertya dimerostigma, Westringia rigida, Phebalium lepidotum, Grevillea oligantha, Rinzia communis, Leucopogon obtusatus, Leucopogon concinnus, Hibbertia gracilipes, Hibbertia exasperata, Grevillea huegelii, Gastrolobium punctatum, Isopogon* sp. Fitzgerald River*, Melaleuca carrii***,** *Calytrix leschenaultii, Verticordia plumosa, Cryptandra nutans, Prostanthera serpyllifolia* subsp. *microphylla, Grevillea acuaria, Phebalium filifolium, Verticordia acerosa* var. *preissii, Lasiopetalum rosmarinifolium,* ***Astroloma chloranthum P2***

Very sparse to isolated sedges including *Gahnia ancistrophylla, Lepidosperma sanguinolentum, Lepidosperma* species, *Desmocladus quiricanus, Desmocladus myriocladus, Tetraria* sp. Mt Madden, *Schoenus racemosus*
Isolated rush/perennial herbs *Lomandra effusa, Lomandra mucronata, Dianella revoluta*
Isolates grasses including *Neurachne alopecuroidea*

Comments The Mallee over low *Melaleuca* shrubland and Mixed Mallee vegetation types were grouped together in the analysis with no significant difference shown in species composition. These vegetation types were mapped separately wherever possible however they tend to transition into each other and boundaries are sometimes difficult to detect on the aerial photography.

Mixed Mallee E

Mallee over sparse understorey

Releves	**13, 19, 52**
Landform	Mid to lower slopes
Soils, topography	Duplex sandy soils over clay, flat to gentle slope
Condition	Excellent

Vegetation Description

Upper stratum	Mid dense to sparse shrub mallee (occasionally tree mallee) to 8m including *Eucalyptus phenax, Eucalyptus perangusta, Eucalyptus dissimulata, Eucalyptus phaenophylla*, *Eucalyptus* sp. Southern Wheatbelt
Mid stratum	Isolated to very sparse shrubs, usually to 2m, including *Melaleuca scalena, Santalum acuminatum, Callitris preissii, Melaleuca depauperata, Hakea newbeyana*, *Melaleuca brophyi, Melaleuca carrii, Leptospermum erubescens, Acacia chrysella,* ***Melaleuca sculponeata*** **P3**
Ground	Isolated to sparse shrubs to 0.1 or 0.5m including *Templetonia rossii, Dodonaea bursariifolia, Chamelaucium ciliatum, Daviesia incrassata* , Daviesia lancifolia, *Trymalium elachophyllum, Daviesia nematophylla, Bertya dimerostigma, Westringia rigida, Phebalium lepidotum, Grevillea oligantha, Rinzia communis, Leucopogon concinnus, Melaleuca rigidifolia, Hibbertia exasperata, Grevillea huegelii, Gastrolobium punctatum, Acacia bidentata* , *Prostanthera serpyllifolia* subsp. *microphylla*, *Acacia erinacea, Cryptandra nutans, Lasiopetalum rosmarinifolium, Verticordia plumosa, Acacia leptospermoides, Platysace trachymenioides, Calytrix leschenaultii, Olearia* sp. *eremicola*, *Verticordia acerosa* var. *preissii,* ***Spyridium mucronatum*** **subsp. r*ecurvum* P3, *Astroloma chloranthum* P2** Sparse to mid dense sedges including *Gahnia ancistrophylla, Gahnia trifida*, *Lepidosperma sanguinolentum, Lepidosperma* species, *Desmocladus quiricanus, Tetraria* sp. Mt Madden*, Schoenus racemosus, Desmocladus lateriflorus.* Isolated rush/perennial herbs *Lomandra effusa, Lomandra mucronata, Dianella revoluta, Lomandra micrantha* subsp. *micrantha* Isolated grasses including *Neurachne alopecuroidea*
Comments	The Mallee over low *Melaleuca* shrubland and Mixed Mallee vegetation types were grouped together in the analysis with no significant difference shown in species composition. These vegetation types were mapped separately wherever possible.

Mixed mallee with *Melaleuca depauperata* prominent in the understorey at Releve 24

Mixed Mallee with a sparse understorey of mixed shrub species at Releve 52

Mixed lateritic heathland H

Releves	**36, 39**
Landform	Upper slopes
Soils, topography	Sandy soils with gravel over laterite (ironstone in places), flat to gentle slope
Condition	Excellent

Vegetation Description

Stratum 1	Sparse to isolated shrubs over 1.5m to 2.5m including *Hakea cygna, Callitris preissii, Melaleuca tuberculata, Allocasuarina spinosissima, Acacia uncinella, Melaleuca scalena*
Ground 1	Mid dense to sparse shrubs to 1.0m including *Melaleuca tuberculata, Verticordia roei, Verticordia chrysantha, Melaleuca platycalyx, Isopogon scabriusculus, Ericomyrtus serpyllifolia, Leptospermum spinescens, Petrophile seminuda,* ***Persoonia brevirhachis*** **P3**
Ground 2	Mid dense to sparse shrubs to 0.5m including *Verticordia picta, Allocasuarina microstachya, Beaufortia micrantha, Hakea incrassata, Calytrix leschenaultii, Tetrapora preissiana, Orianthera flaviflora, Synaphea spinulosa, Astroloma serratifolium, Leucopogon dielsianus, Melaleuca lecanantha, Platysace trachymenioides, Mirbelia multicaulis, Pimelea imbricata* var. *piligera, Leucopogon* sp. Wheatbelt*, Andersonia lehmanniana, Tetrapora preissiana, Hibbertia* aff. *exasperata, Comesperma scoparium, Hibbertia gracilipes, Leucopogon dielsianus, Baeckea latens,* ***Banksia xylothemelia*** **P3,** ***Daviesia uncinata*** **P3** Sparse to isolated sedges including *Mesomelaena preissii, Lepidobolus preissianus, Lepidosperma sanguinolentum, Lepidosperma species, Lepidosperma pruinosum, Schoenus brevisetis* Isolated rush/perennial herbs including *Lomandra micrantha* subsp. *micrantha, Chamaexeros fimbriata, Laxmannia paleacea* Isolated forbs/herbs including *Stylidium dichotomum,* ***Stylidium thylax*** **P2,** *Opercularia vaginata* Isolated grasses including *Neurachne alopecuroidea*

Allocasuarina spinosissima shrubland As

Releves	**3, 38**
Landform	Upper slopes
Soils, topography	Sandy soils with gravel over laterite, flat to gentle slope
Condition	Excellent

Vegetation Description

Stratum 1	Isolated shrubs over 2m+ including *Allocasuarina spinosissima* and *Callitris preissii* Mid dense shrubs to 2m including *Allocasuarina spinosissima* (prominent) and *Callitris preissii* (prominent), *Leptospermum erubescens*, *Hakea cygna, Melaleuca scalena*
Stratum 2	Isolated to sparse shrubs to 1.0m including *Melaleuca tuberculata, Verticordia roei, Verticordia chrysantha, Verticordia chrysanthella, Verticordia picta, Petrophile seminuda, Tetrapora preissiana, Acacia uncinella, Ericomyrtus serpyllifolia, Leucopogon cuneifolius, Lysinema pentapetalum, Coleanthera myrtoides*
Stratum 3	Isolated to very sparse shrubs to 0.5m *including Allocasuarina microstachya, Beaufortia micrantha, Hakea incrassata, Synaphea spinulosa, Hibbertia* aff. *exasperata, Hibbertia gracilipes, Leucopogon dielsianus, Mirbelia trichocalyx, Cryptandra leucopogon, Westringia rigida, Leucopogon obtusatus, Dillwynia uncinata, Chamelaucium ciliatum, Brachyloma geissoloma,* Sparse to isolated sedges including *Mesomelaena preissii, Lepidobolus preissianus, Lepidosperma sanguinolentum, Lepidosperma* species Isolated rush/perennial herbs including *Chamaescilla spiralis, Lomandra mucronata, Conostylis argentea* Isolated forbs/herbs including ***Stylidium thylax* P2,** *Opercularia vaginata, Argentipallium niveum, Stylidium zeicolor*

Mixed lateritic heathland at Releve 39

Allocasuarina spinossisima shrubland at Releve 3

Banksia prionotes open woodland Bp

Releves	**47**
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	Very sparse *Banksia prionotes* trees to 5m.
Mid stratum	Isolated shrubs and shrub mallee over 2m including *Leptospermum erubescens, Callitris roei, Hakea obliqua, Hakea corymbosa, Eucalyptus perangusta* Mid dense shrubs to 1.5m including *Eremaea pauciflora* (frequent), *Petrophile ericifolia,* ***Grevillea newbeyi*** **P3**
Ground	Sparse shrubs to 0.5m including *Calytrix leschenaultii, Persoonia striata, Melaleuca subtrigona, Gompholobium viscidulum, Leucopogon* sp. *Coujinup, Verticordia plumosa, Lysinema pentapetalum, Platysace trachymenioides, Lechenaultia brevifolia* Isolated sedges *including Lepidobolus preissianus, Schoenus caespititius, Desmocladus myriocladus, Chordifex sphacelatus* Isolated rush/perennial herbs including *Lomandra* species, *Conostylis petrophiloides, Conostylis argentea* Isolated grasses including *Neurachne alopecuroidea*

Banksia prionotes **open woodland at Reveve 47.**

Eremaea pauciflora heathland Er

Releves	**34, 40, 49**
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 shrub mallee including *Eucalyptus perangusta, Eucalyptus dissimulata, Eucalyptus olivinea*
Stratum 2	Very sparse shrubs to 2m including *Hakea obliqua* subsp. *parviflora, Hakea corymbosa*, *Leptospermum erubescens, Isopogon* sp. Fitzgerald River, *Acacia chrysella, Hakea nitida, Santalum acuminatum*
Stratum 3 (dominant)	Mid dense shrubs to 1.0m(1.5m Releve 40) including *Eremaea pauciflora* (frequent), *Banksia violacea, Melaleuca subtrigona, Petrophile ericifolia, Melaleuca carrii, Olearia* sp. *eremicola, Conostephium roei, Grevillea acuaria, Coleanthera myrtoides, Lysinema pentapetalum, Acacia uncinella, Hakea lissocarpha, Billardiera lehmanniana, Acacia leptospermoides,* ***Grevillea newbeyi*** **P3**
Stratum 4	Sparse to isolated shrubs to 0.5m including *Calytrix leschenaultii, Tetrapora preissiana, Persoonia striata, Verticordia plumosa, Gompholobium viscidulum, Leucopogon* sp. Coujinup, *Cryptandra nutans, Platysace trachymenioides, Verticordia densiflora* Isolated sedges including *Lepidosperma* species, *Desmocladus quiricanus, Desmocladus myriocladus, Lepidosperma sanguinolentum, Lepidosperma* sp. P1 small head, *Lepidobolus preissianus* Isolated rushes/perennial herbs including *Lomandra mucronata, Lomandra rupestris, Patersonia occidentalis,* Isolated herbs/forbs including *Conostylis petrophiloides, Argentipallium niveum, Lechenaultia brevifolia, Stylidium piliferum* Isolated grasses including *Neurachne alopecuroidea*

Eremaea pauciflora **heathland at Releve 40**

Mixed sandy Heathland at Releve 62

Mixed sandy Heathland Hs

Releves	**61, 62, 72**
Landform	Mid slopes**,** deep sandy soils
Soils, topography	sand over laterite at depth, flat to gentle slope
Condition	Excellent

Vegetation Description

Mid Stratum	Isolated shrub mallee including *Eucalyptus perangusta* and *Eucalyptus phenax*
	Very sparse shrubs to 1.5m (isolated to 3m) including *Leptospermum erubescens, Acacia saligna, Santalum acuminatum, Alyxia buxifolia*, *Olearia* sp. *eremicola, Billardiera lehmanniana, Acacia uncinella, Pimelea argentea, Conospermum cinereum, Melaleuca carrii,* ***Grevillea newbeyi*** **P3**
Ground	Mid dense shrubs to 0.5m including *Calytrix leschenaultii* (frequent*), Hakea lissocarpha, Verticordia densifolia, Rhagodia preissii, Westringia rigida, Calytrix tetragona, Ptilotus polystachyus,*
	Isolated sedges including *Lepidobolus preissianus, Lepidosperma carphoides, Lepidosperma sanguinolentum, Desmocladus asper*
	Isolated rush/perennial herbs including *Lomandra rupestris*
	Isolated herbs/forbs including *Waitzia acuminata*
	Isolated grass *Neurachne alopecuroidea, Austrostipa elegantissima, Austrostipa hemipogon*
Comments	Mixed sandy heath covers only small areas in the Lake Bryde Conservation Park. It has been mapped separately in the present survey but probably represents a transition area from shrubland occurring on deep sandy soils to Mallee or woodland areas. Further survey work in the catchment will clarify the situation.

Melaleuca shrubland M

Releves	**6, 18, 23, 27, 54, 55, 56, 57, 64, 74, 76,**
Landform	Closed depressions, drainage lines, edge of small lakes
Soils, topography	Silt and sandy soils over clay, clay soils, poorly drained
Condition	Very Good to Excellent - weed invasion in some areas and some degradation due to water logging/salinisation in the south western section of the park

Vegetation Description

Stratum 1	Isolated trees including *Eucalyptus occidentalis* and *Eucalyptus kondininensis* and isolated shrub mallee including *Eucalyptus perangusta, Eucalyptus phenax* and *Eucalyptus suggrandis* are present in some areas
Stratum 2	Mid dense shrubs over 2m (to 4m) *including Melaleuca lateriflora, Melaleuca thyoides, Melaleuca acuminata, Melaleuca strobophylla, Melaleuca adnata, Melaleuca marginata, Melaleuca lanceolata, Melaleuca atroviridis, Melaleuca brophyi, Melaleuca scalena,* ***Melaleuca sculponeata*** **P3**
Stratum 3	Isolated to sparse shrubs to 0.5m including *Rhagodia preissii, Disphyma crassifolium, Maireana brevifolia, Olearia* sp. *eremicola, Enchylaena lanata, Threlkeldia diffusa, Ozothamnus lepidophyllus, Sclerolaena diacantha, Templetonia rossii, Acacia erinacea* Isolated occasionally to sparse grasses including *Austrostipa elegantissima, Neurachne alopecuroidea, *Avellinia michelii, *Lolium perenne, *Pentameris airoides, *Vulpia myuros, Lachnagrostis filiformis, Rytidosperma caespitosum* Isolated sedges including *Gahnia ancistrophylla, Gahnia trifida, Lepidosperma* species*, Desmocladus lateriflorus, Isolepis congrua, Centrolepis strigosa, Schoenus subfascicularis* Isolated forbs/herbs including *Calandrinia calyptrata, Carpobrotus modestus, Crassula colorata, Podolepis capillaris, Crassula exserta, *Brassica tournefortii, *Sonchus oleraceus, Pseudognaphalium luteoalbum, *Arctotheca calendula, *Centaurium erythraea, Centipeda cunninghamii, *Sagina apetala, *Corrigiola litoralis* Isolated rush/perennial herb *Bulbine semibarbata, Dianella revoluta*

***Melaleuca* shrubland at Releve 18**

***Melaleuca* shrubland at Releve 54**

Melaleuca shrubland - regeneration M r

Releve	**5, 21**
Landform	Depressions, edge of lake
Soils, topography	Shallow sandy soils over clay, clay, poorly drained
Condition	Excellent, regeneration after the 2006 floods

Vegetation Description

Stratum 1	Isolated trees and shrub mallee including *Eucalyptus perangusta, Eucalyptus phenax, Eucalyptus suggrandis*
Stratum 2	Mid dense shrubs to 1.0m or 1.5m including *Melaleuca acuminata* (often prominent), *Melaleuca lateriflora, Melaleuca strobophylla, Melaleuca atroviridis, Melaleuca thyoides, Melaleuca depauperata*
Stratum 3	Isolated shrubs to 0.5m including *Acacia erinacea, Vittadinia gracilis*,

***Melaleuca* shrubland – regeneration at Releve 5**

Duma horrida/Tecticornia verrucosa shrubland Dh

Landform Lake bed (fresh)

Soils, topography Clay, poorly drained

Condition **Not assessed**

Vegetation Description **Under water at time of survey**

Comments Threatened Ecological Community photos Nov 2013

Samphire (*Tecticornia*) shrubland Te

Releve	16, 22, 75	45, 46, 77 gypsum
Landform	Lake bed	
Soils, topography	Clay, silt - poorly drained salt lakes (gypsum on 2 lakes)	
Condition	Excellent	

Vegetation Description

Stratum 1	Isolated shrubs of *Melaleuca lateriflora, Melaleuca thyoides* at edges
Stratum 2	Mid dense shrubs to 0.5m including *Tecticornia pergranulata, Tecticornia indica* subsp. *bidens, Tecticornia lepidosperma, Disphyma crassifolium, Threlkeldia diffusa*, **Mesembryanthemum crystallinum* Also recorded in areas with gypsum *Lawrencia squamata, Tecticornia halocnemoides* subsp. *caudata, Lawrencia diffusa, Lawrencia glomerata, Tecticornia moniliformis,* ***Frankenia* sp. southern gypsum P3** Isolated forbs/herbs including *Senecio glossanthus, Vittadinia gracilis* Isolated grasses including *Austrostipa juncifolia*, *Austrostipa elegantissima,*

Samphire (*Tecticornia*) shrubland at Releve 45 (gypsum)

Granite complex
Shrubland Gs

Releves	**1, 9**
Landform	Granite outcrop and surrounds
Soils, topography	Sandy loam soils over granite
Condition	Excellent, some weed invasion

Vegetation Description

Stratum 1	Sparse shrubs over 2m including *Melaleuca elliptica, Leptospermum nitens, Acacia lasiocalyx, Acacia saligna, Callitris preissii, Santalum acuminatum*
Stratum 2	Sparse to very sparse shrubs to 1.0m including *Allocasuarina campestris, Calothamnus quadrifidus, Ericomyrtus serpyllifolia, Melaleuca carrii, Acacia multispicata, Hakea cygna, Grevillea teretifolia, Melaleuca depauperata*
Stratum 3	Very sparse shrubs to 0.5m including *Calytrix leschenaultii, Verticordia densiflora, Hakea incrassata, Mirbelia trichocalyx, Dampiera juncea, Synaphea spinulosa* Sparse sedges including *Lepidosperma pruinosum, Lepidobolus preissianus, Lepidosperma sanguinolentum, Gahnia ancistrophylla, Mesomelaena preissii* Mid dense herbs of *Borya constricta*. Also recorded *Podolepis lessonii, Stackhousia monogyna, Waitzia acuminata, Stypandra glauca, *Ursinia anthemoides* Isolated grasses including *Austrostipa trichophylla* Isolated rush/perennial herb *Laxmannia paleacea, Lomandra mucronata*

Granite complex

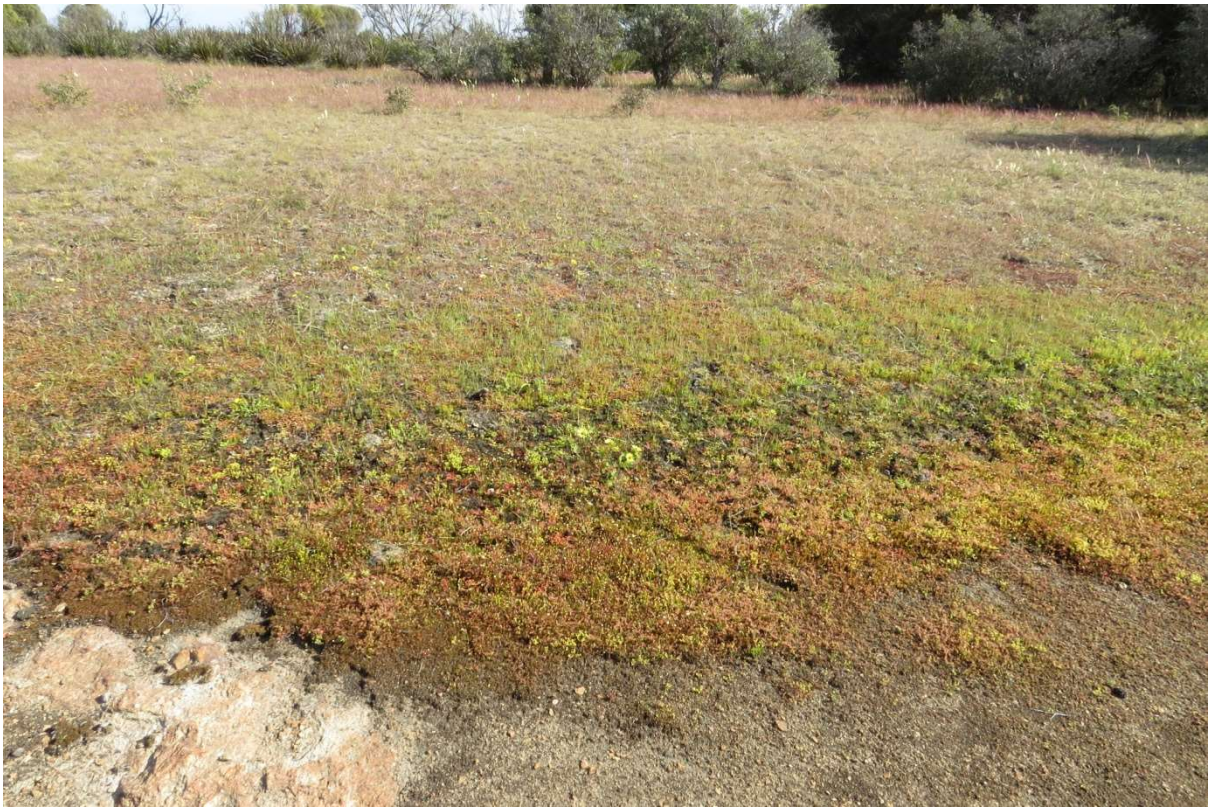
Herbland Hs

Releve	**2**
Landform	Granite outcrop and surrounds
Soils, topography	Shallow sandy soils over granite, soil pockets
Condition	Excellent, some weed invasion

Vegetation Description

Stratum 1	Isolated shrubs including *Melaleuca elliptica*
Stratum 2	Mid dense herbs/forbs including *Brachyscome eyrensis, Brachyscome iberidifolia, Brachyscome perpusilla, Calandrinia porifera, Cotula cotuloides, Crassula exserta, Drosera ramellosa, Hydrocotyle diantha, Myriocephalus occidentalis, Podolepis lessonii, Siloxerus multiflorus, Stackhousia monogyna, *Arctotheca calendula, *Cotula bipinnata, *Crassula natans, *Lysimachia arvensis, *Parentucellia latifolia, *Plantago coronopus, *Spergularia diandra* Isolated grasses including **Briza minor, Eragrostis dielsii, *Pentameris airoides, *Vulpia myuros* Isolated sedges including *Triglochin* sp. A Flora of Australia

Granite complex – shrubland at Releve 1



Granite complex – herbland at Releve 2

Appendix 6

Plant Species List

Species in red from DBCA transect survey and Mattiske (2010)

Family	Weed	Taxon	Cons Code
Aizoaceae		Carpobrotus modestus	
Aizoaceae		Disphyma crassifolium	
Aizoaceae	*	Mesembryanthemum crystallinum	
Aizoaceae	*	Mesembryanthemum nodiflorum	
Amaranthaceae		Ptilotus humilis	
Amaranthaceae		Ptilotus polystachyus	
Amaranthaceae		Ptilotus spathulatus	
Apiaceae	*	Cyclospermum leptophyllum	
Apiaceae		Platysace deflexa	
Apiaceae		Platysace trachymenioides	
Apocynaceae		Alyxia buxifolia	
Araliaceae		Hydrocotyle diantha	
Araliaceae		Hydrocotyle rugulosa (Mattiske 2010)	
Araliaceae		Trachymene pilosa	
Asparagaceae		Chamaescilla spiralis	
Asparagaceae		Chamaexeros fimbriata	
Asparagaceae		Chamaexeros serra	
Asparagaceae		Laxmannia paleacea	
Asparagaceae		Lomandra effusa	
Asparagaceae		Lomandra micrantha subsp. micrantha	
Asparagaceae		Lomandra micrantha subsp. teretifolia	
Asparagaceae		Lomandra mucronata	
Asparagaceae		Lomandra rupestris	
Asphodelaceae		Bulbine semibarbata	
Asteraceae		Angianthus tomentosus	
Asteraceae	*	Arctotheca calendula	
Asteraceae		Argentipallium niveum	
Asteraceae		Blennospora drummondii	
Asteraceae		Brachyscome eyrensis	
Asteraceae		Brachyscome iberidifolia	
Asteraceae		Brachyscome perpusilla	
Asteraceae		Centipeda cunninghamii	
Asteraceae	*	Cotula bipinnata	
Asteraceae		Cotula cotuloides	
Asteraceae		Erymophyllum tenellum (Mattiske 2010)	
Asteraceae		Gnephosis acicularis	
Asteraceae		Gnephosis drummondii (Mattiske 2010)	
Asteraceae		Hyalosperma demissum	
Asteraceae		Helychrysum leucopsidium	
Asteraceae	*	Hypochaeris glabra (Mattiske 2010)	
Asteraceae		Millotia tenuifolia	

Asteraceae		Myriocephalus occidentalis
Asteraceae		Olearia adenolasia
Asteraceae		Olearia ciliata
Asteraceae		Olearia muelleri
Asteraceae		Olearia sp. Eremicola
Asteraceae		Ozothamnus lepidophyllus
Asteraceae		Podolepis capillaris
Asteraceae		Podolepis lessonii
Asteraceae		Podotheca angustifolia
Asteraceae		Pogonolepis muelleriana
Asteraceae		Pogonolepis stricta
Asteraceae		Pseudognaphalium luteoalbum
Asteraceae		Rhodanthe laevis
Asteraceae		Senecio glossanthus
Asteraceae		Siloxerus multiflorus
Asteraceae	*	Sonchus oleraceus
Asteraceae	*	Ursinia anthemoides
Asteraceae		Vittadinia gracilis
Asteraceae		Waitzia acuminata
Boryaceae		Borya constricta
Brassicaceae	*	Brassica tournefortii
Brassicaceae		Stenopetalum sphaerocarpum
Campanulaceae		Wahlenbergia preissii
Caryophyllaceae	*	Corrigiola litoralis
Caryophyllaceae	*	Sagina apetala
Caryophyllaceae	*	Spergularia diandra
Casuarinaceae		Allocasuarina acutivalvis
Casuarinaceae		Allocasuarina campestris
Casuarinaceae		Allocasuarina microstachya
Casuarinaceae		Allcasuarina pinaster
Casuarinaceae		Allocasuarina spinosissima
Celastraceae		Stackhousia monogyna
Centrolepidaceae		Centrolepis strigosa
Centrolepidaceae		Centrolepis polygyna
Chenopodiaceae		Atriplex paludosa
Chenopodiaceae		Atriplex vesicaria
Chenopodiaceae		Chenopodium desertorum subsp. microphyllum
Chenopodiaceae		Didymanthus roei
Chenopodiaceae		Enchylaena lanata
Chenopodiaceae		Enchylaena tomentosa
Chenopodiaceae		Maireana brevifolia
Chenopodiaceae		Maireana erioclada
Chenopodiaceae		Rhagodia crassifolia
Chenopodiaceae		Rhagodia drummondii

Chenopodiaceae		Rhagodia preissii	
Chenopodiaceae		Sclerolaena diacantha	
Chenopodiaceae		Tecticornia halocnemoides subsp. caudata	
Chenopodiaceae		Tecticornia indica subsp. bidens	
Chenopodiaceae		Tecticornia lepidosperma	
Chenopodiaceae		Tecticornia moniliformis	
Chenopodiaceae		Tecticornia pergranulata	
Chenopodiaceae		Tecticornia verrucosa	
Chenopodiaceae		Threlkeldia diffusa	
Crassulaceae		Crassula colorata	
Crassulaceae		Crassula exserta	
Crassulaceae	*	Crassula natans	
Cupressaceae		Callitris preissii	
Cupressaceae		Callitris roei	
Cyperaceae		Gahnia ancistrophylla	
Cyperaceae		Gahnia trifida	
Cyperaceae		Isolepis congrua	
Cyperaceae		Isolepis marginata	
Cyperaceae		Lepidosperma carphoides	
Cyperaceae		Lepidosperma pruinosum	
Cyperaceae		Lepidosperma sanguinolentum	
Cyperaceae		Lepidosperma sp. Bandalup Scabrid complex	
Cyperaceae		Lepidosperma sp. P1 small head (M.D. Tindale 166A)	
Cyperaceae		Lepidosperma tenue	
Cyperaceae		Mesomelaena preissii	
Cyperaceae		Schoenus brevisetis	
Cyperaceae		Schoenus caespititius	
Cyperaceae		Schoenus racemosus	
Cyperaceae		Schoenus sesquispiculus	
Cyperaceae		Schoenus subfascicularis	
Cyperaceae		Tetraria sp. Mt Madden	
Dasypogonaceae		Calectasia obtusa	3
Dilleniaceae		Hibbertia exasperata complex	
Dilleniaceae		Hibbertia gracilipes complex	
Droseraceae		Drosera ramellosa	
Ericaceae		Andersonia lehmanniana	
Ericaceae		Astroloma chloranthum	2
Ericaceae		Astroloma serratifolium	
Ericaceae		Brachyloma geissoloma	
Ericaceae		Coleanthera myrtoides	
Ericaceae		Conostephium roei	
Ericaceae		Leucopogon concinnus	
Ericaceae		Leucopogon cuneifolius	
Ericaceae		Leucopogon dielsianus	

Ericaceae		Leucopogon obtusatus	
Ericaceae		Leucopogon sp. Coujinup	
Ericaceae		Leucopogon sp. Frank Hann	
Ericaceae		Leucopogon sp. Wheatbelt	
Ericaceae		Lysinema pentapetalum	
Euphorbiaceae		Bertya dimerostigma	
Euphorbiaceae		Beyeria sulcata	
Fabaceae		Acacia acanthoclada	
Fabaceae		Acacia acutata	
Fabaceae		Acacia bidentata	
Fabaceae		Acacia chamaeleon	
Fabaceae		Acacia chrysella	
Fabaceae		Acacia cupularis	
Fabaceae		Acacia erinacea	
Fabaceae		Acacia evenulosa	
Fabaceae		Acacia lasiocalyx	
Fabaceae		Acacia lasiocarpa var. sedifolia	
Fabaceae		Acacia leptospermoides	
Fabaceae		Acacia microbotrya	
Fabaceae		Acacia multispicata	
Fabaceae		Acacia redolens	
Fabaceae		Acacia saligna	
Fabaceae		Acacia uncinella	
Fabaceae		Chorizema aciculare	
Fabaceae		Daviesia aphylla	
Fabaceae		Daviesia incrassata	
Fabaceae		Daviesia lancifolia	
Fabaceae		Daviesia nematophylla	
Fabaceae		Daviesia uncinata	3
Fabaceae		Dillwynia uncinata	
Fabaceae		Eutaxia nanophylla	
Fabaceae		Gastrolobium punctatum	
Fabaceae		Gompholobium viscidulum	
Fabaceae		Jacksonia racemosa	
Fabaceae		Mirbelia multicaulis	
Fabaceae		Mirbelia trichocalyx	
Fabaceae		Pultenaea empetrifolia	
Fabaceae		Senna artemisioides subsp. x artemisioides	
Fabaceae		Templetonia rossii	
Fabaceae	*	Trifolium tomentosum	
Frankeniaceae		Frankenia sp. southern gypsum	3
Gentianaceae	*	Centaurium erythraea	
Geraniaceae		Pelargonium havlasae	
Goodeniaceae		Coopernookia strophiolata	

Goodeniaceae	Dampiera juncea	
Goodeniaceae	Dampiera lavandulacea	
Goodeniaceae	Dampiera orchardii	2
Goodeniaceae	Goodenia affinis	
Goodeniaceae	Goodenia concinna	
Goodeniaceae	Goodenia viscida	
Goodeniaceae	Lechenaultia brevifolia	
Goodeniaceae	Scaevola spinescens	
Haemodoraceae	Conostylis argentea	
Haemodoraceae	Conostylis petrophiloides	
Haloragaceae	Glischrocaryon angustifolium	
Hemerocallidaceae	Dianella revoluta	
Hemerocallidaceae	Stypandra glauca	
Iridaceae	Patersonia occidentalis	
Juncaginaceae	Triglochin longicarpa	
Juncaginaceae	Triglochin minutissima	
Juncaginaceae	Triglochin mucronata	
Juncaginaceae	Triglochin sp. A Flora of Australia (G.J. Keighery 2477)	
Lamiaceae	Dasymalla terminalis	
Lamiaceae	Prostanthera serpyllifolia subsp. microphylla	
Lamiaceae	Teucrium sessiliflorum	
Lamiaceae	Westringia cephalantha	
Lamiaceae	Westringia rigida	
Lauraceae	Cassytha melantha	
Loganiaceae	Orianthera flaviflora	
Malvaceae	Lasiopetalum rosmarinifolium	
Malvaceae	Lawrencia diffusa	
Malvaceae	Lawrencia glomerata	
Malvaceae	Lawrencia squamata	
Myrtaceae	Baeckea latens	
Myrtaceae	Beaufortia micrantha	
Myrtaceae	Calothamnus quadrifidus subsp. quadrifidus	
Myrtaceae	Calytrix leschenaultii	
Myrtaceae	Calytrix tetragona	
Myrtaceae	Chamelaucium ciliatum	
Myrtaceae	Cyathostemon tenuifolius	
Myrtaceae	Darwinia sp. Lake Cobham (K. Newbey 3262)	
Myrtaceae	Ericomyrtus serpyllifolia	
Myrtaceae	Eucalyptus dissimulata	
Myrtaceae	Eucalyptus flocktoniae	
Myrtaceae	Eucalyptus kondininensis	
Myrtaceae	Eucalyptus longicornis	
Myrtaceae	Eucalyptus occidentalis	
Myrtaceae	Eucalyptus olivina	

Myrtaceae	Eucalyptus perangusta	
Myrtaceae	Eucalyptus phaenophylla subsp. phaenophylla	
Myrtaceae	Eucalyptus phenax	
Myrtaceae	Eucalyptus pileata	
Myrtaceae	Eucalyptus sp. Southern Wheatbelt	
Myrtaceae	Eucalyptus sporadica	
Myrtaceae	Eucalyptus suggrandis subsp. promiscua	
Myrtaceae	Eucalyptus urna	
Myrtaceae	Kunzea jucunda	
Myrtaceae	Kunzea preissiana	
Myrtaceae	Leptospermum erubescens	
Myrtaceae	Leptospermum nitens	
Myrtaceae	Leptospermum spinescens	
Myrtaceae	Melaleuca acuminata	
Myrtaceae	Melaleuca adenostyla (Mattiske 2010)	
Myrtaceae	Melaleuca adnata	
Myrtaceae	Melaleuca atroviridis	
Myrtaceae	Melaleuca brophyi	
Myrtaceae	Melaleuca carrii	
Myrtaceae	Melaleuca depauperata	
Myrtaceae	Melaleuca eleuterostachya	
Myrtaceae	Melaleuca elliptica	
Myrtaceae	Melaleuca halmaturorum	
Myrtaceae	Melaleuca hamata	
Myrtaceae	Melaleuca lanceolata	
Myrtaceae	Melaleuca lateralis	
Myrtaceae	Melaleuca lateriflora	
Myrtaceae	Melaleuca laxiflora	
Myrtaceae	Melaleuca lecanantha	
Myrtaceae	Melaleuca marginata	
Myrtaceae	Melaleuca rigidifolia	
Myrtaceae	Melaleuca sapientes	
Myrtaceae	Melaleuca scalena	
Myrtaceae	Melaleuca sculponeata	3
Myrtaceae	Melaleuca spicigera	
Myrtaceae	Melaleuca strobophylla	
Myrtaceae	Melaleuca subfalcata	
Myrtaceae	Melaleuca subtrigona	
Myrtaceae	Melaleuca thyoides	
Myrtaceae	Melaleuca tuberculata	
Myrtaceae	Oxymyrrhine sp	
Myrtaceae	Rinzia communis	
Myrtaceae	Tetrapora preissiana	
Myrtaceae	Tetrapora preissiana	

Myrtaceae		Verticordia acerosa	
Myrtaceae		Verticordia chrysantha	
Myrtaceae		Verticordia chrysanthella	
Myrtaceae		Verticordia densiflora	
Myrtaceae		Verticordia picta	
Myrtaceae		Verticordia plumosa var. incrassata	
Myrtaceae		Verticordia roei	
Orchidaceae		Caladenia doutchiae	
Orchidaceae		Thelymitra antennifera	
Orobanchaceae	*	Parentucellia latifolia	
Pittosporaceae		Billardiera lehmanniana	
Pittosporaceae		Pittosporum angustifolium	
Plantaginaceae	*	Plantago coronopus	
Poaceae		Amphipogon turbinatus	
Poaceae		Austrostipa elegantissima	
Poaceae		Austrostipa hemipogon	
Poaceae		Austrostipa juncifolia	
Poaceae		Austrostipa pycnostachya	
Poaceae		Austrostipa trichophylla	
Poaceae	*	Avellinia michelii	
Poaceae	*	Avena fatua	
Poaceae	*	Briza minor	
Poaceae		Eragrostis dielsii	
Poaceae		Lachnagrostis filiformis	
Poaceae	*	Lolium perenne	
Poaceae		Neurachne alopecuroidea	
Poaceae	*	Parapholis incurva	
Poaceae	*	Pentameris airoides	
Poaceae		Rytidosperma caespitosum	
Poaceae	*	Vulpia myuros	
Polygalaceae		Comesperma integerrimum	
Polygalaceae		Comesperma scoparium	
Polygalaceae		Comesperma spinosum	
Polygalaceae		Duma horrida subsp. abdita	T
Portulacaceae		Calandrinia calyptrata	
Portulacaceae		Calandrinia corrigioloides	
Portulacaceae		Calandrinia granulifera	
Portulacaceae		Calandrinia porifera	
Primulaceae	*	Lysimachia arvensis	
Proteaceae		Banksia prionotes	
Proteaceae		Banksia xylothemelia	3
Proteaceae		Banksia violacea	
Proteaceae		Conospermum cinereum	
Proteaceae		Grevillea acuaria	

Proteaceae	Grevillea eryngioides	
Proteaceae	Grevillea huegelii	
Proteaceae	Grevillea newbeyi	3
Proteaceae	Grevillea oligantha	
Proteaceae	Grevillea shuttleworthiana	
Proteaceae	Grevillea teretifolia	
Proteaceae	Hakea corymbosa	
Proteaceae	Hakea cygna	
Proteaceae	Hakea erecta	
Proteaceae	Hakea incrassata	
Proteaceae	Hakea lissocarpha	
Proteaceae	Hakea newbeyana	
Proteaceae	Hakea nitida	
Proteaceae	Hakea obliqua subsp. parviflora	
Proteaceae	Isopogon scabriusculus	
Proteaceae	Isopogon sp. Fitzgerald River	
Proteaceae	Isopogon teretifolius	
Proteaceae	Persoonia brevirhachis	3
Proteaceae	Persoonia coriacea	
Proteaceae	Persoonia striata	
Proteaceae	Petrophile brevifolia	
Proteaceae	Petrophile ericifolia	
Proteaceae	Petrophile glauca	
Proteaceae	Petrophile seminuda	
Proteaceae	Synaphea interioris	
Proteaceae	Synaphea spinulosa	
Ranunculaceae	Clematis delicata	
Restionaceae	Chordifex sphacelatus	
Restionaceae	Desmocladus asper	
Restionaceae	Desmocladus lateriflorus	
Restionaceae	Desmocladus myriocladus	
Restionaceae	Desmocladus quiricanus	
Restionaceae	Lepidobolus preissianus	
Rhamnaceae	Cryptandra leucopogon	
Rhamnaceae	Cryptandra minutifolia	
Rhamnaceae	Cryptandra nutans	
Rhamnaceae	Spyridium mucronatum subsp. recurvum	3
Rhamnaceae	Spyridium mucronatum subsp. mucronatum	
Rhamnaceae	Trymalium elachophyllum	
Rubiaceae	Opercularia vaginata	
Rutaceae	Boronia coerulescens	
Rutaceae	Microcybe multiflora subsp. baccharoides	
Rutaceae	Phebalium filifolium	
Rutaceae	Phebalium lepidotum	

Santalaceae		Exocarpos aphyllus	
Santalaceae		Exocarpos sparteus	
Santalaceae		Leptomeria preissiana	
Santalaceae		Santalum acuminatum	
Santalaceae		Santalum murrayanum	
Sapindaceae		Dodonaea bursariifolia	
Sapindaceae		Dodonaea stenozyga	
Sapindaceae		Dodonaea viscosa	
Scrophulariaceae		Eremophila decipiens	
Scrophulariaceae		Eremophila glabra subsp. albicans	
Solanaceae	*	Solanum nigrum	
Stylidiaceae		Levenhookia stipitata	
Stylidiaceae		Stylidium dichotomum	
Stylidiaceae		Stylidium piliferum	
Stylidiaceae		Stylidium repens	
Stylidiaceae		Stylidium thylax	2
Stylidiaceae		Stylidium zeicolor	
Thymelaeaceae		Pimelea argentea	
Thymelaeaceae		Pimelea imbricata var. piligera	

Appendix 7

Department of Biodiversity Conservation and Attractions
Parks and Wildlife Service

CONSERVATION CODES
For the Western Australian Flora and Fauna

Department of
Parks and Wildlife

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 8
Photographic History of Lake Bryde

1986 – *Duma horrida* subsp. *abdita*

May 1996 - *Duma horrida* subsp. *abdita* and *Tecticornia verrucosa* on the lake bed

May 1996 - *Duma horrida* subsp. *abdita* and *Tecticornia verrucosa* on the lake bed

January 2000

April 2000

2006

Nov 2013 – *Tecticornia verrucosa* (purple)

Nov 2013 - *Tecticornia verrucosa* (purple) and *Duma horrida* subsp. *abdita*

November 2013

April 2017

Lake Bryde Conservation Park 48436
Vegegtation Map
A Rick. 2018

- Releves
- Spot observations
- Es - Eucalyptus salmonophloia (salmon gum) woodland
- Es_r - Eucalyptus salmonophloia woodland (regeneration)
- Eu - Eucalyptus urna open forest
- El - Eucalyptus longicornis (red morrel) woodland
- Ek - Eucalyptus kondininensis (Kondinin blackbutt) woodland
- Ek_r - Eucalyptus kondininensis woodland (regeneration)
- Eo - Eucalyptus occidentalis (flat-topped yate) woodland
- Eo_r - Eucalyptus occidentalis woodland (regeneration)
- EMs/L - Mallee over Melaleuca scalena – laterite
- EMac - Mallee over Melaleuca acuminata
- EMsu - Mallee over Melaleuca low shrubland (M. subtrigona)
- E - Mixed Mallee
- Ex - Mixed mallee (sparse understorey)
- Ex_d - Mixed mallee (sparse understorey) damaged
- H - Mixed lateritic heathland
- H- Mixed lateritic heathland (regeneration)
- As - Allocasuarina spinosissima shrubland
- Bp - Banksia prionotes open woodland
- Er - Eremaea pauciflora heathland
- Hs - Mixed sandy heathland
- M - Melaleuca shrubland
- M_r - Melaleuca shrubland (regeneration)
- M_d - Melaleuca shrubland (damaged)
- Dh - Duma horrida/Tecticornia verrucosa shrubland
- Te - Samphire (Tecticornia) shrubland
- Gx - Granite complex
- Revegetation

N

0 125 250 500 750 1,000

Metres

Produced by the
Department of
Biodiversity, Conservation and Attractions

Department of **Biodiversity, Conservation and Attractions**

1:8,000
(A1)

FOURTEEN MILE RD

NEWDEGATE RD

LAKE BRYDE RD

Reveg

667000 668000 669000 670000 671000 672000 673000

118°48' 118°49' 118°50' 118°51'

6311000 6310000 6309000 6308000

33°29' 33°30'

Lake Bryde Conservation Park 48436
Vegegtation Map
A Rick. 2018

- Releves
- Spot observations
- Es - Eucalyptus salmonophloia (salmon gum) woodland
- Es_r - Eucalyptus salmonophloia woodland (regeneration)
- Eu - Eucalyptus urna open forest
- El - Eucalyptus longicornis (red morrel) woodland
- Ek - Eucalyptus kondininensis (Kondinin blackbutt) woodland
- Ek_r - Eucalyptus kondininensis woodland (regeneration)
- Eo - Eucalyptus occidentalis (flat-topped yate) woodland
- Eo_r - Eucalyptus occidentalis woodland (regeneration)
- EMs/L - Mallee over Melaleuca scalena – laterite
- EMac - Mallee over Melaleuca acuminata
- EMsu - Mallee over Melaleuca low shrubland (M. subtrigona)
- E - Mixed Mallee
- Ex - Mixed mallee (sparse understorey)
- Ex_d - Mixed mallee (sparse understorey) damaged
- H - Mixed lateritic heathland
- H- Mixed lateritic heathland (regeneration)
- As - Allocasuarina spinosissima shrubland
- Bp - Banksia prionotes open woodland
- Er - Eremaea pauciflora heathland
- Hs - Mixed sandy heathland
- M - Melaleuca shrubland
- M_r - Melaleuca shrubland (regeneration)
- M_d - Melaleuca shrubland (damaged)
- Dh - Duma horrida/Tecticornia verrucosa shrubland
- Te - Samphire (Tecticornia) shrubland
- Gx - Granite complex
- Revegetation

N

0 125 250 500 750 1,000

Metres

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Department of Biodiversity, Conservation and Attractions
GOVERNMENT OF WESTERN AUSTRALIA

1:8,000
(A1)

FOURTEEN MILE RD

NEWDEGATE RD

LAKE BRYDE RD

667000 668000 669000 670000 671000 672000 673000

118°48' 118°49' 118°50' 118°51'

6311000 6310000 6309000 6308000

33°20' 33°21'