



Lakeland Nature Reserves 2024 and 2025 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 Lakeland Nature Reserve 29024 (1579 ha) and 29025 (207 ha) 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 Nature Reserves are 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 30 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 September, October and November 2018. 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 (relevés) described. Relevés were chosen rather than quadrats for sampling because of the large number of site descriptions required to capture the complexity of the vegetation patterns in the reserve.

Vegetation type descriptions are 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. The assessment of vegetation condition follows the Vegetation Condition Scale used by B.J. Keighery for the Swan Coastal Plain Survey in 1994.

Twenty five vegetation types are mapped and described in this study including 6 woodland, 7 mallee, 11 shrubland and 1 herbland community. In Lakeland Nature Reserve 29025 granite and lateritic soils are widespread. Vegetation types associated with these soils are therefore common throughout. Small areas of *Eucalyptus salubris* (Esu) woodland and *Eucalyptus urna* (Eu) woodland were also recorded on heavier clay soils with mallee vegetation types found on duplex soils of sand over clay.

In Lakeland Nature Reserve 29024 vegetation types occurring on lateritic soils are generally found on upper slopes with mallee associations extensive on the gentle mid slopes to the valley floor. On the lower slopes/valley floor woodlands are usually found adjacent to salt lakes with *Melaleuca* shrublands growing on poorly drained areas on clay soils and in depressions. Salt lakes, a number with gypsum, have areas of samphire (*Tecticornia*) shrublands and small closed depressions with clay soils are characterized by isolated shrubs of *Wilsonia humilis* and *Wilsonia rotundifolia*. The *Duma horrida* subsp. *abdita* Threatened Ecological Community (Dh) covers a small area on one of the lakes.

Most of Lakeland Reserve 29025 and areas higher in the landscape in Lakeland Nature Reserve 29024 are in excellent condition with very little disturbance and only the occasional non-aggressive weed species present. Weeds were more common in vegetation near the boundaries especially adjacent to farmland and in degraded low lying areas of Nature Reserve 29024. There

was also some minor weed invasion on areas of granite. Low lying areas in Lakelands Nature Reserve 29024 show heath decline primarily associated with waterlogging and subsequent rising groundwater levels.

A total of 396 plant species are recorded in Appendix 8 as occurring in the study area, 13 are introduced or weed species. 338 species were recorded during the present survey and a further 58 species are included from previous studies. 2018 was a particularly dry year and the flora survey was limited because of a lack of flowering and fruiting material and the absence of some annuals and geophytes.

Lakeland Nature Reserves 29024 and 29025 have high conservation values. Information collected during the present survey is summarized below.

- The Reserves include a range of vegetation types from the species rich heath communities on lateritic soils on the upper slopes, granite rock flora, extensive mallee communities, woodlands and shrublands on the lower slopes and valley floor.
- A relatively high diversity of vascular plant species occurs in the area with 396 plant species recorded in Appendix 8.
- The Declared Rare Flora *Duma horrida* subsp. *abdita* is present in Nature Reserve 29024
- Two priority species were recorded in Nature Reserve 29025 and 15 priority species have been recorded for Nature Reserve 29024 during the present and previous surveys.
- Lakeland Nature Reserve 29024 includes woodlands of *Eucalyptus salmonophloia*, *Eucalyptus kondininensis*, *Eucalyptus alipes* and one small area of *Eucalyptus myriadena* which meet key diagnostic characteristics for the Critically Endangered - Eucalypt Woodlands of the WA Wheatbelt.
- 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" is present in Lakeland Nature Reserve 29024
- The reserves are an important part of the wildlife corridor connecting reserves and other remnant vegetation in the catchment. The salmon gums (nesting sites) and heath areas (feeding grounds) provide ideal habitat for the Carnaby's cockatoos.

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Excel file Physical description of releves

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 Lakeland Nature Reserves 29024 and 29025 was commissioned by the Parks and Wildlife Service of the Department of Biodiversity, Conservation and Attractions to assist with the management of the Nature Reserves and the Lake Bryde Recovery Catchment. The objectives of the survey include:

- the description and mapping of vegetation types
- the assessment 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. Lakeland Nature Reserves 29024 and 29025 are 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 Conservation Park and East Lake Bryde Nature Reserve. 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

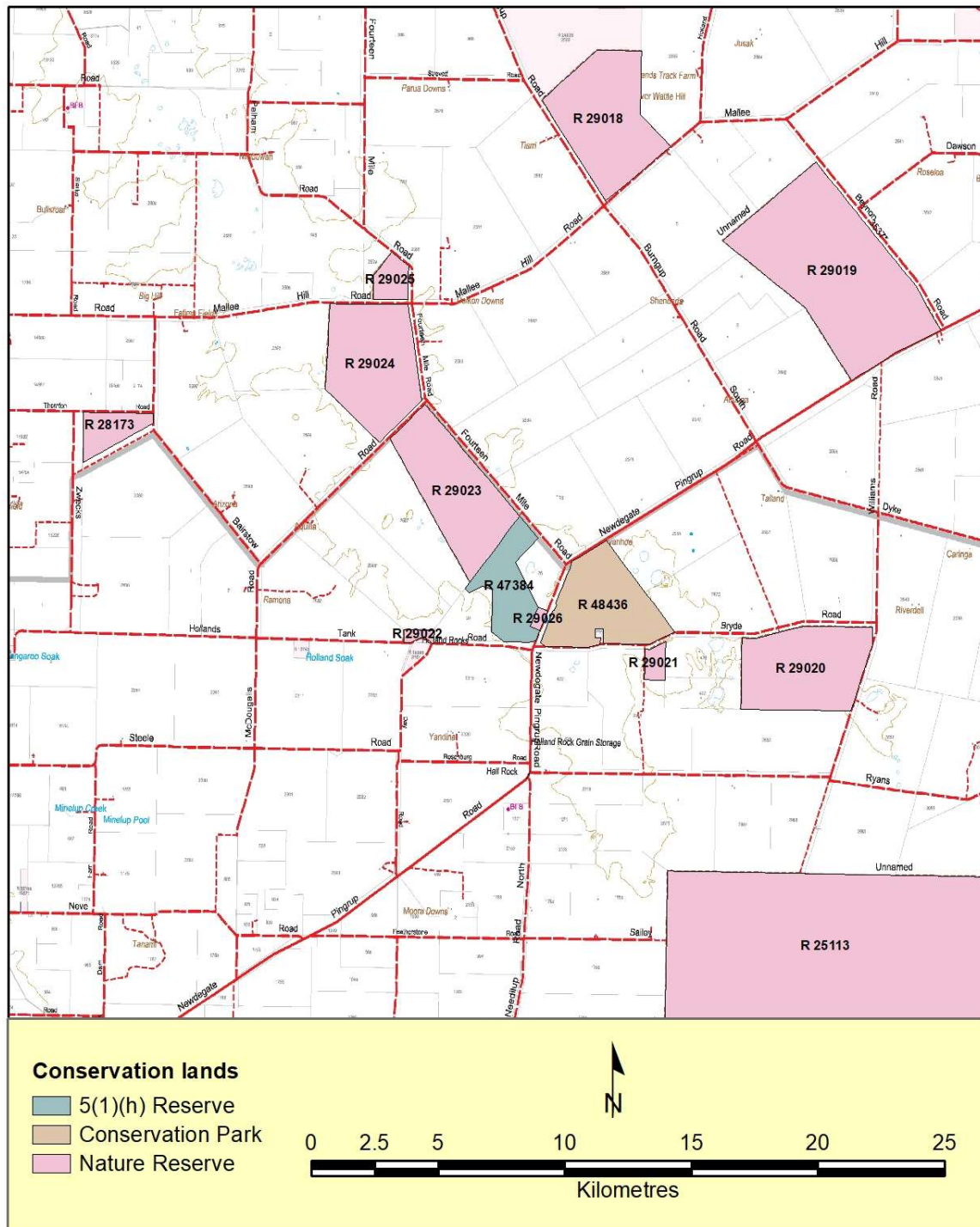
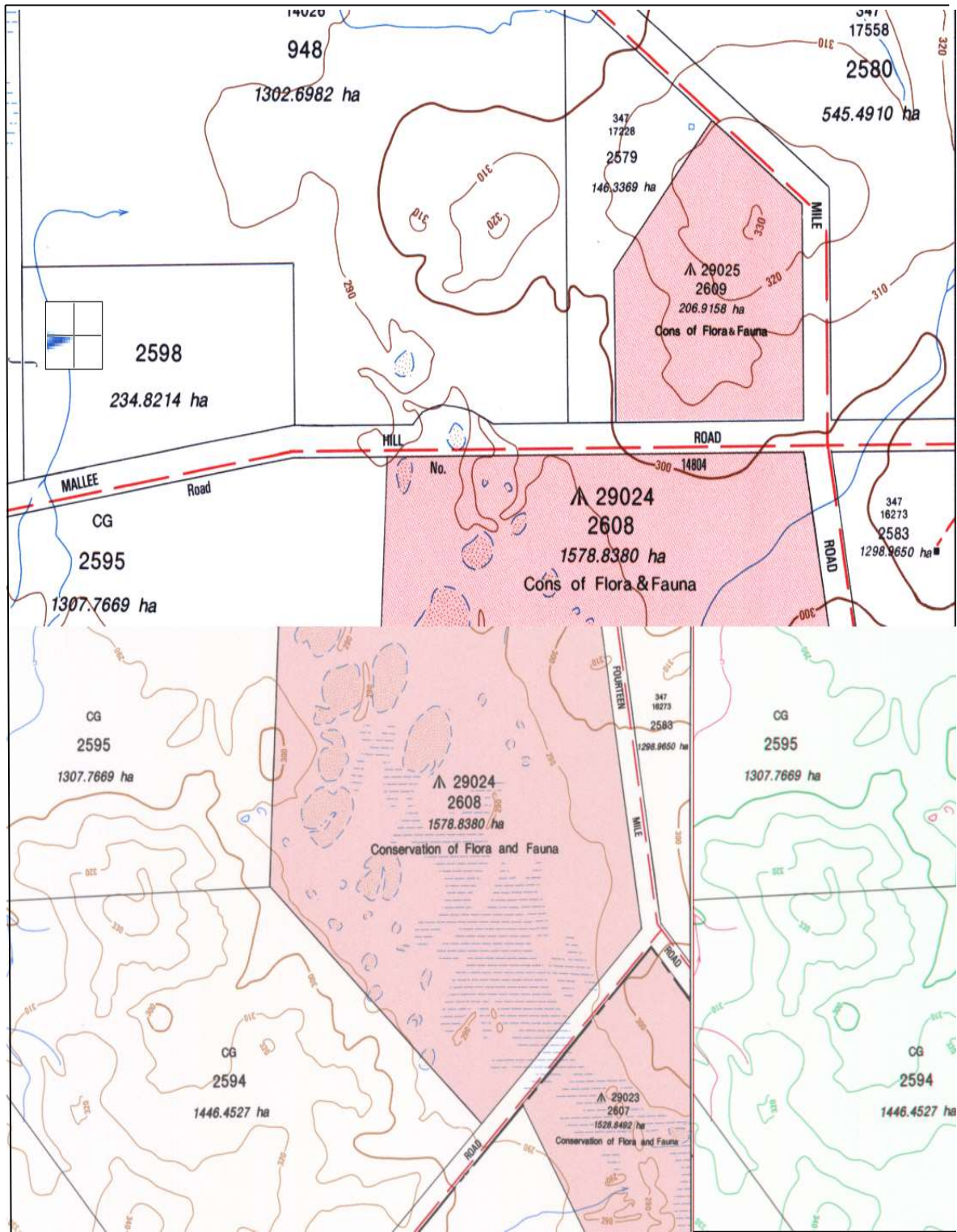


Figure 2: From South West WA 1:50,000 scale topographical maps (Landgate 2013)



1.3 Lakeland Nature Reserves 29024 and 29025

Lakeland Nature Reserves 29024

Lakeland Nature Reserve 29024 is situated approximately 31kms SW of the Newdegate town site in the Shire of Lake Grace. The Nature Reserve is bounded by Mallee Hill Road to the North, Fourteen Mile Road to the East and Bairstow Road to the South. The Nature Reserve is approximately 1579 ha in size with cleared farmland on the western boundary. The Nature Reserve is relatively flat with the highest points on the northern and eastern boundaries and sandy ridges within the park at 300 m above sea level. The area includes salt lakes and small closed depressions. 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 Reserve.

Lakeland Nature Reserves 29025

Lakeland Nature Reserve 29025 is situated approximately 30kms SW of the Newdegate town site in the Shire of Lake Grace. The Nature Reserve is bounded by Mallee Hill Road to the South and Fourteen Mile Road to the East and North East with cleared farmland to the West. The Nature Reserve is approximately 207 ha in size. The Nature Reserve slopes gently from north to south with the highest points on the northern boundary. Areas of granite and laterite are widespread.

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 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 Lakeland Nature Reserves 29024 and 29025 from the 1:250 000 Geological series – Newdegate sheet (Thom et al 1984) include:

Lakeland Nature Reserve 29025

- Agg Granitoid - 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.
- Czl Laterite – limonite nodules in cemented matrix

Lakeland Nature Reserve 29024

- Qd Aeolian and alluvial deposits of silt and sand in sheets and dunes, gypsiferous near playa lakes; Ancient drainage flats; commonly contain calcrete nodules.
- Ql Saline and gypsiferous clay and silt in playa lake deposits
- Czg Reworked sandplain with undulating surface – contains yellow to white sand and clay, gravel and minor laterite outcrop.
- Czl Laterite – limonite nodules in cemented matrix

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. Reworking and local removal of parts of the Tertiary soil profile have commonly exposed underlying gravels and form unit Czg. Deeper erosion has exposed laterite (Czl) and ultimately bedrock (Thom et al 1984). 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).

Soil-landscape mapping units developed by the Department of Agriculture and Food and outlined in Ecoscape (2001) are presented in Appendix 1.

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 September, October and November 2018. The work included data collection through targeted and opportunistic searches. Traverses were made through the survey area to collect data to map vegetation boundaries, describe vegetation types and examine habitat where rare flora and endangered ecological communities were likely to occur.

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

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

Vegetation type descriptions were based on the National Vegetation Information System (NVIS) (ESCAVI 2003) Table 2. Descriptions 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 so that comparisons can 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 relevé included:

- GPS location at the centre of the relevé
- 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 2. The plant inventory in relevés was comprehensive, but very small plants or those that would have been inconspicuous at the time of survey would not have been included. This is in contrast to quadrat work where every species in the quadrat is included. The emphasis was on frequently occurring and characteristic species. As the same person carried out all field work it is expected that the method of data collection is consistent.

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

Table 1: Muir System of Vegetation Classification

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

Table 2: NVIS structural Formation Terminology (ESCAVI 2003)

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

Table 3: Vegetation Condition Scale

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

2.3 PRIMER Analysis

The multivariate statistics package used to analyse the species information for each releve was PRIMER v6 (Clarke & Gorley, 2006). Relevés were classified according to similarities in species composition (presence/absence data) using the Bray-Curtis Similarity Coefficient. The results of the Cluster classification 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. 2018 was unusually dry and lack of good quality flowering and/or fruiting material made plant identification challenging.

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 gracilipes* complex.

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

Tecticornia species were often difficult to identify especially sterile material and expert assistance is required to check some of the identifications. Identification work was however consistent and final identifications should not affect the PRIMER analysis.

Databases

The following data sets were accumulated in EXCEL spread sheets.

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

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

Beard (1976) has mapped the Lakeland Nature Reserves at a scale of 1:250 000. The map units covering the Reserves include:

Lake land Nature Reserve 29024

eMi mixed woodland in lakes country *E. salmonophloia*, *E. longicornis*, *E. salubris*, *E. kondininensis*

eSi Mallee on lateritic soil *Eucalyptus eremophila* – *E. oleosa* association

Lake land Nature Reserve 29025

eSi Mallee on lateritic soil *Eucalyptus eremophila* – *E. oleosa* association

Granite outcrop

Mattiske (1999) mapped the vegetation of low lying areas (below 300ms) of the Lakeland Nature Reserves. Eight sites were situated in Lakeland Nature Reserve 29024 including Lake 1 (vegetation type 3.4), Lake 2 (vegetation type 3.5), LG4 (vegetation type 1.1), LG5 (vegetation type 3.1), LG6 (vegetation type 3.3), LG7 (vegetation type 2.5), LG8 (vegetation type 1.3) and Peg 1 (vegetation type 1.2). The vegetation map covering Lakeland Nature Reserve 29024 and photographs of these sites is presented in Appendix 3. Those formations relevant to the Lakeland Nature Reserves are listed below.

Woodland Formations

- 1.1 Open Woodland of *Eucalyptus kondininensis* over Scrub over Open Dwarf Scrub C in loamy sand on the rises above salt lakes
- 1.2 Low Forest A of *Eucalyptus vegrandis* (now *Eucalyptus alipes*), *Callitris roei* over Very Open Herbs in sand
- 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
- 1.5 Tall Woodland of *Eucalyptus flocktoniae* (now *Eucalyptus urna*), *Eucalyptus phenax* over Open Scrub over Open Dwarf Scrub D
- 1.6 Open Woodland of *Eucalyptus salmonophloia* over Low Heath C over Open Herbs in loamy clay

Mallee Formations

- 2.1 Open Tree Mallee of *Eucalyptus vegrandis* (now identified as *Eucalyptus suggrandis*), *Eucalyptus calycogona* var. *calycogona* and *Eucalyptus occidentalis* to Very Open Tree Mallee over Open Scrub over Dwarf Scrub C on sand
- 2.2 Open Tree Mallee of *Eucalyptus vegrandis* (now identified as *Eucalyptus suggrandis*), *Eucalyptus hypochlamydea* subsp. *ecdysiastes* (now *Eucalyptus horistes* and other), *Eucalyptus transcontinentalis* (now *Eucalyptus neutra*) over Mid Dense Heath A over Open Low Sedges on sandy loam.
- 2.3 Very Open Tree Mallee of *Eucalyptus sporadica*, *Eucalyptus incrassata*, *Eucalyptus phenax* over Open Low Scrub A over Mid-dense Low Scrub C
- 2.5 Dense Shrub Mallee of *Eucalyptus capillosa* subsp. *polyclada* (unlikely to occur in the area, possibly *Eucalyptus phaenophylla*) over Open Dwarf Scrub D over Open Herbs

Shrubland Formations

- 3.1 Thicket of *Melaleuca adnata*, *Melaleuca halmaturorum*, *Melaleuca lateriflora*, *Melaleuca uncinata* (now *Melaleuca hamata*, *Melaleuca scalena* or *Melaleuca atroviridis*) over Open Dwarf Scrub D in sandy soils
- 3.3 Open Scrub of *Acacia chamaeleon*, *Acacia saligna*, *Leptospermum erubescens* over Low Scrub B over Low Sedges in sand
- 3.4 Dwarf Scrub D or Open Dwarf Scrub D of *Halosarcia pergranulata* (now *Tecticornia pergranulata*), *Halosarcia syncarpa* (now *Tecticornia syncarpa*), *Tecticornia verrucosa* over Very Open Herbs in clay soils

3.5 Open Dwarf Scrub D of *Halosarcia pergranulata* (*Tecticornia perangusta*), *Halosarcia syncarpa* (*Tecticornia syncarpa*), *Halosarcia indica* subsp. *bidens* (now *Tecticornia indica* subsp. *bidens*) over Dense Herbs in clay

In 2000, Ecoscape conducted a vegetation survey of reserves in the Lake Bryde Recovery Catchment. This survey included 6 quadrats situated in Lakeland Nature Reserve 29024 including LB37 (Mattiske Site Peg 1), LB38 (Mattiske site LG07), LB39 (Mattiske site LK08), LB41 (Mattiske site LG05), Mattiske site LG04 and Mattiske site LG06. Details from the report can be found in Appendix 4.

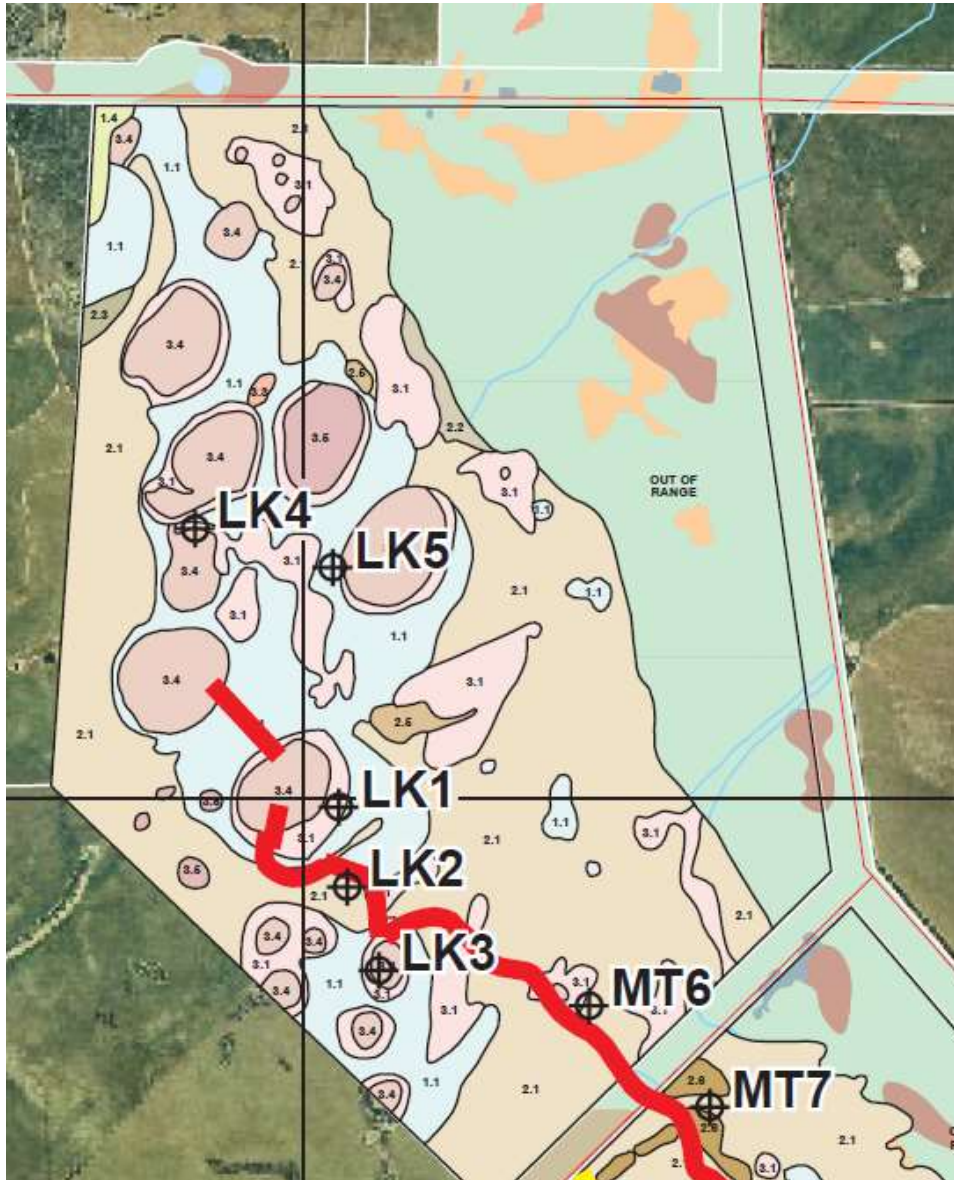
SAP sites (Salinity Action Plan sites) situated in Lakeland Natures Reserves 29024 and 29025 include PI20, PI21, PI22 and PI23 (Gibson et al 2004). Descriptions of these sites are detailed below.

Quadrat number	Vegetation Description (Muir 1977)	Vegetation Type present survey
PI20 Bairstow Road reserve	<i>Melaleuca lateriflora</i> , <i>Melaleuca adenostyla</i> dense heath A.	<i>Melaleuca</i> shrubland M
PI21 Reserve 29025	<i>Allocasuarina acutivalvis</i> , <i>Callitris tuberculata</i> scrub, over <i>Melaleuca pungens</i> , <i>Hakea scoparia</i> , <i>Persoonia quinquenervis</i> heath B, over <i>Beaufortia micrantha</i> open dwarf scrub D.	<i>Allocasuarina</i> shrubland As
PI22 Reserve 29024	<i>Tecticornia arborea</i> , <i>Halosarcia indica</i> , <i>Halosarcia pergranulata</i> dwarf scrub D, over <i>Angianthus pygmaeus</i> open herbs.	<i>Tecticornia</i> shrubland Te
PI23 Reserve 29024	<i>Eucalyptus sporadica</i> , <i>Eucalyptus perangusta</i> shrub mallee, over <i>Bossiaea halophila</i> , <i>Leptospermum erubescens</i> heath A, over <i>Lepidosperma squamata</i> , <i>Tetraria capillaris</i> open low sedges.	<i>Eucalyptus perangusta</i> over shrubland Ep

In 2005, 17 permanent vegetation monitoring transects were established by Mattiske Consulting Pty Ltd in the Lake Bryde and Lakeland 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). Six of these transects were established in Lakeland Nature Reserve 29024 (MT6, LK1, LK2, LK3, LK4, and LK5). The data indicates that the vegetation in these transects is declining. DBCA staff continued to monitor these transects in 2011 and 2013.

In 2009 the author surveyed a small area of Lakeland Nature Reserve 29024 for rare flora and recorded *Frankenia drummondii* P3. Details of the survey are presented in Appendix 5.

Figure 3: The location of monitoring transects (Mattiske 2010) in Lakeland Nature Reserve 29024



3.2 Present Survey - Vegetation Types

The vegetation types mapped and described in the present study are outlined in Table 4. Descriptions of the vegetation structure (with photographs) recorded at relevés can be found in Appendix 6. Muir (1977) and NVIS (to level 6 Sub-Association) vegetation descriptions are included. Detailed vegetation descriptions can be found in Appendix 7. The species are listed in order of prominence and the first 5 species in each layer/substrata can be used for NVIS descriptions to level 6. Data sets (EXCEL spread sheets) with species recorded at each relevé 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. Variation in vegetation can also be related to changes in topography, geology e.g. presence of granite rock and hydrology (drainage). In the study area there is 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. 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).

Lakeland Nature Reserve 29025

In Lakeland Nature Reserve 29025 granite and lateritic soils are widespread. Species rich heathland (H), *Allocasuarina* shrubland (As) and Mallee over *Melaleuca scalena*/laterite (Ems/L) vegetation types associated with laterite are therefore common throughout as are vegetation types associated with granite such as isolated *Eucalyptus loxophleba* subsp. *gratae* over shrubland (Elox), *Allocasuarina campestris* shrubland (Ac), granite shrublands (Gs) and herblands (Gh). Small areas of *Eucalyptus salubris* (Esu) woodland and *Eucalyptus urna* (Eu) woodland were also recorded on heavier clay soils. The mallee associations mapped in this reserve include Mallee over *Melaleuca adnata* (EMa) typical of heavier soils and Mallee over *Melaleuca scalena* (Ems) associated with duplex soils of sand and sandy loam over clay.

Lakeland Nature Reserve 29024

In Lakeland Nature Reserve 29024 species rich heathland (H) and a small areas of *Allocasuarina* shrubland (As) occur on lateritic soils generally higher in the landscape. *Eremaea* heathland (Er) and mixed sandy heathland (Hs) are found on deeper sandy soils. Mallee over *Melaleuca scalena* /laterite (Ems/L) occurs on intergrade soils of laterite and clay.

On the gentle mid slopes to the lower slopes/valley floor mallee associations are extensive including Mallee over *Melaleuca scalena* (Ems) merging into smaller areas of mixed mallee over *Melaleuca depauperata* (EMd) on duplex soils of sand over clay. Mallee over *Melaleuca adnata* (EMa) covers areas on heavier duplex soils along with small areas of Mallee over *Melaleuca acuminata* (EMac). Mallee over *Melaleuca carrii* (EMc) occurs on deeper sandy duplex soils probably with laterite at depth and here intergrades into *Eucalyptus perangusta* over shrubland (Ep) which is typical of the deeper sandy soils associated with the salt lakes.

On lower slopes/valley floor *Eucalyptus kondininensis* woodland (Ek) grows on elevated areas adjacent to lakes. *Eucalyptus salmonophloia* woodland (Es) occurs on loam/clay soils along with small areas of *Eucalyptus myriadena* woodland (Emy). Only a few trees of *Eucalyptus occidentalis* (flat topped yate) and *Eucalyptus longicornis* (morrel) were recorded during the survey. *Melaleuca* shrublands (M) are found on poorly drained areas on clay soils and in depressions. Salt lakes, a number with gypsum, have areas of samphire (*Tecticornia*) shrublands (Te) and small closed depressions with clay soils are characterised by isolated shrubs of *Wilsonia humilis* and *Wilsonia rotundifolia* (W). The *Duma horrida* subsp. *abdita* Threatened Ecological Community (Dh) covers a small area on one of the lakes.

Detailed vegetation descriptions are available in Appendix 7. 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 4. Ninety four relevés were selected for the vegetation analysis. Some relevés recorded during the survey were not included as they were thought to represent transition zones not typical of the vegetation types or influenced by edge affect (a number of species present considered to be characteristic of adjacent areas/vegetation types). Only a representative selection of 11 samphire (*Tecticornia*) shrubland relevés was used in the analysis. Differences between the Vegetation classification based on characteristic species and vegetation structure and the classification based on the analysis of floristic composition data i.e. presence/absence of species at each releve are discussed below.

1. The Mallee over *Melaleuca carrii* (EMc) and *Eucalyptus perangusta* over shrubland (Ep) relevés 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. Mallee over *Melaleuca carrii* only covered small areas in Reserve 29024 compared to more extensive areas mapped in the East Lake Bryde Nature Reserve.
2. The Mallee over *Melaleuca depauperata* (EMd) and Mallee over *Melaleuca scalena* (Ems) releves were grouped together in the analysis with no significant difference shown in species composition. These vegetation types differ in the dominant or more frequently occurring species in the understorey strata.
 3. *Eucalyptus alipes* releves clustered in 2 distinct groups in the analysis. These were *Eucalyptus alipes* woodland on sandy ridges and *Eucalyptus alipes* open forest on low lying areas. These areas are all mapped as Ea.
 4. The two small areas of *Eucalyptus myriadena* did not group together in the analysis reflecting their small size and therefore the inclusion in the releve descriptions of species characteristic of adjacent vegetation types.
 5. Mixed lateritic heathland releves cluster in 2 distinct groups, however these groups were not distinct in the field or on the aerial photography and have all been mapped as H. The heath site in Nature Reserve 29025 clustered with *Allocasuarina* shrubland (As) and is probably a transition area.
 6. *Eremaea* heathland and mixed sandy heathland releves cluster together reflecting the similarity in species composition with the presence in both vegetation types of plants that prefer deeper sandy soils.

3.4 Vegetation Condition

Most of Lakeland Reserve 29025 and areas higher in the landscape in Lakeland Nature Reserve 29024 are in excellent condition with very little disturbance and only the occasional non-aggressive weed species present. Weeds were more common in vegetation near the boundaries especially adjacent to farmland and in degraded low lying areas of Nature Reserve 29024. There was also some minor weed invasion on areas of granite. Eight introduced or weed species were recorded during the present survey and a further 5 were recorded in previous surveys. The majority of these weeds were annuals from the families Poaceae and Asteraceae, and the remaining species were herbaceous. *Mesembryanthemum nodiflorum* was common in degraded low lying areas.

Low lying areas in Lakelands Nature Reserve 29024 near the surface water drain show health 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).

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 boundaries are only approximations. 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.

Areas of *Eucalyptus alipes* were difficult to map as they included young regenerating trees, more mature open forest, and woodland on sandy ridges. *Melaleuca* shrubland adjoining these areas often included dead trees and were probably healthy woodland areas in the past. These areas were difficult to delineate on the available aerial photography (2008, 2014).

Table 4 - Vegetation Types in Lakeland Nature Reserves 29024 and 29025

Vegetation Type	Map Unit	Soils/topography	Landform	relevés	Comments/ Rare Flora
Woodland Formations					
<i>Eucalyptus salmonophloia</i> (salmon gum) woodland	Es	Loamy soils over clay. Gentle slope to flat terrain	Valley floor adjacent to lakes and in drainage lines	65, 71, 76	<i>Astroloma chloranthum</i> P2
<i>Eucalyptus urna</i> open forest	Eu	Loamy soils. Flat to gentle slope	Mid to lower slopes	10	Small areas in NR 29025
<i>Eucalyptus salubris</i> (gimlet)	Esu	Clay soils. Flat to gentle slope	Mid to lower slopes, valley floor	1	Small areas in NR 29025
<i>Eucalyptus kondininensis</i> (Kondinin blackbutt) woodland	Ek	Sandy loams. Flat to gentle slope	Valley floor, higher ground adjacent to lakes	33, 38, 41, 49	
<i>Eucalyptus myriadena</i> (small-fruited gum) woodland	Emy	Sandy Loam soils. Flat to gentle slope	Valley floor	54, 72	
<i>Eucalyptus alipes</i>	Ea Open forest	Sandy loam over clay to clay soils. Flat to gentle slope	Valley floor	50, 58, 60, 62, 63	
	Ea woodland	Sandy loam ridges over clay. Flat to gentle slope	Valley floor	53, 57	

Mallee Formations					
Mallee over <i>Melaleuca scalena</i> - laterite	EMs/L	Sandy loam with laterite over clay	Upper to mid slope	12, 14, 73, 90	
Mallee over <i>Melaleuca scalena</i>	EMs	Sandy loam over clay - duplex soils ~30cm to clay	Mid to lower slopes	13, 18, 27, 61, 66, 77, 80, 85	<i>Spyridium mucronatum</i> subsp. <i>recurvum</i> P3 <i>Astroloma chloranthum</i> P2 <i>Melaleuca sculponeata</i> P3 <i>Eutaxia nanophylla</i> P3
Mixed Mallee over <i>Melaleuca depauperata</i>	EMd	Sandy loam over clay - duplex soils	Mid to lower slopes	26, 44	<i>Spyridium mucronatum</i> subsp. <i>recurvum</i> P3
Mallee over <i>Melaleuca carrii</i>	EMc	Deeper sandy soils over clay ?laterite	Mid to lower slopes well drained	64, 69	<i>Spyridium mucronatum</i> subsp. <i>recurvum</i> P3
<i>Eucalyptus perangusta</i> over shrubland	Ep	Deeper sandy soils. Gentle slopes and flat terrain, sandy ridges	Lower slopes, usually adjacent to lakes	23, 29, 42, 45, 56, 82, 84, 93	<i>Dampiera orchardii</i> P2 <i>Spyridium mucronatum</i> subsp. <i>recurvum</i> P3 <i>Astroloma chloranthum</i> P2 <i>Grevillea newbeyi</i> P3
Mallee over <i>Melaleuca adnata</i>	EMa	Heavier soils of loam over clay. Flat to gentle slope	Upper to lower slopes	2, 4, 7, 17, 75, 79	
Mallee over <i>Melaleuca acuminata</i>	EMac	Shallow sandy loam soils over clay	Mid to lower slopes. Usually near lakes and drainage lines		Small areas on map.
Shrubland Formations - Kwongan /Heath					
Mixed lateritic heathland	H	Sandy gravels. Gentle slopes to flat terrain	Upper slopes	15, 28, 70, 74, 89	<i>Banksia xylothemelia</i> P3 <i>Persoonia brevirhachis</i> P3 <i>Drosera grievei</i> P1
<i>Allocasuarina</i> shrubland	As	Sandy gravel	Upper to mid slopes	3, 11, 16, 78	<i>Banksia xylothemelia</i> P3 <i>Persoonia brevirhachis</i> P3

<i>Eremaea pauciflora</i> heathland	Er	Deep sandy soils pale then yellow over laterite, flat to gently sloping terrain	Mid to lower slopes well drained	21, 86	<i>Grevillea newbeyi</i> P3
Mixed sandy heathland	Hs	Sandy soils	Lower slopes	36	
Shrubland Formations					
Isolated <i>Eucalyptus loxophleba</i> subsp. <i>gratia</i> over shrubland	Elox	Gravelly sands and loams adjacent to granite. Flat to gentle slope	Mid to upper slopes associated with granite	8, 87, 88, 94	
<i>Melaleuca</i> shrubland	M	Clay, poorly drained	Lower slopes, valley floor	30, 32, 35, 52, 59, 67, 91	
	Md degraded	Clay, poorly drained, prone to waterlogging	Lower slopes, valley floor	37, 40, 51	
<i>Duma horrida</i> subsp. <i>abdita</i> shrubland	Dh	Silt and clay	Lakebed, valley floor	34	<i>Duma horrida</i> subsp. <i>abdita</i> T
<i>Wilsonia</i> isolated shrubs	W	Silt and clay, poorly drained	Closed depressions, valley floor	68, 81, 83	
Samphire (<i>Tecticornia</i>) shrubland	Te	Clay soils, possibly with gypsum, poorly drained	Salt lake, lakebed	22, 24, 25, 31, 39, 43, 46, 47, 48, 55, 92	? <i>Frankenia</i> sp. southern gypsum P3
Granite Complex					
Shrubland	Gs	Shallow sandy loam over granite	Granite outcrop	5, 20	
<i>Allocasuarina campestris</i> shrubland	Ac	Sandy loam	Granite outcrop	9, 19	
Herbland	Gh	Shallow sandy loam over granite	Granite outcrop	6	

Releve, Taxa, Presence
Group average

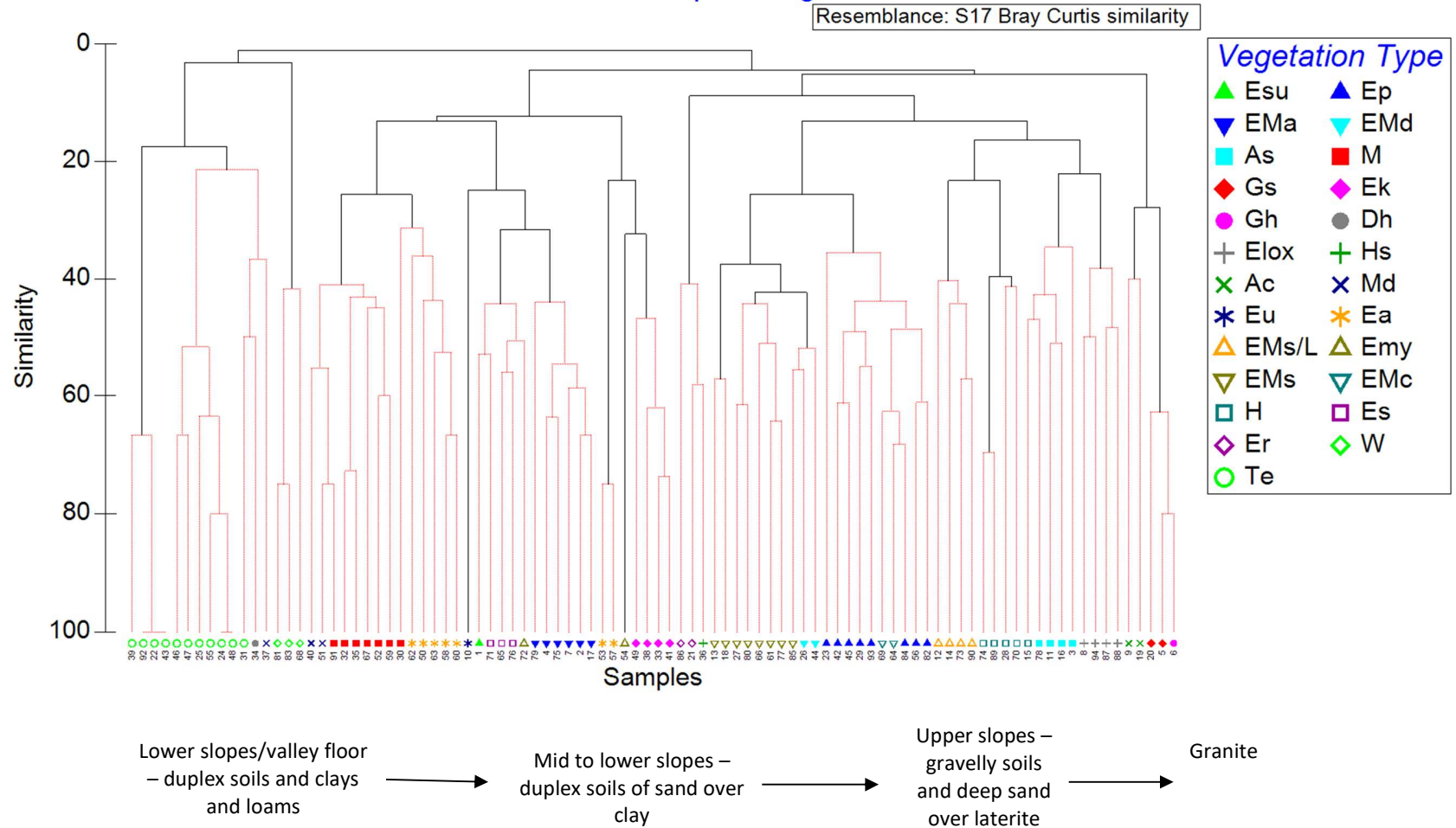


Figure 4: Dendrogram of the releve group classification

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 in the Lake Bryde Recovery Catchment.

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 ~ 56 km South East of Lakeland Nature Reserve 29024. 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 ~ 39 km SW of Lakeland Nature Reserve 29024.

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.

Woodlands of *Eucalyptus salmonophloia*, *Eucalyptus kondininensis* and *Eucalyptus alipes* mapped during the survey meet key diagnostic characteristics for the Critically Endangered - Eucalypt Woodlands of the WA Wheatbelt. The areas of *Eucalyptus urna* and *Eucalyptus salubris* woodlands in Reserve 29025 are too small to meet the size criteria for this endangered community and only one of two small areas of *Eucalyptus myriadena* woodland meet the criteria of over 2 ha of woodland in pristine to good condition.

The key diagnostic characteristics for the Critically Endangered - Eucalypt Woodlands of the WA Wheatbelt are outlined below.

- 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 5 is taken from the Approved Conservation Advice for Eucalypt Woodlands of the Western Australian Wheatbelt (Nov 2015).

Table 5: Minimum condition for patches of the WA Wheatbelt Woodlands ecological community. For each category, both the weed cover and mature tree presence criteria must apply plus one of either patch size or patch width, depending on whether the patch is a roadside remnant or not.

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

4.0 FLORA SURVEY

4.1 Taxonomy

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

4.2 Flora of the Study Area.

A total of 396 plant species are recorded in Appendix 8 as occurring in the study area, 13 are introduced or weed species. 338 species were recorded during the present survey. A further 58 species are included from the Mattiske transect survey (2010), Mattiske (1999), Rick (2009), DBCA personnel and SAP sites (Gibson et al 2004).

Due to time and seasonal constraints, Appendix 8 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 area. 2018 was a particularly dry year and the flora survey was limited because of a lack of flowering and fruiting material and the absence of some annuals and geophytes.

The families with the largest representatives of genera and species during the present survey are listed in Table 6. The families Myrtaceae, Proteaceae, Asteraceae, Fabaceae, Chenopodiaceae, Ericaceae and Poaceae 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 Nature Reserves and species rich heath areas on laterite include high numbers of Proteaceae.

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

Family	No. species	No. Genera	Weeds
Myrtaceae (<i>Melaleuca, Eucalyptus</i>)	87	17	0
Proteaceae (<i>Banksias, Grevilleas</i> etc)	40	8	0
Asteraceae (daisies)	38	29	5
Fabaceae (<i>Acacia, peas</i>)	32	11	0
Chenopodiaceae	22	8	0
Poaceae	21	13	5
Ericaceae	15	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 9.

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, East Lake Bryde and part of a lake in Nature Reserve 29024. The TEC is monitored by DBCA personnel.





Duma horrida subsp. *abdita*



4.3.2 Priority Flora

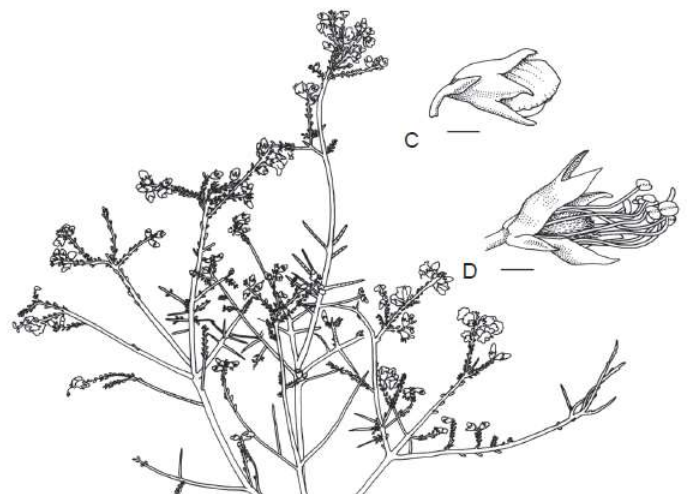

9 priority species were recorded during the present survey. Two of these species grow on lateritic soils and are present in both Nature Reserves 29024 and 29025. The other 7 species were recorded in Lakeland NR 29024 only. Information on the localities at which these species were recorded, growth form and habitat information is presented in Table 7. The coordinates of the priority flora populations are available in Appendix 10. A further 6 priority plants have been recorded from Lakeland NR 29024 but were not recorded in the 2018 survey. These species were recorded by Mattiske (1999), Rick (2009), Mattiske (2010) and by DBCA personnel and are detailed in Table 8.



One of these species has been previously identified by Mattiske (2010) as *Frankenia sessilis*. This species is probably *Frankenia* sp. southern gypsum P3. *Frankenia sessilis* is confined to the south coast (Mike Lyons pers comm.) and *Frankenia* sp. southern gypsum has previously been identified as *Frankenia sessilis* and *Frankenia* aff. *sessilis*.

Table 7: Priority flora recorded in Lakeland Nature Reserves 29024 and 29025

Taxa	Cons code	Location	Habitat	Growth form	Photograph
<i>Drosera grieviei</i>	P1	NR29024 Northern firebreak WP 280	Gravelly soils, edge of firebreak	Fibrous-rooted perennial, herb, to 0.03 m high. Flowers white, Sep.	
<i>Astroloma chloranthum</i>	P2	NR29024 Releve 42 Releve 45 Releve 66 Releve 82 Releve 85 WP 455 Scattered throughout mallee vegetation	<i>Eucalyptus perangusta</i> over shrubland Mallee over <i>Melaleuca scalena</i> <i>Eucalyptus salmonophloia</i> woodland Duplex sandy soils over clay. Laterite in places	Low spreading, dome shaped shrub to 15cm, flowers green in May to July	

Taxa	Cons code	Location	Habitat	Growth form	Photograph
<i>Dampiera orchardii</i>	P2	NR29024 Recorded on transects LK1 Mattiske (2010) Releve 23 Releve 29 Releve 42 Releve 45	<i>Eucalyptus perangusta</i> over shrubland Duplex sandy soils over clay	Erect perennial, herb, 0.2-0.4 m high. Flowers mauve	
<i>Banksia xylothemelia</i>	P3	NR29024 NR29025 Releve 3 Releve 11 Releve 15 Releve 28 Releve 70 Releve 74 WP 878 Releve 89	Mixed Heathland (laterite) <i>Allocasuarina</i> shrubland (As) Common on lateritic soils	Sprawling, lignotuberous shrub to 1m, flowers yellow in September to October	

Taxa	Cons code	Location	Habitat	Growth form	Photograph
<i>Eutaxia nanophylla</i>	P3	NR29024 Releve 77 WP 875	Mallee over <i>Melaleuca scalena</i> Duplex sandy soils over clay	Straggly, rounded shrub, to 0.35 m high. Flowers yellow & orange & red, Oct to Nov	
<i>Grevillea newbeyi</i>	P3	NR29024 Releve 21 Releve 23 WP 430 Releve 45 Releve 86	<i>Eremaea pauciflora</i> shrubland <i>Eucalyptus perangusta</i> over shrubland Sandy gravelly soils	Bushy, intricately branched, spreading shrub to 1.5m, flowers pink, red, cream in January, June, September to November	

Taxa	Cons code	Location	Habitat	Growth form	Photograph
<i>Melaleuca sculponeata</i>	P3	NR29024 WP 657 WP 659	Mallee over <i>Melaleuca scalena</i> Duplex soils sands over clay	Rounded shrub , flowers white in October	
<i>Persoonia brevirhachis</i>	P3	NR29024 NR29025 WP 13 Releve 28 Releve 70 Releve 74 Releve 78 WP 799 WP 878 Releve 89	Mixed heathland (laterite) <i>Allocasuarina</i> shrubland (As) Common on lateritic soils	Erect, often spreading shrub, 0.3-2 m high. Flowers yellow, Aug to Oct.	






Taxa	Cons code	Location	Habitat	Growth form	Photograph
<i>Spyridium mucronatum</i> subsp. <i>recurvum</i>	P3	NR29024 WP 218 Releve 26 Releve 61 Releve 64 Releve 66 Releve 69 Releve 84 Releve 85	<i>Eucalyptus perangusta</i> over shrubland Mallee over <i>Melaleuca depauperata</i> Mallee over <i>Melaleuca scalena</i> Mallee over <i>Melaleuca carrii</i>	Erect or spreading shrub, 0.15-0.6 m high. Flowers white-cream-yellow, Oct to Nov.	

Table 8: Priority Flora recorded during previous surveys in Lakeland Nature Reserve 29024

Taxa	Cons code	Location	Habitat and Growth Form	Photograph
<i>Frankenia drummondii</i>	P3	Rick (2009)	Prostrate shrub found in sandy soils at the edge of salt lakes and has been recorded growing in gypsiferous soils. Flowers are usually white, occasionally pink.	

Taxa	Cons code	Location	Habitat and Growth Form	Photograph
<p>?<i>Frankenia</i> sp. southern gypsum (M.N. Lyons 2864)</p>	<p>P3</p>	<p>Mattiske (2010) LK1, LK3 and LK4 Gypsum was recorded at all these lakes during the 2018 survey</p>	<p><i>Frankenia</i> sp. southern gypsum has been previously identified as <i>Frankenia sessilis</i> and <i>Frankenia</i> aff. <i>sessilis</i>. <i>Frankenia sessilis</i> is a species now believed to be confined to the south coast (Mike Lyons pers comm.). Prostrate shrub with white flowers. A possible gypsophile ie mostly restricted to gypsum soils.</p>	

Taxa	Cons code	Location	Habitat and Growth Form	Photograph
<i>Haegiela tatei</i>	P4	<p>Mattiske (2010)</p> <p><i>Haegiela tatei</i> P4 was recorded on transect LK2 in 2005 but was not relocated in the 2009 Mattiske survey.</p>	<p>Ascending to erect annual herb, 2 to 8cm high with white and yellow flowers. This species flowers from August to November and has been recorded in clay, sandy loam and gypsum soils in saline habitats.</p>	

Taxa	Cons code	Location	Habitat and Growth Form	Photograph
<i>Hydrocotyle muriculata</i>	P1	Collected by DBCA personnel at LK5 in 2013	Low spreading to prostrate annual, herb. Fl. yellow, Sep. Margins of salt lakes & flats.	
<i>Gnephosis multiflora</i>	P3	Recorded by Mattiske in 2005 and Rick in 2009 before this species was classified as priority flora	Erect annual, herb, 0.025-0.04 m high. Fl. yellow, Nov. Sandy saline soils. River flats, sandy rises.	
<i>Coleanthera coelophylla</i>	P1	Recorded by Mattiske in 1999 in plant communities 1.2, 1.3, 2.5. Only <i>Coleanthera myrtoides</i> was	Erect shrub, 0.3-0.6 m high. Fl. pink/white, Sep to Nov. Gravelly sandy soils. Collected in the Kent Shire from Nyabing Also collected from Tarin Rock, Kukerin, Borden, Gibson's Soak N	

Taxa	Cons code	Location	Habitat and Growth Form	Photograph
		recorded in the present survey	of Esperance	

4.3.3 Other Flora of significance

Grevillea acacioides was recorded in Lakeland Nature Reserve 29025 in the *Allocasuarina* shrubland (As). This species has not been previously recorded in the Kent Shire and is a range extension (Flora Base).



Grevillea acacioides

5.0 WETLANDS

The Department of Biodiversity, Conservation and Attractions has identified 35 wetlands in Lakeland Nature Reserve 29024. Photographs and field notes recorded for these wetlands are presented in Appendix 11. Figure 5 shows the location of these wetlands in the reserve. A brief assessment of the wetlands is summarized in Table 9. Soil testing was not carried out as part of the present survey and therefore the presence of gypsum needs to be confirmed by further soil analysis.

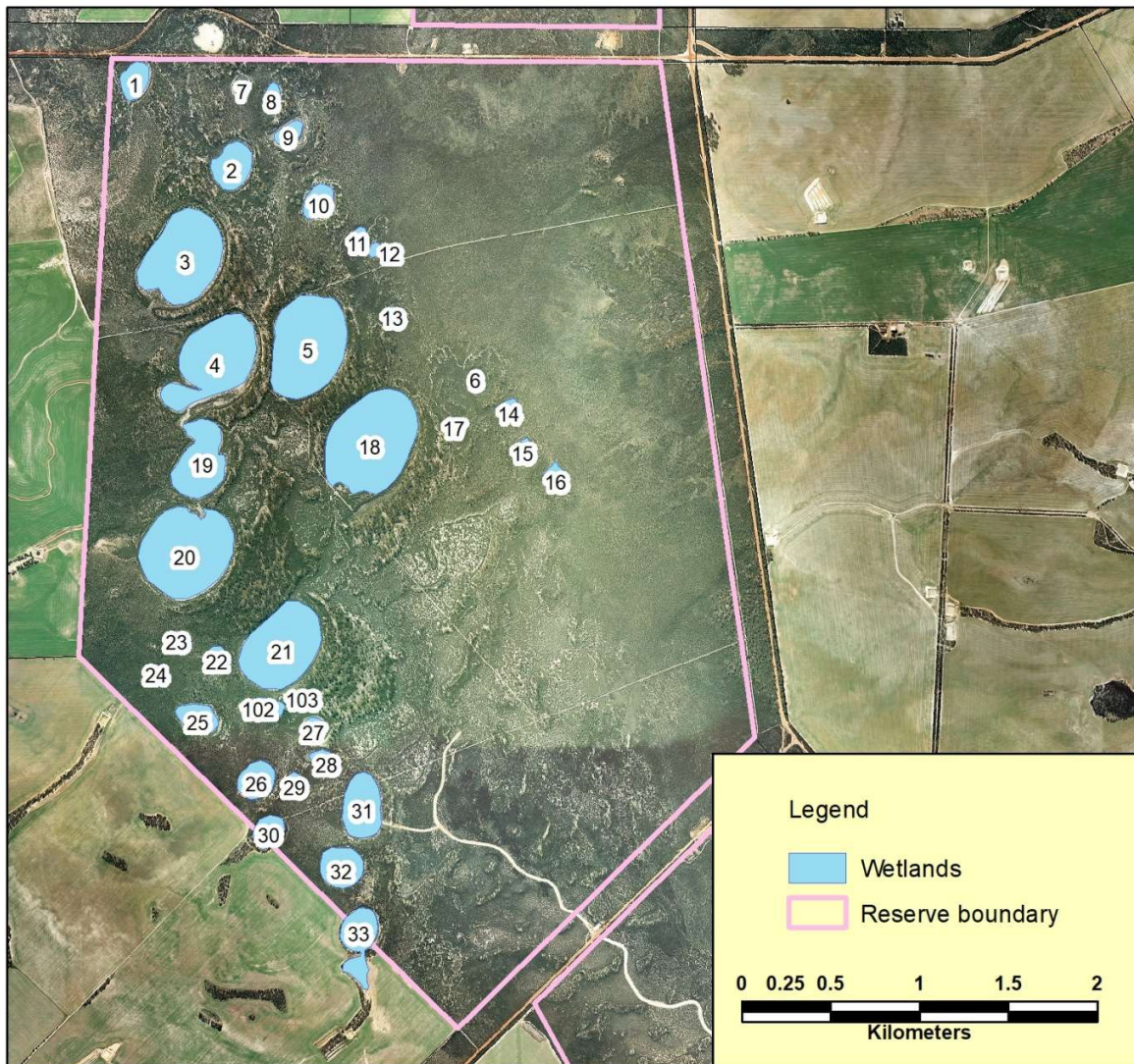
Table 9: Wetlands in Lakeland Nature Reserve 29024

Wetland No.	Description	Vegetation	Condition	WP/Releve/ vegetation map unit
1	Salt lake, clay soils	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% covering lake	Excellent to very good	179 Te 177 M
2	Salt lake, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubs scattered	Good	196 Te
3	Salt lake, gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubs 10-30% covering lake	Excellent to very good	211 M Releve 22 Te
4 LG5 Lake 1 PI22	Salt lake, ?gypsum over clay	<i>Melaleuca</i> shrubland adjacent <i>Tecticornia</i> shrubs 2-10% south <i>Tecticornia</i> shrubs 10-30% covering main lake. Dead <i>Melaleuca</i> shrubs southern section	Excellent to very good	375 Te 377 Te
5 Lake 2	Salt lake, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland edge with <i>Wilsonia humilis</i> <i>Duma horrida</i> shrubland south east corner	Excellent to very good	Releve 31 Te Releve 32 M Releve 34 Dh
6	Closed depression, clay	<i>Melaleuca</i> shrubland edge Shrubs, annuals edge including <i>Wilsonia</i> species. Dead shrubs middle	Excellent to very good	Releve 83 W 833 M
7	Clay pan, salt, gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% covering lake	Excellent to very good	Releve 24 Te 240 M
8	Clay pan, salt, gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% covering lake	Excellent to very good	245 Te 243 M 246 M regeneration
9	Clay pan, bare, gypsum edge, clay,	<i>Melaleuca</i> shrubland adjacent <i>Tecticornia</i> shrubland edge lake dead shrubs Bare clay pan area	Good to degraded – lakebed. Excellent to very good M adjacent	252 bare lakebed 251 Te edge dead shrubs 254 M
10	Clay pan, gypsum, clay	<i>Melaleuca</i> shrubland edge regen with scattered <i>Eucalyptus kondininensis</i> regen. <i>Tecticornia</i> shrubland 30-70% covering lake	Excellent to very good	259 M regeneration 260 Te edge Releve 25 Te 262 M edge some regen with trees
11	Closed depression, clay	? <i>Melaleuca</i> shrubland		Not visited in field M?
12	Closed depression, clay	<i>Melaleuca</i> shrubland edge Scattered <i>Wilsonia rotundifolia</i> on lakebed	Excellent to very good	813 M Releve 81 W
13	Closed depression, clay	<i>Eucalyptus kondininensis</i>	Excellent	817 Ek
14	Closed depression	? <i>Melaleuca</i> shrubland		M? not visited in field
15	Clay pan, gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% covering lake	Excellent to very good	681 Te 679 M 682 M
16	Closed depression, clay	<i>Melaleuca</i> shrubland edge <i>Wilsonia rotundifolia</i> covering lake	Excellent to very good	Releve 68 W
17	Closed depression	? <i>Melaleuca</i> shrubland		M? not visited in

Wetland No.	Description	Vegetation	Condition	WP/Releve/ vegetation map unit
				field
18/LK5	Salt lake, gypsum, clay	<i>Tecticornia</i> shrubland 30-70% edge Area of scattered <i>Tecticornia</i> shrubs Dead <i>Tecticornia</i> shrubs	Excellent to degraded	332 Te 334 Te dead 335 M dead Releve 35 M some dead shrubs
19/LK4	Salt lake, ?gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland with dead <i>Melaleuca</i> shrubs edge <i>Tecticornia</i> shrubland 30-70% some dead shrubs covering lake	Very good to degraded	369 Te dead <i>Melaleuca</i> shrubs (Md) Releve 39 Te
20	Salt lake, gypsum over clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% covering lake	Very Good	417 M 419 M Releve 92 Te 933, 936 M
21/LK1	Salt lake, clay , bare area 440 gypsum	<i>Melaleuca</i> shrubland edge Bare lakebed <i>Tecticornia</i> shrubland 10-30% gypsum south east corner	Degraded to very good – some regeneration	436 M 438 M 439 M 440 Te 441 M
22	Closed depression, clay, salt,	<i>Melaleuca</i> shrubland <i>Tecticornia</i> shrubland 30-70% dead shrubs	Degraded Md Fringing M Excellent	431 M 432 M regeneration Releve 43 Te dead <i>Melaleuca</i> shrubs (Md)
23	Closed depression, clay	<i>Melaleuca</i> shrubland regeneration	Excellent	427 M regeneration
24	Closed depression , clay, poorly drained	Mallee and trees <i>Eucalyptus kondininensis</i> scattered. Sparse <i>Melaleuca</i> shrubland	Very Good to excellent	460 M
25	Salt lake, gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% covering lake. Gypsum area south east M	Excellent to very good	464 M 465 Te 468 M
26	Salt lake, gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Melaleuca</i> shrubland regen. <i>Tecticornia</i> shrubland 30-70% covering lake some dead	Excellent to very good	498 Te 496 M 500 M
27/LK2	Salt lake, gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% covering lake	Excellent to very good	Releve 47 Te 480 M 483 M
28	Closed depression, gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% covering lake	Excellent to very good	486 M Releve 48 Te 489 M
29	Closed depression, gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% centre lake	Excellent to very good	491 M 493 Te 494 M
30	Closed depression, gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% some dead	Degraded, part farmland piles of sand and dead shrubs. Fringing vegetation very good condition	576 Te 574 M 577 M
31/LK3	Salt lake, clay,	<i>Melaleuca</i> shrubland edge	Degraded	549 M

Wetland No.	Description	Vegetation	Condition	WP/Releve/ vegetation map unit
	edge gypsum	bare , scattered dead shrubs. Area dead shrubs south	M back from edge of lake very good	551 Te dead shrubs 552 Md
32	Salt lake, thin layer gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% covering lake	Degraded areas – dead melaleuca shrubs Most very good	559 M Releve 55 Te 562 M
33	Salt lake, thin layer gypsum, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70% some dead shrubs	Part farmland, degraded. Some areas in very good condition	567 Te 566 M 582 M
102	Closed depression, clay pan, gypsum	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland 30-70%	Te western section very good M Excellent to very good. Dead shrubs edge	Releve 46 Te 474 edge channel 471 M 475 M
103	Closed depression, clay	<i>Melaleuca</i> shrubland edge <i>Tecticornia</i> shrubland	Te areas excellent to very good M very good – some dead trees	475 M 477 M

Figure 5: Wetlands in Lakeland Nature Reserve 29024



6.0 CONSERVATION SIGNIFICANCE

Lakeland Nature Reserves 29024 and 29025 have high conservation values. Some of these values are summarized below.

- The Reserves include a range of vegetation types from the heath communities on lateritic soils on the upper slopes, granite rock flora, extensive mallee communities, woodlands and shrublands on the lower slopes and valley floor.
- A relatively high diversity of vascular plant species occurs in the area with 396 plant species recorded in Appendix 6.
- The Declared Rare Flora *Duma horrida* subsp. *abdita* is present in NR 29024.
- Two priority species were recorded in Nature Reserve 29025 and 14 priority species have been recorded for Nature Reserve 29024 during the present and previous surveys.

- Lakeland Nature Reserve 29024 includes woodlands of *Eucalyptus salmonophloia*, *Eucalyptus kondininensis*, *Eucalyptus alipes* and one small area of *Eucalyptus myriadena* which meet key diagnostic characteristics for the Critically Endangered - Eucalypt Woodlands of the WA Wheatbelt.
- 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” is present in Nature Reserve 29024
- The reserves are an important part of the wildlife corridor connecting reserves and other remnant vegetation in the catchment. 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 8 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 Lakeland Nature Reserves. 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.

Figures from the nearest Bureau of Meteorology Station (Newdegate Research Station) indicate that 2018 was a dry year in the Recovery Catchment with an annual rainfall of 230.2mm. The average annual rainfall for the station is 370.0mm. The flora survey was therefore limited because of a lack of flowering and fruiting material and the absence of some annuals and geophytes.

Further quadrat work is needed to confirm the releve groups identified in the PRIMER analysis 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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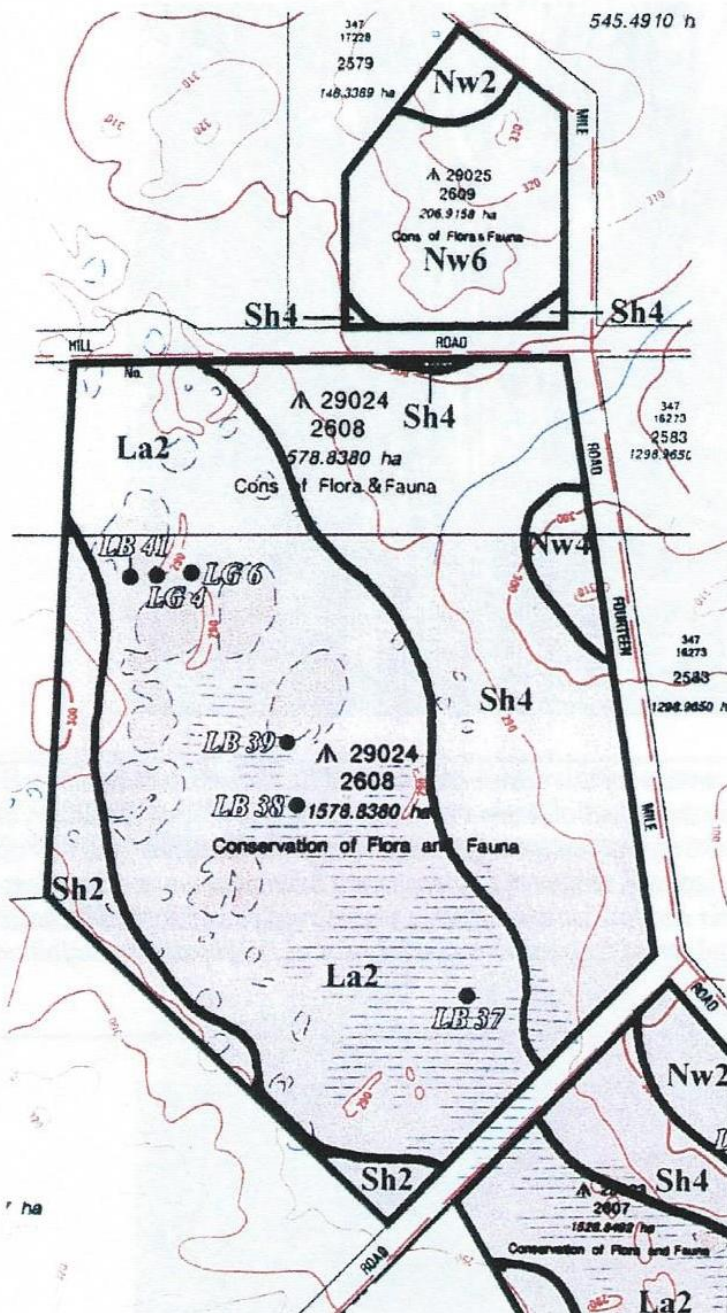
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Appendix 1
Soil Landscape Descriptions
(Ecoscape 2001)

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

Soil Landscape units covering Lakeland Nature Reserves 29025 and 29024 (Ecoscape 2001)



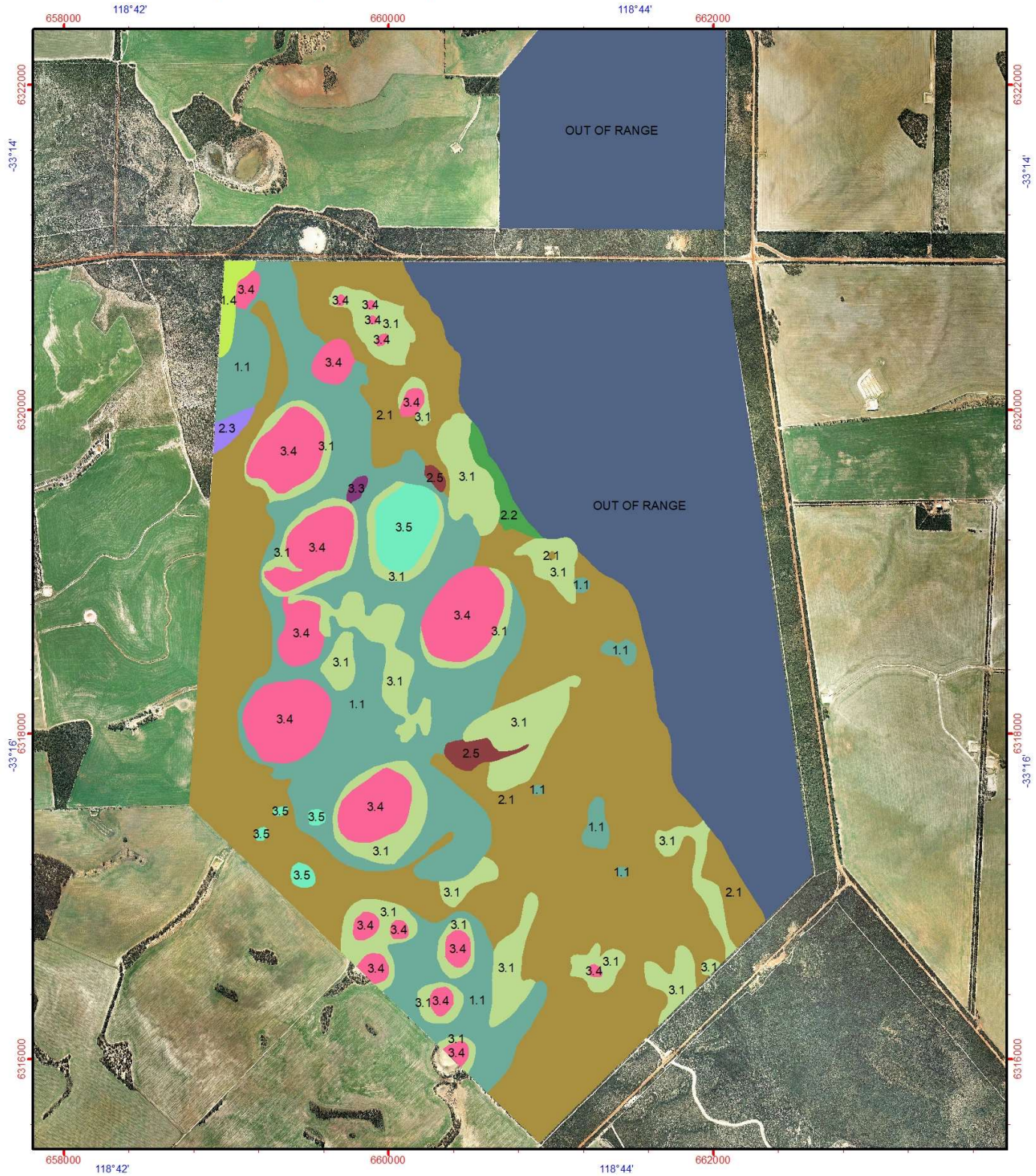
Appendix 1

Field Releve Sheet

Appendix 3

Mattiske (1999) Vegetation Map of Lakeland Nature Reserve 29023

Mattiske (1999) vegetation map of Lakeland Nature Reserve 29024 and 29025



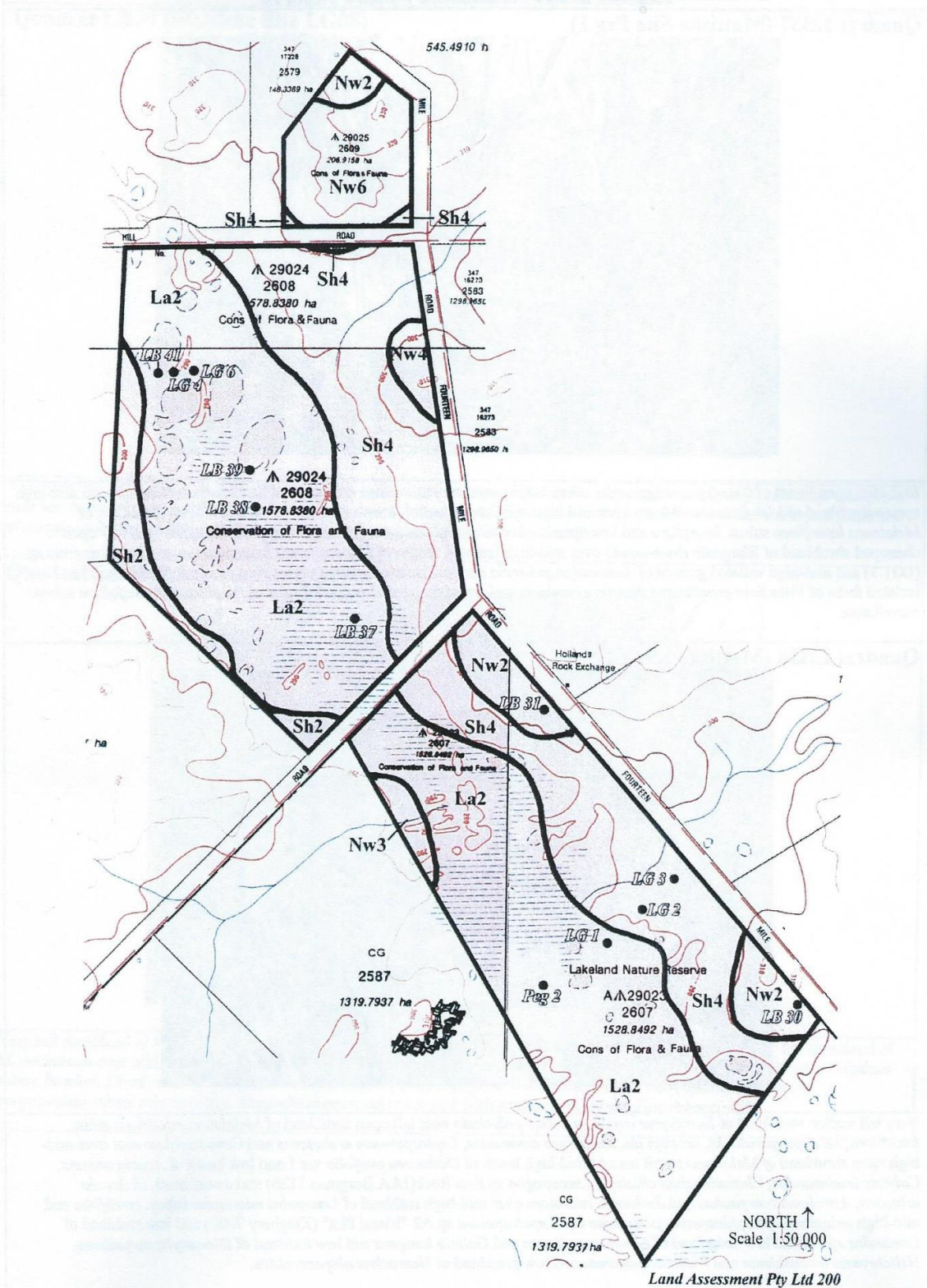
Legend

- 1.1 - Open Woodland of *Eucalyptus kondininensis*
- 1.4 - Very Open Woodland of *Eucalyptus flocktoniae* and *E. phenax*
- 2.1 - Open Tree Mallee of *Eucalyptus vegrendis*, *E. calycogona* var. *calycogona* and *E. occidentalis*
- 2.2 - Open Tree Mallee of *Eucalyptus vegrendis*, *E. hypoclamydes*, and *E. transcontinentalis*
- 2.3 - Very Open Tree Mallee of *Eucalyptus aporadica*, *E. incrassata* and *E. phenax*
- 2.5 - Dense Shrub Mallee of *Eucalyptus capillosa* subsp. *polyciads*
- 3.1 - Thicket of *Melaleuca adnais*, *M. helmatorum*, *M. lateriflora* and *M. uncinata*
- 3.3 - Open Scrub of *Acacia charmaeleon*, *A. saligna*, *Leptospermum erubescens*
- 3.4 - Dwarf Scrub D of *Halosarcia pergranulata*, *H. syncarpa*, *Tecticornia verrucosa*
- 3.5 - Open Dwarf Scrub D of *Halosarcia pergranulata*, *H. syncarpa* and *H. indica*
- OUT OF RANGE



Appendix 4
Ecoscape (2001)
Quadrat Descriptions

Reserves 29023, 29024 and 29025 – Lakeland Nature Reserve



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

Reserve 29024 – Lakeland Nature Reserve

Quadrat LB39 (Matisse Site LG08)



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

Quadrat LB41 (Matisse Site LG05)



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

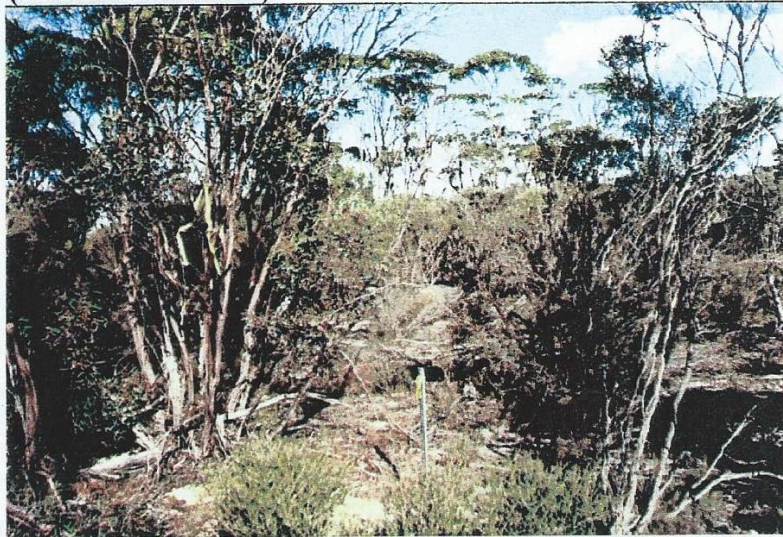
Reserve 29024 – Lakeland Nature Reserve

Quadrat LB37 (Mattiske Site Peg 1)



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

Quadrat LB38 (Mattiske Site LG07)



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

Reserve 29024 – Lakeland Nature Reserve

Quadrat LG04



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

Quadrat LG06



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

Appendix 5

Rick (2009) Rare Flora Survey



Rare Flora Survey

Lakeland Nature Reserve 29024

Stage 4b2 Access Track

**BOTANICAL CONSULTANTS
REPORT
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2009

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1.0 Introduction

The aim of this project was to survey an area 300m long by 10m wide for the presence of rare flora. This area is to be cleared in March 2009 and is situated in the Lakeland Nature Reserve 29024. The cleared area will be used as an access track (stage 4b2) to the waterway construction and is additional to the original proposal and vegetation surveys already undertaken. The original proposal was to work out of the termination lake which is now full of water. The location of the proposed track is shown in Figures 1 and 2.

The report includes

- A brief description of the vegetation and flora on the proposed access track
- Information on rare flora found
- A rare flora evaluation sheet for the application to clear
- Survey limitations

2.0 Method

The ground survey of the flora of the study area was carried out on the 25th February 2009. The work included descriptions of the vegetation and flora in the study area and the collection of plant voucher specimens where needed for accuracy of plant identification.

Vegetation association descriptions were based on the classification system devised by Muir (1977) which was specifically designed for describing wheatbelt vegetation (see Table 1). 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 2).

The vegetation and plant species of interest were mapped using a GPS. Specimens of plant species encountered were collected and identified using keys and by comparison with specimens at the Western Australian Herbarium. Experts involved in revising particular genera were consulted wherever possible to ensure accuracy with identification.

Figure 1 Location of the study area – Map1.

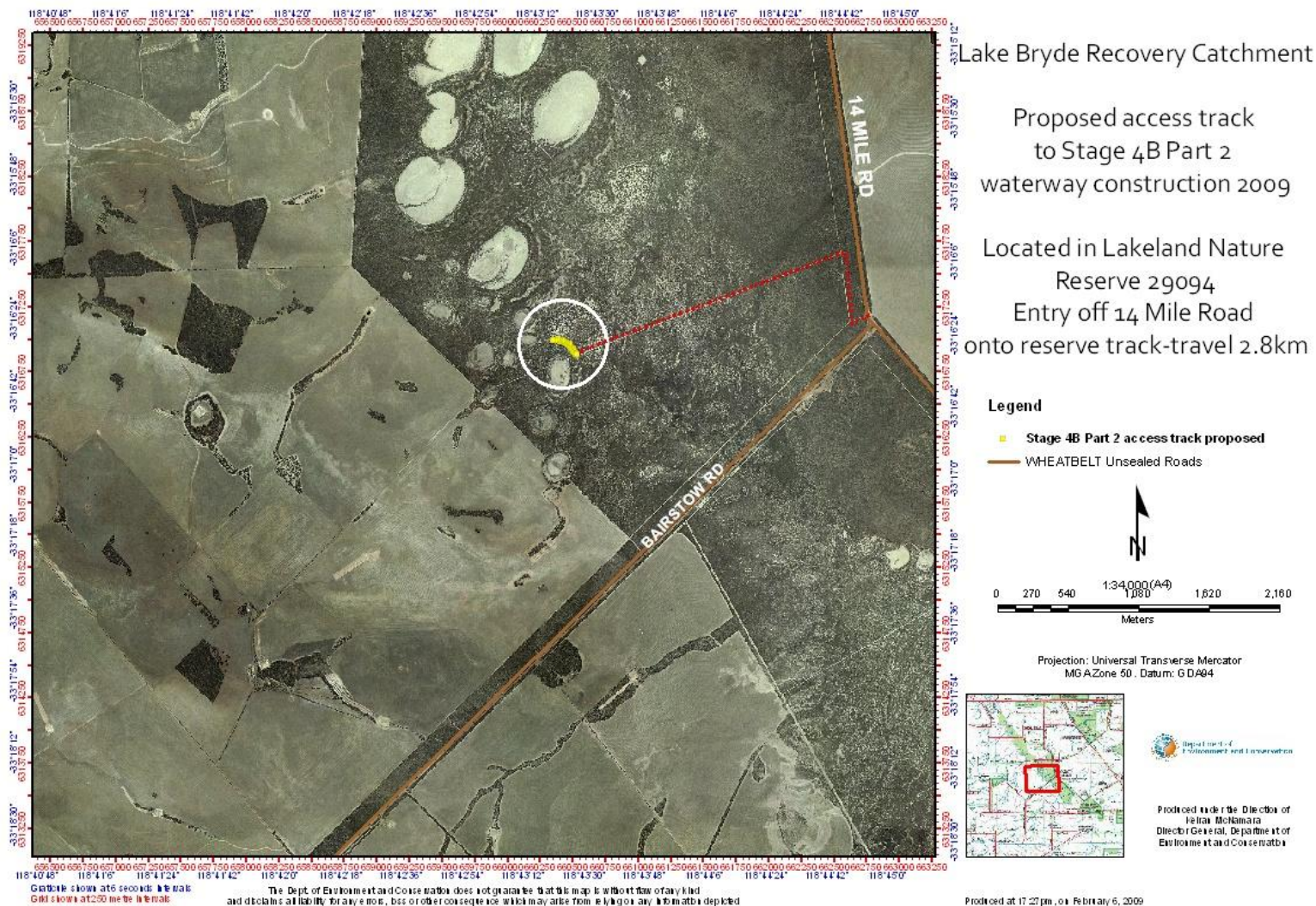


Figure 2 Location of the study area - Map 2

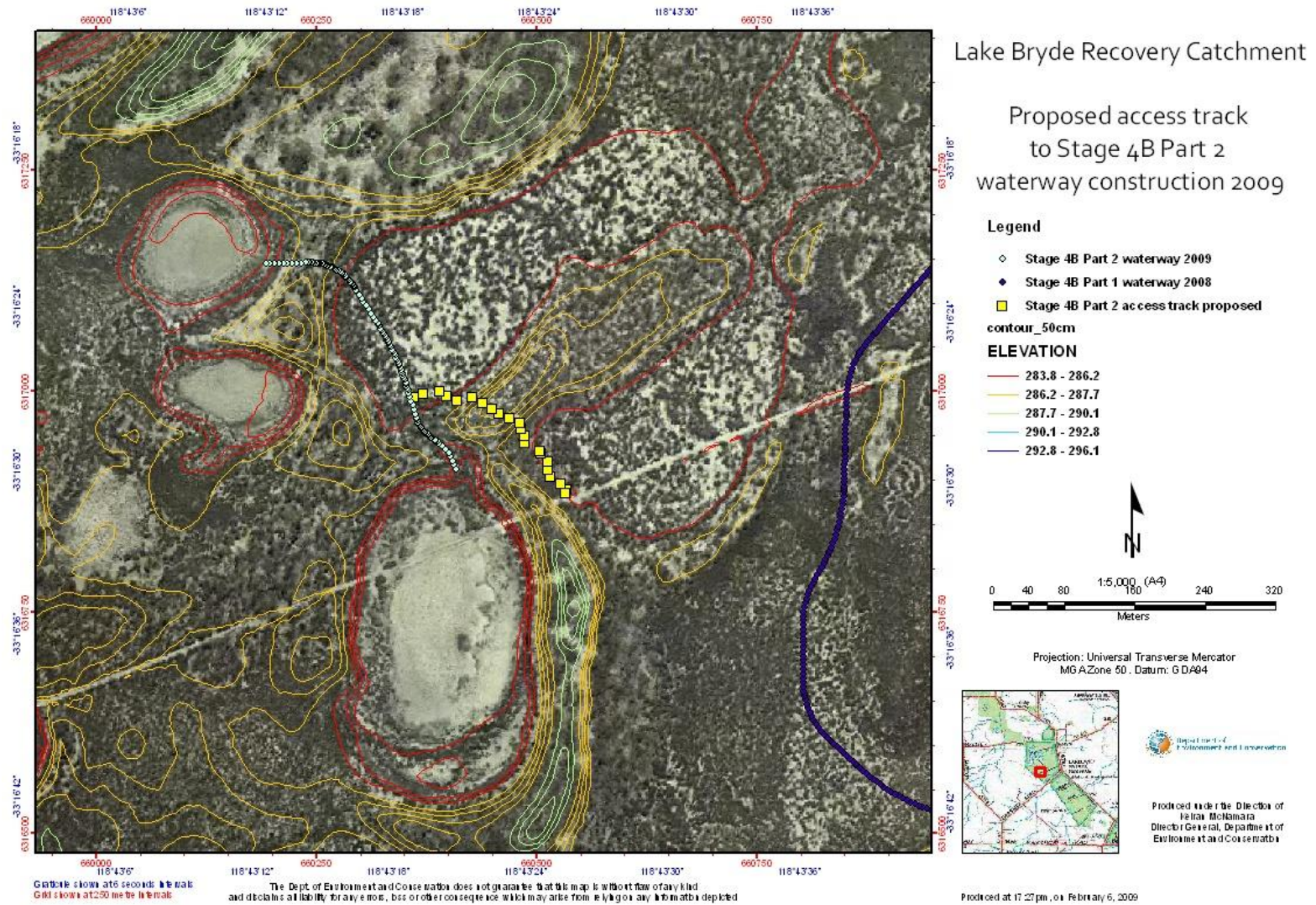


TABLE 1 - MUIR SYSTEM OF VEGETATION CLASSIFICATION

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

Table 2 Vegetation Condition Scale

Table 2 : 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.

3.0 Results

3.1 Previous Surveys

Table 3 includes a list of declared rare and priority species previously recorded for the area. Information was included from the Threatened Flora Data Base (DEFL), the WA Herbarium Database (waherb) and a Nature Map Species List for Lakeland NR with a 20km buffer created by Peter Lacey 5/02/2009. These species have been classified by the Department of Environment and Conservation into categories which reflect their conservation status. These categories are listed below:

R: Declared Rare Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

X: Declared Rare Flora - Presumed Extinct Flora

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which known wild populations have been destroyed more recently, and have been gazetted as such.

1: Priority One - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, which are under threat either due to small population size, or being on lands under immediate threat, eg. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, eg. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

2: Priority Two - Poorly Known Taxa

Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (ie. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

3: Priority Three - Poorly Known Taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.

4: Priority Four - Rare Taxa

Taxa which are considered to have been adequately surveyed and which whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

Table 3 Rare Flora recorded for the study area

GENUS	SPECIES	RANK	INFRASP	CONSCODE
<i>Acacia</i>	<i>auratiflora</i>			R
<i>Acacia</i>	<i>drewiana</i>	subsp.	<i>minor</i>	P2
<i>Acacia</i>	<i>lanuginophylla</i>			R
<i>Acacia</i>	<i>mutabilis</i>	subsp.	<i>stipulifera</i>	P1
<i>Acacia</i>	<i>obesa</i>			P3
<i>Acacia</i>	<i>singula</i>			P3
<i>Acacia</i>	<i>undosa</i>			P3
<i>Angianthus</i>	<i>halophilus</i>			P3
<i>Astroloma</i>	<i>recurvum</i>			P3
<i>Banksia</i>	<i>erythrocephala</i>	var.	<i>inopinata</i>	P2
<i>Banksia</i>	<i>idiogenes</i>			P2

<i>Banksia</i>	<i>pteridifolia</i>	subsp.	<i>inretita</i>	P1
<i>Banksia</i>	<i>rufa</i>	subsp.	<i>chelomacarpa</i>	P3
<i>Banksia</i>	<i>rufa</i>	subsp.	<i>flavescens</i>	P3
<i>Banksia</i>	<i>xylothemelia</i>			P3
<i>Bentleya</i>	<i>spinescens</i>			P4
<i>Blennospora</i>	<i>phlegmatocarpa</i>			P3
<i>Bossiaea</i>	<i>atrata</i>			P3
<i>Brachyloma</i>	<i>nguba</i>			P1
<i>Calectasia</i>	<i>obtusa</i>			P3
<i>Calectasia</i>	<i>pignattiana</i>			R
<i>Dampiera</i>	<i>orchardii</i>			P2
<i>Daviesia</i>	<i>elongata</i>	subsp.	<i>implexa</i>	P3
<i>Daviesia</i>	<i>tortuosa</i>			P3
<i>Daviesia</i>	<i>uncinata</i>			P3
<i>Dicrastylis</i>	<i>corymbosa</i>			P3
<i>Dillwynia</i>	<i>acerosa</i>			P1
<i>Drosera</i>	<i>grievei</i>			P1
<i>Eucalyptus</i>	<i>mimica</i>	subsp.	<i>mimica</i>	P3
<i>Frankenia</i>	<i>drummondii</i>			P3
<i>Gastrolobium</i>	<i>cruciatum</i>			P3
<i>Gastrolobium</i>	<i>densifolium</i>			P4
<i>Gastrolobium</i>	<i>spectabile</i>			P3
<i>Grevillea</i>	<i>asteriscosa</i>			P4
<i>Grevillea</i>	<i>involucrata</i>			R
<i>Grevillea</i>	<i>newbeyi</i>			P3
<i>Grevillea</i>	<i>prostrata</i>			P4
<i>Guichenotia</i>	<i>asteriskos</i>			P2
<i>Gyrostemon</i>	<i>sessilis</i>			P3
<i>Haegiela</i>	<i>tatei</i>			P2
<i>Hydrocotyle</i>	<i>muriculata</i>			P1
<i>Leucopogon</i>	<i>cymbiformis</i>			P2
<i>Microseris</i>	<i>scapigera</i>			P3
<i>Olearia</i>	<i>laciniifolia</i>			P2
<i>Persoonia</i>	<i>brevirhachis</i>			P3
<i>Phebalium</i>	<i>drummondii</i>			P3
<i>Phlegmatospermum</i>	<i>drummondii</i>			P3
<i>Rinzia</i>	<i>affinis</i>			P4
<i>Stylidium</i>	<i>pseudohirsutum</i>			P3
<i>Stylidium</i>	<i>thylax</i>			P2
<i>Synaphea</i>	<i>cervifolia</i>			P2
<i>Synaphea</i>	<i>flexuosa</i>			P2
<i>Synaphea</i>	<i>parviflora</i>			P2
<i>Synaphea</i>	<i>tripartita</i>			P2
<i>Thysanotus</i>	<i>acerosifolius</i>			P2
<i>Thysanotus</i>	<i>sabulosus</i>			P1
<i>Trymalium</i>	<i>myrtillus</i>	subsp.	<i>pungens</i>	P1
<i>Verticordia</i>	<i>integra</i>			P4

3.2 Current Survey

A description of the flora and vegetation of the study area is available in Appendix 1 and a plant species list is provided in Appendix 2. Plant 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 (The WA Herbarium data base).

The condition of the vegetation was generally good for this time of year (February survey) due to the unusual amount of late spring – summer rain with records up to 200mm in the catchment. The vegetation in some of the low lying areas has been effected by previous water logging.

No Threatened Ecological Communities were recorded during the survey and out of a total of 40 plant species listed in Appendix 2 only one priority species *Frankenia drummondii* P3 was found to occur in the area to be cleared.

3.2.1 *Frankenia drummondii* P3

Frankenia drummondii is a prostrate spreading shrub. The plant found during the present survey was in poor condition and was not in flower. The identification of this species will need to be confirmed when flowering material becomes available however the vegetative material collected was a good match with the specimen of *Frankenia drummondii* present in the reference collection at the WA Herbarium. The plant was recorded in *Eucalyptus suggrandis* Open Mallee at S33° 16.4500' E118° 43.3393' WGS 84.

3.3 Survey Limitations

The survey work was limited because of the following seasonal and time constraints.

- Fieldwork which covers only one day of the year can not be expected to exclude the possibility that there are still rare flora in the site surveyed that have not as yet been located.
- The best time for survey is during the spring, 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.

Searches carried out at other times of the year, especially early spring may find other populations of rare flora and increase the plant species list for the area. Table 4 lists rare plants recorded for the Lakelands NR and surrounds which occur in similar habitat to the area to be cleared and are annuals or inconspicuous when not in flower. These species would therefore be the most difficult to find and may have been missed during the present survey. It should be noted however that the survey did find 5 species of small annual asteraceae. Although these plants had finished flowering enough material was still available for identifications to be made.

Table 4 Rare Flora from similar habitats

GENUS	SPECIES	CONSCODE	DESCRIPTION	SITE
<i>Angianthus</i>	<i>halophilus</i>	P3	Small annual herb	Margins of alkaline basin
<i>Blennospora</i>	<i>phlegmatocarpa</i>	P3	Erect annual herb 0.02-0.05m. Flowers Sep-Oct	Saline basin. Margins of Lake Grace and surrounding vegetation.
<i>Haegiela</i>	<i>tatei</i>	P2	Ascending to erect annual herb 0.02-0.08m. Flowers Aug-Nov	Salinisation. Dune at edge of salt lake. Soil: Deep pale orange clay.
<i>Hydrocotyle</i>	<i>muriculata</i>	P1	Low spreading to prostrate annual herb. Flowers Sep	White sandy clay over clay. Growing on margin of salt lake. Light brown clay-loam, flat terrain, raised lake margin.
<i>Microseris</i>	<i>scapigera</i>	P3	Erect tuberous, perennial herb; 0.15-0.8m: summer dormant	Topography: Dune at edge of salt lake. Soil: Deep pale orange clay. Slopes above salt lake. White sandy clay over clay.
<i>Phlegmatospermum</i>	<i>drummondii</i>	P3	Erect annual herb to 0.3m. Flowers Aug-Sep	Red clay and sand

3.0 Acknowledgements

Access to the WA herbarium collections was essential for carrying out the project and is greatly appreciated. Thank you to Natalie Nicholson and Peter Lacey for plant species lists and information supplied.

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Appendix 1

Vegetation and Flora

Vegetation *Melaleuca lateriflora* Scrub

Soils and Topography: Low Lying area. Shallow sandy loam surface
soil over clay. Saline

GPS (WGS 84): S33° 16.4491' E118° 43.3149' to S33° 16.4500' E118° 43.3393'

Diagnosis (Muir description): Scrub over Dwarf Scrub D

Vegetation condition Very Good. ~50% shrubs appear dead probably due to
past water logging

Species List

Melaleuca lateriflora

Halosarcia pergranulata

Disphyma crassifolium

Wilsonia rotundifolia



Photograph 1

Vegetation *Eucalyptus suggrandis* Open Shrub Mallee

Soils and Topography: Sandy rise adjacent to drainage channel. Sandy soils

GPS (WGS 84) S33° 16.4500' E118° 43.3393' to S33° 16.4531' E118° 43.3599'

Diagnosis (Muir description): Open Shrub Mallee over Open Scrub over Scrub B (patch only) over Dwarf Scrub D over Open Herbs (scattered grasses and sedge)

Vegetation condition: Excellent. Some dead shrubs, weeds non-aggressive species

Species List:

Eucalyptus suggrandis subsp. *promiscua*
Melaleuca lateriflora
Melaleuca hamata
Melaleuca eleuterostachya
Melaleuca carrii
Rhagodia drummondii
Halosarcia pergranulata
Threlkeldia diffusa
Disphyma crassifolium
**Mesembryanthemum nodiflorum*
Lobelia gibbosa

***Frankenia drummondii* P3**
Gnephosis multiflora
Brachycome pusilla
Dianella revoluta
Austrostipa ?hemipogon
Austrostipa species
**Ursinia anthemoides*
Podolepis capillaris
Lomandra effusa
**Pentaschistis airoides*
Lepidosperma species



Photograph 2

Vegetation *Eucalyptus suggrandis* Open Shrub Mallee

Soils and Topography: Slope of sandy rise. Sandy soils

GPS (WGS 84) S33°16.4531' E118° 43.3599' to S33° 16.4593' E118° 43.3650'

Diagnosis (Muir description): Open Shrub Mallee over Scrub A over Open Low Sedges

Vegetation condition: Pristine

Species List

Eucalyptus suggrandis subsp. *promiscua*

Leptospermum erubescens

Santalum acuminatum

Melaleuca carrii

Melaleuca depauperata

Billardiera lehmanniana

Conostephium sp. Salt Lake

Callitris roei

Calytrix leschenaultii

Gahnia ancistrophylla

Desmocladius quiricanus

Desmocladius species



Photograph 3

Vegetation

Heath

Soils and Topography:

Top of sandy ridge. Sandy soils

GPS (WGS 84)

S33° 16.4593' E118° 43.3650' to S33° 16.4638' E118° 43.3874'

Diagnosis (Muir description): Open Scrub B over Low Heath C (scattered Shrub Mallee)

Vegetation condition:

Pristine

Species List:

Leptospermum erubescens

Melaleuca carrii

Conostephium sp Salt Lake

Callitris roei

Podolepis capillaris

Desmocladius species



Photograph 4

Vegetation *Eucalyptus calycogona* Shrub Mallee

Soils and Topography: Flat to gently sloping area after sand dune. Duplex soils of sandy loam over clay.

GPS (WGS 84) S33° 16.4638' E118° 43.3874' to S33° 16.4717' E118° 43.3959'

Diagnosis (Muir description): Shrub Mallee over Open Scrub over Open Dwarf Scrub D

Vegetation condition: Excellent. Non-aggressive weeds.

Species List:

Eucalyptus calycogona

Eucalyptus suggrandis subsp. *promiscua*

Melaleuca acuminata

Halosarcia pergranulata

Threlkeldia diffusa

Eremophila decipiens

Disphyma crassifolium

Lepidosperma species

Gahnia ancistrophylla

Lomandra effusa

**Pentaschistis airoides*

Atriplex sp



Photograph 5

Vegetation *Melaleuca lateriflora* Scrub

Soils and Topography: Low lying area. Clay soils, saline.

GPS (WGS 84) S33° 16.4717' E118° 43.3959' to S33° 16.4946' E118° 43.4146'

Diagnosis (Muir description): Thicket over Dwarf Scrub D

Vegetation condition: Very Good. Plant death due to past water logging. Some weed invasion.

Species List:

<i>Melaleuca lateriflora</i>	* <i>Mesembryanthemum nodiflorum</i>
<i>Disphyma crassifolia</i>	<i>Pogonolepis stricta</i>
<i>Halosarcia pergranulata</i>	<i>Blennospora drummondii</i>
<i>Atriplex</i> species	<i>Austrostipa elegantissima</i>
<i>Threlkeldia diffusa</i>	<i>Crassula</i> species



Photograph 6

Vegetation *Eucalyptus calycogona* Shrub Mallee

Soils and Topography: Low lying area adjacent to track. Clay soils, saline

GPS (WGS 84) S33° 16.4946' E118° 43.4146' to S33° 16.5117' E118° 43.4297'

Diagnosis (Muir description): Open Shrub Mallee over Low Scrub B over Low Heath D

Vegetation condition: Very Good. Plant death due to past water logging. Some weed invasion

Species List:

Eucalyptus calycogona

Eucalyptus suggrandia subsp. *promiscua*

Melaleuca lateriflora

Disphyma crassifolia

Halosarcia pergranulata

**Mesembryanthemum nodiflorum*

Atriplex species

Threlkeldia diffusa

Podolepis capillaris

Pogonolepis stricta

Blennospora drummondii

Gahnia trifida

Lobelia gibbosa

Austrostipa ?hemipogon



Photograph 7

Appendix 2

Plant Species List

Plant species List

Taxon Name

- 110 **Aizoaceae**
Disphyma crassifolium (L.) L.Bolus
*Mesembryanthemum nodiflorum L.
- 345 **Asteraceae**
Blennospora drummondii A.Gray
Brachyscome pusilla Steetz
Gnephosis multiflora (P.S.Short) P.S.Short
Podolepis capillaris (Steetz) Diels
Pogonolepis stricta Steetz
*Ursinia anthemoides (L.) Poir.
- 105 **Chenopodiaceae**
Atriplex species
Halosarcia pergranulata (J.M.Black) Paul G.Wilson
Rhagodia drummondii Moq.
Threlkeldia diffusa R.Br.
- 307 **Convolvulaceae**
Wilsonia rotundifolia Hook.
- 18 **Cupressaceae**
Callitris roei (Endl.) F.Muell.
- 32 **Cyperaceae**
Gahnia ancistrophylla Benth.
Gahnia trifida Labill.
Lepidosperma species
- 054C **Dasyopogonaceae**
Lomandra effusa (Lindl.) Ewart
- 288 **Epacridaceae**
Conostephium sp. Salt Lake (J. Buegge D7)
- 236 **Frankeniaceae**
Frankenia drummondii Benth.
- 340 **Lobeliaceae**
Lobelia gibbosa Labill.
- 326 **Myoporaceae**
Eremophila decipiens Ostenf.
- 273 **Myrtaceae**
Calytrix leschenaultii (Schauer) Benth.
Eucalyptus calycogona Turcz.
Eucalyptus suggrandis subsp. promiscua D.Nicolle & Brooker
Leptospermum erubescens Schauer
Melaleuca acuminata F.Muell.
Melaleuca carrii Craven

Melaleuca depauperata Turcz.
Melaleuca eleuterostachya F.Muell.
Melaleuca hamata Fielding & Gardner
Melaleuca lateriflora Benth.

054E

Phormiaceae

Dianella revoluta R.Br.

152

Pittosporaceae

Billardiera lehmanniana F.Muell.

31

Poaceae

Austrostipa ?hemipogon

Austrostipa elegantissima (Labill.) S.W.L.Jacobs & J.Everett

Austrostipa species

*Pentaschistis airoides (Nees) Stapf

39

Restionaceae

Desmocladus quiricanus B.G.Briggs & L.A.S.Johnson

92

Santalaceae

Santalum acuminatum (R.Br.) A.DC.

Appendix 3

Impact Evaluation Checklist

IMPACT EVALUATION CHECKLIST

1. NAME OF PARK, RESERVE, DISTRICT INVOLVED Lakeland Nature Reserve (A29024), Great Southern District				
2. LOCATION WITHIN RESERVE (block, etc) Grid reference 660526E 6316886N, SW part of reserve				
3. PRIMARY MANAGEMENT OBJECTIVE OF THE RESERVE Conservation of flora and fauna				
4. THE WORK PROPOSED – PURPOSE Clearing Native Vegetation for creation of access track for surveyors, DEC and contractor vehicles to construction site of waterway.				
5. TYPE & EXTENT OF THE WORK Approximately 300 m x 3m wide clearing				
6. ANY OTHER OPTIONS AVAILABLE No.				
7. IMPLICATIONS OF ‘DO NOTHING’ OPTION OR POSTPONEMENT Contractor vehicles will be unable to access site due to termination lake being full of water. Once waterway is constructed, will not be allowed to traverse it with vehicles to allow it to settle.				
INSTRUCTION: Indicate with (√) or (x) in Column (1) if proposed work is acceptable or not with respect to the environmental and management issues listed. If not acceptable, consider acceptability of modified proposal in column (2), or ‘do nothing’ option column (3). Use column (4) for additional comments.	(1)	(2)	(3)	(4)
	<u>COMMENT</u> Indicate action required to overcome/minimize adverse impact, or if no information is available to allow a decision.			
ISSUE	√ X	√ X	√ X	
1. <u>GEOLOGY, SOILS, WATER</u>	√			
1.1 Caves, fossils, dunes				
1.2 Soil erosion/soil damage	√			
1.3 Stream salinity, sediment, run-off, drainage.	√			
2. <u>FLORA, FAUNA AND ECOSYSTEMS</u>		√		Area has been surveyed by Anne Rick. One spreading plant of <i>Frankenia drummondii</i> P3 identified in the area to be cleared. Track can be

2.1	Gazetted rare plants, restricted or unusual vegetation.				moved a couple of meters to avoid the plant
2.2	Populations of fire sensitive species, wildflower display.	√			
2.3	Rare fauna, special habitats	√			
2.4	Stream, swamps, lakes, gorges, rock outcrops etc	√			
3	<u>ENVIRONMENTAL PROTECTION</u>	√			Plant undertaking works will be doing other works in reserve to be clean on entry and be subject to wash down and other management conditions
3.1	Disease (eg dieback, insects)				See above
3.2	Weeds, feral animals	√			
3.3	Requirement for gravel, rock, borrow pits	√			
3.4	Modify fire regime/patterns	√			
4	<u>CULTURAL HERITAGE, SPECIAL VALUES</u>	√			
4.1	Aboriginal sites				
4.2	European	√			
4.3	Special reference sites, research plots	√			
4.4	High value sites, (farms, settlements, plantations etc)	√			
5	<u>RECREATION, ACCESS, OTHER USES</u>	√			
5.1	Public access, re-direct public use				
5.2	Increase public mis-use (eg tracks degrade)	√			
5.3	Landscape, features, wilderness appreciation	√			
		√			

5.4 Visitor safety				
5.5 Increase demand for facilities and services (eg rubbish disposal, toilets etc.)	√			
6 <u>MANAGEMENT CONSIDERATIONS</u>	√			
6.1 Can proposal pre-empt future Management Plan.				
6.2 Conflict with existing policy	√			
6.3 Neighbours, local shires, community interests, Apiarists.	√			
6.4 Fulfil legal requirements (eg Bushfires Act etc)	√			
7 <u>ENDORSEMENT/APPROVAL</u>				
<p>PROPOSER: N.Nicholson, Recovery Catchment Officer Lake Bryde Date 18/03/09</p> <p>DISTRICT/REGIONAL MANAGER ENDORSEMENT/COMMENT</p> <p>Signature.....</p> <p>District Manager Great Southern</p> <p>Date</p> <p>APPROVED/NOT APPROVED</p> <p>_____ Date</p> <p>_____</p>				

Appendix 6

Vegetation structure at releves and photographs

Releve 65 *Eucalyptus salmonophloia* (salmon gum) woodland Es

Muir Woodland over Open Shrub Mallee over Scrub over Open Dwarf Scrub D

NVIS U1+^tree\7\i; M1^shrub mallee\6\i; M2^shrub\5\i; G1^shrub\1\r



Releve 71 *Eucalyptus salmonophloia* (salmon gum) woodland Es

Muir Woodland over Heath A over Open Dwarf Scrub D (scattered herbs and grasses)

NVIS U1+^tree\7\i; M1^shrub\3\c; G1^shrub, tussock grass, forb\1\r



Releve 76 *Eucalyptus salmonophloia* (salmon gum) woodland **Es**

Muir Woodland over Scrub over Low Scrub B over Open Dwarf Scrub D (scattered shrub mallee, grasses)

NVIS U1+^tree\7\i;M1^shrub mallee\6\bi;M2^shrub\4\i;M3^shrub\3\i;G1^shrub, tussock grass\1\r



Releve 10 *Eucalyptus urna* Open Forest **Eu**

Muir Low Forest A over Low Scrub B

NVIS U1+^tree\6\c;M1^shrub\4\bi;M2^shrub\3\i



Releve 1 *Eucalyptus salubris* (gimlet) Open Forest

Esu

Muir Low Forest A over Open Low Scrub A over Heath B (isolated shrubs to 0.5m)

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



Releve 54 *Eucalyptus myriadena* (small fruited gum) woodland **Emy**

Muir Low Woodland A over Dwarf Scrub D (scattered sedges and rush/herb)

NVIS U1+^tree\6\i; G1^shrub,sedge,rush\1\i



Releve 72 *Eucalyptus myriadena* (small fruited gum) woodland Emy

Muir Low Woodland A over Scrub (isolated shrubs to 1.0m and isolated grasses)

NVIS U1+\^tree,tree mallee\6\i;M1\^shrub\4\i;G1\^shrub,tussock grass\2\bi



Releve 33 *Eucalyptus kondininensis* (Kondinin blackbutt) woodland Ek

Muir Low Forest A over Open Scrub over Open Dwarf Scrub D (scattered sedges, herbs)

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



Releve 38 *Eucalyptus kondininensis* (Kondinin blackbutt) woodland Ek

Muir Low Forest A (scattered shrubs to 2+m and 0.5m, scattered herbs)

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



Releve 41 *Eucalyptus kondininensis* (Kondinin blackbutt) woodland Ek

Muir Low Forest A (isolated shrubs to 2+m and 1.0m, sedges and herbs)

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



Releve 49 *Eucalyptus kondininensis* (Kondinin blackbutt) woodland Ek

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

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



Releve 53 *Eucalyptus alipes* (Hyden mallet) woodland Ea

Muir Low Woodland A over Scrub over Dwarf Scrub D (scattered grass, herbs and sedges)

NVIS U1+^tree\6\j;M1^shrub\4\j;G1^shrub,forb,sedge,tussock grass\1\j



Releve 57 *Eucalyptus alipes* (Hyden mallet) woodland Ea

Muir Low Woodland A over Open Dwarf Scrub C over Dwarf Scrub D (scattered sedges, herbs, grasses and shrubs to 2m))

NVIS U1+^tree\6\i;M1^shrub\3\bi;G1^shrub\2\r;G2^shrub,forb,sedge,tussock grass\1\i



Releve 50 *Eucalyptus alipes* (Hyden mallet) - degraded Ea

Muir Open Low Woodland A over Heath A over Very Open Low Grass (scattered shrubs to 0.5m and herbs)

NVIS U1+^tree,mallee\6\r;M1^shrub\3\c;G1^tussock grass,shrub,forb\1\r



Releve 58 *Eucalyptus alipes* (Hyden mallet) open forest Ea

Muir Low Forest B over Scrub over Open Dwarf Scrub D (scattered grass)

NVIS U1+\^tree\6\c;M1\^shrub\4\i;G1\^shrub,tussock grass\1\r



Releve 60 *Eucalyptus alipes* (Hyden mallet) open forest Ea

Muir Low Forest A over Scrub (scattered shrubs to 0.5m and grasses)

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



Releve 62 *Eucalyptus alipes* (Hyden mallet) open forest Ea

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

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



Releve 63 *Eucalyptus alipes* (Hyden mallet) open forest Ea

Muir Low Forest B over Heath A

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



Releve 12 **Mallee over *Melaleuca scalena* (laterite)**

EMs/L

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

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



Releve 14 **Mallee over *Melaleuca scalena* (laterite)**

EMs/L

Muir Very Open Shrub Mallee over Open Low Scrub A over Low Heath C (isolated shrubs, sedges and grasses to 0.5m and shrubs over 2m)

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



Releve 73 **Mallee over *Melaleuca scalena* (laterite)** **EMs/L**

Muir Shrub Mallee over Low Scrub A over Dwarf Scrub c (isolated sedges, rush/perennial herbs and shrubs to 0.5m)

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



Releve 90 **Mallee over *Melaleuca scalena* (laterite)** **EMs/L**

Muir Open Shrub Mallee over Low Heath C (isolated shrubs 0.5m and 1.5m, sedge and rush/herb)

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



Releve 13 *Mallee over Melaleuca scalena* EMs

Muir Open Shrub Mallee over Heath A (isolated sedges and shrubs to 1.5m and 0.5m)

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



Releve 18 *Mallee over Melaleuca scalena* EMs

Muir Very Open Shrub Mallee over Heath A over Open Low Scrub D (isolated sedges and grasses)

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



Releve 27 *Mallee over Melaleuca scalena* EMs

Muir Very Open Shrub Mallee over Heath A over Very Open Low Sedge (isolated shrubs to 1.0 m)
NVIS M1\^mallee shrub\6\r;M2+\^shrub\3\c;G1\^shrub\2\bi;G2\^sedge,shrub\1\r



Releve 61 **Mallee over *Melaleuca scalena*** **EMs**

Muir Open Shrub Mallee over Heath A over Open Dwarf Scrub D (isolated sedges and herbs)
NVIS M1+\^mallee shrub\6\i;M2\^shrub\3\c;G1\^shrub,sedge,rush\1\r



Releve 66 **Mallee over *Melaleuca scalena*** **EMs**

Muir Open Shrub Mallee over Heath B over Dwarf Scrub D (isolated sedges and herbs)

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



Releve 77 **Mallee over *Melaleuca scalena*** **EMs**

Muir Heath B over Open Dwarf Scrub D (isolated shrub mallee, sedges and herbs)

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



Releve 80 **Mallee over *Melaleuca scalena*** **EMs**

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

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



Releve 85 **Mallee over *Melaleuca scalena*** **EMs**

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

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



Releve 26 **Mixed Mallee (*Melaleuca depauperata*)** **EMd**

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

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



Releve 44 **Mixed Mallee (*Melaleuca depauperata*)** **EMd**

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

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



Releve 64 **Mallee over *Melaleuca* low shrubland (*Melaleuca carrii*)** **EMc**

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

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



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

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

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



Releve 23 *Eucalyptus perangusta* over mixed shrubland **Ep**

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

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



Releve 29 *Eucalyptus perangusta* over mixed shrubland **Ep**

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

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



Releve 42 *Eucalyptus perangusta* over mixed shrubland **Ep**

Muir Open Shrub Mallee over Heath B over Open Low Sedges (isolated herbs, grasses and shrubs to 0.5m and 2+m)

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



Releve 45 *Eucalyptus perangusta* over mixed shrubland **Ep**

Muir Very Open Shrub Mallee over Heath B (isolated shrubs to 0.5m and 2+m, sedges, herbs)

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



Releve 56 *Eucalyptus perangusta* over mixed shrubland Ep

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

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



Releve 82 *Eucalyptus perangusta* over mixed shrubland Ep

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

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



Releve 84 *Eucalyptus perangusta* over mixed shrubland Ep

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

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



Releve 93 *Eucalyptus perangusta* over mixed shrubland Ep

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

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



Releve 2 *Mallee over Melaleuca adnata* EMa

Muir Shrub Mallee over Open Low Scrub A over Heath C

NVIS M1+^{\^mallee shrub\6\c};M2^{\^shrub\3\r};G1^{\^shrub\2\c}



Releve 4 *Mallee over Melaleuca adnata* EMa

Muir Open Shrub Mallee over Low Heath C (isolated trees, shrubs to 1.5m)

NVIS U1^{\^tree\6\bi};M1+^{\^mallee shrub\6\i};M2^{\^shrub\3\bi};G1^{\^shrub\2\c}



Releve 7 **Mallee over *Melaleuca adnata*** **EMa**

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

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



Releve 17 **Mallee over *Melaleuca adnata*** **EMa**

Muir Open Shrub Mallee over Scrub over Open Low Scrub B over Dwarf Scrub D

NVIS M1+\^mallee shrub\6\i;M2\^shrub\4\i;M3\^shrub\3\r;G1\^shrub\1\bi



Releve 75 *Mallee over Melaleuca adnata*

EMa

Muir Very Open Shrub Mallee over Heath B

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



Releve 79 *Mallee over Melaleuca adnata*

EMa

Muir Open Shrub Mallee over Heath B

NVIS M1+\^mallee shrub\6\iM2;\^shrub\3\c



Releve 15 **Mixed heathland (laterite)** **H**

Muir Low Scrub B over Dwarf Scrub C over Dwarf Scrub D/Very Open Low Sedges (isolated shrubs to 2+m, herbs, grasses)

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



Releve 28 **Mixed heathland (laterite)** **H**

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

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



Releve 70 **Mixed heathland (laterite)** **H**

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

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



Releve 74 **Mixed heathland (laterite)** **H**

Muir Open Low Scrub B over Low Heath C over Dwarf Scrub D (isolated shrubs to 2+m, sedges, grasses)

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



Releve 89 **Mixed heathland (laterite)** **H**

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

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



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

Muir Thicket over Open Dwarf Scrub D (isolated shrubs over 2m, sedges and herbs)

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



Releve 11 *Allocasuarina* shrubland **As**

Muir Scrub over Low Scrub B over Dwarf Scrub D (isolated sedges and grasses)

NVIS M1+^shrub\4\i;M2^shrub\3\i;G1^shrub,sedge,grass\1\i



Releve 16 *Allocasuarina* shrubland **As**

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

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



Releve 78 *Allocasuarina* shrubland As

Muir Thicket over Dwarf Scrub C over Dwarf Scrub D (isolated sedges and herbs)

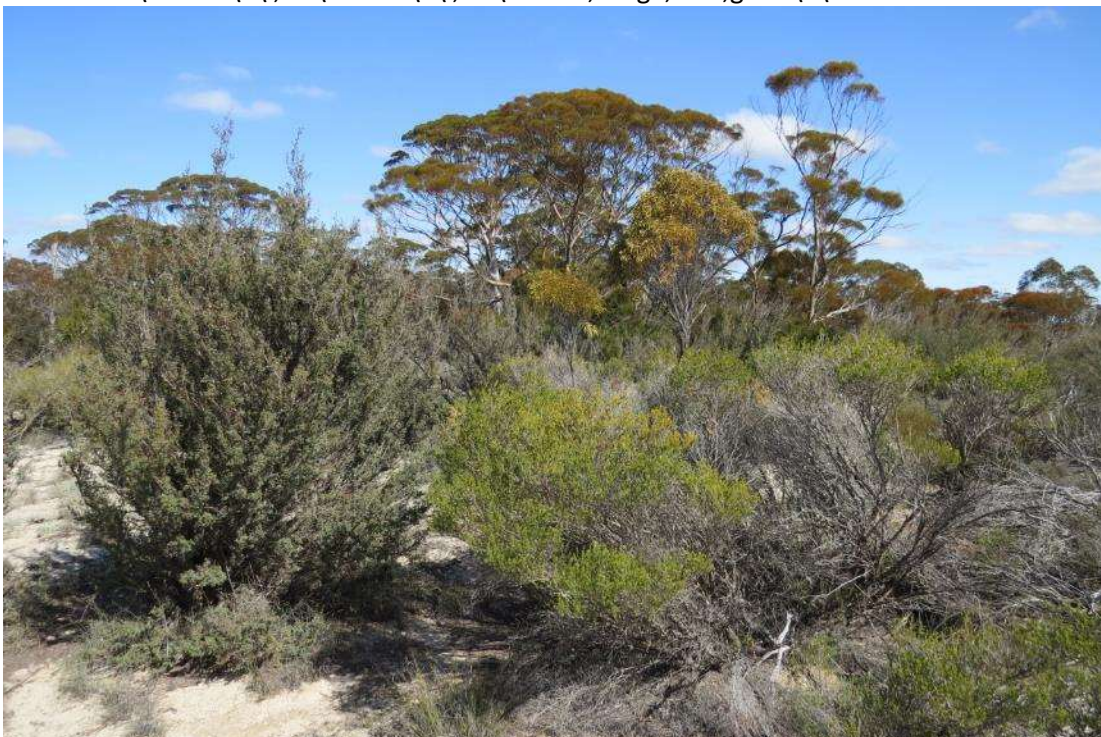
NVIS M1+^shrub\4\c;G1^shrub\2\i;G2^shrub,sedge,rush\1\i



Releve 21 *Eremaea pauciflora* heathland Er

Muir Scrub over Dwarf Scrub C over Dwarf Scrub D/Open Low Sedges/Very Open Herbs (isolated grass)

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



Releve 86 *Eremaea pauciflora* heathland Er

Muir Thicket over Dwarf Scrub C over Very Open Low Sedges (isolated herbs, grass)

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



Releve 36 Mixed sandy heathland Hs

Muir Low Heath C over Open Low Sedges (isolated shrubs to 2m, herbs, grasses)

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



Releve 8 *Isolated Eucalyptus loxophleba subsp. gratiae over shrubland Elox*

Muir Thicket over Very Open Low Sedges (isolated grass and shrubs to 0.5m and 1.0m)

NVIS M1\^mallee shrub\6\bi;M2+\^shrub\4\c;G1\^shrub\2\bi;G2\^sedge,shrub,grass



Releve 87 *Isolated Eucalyptus loxophleba subsp. gratiae over shrubland Elox*

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

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



Releve 88 *Isolated Eucalyptus loxophleba* subsp. *gratiae* over shrubland Elox

Muir Very Open Shrub Mallee over Thicket over Dwarf Scrub C (isolated sedges)

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



Releve 94 *Isolated Eucalyptus loxophleba* subsp. *gratiae* over shrubland Elox

Muir Very Open Shrub Mallee over Thicket (isolated sedges and shrubs to 0.5m)

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



Releve 30 *Melaleuca shrubland*

M

Muir Thicket (isolated herbs)

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



Releve 32 *Melaleuca shrubland*

M

Muir Thicket (isolated sedge, shrubs to 0.5m)

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



Releve 35 *Melaleuca* shrubland M

Muir Thicket (isolated herbs and shrubs to 0.5m)

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



Releve 52 *Melaleuca* shrubland M

Muir Heath A (isolated herbs and shrubs to 0.5m)

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



Releve 59 *Melaleuca shrubland* M

Muir Thicket over Dwarf Scrub D (isolated herbs)

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



Releve 67 *Melaleuca shrubland* M

Muir Thicket over Open Dwarf Scrub D (isolated herbs)

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



Releve 91 *Melaleuca* shrubland M

Muir Heath A (isolated grasses, herbs and shrubs to 0.5m)

NVIS M1+^\^shrub\3\c;G1^\^shrub,forbs,grass\1\bi



Releve 37 *Melaleuca* shrubland degraded M d

Muir Thicket over Dwarf Scrub D (isolated herbs)

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



Releve 40 *Melaleuca* shrubland degraded M d

Muir Dwarf Scrub C over Very Open Dwarf Scrub D (isolated shrubs over 2m, grasses and herbs)

NVIS M1\^shrub\4\bi;G1+\^shrubs\i;G2\^shrub,forbs,grass\1\r



Releve 51 *Melaleuca* shrubland degraded M d

Muir Thicket over Dwarf Scrub C (isolated shrubs to 0.5m, grasses and herbs)

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



Releve 34 *Duma* shrubland

Dh

Muir Low Heath D

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



Releve 68 *Wilsonia* isolated shrubs

W

Muir Low Heath D (scattered herbs)

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



Releve 81 *Wilsonia* isolated shrubs

W

Muir Dwarf Scrub D (scattered herbs)

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



Releve 83 *Wilsonia* isolated shrubs

W

Muir Dwarf Scrub D (scattered herbs)

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



Releve 22 *Samphire (Tecticornia) shrubland*

Te

Muir Dwarf Scrub D

NVIS G1+[^]samphire shrub\1\i



Releve 24 *Samphire (Tecticornia) shrubland*

Te

Muir Low Heath D

NVIS G1+[^]samphire shrub\1\c



Releve 25 *Samphire (Tecticornia) shrubland* Te

Muir Low Heath D (isolated herbs)

NVIS G1+^samphire shrub,shrub\1\c;G2^forbs\1\bi



Releve 31 *Samphire (Tecticornia) shrubland* Te

Muir Low Heath D

NVIS G1^samphire shrub,shrub\1\c



Releve 39 *Samphire (Tecticornia) shrubland* Te

Muir Low Heath D

NVIS G1+\^samphire shrub\1\c



Releve 43 *Samphire (Tecticornia) shrubland*

Te (Degraded M)

Muir Low Heath D (dead shrubs)

NVIS G1+\samphire shrub\1\c



Releve 46 *Samphire (Tecticornia) shrubland*

Te

Muir Low Heath D

NVIS G1+\samphire shrub\1\c



Releve 47 *Samphire (Tecticornia) shrubland*

Te

Muir Low Heath D

NVIS G1+\samphire shrub\1\c



Releve 48 *Samphire (Tecticornia) shrubland*

Te

Muir Low Heath D

NVIS G1+\samphire shrub\1\c



Releve 55 *Samphire (Tecticornia) shrubland*

Te

Muir Low Heath D

NVIS G1+\samphire shrub\1\c



Releve 92 *Samphire (Tecticornia) shrubland*

Te

Muir Low Heath D

NVIS G1+\samphire shrub\1\c



Releve 5 *Granite Complex - Shrubland*

Gs

Muir Heath B over Very Open Herbs (isolated sedges)

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



Releve 20 Granite Complex - Shrubland Gs

Muir Heath B over Herbs (isolated sedges, grass)

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



Releve 9 Granite Complex – *Allocasuna campestris* Shrubland Ac

Muir Thicket (isolated shrubs to 1.0m)

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



Releve 19 Granite Complex – Shrubland *Allocasuarina campestris* Ac

Muir Thicket (isolated shrub to 1.5)

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



Releve 6 Granite Complex - Herbalnd Gh

Muir Open Dwarf Scrub C (patch only) over Herbs

NVIS G1^shrub\2\r;G2+^forb\1\c



Appendix 7

Vegetation Descriptions

Eucalyptus salmonophloia (salmon gum) woodland Es

Relevés 65, 71, 76

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 kondininensis* trees in places. *Eucalyptus pileata* and *Eucalyptus calycogona* shrub mallee are sometimes present

Mid stratum 1 Mid dense to isolated shrubs over 2m in height including *Acacia microbotrya*, *Santalum acuminatum*, *Melaleuca acuminata*, *Melaleuca lateriflora*, *Alyxia buxifolia*, *Melaleuca ?scalena*, *Melaleuca adnata* and *Melaleuca lanceolata*

Mid stratum 2 Mid dense to very sparse shrubs 1.0m to 2m including *Melaleuca pauperiflora*, *Dodonaea stenozyga*, *Melaleuca marginata*, *Exocarpos aphyllus*, *Scaevola spinescens*, *Olearia sp. Eremicola*, *Dodonaea viscosa*, *Acacia hemiteles* and *Acacia merrallii*

Ground Very sparse shrubs to 0.5m including *Templetonia rossii*, *Olearia muelleri*, *Acacia erinacea*, *Rhagodia preissii*, *Grevillea huegelii*, *Senna artemisioides* subsp. x *artemisioides*, *Carpobrotus modestus*, *Hakea commutata* and *Acacia binata*

Isolated sedges in some areas including *Gahnia ancistrophylla*,

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

Isolated grasses including *Neurachne alopecuroidea* and *Austrostipa elegantissima* and *Austrostipa henipogon*

Comments Scattered *Eucalyptus kondininensis* trees are sometimes present in areas adjacent to *Eucalyptus kondininensis* woodlands



Eucalyptus salmonophloia woodland Revele 71



Eucalyptus salmonophloia woodland at Revele 76

Eucalyptus urna open forest

Eu

Relevés **10**

Landform Sandy loam

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. Isolated *Eucalyptus salmonophloia* and *Eucalyptus longicornis* trees also present

Mid stratum Sparse shrubs to 1.5m including *Melaleuca pauperiflora*, *Melaleuca adnata* and *Acacia merrallii*



Eucalyptus urna open forest at releve 10

Eucalyptus salubris open forest (gimlet)

Esu

Relevés	1
Landform	Mid slopes
Soils, topography	Clay soils, gentle slope
Condition	Excellent

Vegetation Description

Upper stratum	Mid dense <i>Eucalyptus salubris</i> trees to 8m in height dominant
Mid stratum 1	Very sparse shrubs to 2m of <i>Melaleuca acuminata</i>
Mid stratum 2	Mid dense shrubs to 1.5m with <i>Melaleuca acuminata</i> , <i>Melaleuca pauperiflora</i> and <i>Melaleuca marginata</i> prominent. <i>Melaleuca lateriflora</i> , <i>Exocarpos aphyllus</i> , <i>Melaleuca adnata</i> , <i>Acacia merrallii</i> , <i>Acacia binata</i> , <i>Dodonaea stenozyga</i> and <i>Hakea commutata</i> are also present
Ground	Isolated shrubs to 0.5m including <i>Olearia muelleri</i> and <i>Acacia intricata</i>



***Eucalyptus salubris* open forest at releve 1**

Eucalyptus myriadena (small-fruited gum) woodland

Emy

Relevés	54, 72
Landform	Valley floor
Soils, topography	Sandy loam soils, gentle slope
Condition	Excellent

Vegetation Description

Upper stratum	Sparse <i>Eucalyptus myriadena</i> trees to 10m dominant. Scattered <i>Eucalyptus kondininensis</i> trees at releve 54 and <i>Eucalyptus celastroides</i> mallee at releve 72
Mid stratum	Sparse shrubs over 2m at releve 72 including <i>Melaleuca acuminata</i> , <i>Melaleuca adnata</i> , <i>Melaleuca lateriflora</i> and <i>Melaleuca scalena</i>
Ground	Sparse to isolated low shrubs to 0.5m including <i>Acacia erinacea</i> , <i>Olearia muelleri</i> , <i>Microcybe multiflora</i> , <i>Acacia hemiteles</i> and <i>Rhagodia preissii</i> Isolated perennial herb/rush <i>Dianella revoluta</i> Isolated sedges in some areas including <i>Lepidosperma</i> species



Eucalyptus myriadena woodland at Releve 54

Eucalyptus kondininensis (Kondinin blackbutt) woodland Ek

Releves 33, 38, 41, 49

Landform Valley floor

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

Condition Excellent

Vegetation Description (mature)

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

Mid stratum Mid dense to isolated shrubs over 2m including *Melaleuca acuminata*, *Melaleuca atroviridis*, *Melaleuca lateriflora*, *Melaleuca thyoides* and *Exocarpos aphyllus*

Ground Very sparse to isolated low shrubs to 0.5m including *Acacia erinacea*, *Olearia muelleri*, *Dodonaea viscosa*, *Templetonia rossii*, *Olearia* sp. *Eremicola*, *Grevillea huegelii*, *Disphyma crassifolium*, *Eremophila decipiens*, *Acacia viscifolia*, *Phebalium megaphyllum*, *Leucopogon* sp. Kau Rock, *Hibbertia ?gracilipes* and *Rhagodia ?drummondii*

Isolated perennial herb/rush *Lomandra effusa*

Isolated sedges of *Gahnia ancistrophylla*



Eucalyptus kondininensis (Kondinin blackbutt) woodland Revele 38

Eucalyptus alipes (Hyden mallet) woodland

Ea

Relevés 53, 57

Landform Valley floor

Soils, topography Well drained, sandy loam soils, sandy ridges

Condition Excellent

Vegetation Description

Upper stratum Sparse *Eucalyptus alipes* trees to 10m in height dominant

Mid stratum Isolated to sparse shrubs over 2m of *Melaleuca acuminata*

Ground 1 Very sparse shrubs to 1.0m including *Conostephium preissii*, *Olearia* sp. *Eremicola* and *Pimelea aeruginosa*

Ground 2 Sparse shrubs to 0.5m including *Calytrix leschenaultii*, *Chamelaucium ciliatum*, *Dodonaea bursariifolia*, *Hibbertia ?gracilipes*

Isolated sedges including *Desmocladus quiricanus*, *Gahnia ancistrophylla* and *Lepidosperma* species

Isolated forbs including *Helichrysum leucopsideum*, *Waitzia acuminata*, *Vittadinia gracilis* and **Ursinia anthemoides*

Isolated perennial herb/rush including *Lomandra effusa* and *Lomandra rupestris*

Isolated tussock grass including **Avellinia michelii*



***Eucalyptus alipes* woodland at releve 57**



***Eucalyptus alipes* open forest at releve 63**

Eucalyptus alipes (Hyden mallet) open forest

Ea

Releves 50, 58, 60, 62, 63

Landform Valley floor

Soils, topography sandy loam over clay, flat to gently sloping terrain

Condition Excellent

Vegetation Description

Upper stratum Mid dense, occasionally sparse *Eucalyptus alipes* trees to 5m in height dominant. Young trees are prominent in areas regenerating after past flood events. Scattered *Eucalyptus calycogona* shrub mallee sometimes present

Mid stratum Sparse to mid dense shrubs 2m and over with *Melaleuca acuminata* prominent and *Melaleuca lateriflora*, *Melaleuca scalena*, *Melaleuca adnata*, *Melaleuca apodocephala* and *Exocarpos aphyllus* also recorded

Ground Isolated to very sparse shrubs to 0.5m including *Rhagodia drummondii*, *Enchylaena tomentosa*, *Disphyma crassifolium*, *Carpobrotus modestus*, *Threlkeldia diffusa*, *Trymalium elachophyllum*, *Dodonaea bursariifolia*, *Rinzia communis*, *Acacia viscifolia*, *Hibbertia ?gracilipes*, *Acacia erinacea* and *Eremophila decipiens*

Isolated to very sparse tussock grass including *Austrostipa elegantissima* and *Austrostipa pycnostachya*

Isolated forbs including *Erymophyllum tenellum*

Mallee over *Melaleuca scalena* – laterite

EMs/L

Relevés 12, 14, 73, 90

Landform upper to mid slopes

Soils, topography sandy gravels over clay, flat to gentle slope

Condition Excellent

Vegetation Description

Mid stratum 1	Mid dense to very sparse shrub mallee to 8m including <i>Eucalyptus phaenophylla</i> , <i>Eucalyptus uncinata</i> , <i>Eucalyptus sporadica</i> and <i>Eucalyptus suggrandis</i> subsp. <i>promiscua</i>
Mid stratum 2	Sparse to scattered shrubs usually to 2m (occasionally over 2m) including <i>Melaleuca scalena</i> , <i>Santalum acuminatum</i> , <i>Allocasuarina acutivalvis</i> , <i>Beyeria sulcata</i> , <i>Callitris roei</i> , <i>Leptospermum erubescens</i> , <i>Hakea newbeyana</i> , <i>Isopogon</i> sp. Fitzgerald River, <i>Hakea corymbosa</i>
Ground 1	Mid dense shrubs usually to 1.0m (occasionally to 1.5m) including <i>Phebalium microphyllum</i> , <i>Phebalium tuberosum</i> , <i>Melaleuca carrii</i> , <i>Beyeria sulcata</i> , <i>Hakea scoparia</i> , <i>Micromyrtus obovata</i> , <i>Melaleuca laxiflora</i> , <i>Melaleuca rigidifolia</i> , <i>Daviesia incrassata</i> , <i>Beaufortia schaueri</i> , <i>Hakea lissocarpa</i> , <i>Coleanthera myrtoides</i>
Ground 2	Very sparse to isolated shrubs to 0.5m including <i>Trymalium elachophyllum</i> , <i>Hibbertia pungens</i> , <i>Rinzia communis</i> , <i>Cryptandra minutifolia</i> , <i>Calytrix leschenaultii</i> , <i>Gastrolobium punctatum</i> , <i>Westringia rigida</i> , <i>Hibbertia gracilipes</i> , <i>Melaleuca lateralis</i> , <i>Leucopogon obtusatus</i> , <i>Grevillea acuaria</i> , <i>Westringia cephalantha</i> and <i>Melaleuca bracteosa</i> Isolated sedges including <i>Desmocladus quiricanus</i> , <i>Lepidosperma</i> species and <i>Gahnia ancistrophylla</i> Isolated grass <i>Neurachne alopecuroides</i> Isolated perennial herb/rush including <i>Lomandra micrantha</i> subsp. <i>micrantha</i> , <i>Lomandra mucronata</i> , <i>Dianella revoluta</i>
Comments	In the Lakeland Nature Reserves the EMs/L vegetation type includes not only areas where <i>Melaleuca scalena</i> is prominent in the understorey but also areas of transition between the shrublands on laterite and the Mallee on duplex soils of sand over clay where more species typical of lateritic soils are prominent.



Mallee over *Melaleuca scalena* – laterite at Revele 12



Mallee over *Melaleuca scalena* – laterite at Revele 73

Mallee over *Melaleuca scalena*

EMs

Releves 13, 18, 27, 61, 66, 77, 80, 85

Landform mid to lower slopes

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

Condition Excellent

Vegetation Description

Mid stratum 1 Mid dense to very sparse shrub mallee to 7m including *Eucalyptus flocktoniae*, *Eucalyptus pileata*, *Eucalyptus phenax*, *Eucalyptus perangusta*, *Eucalyptus suggrandis* subsp. *promiscua* and *Eucalyptus neutra*

Mid stratum 2 Mid dense shrubs, usually to 2m (occasionally to 1.5m) with *Melaleuca scalena* prominent, other species recorded include *Santalum acuminatum*, *Callitris roei*, *Callitris preissii*, *Melaleuca depauperata*, *Leptospermum erubescens*, *Melaleuca laxiflora*, *Melaleuca lateriflora*, *Melaleuca sapientes*, *Hakea newbeyana*, *Melaleuca adnata*, *Exocarpos aphyllus*, *Phebalium filifolium*, *Phebalium tuberosum*, *Acacia dissona*, *Daviesia aphylla* and *Daviesia scoparia*

Ground Isolated to sparse shrubs to 0.5m including *Dodonaea bursariifolia*, *Chamelaucium ciliatum*, *Trymalium elachophyllum*, *Westringia rigida*, *Westringia cephalantha*, *Cryptandra minutifolia*, *Grevillea oligantha*, *Rinzia communis*, *Leucopogon obtusatus*, *Melaleuca rigidifolia*, *Hibbertia gracilipes*, *Hibbertia exasperata*, *Grevillea oligantha*, *Grevillea huegelii*, *Gastrolobium punctatum*, *Acacia viscifolia*, *Acacia amputata*, *Acacia bidentata*, *Acacia binata*, *Dillwynia uncinata*, *Astus subroseus*, *Calytrix leschenaultii*, *Olearia ramosissima*, *Comesperma volubile*, ***Spyridium mucronatum* subsp. *recurvum* P3, *Astroloma chloranthum* P2, *Eutaxia nanophylla* P3**

Very sparse to isolated sedges including *Gahnia ancistrophyll* and *Lepidosperma* species

Isolated rushes/perennial herbs including *Lomandra effusa*

Isolated tussock grass *Neurachne alopecuroidea*

Comment This vegetation association is extensive and merges with other Mallee vegetation types. Vegetation boundaries are sometimes difficult to map



Mallee over *Melaleuca scalena* at Releve 80



Mallee over *Melaleuca scalena* at Releve 85

Mixed mallee - *Melaleuca depauperata* EMd

Relevés 26, 44

Landform mid to lower slopes

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

Condition Excellent

Vegetation Description

Mid stratum 1 Mid dense to sparse shrub mallee including *Eucalyptus perangusta*, *Eucalyptus* sp. Southern Wheatbelt and *Eucalyptus suggrandis* subsp. *promiscua*

Mid Stratum 2 Mid dense to sparse shrubs 1.0 to 2m with *Melaleuca depauperata* prominent, other species recorded include *Melaleuca scalena*, *Santalum acuminatum*, *Hakea newbeyana* and *Leptomeria preissiana*

Ground Very sparse to sparse shrubs to 0.5m including *Templetonia rossii*, *Dodonaea bursariifolia*, *Trymalium elachophyllum*, *Phebalium tuberculosum*, *Grevillea oligantha*, *Rinzia communis*, *Leucopogon dielsianus*, *Hibbertia gracilipes*, *Hibbertia exasperata*, *Cryptandra minutifolia*, *Cryptandra nutans*, *Darwinia* sp. Lake Cobham, *Aotus* sp. Southern Wheatbelt, *Acacia biflora*, *Melaleuca carrii*, ***Spyridium mucronatum* subsp. *recurvum* P3**

Isolated sedges including *Gahnia ancistrophylla*, *Lepidosperma* sp. Bandalup Scabrid and *Lepidosperma* sp. Ravensthorpe

Isolated tussock grass *Neurachne alopecuroidea*

Comments The Mallee over *Melaleuca depauperata* (EMd) and Mallee over *Melaleuca scalena* (EMs) relevés were grouped together in the PRIMER analysis with no significant difference shown in species composition. These vegetation types differ in the dominant or more frequently occurring species in the understorey strata.



Mixed mallee - *Melaleuca depauperata* at releve 44



Mixed mallee - *Melaleuca depauperata* at releve 26

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

Relevés	64, 69
Landform	Mid to lower slopes
Soils, topography	duplex sandy soils over clay (scattered proteaceae indicate some laterite)
Condition	Excellent

Vegetation Description

Mid stratum 1	Sparse shrub mallee including <i>Eucalyptus dissimulata</i> , <i>Eucalyptus perangusta</i> and <i>Eucalyptus suggrandis</i> subsp. <i>promiscua</i>
Mid Stratum 2	Very sparse shrubs to 2m including <i>Melaleuca scalena</i> , <i>Melaleuca brophyi</i> , <i>Hakea corymbosa</i>
Ground 1	Mid dense shrubs usually to 1.0m including <i>Melaleuca carrii</i> (prominent), <i>Melaleuca subtrigona</i> , <i>Melaleuca scalena</i> , <i>Melaleuca brophyi</i> , <i>Melaleuca depauperata</i> , <i>Isopogon</i> sp. Fitzgerald River, <i>Grevillea oligantha</i>
Ground 2	Very sparse to sparse shrubs to 0.5m including <i>Calytrix leschenaultii</i> , <i>Verticordia plumosa</i> , <i>Rinzia communis</i> , <i>Phebalium tuberculosum</i> , <i>Darwinia</i> sp. Lake Cobham, <i>Petrophile squamata</i> , <i>Leucopogon obtusatus</i> , <i>Trymalium elachophyllum</i> , <i>Templetonia rossii</i> , <i>Gastrolobium punctatum</i> , <i>Grevillea acuaria</i> , <i>Hibbertia exasperata</i> , <i>Hibbertia gracilipes</i> , <i>Cryptandra nutans</i> , <i>Spyridium mucronatum</i> subsp. <i>recurvum</i> P3 Isolated sedges including <i>Gahnia ancistrophylla</i> , <i>Gahnia trifida</i> , <i>Lepidosperma</i> species, <i>Desmocladus myriocladus</i> Isolated rushes/perennial herbs including <i>Lomandra mucronata</i> , <i>Lomandra effusa</i>

Comments	The Mallee over <i>Melaleuca carrii</i> (EMc) and <i>Eucalyptus perangusta</i> over shrubland (Ep) relevés were grouped together in the PRIMER 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. Mallee over <i>Melaleuca carrii</i> only covered small areas in Reserve 29024 compared to more extensive areas mapped in the East Lake Bryde Nature Reserve.
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Mallee over *Melaleuca* low shrubland with *Melaleuca carrii* prominent at Releve 64



Mallee over *Melaleuca* low shrubland with *Melaleuca carrii* prominent at Releve 69

Eucalyptus perangusta over shrubland

Ep

Releves	23, 29, 42, 45, 56, 82, 84, 93
Landform	Lower slopes/valley floor including ridges or dunes adjacent to lakes
Soils, topography	deeper sandy soils over clay, sandy areas and ridges
Condition	Excellent

Vegetation Description

Mid stratum 1	Very sparse to mid dense shrub mallee including <i>Eucalyptus perangusta</i> (an indicator species), <i>Eucalyptus sporadica</i> , <i>Eucalyptus dissimulata</i> , <i>Eucalyptus pileata</i> , <i>Eucalyptus ?olivina</i> , <i>Eucalyptus flocktoniae</i> and <i>Eucalyptus suggrandis</i> subsp. <i>promiscua</i>
Mid stratum 2	Isolated to sparse shrubs to 2m and over including <i>Melaleuca brophyi</i> , <i>Leptospermum erubescens</i> , <i>Santalum acuminatum</i> , <i>Hakea corymbosa</i> , <i>Melaleuca scalena</i> and <i>Melaleuca lateriflora</i>
Ground 1	Sparse to mid dense shrubs to 1.5m or 1.0m including <i>Melaleuca depauperata</i> , <i>Chamelaucium ciliatum</i> , <i>Melaleuca brophyi</i> , <i>Leptospermum erubescens</i> , <i>Melaleuca subtrigona</i> , <i>Verticordia densa</i> , <i>Verticordia plumosa</i> , <i>Templetonia rossii</i> , <i>Calytrix leschenaultii</i> , <i>Grevillea huegelii</i> , <i>Melaleuca carrii</i> , <i>Isopogon</i> sp. Fitzgerald River, <i>Grevillea hookeriana</i> , <i>Kunzea jucunda</i> , <i>Exocarpos aphyllus</i> , <i>Grevillea newbeyi</i> P3
Ground 2	Isolated to very sparse shrubs to 0.5m including <i>Calytrix leschenaultii</i> , <i>Cyphanthera microphylla</i> , <i>Acacia amputata</i> , <i>Aotus</i> sp. Southern Wheatbelt <i>Phebalium lepidotum</i> , <i>Hibbertia gracilipes</i> , <i>Darwinia</i> sp. Lake Cobham, <i>Gastrolobium punctatum</i> , <i>Trymalium elachophyllum</i> , <i>Grevillea oligantha</i> , <i>Westringia rigida</i> , <i>Rinzia communis</i> , <i>Leucopogon obtusatus</i> , <i>Grevillea acuaria</i> , <i>Carpobrotus modestus</i> , <i>Melaleuca apodocephala</i> , <i>Bertya dimerostigma</i> , <i>Astroloma chloranthum</i> P2, <i>Dampiera orchardii</i> P2, <i>Spyridium mucronatum</i> subsp. <i>recurvum</i> P3 Sparse to isolated sedges including <i>Gahnia ancistrophylla</i> , <i>Gahnia trifida</i> , <i>Desmocladius myriocladus</i> , <i>Desmocladius quiricanus</i> , <i>Desmocladius parthenicus</i> , <i>Lepidosperma</i> species, <i>Lepidosperma sanguinolentum</i> , <i>Tetraria</i> sp. Mt Madden Isolated rushes/perennial herbs including <i>Lomandra micrantha</i> subsp. <i>teretifolia</i> , <i>Lomandra mucronata</i> , <i>Lomandra effusa</i> , <i>Dianella revoluta</i> Isolated forbs/herbs including <i>Calandrinia eremaea</i> Isolated tussock grass <i>Neurachne alopecuroidea</i>



Eucalyptus perangusta over shrubland at Releve 42



Eucalyptus perangusta over shrubland at Releve 23

Mallee over *Melaleuca adnata*

EMa

Relevés	2, 4, 7, 17, 75, 79
Landform	upper to lower slopes
Soils, topography	heavier shallow duplex soils of sandy loam over clay, flat to gentle slope
Condition	Excellent

Vegetation Description

Mid stratum 1	Mid dense to very sparse shrub mallee to 6m including <i>Eucalyptus calycogona</i> , <i>Eucalyptus tenera</i> , <i>Eucalyptus pileata</i> , <i>Eucalyptus flocktoniae</i> and <i>Eucalyptus neutra</i> with isolated trees of <i>Eucalyptus urna</i> and <i>Eucalyptus extensa</i> at releve 4
Mid stratum 2	Isolated to sparse shrubs to 1.5 or 2m (occasionally mid dense) including <i>Melaleuca adnata</i> , <i>Melaleuca marginata</i> , <i>Melaleuca sapientes</i> , <i>Melaleuca lateriflora</i> , <i>Melaleuca scalena</i> , <i>Daviesia aphylla</i> , <i>Exocarpos aphyllus</i> , <i>Melaleuca pauperiflora</i> , <i>Melaleuca johnsonii</i> and <i>Melaleuca subfalcata</i>
Ground 1	Mid dense shrubs to 1.0m including <i>Melaleuca adnata</i> , <i>Melaleuca marginata</i> and <i>Melaleuca societatis</i> may be prominent. Other species recorded include <i>Melaleuca sapientes</i> , <i>Melaleuca lateriflora</i> , <i>Melaleuca acuminata</i> , <i>Melaleuca scalena</i> , <i>Daviesia aphylla</i> , <i>Hakea commutata</i> , <i>Exocarpos aphyllus</i> , <i>Melaleuca pauperiflora</i> , <i>Phebalium filifolium</i> , <i>Melaleuca laxiflora</i> , <i>Acacia binata</i> .
Ground 2	Isolated to sparse shrubs to 0.5m are sometimes present including <i>Microcybe multiflora</i> , <i>Leucopogon obtusatus</i> , <i>Hakea commutata</i> , <i>Hibbertia gracilipes</i> , <i>Grevillea huegelii</i> , <i>Acacia intricata</i> , <i>Olearia muelleri</i> , <i>Boronia inornata</i> , <i>Cassytha melantha</i> .
Comments	In Lakeland Nature Reserves the description of vegetation type EMa has been broadened to include <i>Melaleuca societatis</i> as a characteristic species along with <i>Melaleuca adnata</i> and <i>Melaleuca marginata</i> . This species may be prominent in some areas and was not recorded in this vegetation type in East Lake Bryde NR and Lake Bryde CP. The vegetation type also covers areas higher on the landscape often adjacent to granite.



Mallee over *Melaleuca adnata* at releve 2



Mallee over *Melaleuca adnata* at releve 75

Mixed lateritic heathland

H

Relevés	15, 28, 70, 74, 89
Landform	Upper slopes
Soils, topography	sandy soils with gravel over laterite (ironstone in places), flat to gentle slope
Condition	Excellent

Vegetation Description

Mid stratum 1	Very sparse shrub mallee to 5m may be present in some areas including <i>Eucalyptus phaenophylla</i> and <i>Eucalyptus dissimulata</i>
Mid stratum 2	Sparse to isolated shrubs over 1.5m to 2.5m including <i>Hakea cygna</i> , <i>Callitris roei</i> , <i>Callitris preissii</i> , <i>Leptospermum erubescens</i> , <i>Leptospermum inelegans</i> , <i>Allocasuarina acutivalvis</i> , <i>Grevillea hookeriana</i> , <i>Banksia erythrocephala</i> , <i>Hakea horrida</i> and <i>Allocasuarina pinaster</i>
Ground 1	Mid dense shrubs to 1.0m including <i>Melaleuca tuberculata</i> (prominent), <i>Melaleuca carrii</i> , <i>Petrophile squamata</i> , <i>Isopogon teretifolius</i> , <i>Beaufortia schaueri</i> , <i>Beaufortia puberula</i> , <i>Lysinema pentapetalum</i> , <i>Isopogon</i> sp. Fitzgerald River, <i>Hakea scoparia</i> , <i>Verticordia roei</i> , <i>Verticordia chrysantha</i> , <i>Petrophile ericifolia</i> , <i>Beyeria sulcata</i> , <i>Isopogon scabriusculus</i> , <i>Ericomyrtus serpyllifolia</i> , <i>Leptospermum spinescens</i> , <i>Petrophile seminuda</i> and <i>Persoonia brevihachis</i> P3
Ground 2	Very sparse to sparse shrubs to 0.5m including <i>Allocasuarina microstachya</i> , <i>Beaufortia micrantha</i> , <i>Calytrix leschenaultii</i> , <i>Jacksonia racemosa</i> , <i>Verticordia picta</i> , <i>Verticordia acerosa</i> , <i>Tetrapora preissiana</i> , <i>Petrophile glauca</i> , <i>Dampiera juncea</i> , <i>Hakea strumosa</i> , <i>Grevillea acuaria</i> , <i>Cryptandra nutans</i> , <i>Cryptandra minutifolia</i> , <i>Daviesia lancifolia</i> , <i>Astroloma serratifolium</i> , <i>Leucopogon</i> sp. Wheatbelt, <i>Leucopogon</i> sp. Newdegate, <i>Leucopogon obtusatus</i> , <i>Andersonia lehmanniana</i> , <i>Tetrapora preissiana</i> , <i>Hibbertia exasperata</i> , <i>Hibbertia gracilipes</i> , <i>Leucopogon dielsianus</i> , <i>Leucopogon cuneifolius</i> and <i>Banksia xylothemelia</i> P3 Isolated sedges including <i>Lepidosperma sanguinolentum</i> , <i>Lepidosperma species</i> and <i>Desmocladus myriocladus</i> Isolated tussock grass <i>Neurachne alopecuroidea</i>
Comments	Mixed lateritic heathland relevés cluster into 2 distinct groups in the PRIMER presence/absence species analysis. These groups were not distinct in the field or on the aerial photography and have all been mapped as H. The heath releve 15 in Nature Reserve 29025 clustered with <i>Allocasuarina</i> shrubland (As) relevés and is probably a transition area and therefore has not been included in this description.



Mixed lateritic heathland at Releve 74



Mixed lateritic heathland at Releve 70

Allocasuarina shrubland

As

Relevés 3, 11, 16, 78

Landform Mid to upper slopes

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

Condition Excellent

Vegetation Description

Mid stratum Mid dense to sparse shrubs usually over 2m including *Allocasuarina acutivalvis*, *Allocasuarina corniculata*, *Allocasuarina campestris*, *Callitris preissii*, *Hakea scoparia*, *Leptospermum ?nitens*, *Hakea erecta* and *Hakea meisneriana*

Mid stratum/Ground Sparse shrubs to 1.0m or 1.5m usually present including *Melaleuca tuberculata*, *Verticordia roei*, *Isopogon scabrusculus*, *Micromyrtus obovata*, *Phebalium tuberosum*, *Melaleuca pungens*, *Leptomeria preissiana*, *Grevillea acacioides*, *Acacia evenulosa*, *Acacia heteroclita*, *Beyeria sulcata*, *Beaufortia puberula*, *Verticordia chrysantha*, *Verticordia chrysanthella*, *Petrophile seminuda*, *Tetrapora preissiana* and ***Persoonia brevirhachis* P3**

Ground Very sparse to sparse shrubs to 0.5m including *Melaleuca cordata*, *Persoonia coriacea*, *Verticordia picta*, *Ericomyrtus serpyllifolia*, *Acacia patagiata*, *Psmmomoya choretroides*, *Melaleuca platycalyx*, *Melaleuca lecanantha*, *Hibbertia gracilipes*, *Leucopogon obtusatus*, *Mirbelia trichocalyx*, *Astroloma serratifolium* and ***Banksia xylothemelia* P3**,

Isolated sedges including *Lepidosperma* species

Isolated rush/perennial herbs including *Lomandra effusa*

Isolated forbs/herbs including *Stylidium neglectum*, *Stylidium involucreatum* and *Drosera macrantha*

Isolated tussock grass *Neurachne alopecuroidea*

Isolated vines *Comesperma volubile* and *Thysanotus ?patersonii*

Comments *Allocasuarina spinosissima* identified in Lake Bryde CP is closely related to *Allocasuarina corniculata* with the differences between these species mainly related to the size of the fruit. The **As** vegetation type is characterised by the presence of *Allocasuarina* shrubs including *Allocasuarina acutivalvis*, *Allocasuarina campestris*, *Allocasuarina corniculata* and *Allocasuarina spinosissima*



***Allocasuarina* shrubland at Releve 78**



***Allocasuarina* shrubland at Releve 11**

Eremaea pauciflora heathland

Er

Relevés 21, 86

Landform Lower slopes, deep sandy soils

Soils, topography Deep sand, flat to gentle slope

Condition Excellent

Vegetation Description

Mid stratum Sparse to mid dense shrubs over 2m including *Leptospermum erubescens*, *Acacia saligna*, *Eremaea pauciflora*, *Santalum acuminatum*, *Callitris preissii* and *Alyxia buxifolia*

Ground 1 Sparse shrubs to 1.0m including *Eremaea pauciflora*, *Melaleuca subtrigona*, *Olearia* sp. *Eremicola*, *Conospermum cinereum*, *Acacia heteroclita*, *Dicrastylis corymbosa*, *Billardiera lehmanniana*, *Acacia leptospermoides* and ***Grevillea newbeyi* P3**

Ground 2 Sparse to isolated shrubs to 0.5m including *Calytrix leschenaultii*, *Verticordia densiflora*, *Dampiera lavendulacea*, *Cyphanthera microphylla*, *Leucopogon* sp. Kau Rock and *Rhagodia preissii*

Isolated sedges including *Lepidosperma sanguinolentum*, *Lepidobolus preissianus* and *Gahnia ancistrophylla*

Isolated rushes/perennial herbs including *Lomandra rupestris*

Isolated herbs/forbs including *Brachycome pusilla*, *Waitzia acuminata*, *Pterochaeta paniculata*, *Trachymene pilosa*, *Gnephosis drummondii*, *Podotheca angustifolia*, *Goodenia affinis*, **Ursinia anthemoides*, *Gnephosis tenuissima* and *Glischrocaryon flavescens*
Isolated tussock grass *Neurachne alopecuroidea*

Comments This vegetation type covers small areas of deep sand adjacent to salt lakes and is not as extensive or species rich as areas mapped in East Lake Bryde NR which are generally higher in the landscape. *Leptospermum erubescens* is dominant in some areas. In Lakeland NR vegetation type **Er** is characterised by taller shrubs to 3m and has been long unburnt.



Eremaea pauciflora heathland at Releve 21



Eremaea pauciflora heathland at Releve 86

Mixed sandy heathland

Hs

Relevés 36

Landform Lower slopes, deep sandy soils adjacent to woodlands

Soils, topography Sandy soils, flat to gentle slope

Condition Excellent

Vegetation Description

Mid stratum Isolated shrubs to 2m including *Leptospermum erubescens*, *Santalum acuminatum*, *Alyxia buxifolia*, *Acacia heteroclita*

Ground Mid dense shrubs to 1.0m including *Calytrix leschenaultii* (frequent), *Olearia* sp. *Eremicola* and *Pimelea argentea*

Isolated sedges including *Lepidobolus preissianus* and *Lepidosperma* species
Isolated rush/perennial herbs including *Lomandra rupestris*
Isolated herbs/forbs including *Waitzia acuminata*, *Brachyscome pusilla*,
Actinobole uliginosum, *Podotheca angustifolia*, *Ptilotus humilis* and
Calandrinia eremaea
Isolated tussock grass **Pentameris airoides*

Comments *Eremaea* heathland and mixed sandy heathland relevés cluster together in the PRIMER analysis reflecting the similarity in species composition with the presence in both vegetation types of plants that prefer deeper sandy soils.



Mixed sandy heathland at Releve 36

Isolated *Eucalyptus loxophleba* subsp. *gratiae* over shrubland **Elox**

Relevés **8, 87, 88, 94**

Landform Mid to upper slopes associated with granite

Soils, topography Gravelly sands and loams adjacent to granite, flat to gentle slope

Condition Excellent

Vegetation Description

Mid stratum Isolated to very sparse shrub mallee to 6m of *Eucalyptus loxophleba* subsp. *gratiae*

Mid stratum Mid dense shrubs over 2m (occasionally to 2m) including *Allocasuarina campestris* and *Melaleuca scalena* (either one of these species may be dominant in different areas). Other species recorded include *Leptospermum nitens*, *Callitris preissii* and *Hakea erecta*

Ground Isolated to sparse shrubs to 1.0m or 0.5m in height including *Phebalium tuberosum*, *Hakea scoparia*, *Beyeria sulcata*, *Hibbertia gracilipes*, *Verticordia picta*, *Verticordia chrysanthella*, *Ericomyrtus serpyllifolia*, *Astus subroseus*, *Calytrix leschenaultii*, *Leucopogon obtusatus*, *Leucopogon dielsianus*, *Melaleuca laxiflora*, *Mirbelia multicaulis*, *Exocarpos aphyllus*, *Melaleuca spicigera*, *Gastrolobium ?discolor*, *Hakea subsulcata* and *Eremophila drummondii*

Isolated to very sparse sedges including *Lepidosperma* sp. Ravensthorpe, *Lepidosperma* species

Isolated tussock grass *Neurachne alopecuroidea*



Isolated *Eucalyptus loxophleba* subsp. *gratae* over shrubland at releve 87



Isolated *Eucalyptus loxophleba* subsp. *gratae* over shrubland at releve 88

Melaleuca shrubland

M

Relevés	30, 32, 35, 52, 59, 67, 91
Landform	Low lying areas, closed depressions, drainage lines, edge of salt lakes
Soils, topography	Silt and sandy soils over clay, clay soils, poorly drained
Condition	Excellent, some minor weeds and isolated <i>Tecticornia</i> species
Vegetation Description	
Mid stratum	Mid dense shrubs usually over 2m (to 4m) occasionally to 1.5m including <i>Melaleuca lateriflora</i> , <i>Melaleuca halmaturorum</i> , <i>Melaleuca adenostyla</i> , <i>Melaleuca thyoides</i> , <i>Melaleuca acuminata</i> , <i>Melaleuca strobophylla</i> , <i>Melaleuca acuminata</i> , <i>Melaleuca hamulosa</i> , <i>Melaleuca atroviridis</i> , <i>Melaleuca brophyi</i> and <i>Melaleuca scalena</i>
Ground stratum	Isolated to very sparse shrubs to 0.5m including <i>Rhagodia preissii</i> , <i>Disphyma crassifolium</i> , <i>Enchylaena tomentosa</i> , <i>Threlkeldia diffusa</i> , <i>Sclerolaena diacantha</i> , <i>Wilsonia humilis</i> and <i>Tecticornia</i> species Isolated tussock grasses including <i>Austrostipa elegantissima</i> and * <i>Avellinia michelii</i> Isolated sedges including <i>Gahnia trifida</i> Isolated forbs/herbs including <i>Calandrinia eremaea</i> , <i>Calandrinia granulifera</i> , <i>Carpobrotus modestus</i> , <i>Crassula colorata</i> , <i>Apium annuum</i> , <i>Erymophyllum tenellum</i> , <i>Crassula exserta</i> , <i>Actinobole uliginosum</i> , <i>Podolepis capillaries</i> , <i>Pogonolepis muelleriana</i> , <i>Brachyscome pusilla</i> , <i>Siloxerus pygmaeus</i> , * <i>Mesembryanthemum nodiflorum</i> and * <i>Arctotheca calendula</i>
Comments	Dead trees at releve 59 indicate that this area is probably a degraded woodland site



***Melaleuca* shrubland at Revele 32**



***Melaleuca* shrubland at Revele 52**

Melaleuca shrubland - degraded

M d

Releves	37, 40, 51
Landform	Low lying areas, valley floor
Soils, topography	Silt and sandy soils over clay, clay soils, poorly drained
Condition	Good to Very Good - weed invasion in some areas and some degradation due to water logging/salinity, dead shrubs

Vegetation Description

Mid stratum	Isolated to mid dense shrubs over 2m (to 4m) including <i>Melaleuca halmaturorum</i> , <i>Melaleuca lateriflora</i> , <i>Melaleuca adenostyla</i> and <i>Melaleuca atroviridis</i>
Ground stratum	<p>Sparse shrubs to 1.0m or 0.5m including <i>Disphyma crassifolium</i>, <i>Maireana brevifolia</i>, <i>Enchylaena tomentosa</i>, <i>Threlkeldia diffusa</i>, <i>Acacia hemiteles</i>, <i>Tecticornia perangusta</i>, <i>Tecticornia syncarpa</i>, <i>Tecticornia lepidosperma</i>, <i>Tecticornia species</i> and <i>Wilsonia humilis</i></p> <p>Isolated occasionally to sparse grasses including <i>Austrostipa elegantissima</i>, <i>Neurachne alopecuroidea</i>, <i>*Avellinia michelii</i>, <i>*Pentameris airoides</i></p> <p>Isolated forbs/herbs including <i>Apium annuum</i>, <i>Carpobrotus modestus</i>, <i>Pogonolepis muelleriana</i>, <i>Crassula colorata</i>, <i>Crassula exserta</i>, <i>Erymophyllum tenellum</i>, <i>Pseudognaphalium luteoalbum</i>, <i>*Sonchus oleraceus</i>, <i>*Cotula bipinnata</i>, <i>*Trifolium species</i>, <i>*Mesembryanthemum nodiflorum</i></p>



Degraded *Melaleuca* shrubland at Releve 37



Degraded *Melaleuca* shrubland at Releve 40

Duma horrida/Tecticornia verrucosa shrubland

Dh

Releve	34
Landform	Lake bed
Soils, topography	clay, poorly drained
Condition	Excellent

Vegetation Description

Stratum Mid dense shrubs to 0.5m including *Duma horrida* subsp. *abdita* T, *Tecticornia verrucosa*, *Tecticornia monilifolmis*, *Tecticornia lepidosperma*, *Tecticornia ?pergranulata* and *Wilsonia humilis*

Comments Threatened Ecological Community



Duma horrida/Tecticornia verrucosa shrubland at releve 34

Wilsonia isolated shrubs

W

Releve	68, 81, 83
Landform	Small closed depressions, valley floor
Soils, topography	Clay, silt - poorly drained
Condition	Excellent to Very Good, vegetation affected by dry season and kangaroo grazing. Dead shrubs at releve 83 need further investigation in wet season

Vegetation Description

Ground Small areas of mid dense shrubs to 10cm including *Wilsonia rotundifolia*, *Wilsonia humilis*, *Disphyma crassifolium*, *Threlkeldia diffusa* and *Maireana brevifolia*

Forbs/herbs including *Angianthus pygmaeus*, *Crassula exserta*, *Crassula colorata* var. *acuminata*, *Centipeda cunninghamii* and **Mesembryanthemum nodiflorum*

Sedge *Schoenus calcatus*

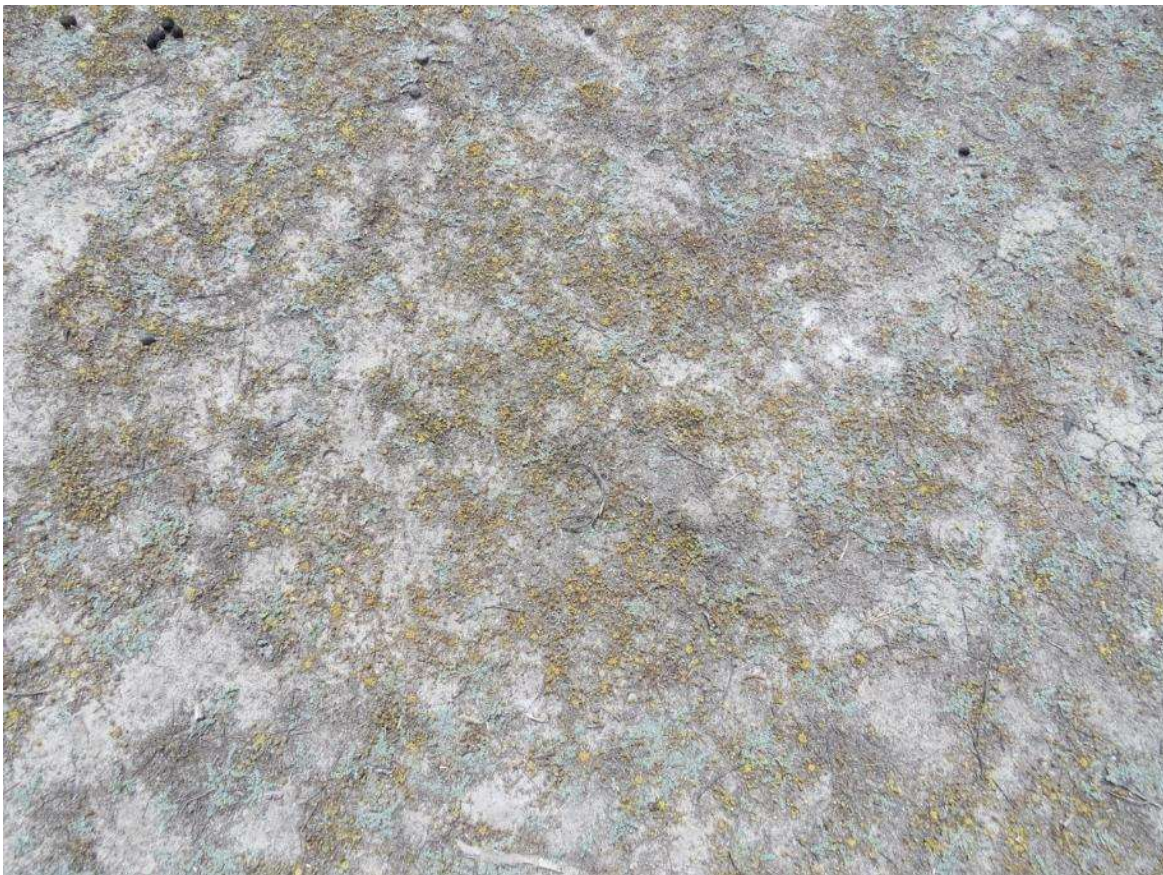
Comments Patchy vegetation possibly more uniform in wetter season, *Melaleuca* shrubland adjacent



Wilsonia isolated shrubs at Releve 68



***Wilsonia* isolated shrubs at Releve 83 with dead shrubs**



***Wilsonia rotundifolia* and *Angianthus pygmaea* at Releve 68**

Samphire (*Tecticornia*) shrubland

Te

Releve	22, 24, 25, 31, 39, 43, 46, 47, 47, 55, 92
Landform	Lake bed
Soils, topography	Clay, silt - poorly drained salt lakes (gypsum on a number of the lakes)
Condition	Excellent to Good, dead shrubs are present in some areas

Vegetation Description

Stratum 1	<p>Sparse to mid dense shrubs to 0.5m including <i>Tecticornia pergranulata</i>, <i>Tecticornia syncarpa</i>, <i>Tecticornia doliiformis</i>, <i>Tecticornia halocnemoides</i>, <i>Tecticornia indica</i> subsp. <i>bidens</i>, <i>Tecticornia lepidosperma</i>, <i>Tecticornia moniliformis</i>, <i>Tecticornia sparagosa</i>, <i>Salicornia blackiana</i>, <i>Disphyma crassifolium</i>, <i>Frankenia cinerea</i> and <i>Wilsonia humilis</i></p> <p>Isolated forbs/herbs including <i>Isotoma scapigera</i>, <i>Senecio glossanthus</i>, <i>Lawrenca diffusa</i> and <i>*Mesembryanthemum nodiflorum</i></p>
Comments	More information about specific wetlands is available in Table 9 and Appendix 11



Samphire (*Tecticornia*) shrubland at Releve 46

Granite complex

Shrubland

Gs

Relevés	5, 20
Landform	Granite outcrop and surrounds
Soils, topography	Sandy loam soils over granite
Condition	Excellent, some weed invasion

Vegetation Description

Stratum 1	Mid dense shrubs to 1.5m including <i>Thryptomene australis</i> , <i>Melaleuca elliptica</i> , <i>Allocasuarina campestris</i> , <i>Acacia lasiocalyx</i> , <i>Leptospermum ?nitens</i> , <i>Grevillea teretifolia</i> and <i>Leptomeria preissiana</i>
Stratum 2	Very sparse to mid dense herbs/forbs of <i>Borya constricta</i> , also recorded <i>Borya lacinata</i> , <i>Stylidium petiolare</i> , <i>Brachyscome pusilla</i> , <i>Thelymitra antennifera</i> , <i>Stylidium neglectum</i> , <i>Drosera subhirtella</i> , <i>Thysanotus ?patersonii</i> and <i>Stackhousia monogyna</i> Sparse sedges including <i>Lepidosperma</i> species and <i>Gahnia ancistrophylla</i> Isolated grass <i>Spartochloa scirpoides</i>



Granite complex – shrubland at Releve 20

Granite complex

Allocasuarina campestris Shrubland

Ac

Relevés	9, 19
Landform	Granite outcrop and surrounds
Soils, topography	Sandy loam soils over granite
Condition	Excellent, some weed invasion

Vegetation Description

Stratum 1	Mid dense shrubs to 3m of <i>Allocasuarina campestris</i> with <i>Melaleuca scalena</i> and <i>Melaleuca elliptica</i> occasional
Stratum 2	Isolated shrubs to 1.0m including <i>Phebalium tuberosum</i> , <i>Astus subroseus</i> , and <i>Acacia acanthaster</i> Isolated herbs/forbs of <i>Trachymene pilosa</i> Isolated vines including <i>Comesperma volubile</i> and <i>Thysanotus ?patersonii</i>



Granite Complex – *Allocasuarina campestris* shrubland at releve 9

Granite complex

Herbland

Gh

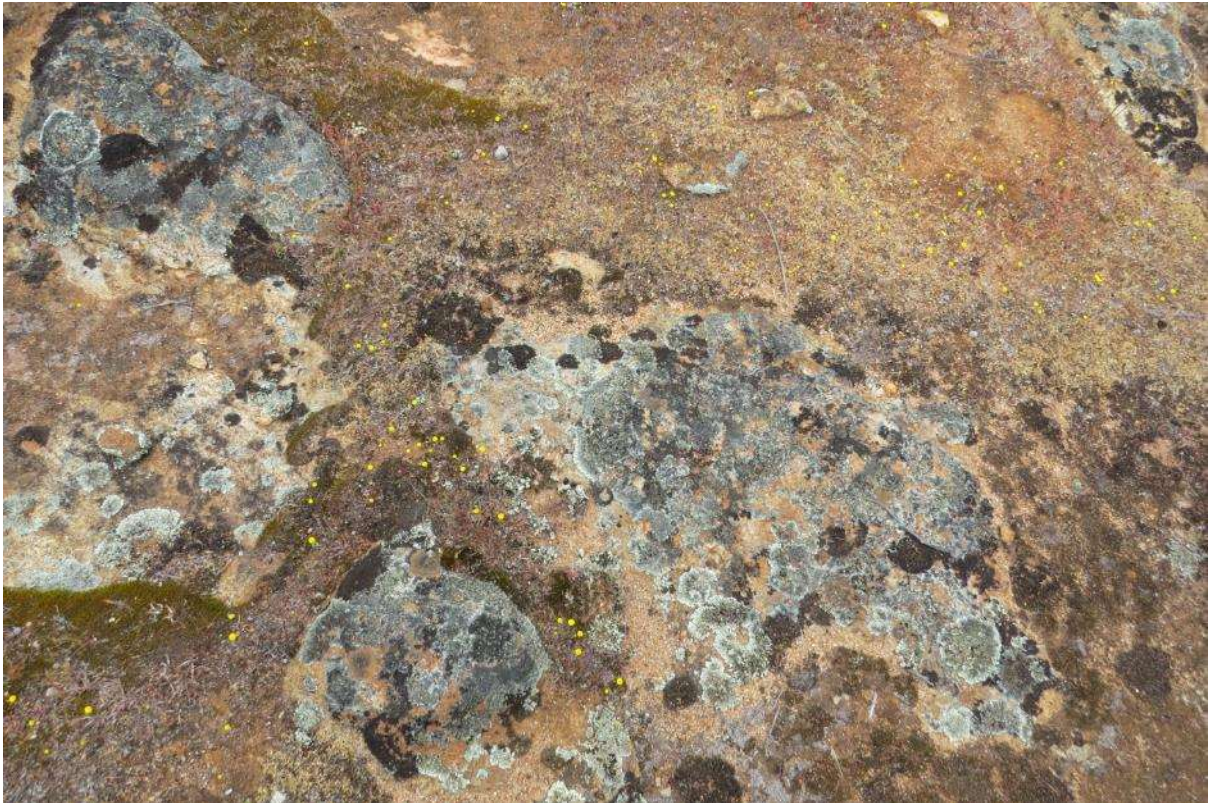
Releve	6
Landform	granite outcrop and surrounds
Soils, topography	Shallow sandy soils over granite, soil pockets
Condition	Excellent, some weed invasion

Vegetation Description

Stratum 1	Isolated to very sparse shrubs to 1.0m including <i>Thryptomene australis</i> and <i>Allocasuarina campestris</i> at the edges.
Stratum 2	Sparse (patchy) herbs/forbs including <i>Borya constricta</i> , <i>Borya lacinata</i> , <i>Stylidium neglectum</i> , <i>Brachyscome pusilla</i> , <i>Drosera subhirtella</i> , <i>Crassula exserta</i> , <i>Podolepis lessonii</i> , <i>Siloxerus pygmaeus</i> , <i>Stackhousia monogyna</i> , <i>*Ursinia anthemoides</i> and <i>*Arctotheca calendula</i> Isolated grass <i>*Pentameris airoides</i>
Comments	The dry season has resulted in a lower number of annual herbs/forbs and geophytes than expected.



Granite complex – herbland at Releve 6



Granite complex – herbland at Releve 6

Appendix 8
Plant Species List

Family Name	weed	Species name	Cons Code	Additions
Aizoaceae		Carpobrotus modestus		
Aizoaceae		Disphyma crassifolium		
Aizoaceae	*	Mesembryanthemum nodiflorum		
Amaranthaceae		Ptilotus holosericeus		LK1, 3
Amaranthaceae		Ptilotus humilis		
Amaranthaceae		Ptilotus polystachyus		
Apiaceae		Apium annuum		
Apiaceae		Platysace trachymenioides		
Araliaceae		Hydrocotyle callicarpa		LK3
Araliaceae		Hydrocotyle diantha		LK1
Araliaceae		Hydrocotyle medicaginoides		
Araliaceae		Hydrocotyle muriculata	1	LK5 DBCA
Araliaceae		Hydrocotyle pilifera var. glabrata		LK1, 2
Araliaceae		Hydrocotyle rugulosa		LK1, 2, 5, SAP
Araliaceae		Trachymene ornata		
Araliaceae		Trachymene pilosa		
Asparagaceae		Laxmannia paleacea		
Asparagaceae		Lomandra micrantha subsp. micrantha		
Asparagaceae		Lomandra rupestris		
Asparagaceae		Thysanotus patersonii		
Asparagaceae		Lomandra mucronata		
Asphodelaceae		Bulbine semibarbata		LK2, 5
Asteraceae		Actinobole uliginosum		
Asteraceae		Angianthus pygmaeus		
Asteraceae	*	Arctotheca calendula		
Asteraceae		Blennospora drummondii		LK3, 4
Asteraceae		Brachyscome pusilla		
Asteraceae		Calotis hispidula		LK1 DBCA
Asteraceae		Centipeda cunninghamii		
Asteraceae		Ceratogyne obionoides		SAP
Asteraceae	*	Cotula bipinnata		
Asteraceae		Erymophyllum tenellum		
Asteraceae		Gnephosis drummondii		
Asteraceae		Gnephosis multiflora	3	Anne Rick
Asteraceae		Gnephosis tenuissima		
Asteraceae		Helichrysum leucopsidium		
Asteraceae		Hyalosperma demissum		LK5, SAP
Asteraceae	*	Hypochaeris glabra		
Asteraceae		Kippistia suaedifolia		
Asteraceae		Millotia tenuifolia		LK5, SAP
Asteraceae		Olearia muelleri		
Asteraceae		Olearia ramosissima		

Family Name	weed	Species name	Cons Code	Additions
Asteraceae		Olearia sp. Eremicola (Diels & Pritzel s.n. PERTH 00449628)		
Asteraceae		Podolepis capillaris		
Asteraceae		Podolepis lessonii		
Asteraceae		Podotheca angustifolia		
Asteraceae		Podotheca gnaphalioides		SAP
Asteraceae		Pogonolepis muelleriana		
Asteraceae		Pseudognaphalium luteoalbum		
Asteraceae		Pterochaeta paniculata		
Asteraceae		Rhodanthe citrina		
Asteraceae		Rhodanthe heterantha		LK4
Asteraceae		Rhodanthe laevis		LK2, SAP
Asteraceae		Rhodanthe pygmaea		LK2
Asteraceae		Senecio glossanthus		
Asteraceae		Siloxerus pygmaeus		
Asteraceae	*	Sonchus oleraceus		LK5, LK2 DBCA
Asteraceae	*	Ursinia anthemoides		
Asteraceae		Vittadinia gracilis		
Asteraceae		Waitzia acuminata		
Boryaceae		Borya constricta		
Boryaceae		Borya laciniata		
Brassicaceae	*	Hornungia procumbens		LK2
Brassicaceae		Lepidium rotundum		LK1, 3 DBCA
Brassicaceae		Stenopetalum sphaerocarpum		MT6
Campanulaceae		Lobelia gibbosa		Anne Rick, SAP
Campanulaceae		Wahlenbergia preissii		SAP
Caryophyllaceae		Spergularia marina		LK4 DBCA
Casuarinaceae		Allocasuarina acutivalvis		
Casuarinaceae		Allocasuarina campestris		
Casuarinaceae		Allocasuarina corniculata		
Casuarinaceae		Allocasuarina huegeliana		
Casuarinaceae		Allocasuarina microstachya		
Casuarinaceae		Allocasuarina pinaster		
Celastraceae		Psammomoya choretroides		
Celastraceae		Stackhousia monogyna		
Chenopodiaceae		Atriplex ?hymenotheca		MT6 DBCA
Chenopodiaceae		Atriplex paludosa		
Chenopodiaceae		Atriplex semibaccata		LK3
Chenopodiaceae		Enchylaena tomentosa		
Chenopodiaceae		Maireana brevifolia		
Chenopodiaceae		Maireana oppositifolia		
Chenopodiaceae		Rhagodia crassifolia		LK1, 3, 4, MT6
Chenopodiaceae		Rhagodia drummondii		
Chenopodiaceae		Rhagodia preissii		

Family Name	weed	Species name	Cons Code	Additions
Chenopodiaceae		Salicornia blackiana		
Chenopodiaceae		Salicornia quinqueflora		LK1, 3, 4, 5
Chenopodiaceae		Sclerolaena diacantha		
Chenopodiaceae		Tecticornia doliiformis		
Chenopodiaceae		Tecticornia halocnemoides subsp. caudata		
Chenopodiaceae		Tecticornia indica subsp. bidens		
Chenopodiaceae		Tecticornia lepidosperma		
Chenopodiaceae		Tecticornia moniliformis		
Chenopodiaceae		Tecticornia pergranulata		
Chenopodiaceae		Tecticornia sparagosa		
Chenopodiaceae		Tecticornia syncarpa		
Chenopodiaceae		Tecticornia verrucosa		
Chenopodiaceae		Threlkeldia diffusa		
Convolvulaceae		Wilsonia humilis		
Convolvulaceae		Wilsonia rotundifolia		
Crassulaceae		Crassula colorata var. acuminata		
Crassulaceae		Crassula exserta		
Cupressaceae		Callitris preissii		
Cupressaceae		Callitris roei		
Cyperaceae		Gahnia ancistrophylla		
Cyperaceae		Gahnia sp. South West		
Cyperaceae		Lepidosperma pruinatum		
Cyperaceae		Lepidosperma sp. Bandalup Scabrid		
Cyperaceae		Lepidosperma sp. Ravensthorpe		
Cyperaceae		Lepidosperma sanquinolentum		
Cyperaceae		Lepidosperma species		
Cyperaceae		Schoenus calcatus		
Cyperaceae		Tetraria sp. Mt Madden		
Dilleniaceae		Hibbertia exasperata		
Dilleniaceae		Hibbertia gracilipes		
Dilleniaceae		Hibbertia pungens		
Droseraceae		Drosera grievei	1	
Droseraceae		Drosera leucoblata		SAP
Droseraceae		Drosera macrantha		
Droseraceae		Drosera subhirtella		
Ericaceae		Andersonia lehmanniana		
Ericaceae		Astroloma chloranthum	2	
Ericaceae		Astroloma serratifolium		
Ericaceae		Astroloma epacridis		
Ericaceae		Coleanthera coelophylla	1	Mattiske 1999
Ericaceae		Coleanthera myrtoides		
Ericaceae		Conostephium preissii		
Ericaceae		Conostephium roei		

Family Name	weed	Species name	Cons Code	Additions
Ericaceae		Leucopogon cuneifolius		
Ericaceae		Leucopogon dielsianus		
Ericaceae		Leucopogon obtusatus		
Ericaceae		Leucopogon sp. Kau Rock		
Ericaceae		Leucopogon sp. Newdegate		
Ericaceae		Leucopogon sp. Wheatbelt		
Ericaceae		Lysinema pentapetalum		
Euphorbiaceae		Bertya dimerostigma		
Euphorbiaceae		Beyeria sulcata		
Fabaceae		Acacia acanthaster		
Fabaceae		Acacia acanthoclada subsp. acanthoclada		
Fabaceae		Acacia amputata		
Fabaceae		Acacia bidentata		
Fabaceae		Acacia binata		
Fabaceae		Acacia erinacea		
Fabaceae		Acacia evenulosa		
Fabaceae		Acacia hemiteles		
Fabaceae		Acacia heteroclita subsp. heteroclita		
Fabaceae		Acacia lasiocalyx		
Fabaceae		Acacia leptospermoides subsp. leptospermoides		
Fabaceae		Acacia merrallii		
Fabaceae		Acacia microbotrya		
Fabaceae		Acacia patagiata		
Fabaceae		Acacia saligna		
Fabaceae		Acacia verriculum		
Fabaceae		Acacia viscifolia		
Fabaceae		Aotus sp. Southern Wheatbelt		
Fabaceae		Bossiaea halophila		
Fabaceae		Daviesia incrassata subsp. incrassata		
Fabaceae		Daviesia lancifolia		
Fabaceae		Daviesia scoparia		
Fabaceae		Dillwynia uncinata		
Fabaceae		Eutaxia nanophylla	3	
Fabaceae		Gastrolobium discolor		
Fabaceae		Gastrolobium punctatum		
Fabaceae		Jacksonia racemosa		
Fabaceae		Mirbelia floribunda		
Fabaceae		Mirbelia multicaulis		
Fabaceae		Mirbelia trichocalyx		
Fabaceae		Senna artemisioides subsp. x artemisioides		
Fabaceae		Templetonia rossii		

Family Name	weed	Species name	Cons Code	Additions
Frankeniaceae		Frankenia cinerea		
Frankeniaceae		Frankenia drummondii	3	Anne Rick
Frankeniaceae		Frankenia sp. southern gypsum (M.N. Lyons 2864)	3	LK1, LK3, LK4
Gentianaceae	*	Centaurium erythraea		LK1, 2 DBCA
Goodeniaceae		Dampiera juncea		
Goodeniaceae		Dampiera lavandulacea		
Goodeniaceae		Dampiera orchardii	2	
Goodeniaceae		Dampiera sacculata		
Goodeniaceae		Goodenia affinis		
Haemodoraceae		Conostylis argentea		
Haemodoraceae		Conostylis petrophiloides		
Haloragaceae		Glischrocaryon flavescens		
Hemerocallidaceae		Dianella brevicaulis		LK2
Hemerocallidaceae		Dianella revoluta		
Juncaginaceae		Triglochin isingiana		LK1, 2
Juncaginaceae		Triglochin mucronata		
Juncaginaceae		Triglochin nana		
Lamiaceae		Dicrasyllis corymbosa		
Lamiaceae		Microcorys subcanescens		SAP
Lamiaceae		Prostanthera serpyllifolia subsp. microphylla		
Lamiaceae		Westringia cephalantha		
Lamiaceae		Westringia rigida		
Lauraceae		Cassytha flava		
Lauraceae		Cassytha glabella		
Lauraceae		Cassytha melantha		
Lauraceae		Cassytha pomiformis		
Malvaceae		Lasiopetalum rosmarinifolium		
Malvaceae		Lawrenzia diffusa		
Malvaceae		Lawrenzia glomerata		DBCA
Malvaceae		Lawrenzia squamata		LK5
Malvaceae		Thomasia sarotes		
Montiaceae		Calandrinia calyptrata		LK2, MT 6, SAP
Montiaceae		Calandrinia eremaea		
Montiaceae		Calandrinia granulifera		
Myrtaceae		Astus subroseus		
Myrtaceae		Beaufortia micrantha		
Myrtaceae		Beaufortia puberula		
Myrtaceae		Beaufortia schaueri		
Myrtaceae		Calothamnus quadrifidus		LK5
Myrtaceae		Calytrix breviseta subsp. stipulosa		SAP
Myrtaceae		Calytrix leschenaultii		
Myrtaceae		Chamelaucium ciliatum		

Family Name	weed	Species name	Cons Code	Additions
Myrtaceae		Chamelaucium sp. Merredin		
Myrtaceae		Cyathostemon tenuifolius		
Myrtaceae		Darwinia sp. Karonie		
Myrtaceae		Darwinia sp. Lake Cobham		
Myrtaceae		Eremaea pauciflora		
Myrtaceae		Ericomyrtus serpyllifolia		
Myrtaceae		Eucalyptus alipes		
Myrtaceae		Eucalyptus calycogona		
Myrtaceae		Eucalyptus celastroides		
Myrtaceae		Eucalyptus dissimulata		
Myrtaceae		Eucalyptus extensa		
Myrtaceae		Eucalyptus flocktoniae		
Myrtaceae		Eucalyptus longicornis		
Myrtaceae		Eucalyptus loxophleba subsp. gratiae		
Myrtaceae		Eucalyptus mimica		florabase DBCA
Myrtaceae		Eucalyptus myriadena		
Myrtaceae		Eucalyptus neutra		
Myrtaceae		Eucalyptus olivina		
Myrtaceae		Eucalyptus perangusta		
Myrtaceae		Eucalyptus phaenophylla		
Myrtaceae		Eucalyptus phenax		
Myrtaceae		Eucalyptus pileata		
Myrtaceae		Eucalyptus salmonophloia		
Myrtaceae		Eucalyptus salubris		
Myrtaceae		Eucalyptus sporadica		
Myrtaceae		Eucalyptus suggrandis subsp. promiscua		
Myrtaceae		Eucalyptus tenera		
Myrtaceae		Eucalyptus uncinata		
Myrtaceae		Eucalyptus urna		
Myrtaceae		Kunzea jucunda		
Myrtaceae		Leptospermum erubescens		
Myrtaceae		Leptospermum inelegans		
Myrtaceae		Leptospermum nitens		
Myrtaceae		Leptospermum spinescens		
Myrtaceae		Melaleuca acuminata		
Myrtaceae		Melaleuca adenostyla		
Myrtaceae		Melaleuca adnata		
Myrtaceae		Melaleuca apodocephala		
Myrtaceae		Melaleuca atroviridis		
Myrtaceae		Melaleuca bracteosa		
Myrtaceae		Melaleuca brophyi		
Myrtaceae		Melaleuca carrii		

Family Name	weed	Species name	Cons Code	Additions
Myrtaceae		Melaleuca cordata		
Myrtaceae		Melaleuca depauperata		
Myrtaceae		Melaleuca elliptica		
Myrtaceae		Melaleuca halmaturorum		
Myrtaceae		Melaleuca hamulosa		
Myrtaceae		Melaleuca johnsonii		
Myrtaceae		Melaleuca lanceolata		
Myrtaceae		Melaleuca lateralis		
Myrtaceae		Melaleuca lateriflora		
Myrtaceae		Melaleuca laxiflora		
Myrtaceae		Melaleuca lecanantha		
Myrtaceae		Melaleuca marginata		
Myrtaceae		Melaleuca pauperiflora		
Myrtaceae		Melaleuca platycalyx		
Myrtaceae		Melaleuca pungens		
Myrtaceae		Melaleuca rigidifolia		
Myrtaceae		Melaleuca sapientes		
Myrtaceae		Melaleuca scalena		
Myrtaceae		Melaleuca sculponeata	3	
Myrtaceae		Melaleuca societatis		
Myrtaceae		Melaleuca spicigera		
Myrtaceae		Melaleuca strobophylla		
Myrtaceae		Melaleuca subfalcata		
Myrtaceae		Melaleuca subtrigona		
Myrtaceae		Melaleuca thyoides		
Myrtaceae		Melaleuca tuberculata		
Myrtaceae		Micromyrtus obovata		
Myrtaceae		Rinzia communis		
Myrtaceae		Tetrapora preissiana		
Myrtaceae		Thryptomene australis		
Myrtaceae		Verticordia acerosa var. preissii		
Myrtaceae		Verticordia chrysantha		
Myrtaceae		Verticordia chrysanthella		
Myrtaceae		Verticordia densiflora		
Myrtaceae		Verticordia eriocephala		
Myrtaceae		Verticordia picta		
Myrtaceae		Verticordia plumosa		
Myrtaceae		Verticordia roei		
Orchidaceae		Caladenia microchila		LK2
Orchidaceae		Thelymitra antennifera		
Phyllanthaceae		Poranthera microphylla		SAP
Pittosporaceae		Billardiera lehmanniana		
Pittosporaceae		Pittosporum angustifolium		

Family Name	weed	Species name	Cons Code	Additions
Poaceae		Amhipogon turbinatus		
Poaceae		Austrostipa elegantissima		
Poaceae		Austrostipa exilis		MT6
Poaceae		Austrostipa hemipogon		
Poaceae		Austrostipa juncifolia		LK2
Poaceae		Austrostipa nitida		LK3
Poaceae		Austrostipa puberula		LK3
Poaceae		Austrostipa pycnostachya		
Poaceae		Austrostipa trichophylla		
Poaceae		Austrostipa variabilis		LK4 DBCA
Poaceae	*	Avellinia michelii		
Poaceae	*	Bromus diandrus		MT6
Poaceae		Eragrostis dielsii		
Poaceae		Lachnagrostis preissii		MT6
Poaceae		Neurachne alopecuroidea		
Poaceae	*	Pentameris airoides		
Poaceae		Puccinellia stricta		LK1, 5 DBCA
Poaceae	*	Rostraria cristata		
Poaceae		Rytidosperma caespitosum		LK1, 2, 3, 4, 5, MT6
Poaceae		Spartochloa scirpoidea		
Poaceae	*	Vulpia myuros		LK5
Polygalaceae		Comesperma spinosum		
Polygalaceae		Comesperma volubile		
Polygonaceae		Duma horrida subsp. abdita	T	
Proteaceae		Banksia erythrocephala		
Proteaceae		Banksia pallida		
Proteaceae		Banksia violacea		
Proteaceae		Banksia xylothemelia	3	
Proteaceae		Conospermum cinereum		
Proteaceae		Grevillea acacioides		
Proteaceae		Grevillea acuaria		
Proteaceae		Grevillea eriostachya		
Proteaceae		Grevillea hookeriana		
Proteaceae		Grevillea huegelii		
Proteaceae		Grevillea newbeyi	3	
Proteaceae		Grevillea oligantha		
Proteaceae		Grevillea teretifolia		
Proteaceae		Grevillea umbellulata		
Proteaceae		Hakea commutata		
Proteaceae		Hakea corymbosa		
Proteaceae		Hakea cygna		
Proteaceae		Hakea erecta		
Proteaceae		Hakea horrida		

Family Name	weed	Species name	Cons Code	Additions
Proteaceae		Hakea kippistiana		
Proteaceae		Hakea lissocarpha		
Proteaceae		Hakea marginata		
Proteaceae		Hakea meisneriana		
Proteaceae		Hakea newbeyana		
Proteaceae		Hakea scoparia		
Proteaceae		Hakea strumosa		
Proteaceae		Hakea subsulcata		
Proteaceae		Isopogon scabriusculus		
Proteaceae		Isopogon sp. Fitzgerald River (D.B. Foreman 813)		
Proteaceae		Isopogon teretifolius		
Proteaceae		Persoonia brevirhachis	3	
Proteaceae		Persoonia coriacea		
Proteaceae		Persoonia quinquenervis		SAP
Proteaceae		Persoonia teretifolia		
Proteaceae		Petrophile ericifolia		
Proteaceae		Petrophile glauca		
Proteaceae		Petrophile merrallii		SAP
Proteaceae		Petrophile seminuda		
Proteaceae		Petrophile squamata		
Proteaceae		Synaphea interioris		
Restionaceae		Desmocladius myriocladus		
Restionaceae		Desmocladius parthenicus		
Restionaceae		Desmocladius quiricanus		
Restionaceae		Lepidobolus preissianus		
Rhamnaceae		Cryptandra leucopogon		
Rhamnaceae		Cryptandra minutifolia		
Rhamnaceae		Cryptandra nutans		
Rhamnaceae		Spyridium mucronatum subsp. recurvum	3	
Rhamnaceae		Trymalium elachophyllum		
Rutaceae		Boronia inornata subsp. inornata		
Rutaceae		Microcybe multiflora subsp. baccharoides		
Rutaceae		Phebalium filifolium		
Rutaceae		Phebalium lepidotum		
Rutaceae		Phebalium megaphyllum		
Rutaceae		Phebalium microphyllum		
Rutaceae		Phebalium tuberculosum		
Santalaceae		Exocarpos aphyllus		
Santalaceae		Leptomeria preissiana		
Santalaceae		Santalum acuminatum		
Santalaceae		Santalum murrayanum		

Family Name	weed	Species name	Cons Code	Additions
Sapindaceae		Dodonaea bursariifolia		
Sapindaceae		Dodonaea stenozyga		
Sapindaceae		Dodonaea viscosa subsp. spatulata		
Scrophulariaceae		Eremophila decipiens		
Scrophulariaceae		Eremophila drummondii		
Solanaceae		Cyphanthera microphylla		
Solanaceae		Lycium australe		
Stylidiaceae		Levenhookia stipitata		SAP
Stylidiaceae		Stylidium dichotomum		
Stylidiaceae		Stylidium involucreatum		
Stylidiaceae		Stylidium neglectum		
Stylidiaceae		Stylidium petiolare		
Thymelaeaceae		Pimelea aeruginosa		
Thymelaeaceae		Pimelea argentea		
Thymelaeaceae		Pimelea brevifolia		
Zygophyllaceae		Roepera billardiarei		LK2

Appendix 9

**Department of Biodiversity Conservation and
Attractions
Parks and Wildlife Service**

**CONSERVATION CODES
For the Western Australian Flora and Fauna**



CONSERVATION CODES

For Western Australian Flora and Fauna

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

Categories of specially protected fauna and flora are:

T Threatened species

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

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

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

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

CR Critically endangered species

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

EN Endangered species

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

VU Vulnerable species

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

EX Presumed extinct species

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

IA Migratory birds protected under an international agreement

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



CD Conservation dependent fauna

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

OS Other specially protected fauna

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

P Priority species

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

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

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

1 Priority 1: Poorly-known species

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

2 Priority 2: Poorly-known species

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

3 Priority 3: Poorly-known species

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

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

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

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

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

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

Appendix 10

Priority Flora Coordinates

Taxa	Cons code	Voucher Number	Releve/ WP	Latitude	Longitude
<i>Drosera grieviei</i>	P1		WP 280	-33.238762	118.725451
<i>Astroloma chloranthum</i>	P2		Releve 42	-33.267815	118.711279
<i>Astroloma chloranthum</i>	P2		Releve 45	-33.270879	118.711296
<i>Astroloma chloranthum</i>	P2		Releve 66	-33.265564	118.740208
<i>Astroloma chloranthum</i>	P2		Releve 82	-33.253419	118.724843
<i>Astroloma chloranthum</i>	P2		Releve 85	-33.251062	118.730462
<i>Astroloma chloranthum</i>	P2		WP 455	-33.263333	118.723154
<i>Dampiera orchardii</i>	P2		Releve 23	-33.245942	118.707163
<i>Dampiera orchardii</i>	P2		Releve 29	-33.248192	118.718712
<i>Dampiera orchardii</i>	P2		Releve 42	-33.267815	118.711279
<i>Dampiera orchardii</i>	P2		Releve 45	-33.270879	118.711296
<i>Banksia xylothemelia</i>	P3		Releve 3	-33.221363	118.731868
<i>Banksia xylothemelia</i>	P3		Releve 11	-33.225151	118.734869
<i>Banksia xylothemelia</i>	P3		Releve 15	-33.235694	118.737082
<i>Banksia xylothemelia</i>	P3		Releve 28	-33.242088	118.725979
<i>Banksia xylothemelia</i>	P3		Releve 70	-33.253034	118.734284
<i>Banksia xylothemelia</i>	P3		Releve 74	-33.2401	118.730749
<i>Banksia xylothemelia</i>	P3		Releve 89	-33.2567	118.738298
<i>Banksia xylothemelia</i>	P3		WP 878	-33.255577	118.739250
<i>Eutaxia nanophylla</i>	P3		Releve 77	-33.240531	118.739226
<i>Eutaxia nanophylla</i>	P3		WP 875	-33.254283	118.740703
<i>Grevillea newbeyi</i>	P3		Releve 21	-33.247126	118.713547
<i>Grevillea newbeyi</i>	P3		Releve 23	-33.245942	118.707163
<i>Grevillea newbeyi</i>	P3		Releve 45	-33.270879	118.711296
<i>Grevillea newbeyi</i>	P3		Releve 86	-33.251661	118.715351
<i>Grevillea newbeyi</i>	P3		WP 430	-33.269236	118.711972
<i>Melaleuca sculponeata</i>	P3		WP 657	-33.265593	118.739274
<i>Melaleuca sculponeata</i>	P3		WP659	-33.265238	118.737724
<i>Persoonia brevirhachis</i>	P3		Releve 28	-33.242088	118.725979
<i>Persoonia brevirhachis</i>	P3		Releve 70	-33.253034	118.734284
<i>Persoonia brevirhachis</i>	P3		Releve 74	-33.2401	118.730749
<i>Persoonia brevirhachis</i>	P3		Releve 78	-33.247514	118.73855
<i>Persoonia brevirhachis</i>	P3		Releve 89	-33.2567	118.738298
<i>Persoonia brevirhachis</i>	P3		WP 13	-33.223889	118.731920
<i>Persoonia brevirhachis</i>	P3		WP 799	-33.246749	118.738941
<i>Persoonia brevirhachis</i>	P3		WP 878	-33.255577	118.739250
<i>Spyridium mucronatum</i> subsp. <i>recurvum</i>	P3		Releve 26	-33.245602	118.721532
<i>Spyridium mucronatum</i> subsp. <i>recurvum</i>	P3		Releve 61	-33.271095	118.742118
<i>Spyridium mucronatum</i> subsp. <i>recurvum</i>	P3		Releve 64	-33.276035	118.741373
<i>Spyridium mucronatum</i> subsp. <i>recurvum</i>	P3		Releve 66	-33.265564	118.740208

<i>Spyridium mucronatum</i> subsp. <i>recurvum</i>	P3		Releve 69	-33.254746	118.731807
<i>Spyridium mucronatum</i> subsp. <i>recurvum</i>	P3		Releve 84	-33.252392	118.729997
<i>Spyridium mucronatum</i> subsp. <i>recurvum</i>	P3		Releve 85	-33.251062	118.730462
<i>Spyridium mucronatum</i> subsp. <i>recurvum</i>	P3		WP 218	-33.247500	118.707905

Appendix 11

Wetlands

Lakeland Nature Reserve 29024

01 small salt lake, clay pan

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
179	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia pergranulata</i>	Flat terrain clay, poorly drained	Very Good to excellent condition, some dead shrubs due to dry season
177	Melaleuca Shrubland M adjacent Shrubs to 3m, 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca ?scalena</i> <i>Melaleuca thyoides</i> <i>Melaleuca adenostyla</i>	Edge of lake clay, poorly drained	Very Good condition, some dead trees present. waterlogging



Wet land 01

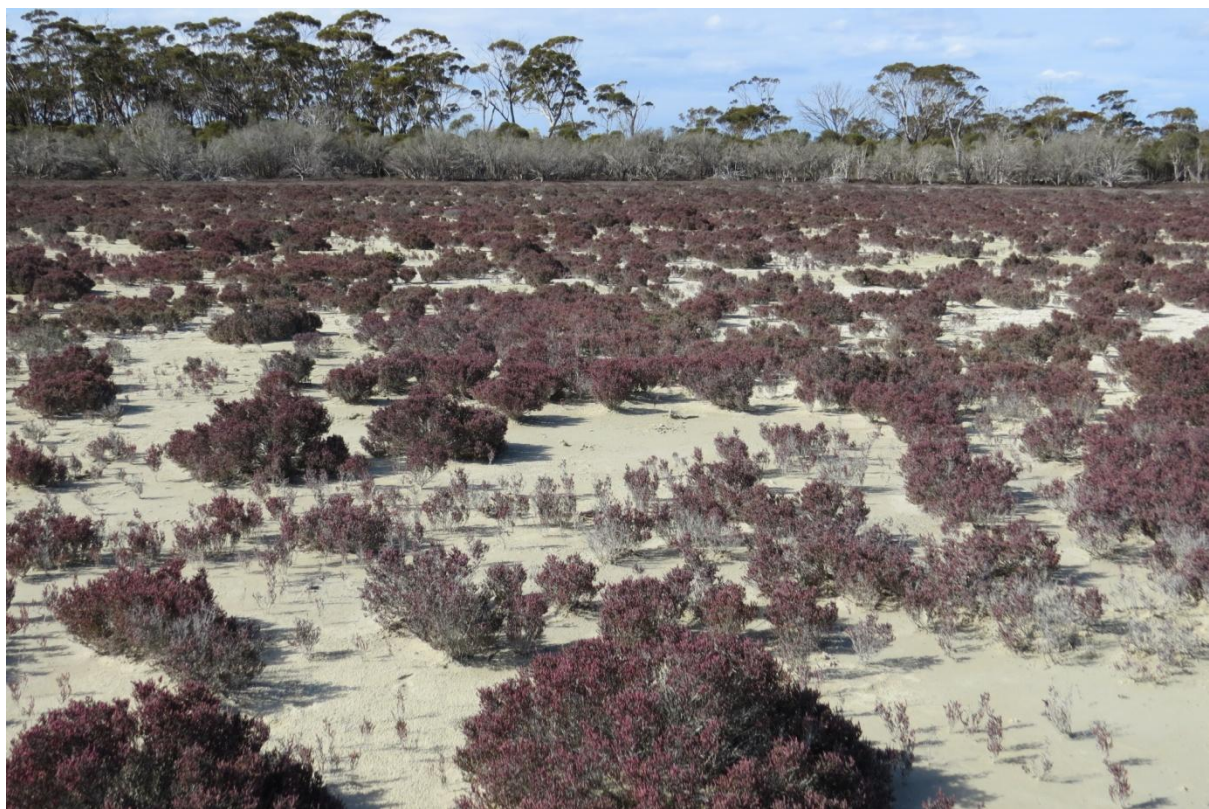
02 Small salt lake, clay pan

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
196	<i>Tecticornia</i> shrubland Te Shrubs to 30cms, scattered/isolated	<i>Tecticornia pergranulata</i>	Flat terrain clay, poorly drained	Good condition isolated shrubs due to dry season/previous waterlogging?
	<i>Melaleuca</i> shrubland M adjacent		Edge of lake clay, poorly drained	Good condition. Dead shrubs at edge. Waterlogging



03 Salt lake, clay pan, gypsum

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 22	Tecticornia shrubland Te Shrubs to 30cms, 10-30% canopy cover	<i>Tecticornia ?pergranulata</i> <i>?Salicornia blackiana</i>	Flat terrain gypsum, clay, poorly drained	Excellent condition, sparse shrubs and lack of annuals due to dry season
211	Melaleuca shrubland M adjacent Shrubs 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca strobophylla</i> <i>Melaleuca halmaturorum</i>	Edge of lake clay, poorly drained	Very Good condition, some dead shrubs at lake edge waterlogging



04 Salt lake, clay pan, ?gypsum
Population 3b Duma shrubland Dh extinguished

SAP site PI22 (Te), Ecoscape/Mattiske LG5/loc. 3.1 (M), Mattiske Lake 1/loc. 3.4 (Te)

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
375	Tecticornia shrubland Te Shrubs to 30cms, 2-10% canopy cover	<i>Tecticornia pergranulata</i> <i>Tecticornia sparagosa</i>	Flat terrain ?gypsum, clay, poorly drained. Gypsum was not recorded at SAP site PI22	Very good condition, very sparse shrubs
377	Tecticornia shrubland Te Shrubs to 30cms, 10-30% canopy cover	<i>Tecticornia</i> species	Flat terrain ?gypsum, clay, poorly drained	Excellent condition, sparse shrubs
	Melaleuca Shrubland M adjacent		Edge of lake clay, poorly drained	Very Good to excellent condition, some dead shrubs at lake edge, mostly southern side



WP 377

**05 Salt lake, clay pan “Plover Lake”
Population 3b Duma shrubland Dh**

Mattiske Lake 2/loc 3.5 (Te)

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 31	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia lepidosperma</i> <i>Tecticornia syncarpa</i> <i>Tecticornia sparagosa</i> <i>Frankenia cinerea</i> <i>Wilsonia humilis</i>	Flat terrain, clay, poorly drained, edge of lake	Very Good condition, some dead shrubs and annuals absent due to dry season
Releve 34	Duma shrubland Dh Shrubs to 30cms, 10-30% canopy cover	<i>Tecticornia verrucosa</i> <i>Tecticornia moniliformis</i> <i>Wilsonia humilis</i> <i>Tecticornia lepidosperma</i> <i>Tecticornia ?pergranulata</i>	Flat terrain Clay and silt, slightly elevated, water infill less salty?	Very Good condition. DBCA monitoring indicates declining plant numbers and condition.
Releve 32	Melaleuca Shrubland M adjacent, narrow strip Shrubs to 4m, 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Mealeuca atroviridis</i> <i>Melaleuca hamulosa</i> <i>Gahnia trifida</i> <i>Disphyma crassifolia</i> <i>Carpobrotus modestus</i>	Clay, poorly drained, gentle slope at lake edge	Very Good to excellent condition





Releve 34



Releve 32

06 Closed depression, clay pan

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 83	Wilsonia isolated shrubs W Shrubs to 10cms, 30-70% canopy cover –edge only	<i>Wilsonia humilis</i> <i>Angianthus pygmaeus</i> <i>Crassula colorata</i> var. <i>acuminata</i> Edge <i>Wilsonia rotundifolia</i> <i>Centipeda cunninghamii</i>	Flat terrain clay, poorly drained	Very good to excellent condition, patchy shrubs – dry season, kangaroo damage
833	Melaleuca Shrubland M adjacent	<i>Melaleuca strobophylla</i> <i>Melaleuca lateriflora</i> <i>Melaleuca atroviridis</i>	Edge of depression, gentle slope, sandy loam over clay, poorly drained	excellent condition





Kangaroo scats



Angianthus pygmaeus and *Wilsonia rotundifolia*



Melaleuca shrubland at edge of wetland

07 Clay pan, gypsum

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 24	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia syncarpa</i> <i>Tecticornia doliiformis</i>	Flat terrain, gypsum over clay, poorly drained	Excellent condition. No annuals – dry season
240	Melaleuca Shrubland M adjacent	<i>Melaleuca lateriflora</i> <i>Melaleuca thyoides</i> <i>Melaleuca acuminata</i>	Clay, poorly drained, gentle slope at lake edge	Very Good to excellent condition, some dead shrubs past waterlogging/dry season





08 Clay pan, gypsum

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
245	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia doliiformis</i>	Flat terrain, gypsum over clay, poorly drained	Excellent condition. No annuals due to dry season
243	Melaleuca Shrubland M adjacent	<i>Melaleuca lateriflora</i> <i>Melaleuca thyoides</i> <i>Melaleuca acuminata</i> <i>Melaleuca</i> <i>?halmaturorum</i> <i>Disphyma crassifolium</i>	Clay, poorly drained, gentle slope at lake edge	Very Good to excellent condition, some dead shrubs edge
246	Melaleuca Shrubland M regeneration Shrubs to 1.0m, 30-70% canopy cover	<i>Melaleuca</i> species <i>Apium annuum</i> <i>Isotoma scapigera</i> * <i>Mesembryanthemum nodiflorum</i> <i>Senecio glossanthus</i> * <i>Rostraria cristata</i> <i>Brachyscome pusilla</i> <i>Crassula exserta</i>	Gypsum over clay, gentle slope at lake edge	Excellent – minor weeds





09 Small salt lake, clay pan, gypsum

WP/releve	Vegetation Description	Characteristic Species	Soils, topography	Vegetation Condition
252	Bare salt lake		Flat, clay soils	
251	<i>Tecticornia</i> shrubland Te Edge of lake Shrubs to 0.5m, 30-70% canopy cover	<i>Tecticornia ?pergranulata</i> <i>?Salicornia blackiana</i> <i>Disphyma crassifolium</i>	Flat terrain, gypsum over clay, edge of lake, poorly drained	Good condition to degraded, dead <i>Melaleuca</i> shrubs. Degraded <i>Melaleuca</i> shrubland
254	<i>Melaleuca</i> Shrubland M adjacent		Clay, poorly drained, gentle slope at lake edge	Very Good to excellent condition, some dead shrubs edge



Bare salt lake



WP251 *Tecticornia* shrubland at the edge of the wetland – dead *Melaleuca* shrubs (Degraded *Melaleuca* shrubland)



Edge of lake with *Melaleuca* shrubland

10 Clay pan, gypsum, clay

WP/releve	Vegetation Description	Characteristic Species	Soils, topography	Vegetation Condition
260	Tecticornia shrubland Te Edge of lake	<i>Lawrenzia diffusa</i> <i>Crasula colorata</i> var. <i>acuminata</i> <i>Senecio glossanthus</i> <i>Isotoma scapigera</i> <i>Carpobrotus modestus</i> <i>Maireana brevifolia</i>	Flat, clay soils	Excellent
Releve 25	Tecticornia shrubland Te Shrubs to 0.5m, 30-70% canopy cover	<i>Tecticornia doliiformis</i> <i>Tecticornia syncarpa</i> <i>Tecticornia pergranulata</i> <i>Disphyma crassifolium</i> <i>Isotoma scapigera</i> <i>Senecio glossanthus</i> <i>Lawrenzia diffusa</i> * <i>Mesembryanthemum nodiflorum</i>	Flat terrain, gypsum over clay, poorly drained	Very Good condition, weeds germinating, some dead shrubs
259, 262	Melaleuca Shrubland M regen Adjacent Shrubs to 1.5m 30-70% canopy cover patchy Scattered Eucalyptus saplings	<i>Melaleuca halmaturorum</i> <i>Melaleuca thyoides</i> <i>Eucalyptus kondininensis</i> <i>Disphyma crassifolium</i> <i>Crassula</i> species	Clay, poorly drained, gentle slope at lake edge	Excellent condition, regenerating





11 Closed depression, clay pan – ?*Melaleuca* shrubland – not visited in field

12 Closed Depression, clay pan

GPS/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 81	Wilsonia isolated shrubs W Isolated shrubs	<i>Wilsonia rotundifolia</i> <i>Wilsonia humilis</i> Edge <i>Maireana brevifolia</i> <i>Threlkeldia diffusa</i> <i>Rhagodia preissii</i> * <i>Mesembryanthemum nodiflorum</i>	Flat terrain clay, poorly drained	Very good condition, poor coverage – dry season
813	Melaleuca Shrubland M adjacent Shrubs to 2.5m 30-70% canopy cover	<i>Melaleuca strobophylla</i> <i>Melaleuca lateriflora</i> <i>Melaleuca atroviridis</i>	Edge of depression, gentle slope, sandy loam over clay, poorly drained	excellent condition





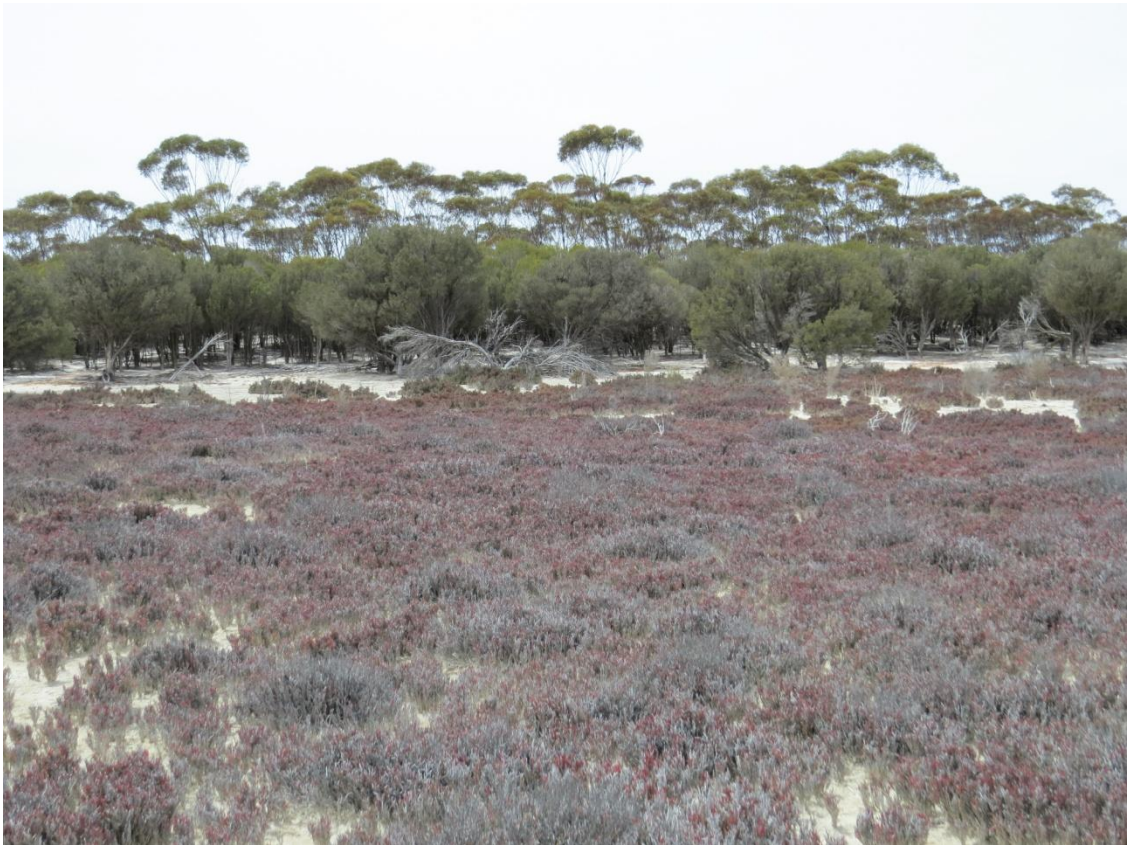
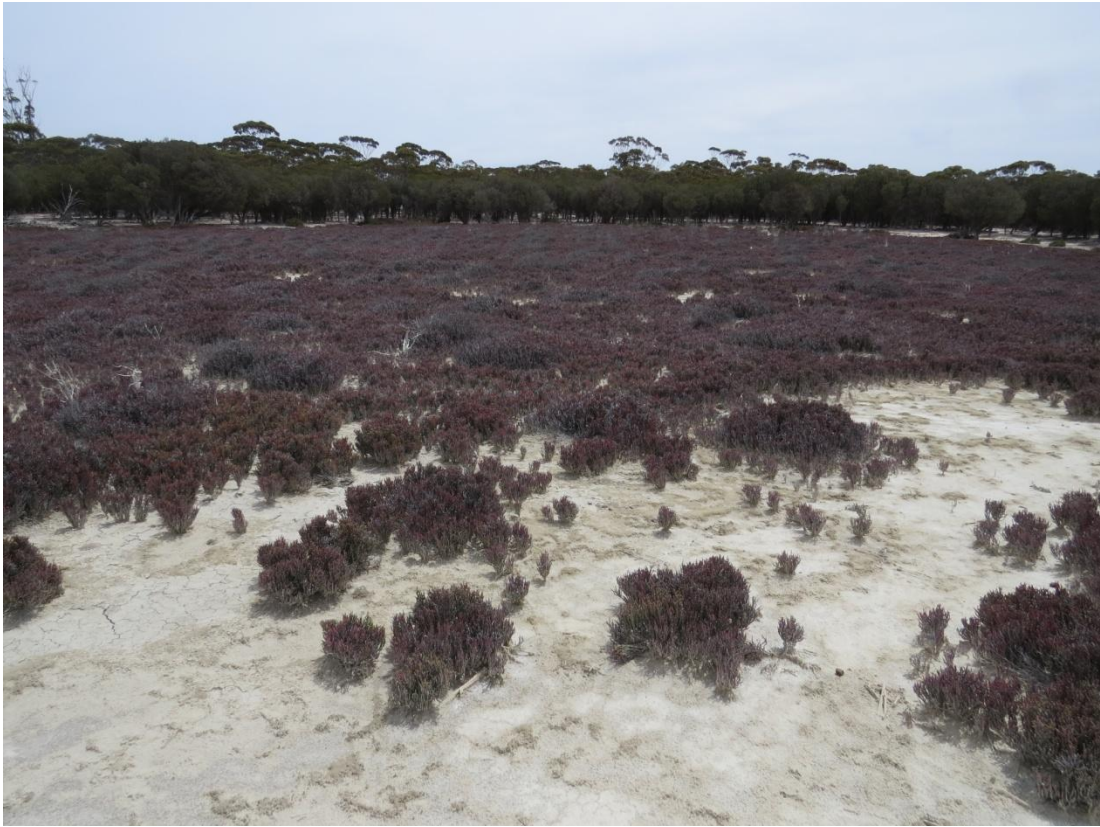
13 Closed Depression, clay pan - *Eucalyptus kondininensis* woodland WP 817

14 Closed depression, clay pan – ?*Melaleuca* shrubland – not visited in field

15 Clay pan, gypsum

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
681	<i>Tecticornia</i> shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia doliiformis</i>	Flat terrain, gypsum over clay, poorly drained	Excellent condition. No annuals due to dry season
679, 682	<i>Melaleuca</i> Shrubland M adjacent	<i>Melaleuca lateriflora</i> <i>Melaleuca hamulosa</i> <i>Melaleuca halmaturorum</i> <i>Hydrocotyle medicaginoides</i> <i>Frankenia cinerea</i> * <i>Mesembryanthemum nodiflorum</i>	Clay, poorly drained, gentle slope at lake edge	Very Good to excellent condition, some dead shrubs edge





16 Closed Depression, clay pan

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 68	Wilsonia isolated shrubs W Shrubs to 10cm, 30-70% canopy cover	<i>Wilsonia rotundifolia</i> * <i>Mesembryanthemum nodiflorum</i> <i>Calandrinia granulifera</i> Edge <i>Angianthus pygmaeus</i> <i>Disphyma crassifolium</i> <i>Schoenus calcatus</i>	Flat terrain clay, poorly drained	Very good condition, dry season
	Melaleuca Shrubland M adjacent Shrubs to 3m 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca halmaturorum</i>	Edge of depression, gentle slope, sandy loam over clay, poorly drained	excellent condition





17 Closed depression, clay pan – ?*Melaleuca* shrubland – not visited in field

18 Salt lake, clay pan, gypsum LK5 (Mattiske)

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
332	Tecticornia shrubland Te Shrubs to 20cms, 30-70% canopy cover	<i>Tecticornia ?pergranulata</i> <i>Wilsonia humilis</i> * <i>Mesembryanthemum nodiflorum</i>	Edge lake, flat terrain gypsum, clay, poorly drained	Very Good condition, minor weed and dry season
334	Tecticornia shrubland Te	<i>Salicornia blackiana</i>	Flat terrain gypsum, clay, poorly drained	Degraded. Plant death dry season/past water logging?
Releve 35	Melaleuca Shrubland M adjacent Shrubs to 4m, 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca halmaturorum</i> <i>Melaleuca hamulosa</i> <i>Disphyma crassifolium</i> <i>Tecticornia ?lepidosperma</i> <i>Carpobrotus modestus</i> <i>Threlkeldia diffusa</i> <i>Crassula colorata</i> var. <i>acuminata</i> <i>Calandrinia eremaea</i> <i>Apium annuum</i>	Edge of lake clay, poorly drained	excellent condition, some dead shrubs
335	Strip of dead <i>Melaleuca</i> shrubs		Strip extending onto lake, gypsum over clay	Degraded



WP 334



WP 332



Releve 35

19 Salt lake, clay pan, ?gypsum LK4 (Mattiske 2010)
 Population 3a Duma shrubland Dh extinguished

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 39	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia ?pergranulata</i> <i>Tecticornia halocnemoides</i> <i>Wilsonia humilis</i> * <i>Mesembryanthemum nodiflorum</i>	flat terrain gypsum, clay, poorly drained	Very good , some dead samphire shrubs
369	Tecticornia shrubland Te/Md Shrubs 30cms, 30-70% canopy cover	<i>Tecticornia</i> species	Edge lake, Flat terrain, gypsum, clay, poorly drained	Degraded. Dead <i>Melaleuca</i> shrubs. Past waterlogging/salt (Md)
373	Strip of dead <i>Melaleuca</i> shrubs		Strip between lakes – near channel, gypsum over clay	Degraded Dead <i>Melaleuca</i> shrubs may regenerate





WP 369 Degraded *Melaleuca* shrubland



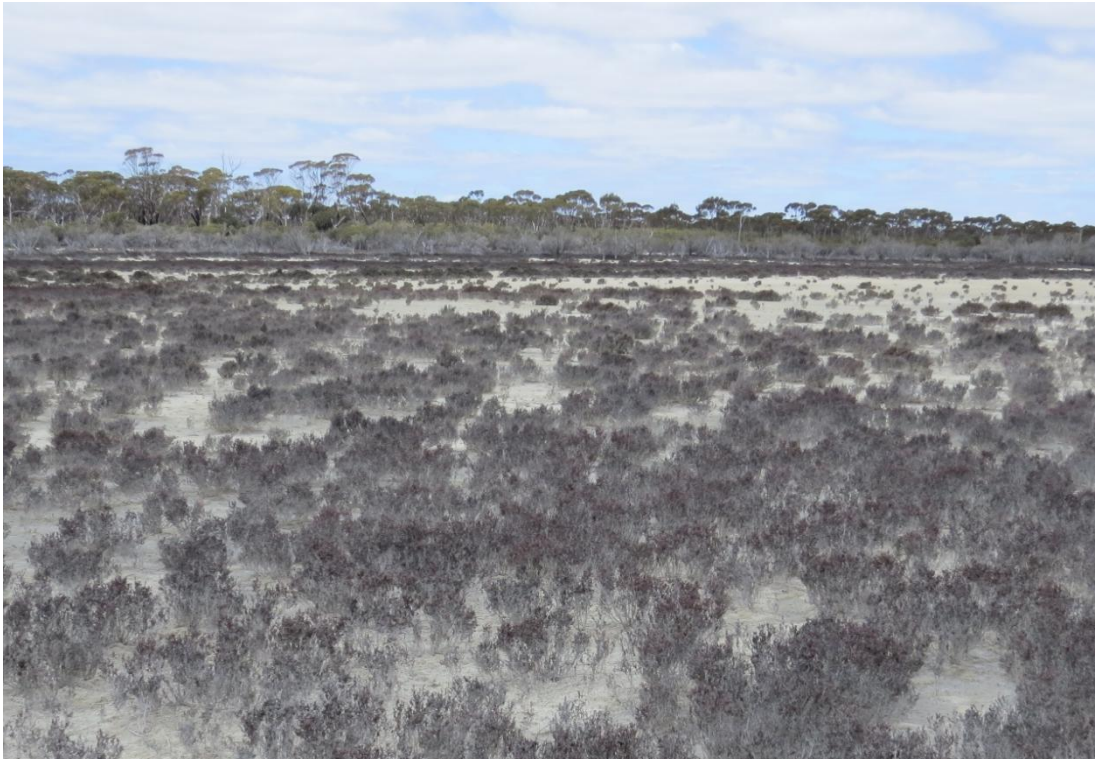
WP 373 – dead *Melaleuca* shrubs

20 Salt lake, clay pan, gypsum

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 92	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia</i> species	flat terrain gypsum, clay, poorly drained	Very good , some dead samphire shrubs
417, 419	Melaleuca shrubland M Shrubs to 3m, 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca halmaturorum</i> <i>Tecticornia</i> <i>Carpobrotus modestus</i> <i>Disphyma crassifolium</i> <i>Rhagodia</i>	Edge lake, gypsum, clay, poorly drained	Very Good. Dead trees edge
933, 936	Melaleuca shrubland M Shrubs to 4m, 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca halmaturorum</i> <i>Melaleuca hamulosa</i> <i>Melaleuca acuminata</i> <i>Melaleuca atroviridis</i>	Edge lake, gypsum, clay, poorly drained	Very Good. Some dead shrubs edge



Releve 92



21 Salt lake, clay pan, bare, gypsum ES LK1 (Mattiske)

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
440	Tecticornia shrubland Te Shrubs to 30cms, 10-30% canopy cover	<i>Tecticornia</i> species	SE corner, flat terrain gypsum (thin layer), clay, poorly drained	Good condition
	Tecticornia shrubland Te		Flat to gentle slope, clay, poorly drained	Bare areas degraded. Good condition edge - dead samphire shrubs, isolated live shrubs, many samphire seedlings
436, 441	Melaleuca shrubland M Shrubs to 3m, 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca atroviridis</i> <i>Melaleuca halmaturorum</i>	Edge lake, clay, poorly drained	Dead shrubs edge, seedling germination. Very Good condition
438, 439	Melaleuca shrubland M Shrubs to 4m, 30-70% canopy cover	<i>Melaleuca halmaturorum</i> Melaleuca ?brevifolia	Ridge extending into lake, clay, poorly drained	Strip live shrubs. Good condition





WP 440 ES corner



440 and strip of Melaleuca shrubs 439



Dead shrubs



Dead shrubs and samphire seedlings



Mattiske transect



441 Edge of lake - samphire and *Melaleuca* shrubland. Some shrub death



Edge of lake - fringing *Melaleuca* shrubland



436 Adjacent *Melaleuca* shrubland

22 Closed depression, clay

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 43	<i>Tecticornia</i> shrubland Te/Md Shrubs to 50cms, 10-30% canopy cover	<i>Tecticornia pergranulata</i>	Loam over clay, flat, poorly drained	Dead <i>Melaleuca</i> shrubs to 2.5m Degraded(Md) Past waterlogging
431	<i>Melaleuca</i> shrubland M Shrubs to 1.5 m, 30-70% canopy cover	<i>Melaleuca lateriflora</i>	Sandy loam over clay	Excellent
432	<i>Melaleuca</i> shrubland M regen Shrubs to 1.0m, 30-70% canopy cover	<i>Melaleuca halmaturorum</i>	Edge of depression gentle slope, Sandy loam over clay	Excellent regeneration



Regenerating *Melaleuca* shrubs foreground, *Tecticornia* shrubland/degraded *Melaleuca* shrubland behind



Regenerating *Melaleuca* shrubland



Releve 43 – dead *Melaleuca* shrubs

23 Closed depression, clay

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
427	Melaleuca shrubland M regen Shrubs to 1.5m, 30-70% canopy cover patchy	<i>Melaleuca lateriflora</i> <i>Melaleuca halmaturorum</i> <i>Carpobrotus modestus</i> <i>Disphyma crassifolium</i> <i>Gahnia trifida</i> <i>Austrostipa trichophylla</i> <i>Crassula colorata</i> var. <i>acuminata</i> <i>Senecio ?glassanthus</i>	clay	Excellent regeneration





24 Closed depression, clay

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
460	<p>Melaleuca shrubland M</p> <p>Shrubs to 2.5m, 2-10% canopy cover patchy</p> <p>Scattered trees and mallee</p>	<p><i>Eucalyptus kondininensis</i></p> <p><i>Eucalyptus phenax</i></p> <p><i>Eucalyptus sporadica</i></p> <p><i>Melaleuca acuminata</i></p> <p><i>Melaleuca brophyi</i></p> <p><i>Melaleuca lateriflora</i></p> <p><i>Melaleuca halmaturorum</i></p> <p><i>Disphyma crassifolium</i></p> <p><i>Gahnia trifida</i></p> <p><i>Eragrostis dielsii</i></p> <p><i>Crassula colorata</i> var. <i>acuminata</i></p> <p><i>Wilsonia rotundifolia</i></p> <p>* <i>Mesembryanthemum nodiflorum</i></p> <p><i>Rhagodia</i> species</p>	Clay, flat, poorly drained	Excellent to very good

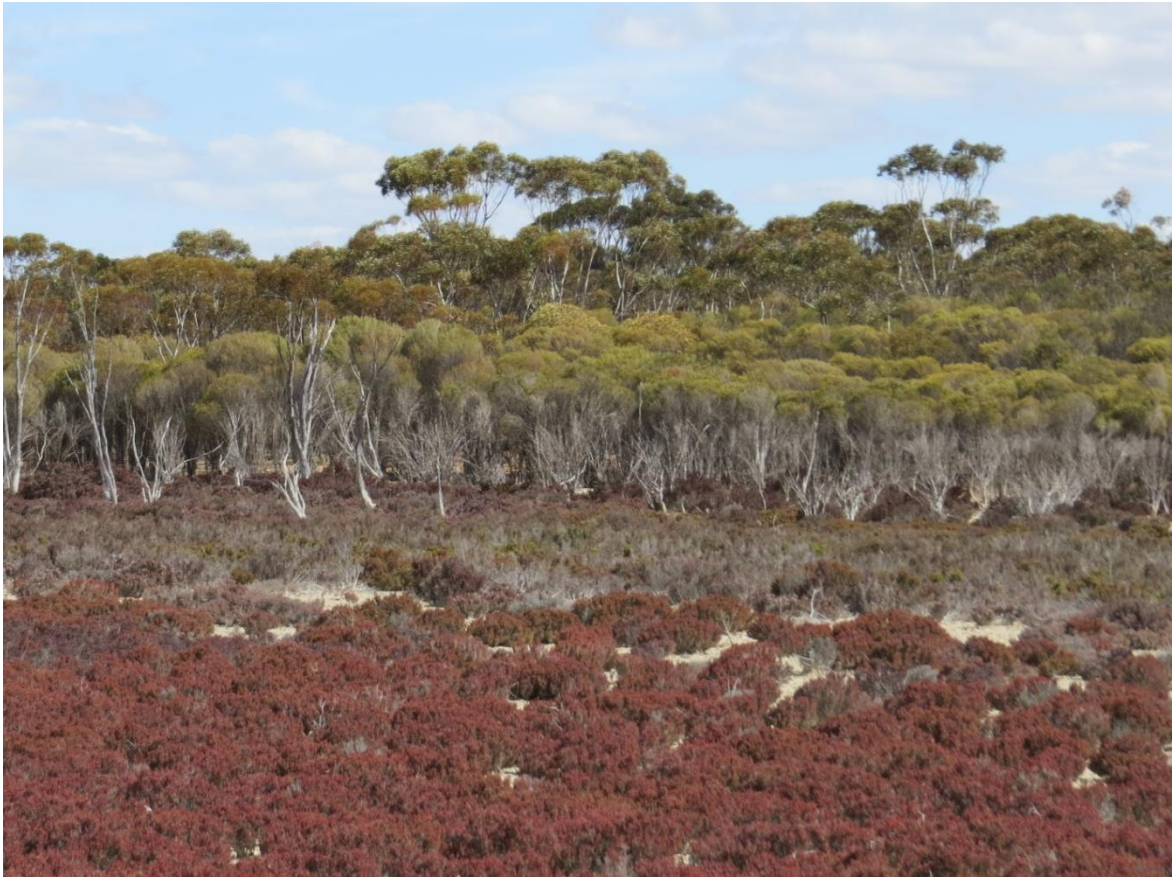




25 Salt lake, clay pan, gypsum

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
465	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia indica</i> subsp. <i>bidens</i> <i>Tecticornia</i> species Edge <i>Tecticornia moniliformis</i> <i>Tecticornia lepidosperma</i> <i>Frankenia cinerea</i>	Flat terrain gypsum, clay, poorly drained	Excellent condition, some dead shrubs due to dry season. No annuals
468, 464	Melaleuca shrubland M Shrubs to 2m, 30-70% canopy cover Regen to 0.5m	<i>Melaleuca lateriflora</i> <i>Melaleuca thyoides</i> * <i>Mesembryanthemum nodiflorum</i> <i>Carpobrotus modestus</i>	Edge of lake sandy loam over clay, gentle slope	Excellent to Very Good. Some dead shrubs on edge, rabbits







26 Salt lake, clay pan, gypsum

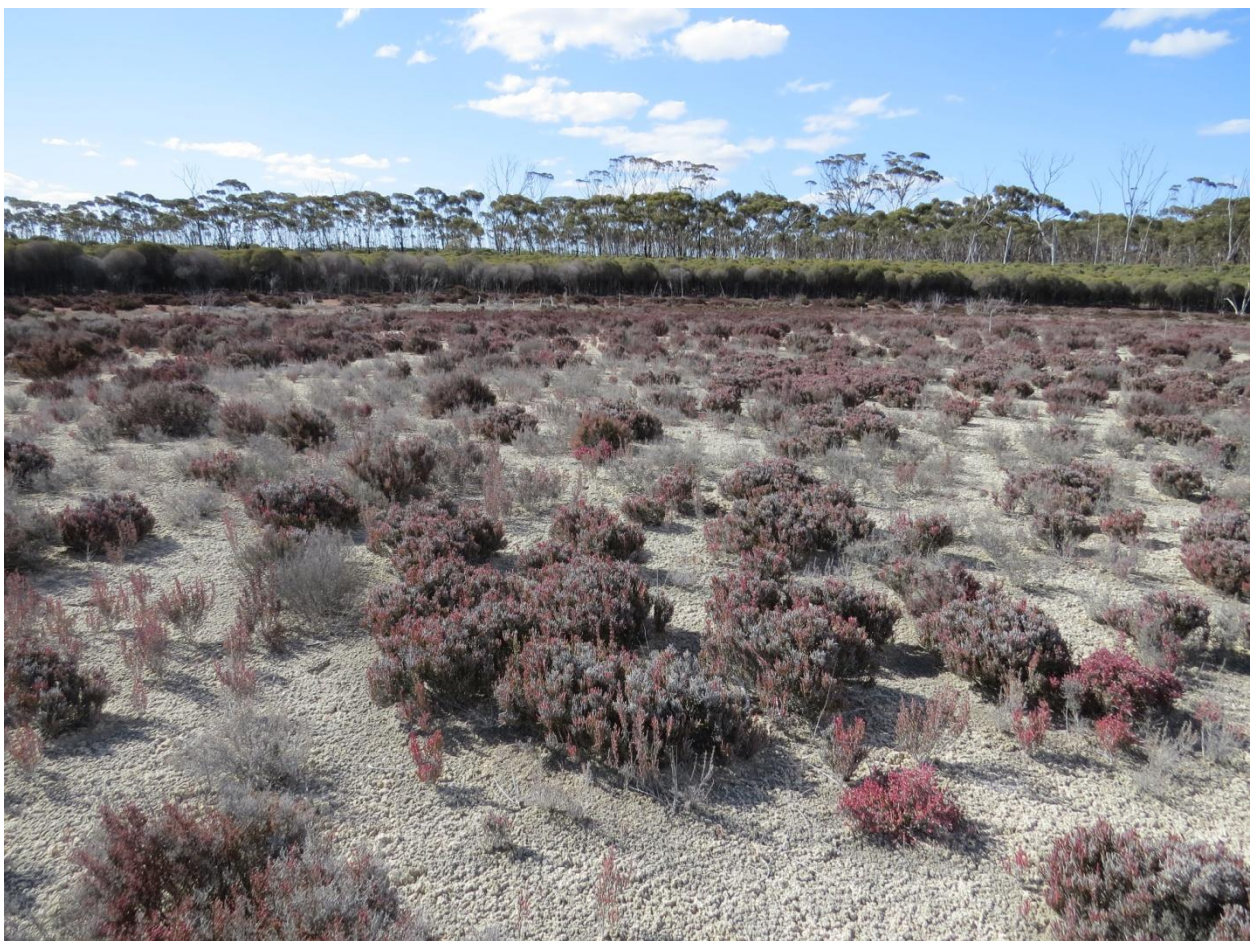
WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
498	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia moniliformis</i> <i>Tecticornia halocnemoides</i> Edge <i>Tecticornia lepidosperma</i>	Flat terrain gypsum, clay, poorly drained	Very good condition, some dead shrubs – dry season/past waterlogging
496, 500	Melaleuca shrubland M Shrubs to 2m, 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca thyoides</i>	Edge of lake sandy soils over clay, gentle slope	Very Good to excellent condition. Some dead shrubs on edge





27 Salt lake, clay pan, gypsum LK2(Mattiske)

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 47	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia indica</i> subsp. <i>bidens</i> <i>Tecticornia doliiformis</i> <i>Tecticornia pergranulata</i> <i>Tecticornia syncarpa</i> <i>?Salicornia blackiana</i>	Flat terrain gypsum, clay, poorly drained	Very Good condition. Some dead shrubs
480, 483	Melaleuca shrubland M Shrubs to 1.5m, 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca atroviridis</i> <i>Carpobrotus modestus</i> <i>Disphyma crassifolium</i> <i>Enchylaena tomentosa</i> <i>Threlkeldia diffusa</i> * <i>Mesembryanthemum nodiflorum</i>	Edge of lake sandy soils over clay, gentle slope	Excellent to Very Good. Some dead shrubs on edge



Releve 47



Releve 47



WP 480

28 Closed depression, clay pan, gypsum

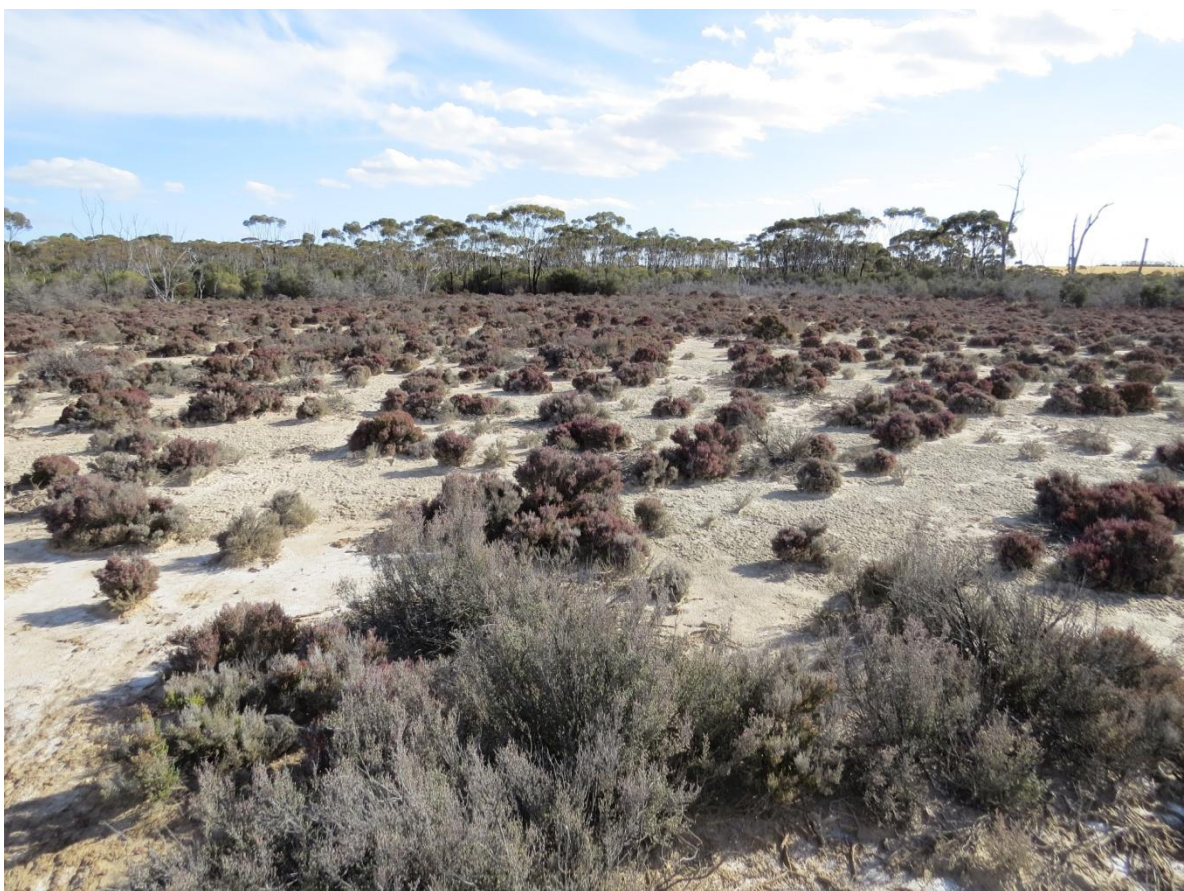
WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 48	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia doliiformis</i> <i>Tecticornia syncarpa</i>	Flat terrain gypsum, clay, poorly drained	Very Good condition. Some dead shrubs
486, 489	Melaleuca shrubland M Shrubs 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca atroviridis</i>	Edge of lake sandy soils over clay, gentle slope	Excellent to Very Good condition. Some dead shrubs on edge





29 Closed depression, clay pan, gypsum

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
493	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	<i>Tecticornia halocnemoides</i> <i>Maireana oppositifolia</i>	Flat terrain gypsum, clay, poorly drained	Excellent. No annuals due to dry season
491, 494	Melaleuca shrubland M Shrubs to 2m, 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca thyoides</i> <i>Disphyma crassifolium</i> <i>Threlkeldia diffusa</i> <i>Carpobrotus modestus</i>	Edge of lake sandy loam over clay, gentle slope	Excellent to Very Good. rabbits





30 Closed depression, clay pan, gypsum

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
576	Tecticornia shrubland Te Shrubs to 30cms, 30-70% canopy cover	? <i>Salicornia blackiana</i> <i>Tecticornia ?pergranulata</i>	Flat terrain gypsum, clay, poorly drained	Degraded Dead shrubs Piles debris and sand
574, 577	Melaleuca shrubland M Shrubs 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca halmaturorum</i>	Edge of lake sandy loam over clay, gentle slope	Live plants on gentle slope – Very Good. Rabbits





31 Salt lake, clay pan, gypsum

LK3 (Mattiske)

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
551	Tecticornia shrubland Te	<i>Dead shrubs, samphire</i> <i>and Melaleuca</i>	Flat terrain Gypsum edge, clay, poorly drained	Dead shrubs. Degraded
549	Melaleuca shrubland M Shrubs 30-70% canopy cover	<i>Melaleuca atroviridis</i> <i>Melaleuca acuminata</i> <i>Tecticornia</i> species	sandy loam over clay, gentle slope	Live shrubs back from lake. Very Good condition
552	Melaleuca shrubland Md	<i>Melaleuca lateriflora</i> <i>Tecticornia</i> species		degraded

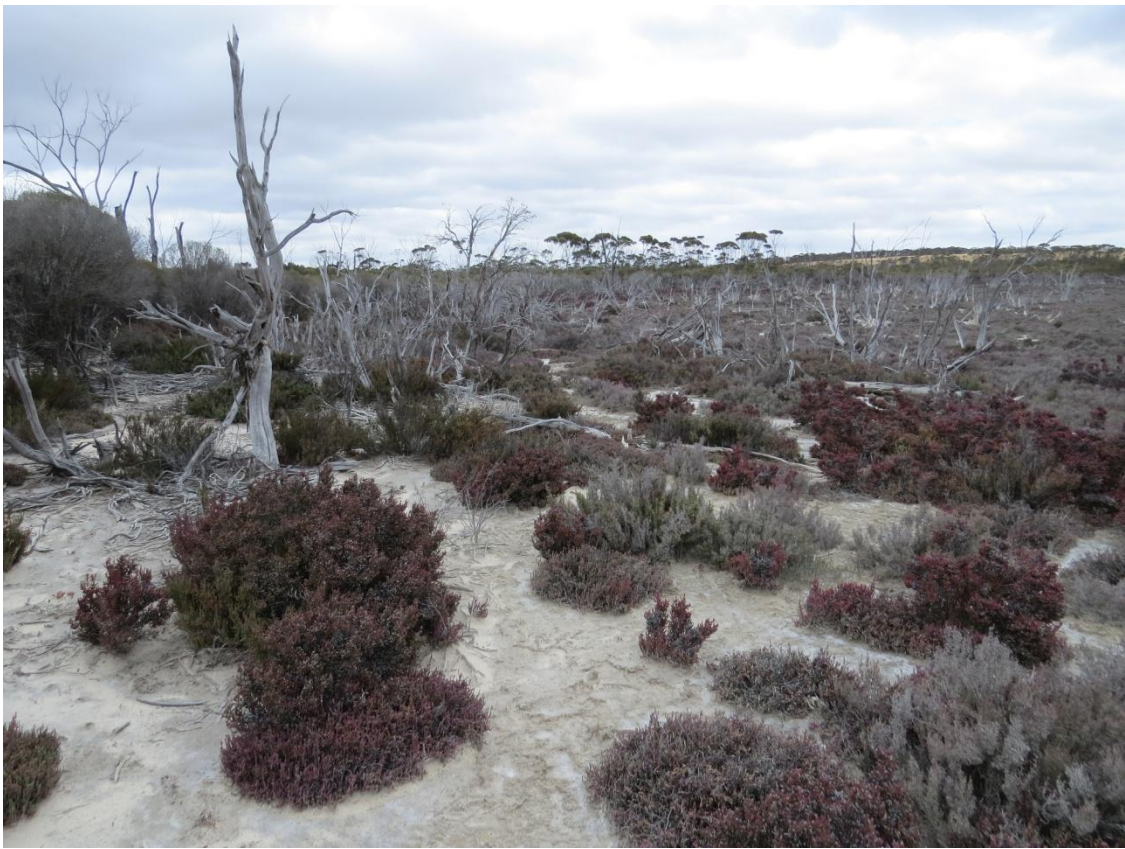




32 Salt lake, clay pan, gypsum

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 55	Tecticornia shrubland Te Shrubs to 0.5m 30-70% cover	<i>Tecticornia doliiformis</i> <i>Tecticornia moniliformis</i> <i>Tecticornia syncarpa</i> <i>Frankenia cinerea</i>	Flat terrain Gypsum (thin layer) over clay, poorly drained	Very Good. Dead shrubs. No annuals due to dry season
559, 562	Melaleuca shrubland M Shrubs to 2.5m, 30-70% canopy cover	<i>Melaleuca atroviridis</i> <i>Melaleuca lateriflora</i> <i>Disphyma crassifolium</i>	Edge lake gentle slope	Dead Melaleuca shrubs – degraded. Live shrubs further back from lake Very Good condition rabbits







33 Salt lake, clay pan, gypsum

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
567	Tecticornia shrubland Te Shrubs to 0.5m 30-70% cover	<i>Tecticornia syncarpa</i> <i>Tecticornia pergranulata</i> <i>Tecticornia halocnemoides</i>	Flat terrain Gypsum (thin layer) over clay, poorly drained	Part farmland degraded, Very Good condition on Nature Reserve. Some dead shrubs
566, 582	Melaleuca shrubland M Shrubs to 2.5m, 30-70% canopy cover	<i>Melaleuca lateriflora</i> <i>Melaleuca thyoides</i> <i>Melaleuca ?adenostyla</i>	Edge lake gentle slope	Track Very Good condition. Dead shrubs edge





102 Closed depression, clay pan, gypsum

WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
Releve 46	Tecticornia shrubland Te Shrubs to 0.5m 30-70% cover	<i>Tecticornia doliiformis</i> <i>Tecticornia pergranulata</i>	Flat terrain Gypsum (thin layer) over clay, poorly drained	Western section very good condition
474	Edge of Channel through eastern section			Degraded
471, 475	Melaleuca shrubland M		Edge lake, sandy soils over clay, gentle slope	Dead shrubs edge Excellent to Very Good

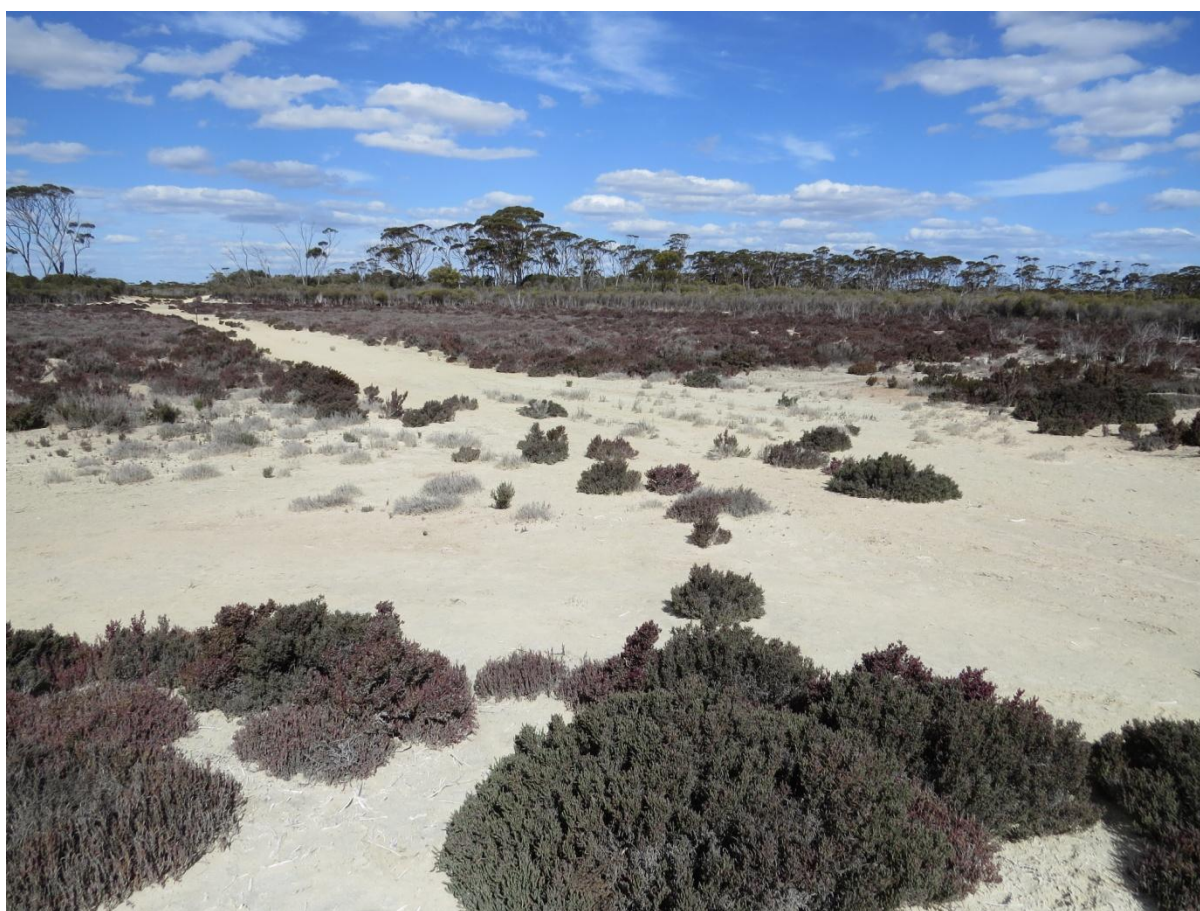


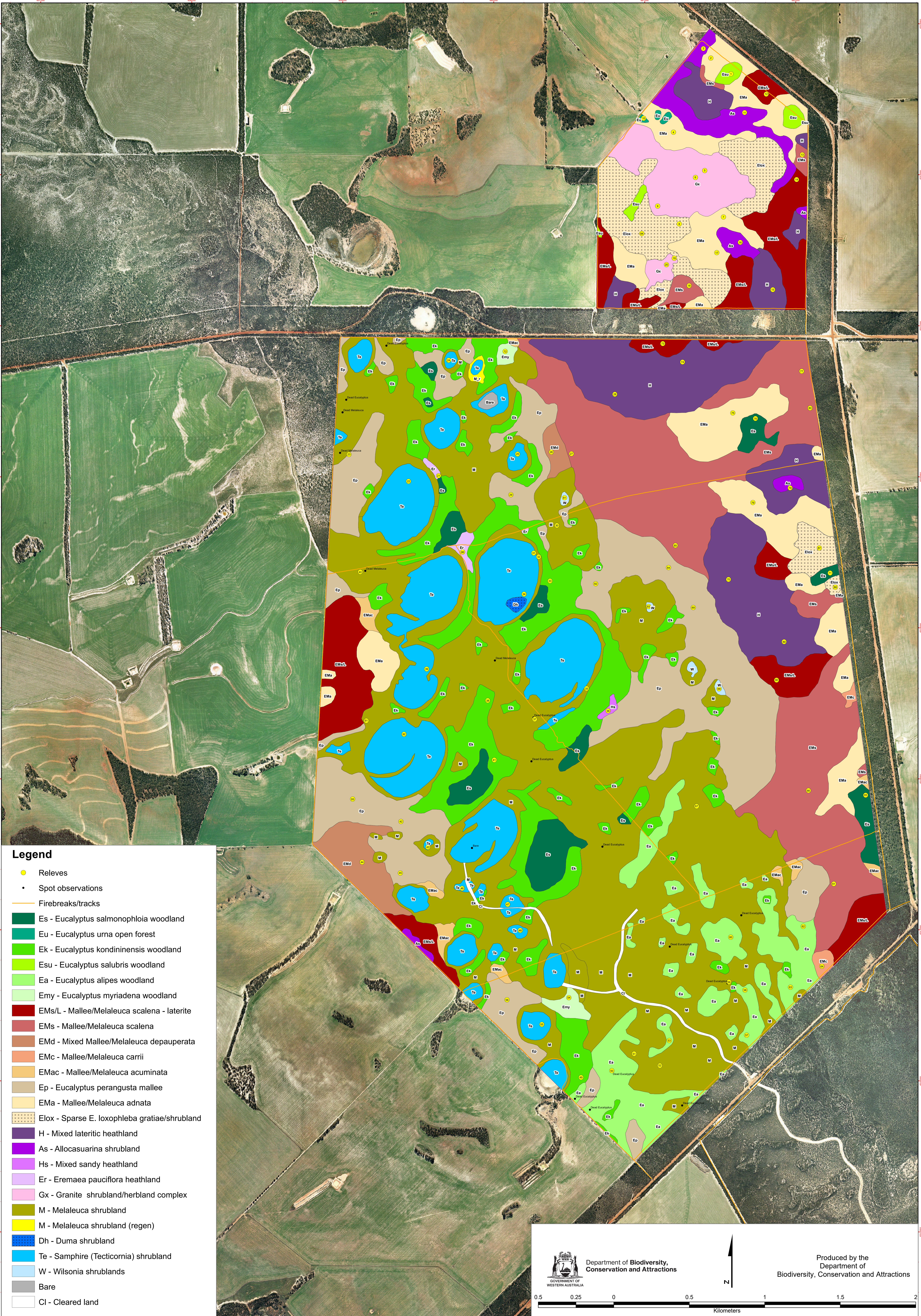




103 Closed depression, clay pan, gypsum


WP/Releve	Vegetation Description	Characteristic Species	Soils, topography	Condition
	<i>Tecticornia</i> shrubland Te Shrubs to 0.5m 30-70% cover in place	<i>Tecticornia</i> species	Flat terrain Gypsum over clay, poorly drained	Joined to 102 by channel Te areas excellent to Very good condition
475, 477	<i>Melaleuca</i> shrubland M	<i>Melaleuca acuminata</i> <i>Melaleuca lateriflora</i>	Edge lake, sandy soils over clay, gentle slope	Some dead trees very good condition



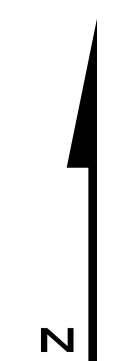


Legend

- Relieves
- Spot observations
- Firebreaks/tracks
- Es - Eucalyptus salmonophloia woodland
- Eu - Eucalyptus urna open forest
- Ek - Eucalyptus kondininensis woodland
- Esu - Eucalyptus salubris woodland
- Ea - Eucalyptus alipes woodland
- Emy - Eucalyptus myriadena woodland
- EMs/L - Mallee/Melaleuca scalena - laterite
- EMs - Mallee/Melaleuca scalena
- EMd - Mixed Mallee/Melaleuca depauperata
- EMc - Mallee/Melaleuca carrii
- EMac - Mallee/Melaleuca acuminata
- Ep - Eucalyptus perangusta mallee
- EMa - Mallee/Melaleuca adnata
- Elox - Sparse E. loxophleba gratiae/shrubland
- H - Mixed lateritic heathland
- As - Allocasuarina shrubland
- Hs - Mixed sandy heathland
- Er - Eremaea pauciflora heathland
- Gx - Granite shrubland/herbland complex
- M - Melaleuca shrubland
- M - Melaleuca shrubland (regen)
- Dh - Duma shrubland
- Te - Samphire (Tecticornia) shrubland
- W - Wilsonia shrublands
- Bare
- Cl - Cleared land

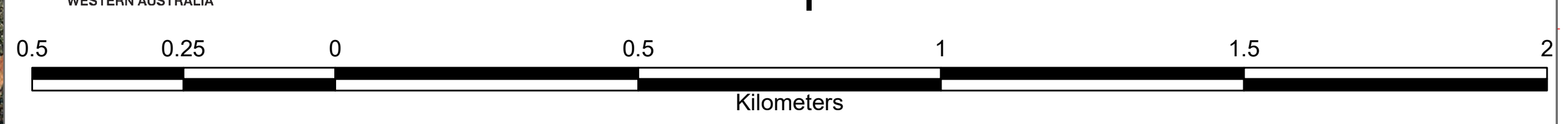


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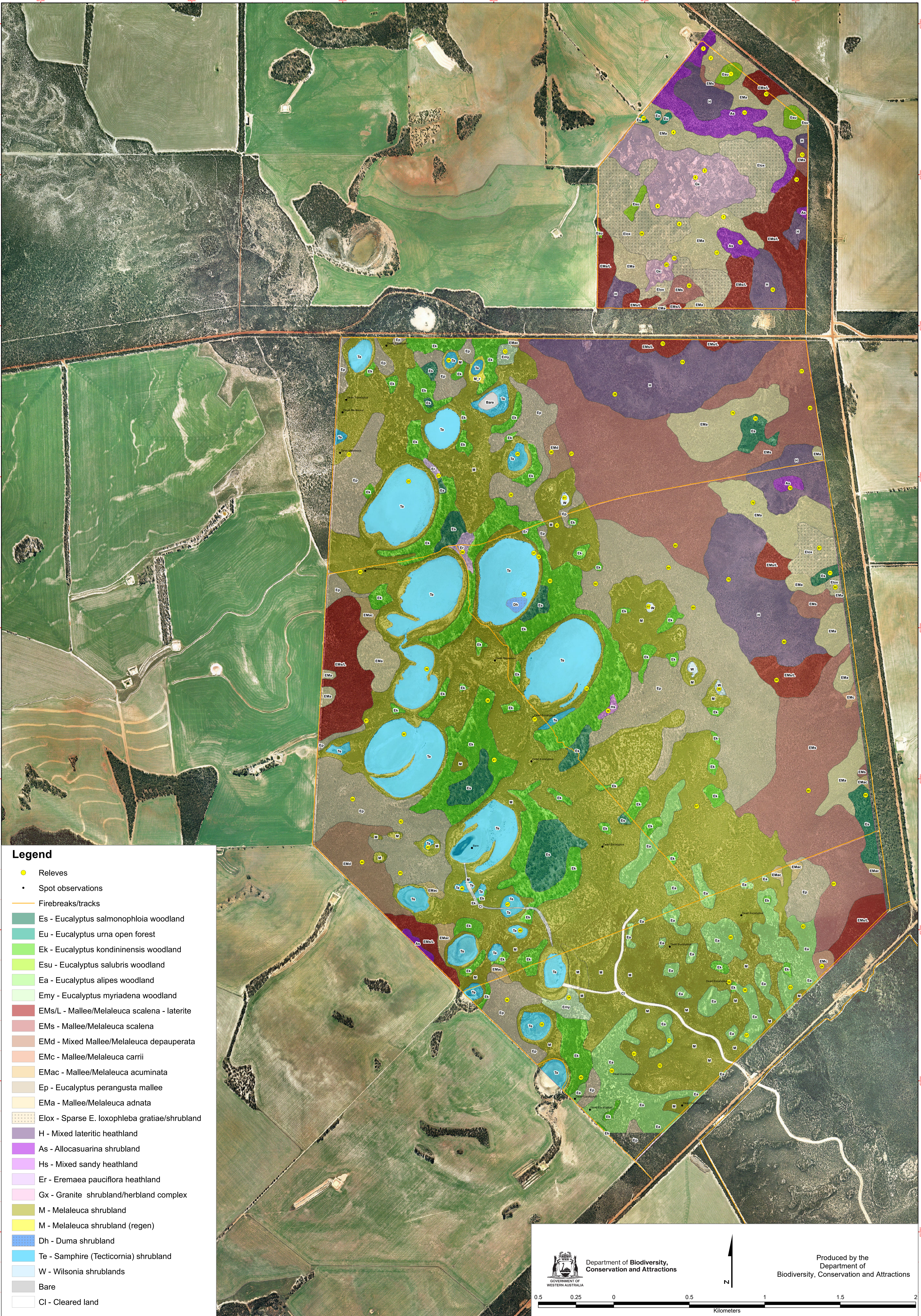


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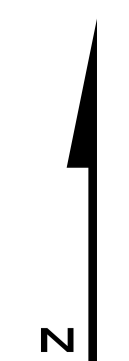


Legend

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- Eu - Eucalyptus urna open forest
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- Esu - Eucalyptus salubris woodland
- Ea - Eucalyptus alipes woodland
- Emy - Eucalyptus myriadena woodland
- EMs/L - Mallee/Melaleuca scalena - laterite
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- EMd - Mixed Mallee/Melaleuca depauperata
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- Te - Samphire (Tecticornia) shrubland
- W - Wilsonia shrublands
- Bare
- Cl - Cleared land



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