



Lake King Townsite

UCL

Vegetation

And Flora

Survey

(2)

**BOTANICAL CONSULTANTS
REPORT
FOR THE LAKE GRACE
SHIRE**

**BY
ANNE (COATES) RICK**
PO Box 36
NEWDEGATE WA 6355
Telephone (08) 98206048
Facsimile (08) 98206047

2008

Table of Contents

Lake King UCL Vegetation and Flora Survey

1.0	Introduction -----	3
2.0	Method -----	3
3.0	Results -----	6
3.1	Vegetation Survey-----	6
3.1.1	Vegetation of the study area-----	6
3.1.2	Vegetation Condition-----	8
3.2	Flora Survey-----	9
3.2.1	Flora of the Study Area-----	9
3.2.2	Species of Interest-----	10
3.3	Survey Limitations-----	15
3.4	Corrections to the 2006 survey-----	15
4.0	Acknowledgments -----	15
5.0	References -----	16

Appendix 1 Site Descriptions

Appendix 2 Plant Species List

List of Figures

- Figure 1 Location of the Study Area.
Figure 2 Vegetation Map of the Study Area
Figure 3 Vegetation Condition Map of the Study Area
Figure 4 The extent of populations of *Acacia singula* P3 and *Melaleuca agathosmoides* P1

List of Tables

- Table 1 Muir (1977) System of Vegetation Classification
Table 2 Vegetation Condition Scale
Table 3 Vegetation Associations of the Study Area
Table 4 The number of species and genera represented within the major families in the Study Area.
Table 5 The number and location of plants of *Acacia singula* recorded during the 2007 survey
Table 6 The number and location of plants of *Melaleuca agathosmoides* recorded during the 2007 survey.

1.0 Introduction

The following is a quote from the 2006 vegetation and flora survey carried out by Anne Rick for the Shire of Lake Grace.

“The study area subject to the vegetation and flora survey is Unallocated Crown Land (UCL) comprising a total area of just over 42 hectares. Prior to agreeing to release this land for residential purposes the Department for Planning and Infrastructure / Western Australian Planning Commission need a comprehensive structure plan prepared to illustrate how the land can be developed. One of the requirements with regard to preparing the structure plan is a vegetation and flora survey of the area.” (Rick 2007)

The UCL proposed to be classified ‘Residential Development’ zone in the Lake King townsite is shown in Figure 1.

Due to the dry conditions occurring at the time of the 2006 survey it was decided that further work was needed to

1. Map the extent of the priority flora populations
2. Survey for further plant species which may not have been recorded during the 2006 survey work
3. Collect flowering or fruiting specimens to confirm previous identifications made from sterile plant material.

2.0 Method

Further ground survey of the vegetation and flora of the study area was carried out on the 24th September 2007. The work included further site descriptions, collection of voucher specimens and mapping the extent of the priority flora populations. The site was revisited on 23rd October 2007 to collect species that may previously have been overlooked. Areas not intensively surveyed in 2006 were targeted.

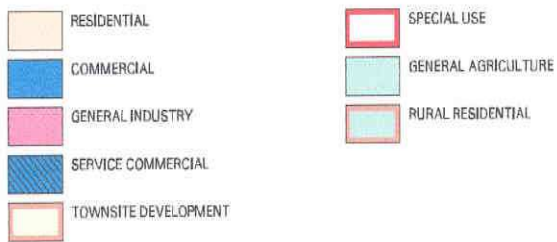
Vegetation association descriptions were based on the classification system devised by Muir (1977) which was specifically designed for describing wheatbelt vegetation (see Table 1). The condition of the vegetation described follows the Vegetation Condition Scale modified from Trudgen (1991) by B.J. Keighery for the Swan Coastal Plain Survey 1994 (Table 2).

Priority flora populations were mapped using a GPS and the use of the computer program Aussie explorer. Further site descriptions were made during traverses walked through the survey area. 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 site. UCL proposed for rezoning as residential in the Lake King Townsite.



ZONES



LOCAL SCHEME RESERVES



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 Vegetation Survey

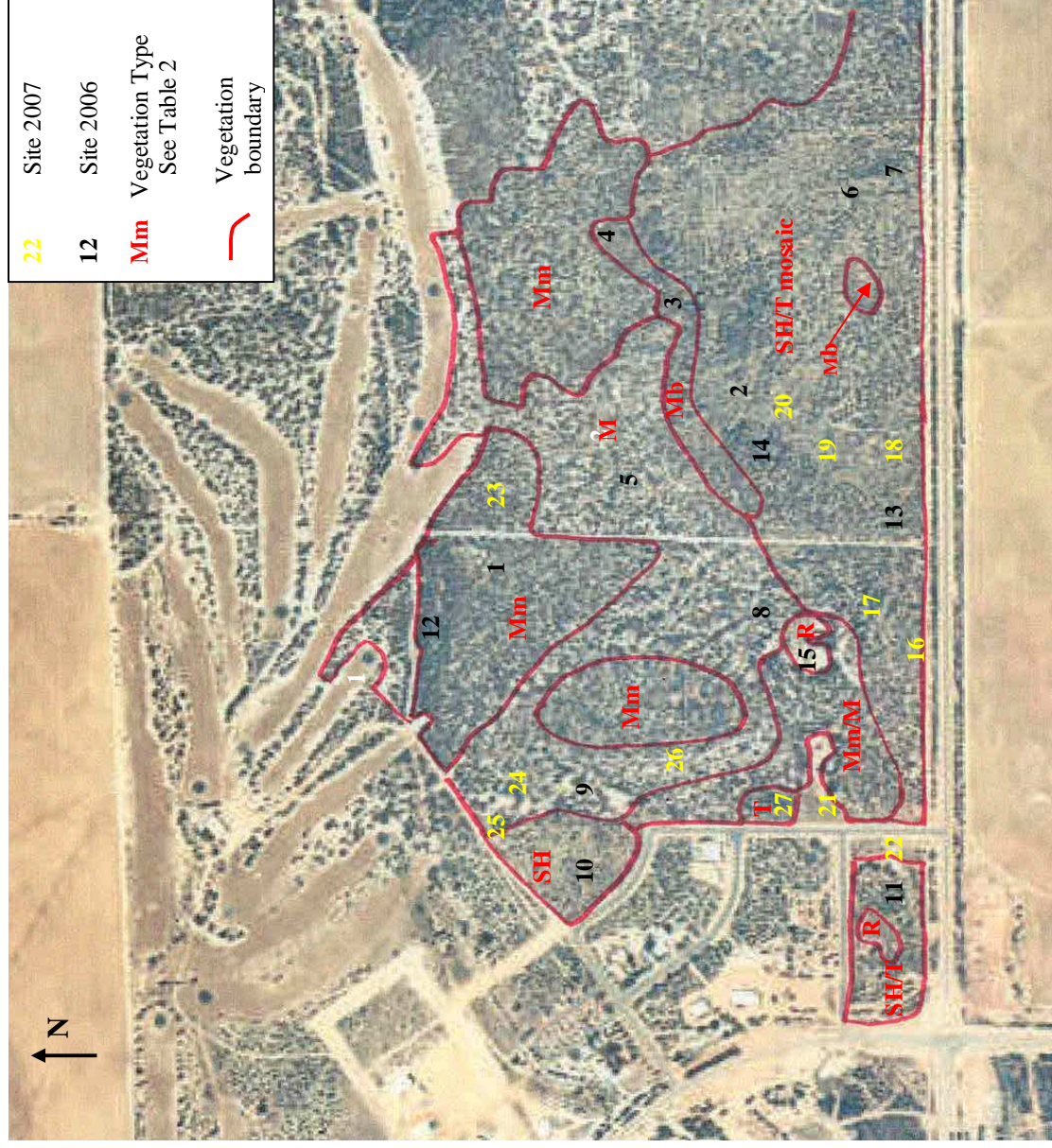
3.1.1 Vegetation of the study area

The vegetation associations mapped and described in the 2006 study are outlined in Table 3. No new vegetation associations were found during the 2007 survey. Descriptions of the vegetation and flora recorded at specific sites during the 2007 survey can be found in Appendix 1. The location of these 2007 sites can be seen on the Vegetation Map (Figure 2) marked in yellow.

Table 3. Vegetation Associations of the Study Area (2007 sites in red).

Vegetation Association	Map Unit	Soils	Topography	Sites	Comments
Open Mallee over mixed <i>Melaleuca</i> Heath	Mm	Loamy soils over clay	Mostly on gentle slope. Site 12 flat terrain	Site 1, Site 12, Site 23	Extensive in the northern section. <i>Melaleuca agathosmoides</i> Priority 1. <i>Eucalyptus depauperata</i> Priority 3 Mostly Pristine condition
Open Mallee over <i>Melaleuca</i> (broombush)	Mb	Stony soils. Sandy loams over clay	Ridge top and gentle slope	Site 3	Covers small areas only. Pristine condition.
Very Open Mallee over <i>Melaleuca</i> (broombush)	Mb	Sandy loam soils over clay	Gentle slope	Site 4	One small area. Pristine condition.
Open Mallee over Low Scrub	M	Shallow loamy soils over clay	Gentle slope and flat terrain	Site 5, Site 8, Site 9, Site 24, Site 26,	Extensive in the northern section. Excellent to Pristine condition.
Scrub Heath	SH	Loamy soils with gravel over gravel sub soils. Sometimes stony	Flat to very gentle slope	Site 2, Site 6, Site 10, Site 11, Site 13, Site 16, Site 18, Site 19, Site 25	Extensive in the southern section. Excellent to pristine condition
<i>Allocasuarina</i> Thicket	T	Loamy soils +/- gravel over gravel sub soils	Flat to very gentle slope	Site 7, Site 14, Site 17, Site 20, Site 27	Small areas forming a mosaic with the Scrub/Heath. Excellent to pristine condition.
Regenerating Vegetation	R			Site 15, Site 11 (part)	
Degraded		Sandy loam +/- gravel	Flat	Site 21, Site 22	Small areas on edges. Degraded

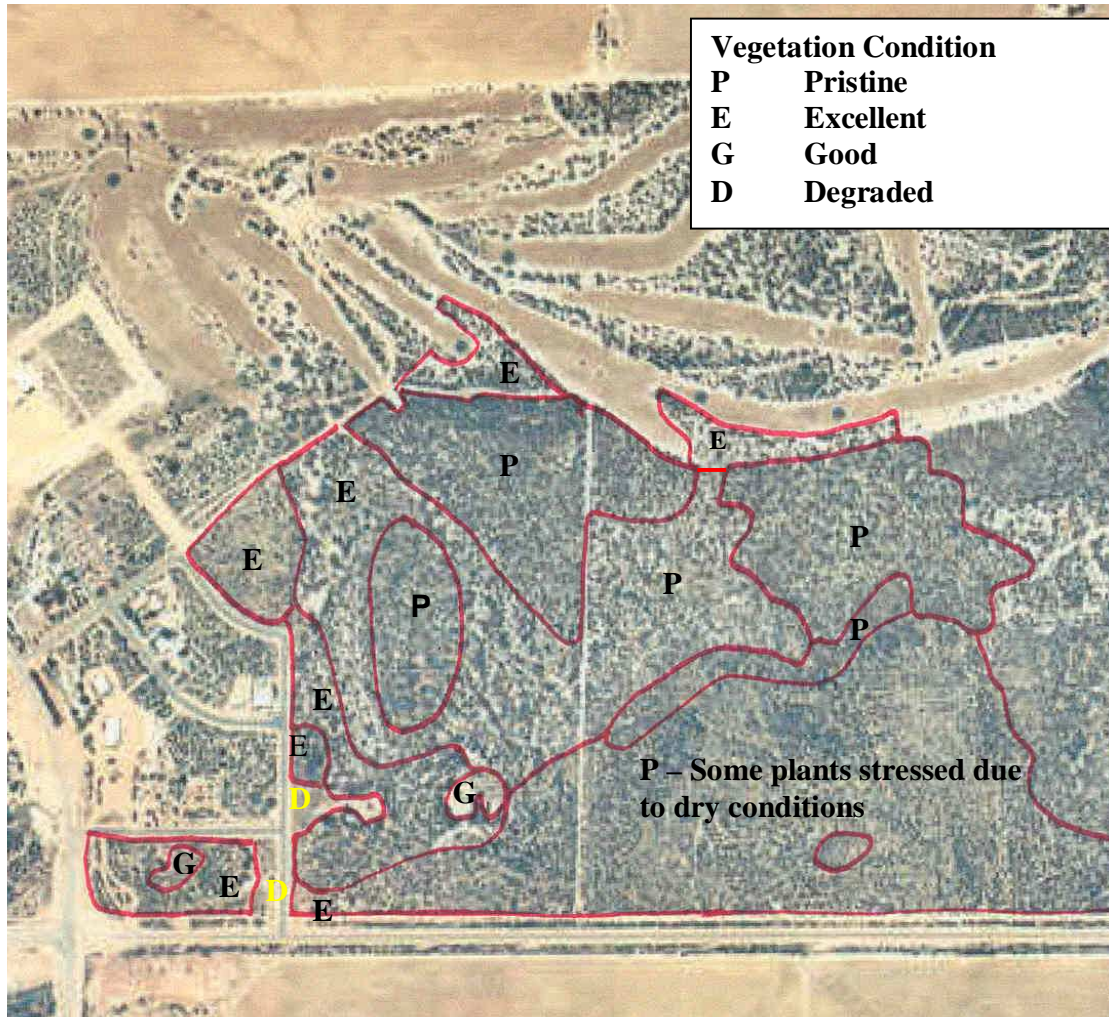
Figure 2. Vegetation Map. UCL Lake King Townsite.



3.1.2 Vegetation Condition

The vegetation condition scale is outlined in Table 2. Two small degraded areas adjacent to the road have been included in the 2007 survey. A number of annual herbaceous plants mostly of the family asteraceae (daisies) were found growing in these areas along with a number of weed species previously not recorded.

Figure 3. Map of vegetation condition. UCL Lake King Townsite.



3.2 Flora Survey

3.2.1 Flora of the Study Area.

A total of 131 plant species were recorded in the 2006 survey. An additional 35 plant species were recorded during September and October 2007. Flowering specimens collected during the 2007 survey also confirmed previous identifications made from sterile material eg *Hibbertia gracilipes* and *Leptospermum nitens*. The nomenclature follows that of the Census of Western Australian Plants (The WA Herbarium data base).

Changes to the number of species and genera listed for the major families occurring in the study area are listed in red in Table 3. The families Myrtaceae (bottlebrushes, *Eucalyptus* etc), Proteaceae (*Grevilleas*, *Hakeas* etc), Mimosaceae (wattles) and Papilionaceae (pea flowers) are still the most strongly represented in the flora of the study area along with the Rutaceae family (*Boronia*, *Phebalium* etc). The number of monocotyledons has now increased with 5 species of orchid (Orchidaceae) recorded. Most of the annuals collected were in disturbed sites on the western boundary.

Table 4. The number of species and genera represented within the major families in the study area. (numbers in red include 2007 collections)

Family	No. species	No. Genera
Myrtaceae (bottlebrushes, <i>Eucalyptus</i> etc)	44 (48)	12
Proteaceae (<i>Grevilleas</i> , <i>Hakeas</i> etc)	18 (20)	6
Mimosaceae (wattles)	10	1
Papilionaceae (pea flowers)	8 (12)	6
Rutaceae (<i>Boronia</i> , <i>Phebalium</i> etc)	8 (11)	4
Epacridaceae (Heath plants)	5 (6)	4
Lamiaceae (<i>Hemigenia</i> , <i>Pityrodia</i> etc)	5	5
Cyperaceae (sedges)	2 (3)	1 (2)
Asteraceae	3 (10)	3 (8)
Orchidaceae	0 (5)	0 (3)
Poaceae	1 (3)	1 (3)

3.2.2 Species of Interest

Species of interest 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, 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 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.

Plant species of interest recorded for the area surveyed include *Acacia singula* P3, *Eucalyptus depauperata* P3 and *Melaleuca agathosmoides* P1. The extent of the *Acacia singula* and *Melaleuca agathosmoides* populations are mapped in Figure 3. Due to confusion in the current taxonomy of *Eucalyptus depauperata* mapping the extent of this species is not possible at this time.

Acacia singula – Priority 3

Acacia singula occurs from Lake Grace to near Hatter Hill with one collection from near Muckinwobert Rock which is ~ 100 km SE of Lake King. The plants grow mostly in gravelly sands over laterite, some times on rises and hilltops, in heath, scrub and mallee shrubland (Maslin 2001). The number of plants and waypoint locations recorded during the 2007 survey are listed in Table 5.

Table 5. The number and location of plants of *Acacia singula* recorded during the 2007 survey

Way Point	Latitude / Longitude (degrees)		Number of Plants Recorded
150	S33.087133	E119.693680	1
151	S33.087105	E119.693468	3
153	S33.087012	E119.691192	1
154	S33.086948	E119.692462	2
155	S33.087007	E119.692712	2
157	S33.086183	E119.694172	6
158	S33.086072	E119.694327	3
159	S33.085960	E119.694308	6
160	S33.085533	E119.694308	4
161	S33.085530	E119.694298	1
162	S33.085580	E119.694665	1
164	S33.087127	E119.695467	1
136	S33.083313	E119.690492	2



Photograph 1 *Acacia singula* – Priority 3

Melaleuca agathosmoides Priority 1

Thirteen collections of *Melaleuca agathosmoides* are present in the WA Herbarium. Most are collections from the Hatter Hill area with one specimen collected 5 kms NE of Lake King. The number of plants and waypoint locations recorded during the 2007 survey are listed in Table 6.

Table 6. The number and location of plants of *Melaleuca agathosmoides* recorded during the 2007 survey.

Waypoint	Latitude / Longitude (degrees)		Number of Plants Recorded
112	S33.083278	E119.694982	1
113	S33.083622	E119.695348	1
117	S33.083022	E119.697025	1
118	S33.083022	E119.697223	1
119	S33.083365	E119.697898	15
120	S33.083350	E119.698030	1
121	S33.083173	E119.698230	9
123	S33.082650	E119.698090	18
124	S33.082523	E119.698325	47
125	S33.082125	E119.698355	13
126	S33.082280	E119.698088	121
127	S33.082445	E119.697655	20
128	S33.082527	E119.697417	1
129	S33.082257	E119.696825	2
130	S33.082385	E119.696330	3
131	S33.083062	E119.695493	1



Photograph 2 *Melaleuca agathosmoides* Priority 1

Eucalyptus ?depauperata – priority 3

Recently Malcolm French (WA specialist in *Eucalyptus*) identified *Eucalyptus depauperata* as extensive in the Ravensthorpe Range. As mentioned in the 2006 report Dean Nicholl a taxonomist specializing in the genus *Eucalyptus* is at present considering including *Eucalyptus tenera* under the name *Eucalyptus depauperata* (Mike Hislop, WA Herbarium pers comm.). This would result in *Eucalyptus depauperata* losing its priority status.

Until the revision of the *Eucalyptus depauperata* group is complete the confusion in the current taxonomy will persist. Quotes from the 2006 report are taken from the latest Euclid CD Third edition 2006 and refer to “*Eucalyptus eremophila*” and related species.

“...the five species that now make up the *Eucalyptus eremophila* group are included in this edition of Euclid - it is not always possible to assign individual plants to one or other of the names with certainty.”

“...the broad concept of which has in recent times been revised extensively (although not all that conclusively) by various botanists.”



Photograph 3

Eucalyptus ?depauperata Priority

3.3 Survey Limitations

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

- Although the number of orchids and annual herbaceous plants recorded during 2007 was a substantial increase from the 2006 survey it should be noted that 2007 was still another dry year
- Fieldwork which covers only a few days of the year can not be expected to exclude the possibility that there are still rare flora in the area surveyed that have not as yet been located.
- Although 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 may find other populations of rare flora and increase the plant species list for the area.

3.4 Corrections to the 2006 survey

1. The photograph of *Melaleuca agathosmoides* in the 2006 report section 3.4.1 page 16 was in fact a photograph of *Melaleuca cucullata*. Please see page 13 in this report for photos of *Melaleuca agathosmoides*.
2. *Melaleuca pauciflora* was incorrectly listed in the species list Appendix 2. This name should be replaced with *Melaleuca pauperiflora* 5811

4.0 Acknowledgements

The assistance of Western Australian Herbarium staff and other Botanists, particularly Bruce Maslin (*Acacia*), Malcolm Trudgen (*Baeckea*, *Rinzia*), Greg Keighery and Mike Hislop (*Melaleuca*, *Leucopogon*) in helping to identify specimens is gratefully appreciated. Access to the WA herbarium collections was essential for carrying out the project.

Thank you also to Nancye Perkins (Lake King rare flora volunteer) who assisted with additional survey work in March 2007 and collected the *Thelymitra petrophila* orchid and to Rosmary Cugley for her assistance in September 2007.

5.0 References

- Beard, J.S. (1976) "The Vegetation of the Newdegate and Bremer Bay Areas, Vegetation Survey of Western Australia 1:250,000 Series." Vegmap Publications, Perth, Western Australia.
- Centre for Plant Biodiversity Research (2006) "EUCLID Eucalypts of Australia." Third Edition. CSIRO Publishing Australia.
- Coates, A. and Weston, A. (2001) "Vegetation and Rare Flora survey, four rezoning proposal areas, Newdegate and Lake King" for Bowman Bishaw Gorham. Prepared for Lake Grace Shire
- English, V. and Blyth, J. (1997). "Identifying and Conserving Threatened ecological Communities(TECs) in the South West Botanical Province." ANCA National Reserves System Cooperative Program: Project Number N702. Department of Conservation and Land Management WA
- Keighery, B. (1994) "Bushland Plant Survey. A guide to plant community survey for the community." Wildflower Society of WA (Inc) Western Australia.
- Maslin, B.R. (2001) "WATTLE Acacias of Australia." Australian Biological Resources Study, Canberra and Department of Conservation and Land Management, Perth.
- Muir, B. (1977) "Vegetation and Habitat of Bendering Reserve" Part 2 of Biological Survey of the Western Australian Wheatbelt. Recordings of the Western Australian Museum. Suppl. No. 3

Appendix 1

Vegetation and Flora

Site Descriptions

Site Information Lake King UCL 2007

Site 16	SH	Scrub Heath
Soils and Topography	Sandy loam soils with gravel, some rocks	
Condition	Excellent condition - some disturbance	
Way point	67	
GPS (WGS 84)	S 33.086987°	E 119.692753°

Diagnosis

Vegetation Description

- Stratum 1** Shrubs to 3m (2-10% canopy cover) including *Allocasuarina acutivalvis*, *Banksia elderiana*, *Grevillea eriostachya* and *Santalum acuminatum*.
- Stratum 2** Shrubs 1.0-1.5ms (2-10% canopy cover) including *Isopogon scabriusculus*, *Grevillea didymobotrya* subsp. *didymobotrya* and *Hakea erecta*.
- Stratum 3** Shrubs 0.5 –1.0 ms (30-70% canopy cover) including *Melaleuca cordata*, *Micromyrtus erichsenii* (frequent), *Thryptomene kochii* (frequent), *Hemigenia teretiuscula* 5942, *Hakea scoparia*, *Chamelaucium pauciflorum* subsp. *pauciflorum* ms, *Persoonia helix*, *Gastrolobium tetragonophyllum*, *Acacia singula* 5932 (Priority 3), *Drummondita hassellii* 5946, *Grevillea teretifolia* 5949, *Acacia dielsii* 5943 and *Pityrodia terminalis*.
Leptospermum sp. 1 sedges to 1.0m (2-10% canopy cover)
- Stratum 4** Shrubs to 0.5ms (2-10% canopy cover) including *Acacia* aff. *loxophylla*, *Dampiera sacculata* 5945, *Astroloma serratifolium* 5939, *Philotheca gardneri*, *Pimelea suaveolens* subsp. *flava* 5936, *Verticordia chrysantha*, *Gastrolobium crassifolium*, *Cryptandra nutans* 5948, *Daviesia cardiophylla* 5947 and *Psammomoya choretroides*.
 Creeping herb *Stylidium stowardii* 5954
 Orchids *Thelymitra petrophila* ms 5989, *Caladenia microchila* 5950, *Pterostylis sanguinea* 5951, *Pterostylis recurva* 5952, *Pterostylis sargentii* 5953
 Sedge *Lepidosperma* sp. 2
 Grass *Neurachne alopecuroidea*
 Climber *Thysanotus manglesianus*

Site 17	T	<i>Allocasuarina</i> Thicket
Soils and Topography	Loamy soils over gravel sub soils	
Condition	Excellent	
Way point	68	
GPS (WGS 84)	S 33.086545°	E 119.693385°

Diagnosis

Vegetation Description

Stratum 1 Shrubs to 3m (30-70% canopy cover) including *Allocasuarina acutivalvis*.

Stratum 2 Shrubs 1.0-1.5ms (10-30% canopy cover) including *Hakea scoparia*, *Grevillea shuttleworthiana* subsp. *obovata*, *Acacia* aff. *loxophylla*, *Micromyrtus erichsenii* (frequent), *Thryptomene kochii* (frequent), *Banksia elderiana*, *Leptospermum erubescens* 5940, *Isopogon scabriusculus* and *Hakea subsulcata*.

Stratum 3 Shrubs to 0.5ms (10-30% canopy cover) including *Hemigenia teretiuscula*, *Melaleuca cordata*, *Dampiera sacculata* 5945, *Astroloma serratifolium* 5954, *Verticordia chrysantha*, *Leucopogon* sp. Wheatbelt (S. Murray 257) 5930, *Hibbertia rostellata* 5934, *Hibbertia lepidocalyx* subsp. *lepidocalyx* 5935, *Phebalium ambiguum* 5938, *Phebalium lepidotum* 5941, *Phebalium tuberosum*, *Psammomoya choretroides*, *Baeckea crispiflora*, *Calytrix leschenaultii*, *Persoonia helix* and *Hibbertia gracilipes*

Sedges *Lepidosperma* sp. 1 and *Lepidosperma* sp. 2

Climber *Comesperma volubile* 5937 and *Thysanotus manglesianus*

Grass *Neurachne alopecuroidea*

Creeping herb *Stylidium stowardii*

Site 18**Scrub Heath****Soils and Topography:** Sandy loam over gravel sub soils**Condition** Pristine**Way point** 74**GPS (WGS 84)** S 33.087120° E 119.694905°**Diagnosis:****Vegetation Description****Stratum 1** Shrubs to 4m (2-10% canopy cover) including *Allocasuarina acutivalvis* (frequent), *Callitris preissii* and *Grevillea eriostachya***Stratum 2** Shrubs 1.0-1.5ms (2-10% canopy cover) including *Grevillea shuttleworthiana* subsp. *obovata*, *Banksia elderiana*, *Hakea subsulcata* and *Drummondita hassellii*.**Stratum 3** Shrubs 0.5-1.0m (30-70% canopy cover) including *Beaufortia micrantha* (frequent), *Isopogon scabriusculus*, *Thryptomene kochii*, *Melaleuca cordata*, *Chamelaucium pauciflorum*, *Verticordia chrysantha* and *Verticordia roei*.
Sedges to 1.0m *Lepidosperma* sp. 1**Stratum 4** Shrubs to 0.5ms (10-30% canopy cover) including *Astroloma serratifolium*, *Verticordia chrysantha*, *Verticordia picta*, *Leucopogon* sp. Wheatbelt (S. Murray 257), *Phebalium ambiguum*, *Psammomoya choretroides*, *Calytrix leschenaultii*, *Grevillea beardiana* 5964, *Jacksonia nematoclada* 5960 and *Halgania andromedifolia* 5957Creeping perennial herb *Stylidium stowardii*Sedge *Schoenus calcatus* 5958

Site 20	T	<i>Allocasuarina</i> Thicket
Soils and Topography	Loamy soils with gravel, gravel sub soils. Very gentle slope	
Condition	Pristine	
Waypoint	78	
GPS (WGS 84)	S33.086048°	E119.695255°

Diagnosis

Vegetation Description

- Stratum 1** Shrubs over 2m (30-70% canopy cover) including *Allocasuarina acutivalvis* and *Callitris preissii*. Shrubs 1.0-1.5ms (scattered) including *Leptospermum erubescens* and *Hakea scoparia*.
- Stratum 2** Shrubs 0.5-1.0m (30-70% canopy cover) including *Micromyrtus erichsenii* (frequent), *Thryptomene kochii* (frequent), *Melaleuca cordata*, *Grevillea beardiana*, *Melaleuca villosisepala*, *Beyeria brevifolia* 5961, *Acacia* aff. *loxophylla* and *Chamelaucium pauciflorum*.
- Stratum 3** Shrubs to 0.5ms (2-10% canopy cover) including *Leucopogon cuneifolius*, *Hemigenia teretiuscula* and *Lysinema ciliatum*.
- Sedges to 1.0m (10-30%) canopy cover *Lepidosperma* sp. 1

Site 21

Soils and Topography	Sandy loam, flat terrain	
Condition	Degraded	
Waypoint	103 / 143	
GPS (WGS 84)	S33.086500°	E119.690978°

Diagnosis:

Vegetation Description

Stratum 1 Annual herbs including *Erymophyllum tenellum*, *Waitzia acuminata* var. *albicans*, *Waitzia acuminata* var. *acuminata*, *Blennospora drummondii*, *Angianthus tomentosus*, *Podolepis lessonii* and *Rhodanthe pygmaea*.

Shrubs to 0.5ms (scattered) including *Santalum acuminatum*, *Daviesia benthamii*, *Cooperookia strophiolata* and *Grevillea huegelii*.

Grass *Austrostipa elegantissima*

Perennial herb *Dianella revoluta*

Sedges to 1.0m scattered *Lepidosperma* sp. 1

Introduced grass **Avena ? barbata* – wild oats

Introduced asteraceae **Arctotheca calendula*- cape weed

Site 22

Soils and Topography	Sandy loam with gravel, flat terrain	
Condition	Degraded	
Waypoint	104	
GPS (WGS 84)	S33.086645°	E119.690597°

Diagnosis

Vegetation Description

Stratum 1 Annual herbs including *Erymophyllum tenellum*, *Waitzia acuminata* var. *albicans*, *Waitzia acuminata* var. *acuminata*, *Podolepis lessonii*

Shrubs to 0.5ms (scattered) including *Leptosema daviesioides* 5972.

Grass *Neurachne alopecuroidea*

Perennial herb *Dianella revoluta*

Introduced grass *Avena barbata* – wild oats

Introduced asteraceae *Arctotheca calendula* – cape weed

Site 11 (2006) **SH Scrub Heath**

Soils and Topography	Stony soils, flat terrain	
Condition	Excellent	
Waypoint	105	
GPS (WGS 84)	S33.086467	E119.689955

Diagnosis:

Vegetation Description

Stratum 1 Annual herbs including *Waitzia acuminata* var. *albicans*, *Podolepis lessonii* and *Angianthus tomentosus*

Shrubs (scattered) including *Hakea multilineata*, *Glischrocaryon aureum*, *Templetonia sulcata*, *Leptosema daviesioides* 5972, *Baeckea crispiflora* and *Westringia cephalantha*.

Grass *Neurachne alopecuroidea*

Perennial herb *Lomandra mucronata* 5970

Orchid *Caladenia microchila* 5950

Site 25	SH	Shrub Heath
Soils and Topography	Gravel soils with rocks	
Condition	Excellent	
Waypoint	135	
GPS (WGS 84)	S33.082693°	E119.690952°

Diagnosis:

Vegetation Description

- Stratum 1** Shrubs to 3m (2-10% canopy cover) including *Allocasuarina acutivalvis* (frequent), *Leptospermum erubescens*, *Hakea scoparia*, *Grevillea eriostachya* and *Santalum acuminatum*.
- Stratum 2** Shrubs 1.0-1.5m (10-30% canopy cover) including *Micromyrtus erichsenii*, *Grevillea oligantha*, *Leptomeria preissiana* and *Grevillea didymobotrya*
- Stratum 3** Shrubs to 0.5-1.0ms (10-30%) including *Acacia* aff. *loxophylla*, *Gastrolobium tetragonophyllum*, *Phebalium tuberosum*, *Phebalium filifolium*, *Persoonia helix*, *Thryptomene kochii*, *Isopogon scabriusculus*, *Gastrolobium crassifolium*, *Melaleuca cordata*, *Grevillea shuttleworthiana* subsp. *obovata* and *Beaufortia schaueri*
- Sedges to 1.0m patch *Lepidosperma* sp. 1
- Stratum 4** Shrubs to 0.5ms (10-30%) including *Leucopogon cuneifolius*, *Rinzia communis*, *Westringia cephalantha*, *Verticordia chrysantha*, *Dodonaea bursariifolia*, *Dampiera sacculata*, *Hibbertia lepidocalyx*, *Microcybe pauciflora* subsp. *pauciflora*, *Phebalium ambiguum*, *Hibbertia gracilipes*, *Beaufortia micrantha*, *Lysinema ciliatum*, *Chamelaucium ciliatum* and *Astroloma serratifolium*.
- Sedges scattered *Schoenus calcatus* and *Lepidosperma* sp. 2

Site 9 (2006) **M Open Mallee over Low Scrub**

Soils and Topography Loam clay soils, flat terrain

Condition Excellent

Waypoint 138

GPS (WGS 84) S33.084010° E119.691167°

Diagnosis:

Vegetation Description

Stratum 1 Shrub Mallee to 6ms (10-30% canopy cover) including *Eucalyptus flocktoniae*, *Eucalyptus ?depauperata* (Priority 3) and *Eucalyptus pileata*.

Stratum 2 Shrubs 1.0-1.5ms (10-30% canopy cover) including *Melaleuca coronicarpa*, *Daviesia benthamii*, *Grevillea huegelii*, *Exocarpos aphyllus* and *Melaleuca pauperiflora*

Stratum 3 Shrubs to 0.5ms (30-70% canopy cover) including *Melaleuca johnsonii* (frequent), *Acacia crassuloides*, *Boronia inornata* (frequent), *Grevillea pectinata*, *Halgania andromedifolia*, *Pultenaea purpurea*, *Hibbertia rostellata*, *Gastrolobium tetragonophyllum*, *Cooperookia strophiolata* and *Hibbertia gracilipes*.

Parasitic vine *Cassytha melantha*

Site 27	T	<i>Allocasuarina</i> Thicket
Soils and Topography	Gravel soils	
Condition	Excellent	
Waypoint	140	
GPS (WGS 84)	S33.085192°	E119.691233°

Diagnosis:

Vegetation Description

- Stratum 1** Shrubs to 3m (10-30% canopy cover) including *Allocasuarina acutivalvis* frequent, *Hakea scoparia* and *Melaleuca undulata*
- Stratum 2** Shrubs to 0.5-1.0ms (30-70% canopy cover) including *Thryptomene kochii* (frequent), *Micromyrtus erichsenii*, *Acacia* aff. *loxophylla*, *Persoonia helix*, *Grevillea didymobotrya*, *Baekkea crispiflora*, *Lysinema ciliatum*, *Leucopogon cuneifolius* and *Philotheca gardneri*
- Sedges scattered *Lepidosperma* sp. 1
- Stratum 3** Shrubs to 0.5ms (2-10%) including *Halgania andromedifolia*, *Melaleuca cordata*, *Psammomoya choretroides*, *Jacksonia nematoclada* and *Phebalium ambiguum*
- Sedges scattered *Schoenus calcatus* and *Lepidosperma* sp. 2

Appendix 2

Plant

Species

List

Lake King UCL Plant Species List 2007

	Taxon Name	Collecting Number
054F	Anthericaceae	
	Thysanotus manglesianus Kunth	5814
345	Asteraceae	
	Angianthus tomentosus J.C.Wendl.	5925
	*Arctotheca calendula (L.) Levyns	
	Blennospora drummondii A.Gray	5923
	Erymophyllum tenellum (Turcz.) Paul G.Wilson	5921
	Olearia muelleri (Sond.) Benth.	
	Podolepis lessonii (Cass.) Benth.	5927
	Rhodanthe pygmaea (DC.) Paul G.Wilson	5928
	Waitzia acuminata Steetz var. acuminata	5926
	Waitzia acuminata var. albicans Paul G.Wilson	5922
310	Boraginaceae	
	Halgania andromedifolia Behr & F.Muell.	5957, 5981
70	Casuarinaceae	
	Allocasuarina acutivalvis (F.Muell.) L.A.S.Johnson	
	Allocasuarina corniculata (F.Muell.) L.A.S.Johnson	5830
	Allocasuarina huegeliana (Miq.) L.A.S.Johnson	5885
199	Celastraceae	
	Psammomoya choretroides (F.Muell.) Diels & Loes.	5863
307	Convolvulaceae	
	Wilsonia humilis R.Br.	5901
18	Cupressaceae	
	Callitris preissii Miq.	5847
	Callitris roei (Endl.) F. Muell.	
32	Cyperaceae	
	Lepidosperma ?brunonianum Nees (sp. 2)	5897
	Lepidosperma ?sp. A2 Island Flat (G.J. Keighery 7000) (sp. 1)	5896
	Schoenus calcatus K.L.Wilson	5958
054C	Dasypogonaceae	
	Lomandra mucronata (R.Br.) A.T.Lee	5970
226	Dilleniaceae	
	Hibbertia gracilipes Benth.	5792, 5837, 5968
	Hibbertia lepidocalyx J.R.Wheeler subsp. lepidocalyx	5823, 5875, 5935
	Hibbertia rostellata Turcz.	5822, 5864, 5934

288	Epacridaceae	
	<i>Astroloma serratifolium</i> (DC.) Druce	5939
	<i>Coleanthera myrtooides</i> Stschegl.	5838
	<i>Leucopogon cuneifolius</i> Stschegl.	5819, 5879
	<i>Leucopogon</i> sp. Wheatbelt (S. Murray 257)	5843, 5930, 5955
	<i>Lysinema ciliatum</i> R.Br.	
	<i>Styphelia intertexta</i> A.S.George	5984
185	Euphorbiaceae	
	<i>Beyeria brevifolia</i> (Muell.Arg.) Benth.	5860, 5961
341	Goodeniaceae	
	<i>Cooperookia strophiolata</i> (F.Muell.) Carolin	
	<i>Dampiera sacculata</i> Benth.	5877, 5945, 5969
276	Haloragaceae	
	<i>Glischrocaryon aureum</i> (Lindl.) Orchard	
313	Lamiaceae	
	<i>Cyanostegia lanceolata</i> Turcz.	5874
	<i>Hemigenia teretiuscula</i> F.Muell.	5868, 5883, 5942
	<i>Microcorys ericifolia</i> Benth.	5867, 5887
	<i>Pityrodia terminalis</i> (Endl.) A.S.George	
	<i>Westringia cephalantha</i> F.Muell.	5773
131	Lauraceae	
	<i>Cassytha melantha</i> R.Br.	5808
302	Loganiaceae	
	<i>Logania buxifolia</i> F.Muell.	5844
163	Mimosaceae	
	<i>Acacia brachyclada</i> W.Fitzg.	5800, 5973
	<i>Acacia crassuloides</i> Maslin	5789
	<i>Acacia deficiens</i> Maslin	5791
	<i>Acacia dielsii</i> E.Pritz.	5850, 5943
	<i>Acacia glaucoptera</i> Benth.	5787
	<i>Acacia</i> aff. <i>loxophylla</i> Benth.	5776, 5788, 5979
	<i>Acacia mutabilis</i> Maslin subsp. <i>mutabilis</i>	5777, 5835, 5967
	<i>Acacia singula</i> R.S.Cowan & Maslin Priority 3	5851, 5932, 5985
	<i>Acacia sulcata</i> var. <i>platyphylla</i> Maiden & Blakely	5849
	<i>Acacia uncinella</i> Benth.	5852
326	Myoporaceae	
	<i>Eremophila densifolia</i> subsp. <i>pubiflora</i> Chinnock ms	5812
	<i>Eremophila drummondii</i> F.Muell.	

273 Myrtaceae

<i>Baeckea crispiflora</i> F.Muell.	5876
<i>Baeckea</i> sp. fine-leaved (C.M. Lewis 517)	5848
<i>Beaufortia micrantha</i> var. <i>puberula</i> Benth.	5870
<i>Beaufortia schaueri</i> Schauer	5865
<i>Calothamnus quadrifidus</i> R.Br.	5866
<i>Calytrix leschenaultii</i> (Schauer) Benth.	
<i>Chamelaucium ciliatum</i> Desf.	5821
<i>Chamelaucium pauciflorum</i> (Turcz.) Benth. subsp. <i>pauciflorum</i> ms	5944
<i>Eucalyptus calycogona</i> Turcz.	5781, 5890
<i>Eucalyptus cylindriflora</i> Maiden & Blakely	5782
<i>Eucalyptus</i> ? <i>depauperata</i> L.A.S.Johnson & K.D.Hill Priority 3	5779, 5895
<i>Eucalyptus</i> ? <i>eremophila</i> (Diels) Maiden	5784, 5893, 5894, 5899
<i>Eucalyptus flocktoniae</i> (Maiden) Maiden	5780, 5891
<i>Eucalyptus olivina</i> Brooker & Hopper	5829, 5956
<i>Eucalyptus pileata</i> Blakely	5775, 5898
<i>Eucalyptus scyphocalyx</i> (Benth.) Maiden & Blakely	5840
<i>Leptospermum erubescens</i> Schauer	5940
<i>Leptospermum nitens</i> Turcz.	5817, 5975
<i>Melaleuca acuminata</i> F.Muell.	
<i>Melaleuca adnata</i> Turcz.	5785
<i>Melaleuca agathosmoides</i> C.A.Gardner Priority 1	5806, 5924
<i>Melaleuca cordata</i> Turcz.	5827
<i>Melaleuca coronicarpa</i> D.A.Herb.	5813
<i>Melaleuca cucullata</i> Turcz.	5801
<i>Melaleuca eleuterostachya</i> F.Muell.	5832
<i>Melaleuca glaberrima</i> F.Muell.	5794, 5842
<i>Melaleuca hamata</i> Fielding & Gardner	5846
<i>Melaleuca johnsonii</i> Craven	5797, 5978
<i>Melaleuca lateriflora</i> Benth.	5778
<i>Melaleuca laxiflora</i> Turcz.	5903
<i>Melaleuca pauperiflora</i> F.Muell.	5811, 5966
<i>Melaleuca platycalyx</i> Diels	
<i>Melaleuca rigidifolia</i> Turcz.	
<i>Melaleuca sapientes</i> Craven	5783
<i>Melaleuca scalena</i> Craven & Lepschi	5795, 5818, 5834
<i>Melaleuca societatis</i> Craven	5802
<i>Melaleuca spicigera</i> S.Moore	5798
<i>Melaleuca teuthidoides</i> Barlow	5803
<i>Melaleuca torquata</i> Barlow	5804, 5965
<i>Melaleuca undulata</i> Benth.	
<i>Melaleuca villosisepala</i> Craven	5816, 5963
<i>Micromyrtus erichsenii</i> Hemsl.	5881
<i>Rinzia communis</i> Trudgen	5825
<i>Thryptomene kochii</i> E.Pritz.	5861
<i>Verticordia chrysantha</i> Endl.	5857
<i>Verticordia densiflora</i> var. <i>cespitosa</i> (Turcz.) A.S.George	5856
<i>Verticordia eriocephala</i> A.S.George	5855
<i>Verticordia picta</i> Endl.	5858
<i>Verticordia roei</i> Endl.	

Orchidaceae		
66	<i>Caladenia microchila</i> Hopper & A.P.Br.	5950
	<i>Pterostylis recurva</i> Benth.	5952
	<i>Pterostylis sanguinea</i> D.L.Jones & M.A.Clem.	5951
	<i>Pterostylis sargentii</i> C.R.P.Andrews	5953
	<i>Pyrorchis nigricans</i> (R.Br.) D.L.Jones & M.A.Clem.	Leaves only
	<i>Thelymitra petrophila</i> Jeanes ms	5989
Papilionaceae		
165	<i>Daviesia benthamii</i> Meisn.	
	<i>Daviesia cardiophylla</i> F.Muell.	5947
	<i>Dillwynia divaricata</i> (Turcz.) Benth.	5836
	<i>Gastrolobium crassifolium</i> Benth.	5859
	<i>Gastrolobium tetragonophyllum</i> (E.Pritz.) Crisp	5833, 5977
	<i>Jacksonia nematoclada</i> F.Muell.	5878
	<i>Leptosema daviesioides</i> (Turcz.) Crisp	5972
	<i>Pultenaea heterochila</i> F.Muell.	5873
	<i>Pultenaea purpurea</i> (Turcz.) Crisp & Orthia	5839
	<i>Templetonia sulcata</i> (Meisn.) Benth.	5786
Phormiaceae		
054E	<i>Dianella revoluta</i> R.Br.	
Pittosporaceae		
152	<i>Marianthus bicolor</i> (Putt.) F.Muell.	
Poaceae		
31	<i>Austrostipa elegantissima</i> (Labill.) S.W.L.Jacobs & J.Everett	
	* <i>Avena barbata</i> Link	
	<i>Neurachne alopecuroidea</i> R.Br.	
Polygalaceae		
183	<i>Comesperma spinosum</i> F.Muell.	5796
	<i>Comesperma volubile</i> Labill.	5937
90	Proteaceae	
	<i>Banksia elderiana</i> F.Muell. & Tate	
	<i>Conospermum brownii</i> Meisn.	5902
	<i>Grevillea beardiana</i> McGill.	5815, 5964
	<i>Grevillea cagiana</i> McGill.	
	<i>Grevillea didymobotrya</i> Meisn. subsp. <i>didymobotrya</i>	5854, 5929
	<i>Grevillea excelsior</i> Diels	5886
	<i>Grevillea huegelii</i> Meisn.	5810
	<i>Grevillea oligantha</i> F.Muell.	5790
	<i>Grevillea pectinata</i> R.Br.	5799
	<i>Grevillea shuttleworthiana</i> subsp. <i>obovata</i> (Benth.) Olde & Marriott	5853
	<i>Grevillea teretifolia</i> Meisn.	5949
	<i>Hakea commutata</i> F.Muell.	5807
	<i>Hakea erecta</i> Lamont	5826
	<i>Hakea meisneriana</i> Kippist	5880
	<i>Hakea multilineata</i> Meisn.	

	Hakea newbeyana R.M.Barker	
	Hakea scoparia Meisn.	
	Hakea subsulcata Meisn.	
	Isopogon scabriusculus Meisn.	
	Persoonia helix P.H.Weston	5869
	Persoonia quinquenervis Hook.	5824
215	Rhamnaceae	
	Cryptandra minutifolia subsp. brevistyla Rye	5872
	Cryptandra nutans Steud.	5948, 5976
	Spyridium mucronatum Rye subsp. mucronatum	5793
175	Rutaceae	
	Boronia inconspicua Benth.	5892
	Boronia inornata subsp. leptophylla (Turcz.) Burgman	5809, 5971
	Drummondita hassellii (F.Muell.) Paul G. Wilson	5946
	Microcybe multiflora Turcz.	5845
	Microcybe pauciflora Turcz. subsp. pauciflora	5980
	Phebalium ambiguum C.A.Gardner	5938
	Phebalium filifolium Turcz.	5882
	Phebalium lepidotum (Turcz.) Paul G. Wilson	5841, 5941
	Phebalium tuberculosum (F.Muell.) Benth.	
	Philotheca gardneri (Paul G.Wilson) Paul G.Wilson	5828
	Philotheca rhomboidea (Paul G. Wilson) Paul G.Wilson	5862, 5962
92	Santalaceae	
	Exocarpos aphyllus R.Br.	5805
	Leptomeria preissiana (Miq.) A.DC.	5831
	Santalum acuminatum (R.Br.) A.DC.	
207	Sapindaceae	
	Dodonaea bursariifolia F.Muell.	5889
	Dodonaea stenozyga F.Muell.	5871
343	Stylidiaceae	
	Stylidium stowardii Scott	5954
263	Thymelaeaceae	
	Pimelea brevifolia R.Br.	5820, 5888
	Pimelea suaveolens subsp. flava Rye	5936