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Assessment of the nature conservation values of the Byenup-Muir peat swamp system, south western Australia: flora and vegetation

by

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Biodiversity Group of Environment Australia

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Disclaimer

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Cover photo

Tordit-Gurru Lagoon with Lake Muir in background showing the complex nature of the vegetation of the area. (Photo GJ Keighery 12-1-99).

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Recommendations

- 1) Detailed biological assessments be made in the appropriate season before consideration is given to granting any approval to establish drains into the conservation reserves of the Byenup - Muir system.
- 2) Detailed *Phytophthora* dieback assessments be mandatory before any drain system is established in the conservation reserves of the Byenup - Muir system.
- 3) Immediate action be taken to close any illegal drainage into the Byenup - Muir Nature Reserves.
- 4) The zoning of dieback hazard of the low lying areas of the reserves be changed to moderate - high.
- 5) Further detailed studies be undertaken on Byenup Lagoon to determine if the apparent decline of the sedgeland in 1995 was a result of increased salinity levels.
- 6) Detailed time series analysis of available photography be undertaken to assess the impact of drainage in the north west corner of Kulunilup Nature Reserve.
- 7) Possible impacts of *Armillaria* infections in Lake Muir Nature Reserve be investigated.
- 8) At Bokarup Nature Reserve, the *Acacia dealbata* thicket and the *Watsonia* infestation on the dune between the wetlands be removed before they become a major weed problems.
- 9) At Galamup Nature Reserve, the *Acacia longifolia* subsp. *longifolia* infestation be removed before it becomes a major weed problem.
- 10) Nutrient outflow from dams on the boundaries of Cobertup and Galamup be ameliorated to stop habitat degradation and weed spread into the reserves.
- 11) *Tribonanthes* sp. Lake Muir (GJK & NG 2387), which appears to be endemic to the Byenup - Muir reserves, be listed on CALM's priority flora list as a Priority 4 taxon.

Abstract

The study confirmed the high conservation values of Byenup - Muir wetland reserves in terms of both flora and diversity of plant communities recorded. A total of 976 taxa were recorded in 13 reserves, this included 3 species of Declared Rare Flora and 33 taxa on CALM's priority flora list. Structural vegetation mapping carried out in 9 reserves showed a complex mosaic of more than 30 vegetation types.

Eryngium sp. Lake Muir (E Wittwer 2293) and *Tribonanthes* sp. Lake Muir (GJK & NG 2387) appear to be endemic taxa to the Byenup - Muir area. The Lake Muir Nature Reserve contains the only known populations of *Euphrasia scabra* and *Lilaeopsis polyantha* in WA. The Byenup - Muir wetland reserve system fulfils at least four criteria for listing as a wetland of international importance under the Ramsar Convention.

The major threats to conservation values of the reserve system identified were (a) increases in salinity resulting from drainage schemes and rising water table and (b) spread of dieback. Major changes in plant communities in many of the wetlands have occurred since 1980. These changes were not just confined to lake margins but also occurred in sunplands and damplands.

Introduction

The Byenup - Muir wetland complex covers a sequence of basin wetlands, swamps, seasonally wet flats and low sandy and occasionally lateritic rises in the south west of Western Australia. It is unusual in that this wetland complex is largely undisturbed and contains peat based wetlands which are very rare in Western Australia (ANCA 1996, CALM 1998). The wetland complex is reserved in 13 separate nature reserves (Bokarup, Cobertup, Cowerup, Galamup, Kodjinup, Kulunilup, Lake Muir, Noobijup, Pindicup, Pinticup, Quindinup, Unicup and Yarnup).

The broad plain on which most of the wetlands occur has had a complex geological history. The area was subject to several marine incursions while most of the soils are of Tertiary and Quaternary age and represent infilling of blocked paleodrainage systems (Wilde & Warker 1984, Chakravartula & Street 1999). Churchwood *et al.* (1988) mapped landforms and soils south of Byenup Lagoon. The wetlands fell into their swampy terrain landform with Cambellup (plains with drainage floors, swamps and low rises) and Morande (lunettes, dunes, hummocks and intervening swamps) being the most common units. Chakravartula & Street (1999) have recently produced a more detailed soil interpretation from airborne radiometric data for the entire Muir and Unicup catchments.

Regional vegetation mapping at 1:250 000 scale was undertaken by Smith (1972) and at 1: 1 000 000 scale by Beard (1981). The reserves fall mainly into Beard's Kwornicup vegetation system with the upland areas around Unicup Nature Reserve in the Jingalup vegetation system. The Jingalup uplands have extensive areas of lateritic capping and deeply dissected watercourses. Most of this system is dominated by eucalypt woodland with the creek lines dominated by *Eucalyptus rudis*, *Melaleuca cuticularis* and *M. viminea*. The more extensive Kwornicup system is characterised by a poorly drained swampy plain between the headwaters of the Kent, Hay and Gordon Rivers. The vegetation is a mosaic of Jarrah - Marri forests, paperbark low forest and reed swamps, with *Eucalyptus decipiens* occurring on sandy swampy sites as the dominant or understorey species. Clay swamps usually contain stands of Yate with an understorey of *Melaleuca cuticularis* and *M. violacea* while sandy swamps may have dense stands of *Melaleuca cuticularis* grading into reed swamps (Beard 1981).

The broad scale vegetation mapping gives little indication of the degree of patterning or the array of plant communities found in the area. More detailed information is available for three of the nature reserves (Kulunilup, Unicup and Yarnup, Griffin 1984). In that report Griffin described 24 vegetation associations ranging from upland lateritic Jarrah communities to shrublands and sedgelands of the wet flats and commented on the gradational nature of the vegetation with the complex mosaic apparently related to soil type, moisture status and salinity.

The aim of the present work was to map the nine wetland reserves for which detailed vegetation information is lacking, to compile species lists for the reserves, and to establish monitoring sites across the wetland system to provide baseline data from which future change can be measured.

Methods

Vegetation and flora

Structural vegetation mapping was undertaken for Bokarup, Cobertup, Cowerup, Galamup, Kodjinup, Lake Muir, Noobijup, Pindicup, Pinticup Nature Reserves using 1:25 000 stereo colour airphotos (WA3619 - 23/10/95) (Figure 1). Structural units were mapped then field checked by traverses of external boundaries and internal tracks. The Lake Muir Reserve is over 11,000 ha and much is inaccessible by vehicle, mapping units in this reserve were checked by air. Vegetation units were found to occur in complex mosaics and broad units similar to those used by Griffin (1984) were adopted.

For each reserve detailed flora lists were compiled by major vegetation unit. The lists for Lake Muir and Cowerup Nature Reserves are considered preliminary because of the large size in the case of Lake Muir and lack of sampling of annuals in Cowerup. Species lists are considered more complete than lists by vegetation types. The mapping and flora survey was undertaken over five field trips during spring, summer and autumn from 1997 to 1999. Voucher collections were lodged in the Western Australian Herbarium. Nomenclature generally follows Green (1985) and current usage at the Western Australian Herbarium (ms indicates manuscript name).

Current vegetation patterns and aerial photographs were compared to oblique aerial photography taken by JAK Lane in 1980 of many of the reserves. This allowed a qualitative assessment of vegetation change within the reserves over the last 19 years. Historic and recent oblique photography is appended to the report on a cd-rom.

Wetland monitoring

For the wetland monitoring 47 quadrats were located over 27 wetlands (Figure 1). Each quadrat was 5m x 10m with corners marked by steel droppers or star bars. In basin wetlands plots were laid out with their long axis parallel to the lake shoreline. Between one and three plots were established at each wetland. Lists were compiled of all vascular species encountered at each site. Percentage cover was estimated for each species (<2, 2-10, 10-30, 30-70, >70%), however only presence / absence data was used in the present analyses. All quadrats were scored on two occasions to ensure that comprehensive lists of the annual flora were achieved. The position of the quadrats was fixed with a GPS unit. The wetland was classified as either permanent or seasonal, into the Semeniuk & Semeniuk (1997) and Ramsar (ANCA 1996) wetland classification systems. Notes were also made on slope, aspect and soil type. Macroinvertebrates, fish and water quality sampling was also undertaken at these 27 wetlands and will be reported elsewhere (A.W. Storey, pers. comm.).

The 47 sites were classified using Bray Curtis dissimilarity measure and UPGMA fusion strategy for both the normal and inverse classifications. Singletons (taxa occurring at only one site) were included in the analysis.

Results and Discussion

Flora

Reserve summaries, new vegetation mapping and flora lists for the 13 reserves of the Byenup - Muir wetland system are given in Appendix 1. A total of 976 taxa were recorded from the 13 reserves (Appendix 2), of these 862 were native and 114 were introduced. The most species rich native families were the Orchidaceae (70 taxa), Cyperaceae (65 taxa), Myrtaceae (60 taxa), Proteaceae and Papilionaceae (52 taxa), Asteraceae (50 taxa) and Stylidiaceae (36 taxa). The families with the most introduced taxa were Poaceae (22 taxa), Asteraceae (18 taxa) and the Papilionaceae (12 taxa).

During the survey three taxa listed as Declared Rare Flora were recorded from the area, as were 33 taxa listed on CALM's priority flora list (Atkins 1998, Table 1). This is a considerable increase in the number of priority flora previously reported (3 DRF and 4 priority species - CALM 1998).

This is a rich flora for such a small area being more than 10% of that recorded for the south west, about half that recorded for Fitzgerald River National Park (Newbey & McQuoid 1997) and more than that known for Lesueur National Park (Griffin *et al.* 1990), both these latter areas are major centres of biodiversity in south west Western Australia (Table 2). The reasons for such diversity in the Byenup - Muir area probably relate to complexes of soil types and hydrological patterns (both local and regional)

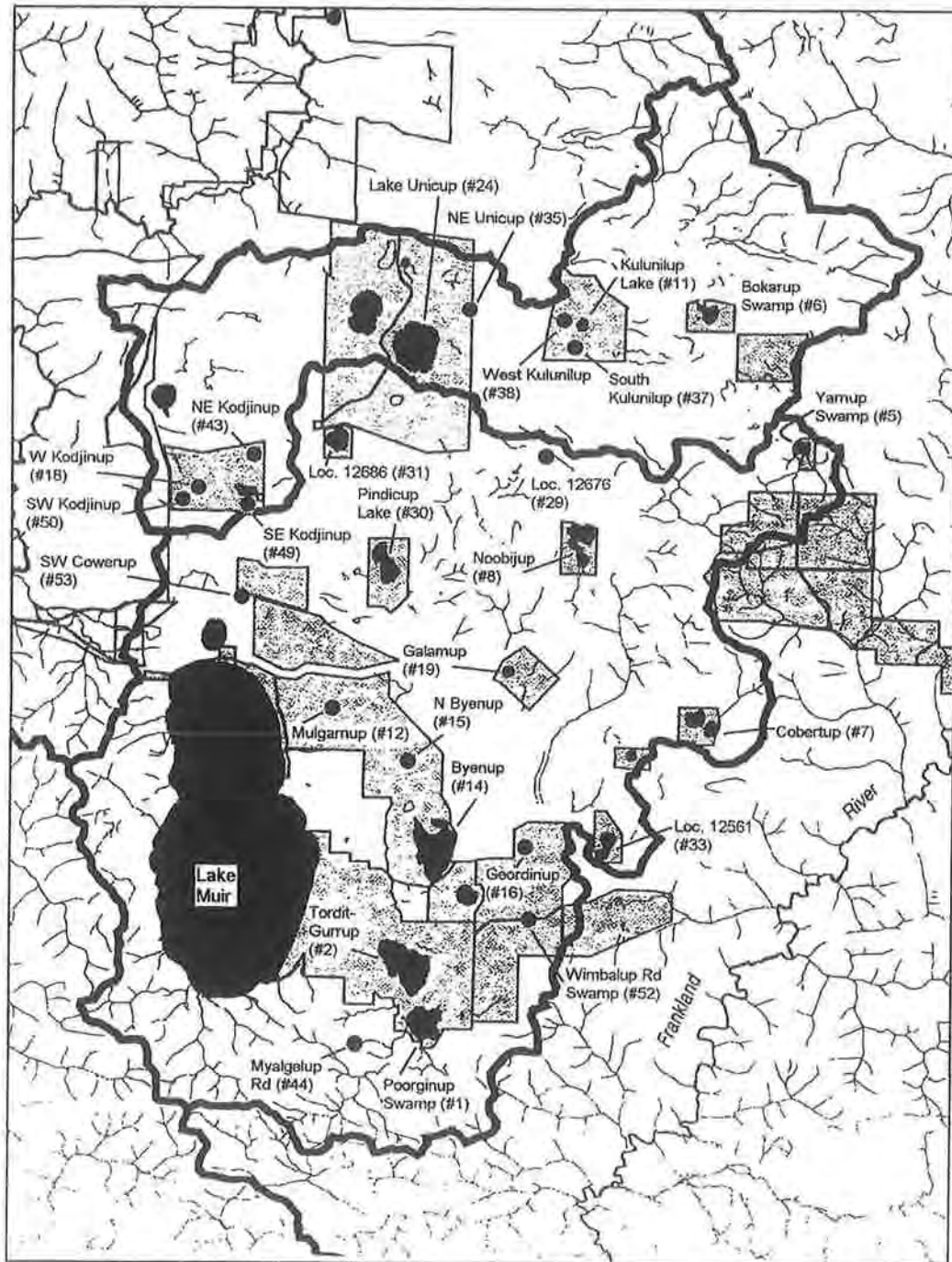


Figure 1 Location of the 13 Nature Reserves in the Muir - Byenup wetland system showing location of the 27 wetlands where permanent monitoring sites were established.

found over short distances relating to the blockage of major drainage patterns during the Tertiary and subsequent infilling of the plain (Chakravartula & Street 1999). The complex of vegetation patterning is also related to these patterns (particularly period of inundation, and quality of ground water) as well as fire history, although much detailed work would be required to demonstrate these correlations.

Table 1 Rare and priority flora recorded from the Byenup - Muir wetland reserves (DRF, Declared Rare Flora; 1-4, Priority flora listing - after Atkins 1998)

Taxon	Priority listing
<i>Amphibromus vickeryae</i>	1
<i>Anthotium junciforme</i>	4
<i>Apodasmia ceramophila</i> ms	2
<i>Caladenia christineae</i> ms	DRF
<i>Caladenia harringtoniae</i> ms	DRF
<i>Caladenia starteorum</i> ms	2
<i>Caustis</i> sp. Boyanup (GS McCutcheon 1706)	1
<i>Diuris drummondii</i>	DRF
<i>Dryandra porrecta</i>	4
<i>Eryngium</i> sp. Lake Muir (E Wittwer 2293)	1
<i>Eucalyptus aspersa</i>	4
<i>Eucalyptus latens</i>	4
<i>Euchiton gymnocephalus</i>	3
<i>Euphrasia scabra</i>	2
<i>Gratiola pedunculata</i>	2
<i>Hibbertia silvestris</i>	4
<i>Hydatella australis</i>	1
<i>Jacksonia sparsa</i> ms	3
<i>Leucopogon lasiophyllus</i>	2
<i>Leucopogon tamariscinus</i>	2
<i>Lilaeopsis polyantha</i>	2
<i>Melaleuca pritzelii</i>	2
<i>Opercularia rubioides</i>	2
<i>Phyllangium palustre</i>	2
<i>Pithocarpa corymbulosa</i>	2
<i>Pterostylis turfosa</i>	1
<i>Rhodanthe pyrethrum</i>	3
<i>Schoenus benthamii</i>	3
<i>Schoenus capillifolius</i>	2
<i>Schoenus loliaceus</i>	2
<i>Schoenus natans</i>	4
<i>Stylidium lepidum</i>	3
<i>Stylidium mimeticum</i>	3
<i>Stylidium rhipidium</i>	1
<i>Synaphea decumbens</i>	1
<i>Tribonanthes</i> sp. Lake Muir (GJK & NG 2387).	Recommended P4
<i>Villarsia submersa</i>	4

Table 2. Comparison of species richness of the Byenup - Muir wetland reserves with Fitzgerald River National Park and Lesueur National Park.

	Area (ha)	Number of taxa recorded ,
13 Byenup - Muir wetland reserves	19 888	976
Fitzgerald River National Park	329 000	1883
Lesueur National Park	26 978	821

The area was remarkable for the number of threatened or poorly known taxa recorded (Table 1). Of particular note were *Euphrasia scabra*, *Lilaeopsis polyantha*, *Schoenus natans*, *Eryngium* sp. Lake Muir (E Wittwer 2293), and *Tribonanthes* sp. Lake Muir (GJK & NG 2387).

Euphrasia scabra and *Lilaeopsis polyantha* are only known in Western Australia from the Byenup - Lake Muir area. *E. scabra* was widespread in the eastern states but is now considered extinct in New South Wales and South Australia, many populations in Victoria and Tasmania have disappeared and the remaining ones are declining badly (Thompson 1992, Gilfedder & Kirkpatrick 1995, Gilfedder & Kirkpatrick 1996). Two large populations of this taxon were located during the course of this work, both appear in good health.

Schoenus natans is an aquatic sedge that was believed to be extinct until it was rediscovered on the Swan Coastal Plain in the early 1990s when it was listed as Declared Rare Flora (Keighery & Keighery 1996). It was subsequently found in a number of clay based wetlands on the plain and the adjacent Darling Scarp. During the present survey large populations of this taxon were found in five of the nature reserves. This taxon was subsequently taken off the DRF list.

Two taxa appear to be endemic to the Byenup - Muir wetland reserves *Eryngium* sp. Lake Muir (E Wittwer 2293), and *Tribonanthes* sp. Lake Muir (GJK & NG 2387). Both taxa occur on winter wet clay flats. While the *Eryngium* has been recognised for some time the *Tribonanthes* appears to be a previously unrecognised taxon. It is recommended that it be listed on CALM's priority flora list as a Priority 4 taxon, given its widespread occurrence in clay wetlands within the reserve system.

Vegetation

More than 30 different structural vegetation units were used to map nine nature reserves. The general pattern found was that of complex mosaics and gradational change as had been previously reported by Griffin (1984). Initially mapping was undertaken using the same map units as earlier mapping of Unicup, Kulunilup and Yarnup Nature Reserves (Griffin 1984). It was found that some of these units were too heterogenous to reliably map. Final map units chosen are generally comparable with the earlier work and correlations are made in relevant sections of Appendix 1.

Major vegetation patterning appears to be related to soil type, period of inundation, quality and type of ground water, and fire history. The complex hydrology of the area is evident in reserves such as Unicup where saline and freshwater plant communities can occur on the same wetland. The occurrence of a patch of *Baumea articulata* on the eastern side of Little Unicup in an otherwise saline lake implies the occurrence of a freshwater spring (Froend & McComb 1991). Similar patterning is seen in other lakes in Unicup and Pindicup Nature Reserves. In both these reserves saline wetlands (presumably in contact with saline ground water) and freshwater wetlands (presumably fed by perched aquifers) can occur within very short distances of each other.

Considerable change in vegetation communities can be noted since JAK Lane took a series of oblique aerial photographs of many of the reserves in 1980 (see Appendix 2). These changes have not been restricted to the margins of the basin wetlands but also affect damplands and sumplands (primarily wet heath communities).

Of the 10 basin wetlands dominated by *Baumea* sedgeland photographed in 1980 five (Cobertup, Kulunilup, Pindicup, Pinticup and Yarnup) show no obvious change when compared to recent aerial photographs. In three wetlands (Galamup, Kodjinup, and Noobijup) the density of the *Baumea* appears to have dropped but the area of open water shows little change. At Bokarup Swamp the cover of *Baumea* sedgeland has decreased by about 50 percent. Associated with this dramatic change is the almost complete replacement of a *Melaleuca lateritia* wet heath in the eastern wetland by open water. The 1980 photography shows the wet heath beginning to die from the centre of the wetland suggesting that rise in water table rather than fire has precipitated this change.

Lane's 1980 photography of Byenup Lagoon (Appendix 2) shows extensive areas of *Baumea* sedgeland in good condition interspersed by small patches of open water and clumps of *Melaleuca* forming small "islands". The October 1995 aerial photography appears to show most of the *Baumea* on the western and north eastern side to be an orange colour which is indicative of stress. None of the other *Baumea* sedgelands in the Byenup - Muir wetlands shows this pattern on this series of air photographs. Recent

aerial inspections of the wetland (Jan 99) indicate the *Baumea* no longer appears stressed but does appear to be less dense in some areas. Salinity levels reached an 8 year peak (and water levels an 8 year low) in Byenup Lagoon in 1995 (JAK Lane, pers. comm.). It is recommended that a time sequence of photography covering the period 1985 to 1999 be compiled to determine if the health of the *Baumea* sedgeland of Byenup Lagoon is correlated with salinity levels.

The seasonally inundated clay flats (sumplands) on the west side of Noobijup Nature Reserve also show severe impacts of a rising saline water table dating from 1980 (see Appendix 2). In the 1980 photography much of the private property on the eastern side of Noobijup had just been cleared and the wet clay flats were in excellent condition. Subsequent hydrological changes have resulted in significant death of both the tree and understorey layer in the reserve over an extensive area. Urgent remedial action is required to stop these impacts in the highly diverse Noobijup clay flats communities.

A salt scald has also developed on the west side of Yarnup Nature Reserve since 1980. Halse *et al.* (1993) reports that this was first observed about 1988. Surprisingly the October 1995 aerial photography shows no obvious change since 1980 in the density of the *Baumea* sedgeland in this reserve.

The observed changes seen in the *Baumea* sedgelands and wet heath communities are consistent with increases in salinity and / or water table depth (Froend & McComb 1991). The comparison of aerial photography is imprecise and subtle changes may not be apparent from these comparisons. What is clear is that there has been significant changes to a number of the wetlands since 1980 and in all cases this change has been toward wetland degradation.

Significant degradation has also occurred on the *Banksia ilicifolia* woodlands (damplands) in Kodjinup Nature Reserve since 1993 as the result of installation of an approved drain (CALM 1998, Appendix 2). The drains constructed through the central part have caused massive deaths of *Banksia ilicifolia* woodland and associated heath species as result of *Phytophthora* dieback spread (Map 4). This impact is being monitored by a series of photopoints (22 March 1997) laid along a 50m transect perpendicular to the drain (Appendix 2). Changes in inundation due to drain construction have also resulted in the death in small areas of Jarrah woodland (Map 4). The northern (upslope) section of the drain was constructed through what appear to be areas of old dieback infections.

The nature conservation values of Kodjinup Nature Reserve have been severely compromised by the construction of this drain. It is clear that detailed biological and *Phytophthora* dieback assessments should be made in the appropriate season before consideration is given to granting any approval to establish drains into any conservation reserve of the Byenup - Muir system. The dieback hazard of the low lying areas of the Byenup - Muir reserves system should be considered moderate - high. Extensive areas of death of *Banksia ilicifolia* woodland were also observed along the Muir Highway and on the southern boundary of Kodjinup Nature Reserve.

Some degraded vegetation was mapped at the southern end of Lake Muir (Map 5). This was investigated during the aerial survey of the Lake Muir vegetation and appears to be an *Armillaria* infection. This needs to be investigated further.

Vegetation monitoring

Baseline monitoring data were compiled from 47 quadrats in 27 wetlands (Appendix 3). The analysis of floristic variation in the 47 monitoring plots from the 27 wetlands (Table 3) showed distinct patterning related to wetland type, winter water depth and salinity. The first site group comprises plots in deeper water dominated by *Baumea articulata* and *Triglochin huegelii* (Tables 4 & 5). Within these the site at Poorginup (plot 1-1) is unusual in that it only shares *B. articulata* with other sites. This site was unusual in consisting of flooded mounds of organic material. The second site group consists of sites in shallow water at the edge of the basin wetlands. *Lepidosperma longitudinale* and *Melaleuca raphiophylla* and sometimes *Melaleuca preissiana* are characteristic of these sites. (*Lepidosperma longitudinale* is also a common component of site group 3). Elements in species group A largely define these groups with species accumulation in site group 2 as a result of shorter inundation periods (Table 5). These two floristic communities grade into each other over an ecotone of 10 m or so in the field.

The third site group comprises the dense shrublands of long inundated seasonal wetlands. Species composition is somewhat variable but *Melaleuca densa* and *Lepidosperma longitudinale* are typical of

this group but not restricted to it (Table 5). The aquatic taxa typical of the basin wetlands (site groups 1 & 2) are almost entirely lacking. Species groups B & D are largely faithful to this group but with only moderately levels of constancy. Species group J consists almost entirely of singletons occurring in site 49-1.

One site (19-2) on the edge of Galamup Swamp is in the same position at the edge of the wetland as sites in site group 2 but was quite species poor and quite different species composition. This was the only site where *Villarsia albiflora* dominated the herbland around the waters edge.

Herb and rush dominated seasonally wet clay flats were only sampled at one site (38-1) in Kululinup Nature Reserve. Here *Apodasmia ceramophila* dominated the herb rich clay flat and species group I was largely confined to this site (Table 3). Interestingly *Schoenus natans* (an aquatic sedge) was recorded from this site. This species was considered to have a very restricted distribution on the uncleared clay flats of the Swan Coastal Plain and Scarp. In fact this species is widespread on the seasonally flooded clay flats Byenup - Lake Muir area.

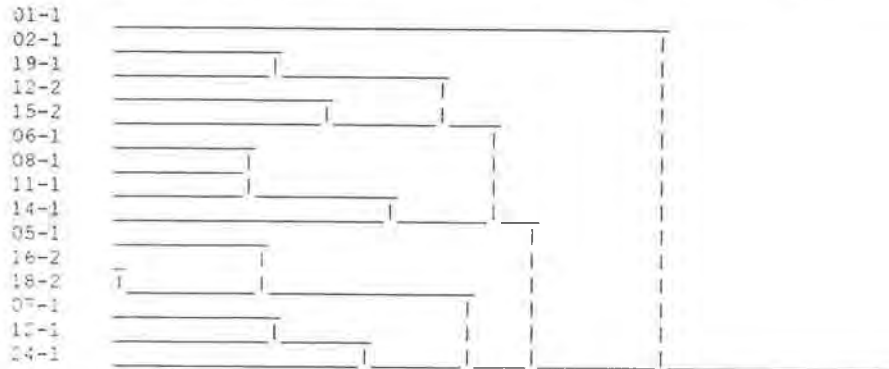
Table 3. List of wetlands monitored in Byenup - Muir area.

Wetland	Wetland Name
01	Poorginup Swamp
02	Tordit-Gurrup Lagoon
05	Yarnup Swamp
06	Bokarup Swamp
07	Cobertup Swamp
08	Noobijup Lake
11	Kululinup Lake
12	Mulgarnup Lagoon
14	Byenup Lagoon
15	North Byenup Lagoon
16	Geordinup Lagoon
18	Large Swamp in SW of Kodjinup Nature Reserve
19	Galamup Swamp
24	Lake Unicup
29	Creekline in Location 12676
30	Pindicup Lake
31	Swamp in Location 12686
33	Lake in Location 12561
35	Lake Unicup
37	Wet flat in Kululinup Nature Reserve
38	Clay flat in Kululinup Nature Reserve
43	Wet flats in NE of Kodjinup Nature Reserve
44	Myalgelup Rd Swamp
49	Drainage line S of Kodjinup Swamp
50	Small Swamp in SW of Kodjinup Nature Reserve
52	Wet clay flat on Wimbalup Rd
53	Wet flats NW of Red Lake Reserve

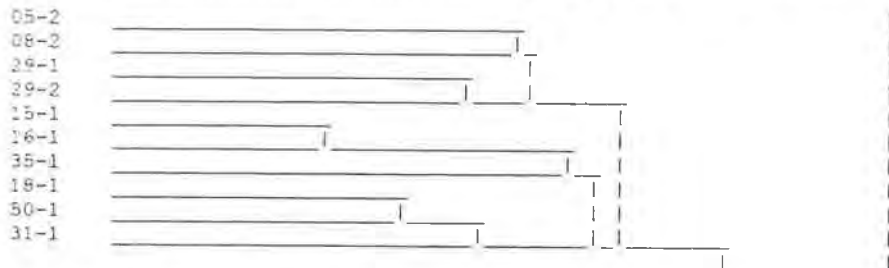
Table 4. Dendrogram of 41 plots based on occurrence of 176 species. Plot codes refer to wetland (table 1) then quadrat.

0.0000 0.2500 0.5000 0.7500 1.0000 1.2500

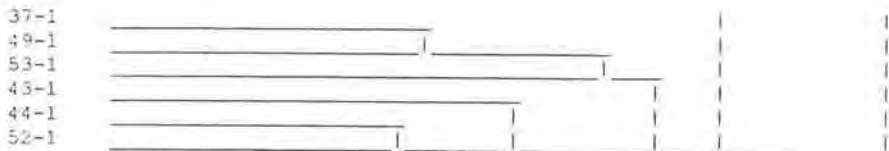
Site Group 1. Deep water plots dominated by *Baumea articulata* & *Triglochin huegelii*



Site Group 2. Shallow water plots at edge of wetlands dominated by *Lepidosperma longitudinale*, *Melaleuca raphiophylla* and / or *Melaleuca preissiana*.



Site group 3. Dense shrublands of wetlands with long periods of inundation. *Melaleuca densa* is a common dominant of these wetlands.



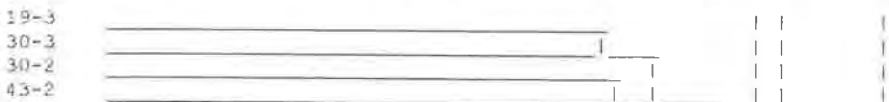
Site group 4. Wetland edge herbland - sedgeland



Site group 5. Herb rich clay flat



Site group 6. Wet heath community of palusplains & floodplains



Site group 7. Brackish / saline wetlands

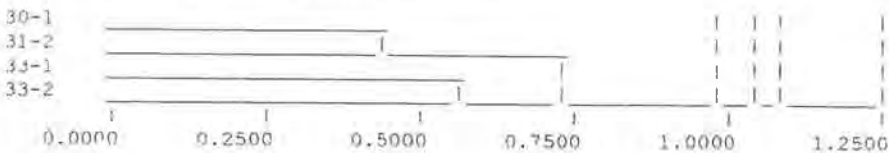


Table 5. Two way table of 47 plot classification.

	001110011011012	0022113153	345445	113	1334	3333
	129256814568724	5899565801	793342	918	9003	0133
	11122111122111	2212111111	111111	21	3322	1212
SPECEIE GROUP A						
Acacia cyclops		*				
Isolepis nodosa		*				
Sonchus hydrophilus		*				
Stipa juncifolia		*				
Thelymitra sp.		*				
Anagallis arvensis		*				
Eucalyptus rudis		*	*	*		
Hemarthria uncinata		*	*	*		
Lobelia alata		*	*	*		
Samolus junceus	*	*	*	*	*	*
Gahnia trifida		*	*	*	*	*
Villarsia parnassifolia		*	*	*	*	*
Meeboldina tephрина MS		*	*	*	*	*
Melaleuca densa		*	*	*	*	*
Baumea articulata		*	*	*	*	*
Triglochin huegelii	*	*	*	*	*	*
Baumea juncea	*	*	*	*	*	*
Lepidosperma longitudinale	*	*	*	*	*	*
Melaleuca raphiophylla	*	*	*	*	*	*
Baumea vaginalis	*	*	*	*	*	*
Baumea sp	*	*	*	*	*	*
Chenopodium sp	*	*	*	*	*	*
Potamogeton tricarinatus	*	*	*	*	*	*
Triglochin striatum	*	*	*	*	*	*
Amperea volubilis	*	*	*	*	*	*
Leptocarpus scariosus	*	*	*	*	*	*
Astartea fascicularis	*	*	*	*	*	*
SPECEIE GROUP B						
Anarthria laevis		*				
Boronia megastigma		*				
Juncus kraussii		*				
Trithuria submersa		*				
Hakea varia		*		*	*	
Hypocalymma angustifolium		*		*	*	
Hypolaena ramosissima		*		*	*	
Brachysema melanopetalum		*	*	*	*	*
Cassytha racemosa		*	*	*	*	*
Melaleuca viminea		*	*	*	*	*
Lepyrodia muirii		*	*	*	*	*
Pterostylis sp.		*	*	*	*	*
Melaleuca lateritia	*	*	*	*	*	*
Villarsia sp.	*	*	*	*	*	*
SPECEIE GROUP C						
Aphelia cyperoides		*		*	*	
Centrolepis aristata		*		*	*	*
Schoenus spp		*		*	*	*
Dampiera sp.		*		*	*	*
Stylidium spathulatum		*		*	*	*
Lepidosperma angustatum		*		*	*	*
Patersonia occidentalis (swamp form)		*		*	*	*
Bossiaea linophylla	*	*		*	*	*
Hibbertia cunninghamii		*		*	*	*
Lagenifera huegelii		*		*	*	*
Caesia micrantha		*		*	*	*
Deyeuxia quadriseta		*		*	*	*
Villarsia albiflora		*		*	*	*
Gratiola peruviana		*		*	*	*
Microtis atrata		*		*	*	*
Microtis orbicularis		*		*	*	*
Prasophyllum macrostachyum		*		*	*	*
SPECEIE GROUP D						
Astartea sp. pink		*		*	*	*

Samolus caespitosus		*				
Schoenus natans		*				
Schoenus tenellus		*				
Selaginella gracillima		*				
SPECEIE GROUP K						
Aira caryophyllea					*	
Briza minor					*	
Centaureum spicatum					*	
Cyperus tenellus					*	
Hydrocotyle sp.					*	
Hypochaeris glabra					*	
Neurachne alopecuroidea					*	
Parietaria debilis					*	
Podolepis gracilis					*	
Siloxerus humifusus					*	
Sphaerolobium vimineum					*	
Stylidium assimile					*	
Velleia trinervis					*	
SPECEIE GROUP L						
Anthotium junciforme					*	
Astartea sp. small					*	
Burchardia monantha					*	
Daviesia incrassata					*	
Hakea sulcata					*	
Hibbertia stellaris					*	
Isolepis cernua					*	
Melaleuca aff scabra					*	
Melaleuca pulchella					*	
Philydrella pygmaea					*	
Polypogon monspeliensis					*	
Tremulina tremula					*	
Restio sp.					*	
Schoenus humilis					*	
Sphaerolobium sp.					*	
Triglochin calceitrapum					*	
Viminaria juncea					*	
SPECEIE GROUP M						
Astroloma ciliatum					*	
Astroloma pallidum					*	
Billardiera variifolia					*	
Caladenia flava					*	
Chamaescilla corymbosa					*	
Daucus glochidiatus					*	
Desmocladius fasciculatus MS					*	
Drosera macrantha					*	
Eucalyptus decipiens					*	
Gompholobium marginatum					*	
Hakea lissocarpha					*	
Lomandra micrantha					*	
Phyllanthus calycinus					*	
Stipa sp.					*	
Synaphea sp.					*	
Tetraria capillaris					*	
Thelymitra benthamiana					*	
Tricoryne elatior					*	
Trymalium ledifolium					*	

Site group 6 is the wet heaths of the palusplain and floodplains. While these sites share species group C, each site also shows a significant number of singletons (species groups F, K, L, & M - Table 5). The final site group comprises sites of brackish / saline substrates, generally dominated by *Melaleuca cuticularis*, although this taxa also occurs in some of the wet heaths of site group 6.

High levels of heterogeneity can be seen in the analysis resulting at least in part from the low species richness found in some of the sites. Species richness varies dramatically between site groups, with the deep freshwater group having the lowest mean species richness and the wet heaths the highest (Table 6). One hundred and twenty two of the 176 taxa in the analysis only occur at a single site (69%), this number of singletons adds considerably to the observed heterogeneity. While further sampling is likely

to lower the number of singletons work on the Swan Coastal Plain (Gibson *et al.* 1994) and the Karri belt (Wardell-Johnson & Williams 1996) indicates that wetland vegetation, in particular, has a high component of naturally uncommon species. The reasons for this are poorly understood.

Table 6. Species richness by site group.

Site group	Species richness
1	3.6
2	11.0
3	12.2
4	7.0
5	14.0
6	28.3
7	7.3

Conclusions

The wetlands of the Byenup - Muir reserve system have very high conservation values in terms of total flora diversity, diversity of rare and priority taxa, and diversity of plant communities and their complex mosaic and gradational patterning. The study has shown that the flora of this area is not well known and with further survey work more species will be recorded, especially in Lake Muir Nature Reserve.

The Byenup - Muir wetland system is listed in the Directory of Important Wetlands in Australia (ANCA 1996) under Byenup Lagoon system (including 11 nature reserves) and Lake Muir listings. The flora and vegetation of the Byenup - Muir wetland system would meet at least four Ramsar Convention criteria for listing as Wetlands of International Importance (ANCA 1996). (*Criteria 1a* - is a particularly good representative example of natural or near natural wetland, characteristic of the appropriate biogeographical region; *Criteria 1d* - it is an example of a specific type of wetland, rare or unusual in the appropriate biogeographical region; *Criteria 2a* - it supports an appreciable assemblage of rare, vulnerable or endangered species or subspecies of plant or animal, or an appreciable number of individuals of any one or more of these species; *Criteria 2d* - it is of special value for one or more endemic plant or animal species or communities).

There has been significant degradation of some of the wetland areas in the Byenup - Muir system since 1980. The degradation has generally resulted from changes in the hydrological regime or as result of *Phytophthora* dieback. Changes in hydrological regime have resulted from a rising water table, presumably as a result of land clearance, or as a result of drainage works. The spread of *Phytophthora* dieback is correlated with drainage and road works.

The impacts of dieback spread in Kodjilup Nature Reserve since 1993 clearly show how drainage works can have a serious impact on the nature conservation values of a reserve in a short time period. Detailed biological survey and dieback mapping are essential before consideration is given to granting approval for any new drainage works in conservation reserves of the Byenup - Muir system.

The designation of the Muir - Unicup catchments as a recovery catchment under the Salinity Action Plan (Government of Western Australia 1996) should provide resources to protect and manage the very significant biodiversity values of this area into the future.

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Appendix 1

Descriptions of 13 reserves of the Byenup - Muir reserve system.

Bokarup Nature Reserve

Reserve number: 14739

Class: A

Location: 34 20 09S 116 49 52E;

Land tenure : Nature Reserve

Purpose : Water & Conservation of flora and fauna

Area: 146 ha

Biological values

Flora: Three hundred and seventy one species have been recorded from the reserve (Table 1). These include four priority taxa (*Jacksonia sparsa* ms (Priority 3), *Schoenus benthamii* (Priority 3), *Schoenus natans* (Priority 4), *Villarsia submersa* (Priority 4)).

Vegetation description: Twelve vegetation units have been mapped on the reserve (Map 1).

- 1) **Jarrah - Marri forest and woodlands** on laterites and lateritic gravels cover most of the reserve. The understorey is diverse in shrub, herbs and grasses. Typical understorey shrubs include *Hibbertia* spp., *Leucopogon* spp. and peas such as *Bossiaea* spp., *Daviesia* spp. and *Gompholobium* spp.
- 2) **Jarrah - Marri open woodlands** occupy the sand dune between the large wetlands. Typical understorey species included *Phyllanthus calycinus* and *Hakea ruscifolia* with *Centrolepis* spp. and *Johnsonia* spp. being the common herbs.
- 3) ***Melaleuca preissiana* - *Banksia littoralis* woodland** occurred along the drainage lines on the western side of the reserve. *Pericalymma ellipticum* and *Lepidosperma longitudinale* were the dominant understorey species.
- 4) ***Melaleuca preissiana* - *Eucalyptus rudis* woodland** occurred on seasonally wet flats on the transition zones between the drainage lines and wetlands, and the Jarrah - Marri woodlands on the laterites. Again *Lepidosperma longitudinale* was the common understorey species.
- 5) ***Melaleuca raphiophylla* low forest** surrounds the major wetland on the eastern side of the reserve, at western end of Bokarup Swamp and small swamp on the northern boundary. These areas are inundated for long periods in winter and spring and the dense overstorey precludes development of any significant understorey layer.
- 6) ***Melaleuca raphiophylla* open woodland** was found on less inundated areas than the previous unit. *Eucalyptus rudis* was also recorded from this community, while the understorey was generally dominated *Lepidosperma longitudinale* and/or *Pericalymma ellipticum*.
- 7) **Wet heath** along the south western shore of the eastern wetland. This unit was dominated by *Melaleuca lateritia* and once dominated this wetland. A visit in late summer showed the remains of an old post and rail fence line crossing the lake and extending into the upland vegetation on the eastern side of the lake.
- 8) ***Baumea* sedgeland** covered about half of Bokarup Swamp. This community was very species poor, with *Baumea articulata* dominating in deeper water and *Baumea vaginalis*, *B. juncea* and *Villarsia albiflora* co-dominating in shallows near shore.
- 9) ***Acacia dealbata* thicket** occurs near the northern boundary of Bokarup Swamp on the edge of the cleared area. This introduced species appears to be the result of early rehabilitation efforts. There was little understorey under the dense canopy.
- 10) **Revegetation** of mostly planted eucalypt occurs in the north west corner of the reserve.
- 11) **Cleared area** largely dominated by annual grasses occur in the same area as units 9 and 10. The northern end of the dune between the two major wetlands has also been cleared.
- 12) **Open water** dominates all of the eastern wetland and approximately half the Bokarup Swamp.

Vegetation change: Oblique air photos from April 1980 (Photo 1 & 2 - JAK Lane, unpub data) show the eastern wetland almost totally covered by a *Melaleuca lateritia* wet heath community, this is currently open water (Map 1). The heath appears to be dying from the centre in the 1980 photography. The same series of photos show Bokarup Swamp itself was fully covered with *Baumea* sedgeland approximately half of which is now open water. The only revegetation work obvious on the 1980 photography was the *Acacia dealbata* thicket.

Disturbance or threats: The cause of the major change in the wetland vegetation in this reserve is not clear but appears to have resulted from a rising water table. The occurrence of the *Acacia dealbata* thicket represents a significant potential weed threat and should be removed as soon as possible.

Family**Map Units**

1 1/2 2 3 4 5/6 6 8 11

Table 1 - Bokarup Nature Reserve flora list**Aizoaceae**

Carpobrotus modestus

1

Amaranthaceae

Alternanthera nodiflora

1

Ptilotus manglesii

1

Amaryllidaceae

* *Amaryllis belladonna*

1

Anthericaceae

Agrostocrinum scabrum

1

Arthropodium capillipes

1

Arthropodium preissii

1

Borya scirpoidea

1

Caesia micrantha

1

Caesia occidentalis

1

Chamaescilla corymbosa

1

Chamaescilla spiralis

1

Johnsonia acaulis

1

Johnsonia lupulina

1

Laxmannia sessiliflora

1

Sowerbaea laxiflora

1

Thysanotus patersonii

1

Thysanotus tenellus

1

Thysanotus thyrsoides

1

Thysanotus triandrus

1

Tricoryne elatior

1

Tricoryne humilis

1

Apiaceae

Daucus glochidiatus

1

Eryngium pinnatifidum

1

Homalosciadium homalocarpum

1

Hydrocotyle alata

1

Hydrocotyle diantha

1

Hydrocotyle pilifera

1

Schoenolaena tenuior

1

Trachymene pilosa

1

Xanthosia candida

1

Xanthosia huegelii

1

Asteraceae

Angianthus tomentosus

1

* *Arctotheca calendula*

1

* *Aster subulatus*

1

Blennospora drummondii

1

Brachyscome iberidifolia

1

* *Carduus pycnocephalus*

1

* *Cirsium vulgare*

1

* *Conyza albida*

1

Cotula coronopifolia

1

Cotula cotuloides

1

Craspedia variabilis

1

Euchiton gymnocephalus

1

Hyalosperma cotula

1

* *Hypochoeris glabra*

1

Lagenifera huegelii

1

Millotia myosotidifolia

1

Podolepis gracilis

1

Podotrocha angustifolia

1

Pterochaeta paniculata

1

Quinetia urvillei

1

Senecio glomeratus

1

Senecio minimus

1

Senecio picridioides

1

Siloxerus humifusus

1

* *Sonchus hydrophilus*

1

* *Sonchus oleraceus*

1

* *Tolpis barbata*

1

* *Vellereophyton dealbatum*

1

Waitzia nitida

1

Brassicaceae

* *Sisymbrium officinale*

1

Campanulaceae

Family**Map Units**

	1	1/2	2	3	4	5/6	6	8	11
Wahlenbergia multicaulis	1		1						
Wahlenbergia preissii			1						
Caryophyllaceae									
* Cerastium glomeratum			1						
* Petrorhagia velutina			1						1
Casuarinaceae									
* Allocasuarina humilis	1								
Centrolepidaceae									
Aphelia cyperoides			1						
Brizula drummondii					1				
Centrolepis aristata			1		1				
Centrolepis glabra					1				
Centrolepis pilosa					1				
Centrolepis polygyna					1				
Colchicaceae									
Burchardia congesta		1							
Burchardia monantha					1				
Wurmbea dioica subsp. alba					1				
Convolvulaceae									
Dichondra repens					1				
Crassulaceae									
Crassula colorata			1						
Crassula exserta	1								
* Crassula natans						1			
Cyperaceae									
Baumea articulata								1	
Baumea juncea								1	
Baumea vaginalis								1	
Chorizandra enodis					1				
Cyathochaeta avenacea					1				
* Cyperus eragrostis									1
* Cyperus tenellus					1				
Isolepis cernua					1				
* Isolepis marginata	1								
Isolepis nodosa			1						
Isolepis oldfieldiana					1				
* Isolepis prolifera									1
Isolepis stellata					1				
Lepidosperma angustatum	1								
Lepidosperma longitudinale					1				
Lepidosperma squamatum	1								
Lepidosperma tenue	1								
Mesomelaena tetragona					1				
Schoenus benthamii					1				
Schoenus curvifolius	1		1						
Schoenus elegans					1				
Schoenus natans					1				
Schoenus tenellus					1				
Tetraria capillaris	1								
Tetraria octandra					1				
Dasypogonaceae									
Chamaexeros serra	1								
Dasypogon bromeliifolius			1						
Lomandra caespitosa	1								
Lomandra nigricans	1								
Lomandra purpurea	1								
Lomandra sericea			1						
Lomandra suaveolens			1						
Dennstaedtiaceae									
Pteridium esculentum					1	1			
Dilleniaceae									
Hibbertia acerosa	1								
Hibbertia commutata	1								
Hibbertia cunninghamii	1								
Hibbertia racemosa	1								
Hibbertia stellaris					1				
Hibbertia vaginata			1						
Droseraceae									
Drosera erythrorhiza	1								
Drosera glanduligera	1								
Drosera macrantha	1								

Family

Map Units

1 1/2 2 3 4 5/6 6 8 11

	Drosera menziesii				1				
	Drosera rosulata				1				
	Drosera stolonifera			1	1				
Epacridaceae									
	Astroloma baxteri			1					
	Astroloma ciliatum	1							
	Astroloma pallidum	1							
	Leucopogon australis				1				
	Leucopogon capitellatus	1							
	Leucopogon conostephioides	1							
Euphorbiaceae									
	Monotaxis occidentalis	1							
	Phyllanthus calycinus	1		1					
	Poranthera microphylla			1					
Gentianaceae									
*	Cicendia filiformis				1				
Geraniaceae									
	Geranium solanderi				1				
	Pelargonium littorale			1					
Goodeniaceae									
	Anthotium humile				1				
	Dampiera alata				1				
	Dampiera cuneata	1							
	Dampiera linearis	1							
	Goodenia micrantha				1				
	Goodenia pulchella				1				
	Scaevola phlebopetala	1							
	Velleia trinervis	1							
Haemodoraceae									
	Anigozanthos flavidus				1				
	Anigozanthos manglesii			1					
	Conostylis aculeata	1							
	Conostylis laxiflora	1			1				
	Conostylis setigera	1							
	Haemodorum laxum	1							
	Haemodorum simplex				1				
	Haemodorum sparsiflorum				1				
	Haemodorum spicatum	1							
	Tribonanthes violacea				1				
Haloragaceae									
	Gonocarpus cordiger	1							
Hydatellaceae									
	Trithuria bibracteata				1				
Hypoxidaceae									
	Hypoxis occidentalis				1				
Iridaceae									
*	Iris germanica								1
	Patersonia juncea	1							
	Patersonia occidentalis	1							
	Patersonia occidentalis (swamp form)				1				
*	Romulea rosea	1							1
*	Watsonia bulbillifera								1
Juncaceae									
*	Juncus bufonius				1				
*	Juncus capitatus				1				
	Juncus holoschoenus					1			
	Juncus pallidus					1			
Juncaginaceae									
	Triglochin centrocarpum				1				
	Triglochin huegelii					1			
	Triglochin lineare				1				
	Triglochin mucronatum				1				
Lamiaceae									
	Hemiandra pungens	1							
Lauraceae									
	Cassytha glabella				1				
	Cassytha racemosa				1				
Lentibulariaceae									
	Polypompholyx multifida				1				
	Utricularia inaequalis				1				

Family**Map Units**

1 1/2 2 3 4 5/6 6 8 11

Linaceae

Linum marginale

1

Lindsaeaceae

Lindsaea linearis

1

Lobeliaceae

Isotoma hypocrateriformis

1

Lobelia alata

1

Lobelia tenuior

1

Loganiaceae

Logania campanulata

1

Logania serpyllifolia

1

Phyllangium paradoxum

1

Lycopodiaceae

Phylloglossum drummondii

1

Lythraceae

* Lythrum hyssopifolia

1

Menyanthaceae

Villarsia albiflora

1

Villarsia submersa

1

Villarsia ?violifolia

1

Mimosaceae

* Acacia dealbata

1

Acacia extensa

1

Acacia huegelii

1

Acacia incurva

1

Acacia myrtifolia

1

Acacia pulchella

1

Acacia saligna

1

Myoporaceae

Myoporum caprarioides

1

Myrtaceae

Agonis parviceps

1

Astartea fascicularis

1

Astartea sp. sops

1

Baeckea camphorosmae

1

Calothamnus lateralis

1

Eucalyptus calophylla

1

Eucalyptus decipiens

1

Eucalyptus marginata

1

Eucalyptus occidentalis

1

Eucalyptus rudis

1

Eucalyptus wandoo

1

Kunzea micrantha

1

Kunzea recurva

1

Melaleuca lateritia

1

Melaleuca leptoclada

1

Melaleuca preissiana

1

Melaleuca raphiophylla

1

Melaleuca viminea

1

Pericalymma ellipticum

1

Olacaceae

Olax benthamiana

1

Onagraceae

Epilobium billardierianum

1

Orchidaceae

Caladenia flava

1

Caladenia longicauda

1

Caladenia marginata

1

Caladenia radiata

1

Caladenia reptans

1

Caladenia varians

1

Cryptostylis ovata

1

Cyrtostylis robusta

1

Diuris laxiflora

1

Diuris longifolia

1

Drakonorchis barbarossa MS

1

Elythranthera brunonis

1

Elythranthera emarginata

1

Leporella fimbriata

1

Leptoceras menziesii

1

Microtis atrata

1

Family**Map Units**

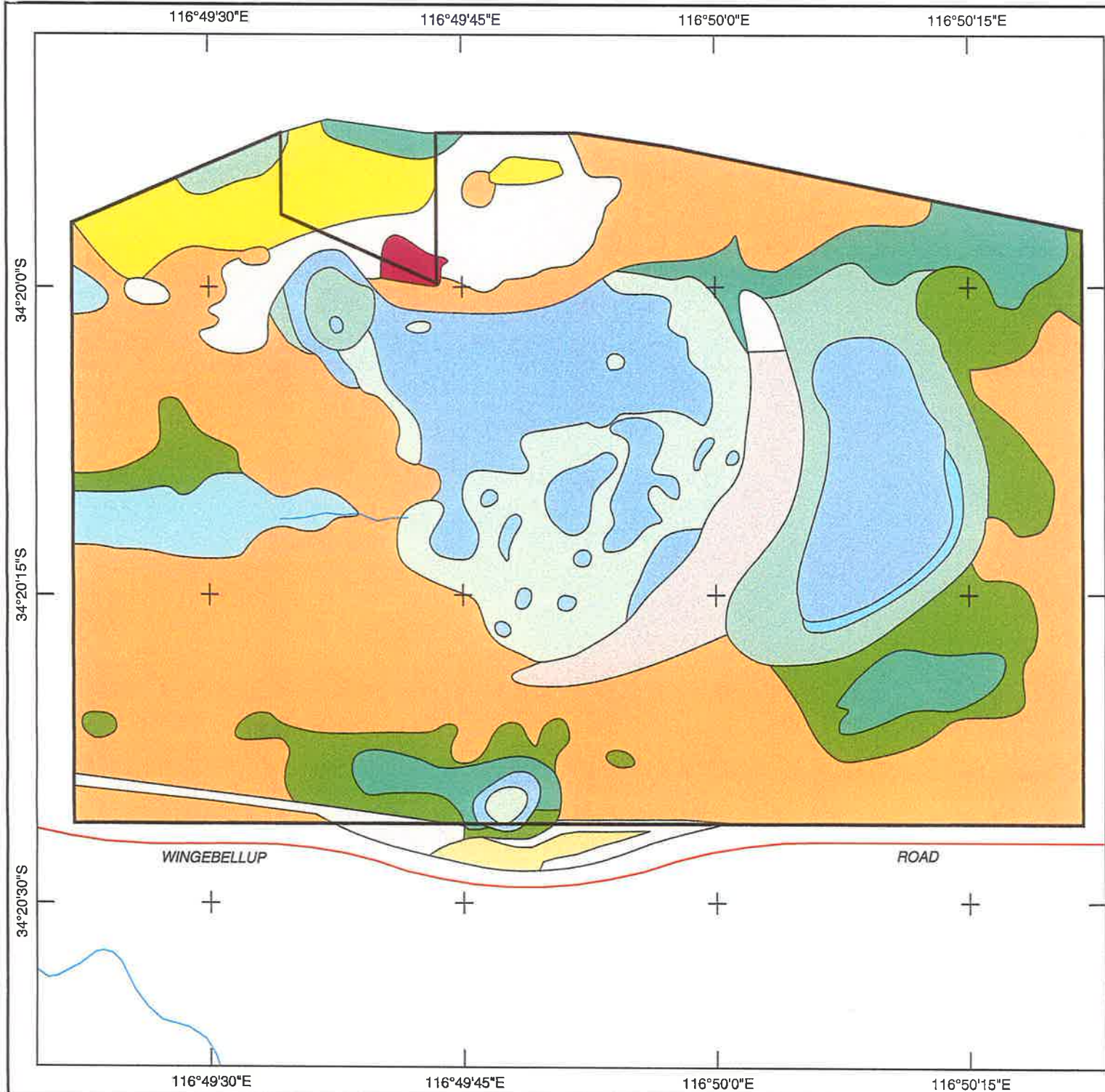
	1	1/2	2	3	4	5/6	6	8	11
<i>Microtis orbicularis</i>					1				
* <i>Monadenia bracteata</i>	1								1
<i>Pterostylis barbata</i>	1								
<i>Pterostylis nana</i>					1				
<i>Pterostylis recurva</i>	1								
<i>Pterostylis vittata</i>	1								
<i>Pyrorchis nigricans</i>	1								
<i>Thelymitra crinita</i>	1								
<i>Thelymitra flexuosa</i>					1				
<i>Thelymitra pauciflora</i>	1								
Orobanchaceae									
* <i>Orobanche minor</i>					1				1
Papilionaceae									
<i>Aotus intermedia</i>					1				
<i>Bossiaea eriocarpa</i>	1								
<i>Bossiaea ornata</i>	1								
<i>Bossiaea praetermissa</i>					1				
<i>Brachysema melanopetalum</i>					1				
<i>Callistachys lanceolata</i>						1			
<i>Daviesia cordata</i>	1								
<i>Daviesia physodes</i>	1								
<i>Daviesia preissii</i>					1				
<i>Eutaxia virgata</i>					1				
<i>Gompholobium marginatum</i>	1								
<i>Gompholobium polymorphum</i>	1								
<i>Gompholobium preissii</i>	1		1						
<i>Gompholobium tomentosum</i>	1								
<i>Hovea chorizemifolia</i>	1								
<i>Hovea trisperma</i> var. <i>grandiflora</i>	1								
<i>Isotropis cuneifolia</i>	1		1						
<i>Jacksonia sparsa</i> MS	1								
<i>Kennedia coccinea</i>			1						
<i>Kennedia prostrata</i>	1		1						
* <i>Lotus angustissimus</i>									1
<i>Oxylobium lineare</i>					1				
<i>Pultenaea ochreatea</i>					1				
<i>Sphaerolobium medium</i>	1								
* <i>Trifolium campestre</i>									1
* <i>Trifolium dubium</i>									1
* <i>Trifolium repens</i>									1
* <i>Trifolium subterraneum</i>									1
Philydraceae									
<i>Philydrella pygmaea</i>					1				
Phormiaceae									
<i>Dianella brevicaulis</i>					1				
<i>Dianella revoluta</i>	1								
<i>Stypandra glauca</i>		1							
Pittosporaceae									
<i>Billardiera candida</i>	1								
<i>Billardiera variifolia</i>			1						
<i>Sollya heterophylla</i>	1		1						
Plantaginaceae									
<i>Plantago debilis</i>	1		1						
Poaceae									
<i>Agrostis avenacea</i>					1	1			
* <i>Aira caryophyllea</i>			1						1
<i>Amphipogon turbinatus</i>	1								
* <i>Anthoxanthum odoratum</i>									1
* <i>Briza maxima</i>					1	1			1
* <i>Briza minor</i>					1				
* <i>Cynodon dactylon</i>									1
<i>Danthonia occidentalis</i>	1								
<i>Deyeuxia quadriseta</i>						1			
<i>Eragrostis elongata</i>	1								
<i>Hemarthria uncinata</i>						1			
* <i>Holcus lanatus</i>						1			1
* <i>Hordeum leporinum</i>									1
* <i>Lolium multiflorum</i>									1
<i>Microlaena stipoides</i>	1								
<i>Poa poiformis</i>	1								
* <i>Stenotaphrum secundatum</i>									1
<i>Stipa pycnostachya</i>	1								

Family**Map Units**

	1	1/2	2	3	4	5/6	6	8	11
Stipa ?trichophylla	1								
Tetarrhena laevis	1								
* Vulpia myuros									1
Polygalaceae									
Comesperma calymega			1						
Comesperma flavum					1				
Comesperma virgatum					1				
Comesperma volubile	1								
Polygonaceae									
Muehlenbeckia adpressa	1								
Persicaria prostrata					1				1
* Rumex acetosella									1
Primulaceae									
* Anagallis arvensis									1
Proteaceae									
Banksia grandis	1								
Banksia littoralis					1	1			
Dryandra lindleyana	1								
Grevillea fasciculata			1						
Hakea ceratophylla					1				
Hakea lissocarpa	1								
Hakea prostrata	1								
Hakea ruscifolia			1						
Hakea sulcata					1				
Hakea trifurcata	1								
Hakea varia					1				
Persoonia longifolia		1							
Petrophile media					1				
Petrophile serruriae	1								
Synaphea petiolaris	1				1				
Ranunculaceae									
Ranunculus colonorum					1	1			
Restionaceae									
Anarthria laevis					1				
Anarthria prolifera	1				1				
Harperia lateriflora	1				1				
Hypolaena exsulca			1						
Lepyrodia muiirii						1			
Lyginia barbata	1								
Meeboldina cana MS					1				
Meeboldina tephrrina MS					1				
Rhamnaceae									
Trymalium ledifolium	1								
Rosaceae									
* Acaena echinata			1						
Rubiaceae									
* Galium murale					1				1
Opercularia apiciflora	1								
Opercularia hispidula	1				1				
Rutaceae									
Boronia megastigma					1				
Boronia ramosa	1				1				
Boronia spathulata	1								
Santalaceae									
Leptomeria squarrolosa	1								
Scrophulariaceae									
* Bartsia trixago					1				
* Parentucellia latifolia	1								
* Parentucellia viscosa					1				
Selaginellaceae									
Selaginella gracillima					1				
Solanaceae									
* Solanum nigrum					1				1
Stackhousiaceae									
Stackhousia monogyna	1								
Tripterococcus brunonis					1				
Stylidiaceae									
Levenhookia pusilla	1				1				
Levenhookia stipitata		1							
Stylidium affine	1								

Family**Map Units**

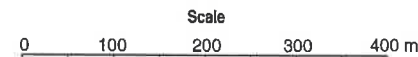
	<i>1</i>	<i>1/2</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5/6</i>	<i>6</i>	<i>8</i>	<i>11</i>
<i>Stylidium assimile</i>					1				
<i>Stylidium brunonianum</i> subsp. <i>minor</i>	1		1						
<i>Stylidium calcaratum</i>	1								
<i>Stylidium ecorne</i>					1				
<i>Stylidium guttatum</i>					1				
<i>Stylidium hispidum</i>	1								
<i>Stylidium junceum</i>	1								
<i>Stylidium repens</i>	1		1						
<i>Stylidium schoenoides</i>	1								
<i>Stylidium spathulatum</i>	1								
Thymelaeaceae									
<i>Pimelea angustifolia</i>	1		1						
<i>Pimelea argentea</i>							1		
<i>Pimelea sylvestris</i>	1								
Tremandraceae									
<i>Platytheca galioides</i>					1				
Typhaceae									
* <i>Typha orientalis</i>						1			
Xanthorrhoeaceae									
<i>Xanthorrhoea preissii</i>		1							
Zamiaceae									
<i>Macrozamia riedlei</i>		1							



Salinity Action Plan Lake Muir-Unicup Recovery Catchment

Bokarup Nature Reserve Res 14739

- 1 Jarrah - Marri forest and woodland on laterite
- 2 Jarrah - Marri open woodland on sand
- 3 Melaleuca preissiana - Banksia littoralis woodland
- 4 Melaleuca preissiana - Eucalyptus rudis woodland
- 5 Melaleuca raphiophylla low forest
- 6 Melaleuca raphiophylla open woodland
- 7 Wet heath
- 8 Baumea sedgeland
- 9 Acacia dealbata thicket
- 10 Revegetation works
- 11 Cleared Areas
- 12 Open water
- Sealed Road
- Minor Intermittent Watercourse



Produced by INFORMATION MANAGEMENT BRANCH, April 1998
DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Job Number: IMB 98017127

Cobertup Nature Reserve

Reserve number: 26681

Class: A

Location: 34 27 23S 116 49 50E;

Land tenure : Nature Reserve

Purpose : Water & Conservation of flora and fauna

Area: 151 ha

Biological values

Flora: Three hundred and seventy taxa were recorded from the reserve (Table 2). These include two priority taxa (*Apodasmia ceramophila* ms (Priority 2) and *Rhodanthe pyrethrum* (Priority 3)).

Vegetation description: Ten vegetation units have been mapped on the reserve (Map 2).

- 1) **Jarrah - Marri forest and woodland** on laterite occupies the higher ground in the north west, north east and south west corners of the reserve. The understorey is diverse in shrub, herbs and grasses. Typical understorey shrubs include *Hibbertia* spp., *Leucopogon* spp. and peas such as *Bossiaea* spp., *Daviesia* spp. and *Gompholobium* spp.
- 2) **Jarrah - Marri open woodland** occupies the dune areas around the major swamps. The understorey is dominated by species such as *Phyllanthus calycinus*, *Allocasuarina humilis*, *Desmodium flexuosus*, *Hypolaena exsulca*, and *Lyginia barbata*, taxa typical of sandy substrates. Yate (*Eucalyptus occidentalis*) was common on ecotone between this unit and the clay flats (vegetation unit 8).
- 3) **Melaleuca preissiana woodland** occurs in the south eastern corner of the reserve. In the wettest areas *Banksia littoralis* is a co-dominant. Common understorey species include *Hakea varia*, *Gonocarpus paniculatus*, and *Hemarthria uncinata*. This area was recently burnt in a hot fire.
- 4) **Eucalyptus decipiens woodland** occurs on the northern boundary of the reserve, common elements in the understorey include *Xanthorrhoea preissii*, *Hypocalymma angustifolium*, and the sedges *Mesomelaena tetragona* and *Tetraria octandra*.
- 5) **Melaleuca raphiophylla woodland** occurs as a band around the major *Baumea* swamps and intergrades into *Melaleuca preissiana* woodland in the south east corner of the reserve. The dominant understorey species is *Lepidosperma longitudinale*.
- 6) **Melaleuca raphiophylla woodland over wet heath** has also recently been burnt but appears similar in species composition to vegetation unit 8 (heathland on clay flats) with an open overstorey of *Melaleuca raphiophylla*.
- 7) **Melaleuca lateritia - Hakea varia heath** has been recently burnt in a hot fire. Most shrubs were killed and are regenerating from seed. *Lepidosperma longitudinale* has resprouted and is the dominated species at this time.
- 8) **Heathland** on clay flats are variously dominated by *Melaleuca viminea*, *Melaleuca densa*, *Kunzea micrantha* and *Astartea* sp. over a very rich and diverse herb layer including taxa such as *Rhodanthe pyrethrum*, *Hyalosperma simplex*, *Caesia micrantha*, *Burchardia congesta*, *Wurmbea dioica*, *Goodenia mimuloides*, and *Tribonanthes* sp Lake Muir, rushes and annual sedges are also prolific in the understorey.
- 9) **Open Baumea sedgeland** occupy the western swamp, this community is very species poor being dominated by *Baumea articulata*. Other sedges occurring in this sedgeland include *Baumea arthropphylla* and *B. juncea*.
- 10) **Closed Baumea sedgeland** occupy the eastern swamp with essentially same species composition as vegetation unit 9, however *Baumea* spp. cover is denser.

Vegetation change: Oblique air photos from April 1980 (Photo 3, 4 & 5 - JAK Lane, unpub data) show that although there has been considerable vegetation clearance in the area around Cobertup Nature Reserve there is no obvious large scale changes to the vegetation.

Disturbance or threats: On the northern boundary where run off from a dam is providing extra nutrients on the clay flat there has been considerable weed invasion. Management of this run off is urgently needed. Further monitoring of the reserve is needed to determine if vegetation communities are stable given the recent nature clearance of the adjoining lands.

Family

Map Units

1 2 3 4 5 5/6 7 7/8 8 10

Table 2 - Cobertup Nature Reserve flora list

Amaranthaceae

Ptilotus drummondii

1

Ptilotus manglesii

1

Anthericaceae

Agrostocrinum scabrum

1

Arthropodium preissii

1

Borya sphaerocephala

1

Caesia micrantha

1

Caesia occidentalis

1

Chamaescilla corymbosa

1

Chamaescilla ?spiralis

1

Johnsonia lupulina

1

Laxmannia sessiliflora

1

Sowerbaea laxiflora

1

Thysanotus manglesianus

1

Thysanotus sparteus

1

Thysanotus tenellus

1

Tricoryne elatior

1

1

Tricoryne humilis

1

Apiaceae

Daucus glochidiatus

1

1

Eryngium pinnatifidum

1

Homalosciadium homalocarpum

1

Hydrocotyle alata

1

Hydrocotyle diantha

1

Hydrocotyle pilifera var. glabrata

1

Hydrocotyle sp.

1

Platysace juncea

1

Schoenolaena tenuior

1

Trachymene pilosa

1

Xanthosia candida

1

Xanthosia huegelii

1

Asteraceae

* Arctotheca calendula

1

Asteridea athrixioides

1

* Cirsium vulgare

1

Cotula coronopifolia

1

Craspedia variabilis

1

1

Hyalosperma simplex

1

* Hypochaeris glabra

1

1

Lagenifera huegelii

1

Millotia myosotidifolia

1

Podolepis gracilis

1

Quinetia urvillei

1

Rhodanthe pyrethrum

1

Rutidosia multiflora

1

Senecio glomeratus

1

1

Senecio minimus

1

1

Siloxerus humifusus

1

* Sonchus asper

1

* Sonchus oleraceus

1

Trichocline spathulata

1

* Ursinia anthemoides

1

* Vellereophyton dealbatum

1

Waitzia nitida

1

Waitzia suaveolens

1

Campanulaceae

Wahlenbergia gracilentia

1

Wahlenbergia preissii

1

Caryophyllaceae

* Petrorhagia velutina

1

Casuarinaceae

Allocasuarina humilis

1

Allocasuarina lehmanniana

1

1

Centrolepidaceae

Aphelia cyperoides

1

1

Brizula drummondii

1

Centrolepis aristata

1

Centrolepis drummondiana

1

Centrolepis glabra

1

Colchicaceae

Burchardia congesta

1

Burchardia monantha

1

Family

Map Units

[illegible]

Family**Map Units**

	1	2	3	4	5	5/6	7	7/8	8	10
Geranium solanderi		1								
Pelargonium littorale		1								
Goodeniaceae										
Anthotium humile									1	
Dampiera alata		1								
Dampiera linearis		1								
Dampiera trigona						1				
Goodenia micrantha									1	
Goodenia mimuloides									1	
Goodenia pulchella									1	
Lechenaultia formosa	1									
Scaevola phlebopetala		1								
Velleia trinervis									1	
Haemodoraceae										
Anigozanthos bicolor		1							1	
Anigozanthos flavidus						1				
Anigozanthos manglesii		1								
Conostylis aculeata		1								
Conostylis setigera		1					1			
Haemodorum laxum							1			
Haemodorum simplex							1			
Haemodorum sparsiflorum		1								
Haemodorum spicatum	1	1								
Tribonanthes australis		1								
Tribonanthes longipetala		1								
Tribonanthes sp Lake Muir									1	
Tribonanthes violacea		1								
Haloragaceae										
Glischrocaryon aureum	1									
Gonocarpus paniculatus			1							
Haloragis brownii						1				
Myriophyllum crispatum					1					
Myriophyllum limnophilum									1	
Hydatellaceae										
Hydatella sp									1	
Trithuria submersa									1	
Hypoxidaceae										
Hypoxis occidentalis									1	
Iridaceae										
Patersonia juncea		1								
Patersonia occidentalis		1								
Patersonia occidentalis (swamp form)									1	
Isoetaceae										
Isoetes drummondii									1	
Juncaceae										
* Juncus articulatus									1	
* Juncus bufonius		1				1				
* Juncus capitatus		1								
Juncus pallidus						1				
Juncus planifolius					1					
Juncaginaceae										
Triglochin huegelii						1				
Triglochin sp.						1				
Lauraceae										
Cassytha glabella						1				
Cassytha racemosa						1				
Lentibulariaceae										
Polypompholyx multifida									1	
Utricularia hookeri									1	
Lindsaeaceae										
Lindsaea linearis		1								
Lobeliaceae										
Grammatotheca bergiana					1	1				
Isotoma hypocrateriformis	1								1	
Lobelia alata						1				
Lobelia heterophylla		1					1			
Lobelia rhombifolia		1								
Loganiaceae										
Logania campanulata		1								
Logania serpyllifolia	1									
Phyllangium paradoxum	1									
Lythraceae										
* Lythrum hyssopifolia									1	
Menyanthaceae										
Villarsia albiflora						1				

Family**Map Units**

	1	2	3	4	5	5/6	7	7/8	8	10
Villarsia parnassifolia						1				
Mimosaceae										
Acacia alata		1								
Acacia extensa		1								
Acacia huegelii		1								
Acacia incurva								1		
Acacia myrtifolia		1				1				
Acacia nervosa	1									
Acacia pulchella	1									
Acacia saligna		1							1	
Acacia stenoptera		1								
Myoporaceae										
Myoporum caprarioides						1				
Myrtaceae										
Astartea fascicularis						1				
Astartea sp. (pink weeping)									1	
Baekkea camphorosmae	1									
Calothamnus lateralis									1	
Calytrix angulata		1								
Eucalyptus calophylla		1								
Eucalyptus decipiens				1						
Eucalyptus marginata		1								
Eucalyptus occidentalis		1								
Eucalyptus patens		1								
Eucalyptus rudis		1								
Hypocalymma angustifolium		1							1	
Kunzea ericifolia		1								
Kunzea micrantha									1	
Melaleuca densa									1	
Melaleuca lateritia							1			
Melaleuca leptoclada									1	
Melaleuca preissiana			1							
Melaleuca raphiophylla						1				
Melaleuca spathulata									1	
Melaleuca viminea		1								
Pericalymma ellipticum									1	
Verticordia densiflora								1		
Verticordia habrantha								1		
Olacaceae										
Olax benthamiana		1								
Onagraceae										
Epilobium billardierianum						1				
Epilobium hirtigerum						1				
Orchidaceae										
Caladenia flava		1								
Caladenia longicauda		1								
Caladenia radiata		1								
Caladenia reptans		1								
Diuris laxiflora									1	
Diuris longifolia		1								
Elythranthera brunonis		1								
Elythranthera emarginata									1	
Eriochilus dilatatus		1								
Microtis atrata							1			
Microtis media						1				
Microtis orbicularis									1	
* Monadenia bracteata		1							1	
Prasophyllum macrostachyum									1	
Pterostylis nana		1								
Pterostylis recurva		1								
Pterostylis vittata		1								
Thelymitra crinita		1								
Thelymitra flexuosa									1	
Orobanchaceae										
* Orobanche minor		1								
Oxalidaceae										
Oxalis perennans		1								
Papilionaceae										
Bossiaea eriocarpa		1								
Bossiaea linophylla	1									
Bossiaea ornata	1									
Brachysema praemorsum		1								
Callistachys lanceolata						1				
Chorizema nanum						1				
Daviesia ?incrassata		1								

Family

Map Units

	1	2	3	4	5	5/6	7	7/8	8	10
Daviesia preissii										1
Eutaxia virgata						1				
Gompholobium knightianum			1							
Gompholobium marginatum			1							
Gompholobium polymorphum			1							
Gompholobium preissii	1									
Gompholobium tomentosum			1							
Goodia lotifolia				1						
Hovea chorizemifolia	1	1								
Hovea trisperma	1	1								
Isotropis cuneifolia	1	1								
Jacksonia furcellata			1							
Kennedia coccinea			1							
Kennedia prostrata			1							
* Lotus angustissimus						1				
Oxylobium lineare						1				
Sphaerolobium linophyllum										1
Sphaerolobium medium			1							
Sphaerolobium ?vimineum						1				
Viminaria juncea							1			
Philydraceae										
Philydrella drummondii										1
Philydrella pygmaea			1							
Phormiaceae										
Dianella brevicaulis			1		1					
Dianella revoluta			1							
Stypantra glauca			1					1		
Pittosporaceae										
Sollya heterophylla						1				
Poaceae										
Agrostis avenacea										1
Amphibromus nervosus								1		
Amphipogon ?debilis										1
Amphipogon turbinatus	1									
* Briza minor						1				
Danthonia caespitosa			1							1
Deyeuxia quadriseta			1	1						
Eragrostis ?brownii										1
Hemarthria uncinata				1						
* Lolium multiflorum						1				
Microlaena stipoides			1							
Neurachne alopecuroidea			1							
* Poa annua						1				
Poa drummondiana			1							
Poa poiformis						1				
* Polypogon monspeliensis						1				1
Stipa compressa			1							
Stipa ?pycnostachya			1							
Stipa trichophylla	1									
Tetrarrhena laevis			1							
* Vulpia myuros						1				
Polygalaceae										
Comesperma calymega			1							
Comesperma virgatum			1							
Comesperma volubile			1							
Polygonaceae										
Muehlenbeckia adpressa					1					
Persicaria prostrata										1
Portulacaceae										
Calandrinia ?composita										1
Calandrinia granulifera			1							
Primulaceae										
* Anagallis arvensis			1							
Samolus junceus			1							
Proteaceae										
Banksia littoralis				1		1				
Dryandra armata	1									
Dryandra lindleyana			1							
Grevillea fasciculata			1					1		
Hakea ceratophylla										1
Hakea lissocarpa	1									
Hakea prostrata	1									
Hakea sulcata										1
Hakea varia				1						1
Persoonia longifolia	1									

Family**Map Units**

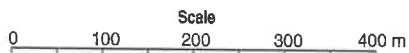
	1	2	3	4	5	5/6	7	7/8	8	10
Synaphea petiolaris									1	
Ranunculaceae										
Clematis pubescens		1								
Ranunculus colonorum		1				1				
Restionaceae										
Anarthria prolifera		1								
Apodasmia ceramophila MS									1	
Chordifex sp.							1			
Desmocladius fasciculatus MS		1								
Desmocladius flexuosus MS		1								
Harperia lateriflora		1					1			
Hypolaena exsulca		1								
Lyginia barbata		1								
Meeboldina cana MS									1	
Rhamnaceae										
Trymalium ledifolium		1								
Rosaceae										
* Acaena echinata	1									
Rubiaceae										
* Galium divaricatum		1								
Opercularia hispidula		1								
Opercularia vaginata		1								
Rutaceae										
Boronia juncea subsp. ?laniflora									1	
Boronia megastigma						1				
Boronia spathulata		1								
Santalaceae										
Leptomeria squarulosa					1					
Scrophulariaceae										
Gratiola peruviana						1				
Gratiola pedunculata			1							
* Parentucellia latifolia		1								
* Parentucellia viscosa							1			
Selaginellaceae										
Selaginella gracillima									1	
Solanaceae										
* Solanum nigrum		1				1				
Stackhousiaceae										
Stackhousia monogyna		1								
Tripterococcus brunonis		1							1	
Stylidiaceae										
Levenhookia pusilla		1								
Levenhookia stipitata		1								
Stylidium brunonianum subsp. minor		1								
Stylidium caespitosum									1	
Stylidium calcaratum	1	1								
Stylidium crassifolium		1							1	
Stylidium guttatum		1								
Stylidium inundatum									1	
Stylidium perpusillum									1	
Stylidium pulchellum									1	
Stylidium sp. scps							1			
Stylidium spathulatum		1					1			
Thymelaeaceae										
Pimelea angustifolia		1								
Pimelea ?rosea		1								
Pimelea suaveolens		1								
Tremandraceae										
Platytheca galioides		1								
Tetratheca sp wheat		1								
Typhaceae										
* Typha orientalis						1				
Violaceae										
Hybanthus floribundus	1									
Xanthorrhoeaceae										
Xanthorrhoea gracilis		1								
Xanthorrhoea preissii				1						
Zamiaceae										
Macrozamia riedlei		1								

Salinity Action Plan Lake Muir-Unicup Recovery Catchment

**Cobertup Nature Reserve (Unofficial)
Res 26681**

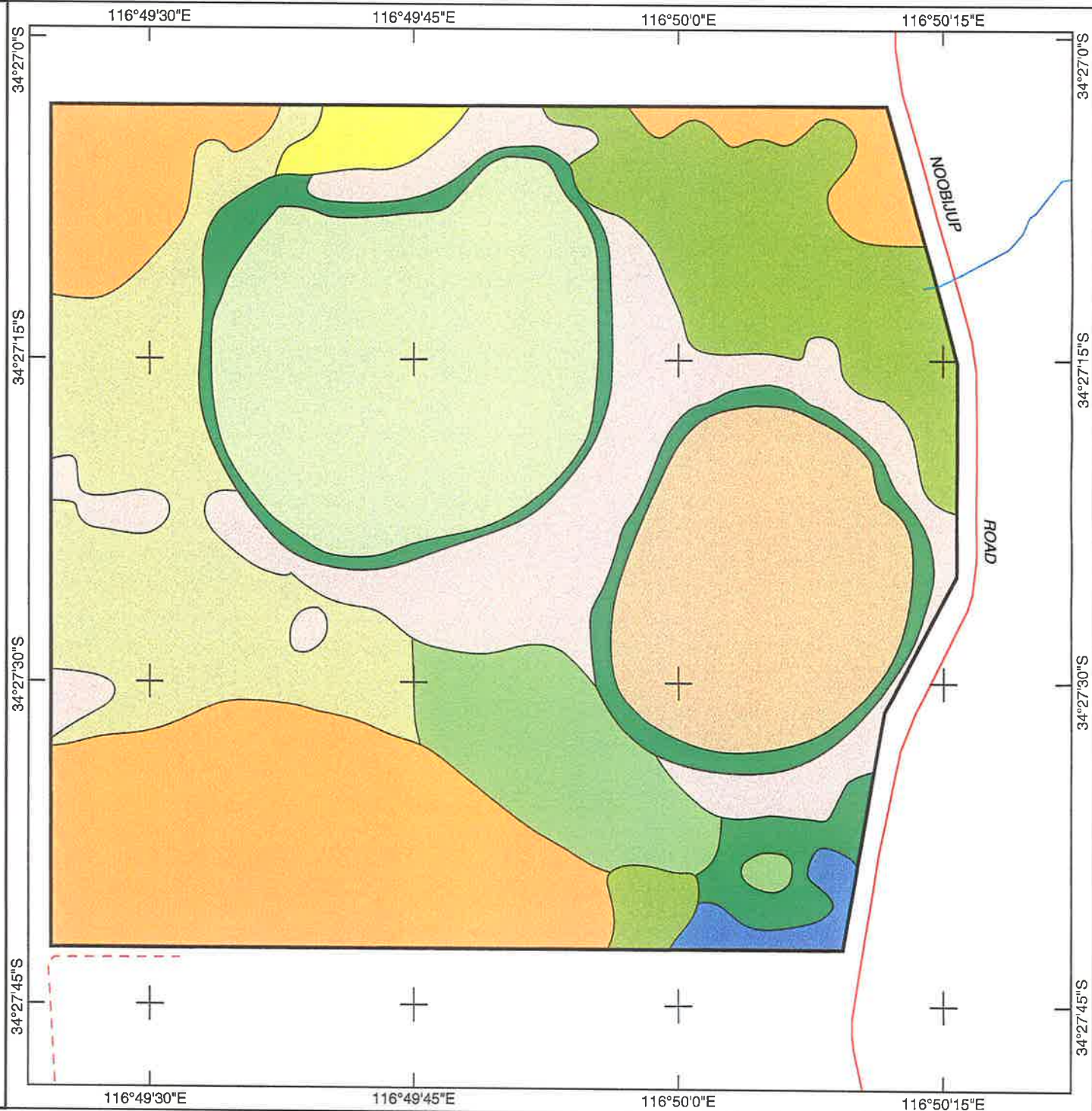
- 1 Jarrah - Marri forest and woodland on laterite
- 2 Jarrah - Marri open woodland on sand
- 3 Melaleuca preissiana woodland
- 4 Eucalyptus decipiens woodland
- 5 Melaleuca raphiophylla woodland
- 6 Melaleuca raphiophylla woodland over wet heath
- 7 Melaleuca lateritia - Hakea varia heath
- 8 Heathland on clay flats
- 9 Open Baumea sedgeland
- 10 Closed Baumea sedgeland

- Sealed Road
- - - Vehicular Track
- Minor Intermittent Watercourse



Produced by INFORMATION MANAGEMENT BRANCH, April 1998
DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Job Number: IMB 98017127



Cowerup Nature Reserve

Reserve number: 33455

Class: C

Location: 34 25 48S 116 25 00E;

Land tenure : Nature Reserve

Purpose : Conservation of flora and fauna

Area: 270 ha

Biological values

Flora: One hundred and eighty five taxa have been recorded for the reserve (Table 3). This is likely to seriously underestimate the total flora since only minimal sampling was undertaken when the annuals were conspicuous. Four priority taxa were found (*Rhodanthe pyrethrum* (Priority 3), *Schoenus benthamii* (Priority 3), *Schoenus natans* (Priority 4), and *Villarsia submersa* (Priority 4)).

Vegetation description: Cowerup Nature Reserve adjoins the northern boundary of Lake Muir Nature Reserve. Consequently both reserves were mapped using the same vegetation units. Of the 30 units that occurred in Lake Muir Nature Reserve, eight were found in Cowerup Nature Reserve, one unit was too small to map (Map 5).

- 1) **Jarrah - Marri forest and woodland** on laterite and lateritic gravels occurred as small flat ridges in the sandy Jarrah - Marri woodlands and could not be distinguished from them on aerial photography. They occurred on the predominantly on the eastern boundary of the reserve. The understorey is typically diverse in shrub, herbs and grasses. Typical understorey shrubs include *Hibbertia* spp., *Leucopogon* spp. and peas such as *Bossiaea* spp., *Daviesia* spp. and *Gompholobium* spp.
- 2) **Jarrah - Marri open woodland** on sandy soils occurs widely in the eastern half of the reserve, common understorey storey species include *Hibbertia racemosa*, *Astroloma baxteri*, *Leucopogon* spp., *Phyllanthus calycinus*, *Acacia pulchella*, *Jacksonia furcellata*. On wetter sites this community is replaced by Jarrah - Marri woodland over *Agonis* scrub (unit 3).
- 3) **Jarrah - Marri woodland over Agonis scrub** occurs along on seasonally wet flats, on slight sandy rises *Banksia ilicifolia* often becomes the dominant canopy species. Understorey development depends on density of the *Agonis* layer.
- 12) **Melaleuca cuticularis woodland over wet heath** forms a distinct unit in the south western corner of the reserve. The substrate is generally clayey and this unit is has a very rich and diverse annual herb layer. The Asteraceae, Centrolepidaceae, Cyperaceae, Orchidaceae, Stylidiaceae are well represented. Common perennial taxa include *Melaleuca* spp., *Kunzea micrantha* and the rushes *Apodasmia ceramophila*, *Meeboldina coangustata*, and *Meeboldina cana*.
- 14) **Melaleuca preissiana woodland over wet heath** occurs extensively along the wet drainage lines Understorey is variable in the wettest sites is generally dominated by *Pericalymma ellipticum*. On drier sites understorey is diverse with peas and Myrtaceae dominating. In the western side of the reserve *Banksia littoralis* takes over as the canopy dominant.
- 15) **Melaleuca raphiophylla forest** forms dense stands around the deepest wetland and in the wettest parts of the flats. The understorey is generally dominated by *Lepidosperma* spp. and *Baumea* spp. but where the canopy is more open a variety of shrubs such as *Hypocalymma angustifolium*, *Pericalymma ellipticum*, *Callistachys lanceolata*, *Banksia littoralis*, *Hakea sulcata* become common..
- 17) **Melaleuca densa - Melaleuca viminea heath** occupy drainage lines with sandy clay substrates. These areas are winter wet and dry slowly in late spring and early summer. In the Lake Muir reserve this type flat was characterised by aquatic taxa such as *Schoenus natans* and *Villarsia* spp. early in spring giving way to diverse herblands as the wetlands dry.
- 24) **Closed Baumea sedgeland** occupy basin wetlands, *Baumea articulata* is the dominate sedge over most of the wetland, while toward the edge *B. juncea* and *B. vaginalis* co-dominate.

Vegetation change: No photos were taken of this reserve in 1980.

Disturbance or threats: The land to the west of the reserve has been cleared for sometime. Aerial photography indicates this may have resulted in increased inundation in the wetlands on the western boundary. Recently a new fence and bund has been constructed along this property line. There has been some recent clearance on the south eastern boundary.

Family**Map Units**

1 2 3 12 14 15 17 24

Table 3 - Cowerup Nature Reserve flora list**Anthericaceae**

Johnsonia acaulis

1

Apiaceae

Actinotus omnifertilis

1

Schoenolaena tenuior

1

Trachymene pilosa

1

Xanthosia huegelii

1

Asteraceae

Craspedia sp.

1

* Hypochaeris glabra

1

Podolepis gracilis

1

Rhodanthe pyrethrum

1

Senecio glomeratus

1

Siloxerus humifusus

1

Waitzia suaveolens

1

Casuarinaceae

Allocasuarina humilis

1

Centrolepidaceae

Brizula drummondii

1

Centrolepis aristata

1

Centrolepis drummondiana

1

Centrolepis glabra

1

Colchicaceae

Burchardia congesta

1

Burchardia monantha

1

Wurmbea dioica

1

Cupressaceae

Actinostrobus pyramidalis

1

Cyperaceae

Baumea articulata

1

Baumea juncea

1

Baumea vaginalis

1

Cyathochaeta avenacea

1

Gahnia trifida

1

Isolepis cernua

1

Isolepis stellata

1

Lepidosperma angustatum

1

Lepidosperma longitudinale

1

Mesomelaena tetragona

1

Schoenus benthamii

1

Schoenus efoliatus

1

Schoenus maschalinus

1

Schoenus natans

1

Schoenus tenellus

1

Tetraria octandra

1

Tricostularia neesii var. elatior

1

Dasypogonaceae

Dasypogon bromeliifolius

1

Lomandra purpurea

1

Lomandra sericea

1

Dennstaedtiaceae

Pteridium esculentum

1

Dilleniaceae

Hibbertia commutata

1

Hibbertia cunninghamii

1

Hibbertia racemosa

1

Hibbertia stellaris

1

Epacridaceae

Astroloma baxteri

1

Astroloma ciliatum

1

Leucopogon australis

1

Leucopogon glabellus

1

Leucopogon pendulus

1

Leucopogon propinquus

1

Lysinema ciliatum

1

Euphorbiaceae

Amperea volubilis

1

Monotaxis occidentalis

1

Gentianaceae

Centaurium spicatum

1

Goodeniaceae

Dampiera linearis

1

Family**Map Units**

1 2 3 12 14 15 17 24

Goodenia claytoniacea				1				
Goodenia pulchella				1				
Scaevola phlebopetala			1					
Haemodoraceae								
Conostylis aculeata		1						
Haloragaceae								
Gonocarpus hexandrus subsp.				1				
Gonocarpus paniculatus				1				
Myriophyllum ?limnophilum						1		
Iridaceae								
Patersonia occidentalis			1					
Patersonia occidentalis (swamp form)			1					
Juncaginaceae								
Triglochin huegelii						1		
Lamiaceae								
Hemiandra pungens			1					
Lauraceae								
Cassytha glabella				1				
Cassytha racemosa							1	
Lentibulariaceae								
Polypompholyx multifida				1			1	
Utricularia hookeri				1			1	
Utricularia violacea				1			1	
Lobeliaceae								
Lobelia alata						1		
Loganiaceae								
Phyllangium paradoxum			1					
Loranthaceae								
Nuytsia floribunda			1					
Menyanthaceae								
Villarsia albiflora					1			
Villarsia submersa				1			1	
Mimosaceae								
Acacia extensa			1					
Acacia myrtifolia	1							
Acacia saligna					1			
Acacia stenoptera					1			
Myrtaceae								
Actinodium cunninghamii			1					
Agonis parviceps			1					
Astartea sp. (pink weeping)			1					
Astartea sp. (white erect)			1					
Baeckea camphorosmae	1							
Calothamnus hirsutus			1					
Calothamnus lateralis			1		1			
Calytrix angulata			1					
Eucalyptus calophylla		1						
Eucalyptus decipiens		1						
Eucalyptus marginata		1	1					
Eucalyptus rudis					1			
Hypocalymma angustifolium		1						
Kunzea ericifolia		1			1			
Kunzea micrantha							1	
Melaleuca cordata					1			
Melaleuca cuticularis				1	1		1	
Melaleuca densa		1					1	
Melaleuca lateritia							1	
Melaleuca preissiana		1			1			
Melaleuca raphiophylla						1		
Melaleuca spathulata							1	
Melaleuca thymoides		1	1					
Melaleuca viminea		1		1	1		1	
Melaleuca violacea					1			
Pericalymma ellipticum		1	1					
Verticordia densiflora			1					
Olacaceae								
Olax phyllanthi					1			
Orchidaceae								
Caladenia flava		1						
Caladenia reptans				1			1	
Elythranthera brunonis		1						
Microtis atrata						1		
Microtis orbicularis						1		
Pterostylis nana		1						

Family**Map Units**

	1	2	3	12	14	15	17	24
<i>Pterostylis vittata</i>		1						
<i>Thelymitra pauciflora</i>		1						
Papilionaceae								
<i>Aotus intermedia</i>			1					
<i>Bossiaea linophylla</i>		1						
<i>Bossiaea rufa</i>			1	1				
<i>Brachysema melanopetalum</i>							1	
<i>Callistachys lanceolata</i>				1				
<i>Daviesia physodes</i>				1				
<i>Gompholobium capitatum</i>			1					
<i>Jacksonia furcellata</i>			1					
<i>Kennedia prostrata</i>	1							
<i>Pultenaea ochreatea</i>			1	1				
<i>Pultenaea reticulata</i>							1	
<i>Viminaria juncea</i>				1				
Phormiaceae								
<i>Dianella revoluta</i>				1				
Pittosporaceae								
<i>Billardiera candida</i>	1							
<i>Sollya heterophylla</i>				1				
Poaceae								
* <i>Aira caryophyllea</i>	1							
<i>Amphipogon laguroides</i>				1				
<i>Danthonia occidentalis</i>				1				
<i>Danthonia</i> sp.	1							
<i>Stipa compressa</i>			1					
<i>Stipa pycnostachya</i>	1							
* <i>Vulpia myuros</i>			1					
Polygalaceae								
<i>Comesperma calymega</i>			1					
<i>Comesperma flavum</i>				1				
<i>Comesperma volubile</i>				1				
Primulaceae								
<i>Samolus caespitosus</i>							1	
Proteaceae								
<i>Adenanthos obovatus</i>			1					
<i>Banksia grandis</i>		1	1					
<i>Banksia ilicifolia</i>			1					
<i>Banksia littoralis</i>		1		1			1	
<i>Dryandra lindleyana</i>		1						
<i>Hakea ceratophylla</i>		1		1				
<i>Hakea lissocarpa</i>	1							
<i>Hakea prostrata</i>		1						
<i>Hakea ruscifolia</i>	1							
<i>Hakea sulcata</i>		1						
<i>Hakea trifurcata</i>		1						
<i>Hakea undulata</i>	1							
<i>Hakea varia</i>							1	
<i>Persoonia longifolia</i>		1		1				
<i>Synaphea petiolaris</i>		1						
Restionaceae								
<i>Anarthria laevis</i>			1	1				
<i>Anarthria prolifera</i>			1					
<i>Anarthria scabra</i>			1	1				
<i>Desmocladus fasciculatus</i> MS		1	1					
<i>Hypolaena exsulca</i>			1					
<i>Lepyrodia muirii</i>							1	
<i>Lyginia barbata</i>			1					
<i>Meeboldina cana</i> MS				1				
<i>Meeboldina coangustata</i> MS							1	
<i>Meeboldina denmarkica</i>				1			1	
<i>Meeboldina scariosa</i> MS				1				
<i>Tremulina tremula</i> MS			1	1				
Rubiaceae								
<i>Opercularia hispidula</i>	1							
Rutaceae								
<i>Boronia juncea</i> subsp. <i>laniflora</i> MS			1					
<i>Boronia megastigma</i>				1				
<i>Boronia spathulata</i>			1					
Santalaceae								
<i>Leptomeria spinosa</i>				1				
<i>Leptomeria squarrolosa</i>	1							
Selaginellaceae								
<i>Selaginella gracillima</i>				1			1	

Family**Map Units**

	1	2	3	12	14	15	17	24
Stylidiaceae								
Levenhookia pusilla			1					
Levenhookia stipitata			1					
Stylidium repens			1					
Stylidium scandens			1					
Tremandraceae								
Platytheca galioides					1			
Xanthorrhoeaceae								
Xanthorrhoea preissii		1	1					
Zamiaceae								
Macrozamia riedlei	1							

Galamup Nature Reserve

Reserve number: 6549

Class: A

Location: 34 26 35S 116 46 10E;

Land tenure : Nature Reserve

Purpose : Conservation of flora and fauna

Area: 222 ha

Biological values

Flora: Two hundred and ninety one taxa and one hybrid have been recorded for the reserve (Table 4). Eight priority taxa were found (*Caladenia starteorum* ms (Priority 2), *Cryptandra arbutiflora* subsp. *minor* (Priority 1), *Leucopogon lasiophyllus* (Priority 2), *Leucopogon tamariscinus* (Priority 2), *Pterostylis turfosa* (Priority 1), *Schoenus benthamii* (Priority 3), *Schoenus loliaceus* (Priority 2), *Stylidium mimeticum* (Priority 3)). While the hybrid *Caladenia starteorum* x *splendens* was recorded only one of the presumed parent was seen.

Vegetation description: Fourteen vegetation units were mapped on the reserve (Map 3).

- 1) **Jarrah - Marri forest and woodland** is the dominant vegetation unit of the reserve, including a mixture of both sandy and lateritic substrates. The gentle topography did not allow different substrates to be mapped. The understorey was diverse and predominantly shrubby.
- 2) **Jarrah - Marri open woodland** on sandy soils in the central part of the reserve had understorey species typical of damplands. The most common of these included *Hypocalymma angustifolium*, *Kunzea micrantha*, *Pericalymma ellipticum*, *Viminaria juncea*, sedge and rushes were also common.
- 3) **Jarrah - Marri open woodland over wet heath** occurred along a drainage line on the north eastern side of the reserve, with an understorey of scattered *Melaleuca preissiana* and a dense ground layer of *Pericalymma ellipticum* and/or *Agonis parviceps* and sedges such as *Lyginia barbata*. It also occurs in the centre of the reserve where the *Agonis* forms a dense thicket.
- 4) ***Eucalyptus decipiens* woodland** occurs in the south eastern corner of the reserve and grades into vegetation unit 11 (heathland on clay flats). The woodland is extremely species rich with high diversity in shrubs and herbs. Seven species of *Stylidium* were recorded.
- 5) ***Melaleuca raphiophylla* - *Banksia littoralis* woodland** occurs around the edge of Galamup Swamp. This unit is inundated during the winter and early spring.
- 6) ***Melaleuca lateritia* heath** occurs in a small basin wetland in the centre of the reserve. Taxa such as *Baumea articulata* and *Lepidosperma longitudinale* co-occur with *M. lateritia* and as the wetland dries diverse annual herbland develops.
- 7) ***Pericalymma elliptica* - *Lepidosperma longitudinale* heath** dominates another small basin wetland in the centre of the reserve. This wetland has much lower species richness than vegetation unit 6. *Schoenus loliaceus* was recorded from this wetland. A few scattered *Banksia littoralis* are also found but most have been killed by fire.
- 8) ***Hakea prostrata* heath** occurs as a series narrow bands within the Jarrah - Marri woodland (vegetation unit 1) and appear to represent minor drainage features. Shrubs associated with damplands are typical of this unit as well sedges and annual herbs.
- 9) ***Baumea* sedgeland** dominates most of Galamup Swamp. *Baumea articulata* is dominant while toward the edge of the wetland *B. juncea* and *B. vaginalis* also occur. In the narrow transition zone between the swamp vegetation and the *Melaleuca raphiophylla* - *Banksia littoralis* woodland an unusual herb-sedgeland dominated by *Drosera glanduligera*, *Poranthera microphylla*, *B. juncea* and *Villarsia albiflora* was found.
- 10) ***Agonis* heath and scrub** occurred along a sandy drainage line in the northern part of the reserve. *Melaleuca thymoides* is a common element of this community.
- 11) **Wet heath** on clay flats occurs in the southern corner of the reserve. In terms of species composition it is very similar to vegetation unit 4 (*Eucalyptus decipiens* woodland) without the overstorey element.

- 12) **Wet heath** on sandy substrate occurs in the very centre of the reserve. This heath had a similar species composition to vegetation unit 3 (Jarrah - Marri woodland over wet heath) without the overstorey element.
- 13) **Disturbed areas** on the south western and north western sides have been used for gravel extraction while the area on the north eastern boundary is a wet flat degrading as a result of nutrient rich runoff from a dam across the fence line.
- 14) **Open water** occurs in the centre of Galamup Swamp.

Vegetation change: Oblique air photos from February and April 1980 (Photos 6, 7 & 8 - JAK Lane, unpub data) show a more dense *Baumea* sedgeland in Galamup Swamp. No obvious cause is apparent for this change.

Disturbance or threats: The changes to Galamup Swamp are of concern, as is the wet heath degradation on the north eastern boundary which is becoming badly weed invaded as a result of nutrient rich run off from a dam on private property. Further degradation of the wet heath can be expected unless this nutrient run off is controlled.

Family

Map Units

1/2 2 4/11 5 7 8 9 11 12 14

Table 4 - Galamup Nature Reserve flora list

Amaranthaceae										
Ptilotus manglesii			1							
Anthericaceae										
Agrostocrinum scabrum	1									
Borya scirpoidea			1							
Caesia micrantha	1						1			
Caesia occidentalis	1						1			
Chamaescilla corymbosa	1						1			
Johnsonia acaulis			1							
Johnsonia lupulina	1									
Sowerbaea laxiflora	1									
Thysanotus manglesianus	1									
Thysanotus tenellus	1									
Tricoryne humilis	1									
Tricoryne tenella			1							
Apiaceae										
Centella cordifolia		1								
Homalosciadium homalocarpum	1			1						
Hydrocotyle alata		1					1			
Hydrocotyle pilifera var. glabrata	1						1			
Platysace ?juncea		1								
Schoenolaena tenuior		1								
Trachymene pilosa	1		1							
Xanthosia candida	1									
Xanthosia huegelii	1									
Asteraceae										
Brachyscome iberidifolia	1						1			
Craspedia variabilis			1							
Euchiton gymnocephalus		1								
Hyalosperma cotula	1									
* Hypochaeris glabra				1						1
Lagenifera huegelii	1									
Millotia tenuifolia	1		1							
Podolepis gracilis		1					1			
Pterochaeta paniculata		1								
Quinetia urvillei	1									
Senecio glomeratus	1	1								
Senecio minimus	1									
Siloxerus humifusus							1			
* Sonchus asper		1								
* Sonchus oleraceus		1								
Waitzia suaveolens	1									
Campanulaceae										
Wahlenbergia multicaulis	1	1								
Wahlenbergia preissii		1	1							
Casuarinaceae										
Allocasuarina humilis	1		1							
Allocasuarina microstachya			1							
Centrolepidaceae										
Aphelia cyperoides									1	
Centrolepis aristata			1				1			
Centrolepis glabra			1				1			
Colchicaceae										
Burchardia congesta	1									
Burchardia monantha			1							
Burchardia multiflora							1			
Cyperaceae										
Baumea arthropphylla						1				
Baumea articulata									1	
Baumea juncea		1							1	
Baumea vaginalis									1	
Cyathochaeta avenacea	1	1					1			
* Cyperus tenellus						1				
Lepidosperma ?gracile							1			
Lepidosperma longitudinale		1							1	
Lepidosperma squamatum	1									
Lepidosperma tenue	1									
Mesomelaena stygia			1							
Mesomelaena tetragona	1	1					1			
Schoenus benthamii			1							
Schoenus bifidus							1			
Schoenus curvifolius	1	1								

Family

Map Units

1/2 2 4/11 5 7 8 9 11 12 14

Family	Genus	Species	Number of species	Number of genera	Number of families
Schoenaceae	<i>Schoenus ?humilis</i>		1		
	<i>Schoenus ?oliaceus</i>		1		
	<i>Schoenus odontocarpus</i>			1	
	<i>Schoenus sp.</i>	1			
	<i>Schoenus subbulbosus</i>	1			
	<i>Schoenus unispiculatus</i>		1		
	<i>Tetraria capillaris</i>	1			
	<i>Tetraria octandra</i>	1	1		
Dasypogonaceae					
<i>Chamaexeros serra</i>		1			
<i>Dasypogon bromeliifolius</i>	1	1			
<i>Lomandra collina</i>	1		1		
<i>Lomandra sericea</i>	1				
<i>Lomandra suaveolens</i>		1			
Dennstaedtiaceae					
<i>Pteridium esculentum</i>		1			
Dilleniaceae					
<i>Hibbertia acerosa</i>	1				
<i>Hibbertia ?amplexicaulis</i>	1				
<i>Hibbertia commutata</i>	1				
<i>Hibbertia microphylla</i>	1				
<i>Hibbertia racemosa</i>	1				
<i>Hibbertia stellaris</i>		1			
Droseraceae					
<i>Drosera bulbosa</i>	1			1	
<i>Drosera erythrorhiza</i>	1				1
<i>Drosera gigantea</i>		1		1	
<i>Drosera glanduligera</i>		1			1
<i>Drosera heterophylla</i>					1
<i>Drosera menziesii</i>	1	1			
<i>Drosera pallida</i>	1				
<i>Drosera rosulata</i>			1		
<i>Drosera stolonifera</i>	1				
Epacridaceae					
<i>Andersonia ?caerulea</i>		1			
<i>Astroloma microcalyx</i>	1				
<i>Astroloma pallidum</i>	1				
<i>Leucopogon australis</i>	1	1			
<i>Leucopogon capitellatus</i>	1				
<i>Leucopogon lasiophyllus</i>		1			
<i>Leucopogon parviflorus</i>	1				
<i>Leucopogon ?pendulus</i>	1	1			
<i>Leucopogon propinquus</i>	1				
<i>Leucopogon tamariscinus</i>	1				
<i>Leucopogon verticillatus</i>	1				
<i>Lysinema ciliatum</i>	1				
<i>Sphenotoma gracile</i>					1
Euphorbiaceae					
<i>Monotaxis occidentalis</i>	1				
<i>Phyllanthus calycinus</i>	1	1			
<i>Poranthera microphylla</i>	1			1	
Geraniaceae					
<i>Pelargonium littorale</i>		1			
Goodeniaceae					
<i>Dampiera linearis</i>	1				
<i>Dampiera trigona</i>					1
<i>Velleia trinervis</i>	1	1			
Haemodoraceae					
<i>Anigozanthos bicolor</i>		1		1	
<i>Anigozanthos manglesii</i>	1				
<i>Conostylis aculeata</i>	1	1			
<i>Conostylis laxiflora</i>		1			
<i>Conostylis setigera</i>	1				
<i>Haemodorum simplex</i>		1		1	
<i>Haemodorum sparsiflorum</i>		1	1		
<i>Haemodorum spicatum</i>	1	1			
<i>Phlebocarya ciliata</i>	1				
<i>Tribonanthes australis</i>			1		
<i>Tribonanthes longipetala</i>		1			
Haloragaceae					
<i>Glischrocaryon aureum</i>	1				
<i>Gonocarpus pithyoides</i>	1	1			
Iridaceae					
<i>Patersonia juncea</i>	1	1			

Family

Map Units

Map Units

1/2 2 4/11 5 7 8 9 11 12 14

[illegible]

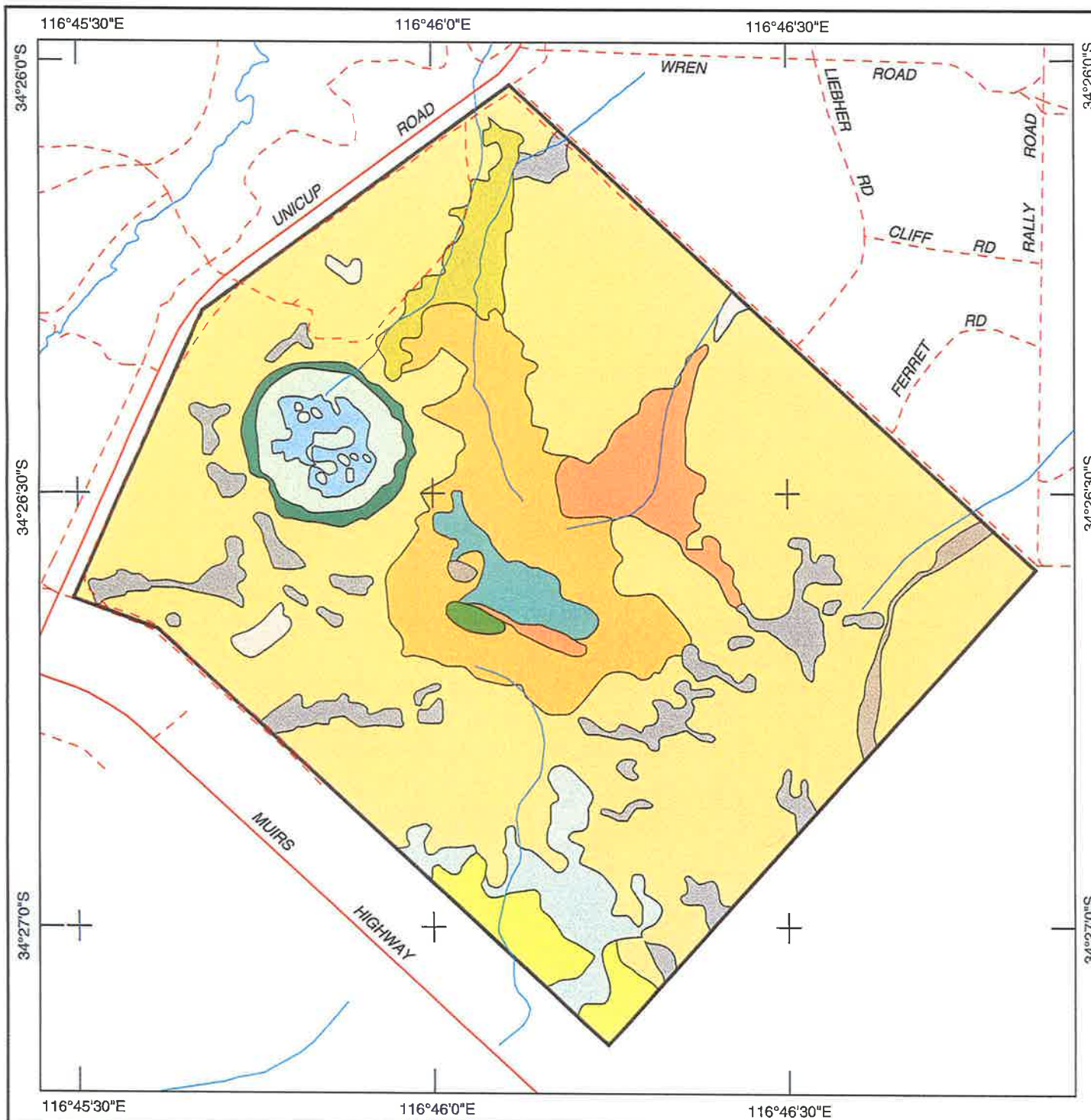
Oxalis perennans		1			
Papilionaceae					
Aotus intermedia			1		
Bossiaea linophylla	1				
Bossiaea ornata	1				
Brachysema praemorsum	1				
Daviesia sp.					1
Gastrolobium bilobum			1		
Gompholobium capitatum			1		
Gompholobium confertum	1				
Gompholobium marginatum	1		1		
Gompholobium polymorphum			1		
Gompholobium preissii	1				
Gompholobium tomentosum	1				
Hovea trisperma var. grandiflora	1				
Isotropis cuneifolia	1	1			
Jacksonia ?furcellata	1				
Kennedia coccinea	1				1
Oxylobium lineare		1			
Sphaerolobium vimineum	1	1			
Viminaria juncea		1			
Philydraceae					
Philydrella pygmaea	1				1
Phormiaceae					
Dianella brevicaulis		1			
Dianella revoluta	1				
Stypandra glauca	1				
Pittosporaceae					
Sollya heterophylla	1				
Poaceae					
* Aira caryophyllea	1				
* Briza maxima					1
* Briza minor			1		1
Danthonia caespitosa	1			1	
Danthonia setacea	1				
Deyeuxia quadriseta		1			
Neurachne alopecuroidea			1		
Stipa compressa		1			
Stipa ?pycnostachya	1				
Tetrarrhena laevis	1				
* Vulpia myuros	1				
Polygalaceae					
Comesperma volubile	1				
Proteaceae					
Adenanthos obovatus	1	1			
Banksia grandis	1				
Banksia littoralis		1			
Dryandra lindleyana	1				
Franklandia fucifolia	1				
Hakea lissocarpa	1				
Hakea prostrata			1		1
Hakea sulcata			1		
Hakea varia		1			1
Petrophile acicularis			1		
Synaphea petiolaris	1				
Synaphea sp.			1		
Ranunculaceae					
Clematis pubescens	1				
Restionaceae					
Anarthria laevis			1		
Anarthria prolifera	1	1			
Anarthria scabra	1				
Chordifex sp.			1		
Cytгонidium leptocarpoides MS			1		
Desmocladius fasciculatus MS	1		1		
Desmocladius flexuosus MS	1				
Harperia lateriflora		1			
Hypolaena exsulca	1				
Lyginia barbata	1	1			
Meeboldina kraussii MS		1			1
Rhamnaceae					
Cryptandra arbutiflora subsp. minor	1				
Trymalium ledifolium	1				
Rubiaceae					

Family

Map Units

1/2 2 4/11 5 7 8 9 11 12 14

Opercularia hispida	1		
Opercularia vaginata	1		
Rutaceae			
Boronia crenulata	1		
Boronia spathulata	1		
Santalaceae			
Leptomeria cunninghamii	1		
Leptomeria scrobiculata	1		
Leptomeria squarrolosa	1		
Schizaeaceae			
Schizaea dichotoma		1	
Scrophulariaceae			
Gratiola peruviana	1		1
* Parentucellia viscosa	1		
Selaginellaceae			
Selaginella gracillima			1
Stackhousiaceae			
Stackhousia monogyna	1	1	
Tripterococcus brunonis	1	1	
Stylidiaceae			
Levenhookia pusilla	1	1	
Levenhookia stipitata			1
Stylidium ?assimile	1		
Stylidium brunonianum subsp. minor	1	1	
Stylidium calcaratum	1		
Stylidium corymbosum			1
Stylidium guttatum	1	1	
Stylidium inundatum			1
Stylidium mimeticum	1	1	
Stylidium periscelanthum		1	
Stylidium perpusillum		1	
Stylidium petiolare		1	
Stylidium pulchellum		1	1
Stylidium repens	1		
Stylidium roseonanthum			1
Stylidium schoenoides	1		
Stylidium spathulatum	1		
Thymelaeaceae			
Pimelea angustifolia		1	
Pimelea imbricata		1	
Pimelea rosea	1		
Pimelea sulphurea	1		
Pimelea sylvestris	1		
Tremandraceae			
Tetratheca affinis	1		
Tetratheca setigera	1		
Tetratheca virgata	1		
Violaceae			
Hybanthus floribundus		1	
Xanthorrhoeaceae			
Xanthorrhoea gracilis	1		
Xanthorrhoea preissii	1	1	
Zamiaceae			
Macrozamia riedlei	1		

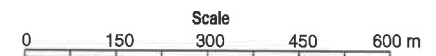


Salinity Action Plan

Lake Muir-Unicup Recovery Catchment

Galamup Nature Reserve Res 6549

- 1 Jarrah - Marri forest and woodland
 - 2 Jarrah - Marri open woodland
 - 3 Jarrah - Marri open woodland over wet heath
 - 4 Eucalyptus decipiens woodland
 - 5 Melaleuca raphiophylla - Banksia littoralis woodland
 - 6 Melaleuca lateritia heath
 - 7 Pericalymma elliptica - Lepidosperma longitudinale heath
 - 8 Hakea prostrata heath
 - 9 Baumea sedgeland
 - 10 Agonis heath and scrub
 - 11 Wet heath on clay flats
 - 12 Wet heath on sand
 - 13 Disturbed areas and gravel pits
 - 14 Open water
- Sealed Road
 - - - Vehicular Track
 ~ Minor Intermittent Watercourse



Produced by INFORMATION MANAGEMENT BRANCH, April 1998
 DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Job Number: IMB 98017127

Kodjinup Nature Reserve

Reserve number: 26678

Class: A

Location: 34 23 07S 116 39 30E;

Land tenure : Nature Reserve

Purpose : Water & Conservation of flora and fauna

Area: 626 ha

Biological values

Flora: Three hundred and forty-one taxa and one hybrid have been recorded from the reserve (Table 5). This includes four priority taxa (*Jacksonia sparsa* ms (Priority 3), *Leucopogon tamariscinus* (Priority 2), *Schoenus benthamii* (Priority 3), *Stylidium mimeticum* (Priority 3)). A hybrid swarm of *Kunzea recurva* x *sulphurea* and backcrosses to both parents can be seen in several places along the southern boundary of the reserve.

Vegetation description: Thirteen vegetation units were mapped in the reserve (Map 4).

- 1) **Jarrah - Marri forest and woodland** occur on laterites and lateritic gravels on the western side of the reserve. The understorey is diverse in shrub, herbs and grasses. Typical understorey shrubs include *Hibbertia* spp., *Leucopogon* spp. and peas such as *Bossiaea* spp., *Daviesia* spp. and *Gompholobium* spp.
- 2) **Jarrah - Marri open woodland** on sandy low lying soils are widespread in the northern and eastern parts of the reserve. The understorey is variable but includes species such as *Hibbertia racemosa*, *Andersonia caerulea*, *Astroloma baxteri*, *Leucopogon propinquus*, *Calytrix angulata* and *Melaleuca thymoides*. Where it is wettest, *Agonis parviceps* dominates. The herb layer is similarly diverse.
- 3) ***Banksia ilicifolia* - Jarrah woodland** occur commonly in the southern and western part of the reserve. This vegetation unit is a dampland with dominant understorey species including *Melaleuca thymoides*, *Kunzea recurva*, *Aotus intermedia*, *Pultenaea ochreatea* and *Adenanthos obovatus*. In the wettest areas Jarrah disappears (Photo 8). This community grades into vegetation unit 6 (*Melaleuca preissiana* - *Banksia littoralis* woodland) which occupies somewhat wetter sites.
- 4) **Dieback affected *Banksia ilicifolia* - Jarrah woodland** a significant area of *Banksia ilicifolia* woodland has been destroyed by dieback in the south western corner of the reserve. Some trees are still standing dead, the understorey is dominated by *Pultenaea ochreatea*.
- 5) ***Melaleuca cuticularis* woodland** occurs in the north eastern corner of the reserve. A well developed but variable herb and sedge layer develops under the *Melaleuca*. Obvious species include *Lepyrodia muirii*, *Gahnia trifida*, *Lepidosperma longitudinale*, *Cotula coronopifolia*, *Triglochin* spp., *Juncus* spp., *Tribonanthes* spp. and *Burchardia monantha*. Variability in understorey species appears to be correlated with variation in sand and clay content.
- 6) ***Melaleuca preissiana* - *Banksia littoralis* woodland** is common vegetation unit on low lying sandy areas, the understorey is quite variable depending on period of inundation. In the wettest areas *Pericalymma ellipticum* and *Lepidosperma longitudinale* form a dense understorey. In slightly drier sites this is replaced by an understorey dominated by *Melaleuca* spp. (often *M. densa*, *M. spathulata*, and *M. viminea*), *Kunzea recurva*, and *Viminaria juncea*.
- 7) ***Melaleuca preissiana* woodland over *Agonis* scrub** is a species poor unit where the understorey is dominated by dense stands of *Agonis parviceps*.
- 8) ***Melaleuca raphiophylla* low forest** occurs around the basin wetlands and drainage lines. This unit is generally species poor due to the dense canopy and the understorey is usually dominated by sedges (*Lepidosperma longitudinale*, *Baumea* spp.).
- 9) **Open *Melaleuca raphiophylla* low forest** has a richer understorey with sedges, shrubs (such as *Agonis linearifolia*, and *Aotus intermedia*) and herbs (such as *Villarsia albiflora*, *Samolus junceus*, and *Opercularia hispidula*).
- 10) **Open *Baumea* sedgeland** occurs over Kodjinup Swamp itself, *Baumea articulata* is the dominant sedge, while toward the edge *B. juncea* and *B. vaginalis* co-dominate.
- 11) **Closed *Baumea* sedgeland** occurs in the western basin wetland, and has an identical species composition to vegetation unit 10 but has a higher cover of the *Baumea* spp.
- 12) **Disturbed areas** associated with an old mill occurs on eastern side.
- 13) **Open water** occurs in small areas but may dry to herbland later in summer.

Vegetation change: Oblique air photos from April 1980 (Photo 9 - JAK Lane, unpub data) show that the *Baumea* in Kodjinup Swamp appears to have become less dense although expanses of open water are not yet apparent.

Disturbance or threats: Drain constructed through the central part of the reserve in 1993 (CALM 1998) has caused massive deaths of *Banksia ilicifolia* woodland and associated heath species as result of dieback spread. This impact is being monitored by a series of photopoints (22 March 1997) laid along a 50m transect perpendicular to the drain. At 10m intervals a photo has been taken toward the east parallel to the drain (Photos 10 - 15). All photopoints were marked with a fence dropper. Changes in inundation due to drain construction has resulted the death in small areas of Jarrah woodland (Map 4). The northern (upslope) section of the drain was constructed through what appear to be areas of old dieback infections. The nature conservation values of this reserve have been severely compromised by the construction of this drain.

A much smaller drain directs water in wetland vegetation on the southern boundary of the reserve (Photo 16), no impacts to the vegetation at this time.

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

Table 5 - Kodjilup Nature Reserve flora list

[illegible]

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

* Isolepis marginata				1
Isolepis oldfieldiana				1
Isolepis stellata				1
Lepidosperma angustatum				1
Lepidosperma longitudinale			1	1
Lepidosperma squamatum	1			1
Lepidosperma tenue	1			
Mesomelaena graciliceps				1
Mesomelaena tetragona	1			1
Schoenus asperocarpus				1
Schoenus benthamii				1
Schoenus efoliatus		1	1	1
Schoenus humilis				1
Schoenus odontocarpus				1
Schoenus plumosus				1
Schoenus submicrostachyus				1
Tetralix capillaris	1			
Tetralix octandra	1			
Tricostularia neesii var. neesii		1		
Dasyopogonaceae				
Dasyopogon bromeliifolius		2		1
Lomandra hermaphrodita	1			
Lomandra micrantha			1	1
Lomandra sericea	1			
Dennstaedtiaceae				
Pteridium esculentum				1
Dilleniaceae				
Hibbertia ?amplexicaulis				1
Hibbertia commutata	1			
Hibbertia pulchra				2
Hibbertia racemosa		1		
Hibbertia stellaris				1
Hibbertia vaginata				1
Droseraceae				
Drosera erythrorhiza	1			1
Drosera gigantea				1
Drosera glanduligera	1			1
Drosera menziesii		1		1
Drosera pallida	1			
Drosera stolonifera	1			
Epacridaceae				
Andersonia caerulea		1		1
Astroloma baxteri		1		
Astroloma ciliatum	1			
Astroloma pallidum	1			
Leucopogon australis				1
Leucopogon capitellatus	1			
Leucopogon glabellus				1
Leucopogon oxycedrus	1			
Leucopogon ?polymorphus		1		
Leucopogon propinquus		1		
Leucopogon tamariscinus		1		
Leucopogon unilateralis	1			
Leucopogon verticillatus	1			
Lysinema ciliatum			1	
Styphelia tenuiflora	1			
Euphorbiaceae				
Monotaxis occidentalis		1		
Poranthera microphylla		1		
Goodeniaceae				
Anthodium humile				1
Dampiera alata	1			
Dampiera cuneata			1	
Dampiera ?juncea				1
Dampiera linearis		1		
Dampiera ?pedunculata		1		
Dampiera aff. triloba				1
Goodenia claytoniacea			1	
Goodenia micrantha			1	
Goodenia pulchella				1
Velleia trinervis				1
Haemodoraceae				
Anigozanthos bicolor				1
Anigozanthos flavidus				

Family**Map Units**

	1	2	3	5	6	7	8/9	10/11	12
<i>Conostylis aculeata</i>	1	1							
<i>Conostylis laxiflora</i>	1				1				
<i>Conostylis setigera</i>	1								
<i>Haemodorum laxum</i>	1								
<i>Haemodorum spicatum</i>		2			1				
<i>Tribonanthes australis</i>				1	1				
<i>Tribonanthes violacea</i>				1					
Haloragaceae									
<i>Glischrocaryon aureum</i>	1								
<i>Gonocarpus hexandrus</i> subsp. <i>integrifolius</i>							1		
<i>Gonocarpus paniculatus</i>					1				
Hydatellaceae									
<i>Trithuria bibracteata</i>					1				
<i>Trithuria submersa</i>				1					
Iridaceae									
* <i>Gladiolus undulatus</i>		1							
<i>Patersonia juncea</i>	1	1			1				
<i>Patersonia occidentalis</i>		1							
<i>Patersonia occidentalis</i> (swamp form)					1				
Juncaceae									
* <i>Juncus bufonius</i>				1					
* <i>Juncus capitatus</i>				1					1
<i>Juncus kraussii</i>				1					
<i>Juncus pallidus</i>							1		1
Juncaginaceae									
<i>Triglochin calcitrapum</i>				1					
<i>Triglochin centrocarpum</i>				1					
<i>Triglochin huegelii</i>				1					
<i>Triglochin striatum</i>				1					
Lamiaceae									
<i>Hemianthera pungens</i>	1	1							
Lauraceae									
<i>Cassytha glabella</i>					1		1		
<i>Cassytha micrantha</i>					1				
<i>Cassytha racemosa</i>					1				
Lentibulariaceae									
<i>Polypompholyx multifida</i>					1				
Lindsaeaceae									
<i>Lindsaea linearis</i>		1			1				
Lobeliaceae									
<i>Lobelia alata</i>					1				
Loganiaceae									
<i>Logania serpyllifolia</i>	1								
<i>Phyllangium paradoxum</i>	1		1						
Loranthaceae									
<i>Nuytsia floribunda</i>					1				
Lythraceae									
* <i>Lythrum hyssopifolia</i>								1	
Menyanthaceae									
<i>Villarsia albiflora</i>							1		
<i>Villarsia parnassifolia</i>					1				
Mimosaceae									
<i>Acacia extensa</i>	1				1				
<i>Acacia incurva</i>					1				
<i>Acacia myrtifolia</i>					1				
<i>Acacia pulchella</i>	1								
<i>Acacia stenoptera</i>					1				
Myrtaceae									
<i>Agonis linearifolia</i>							1		
<i>Agonis parviceps</i>		1			1				
<i>Astartea</i> sp. (pink weeping)					1				
<i>Astartea</i> sp. (tall white)					1				
<i>Baeckea camphorosmae</i>	1								
<i>Baeckea</i> aff. <i>preissiana</i>		1							
<i>Calothamnus lateralis</i>					1				
<i>Calytrix angulata</i>		1							
<i>Eucalyptus calophylla</i>	1	1							
<i>Eucalyptus decipiens</i>					1				
<i>Eucalyptus marginata</i>	1	1							
<i>Hypocalymma angustifolium</i>					1				
<i>Hypocalymma strictum</i>					1				
<i>Kunzea recurva</i>			1		1				
<i>Kunzea recurva</i> x <i>sulphurea</i> hybrid			1						
<i>Kunzea sulphurea</i>			1						

Family**Map Units**

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

Melaleuca cuticularis
 Melaleuca densa
 Melaleuca lateritia
 Melaleuca leptoclada
 Melaleuca preissiana
 Melaleuca raphiophylla
 Melaleuca spathulata
 Melaleuca thymoides
 Melaleuca viminea
 Melaleuca violacea
 Pericalymma ellipticum

Onagraceae

Epilobium billardierianum

Orchidaceae

Caladenia flava
 Caladenia longicauda
 Caladenia radialis
 Caladenia radiata
 Elythranthera brunonis
 Elythranthera emarginata
 Eriochilus dilatatus
 Leporella fimbriata
 * Monadenia bracteata
 Praecoxanthus aphyllus MS
 Prasophyllum drummondii
 Prasophyllum ?elatum
 Pterostylis barbata
 Pterostylis nana
 Pterostylis vittata
 Pyrorchis nigricans
 Thelymitra crinita
 Thelymitra flexuosa
 Thelymitra ?macrophylla

Orobanchaceae

* Orobanche minor

Papilionaceae

Aotus intermedia
 Bossiaea eriocarpa
 Bossiaea linophylla
 Bossiaea ornata
 Bossiaea sp.
 Brachysema melanopetalum
 Brachysema praemorsum
 Chorizema ilicifolium
 Daviesia physodes
 Gompholobium capitatum
 Gompholobium confertum
 Gompholobium knightianum
 Gompholobium polymorphum
 Gompholobium preissii
 Gompholobium tomentosum
 Hovea chorizemifolia
 Hovea trisperma var. grandiflora
 Jacksonia furcellata
 Jacksonia sparsa MS
 Kennedia coccinea
 * Lotus angustissimus
 * Lotus suaveolens
 * Ornithopus compressus
 Oxyllobium lineare
 Pultenaea ochreate
 Pultenaea reticulata
 Sphaerolobium macranthum
 Sphaerolobium medium
 Sphaerolobium vimineum
 Viminaria juncea

Philydraceae

Philydrella pygmaea

Phormiaceae

Dianella revoluta

Pittosporaceae

Billardiera candida
 Billardiera variifolia

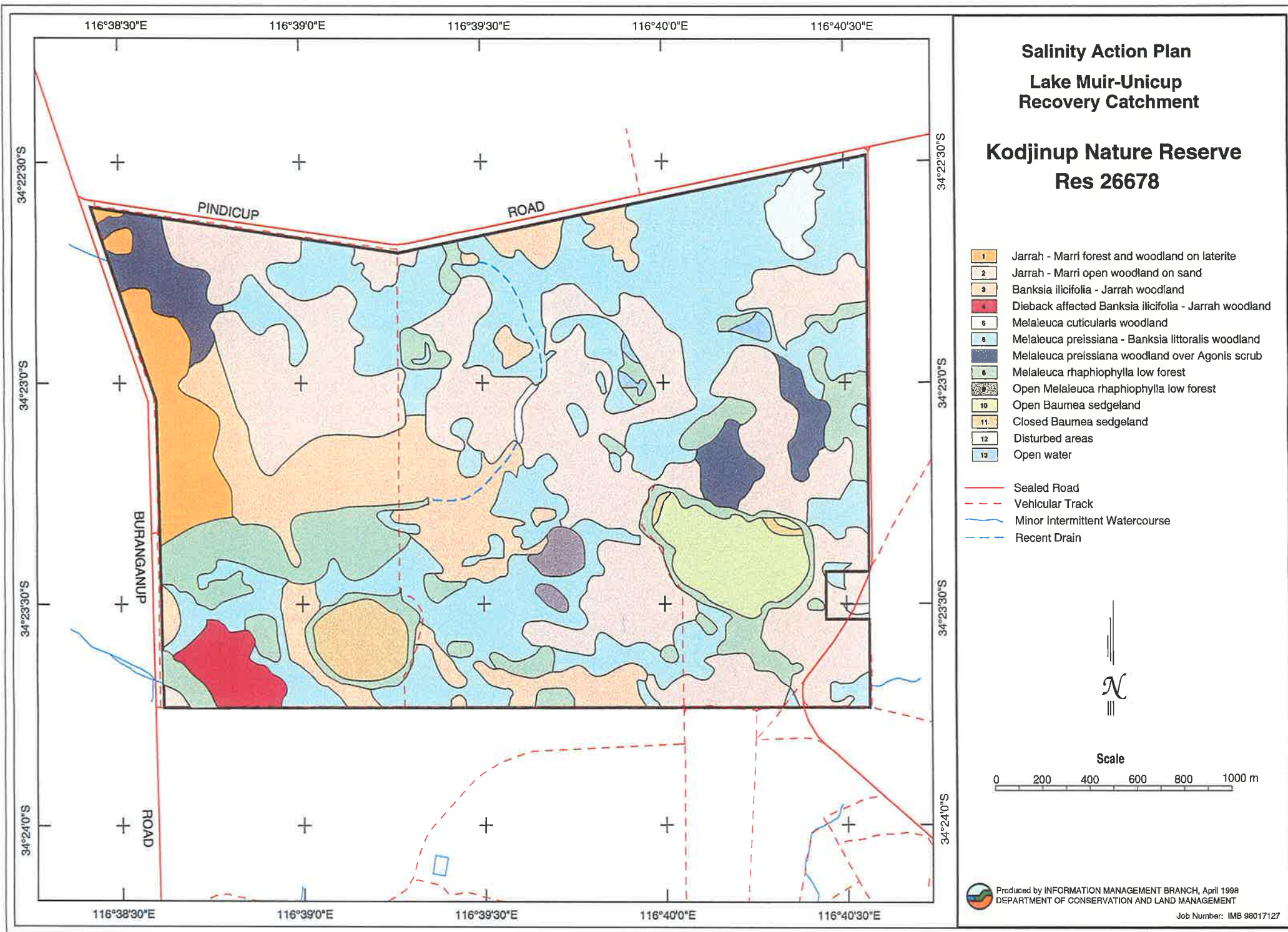
Poaceae

Family**Map Units**

	1	2	3	5	6	7	8/9	10/11	12
* <i>Aira caryophyllea</i>		1			1				1
<i>Amphipogon debilis</i>	1								
<i>Amphipogon turbinatus</i>		1							
<i>Deyeuxia quadriseta</i>							1		
<i>Hemarthria uncinata</i>							1		
* <i>Holcus lanatus</i>					1				1
<i>Neurachne alopecuroidea</i>	1								
<i>Poa poiformis</i>							1		
<i>Stipa compressa</i>	1								
<i>Stipa juncifolia</i>				1					
<i>Tetrarrhena laevis</i>	1								
* <i>Vulpia myuros</i>		1			1				1
Podocarpaceae									
<i>Podocarpus drouynianus</i>		1							
Polygalaceae									
<i>Comesperma calymega</i>		1							
<i>Comesperma flavum</i>					1				
<i>Comesperma virgatum</i>					1				
<i>Comesperma volubile</i>					1				
Polygonaceae									
* <i>Rumex acetosella</i>									1
* <i>Rumex crispus</i>									1
* <i>Rumex pulcher</i>		1							1
Primulaceae									
<i>Samolus junceus</i>				1			1		
Proteaceae									
<i>Adenanthos obovatus</i>			1		1				
<i>Banksia grandis</i>	1		1						
<i>Banksia ilicifolia</i>		1	1		1				
<i>Banksia littoralis</i>					1				
<i>Conospermum flexuosum</i>		1							
<i>Dryandra armata</i>	1								
<i>Dryandra lindleyana</i>					1				
<i>Franklandia fucifolia</i>		1							
<i>Hakea ceratophylla</i>					1				
<i>Hakea lissocarpa</i>	1								
<i>Hakea prostrata</i>	1	1							
<i>Hakea ruscifolia</i>	1								
<i>Hakea sp.</i>					1				
<i>Hakea sulcata</i>					1				
<i>Hakea trifurcata</i>	1								
<i>Hakea varia</i>					1				
<i>Isopogon sp.</i>		1							
<i>Persoonia longifolia</i>	1				1				
<i>Petrophile media</i>					1				
<i>Petrophile rigida</i>			1		1				
<i>Petrophile serruriae</i>	1								
<i>Stirlingia anethifolia</i>				1					
<i>Synaphea sp.</i>	1								
Ranunculaceae									
<i>Clematis pubescens</i>	1								
Restionaceae									
<i>Anarthria laevis</i>					1				
<i>Anarthria prolifera</i>					1				
<i>Desmocladius fasciculatus</i> MS	1								
<i>Desmocladius flexuosus</i> MS	1	1							
<i>Hypolaena exsulca</i>	1	1			1				
<i>Leptocarpus tenax</i>					1				
<i>Lepyrodia muirii</i>				1			1		
<i>Lyginia barbata</i>	1		1		1				
<i>Meeboldina tephрина</i> MS							1		
<i>Sporadanthus strictus</i> MS					1				
<i>Stenopa ramosissima</i> MS					1				
<i>Tremulina tremula</i> MS					1				
Rhamnaceae									
<i>Trymalium ledifolium</i>	1								
Rubiaceae									
<i>Opercularia hispidula</i>							1		
Rutaceae									
<i>Boronia nematophylla</i>		1							
<i>Boronia spathulata</i>	1				1				
<i>Eriostemon nodiflorus</i> subsp. lasiocalyx					1				
Santalaceae									
<i>Leptomeria pauciflora</i>					1				

*Family**Map Units*

	1	2	3	5	6	7	8/9	10/11	12
Leptomeria scrobiculata					1				
Leptomeria squarulosa	1								
Scrophulariaceae									
Gratiola peruviana								1	
Stackhousiaceae									
Stackhousia monogyna	1		1		1				
Sterculiaceae									
Thomasia ?pauciflora							1		
Stylidiaceae									
Levenhookia pusilla	1		1		1				
Levenhookia stipitata			1		1				
Stylidium calcaratum	1	1							
Stylidium guttatum					1				
Stylidium luteum	1								
Stylidium mimeticum					1				
Stylidium perpusillum					1				
Stylidium repens			1		1				
Stylidium scandens			1		1				
Stylidium schoenoides		1			1				
Stylidium spatulatum	1				1				
Stylidium violaceum	1								
Thymelaeaceae									
Pimelea angustifolia					1				
Pimelea ciliata subsp. ciliata		1							
Pimelea imbricata var. major					1				
Pimelea rosea					1				
Pimelea sulphurea	1				1				
Tremandraceae									
Tetratheca sp	1								
Tremandra diffusa							1		
Xanthorrhoeaceae									
Xanthorrhoea gracilis	1								
Xanthorrhoea preissii					1				
Zamiaceae									
Macrozamia riedlei	1								



Kulunilup Nature Reserve

Reserve number: 26677

Class: A

Location: 34 20 05S 116 47 16E;

Land tenure : Nature Reserve

Purpose : Water & Conservation of flora and fauna

Area: 612 ha

Biological values

Flora: Using Griffin (1984) data as a basis, a flora list of 432 taxa was compiled from the reserve (Table 6). This included seven priority taxa (*Amphibromus vickeryae* (Priority 1), *Apodasmia ceramophila* ms (Priority 2), *Euchiton gymnocephalus* (Priority 3), *Phyllangium palustre* (Priority 2), *Rhodanthe pyrethrum* (Priority 3), *Schoenus natans* (Priority 4), *Villarsia submersa* (Priority 4)).

Vegetation description: Griffin (1984) mapped the reserve and described 11 vegetation units. Brief descriptions of these units are given below.

- 3(1) *Eucalyptus marginata* (Jarrah) Forest (Type 2) [bottom of lateritic ridges]. Jarrah / Marri forest at base of lateritic ridges, essentially similar to Kodjinup vegetation unit 1.
- 3/9) *Eucalyptus marginata* (Jarrah) Forest (Type 2) / *Agonis parviceps* Thicket. Variable unit similar to Kodjinup vegetation unit 2, common on low lying sandy substrates.
- 4/6) *Eucalyptus marginata* (Jarrah) - *E. wandoo* Forest / *Hakea prostrata* Low Scrub A. A variable unit dominated by Jarrah and / or Wandoo, occasionally Marri, over a *Hakea prostrata* - *Hypocalymma angustifolia* heath with sedges *Mesomelaena tetragona* and *M. stygia*. This unit occupies old sandy drainage lines.
- 6) *Hakea prostrata* Low Scrub A Similar to unit 4/6 without the overstorey. Essentially same as Galamup vegetation unit 8.
- 10) *Melaleuca preissiana* - *Banksia littoralis* Open Low Woodland A. A complex unit essentially similar to Kodjinup vegetation unit 6.
- 12) *Melaleuca lateritia* Dense Low Heath Essentially similar to Galamup vegetation unit 6, these are small basin wetlands on loamy clays.
- 13) *Melaleuca raphiophylla* Dense Low Forest B. Occurs as circular or ring shaped areas in centre of some basin wetlands. This unit is equivalent to Muir vegetation unit 15.
- 19) *Baumea* Sedges. Occupying basin wetlands, essentially same as Kodjinup vegetation units 10 and 11.
- 22) *Melaleuca viminea* Heath. Occurring on grey clayey soils, with a variable understorey of *Baumea* sp. and *Leptocarpus aristatus*.
- 23) *Melaleuca spathulata* Complex. Very variable unit of poorly drained flats. Its composition depending on drainage conditions, in the wettest areas *M. spathulata* forms a dense heath, in the drier peripheral zones it is more similar to vegetation unit 10.
- 24) *Leptocarpus* Sedges. Clay flats dominated by *Apodasmia ceramophila* ms. Griffin (1984) states that there are few herbs, however these winter wet flats have a diverse annual herb flora in spring and early summer as these seasonally inundated wetlands dry.

Disturbed areas) Not mapped by Griffin (1984) but used in compiling species lists.

Vegetation change: Oblique air photos from April 1980 (Photo 17 & 18 - JAK Lane, unpub data) show little change to the central wetland.

Disturbance or threats: Recent aerial photography and on the ground inspections show several major drains entering the reserve. Of particular concern is the impacts on the *Melaleuca spathulata* heath in the north eastern corner of the reserve. Presently the community is very open with large areas of bare ground. This may be the result of salinity, this needs to be investigated using a time series of aerial photography to determine if this is the case and, if so, the rate of spread of this impact.

Other major drains enter the reserve from the west and south. No obvious impacts from these drains are apparent at this time.

Family

Map Unit

3(1)	3/9	4/6	6	10	12	13	19	22	23	24	Dist
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Table 6 - Kulunilup Nature Reserve flora list

Aizoaceae

- * Carpobrotus edulis 1
- Carpobrotus modestus 1

Amaranthaceae

- Alternanthera nodiflora 1

Anthericaceae

- Agrostocrinum scabrum 1
- Arthropodium preissii 1
- Borya scirpoidea 1
- Borya sphaerocephala 1
- Caesia micrantha 1 1 1 1
- Caesia occidentalis 1 1
- Chamaescilla corymbosa 1
- Chamaescilla spiralis 1
- Johnsonia lupulina 1
- Laxmannia minor 1
- Sowerbaea laxiflora 1 1
- Thysanotus manglesianus 1
- Thysanotus tenellus 1
- Tricoryne elatior 1 1
- Tricoryne humilis 1

Apiaceae

- Centella cordifolia 1
- Daucus glochidiatus 1
- Eryngium pinnatifidum 1 1 1
- Homalosciadium homalocarpum 1
- Hydrocotyle alata 1 1
- Hydrocotyle diantha 1
- Hydrocotyle pilifera 1
- Schoenolaena tenuior 1
- Trachymene pilosa 1 1
- Xanthosia candida 1
- Xanthosia huegelii 1

Asteraceae

- Angianthus preissianus 1
- Angianthus tomentosus 1
- * Arctotheca calendula 1 1
- Asteridea athrixioides 1
- Blennospora drummondii 1
- Brachyscome iberidifolia 1
- * Carduus pycnocephalus 1
- Cotula coronopifolia 1 1
- Craspedia variabilis 1 1
- * Dittrichia graveolens 1
- Euchiton gymnocephalus 1
- Euchiton sphaericus 1
- Gnephosis tenuissima 1
- Hyalosperma simplex 1
- * Hypochaeris glabra 1 1
- Lagenifera huegelii 1 1 1
- Millotia myosotidifolia 1
- Olearia paucidentata 1
- Podolepis gracilis 1
- Podotheca angustifolia 1
- * Pseudognaphalium luteoalbum 1
- Pterochaeta paniculata 1
- Quinetia urvillei 1
- Rhodanthe citrina 1
- Rhodanthe pyrethrum 1 1
- Rutidosia multiflora 1
- Senecio minimus 1
- Siloxerus humifusus 1
- * Sonchus asper 1 1
- * Sonchus hydrophilus 1
- * Sonchus oleraceus 1 1
- Trichocline sp wheat 1
- * Vellereophyton dealbatum 1 1

Campanulaceae

- Wahlenbergia multicaulis 1
- Wahlenbergia preissii 1

Caryophyllaceae

- * Cerastium glomeratum 1

Casuarinaceae

Family	Map Unit											Dist
	3(1)	3/9	4/6	6	10	12	13	19	22	23	24	
<i>Allocauarina humilis</i>		1	1		1							
<i>Allocauarina lehmanniana</i>		1										
<i>Allocauarina thuyoides</i>		1										
Centrolepidaceae												
<i>Aphelia cyperoides</i>		1			1							
<i>Brizula drummondii</i>									1			
<i>Centrolepis aristata</i>		1			1							
<i>Centrolepis drummondiana</i>		1										
<i>Centrolepis glabra</i>									1			
<i>Centrolepis pilosa</i>		1										
<i>Centrolepis polygyna</i>						1						
Colchicaceae												
<i>Burchardia congesta</i>	1								1			
<i>Burchardia monantha</i>					1				1			
<i>Burchardia multiflora</i>									1			
<i>Wurmbea dioica</i>									1			
Crassulaceae												
<i>Crassula colorata</i>		1										
<i>Crassula decumbens</i> var. <i>decumbens</i>		1										
* <i>Crassula natans</i>												1
<i>Crassula pedicellosa</i>			1									
<i>Crassula peduncularis</i>		1										
Cupressaceae												
<i>Actinostrobus pyramidalis</i>										1		
Cyperaceae												
<i>Baumea articulata</i>								1				
<i>Baumea juncea</i>								1				
<i>Baumea rubiginosa</i>									1			
<i>Baumea ?vaginalis</i>								1				
<i>Chorizandra enodis</i>					1				1			
<i>Cyathochaeta avenacea</i>		1			1				1			
* <i>Cyperus tenellus</i>									1			
<i>Eleocharis sphacelata</i>								1				
<i>Gahnia ancistrophylla</i>			1									
<i>Gahnia trifida</i>									1			
<i>Isolepis cernua</i>									1			
* <i>Isolepis marginata</i>		1			1				1			
<i>Isolepis oldfieldiana</i>		1		1	1							
<i>Isolepis</i> sp.									1			
<i>Isolepis stellata</i>		1			1							
<i>Lepidosperma angustatum</i>	1											
<i>Lepidosperma longitudinale</i>					1					1		
<i>Lepidosperma</i> sp.				1								
<i>Lepidosperma squamatum</i>		1										
<i>Lepidosperma tenue</i>	1		1									
<i>Mesomelaena stygia</i>		1			1							
<i>Mesomelaena tetragona</i>		1			1							
<i>Schoenus bifidus</i>		1			1							
<i>Schoenus efoliatus</i>										1		
<i>Schoenus elegans</i>									1			
<i>Schoenus natans</i>									1			
<i>Schoenus</i> sp.				1	1				1			
<i>Schoenus subbulbosus</i>				1								
<i>Schoenus tenellus</i>									1			
<i>Tetraria capillaris</i>			1									
<i>Tetraria octandra</i>	1	1			1							
Dasypogonaceae												
<i>Chamaexeros serra</i>		1			1							
<i>Dasypogon bromeliifolius</i>		1										
<i>Lomandra caespitosa</i>		1										
<i>Lomandra collina</i>		1										
<i>Lomandra micrantha</i>			1									
<i>Lomandra nigricans</i>		1										
<i>Lomandra purpurea</i>	1	1										
<i>Lomandra sonderi</i>		1										
<i>Lomandra suaveolens</i>		1							1			
Dennstaedtiaceae												
<i>Pteridium esculentum</i>		1										
Dilleniaceae												
<i>Hibbertia ?commutata</i>			1									
<i>Hibbertia cunninghamii</i>		1	1									
<i>Hibbertia gracilipes</i>			1									
<i>Hibbertia racemosa</i>		1										
<i>Hibbertia spicata</i> subsp. <i>spicata</i>	1		1									
<i>Hibbertia stellaris</i>					1				1			

Family

	Map Unit											Dist
	3(1)	3/9	4/6	6	10	12	13	19	22	23	24	
<i>Hibbertia subvaginata</i>				1	1							
Droseraceae												
<i>Drosera erythrorhiza</i>			1									
<i>Drosera gigantea</i>					1				1			
<i>Drosera glanduligera</i>		1	1									
<i>Drosera macrantha</i>	1		1									
<i>Drosera menziesii</i>		1			1					1		
<i>Drosera neesii</i>									1			
<i>Drosera rosulata</i>					1				1			
Epacridaceae												
<i>Andersonia caerulea</i>			1									
<i>Astroloma baxteri</i>			1									
<i>Astroloma ciliatum</i>	1			1								
<i>Astroloma pallidum</i>				1	1							
<i>Leucopogon australis</i>					1							
<i>Leucopogon capitellatus</i>	1	1	1									
<i>Leucopogon conostephioides</i>		1										
<i>Leucopogon parviflorus</i>	1											
<i>Leucopogon pendulus</i>			1									
<i>Leucopogon verticillatus</i>	1											
<i>Lysinema ciliatum</i>		1										
<i>Sphenotoma capitatum</i>									1			
Euphorbiaceae												
<i>Poranthera microphylla</i>			1									
Gentianaceae												
* <i>Centaurium erythraea</i>												1
* <i>Cicendia filiformis</i>									1			
Geraniaceae												
* <i>Erodium cicutarium</i>			1									
<i>Geranium solanderi</i>			1									
Goodeniaceae												
<i>Anthotium humile</i>									1			
<i>Dampiera alata</i>	1	1	1									
<i>Dampiera linearis</i>		1										
<i>Dampiera pedunculata</i>		1										
<i>Goodenia mimuloides</i>									1			
<i>Goodenia pulchella</i>									1			
<i>Lechenaultia formosa</i>		1										
<i>Scaevola phlebopetala</i>		1										
<i>Velleia trinervis</i>		1	1		1							
Haemodoraceae												
<i>Anigozanthos bicolor</i>				1								
<i>Anigozanthos manglesii</i>		1										
<i>Conostylis aculeata</i>	1	1			1							
<i>Conostylis aurea</i>									1			
<i>Conostylis laxiflora</i>		1										
<i>Conostylis setigera</i>		1										
<i>Haemodorum laxum</i>	1		1									
<i>Haemodorum simplex</i>					1				1			
<i>Haemodorum sparsiflorum</i>			1						1			
<i>Haemodorum spicatum</i>		1										
<i>Tribonanthes australis</i>					1				1			
<i>Tribonanthes longipetala</i>		1			1							
<i>Tribonanthes</i> sp Lake Muir									1			
<i>Tribonanthes violacea</i>					1							
Haloragaceae												
<i>Glischrocaryon aureum</i>	1											
<i>Myriophyllum crispatum</i>							1					
<i>Myriophyllum limnophilum</i>									1			
Hydatellaceae												
<i>Trithuria bibracteata</i>						1						
<i>Trithuria submersa</i>									1			
Hypoxidaceae												
<i>Hypoxis occidentalis</i>				1	1	1			1			
Iridaceae												
<i>Patersonia juncea</i>		1	1						1			
<i>Patersonia occidentalis</i>		1										
* <i>Romulea rosea</i>		1										
Isoetaceae												
<i>Isoetes drummondii</i>									1			
Juncaceae												
* <i>Juncus articulatus</i>									1		1	
* <i>Juncus bufonius</i>					1				1			
* <i>Juncus capitatus</i>		1										
<i>Juncus pallidus</i>							1				1	

Family

	Map Unit											Dist
	3(1)	3/9	4/6	6	10	12	13	19	22	23	24	
Juncus radula												1
Juncus sp.									1			
Juncaginaceae												
Triglochin centrocarpum									1			
Triglochin huegelii								1				
Triglochin lineare						1	1					
Lamiaceae												
Hemiandra pungens			1									
* Mentha pulegium												1
Lauraceae												
Cassytha racemosa			1		1							
Lentibulariaceae												
Polypompholyx multifida				1					1			
Polypompholyx tenella										1		
Utricularia inaequalis									1			
Linaceae												
Linum marginale			1									
Lindsaeaceae												
Lindsaea linearis	1	1										
Lobeliaceae												
Grammatotheca bergiana							1					
Lobelia alata					1							
Lobelia gibbosa			1									
Loganiaceae												
Logania campanulata			1									
Logania serpyllifolia	1											
Phyllangium palustre									1			
Phyllangium paradoxum			1		1							
Loranthaceae												
Nuytsia floribunda			1									
Lythraceae												
* Lythrum hyssopifolia									1			1
Menyanthaceae												
Villarsia albiflora								1				
Villarsia submersa						1			1			
Mimosaceae												
Acacia alata	1											
Acacia cyclops		1			1							
Acacia extensa		1			1							
Acacia huegelii		1										
Acacia incurva					1				1			
Acacia larinina var. larinina			1									
Acacia nervosa		1										
Acacia pulchella	1											
Acacia saligna					1							
Acacia stenoptera		1										
Myrtaceae												
Actinodium cunninghamii		1										
Agonis juniperina												1
Astartea sp. (pink weeping)					1							1
Astartea sp. (white erect)					1							1
Calothamnus lateralis				1	1							1
Calothamnus sanguineus	1											
Calothamnus schaueri	1											
Calytrix flavescens		1										
Eremaea pauciflora	1		1									
Eucalyptus calophylla		1										
Eucalyptus decipiens		1										
Eucalyptus marginata		1										
Eucalyptus occidentalis										1		
Eucalyptus rudis					1		1					
Eucalyptus wandoo			1									
Hypocalymma angustifolium				1	1						1	
Kunzea micrantha				1	1							
Melaleuca cuticularis											1	
Melaleuca densa											1	
Melaleuca lateriflora											1	
Melaleuca lateritia					1	1						
Melaleuca leptoclada					1						1	
Melaleuca preissiana					1							
Melaleuca raphiophylla							1					
Melaleuca spathulata											1	
Melaleuca thymoides		1										
Melaleuca viminea					1				1			
Pericalymma ellipticum					1							

Family

Map Unit

	3(4)	3/9	4/6	6	10	12	13	19	22	23	24	Dist
Verticordia densiflora					1							
Onagraceae												
Epilobium billardierianum							1					
Epilobium hirtigerum												1
Orchidaceae												
Caladenia flava		1										
Caladenia longicauda		1	1		1							
Caladenia marginata		1										
Caladenia radiata									1			
Caladenia splendens MS		1										
Corybas dilatatus					1							
Cyrtostylis robusta							1					
Diuris laxiflora				1					1			
Diuris longifolia		1										
Drakonorchis barbarossa MS					1							
Elythranthera brunonis		1			1				1			
Elythranthera emarginata		1			1				1			
Leporella fimbriata		1										
Microtis atrata									1			
Microtis media		1			1							
Microtis orbicularis						1			1			
* Monadenia bracteata		1			1							
Prasophyllum drummondii		1										
Prasophyllum macrostachyum									1			
Pterostylis nana									1			
Pterostylis pyramidalis		1										
Pterostylis recurva				1								
Pterostylis vittata				1								
Pyrorchis nigricans		1										
Thelymitra crinita	1		1		1							
Thelymitra pauciflora		1										
Orobanchaceae												
* Orobanche minor		1										
Papilionaceae												
Bossiaea eriocarpa		1										
Bossiaea linophylla		1			1							
Bossiaea ornata	1											
Bossiaea praetermissa		1										
Brachysema melanopetalum					1							
Brachysema praemorsum	1		1									
Chorizema aciculare		1										
Daviesia cordata	1											
Daviesia incrassata	1											
Daviesia preissii		1			1							
Eutaxia virgata		1			1							
Gompholobium capitatum		1										
Gompholobium knightianum	1											
Gompholobium marginatum		1	1									
Gompholobium ovatum		1										
Gompholobium polymorphum		1			1							
Gompholobium preissii	1		1									
Gompholobium scabrum		1										
Gompholobium tomentosum		1										
Hovea chorizemifolia		1										
Hovea trisperma var. grandiflora	1											
Isotropis cuneifolia		1										
Jacksonia furcellata		1										
Kennedia coccinea	1		1									
Kennedia prostrata		1										
* Lotus angustissimus												1
* Lotus uliginosus												1
Oxylobium lineare							1					
Pultenaea ericifolia		1										
Sphaerolobium medium			1									
Sphaerolobium vimineum					1							
* Trifolium campestre												1
* Trifolium dubium			1									1
* Trifolium subterraneum												1
Viminaria juncea							1			1		
Phylodraceae												
Philydrella drummondii									1			
Philydrella pygmaea		1			1				1			
Phormiaceae												
Dianella brevicaulis	1											
Dianella revoluta		1		1	1							

Family	Map Unit												Dist
	3(1)	3/9	4/6	6	10	12	13	19	22	23	24		
Pittosporaceae	Stypandra glauca	1		1		1							
	Billardiera candida	1											
	Billardiera sp.	1											
	Sollya heterophylla		1			1							
Poaceae													
*	Agrostis avenacea					1			1				
	Aira caryophyllea											1	
	Amphibromus nervosus										1		
	Amphibromus vickeryae					1			1				
	Amphipogon debilis		1										
*	Briza maxima											1	
*	Briza minor								1				
	Danthonia occidentalis					1							
	Danthonia setacea			1									
	Deyeuxia quadriseta					1							
	Hemarthria uncinata					1		1					
*	Holcus lanatus					1							
	Neurachne alopecuroidea		1	1		1			1				
	Poa drummondiana		1										
*	Polypogon monspeliensis								1			1	
	Stipa compressa		1										
	Stipa pycnostachya	1		1		1							
	Tetrarrhena laevis	1											
*	Vulpia bromoides			1								1	
*	Vulpia myuros		1	1									
Polygalaceae													
	Comesperma calymega		1										
	Comesperma ciliatum		1			1							
	Comesperma flavum					1							
	Comesperma virgatum					1							
Polygonaceae													
	Persicaria prostrata								1			1	
*	Polygonum arenastrum											1	
*	Rumex conglomeratus											1	
*	Rumex pulcher											1	
Primulaceae													
	Samolus junceus								1				
Proteaceae													
	Banksia grandis		1										
	Banksia littoralis					1		1					
	Dryandra armata	1											
	Dryandra lindleyana		1	1		1							
	Grevillea brownii				1								
	Hakea lissocarpa		1	1									
	Hakea prostrata		1										
	Hakea ruscifolia		1										
	Hakea sulcata					1			1				
	Hakea varia					1				1			
	Isopogon polycephalus			1									
	Isopogon teretifolius	1											
	Persoonia longifolia		1										
	Petrophile media				1								
	Petrophile serruriae	1											
	Petrophile squamata		1										
	Synaphea favosa		1										
	Synaphea petiolaris			1	1	1							
Ranunculaceae													
	Clematis pubescens		1										
Restionaceae													
	Anarthria laevis									1			
	Anarthria prolifera	1											
	Apodasmia ceramophila MS										1		
	Desmocladus fasciculatus MS		1	1									
	Harperia lateriflora				1								
	Hypolaena exsulca		1										
	Leptocarpus tenax					1							
	Lepyrodia muirii					1							
	Lyginia barbata		1			1							
	Meeboldina cana MS					1							
	Meeboldina coangustata MS									1			
	Meeboldina scariosa MS								1				
	Tremulina tremula MS									1			
Rhamnaceae													
	Trymalium ledifolium			1									

Family

3(l) 3/9 4/6 6 Map Unit 10 12 13 19 22 23 24 Dist

Rubiaceae

- Opercularia hispidula
Opercularia vaginata

Rutaceae

- Boronia ?juncea
Boronia megastigma
Boronia ramosa
Boronia spathulata

Santalaceae

- Santalum acuminatum

Scrophulariaceae

- Gratiola peruviana
Limosella australis
* Parentucellia latifolia
* Parentucellia viscosa

Selaginellaceae

- Selaginella gracillima

Stackhousiaceae

- Stackhousia monogyna
Tripterococcus brunonis

Stylidiaceae

- Levenhookia pusilla
Levenhookia stipitata
Stylidium assimile
Stylidium brunonianum subsp. minor
Stylidium calcaratum
Stylidium carnosum
Stylidium crassifolium
Stylidium emarginatum
Stylidium guttatum
Stylidium inundatum
Stylidium miniatum
Stylidium perpusillum
Stylidium petiolare
Stylidium pulchellum
Stylidium repens
Stylidium roseonanum
Stylidium schoenoides
Stylidium spathulatum

Thymelaeaceae

- Pimelea angustifolia
Pimelea ?ciliata
Pimelea sulphurea

Tremandraceae

- Platytheca galioides
Tetratheca setigera

Violaceae

- Hybanthus floribundus

Xanthorrhoeaceae

- Xanthorrhoea gracilis
Xanthorrhoea preissii

Zamiaceae

- Macrozamia riedlei

Lake Muir Reserve

Reserve number: 31880

Class: A

Location: 34 29 08S 116 43 24E;

Land tenure : Nature Reserve

Purpose : Water & Conservation of flora and fauna

Area: 11,311 ha

Biological values

Flora: Seven hundred and thirty-seven taxa and one hybrid were recorded from the reserve (Table 7). This list included three Declared Rare Flora (*Caladenia christineae* ms, *Caladenia harringtoniae*, *Diuris drummondii*) and 19 priority taxa (*Amphibromus vickeryae* (Priority 1), *Anthotium junciforme* (Priority 4), *Apodasmia ceramophila* ms (Priority 2), *Caladenia starteorum* ms (Priority 2), *Eryngium* sp. Lake Muir (E Wittwer 2293) (Priority 1), *Euchiton gymnocephalus* (Priority 3), *Euphrasia scabra* (Priority 2), *Jacksonia sparsa* ms (Priority 3), *Leucopogon tamariscinus* (Priority 2), *Lilaeopsis polyantha* (Priority 2), *Melaleuca pritzelii* (Priority 2), *Phyllanthus palustre* (Priority 2), *Rhodanthe pyrethrum* (Priority 3), *Schoenus capillifolius* (Priority 2), *Schoenus natans* (Priority 4), *Stylidium lepidum* (Priority 3), *Stylidium rhipidium* (Priority 1), *Synaphea decumbens* (Priority 1), *Villarsia submersa* (Priority 4)).

Of these taxa *Eryngium* sp. Lake Muir (E Wittwer 2293) appears to be an endemic taxa to the Lake Muir area; the two large *Euphrasia scabra* are the only known extant locations for this taxa in WA, it has been recommended for listing as nationally critical based on population declines in the eastern states; the shrublands and forests surrounding Lake Muir contain the only known populations of *Lilaeopsis polyantha* in WA; the aquatic sedge *Schoenus natans* has recently been delisted as Declared Rare Flora based on the large population of this taxa in Lake Muir Nature Reserve and several other Nature Reserves in the area. It was previously believed to be restricted to the Swan Coastal Plain (Keighery & Keighery 1996)

Vegetation description: Thirty one vegetation units have been mapped in the reserve, wet heaths and scrubs predominate in the northern section of the reserve while eucalypt woodlands are more common in the south (Map 5).

- 1) **Jarrah - Marri forest and woodland** on laterite and lateritic gravels cover a small area in the south eastern corner of the reserve. The understorey is typically diverse in shrub, herbs and grasses. Typical understorey shrubs include *Hibbertia* spp., *Leucopogon* spp. and peas such as *Bossiaea* spp., *Daviesia* spp. and *Gompholobium* spp.
- 2) **Jarrah - Marri open woodland** on sandy soils occurs widely in the southern half of the reserve, common understorey species include *Hibbertia racemosa*, *Hibbertia subvaginata*, *Astroloma baxteri*, *Leucopogon* spp., *Phyllanthus calycinus*, *Acacia pulchella*, *Jacksonia furcellata*. There is generally a very rich and diverse herb layer and orchids are numerous early in the spring. Toward the northern part of the reserve, this vegetation unit is replaced by Jarrah - Yate woodlands (unit 4).
- 3) **Jarrah - Marri woodland over *Agonis* scrub** occurs along seasonally wet drainage lines and in the swales between the dunes to the east of Lake Muir. Typically the *Agonis* scrub is very dense with little or no other understorey.
- 4) **Jarrah - Yate woodland** occur on the large dune bordering the eastern side of Lake Muir and sandy flats in the northern part of the reserve. It is replaced by vegetation unit 3 (Jarrah - Marri woodlands on sand) Both units have very similar understorey composition. Where the Jarrah - Yate community has been grazed weed diversity is high.
- 5) **Jarrah woodland over *Hakea oleifolia* heath** occurs on the red dunes to the east of Poorganup Swamp. This soil unit was not seen elsewhere in the reserve.
- 6) ***Eucalyptus decipiens* woodland** similar to those occurring in Galamup and Cobertup Nature Reserves are found in a small area on the wet clayey flats north of the Muir Highway. *Allocasuarina lehmanniana*, *Allocasuarina microstachya*, *Leucopogon australis*, *Darwinia vestita*, and *Aotus intermedia* are common components of the understorey. There was also a rich and diverse herb and sedge layer.
- 7) ***Eucalyptus rudis* woodland** occurs in small patches on wet flats and small rises. The understorey is typical of seasonally inundated situations and includes *Anigozanthos*

- flavidus*, *Agonis parviceps*, *Kunzea ericifolia*, *Viminaria juncea*, *Hakea ceratophylla*, and *Hakea varia*. Orchids were common in this unit in early spring.
- 8) ***Eucalyptus rudis* woodland on sand dunes** occur on the eastern side of most of the basin wetlands. These woodlands tended to be quite weedy reflecting a history of past grazing. These *E. rudis* woodlands are replaced by Yate woodland (vegetation unit 31) on the fringing dunes of Lake Muir, understorey composition is essentially similar.
 - 9) ***Banksia ilicifolia* woodland** occurs in small patches along and to the north of the Muir Highway. Extensive areas of dieback are apparent. In dieback free areas a diverse understorey of peas, epacrids, and Myrtaceae is present. *Schoenus* spp. and *Mesomelaena tetragona* are also common.
 - 10) ***Melaleuca cuticularis* complex.** The wet flats in the northern half of the reserve are mostly covered by *Melaleuca* shrublands and / or woodlands in a complex mosaic. One of the most variable is the *Melaleuca cuticularis* complex, which ranges from woodland to very open woodland to wet heath with occasional *M. cuticularis* trees. Understorey is also variable, apparently related to period of inundation, but generally includes *Astartea* spp., *Melaleuca densa*, *Hypocalymma angustifolium*, *Hakea varia*, *Harperia lateriflora* and *Meeboldina cana*. The Lake Muir endemic *Eryngium* sp. Lake Muir is also found in this unit.
 - 11) ***Melaleuca cuticularis* woodland over *Gahnia* sedgeland** is a distinct unit occurring on the flats along the edge of Lake Muir. This unit is quite species poor.
 - 12) ***Melaleuca cuticularis* woodland over wet heath** forms a distinct unit in the south eastern part of the reserve. The substrate is generally clayey and this unit is has a very rich and diverse annual herb layer. The Asteraceae, Centrolepidaceae, Cyperaceae, Orchidaceae, Stylidiaceae are well represented. Common perennial taxa include *Melaleuca* spp., *Kunzea micrantha* and the rushes *Apodasmia ceramophila*, *Meeboldina coangustata*, and *Meeboldina cana*.
 - 13) ***Melaleuca preissiana* - *Kunzea sulphurea* woodland** occurs as a small unit on drainage lines on the southern boundary of the reserve.
 - 14) ***Melaleuca preissiana* woodland over wet heath** occurs extensively north of the Muir Highway. Understorey is variable in the wettest sites is generally dominated by *Pericalymma ellipticum*. On drier sites understorey is diverse with peas and Myrtaceae dominating.
 - 15) ***Melaleuca raphiophylla* forest** forms dense stands around basin wetland and in the wettest parts of the flats. The understorey is generally dominated by *Lepidosperma* spp. and *Baumea* spp. but where the canopy is more open a variety of shrubs such as *Hypocalymma angustifolium*, *Pericalymma ellipticum*, *Callistachys lanceolata*, *Banksia littoralis*, *Hakea sulcata* become common..
 - 16) ***Melaleuca* - *Kunzea* scrub** occur on the clay flats near Wimbalup Swamp, dominant melaleucas include *M. viminalis*, *M. densa*, *M. ?spathulata*. The annual herb layer is again very diverse with an aquatic flora (eg *Schoenus natans*, *Villarsia submersa*) giving way to a sequence of annual Asteraceae, Centrolepidaceae, Cyperaceae and Stylidiaceae as the wetlands dries.
 - 17) ***Melaleuca densa* - *Melaleuca viminea* heath** was a widespread unit in the northern area of the reserve occupying both sandy and sandy clay substrates. These areas are winter wet and dry slowly in late spring and early summer. Aquatic taxa such as *Schoenus natans* and *Villarsia* spp. are widespread in early spring giving way to herbs as the wetlands dry. It was in this community that *Euphrasia scabra* was found, this was first collection made in WA since Morrison's collection from Yetemerup Spring (Stirling Range) in 1902. Two large populations were located and more populations could be expected to be found.
 - 18) ***Melaleuca densa* - *Melaleuca viminea* thicket** can develop long inundated sites, here diversity drops as the canopy closes over.
 - 19) **Mixed *Melaleuca* heath** occurs in low lying flats in the southern half of the reserve. Composition is variable *Sphaerolobium vimineum*, *Eutaxia virgata*, *Hakea ceratophylla*, *Aotus intermedia*, and *Calothamnus lateralis* are common. On small rises this unit intergrades with the sandy Jarrah unit (unit 2). In the wettest areas it give way to the wet heath unit (unit 21) often dominated by *Pericalymma ellipticum*. Units 17, 18 and 19 occupy similar positions in the landscape and may reflect differences in fire age and / or period of winter inundation.
 - 20) ***Hakea prostrata* heath** is a very small unit in Lake Muir but has essentially the same species composition to the same unit in Galamup Nature Reserve.

- 21) **Wet heath** occupy very wet sandy sites and are generally dominated by *Pericalymma ellipticum* and *Lepidosperma longitudinale*. On more clayey substrates this community grades into the *Melaleuca* shrublands (units 16 - 19). This unit is most common in the northern part of the reserve.
- 22) ***Gahnia* sedgeland** occurs in the shallow swales along the edge of Lake Muir, this community is very species poor being dominated by *Gahnia trifida*. This unit grades into unit 11.
- 23) **Open *Baumea* sedgeland** occupy basin wetlands. In the deeper water *Baumea articulata* is the sole dominate, closer to the shore *B. juncea* and *B. arthropphylla*. Around the edge of these wetlands taxa such as *Utricularia australis*, *Cotula coronopifolia*, *Centrolepis polygyna*, *Juncus bufonius*, *Villarsia albiflora* and *Microtis atrata* can also be found.
- 24) **Closed *Baumea* sedgeland** occupy basin wetlands and is essentially similar to unit 23, however the *Baumea articulata* tends to be denser.
- 25) **Dying *Baumea* sedgeland**. The *Baumea articulata* in Byenup Lagoon appears to be dying on the aerial photography taken on the 23rd October 1995 (WA3619-5051). This photo shows most of the sedgeland to be bright orange in colour, generally indicative of stress. Recent aerial inspection found a recovery of the sedgeland but that the sedgeland now appears more open than in 1995. It is not clear to the cause of this apparent decline but it does coincide with a 10 year peak in salinity levels in the lagoon (JAK Lane, pers. comm.).
- 26) **Riparian vegetation** (not mapped). Incised creek lines had a narrow but distinctive vegetation unit associated with them, this unit was too small to map. The overstorey of *Agonis* or *Callistachys* with a dense shrub layer of *Brachysema melanopetalum*. The poorly collected orchid *Gastrodia lacista* was found in these habitats.
- 27) **Samphire flats** occur along the shore of Lake Muir between the shore and the *Gahnia* sedgeland. Common species include *Halosarcia indica*, *Halosarcia leptoclada*, *Sarcocornia quinqueflora*, *Suaeda australis* and *Wilsonia backhousei*.
- 28) **Cleared land** occurs on a portion of the reserve north west of Byenup Lagoon, this area is largely covered by pasture grasses and weeds, some revegetation of the shrub and tree layer is occurring. A block of private land west of Poorginup Swamp has previously been cleared, it is also slowly revegetating.
- 29) ***Armillaria* affected shrubland**. Part of the *Melaleuca preissiana* - *Kunzea sulphurea* woodland north of Poorginup Swamp appears to be affected by canker, possibly *Armillaria*. This needs further investigation.
- 30) **Open water** occurs on most of the larger basin wetlands.
- 31) **Yate woodland on sand dunes** replace the more widespread fringing *E. rudis* woodlands (vegetation unit 8) on the eastern shore of Lake Muir.

Vegetation change: The three images of wetlands to the east of Lake Muir from April 1980 (Photo 19 - JAK Lane, unpub data) show little change with recent aerial photography. The photo of Byenup Lagoon (Photo 20 - JAK Lane, unpub data) shows healthy *Baumea* sedgeland, dense around open water and more interspersed with clumps of *Melaleuca* and small patches of open water away from the major water body. As outlined above (vegetation unit 25) 1995 aerial photography appears to show the *Baumea* in a very stressed condition. Recent aerial survey indicates the *Baumea* sedgeland is in good condition but appears to have become more open.

Disturbance or threats: a) Drainage patterns and salinity levels in Byenup Lagoon should be investigated as a matter of priority in an attempt to identify the cause of the apparent collapse of the *Baumea* sedgeland in this wetland. A time series of aerial photos should be assembled to confirm if the health of the *Baumea* sedgeland is correlated with salinity levels. If this proves to be the case then management of salt loads in the lagoon would need to be kept well below the 1995 levels.

b) A series of illegal drains have been constructed into the eastern side reserve during the course of this study. Significant impacts due to salinity and changes to inundation period could be expected.

c) The private land block west of Poorginup Swamp should be acquired to protect Tordit-Gurrup Lagoon and Poorginup Swamp, these are two of the wetland systems in the best condition within the Lake Muir reserve. Any attempt to farm this land could put them at serious risk.

d) Vegetation unit 29 needs investigation to determine if it is a result of fungal canker.

Family

Map Unit

1 2 4 6 7 8 9 10 12 12/21 13 14 15 16 17/18 18 19 20 23 23/24 26 27 28

Table 7 - Lake Muir Nature Reserve flora list

Alzooaceae

Carpobrotus modestus 1 1 1 1

Amaranthaceae

Alternanthera nodiflora 1
Hemichroa diandra 1
Ptilotus drummondii 1
Ptilotus manglesii 1 1

Anthericaceae

Agrostocrinum scabrum 1
Arthropodium capillipes 1
Arthropodium preissii 1
Borya scirpoidea 1
Caesia micrantha 1 1
Caesia occidentalis 1 1
Chamaescilla corymbosa 1 1
Chamaescilla spiralis 1
Johnsonia acaulis 1 1
Johnsonia lupulina 1
Laxmannia minor 1
Laxmannia sessiliflora 1
Sowerbaea laxiflora 1 1
Thysanotus multiflorus 1 1
Thysanotus patersonii 1
Thysanotus tenellus 1
Thysanotus thyrsoides 1 1
Tricoryne elatior 1 1
Tricoryne humilis 1
Tricoryne tenella 1

Aptaceae

Actinotus glomeratus 1
Actinotus omnifertilis 1
Apium annuum 1
Apium prostratum 1
Centella cordifolia 1
Daucus glochidiatus 1 1
Eryngium pinnatifidum 1
Eryngium sp. Lake Muir (E. Wittwer 1193) PN 1
Homalosciadium homalocarpum 1 1
Hydrocotyle alata 1
Hydrocotyle diantha 1
Hydrocotyle pilifera 1
Lilaeopsis polyantha 1
Platysace haplosciadia 1
Platysace filiformis 1
Schoenolaena juncea 1

Family	Map Unit																											
	1	2	4	6	7	8	9	10	12	12/21	13	14	15	16	17/18	18	19	20	23	23/24	26	27	28					
Schoenolaena tenuior										1																		
Trachymene pilosa	1	1					1																					
Xanthosia candida	1						1																					
Xanthosia huegelii		1					1					1																
Asteraceae																												
Angianthus preissianus				1						1																		
Angianthus sp.										1																		
* Arctotheca calendula					1																			1				
* Aster subulatus															1									1				
Asteridea pulverulenta	1	1																										
Blennospora drummondii										1																		
Blennospora sp.										1																		
Brachyscome bellidioides										1																		
Brachyscome iberidifolia	1																											
Calotis erinacea							1																					
* Carduus pycnocephalus				1			1			1																		
* Centaurea melitensis				1																								
* Cirsium vulgare										1				1														
* Conyza albida		1								1														1				
Cotula australis					1								1											1				
Cotula coronopifolia										1										1				1				
Cotula cotuloides										1														1				
* Cotula turbinata					1																							
Craspedia variabilis		1														1												
* Dittrichia graveolens				1																				1				
Euchiton gymnocephalus										1																		
Euchiton sphaericus		1																										
Gnephosis sp.																	1											
* Hedypnois rhagadioloides																						1						
Hyalosperma cotula	1									1			1															
* Hypochaeris glabra		1	1		1											1								1				
Ixiolaena viscosa		1																										
* Lactuca serriola							1																	1				
Lagenifera huegelii	1	1											1															
Millotia myosotidifolia		1																										
Millotia tenuifolia		1																										
Olearia axillaris										1																		
Olearia elaeophila													1							1								
Podolepis gracilis					1					1			1															
Podolepis lessonii					1																							
Podotheca angustifolia		1																										
Pogonolepis stricta										1																		
* Pseudognaphalium luteoalbum							1																					
Pterochaeta paniculata	1	1																										
Quinetia urvillei		1											1															
Rhodanthe pyrethrum										1						1												
Rutidosia multiflora				1	1					1																		

[illegible]

Family

Map Unit

	1	2	4	6	7	8	9	10	12	12/21	13	14	15	16	17/18	18	19	20	23	23/24	26	27	28
Halosarcia leptoclada																						1	
Rhagodia baccata									1														
Sarcocornia quinqueflora																						1	
Suaeda australis																						1	
Clusiaceae																							
Hypericum gramineum			1			1																	
Colchicaceae																							
Burchardia congesta		1										1											
Burchardia monantha							1					1				1							
Burchardia multiflora																1	1						
Wurmbea dioica									1							1							
Convolvulaceae																							
Dichondra repens									1								1						
Wilsonia backhousei																						1	
Crassulaceae																							
Crassula colorata	1	1				1		1															
* Crassula natans									1				1										1
Crassula pedicellosa																1							
Crassula peduncularis		1				1																	
Cupressaceae																							
Actinostrobus acuminatus												1											
Actinostrobus pyramidalis									1														
Cyperaceae																							
Baumea arthropphylla																				1			
Baumea articulata													1							1			
Baumea juncea													1							1			
Baumea vaginalis													1										
Carex appressa																					1		
Carex preissii			1																				
Chorizandra enodis									1				1		1								
Cyathochaeta avenacea	1	1		1								1			1								
Cyathochaeta clandestina		1																					
* Cyperus tenellus									1														1
Gahnia ancistrophylla							1																
Gahnia trifida									1						1								
Isolepis cernua									1			1											
Isolepis cyperoides									1														
Isolepis fluitans									1				1										
* Isolepis marginata		1										1											
Isolepis nodosa			1			1																	
Isolepis oldfieldiana									1			1											
Isolepis producta									1														
* Isolepis prolifera																					1		
Isolepis stellata									1			1											
Lepidosperma angustatum	1																						
Lepidosperma gladiatum													1							1			
Lepidosperma longitudinale												1	1		1				1				

[illegible]

[illegible]

Family	Map Unit																											
	1	2	4	6	7	8	9	10	12	12/21	13	14	15	16	17/18	18	19	20	23	23/24	26	27	28					
Patersonia occidentalis		1	1				1					1																
Patersonia occidentalis (swamp form)													1							1								
Patersonia umbrosa	1																											
* Romulea rosea																								1				
Isoetaceae																												
Isoetes drummondii								1								1												
Juncaceae																												
* Juncus bufonius										1						1	1			1								
* Juncus capitatus										1										1								
Juncus kraussii																				1		1						
Juncus pallidus						1							1											1				
Luzula meridionalis		1										1																
Juncaginaceae																												
Triglochin calcitrapum				1																								
Triglochin centrocarpum				1						1																		
Triglochin huegelii													1															
Triglochin lineare										1			1			1	1											
Triglochin minutissimum										1													1					
Triglochin mucronatum										1													1					
Triglochin striatum										1				1														
Lamiaceae																												
Hemiandra pungens	1	1					1																					
Lauraceae																												
Cassytha flava		1										1																
Cassytha glabella					1							1				1												
Cassytha micrantha																1												
Cassytha racemosa		1			1					1		1																
Lentibulariaceae																												
Polypompholyx multifida												1				1												
Polypompholyx tenella										1						1												
Utricularia australis																				1								
Utricularia inaequalis										1						1												
Utricularia simplex													1			1												
Utricularia sp.															1													
Utricularia violacea										1						1												
Utricularia volubilis																				1								
Linaceae																												
Linum marginale		1		1																								
Lindsaeaceae																												
Lindsaea linearis		1																										
Lobellaceae																												
Isotoma hypocrateriformis	1	1														1												
Isotoma scapigera										1																		
Lobelia alata												1	1															
Lobelia gibbosa					1					1																		
Lobelia rhombifolia	1															1												
Loganiaceae																												

Family

Map Unit

[illegible]

Family	1	2	4	6	7	8	9	10	12	12/21	13	Map Unit															16	17/18	18	19	20	23	23/24	26	27	28
Agonis linearifolia																	1																			
Agonis parviceps		1			1		1						1																							
Astartea fascicularis					1									1																						
Astartea sp. (pink weeping)								1					1																							
Astartea sp. (white erect)								1					1																							
Baeckea camphorosmae	1												1																							
Baeckea pygmaea								1																												
Calothamnus lateralis													1						1																	
Calothamnus lehmannii																				1																
Calytrix angulata	1																																			
Calytrix flavescens							1																													
Calytrix leschenaultii														1																						
Darwinia oederoides		1												1																						
Darwinia vestita					1																															
Eucalyptus calophylla		1																																		
Eucalyptus cornuta				1																																
Eucalyptus decipiens		1			1																															
Eucalyptus marginata	1	1																																		
Eucalyptus megacarpa					1																															
Eucalyptus occidentalis				1																																
Eucalyptus patens		1																																		
Eucalyptus rudis						1																														
Hypocalymma angustifolium								1									1																			
Kunzea ericifolia					1		1							1																						
Kunzea micrantha		1								1				1																						
Kunzea recurva														1																						
Kunzea sulphurea														1																						
Melaleuca cordata														1																						
Melaleuca cuticularis										1				1																						
Melaleuca densa								1						1																						
Melaleuca lateriflora														1																						
Melaleuca lateritia								1						1																						
Melaleuca leptoclada																																				
Melaleuca preissiana										1				1																						
Melaleuca pritzelii								1																												
Melaleuca raphiophylla																																				
Melaleuca spathulata										1							1																			
Melaleuca thymoides		1					1																													
Melaleuca viminea										1				1																						
Melaleuca violacea														1																						
Pericalymma ellipticum														1			1																			
Verticordia densiflora														1																						
Verticordia densiflora subsp. caespitosa														1																						
Verticordia habrantha																																				
Verticordia plumosa																											1									
Olacaceae														1																						
Olax phyllanthi										1																										

Family

	1	2	4	6	7	8	9	10	12	12/21	13	Map Unit		16	17/18	18	19	20	23	23/24	26	27	28
Onagraceae																							
Epilobium billardierianum														1									
Ophloglossaceae																							
Ophioglossum lusitanicum									1														
Orchidaceae																							
Caladenia caesarea																			1				
Caladenia caesarea subsp. caesarea MS									1														
Caladenia christineae MS					1								1										
Caladenia drummondii					1								1										
Caladenia ferruginea													1						1				
Caladenia flava	1												1										
Caladenia harringtoniae									1														
Caladenia latifolia					1																		
Caladenia longicauda		1											1										
Caladenia longiclavata		1																					
Caladenia macrostylis							1																
Caladenia marginata	1	1																					
Caladenia nana													1			1							
Caladenia radiata									1	1						1							
Caladenia reptans		1																					
Caladenia starteorum MS			1																				
Caladenia varians subsp. varians MS							1																
Corybas recurvus														1									
Cryptostylis ovata	1				1									1									
Cyanicula deformis MS	1												1										
Cyanicula gemmata MS	1																						
Cyrtostylis huegelii					1								1										
Diuris drummondii													1										
Diuris laxiflora									1							1							
Diuris longifolia	1	1																					
Drakaea glyptodon		1					1																
Drakaea livida		1					1																
Drakonorchis barbarossa MS														1									
Elythranthera brunonis	1	1											1										
Elythranthera emarginata		1							1				1			1							
Eriochilus dilatatus	1																						
Eriochilus dilatatus subsp. undulatus MS		1					1																
Gastrodia lacista																					1		
Leporella fimbriata		1																					
Leptoceras menziesii		1																					
Microtis atrata									1											1			
Microtis media		1									1					1							
Microtis orbicularis									1														
* Monadenia bracteata			1											1									1
Paracaleana nigrita	1																						
Praecoxanthus aphyllus MS							1																
Prasophyllum drummondii																1							

[illegible]

Family

	1	2	4	6	7	8	9	10	12	12/21	13	Map Unit		16	17/18	18	19	20	23	23/24	26	27	28
Gompholobium tomentosum		1											1										
Hardenbergia comptoniana					1																		
Hovea chorizemifolia	1	1																					
Hovea elliptica	1																						
Hovea trisperma													1										
Hovea trisperma var. grandiflora	1																						
Isotropis cuneifolia	1																						
Jacksonia furcellata		1										1											
Jacksonia sparsa MS		1						1															
Kennedia coccinea		1																					
Kennedia prostrata	1	1											1										
Latrobea tenella													1										
* Lotus angustissimus			1										1			1							1
* Ornithopus compressus					1																		1
Oxylobium lineare														1									
Pultenaea ericifolia								1															
Pultenaea ochreatea		1						1															
Pultenaea reticulata		1			1								1										
Sphaerolobium linophyllum		1																					
Sphaerolobium medium	1	1																					
Sphaerolobium vimineum		1												1		1							
* Trifolium arvense							1																
* Trifolium campestre			1				1																1
* Trifolium dubium			1							1													1
* Trifolium fragiferum							1																
* Trifolium glomeratum							1																
* Trifolium repens							1																1
* Trifolium subterraneum							1																1
Viminaria juncea					1								1	1									
Phlydraceae																							
Philydrella drummondii																							
Philydrella pygmaea										1													
Phormiaceae																							
Dianella brevicaulis					1																		
Dianella revoluta		1						1		1													
Stypandra glauca			1																				
Pinaceae																							
* Pinus pinaster																							1
Pittosporaceae																							
Billardiera candida	1	1																					
Billardiera variifolia	1	1																					
Sollya heterophylla		1					1			1													
Plantaginaceae																							
Plantago exilis							1																
Poaceae																							
Agrostis avenacea			1							1													
* Aira caryophyllea		1												1			1						1

[illegible]

Family

Family	Map Unit																											
	1	2	4	6	7	8	9	10	12	12/21	13	14	15	16	17/18	18	19	20	23	23/24	26	27	28					
* Rumex acetosella			1		1																							
* Rumex brownii		1																										
* Rumex crispus																												
* Rumex pulcher																												
Portulacaceae																												
Calandrinia composita									1																			
Montia australasica													1															
Potamogetonaceae																												
Potamogeton tricarinatus																					1							
Ruppia megacarpa																					1							
Primulaceae																												
* Anagallis arvensis var. arvensis			1																									
* Anagallis arvensis var. caerulea			1																									
Samolus caespitosus									1												1							
Samolus junceus					1			1		1				1									1					
Proteaceae																												
Adenanthos obovatus								1					1															
Banksia grandis	1	1											1	1														
Banksia ilicifolia								1																				
Banksia littoralis													1	1														
Conospermum flexuosum																1												
Dryandra armata	1																											
Dryandra bipinnatifida		1																										
Dryandra lindleyana	1							1																				
Franklandia fucifolia								1																				
Grevillea brownii	1							1																				
Hakea ceratophylla					1																							
Hakea lissocarpa	1	1						1								1												
Hakea oleifolia		1		1				1																				
Hakea prostrata								1																				
Hakea ruscifolia	1													1		1												
Hakea sulcata										1			1	1		1												
Hakea trifurcata	1	1																										
Hakea undulata	1													1														
Hakea varia					1																							
Isopogon polycephalus				1																								
Isopogon teretifolius	1																											
Persoonia longifolia	1	1																										
Petrophile media										1			1															
Petrophile serruriae	1																											
Petrophile squamata	1																											
Stirlingia tenuifolia													1															
Synaphea decumbens		1																										
Synaphea petiolaris	1	1																										
Ranunculaceae																												
Clematis pubescens		1			1																							
Ranunculus colonorum	1				1									1														

[illegible]

Family

Map Unit

	1	2	4	6	7	8	9	10	12	12/21	13	14	15	16	17/18	18	19	20	23	23/24	26	27	28
Schizaeaceae																							
Schizaea dichotoma														1									
Scrophulariaceae																							
* Bartsia trixago																1							1
Euphrasia scabra																1							
Glossostigma diandrum									1														
Glossostigma drummondii									1								1						
Gratiola peruviana					1				1														
* Parentucellia latifolia																1	1						1
* Parentucellia viscosa					1												1						1
Selaginellaceae																							
Selaginella gracillima									1			1			1								
Solanaceae																							
* Solanum americanum														1									
* Solanum nigrum					1				1			1	1										1
Stackhousiaceae																							
Stackhousia monogyna		1																					
Tripterococcus brunonis		1											1	1									
Sterculiaceae																							
Guichenotia sp									1														
Rulingia corylifolia					1								1										
Thomasia foliosa				1																			
Thomasia paniculata									1														
Thomasia pauciflora	1				1																		
Stylidiaceae																							
Levenhookia pusilla		1											1										
Levenhookia stipitata		1											1										
Stylidium adnatum	1																						
Stylidium amoenum	1	1																					
Stylidium assimile					1									1									
Stylidium brunonianum subsp. minor	1	1					1																
Stylidium calcaratum	1	1																					
Stylidium corymbosum								1															
Stylidium crassifolium									1				1			1							
Stylidium ecorne									1				1			1							
Stylidium emarginatum																							
Stylidium guttatum									1				1										
Stylidium hispidum	1	1																					
Stylidium inundatum									1														
Stylidium junceum	1																						
Stylidium lepidum										1													
Stylidium periscelanthum																1	1						
Stylidium perpusillum																	1						
Stylidium petiolare									1														
Stylidium pulchellum									1							1							
Stylidium repens		1					1						1										
Stylidium rhipidium									1							1							

Family

Map Unit

	1	2	4	6	7	8	9	10	12	12/21	13	14	15	16	17/18	18	19	20	23	23/24	26	27	28
Stylidium scandens												1											
Stylidium schoenoides		1																					
Stylidium sp.													1										
Stylidium spathulatum	1	1										1	1		1								
Stylidium spinulosum		1																					
Thymelaeaceae																							
Pimelea angustifolia		1										1											
Pimelea argentea					1																		
Pimelea ciliata	1																						
Pimelea cracens subsp. cracens												1											
Pimelea imbricata var. gracillima								1	1							1							
Pimelea imbricata var. piligera		1																					
Pimelea rosea	1																						
Pimelea suaveolens	1																						
Pimelea sylvestris	1																						
Tremandraceae																							
Platytheca galioides												1											
Tetradthea hirsuta		1																					
Tetradthea nuda		1																					
Tetradthea setigera		1																					
Tremandra diffusa		1																					
Tremandra hirsuta		1																					
Typhaceae																							
Typha domingensis																				1			
* Typha orientalis																				1			
Urticaceae																							
Parietaria debilis								1															
Violaceae																							
Hybanthus debilissimus		1																					
Hybanthus floribundus	1																						
Xanthorrhoeaceae																							
Xanthorrhoea gracilis	1																						
Xanthorrhoea preissii	1	1		1																			
Zamiaceae																							
Macrozamia riedlei		1										1											
Zannichelliaceae																							
Lepilaena australis																				1			

Salinity Action Plan

Lake Muir-Unicup Recovery Catchment

Lake Muir Nature Reserve Res 31880
Cowerup Nature Reserve Res 33455

- 1 Jarrah - Marri forest and woodland on laterite
- 2 Jarrah - Marri open woodland on sand
- 3 Jarrah - Marri woodland over Agonis scrub
- 4 Jarrah - Yate woodland
- 5 Jarrah woodland over Hakea oleifolia heath
- 6 Eucalyptus decipiens woodland
- 7 Eucalyptus rudis woodland
- 8 Eucalyptus rudis woodland on sand dunes
- 9 Banksia ilicifolia woodland
- 10 Melaleuca cuticularis complex
- 11 Melaleuca cuticularis woodland over Gahnia sedgeland
- 12 Melaleuca cuticularis woodland over wet heath
- 13 Melaleuca preissiana - Kunzea sulphurea woodland
- 14 Melaleuca preissiana woodland over wet heath
- 15 Melaleuca raphiophylla forest
- 16 Melaleuca - Kunzea scrub
- 17 Melaleuca densa - Melaleuca viminea heath
- 18 Melaleuca densa - Melaleuca viminea thicket
- 19 Melaleuca spathulata heath
- 20 Hakea prostrata heath
- 21 Wet heath
- 22 Gahnia sedgeland
- 23 Open Baumea sedgeland
- 24 Closed Baumea sedgeland
- 25 Dying Baumea sedgeland
- 26 Riparian vegetation
- 27 Samphire flats
- 28 Cleared land
- 29 Armillaria affected shrubland
- 30 Open water
- 31 Yate woodland on sand dune

- Sealed Road
- Unsealed Road
- - - Vehicular Track

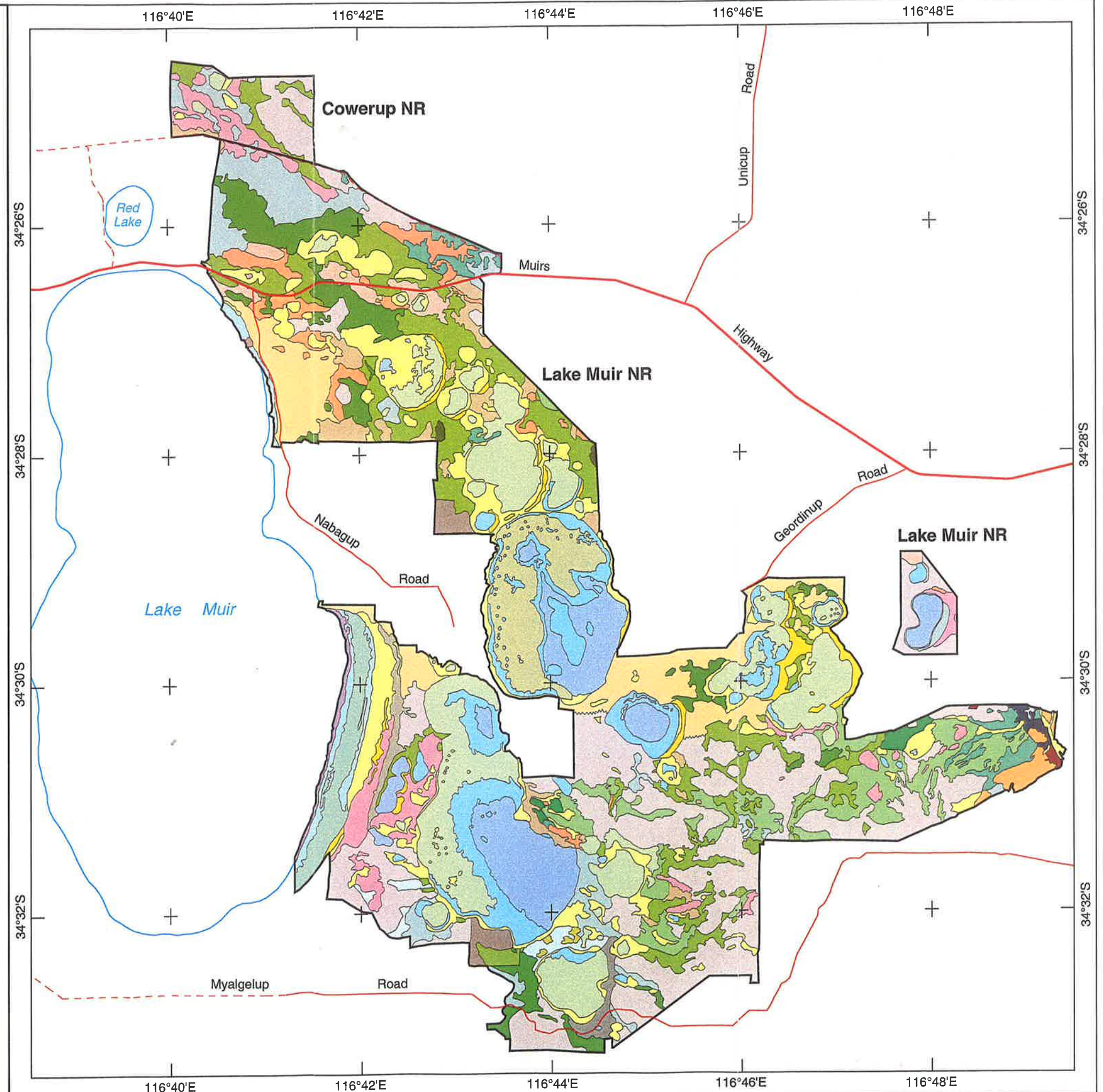


Scale
0 100 200 300 400 m



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DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Job Number: IMB 98017127



Noobijup Nature Reserve

Reserve number: 26680

Class: A

Location: 34 24 18S 116 47 11E;

Land tenure : Nature Reserve

Purpose : Water & Conservation of flora and fauna

Area: 183 ha

Biological values

Flora: Three hundred and forty eight taxa have been recorded from the reserve (Table 8) including four priority taxa (*Anthotium junciforme* (Priority 4), *Leucopogon tamariscinus* (Priority 2), *Rhodanthe pyrethrum* (Priority 3), and *Villarsia submersa* (Priority 4)).

Vegetation description: Nine vegetation units have been mapped in the reserve. These include one clearly resulting from salinity and raised water tables (Map 6). More detailed vegetation mapping has recently been undertaken (D. Gardner, pers. comm.).

- 1) **Jarrah - Marri forest and woodland** on laterite occur in the south west and along the eastern boundary of the reserve. Species composition is similar to that described previously on this surface with a diverse understorey of shrub, herbs and grasses. Typical understorey shrubs include *Astroloma* spp., *Leucopogon* spp. and peas such as *Bossiaea* spp. and *Gompholobium* spp. *Xanthorrhoea gracilis*, *Thysanotus* spp. and *Dryandra armata* are also typical of this community.
- 2) **Jarrah - Marri open woodland on sand** occurs on the flats around the lake. Within this unit some minor lateritic ridges occur on the eastern side of the lake. Typical understorey elements include *Hakea ruscifolia*, *Hakea prostrata*, *Dryandra lindleyana*, *Hibbertia* spp., *Astroloma ciliatum*, *Mesomelaena tetragona*, *Lepidosperma* spp. and *Mesomelaena tetragona* and a diverse array of annual Asteraceae and Anthericaceae. Close to the lake edge *Agonis juniperina*, *Hypocalymma angustifolium*, *Pericalymma ellipticum* and *Lepidosperma longitudinale* become more common.
- 3) ***Eucalyptus decipiens* open woodland** occurs on the clayey soils in the north west corner of the reserve. This unit is essentially similar to that described for Lake Muir and Galamup Nature Reserves. The understorey is diverse in both shrubs and herbs and the dominants include *Calothamnus lateralis*, *Kunzea micrantha*, *Hakea varia* and *Daviesia incrassata*. The unit grades into the wet heath on clay flats (unit 6) which occupies the more water logged sites.
- 4) ***Melaleuca raphiophylla* - *Eucalyptus rudis* open woodland** occurs on a small wet flat near the eastern boundary of the reserve. The understorey is dominated by a pink weeping species of *Astartea* and *Calothamnus lateralis*.
- 5) ***Melaleuca raphiophylla* low forest** occurs as a narrow band on the eastern margin of the lake with *Lepidosperma longitudinale* being the dominant element in the understorey.
- 6) **Wet heath on clay flats** are floristically diverse both in terms of the shrub and herb layers. This unit is dominated by *Melaleuca densa*, *M. lateritica*, and *M. raphiophylla* and becomes inundated in winter. As the wetland dries aquatic species such as *Villarsia submersa*, and *Schoenus natans* dominate to be replaced by a diverse herbland which includes *Rhodanthe pyrethrum*, *Anthotium junciforme*, *Tribonanthes violacea*, *Trithuria bibracteata*, *Trithuria submersa*, *Polypompholyx multifida*, and *Utricularia inaequalis*. Perennial rushes are also a obvious component of this wetland (primarily *Leptocarpus tenax*, *Lepyrodia muii* and *Meeboldina cana*). Three of the four priority taxa recorded for the reserve are found in this area. Rising water table and salt intrusion from the private property to the east is having a significant impact this vegetation.
- 7) **Open *Baumea* sedgeland** occurs in the northern portion of Lake Noobijup and is dominated by *Baumea articulata* in deeper water, closer to the shore *Triglochin huegelii* and *Villarsia albiflora* are also found. This vegetation unit is very species poor.
- 8) **Closed *Baumea* sedgeland** is essentially similar to unit 7, however the *Baumea articulata* tends to be denser.
- 9) **Salt affected vegetation** occurs on the western and southern edges of the reserve and is caused by rising watertable and increasing salinity coming off private property. Initially the herbaceous layer is killed followed by shrub layer and finally the tree cover. The area of

impact appears to be spreading north through the wet heath on the western side of the reserve.

Vegetation change: Oblique air photos from April 1980 (Photo 21 - JAK Lane, unpub data) show the firebreak along the western boundary had recently been cleared as had an area of bushland on the private property that has now been inundated by rising ground water. The area of wet heath that has subsequently destroyed by the rise in ground water (and increases in salinity) in good condition in the 1980 photography. Further clearance along the western boundary has taken place since 1980. The *Baumea* sedgeland in Lake Noobijup appears to be denser in the 1980 photography. Permanent long term monitoring sites (as part of the Salinity Action Plan wetland monitoring program) have been set up in the Lake Noobijup Nature Reserve (Odgen & Froend 1998).

Disturbance or threats: Rising ground water on the western side of the reserve since clearance in 1980 has resulted in destruction of high diversity seasonal clay pan communities. The area impacted is continuing to increase. The vegetation in the Lake itself appears to be becoming less dense. It appears that saline water is entering the Lake from the south, the north (at times of high flow) and perhaps from the west via ground water.

Family**Map Units**

1 2 3 4/5 5 6 8 9

Table 8 - Noobijup Nature Reserve flora list**Amaranthaceae**

Ptilotus manglesii

1

Anthericaceae

Agrostocrinum scabrum

1 1

Arthropodium preissii

1

Caesia micrantha

1

Caesia occidentalis

1

Chamaescilla corymbosa

1

Johnsonia acaulis

1

Johnsonia lupulina

1

Sowerbaea laxiflora

1

Thysanotus patersonii

1

Thysanotus tenellus

1

Thysanotus thyrsoides

1

Thysanotus triandrus

1

Tricoryne elatior

1

Tricoryne humilis

1

Tricoryne tenella

1 1

Apiaceae

Daucus glochidiatus

1

Eryngium ?pinnatifidum

1

1

Homalosciadium homalocarpum

1

Hydrocotyle alata

1

Hydrocotyle callicarpa

1

Platysace filiformis

1

Schoenolaena tenuior

1

Trachymene pilosa

1

Xanthosia candida

1

Xanthosia huegelii

1 1

Asteraceae

Angianthus preissianus

1

Asteridea athrixoides

1

Blennospora drummondii

1

Brachyscome iberidifolia

1

Cotula coronopifolia

1

Craspedia variabilis

1

Euchiton sphaericus

1

Hyalosperma cotula

1

* Hypochaeris glabra

1

Lagenifera huegelii

1

Milotia tenuifolia

1

Podolepis gracilis

1

Podotheca angustifolia

1

Quinetia urvillei

1

Rhodanthe citrina

1

Rhodanthe pyrethrum

1

Senecio glomeratus

1

Senecio minimus

1

Siloxerus humifusus

1

* Sonchus asper

1

* Sonchus oleraceus

1

Trichocline spathulata

1

* Vellereophyton dealbatum

1

Campanulaceae

Wahlenbergia multicaulis

1

Wahlenbergia preissii

1

Caryophyllaceae

* Cerastium glomeratum

1

* Petrorhagia velutina

1

* Spergularia salina

1

Casuarinaceae

Allocasuarina humilis

1

Allocasuarina lehmanniana

1

Centrolepidaceae

Aphelia cyperoides

1

Brizula drummondii

1

Centrolepis aristata

1

Centrolepis drummondiana

1

Centrolepis glabra

1

Centrolepis polygyna

1

1

Chenopodiaceae

Halosarcia indica

1

Colchicaceae

Family**Map Units**

	1	2	3	4/5	5	6	8	9
Burchardia congesta		1						
Burchardia monantha					1			
Burchardia multiflora					1			
Crassulaceae								
Crassula colorata		1						
* Crassula natans					1			
Crassula peduncularis		1						
Cupressaceae								
Actinostrobus pyramidalis	1							
Cyperaceae								
Baumea articulata							1	
Baumea juncea		1		1	1			
Chorizandra enodis					1			1
Cyathochaeta avenacea		1	1		1			
* Cyperus tenellus						1		
Gahnia trifida					1			1
Isolepis cernua					1			
* Isolepis marginata		1						
Isolepis nodosa		1						
Isolepis oldfieldiana						1		
Lepidosperma angustatum		1						
Lepidosperma longitudinale					1			
Lepidosperma squamatum		1						
Lepidosperma ?tenua		1						
Mesomelaena stygia			1					
Mesomelaena tetragona		1						
Schoenus bifidus			1					
Schoenus ?efolius					1			
Schoenus elegans					1			
Schoenus sp.	1							
Schoenus tenellus						1		
Tetraria capillaris		1						
Tetraria octandra		1						
Tricostularia compressa		1						
Dasypogonaceae								
Chamaexeros serra		1	1					
Dasypogon bromeliifolius		1						
Lomandra caespitosa		1						
Lomandra collina		1						
Lomandra micrantha	1		1					
Lomandra sericea	1	1						
Lomandra sonderi		1						
Dennstaedtiaceae								
Pteridium esculentum	1							
Dilleniaceae								
Hibbertia amplexicaulis		1						
Hibbertia commutata	1	1						
Hibbertia cunninghamii	1	1						
Hibbertia racemosa		1						
Hibbertia spicata			1					
Hibbertia stellaris					1	1		
Droseraceae								
Drosera bulbosa			1					
Drosera erythrorhiza		1						
Drosera gigantea		1	1					
Drosera glanduligera		1						
Drosera macrantha		1						
Drosera menziesii			1					
Drosera neesii						1		
Epacridaceae								
Astroloma baxteri	1							
Astroloma ciliatum	1	1						
Astroloma pallidum	1							
Leucopogon australis	1							
Leucopogon capitellatus		1						
Leucopogon glabellus		1	1					
Leucopogon pendulus	1							
Leucopogon propinquus		1						
Leucopogon ?sprengelioides	1							
Leucopogon tamariscinus		1						
Leucopogon verticillatus	1							
Styphelia tenuiflora	1							
Euphorbiaceae								
Phyllanthus calycinus		1	1					
Poranthera huegelii	1							

Family**Map Units**

	1	2	3	4/5	5	6	8	9
Poranthera microphylla		1						
Gentianaceae								
* Cicendia filiformis						1		
Geraniaceae								
Pelargonium littorale					1			
Goodeniaceae								
Anthotium junciforme						1		
Dampiera alata		1						
Dampiera cuneata			1					
Goodenia micrantha					1			
Goodenia mimuloides					1			
Scaevola phlebopetala	1							
Velleia trinervis		1						
Haemodoraceae								
Anigozanthos bicolor					1			
Anigozanthos manglesii		1						
Conostylis aculeata		1						
Conostylis laxiflora		1						
Conostylis setigera	1							
Haemodorum laxum	1							
Haemodorum sparsiflorum				1				
Haemodorum spicatum		1						
Tribonanthes longipetala					1			
Tribonanthes violacea						1		
Haloragaceae								
Glischrocaryon aureum		1						
Gonocarpus paniculatus	1							
Myriophyllum crispatum							1	
Hydatellaceae								
Trithuria bibracteata					1	1		
Trithuria submersa						1		
Hypoxidaceae								
Hypoxis occidentalis						1		
Iridaceae								
Patersonia juncea	1							
Patersonia occidentalis		1						
Patersonia occidentalis (swamp form)					1			
Isoetaceae								
Isoetes drummondii						1		
Juncaceae								
* Juncus bufonius								1
Juncus pallidus					1			
Juncaginaceae								
Triglochin centrocarpum						1		
Triglochin huegelii							1	
Triglochin mucronatum					1			
Lamiaceae								
Hemiandra pungens		1						
Lauraceae								
Cassytha racemosa		1						
Lentibulariaceae								
Polypompholyx multifida						1		
Utricularia inaequalis						1		
Linaceae								
Linum marginale		1						
Lindsaeaceae								
Lindsaea linearis		1						
Lobeliaceae								
Lobelia alata				1	1			
Lobelia tenuior		1						
Loganiaceae								
Logania serpyllifolia		1						
Menyanthaceae								
Villarsia albiflora						1	1	
Villarsia submersa						1		
Mimosaceae								
Acacia browniana	1							
Acacia cochlearis		1						
Acacia cyclops		1						
Acacia extensa		1						
Acacia incurva					1	1		
Acacia myrtifolia	1							
Acacia pulchella	1	1						
Acacia saligna		1						
Acacia stenoptera		1						

Family**Map Units**

1 2 3 4/5 5 6 8 9

Myrtaceae

- Agonis juniperina*
Astartea sp. (pink weeping)
Calothamnus lateralis
Eucalyptus calophylla
Eucalyptus decipiens
Eucalyptus marginata
Eucalyptus occidentalis
Eucalyptus rudis
Hypocalymma angustifolium
Kunzea micrantha
Kunzea recurva
Melaleuca cordata
Melaleuca densa
Melaleuca leptoclada
Melaleuca raphiophylla
Melaleuca thymoides
Melaleuca viminea
Melaleuca violacea
Pericalymma ellipticum

Orchidaceae

- Caladenia flava*
Caladenia longicauda
Caladenia radialis
Caladenia radiata
Cryptostylis ovata
Diuris laxiflora
Diuris longifolia
Elythranthera brunonis
Elythranthera emarginata
Lyperanthus serratus
Microtis atrata
Microtis media
Microtis orbicularis
* *Monadenia bracteata*
Prasophyllum elatum
Prasophyllum macrostachyum
Pterostylis recurva
Pyrorchis nigricans
Thelymitra crinita
Thelymitra flexuosa
Thelymitra macrophylla

Orobanchaceae

- * *Orobanche minor*

Oxalidaceae

- Oxalis perennans*

Papilionaceae

- Bossiaea eriocarpa*
Bossiaea linophylla
Bossiaea ornata
Brachysema melanopetalum
Brachysema praemorsum
Callistachys lanceolata
Daviesia incrassata
Daviesia preissii
Gompholobium marginatum
Gompholobium polymorphum
Gompholobium preissii
Gompholobium tomentosum
Hovea trisperma var. *grandiflora*
Isotropis cuneifolia
Jacksonia furcellata
Kennedia coccinea
Kennedia prostrata
Sphaerolobium vimineum
Viminaria juncea

Phylodraceae

- Philydrella pygmaea*

Phormiaceae

- Dianella revoluta*
Stypandra glauca

Pittosporaceae

- Sollya heterophylla*

Poaceae

- * *Aira caryophyllea*

Family**Map Units**

	1	2	3	4/5	5	6	8	9
Amphipogon amphipogonoides		1						
Amphipogon laguroides		1						
Amphipogon turbinatus	1							
* Avena barbata		1					1	
* Briza maxima		1						
* Briza minor		1					1	
Danthonia caespitosa	1	1						
Deyeuxia quadriseta					1			
Hemarthria uncinata					1			
* Holcus lanatus					1			
* Hordeum murinum							1	
Neurachne alopecuroidea		1			1			
Poa poiformis	1							
* Polypogon monspeliensis					1			
Stipa pycnostachya		1						
Tetrarrhena laevis		1						
* Vulpia myuros		1						
Polygalaceae								
Comesperma calymega		1						
Comesperma flavum				1				
Comesperma virgatum	1							
Comesperma volubile	1							
* Polygala myrtifolia								1
Potamogetonaceae								
Ruppia megacarpa								1
Primulaceae								
* Anagallis arvensis		1						
Samolus junceus				1		1		
Proteaceae								
Banksia grandis		1		1				
Banksia littoralis		1		1				
Dryandra armata	1							
Dryandra lindleyana		1						
Grevillea leptobotrys	1							
Hakea lissocarpa	1							
Hakea oleifolia		1						
Hakea prostrata		1	1					
Hakea ruscifolia		1						
Hakea sulcata					1			
Hakea trifurcata	1	1	1					
Hakea undulata	1							
Hakea varia			1	1	1			
Isopogon polycephalus		1						
Isopogon teretifolius	1							
Persoonia longifolia	1	1						
Petrophile media	1		1					
Petrophile serruriae	1							
Petrophile squamata	1							
Synaphea ?favosa		1						
Synaphea petiolaris	1	1						
Restionaceae								
Anarthria laevis				1				
Anarthria prolifera		1						
Desmocladius fasciculatus MS		1						
Desmocladius flexuosus MS		1						
Harperia lateriflora			1					
Hypolaena exsulca		1						
Leptocarpus tenax						1		
Lepyrodia drummondiana						1		
Lepyrodia muiirii					1	1		
Lyginia barbata		1						
Meeboldina cana MS					1	1		
Rhamnaceae								
Trymalium ledifolium			1					
Rosaceae								
* Acaena echinata	1							
Rubiaceae								
Opercularia apiciflora	1	1						
Opercularia hispidula		1						
Opercularia vaginata		1						
* Sherardia arvensis								1
Rutaceae								
Boronia crenulata	1							
Boronia megastigma				1	1			
Boronia spathulata		1	1					

*Family**Map Units*

1 2 3 4/5 5 6 8 9

Santalaceae

Leptomeria cunninghamii

Leptomeria scrobiculata

Scrophulariaceae

* Parentucellia latifolia

Selaginellaceae

Selaginella gracillima

Stackhousiaceae

Stackhousia monogyna

Tripterococcus brunonis

Stylidiaceae

Levenhookia pusilla

Levenhookia stipitata

Stylidium brunonianum subsp. minor

Stylidium calcaratum

Stylidium junceum subsp. brevius

Stylidium luteum

Stylidium petiolare

Stylidium pulchellum

Stylidium repens

Stylidium schoenoides

Stylidium sp.

Stylidium spathulatum

Thymelaeaceae

Pimelea angustifolia

Pimelea cracens subsp. glabra

Pimelea imbricata

Pimelea ?lanata

Pimelea preissii

Pimelea rosea

Pimelea suaveolens

Pimelea sylvestris

Tremandraceae

Platytheca galioides

Tetratheca hispidissima

Violaceae

Hybanthus floribundus

Xanthorrhoeaceae

Xanthorrhoea gracilis

Xanthorrhoea preissii

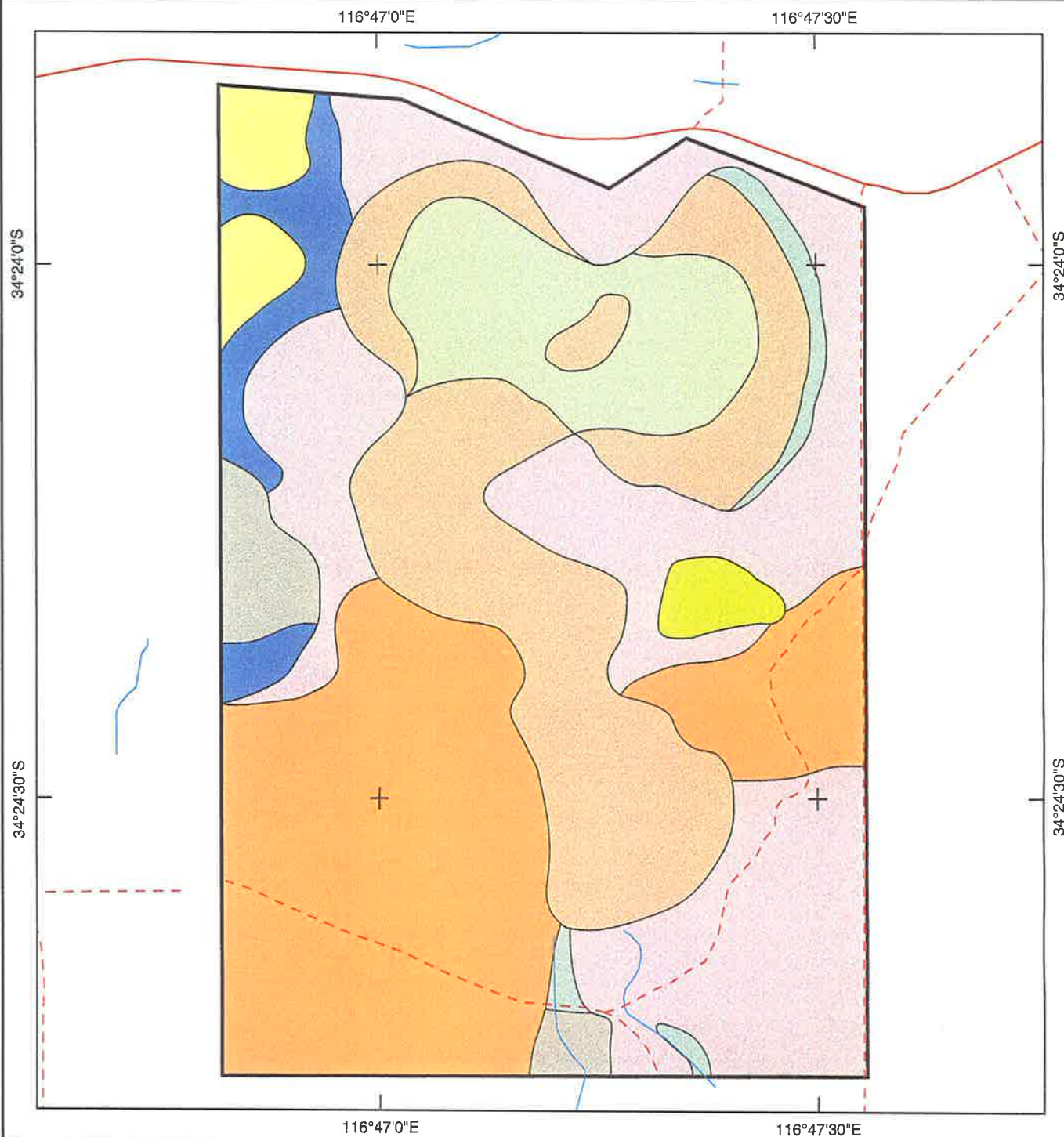
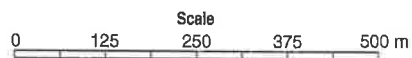
Zamiaceae

Macrozamia riedlei

Salinity Action Plan Lake Muir-Unicup Recovery Catchment

Noobijup Nature Reserve Res 26680

- | | |
|---|---|
| 1 | Jarrah - Marri forest and woodland on laterite |
| 2 | Jarrah - Marri open woodland on sand |
| 3 | Eucalyptus decipiens open woodland |
| 4 | Melaleuca raphiophylla - Eucalyptus rudis open woodland |
| 5 | Melaleuca raphiophylla low forest |
| 6 | Wet heath on clay flats |
| 7 | Open Baumea sedgeland |
| 8 | Closed Baumea sedgeland |
| 9 | Salt affected vegetation |
-
- | | |
|--|--------------------------------|
| | Sealed Road |
| | Vehicular Track |
| | Minor Intermittent Watercourse |



Pindicup Nature Reserve

Reserve number: 26679

Class: A

Location: 34 24 49S 116 43 14E;

Land tenure : Nature Reserve

Purpose : Water & Conservation of flora and fauna

Area: 281 ha

Biological values

Flora: A total of 303 taxa, including three priority taxa (*Anthotium junciforme* (Priority 4), *Euchiton gymnocephalus* (Priority 3), *Leucopogon tamariscinus* (Priority 2)), have been recorded from the reserve (Table 9)

Vegetation description: Lake Pindicup is a naturally saline wetland and is the major feature in the Pindicup Nature Reserve, several small freshwater wetlands also occur in the reserve, the largest being Bodjinup Swamp located near the southern boundary of the reserve. Thirteen vegetation units have been recorded from the reserve (Map 8), with the disturbed areas (unit 13) and the areas of *Eucalyptus decipiens* woodlands (unit 6) being too small to show on the vegetation map.

- 1) **Jarrah - Marri forest and woodland** on laterite occur as a series of ridges on the western side of the reserve. In terms of species composition they are essentially similar to those described for Noobijup Nature Reserve. The understorey is typically diverse in both herbs and shrubs.
- 2) **Jarrah - Marri open woodland** on sand occurs in the valleys between the laterite ridges, along dunes on northern and eastern boundaries and on the flats to the west of the Lake. The vegetation is again essentially similar to the sandy Jarrah unit described for Noobijup Nature Reserve.
- 3) **Jarrah - Marri forest and woodland over *Agonis* scrub** occurred on the wet sandy flats in the north eastern corner of the reserve. This community had a understorey dominated by *Agonis parviceps* which can form dense thickets, where it was more open *Bossiaea praetermissa*, *Gompholobium confertum*, *Astroloma baxteri* were common as well as the sedges *Caustis* sp. Boyanup, *Lepidosperma squamatum* and *Anarthria scabra*. The collection of *Caustis* sp. Boyanup represents the most southern collection of this taxa.
- 4) ***Melaleuca cuticularis* woodland** occurs on the flats at the edge of the lake. This unit usually has an understorey of *Gahnia trifida*. Immediately adjacent to the lake the *Melaleuca* can drop out and the vegetation intergrades into a *Gahnia* sedgeland (unit 11). The inland boundary of this unit around the lake is some narrow ridges of *Eucalyptus decipiens* woodland (unit 6) running parallel to the shoreline, this unit was too narrow to map.
- 5) ***Melaleuca preissiana* - *Banksia littoralis* woodland** occupies sandy substrates in more low lying situations than the sandy Jarrah - Marri woodlands (unit 2). *Banksia ilicifolia* can occur as a co-dominant canopy species. Common components of the understorey include *Lepidosperma longitudinale*, *Baumea juncea*, *Agonis parviceps*, *Astartea* sp., *Calothamnus lateralis*, *Kunzea recurva* and in the wettest parts *Pericalymma ellipticum*. This unit intergrades with the wet heath unit (unit 7).
- 6) ***Eucalyptus decipiens* open woodland** as a narrow band around the edge of the lake immediately inland of the *Melaleuca cuticularis* woodland. South of the lake it occurs on narrow raised dunes at the inland side of the *Melaleuca cuticularis* flat. This community also occurs on the ecotone between the sandy Jarrah unit (unit 2) and the wet flats, in this situation it has a diverse understorey dominated by *Astartea* sp., *Melaleuca viminea*, and *Pericalymma ellipticum*.
- 7) ***Melaleuca raphiophylla* low forest** is the dominant vegetation on long seasonally inundated wetlands and the fringing unit around the freshwater basin wetlands. It is typically dense with a sparse understorey usually dominated by *Lepidosperma longitudinale*, in slightly more open areas *Melaleuca viminea*, *Aotus intermedia* and the perennial rushes *Meeboldina tephрина* and *Meeboldina roylei* are found.
- 8) **Wet heath** dominated by *Pericalymma ellipticum*, *Melaleuca viminea* and *Lepidosperma longitudinale* occupy the lowest lying areas outside the basin wetlands.
- 9) ***Baumea articulata* sedgeland** occurs along the south western edge of Lake Pindicup, in a small basin wetland immediately south of Lake Pindicup and in Bodjinup Swamp near the

southern boundary of the reserve. In the deepest sections *Baumea articulata* is the sole dominant while closer to the shore *Triglochin huegelii* becomes more apparent.

- 10) ***Baumea vaginalis* sedgeland** occurs on the lake floor and is flooded late into summer. The sedgeland generally monospecific stands of *B. vaginalis* although in some areas *B. arthropphylla* may dominate or co-dominate.
- 11) ***Gahnia* sedgeland** occurs on the flats on the eastern side of the lake. *Gahnia trifida* was the dominant taxon but species such as the shrubs *Thomasia grandiflora*, and *Grevillea ?diversifolia*, and the annuals *Cotula cotuloides*, *Gnephosis ?tenuissima*, *Vellereophyton dealbatum* were also common.
- 12) **Lake bed** was clayey and before it completely dried out was cover with an annual herbland primarily made up of *Myriophyllum verrucosum*. While the lake contained water *Lepilaena australis* was a common aquatic.
- 13) **Disturbed areas** are small and confined to areas near tracks and firebreaks, a series of weedy grasses and *Rumex* spp. were collected from these areas.

Vegetation change: Oblique air photos from February and April 1980 (Photo 22, 23 & 24 - JAK Lane, unpub data) show little change in the vegetation of Bodjinup Swamp or Lake Pindicup itself.

Disturbance or threats: No immediate threat is apparent but 1995 aerial photo shows further recent clearance.

1 2 3 4 5 6 7 9 10 11 12 13

Table 9 - Pindicup Nature Reserve flora list

[illegible]

Family**Map Units**

1 2 3 4 5 6 7 9 10 11 12 13

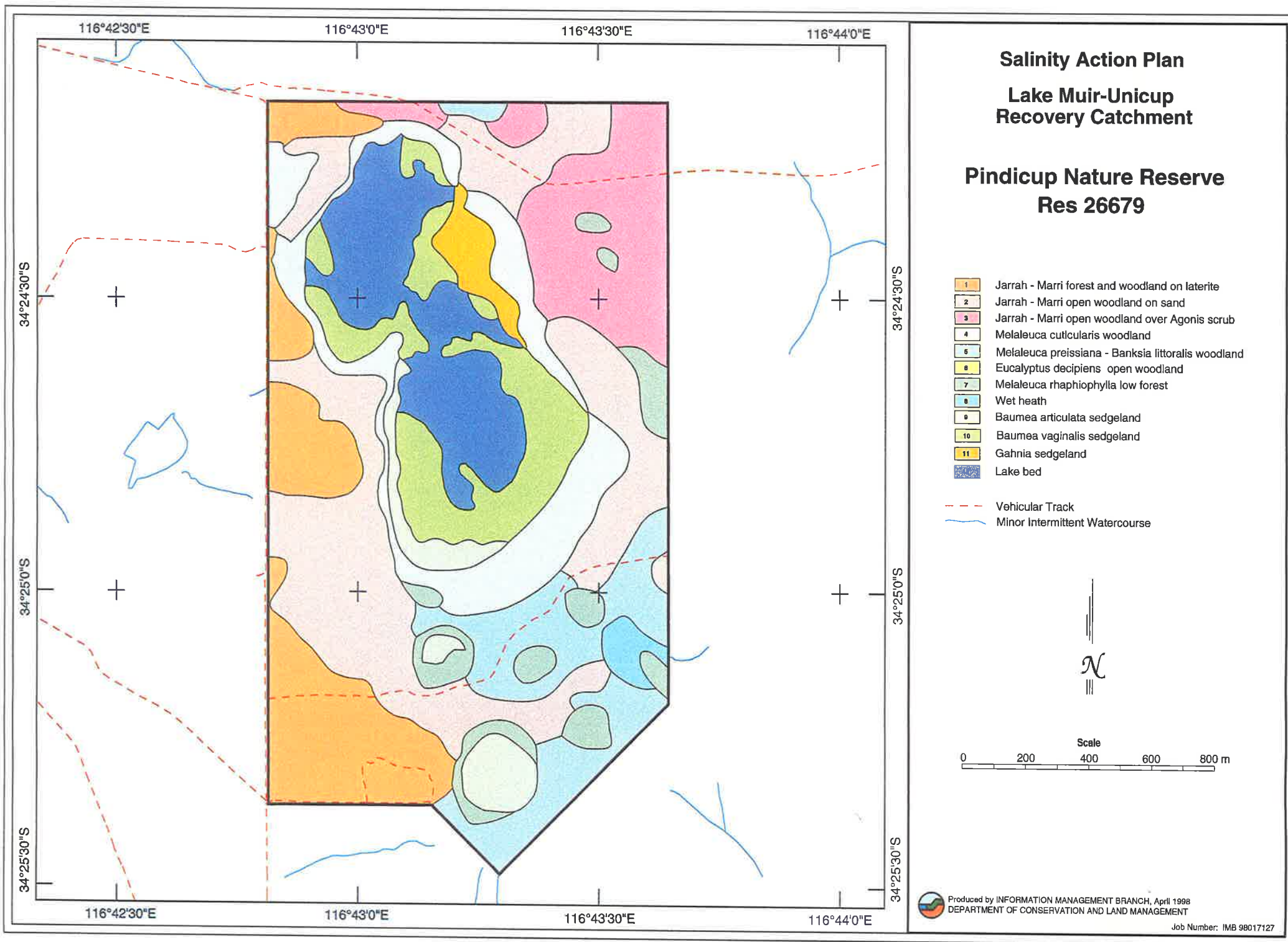
Baumea articulata							1	1				
Baumea juncea				1	1							
Baumea vaginalis									1			
Caustis sp. Boyanup (G.S. McCutcheon 1706)			1									
Chorizandra enodis				1								
Cyathochaeta avenacea	1											
* Cyperus tenellus				1							1	
Gahnia trifida						1						
Isolepis cernua		1										
Isolepis stellata				1								
Lepidosperma angustatum	1											
Lepidosperma longitudinale					1	1	1					
Lepidosperma squamatum			1									
Lepidosperma tenue	1				1	1						
Mesomelaena tetragona					1							
Schoenus ?caespititius					1							
Schoenus curvifolius		1										
Schoenus humilis				1								
Schoenus laevigatus					1							
Schoenus subbulbosus		1										
Schoenus subfascicularis				1								
Tetraria capillaris	1											
Tetraria octandra	1											
Tricostularia neesii						1						
Dasypogonaceae												
Dasypogon bromeliifolius		1										
Lomandra collina						1						
Lomandra micrantha				1		1						
Lomandra sericea	1											
Lomandra sonderi					1							
Lomandra suaveolens	1	1										
Dennstaedtiaceae												
Pteridium esculentum							1					
Dilleniaceae												
Hibbertia ?commutata	1											
Hibbertia amplexicaulis	1											
Hibbertia cunninghamii	1											
Hibbertia glomerata						1						
Hibbertia racemosa		1				1						
Hibbertia stellaris						1						
Droseraceae												
Drosera glanduligera	1											
Drosera macrantha	1					1						
Drosera menziesii						1						
Drosera stolonifera	1	1										
Epacridaceae												
Astroloma baxteri			1									
Astroloma ciliatum	1											
Astroloma pallidum	1											
Astroloma prostratum	1											
Leucopogon ?sprengelioides	1											
Leucopogon australis							1					
Leucopogon capitellatus	1											
Leucopogon glabellus		1										
Leucopogon pendulus					1							
Leucopogon tamariscinus	1											
Leucopogon verticillatus	1											
Euphorbiaceae												
Amperea volubilis							1					
Monotaxis occidentalis					1							
Phyllanthus calycinus	1					1						
Poranthera microphylla		1										
Gentianaceae												
* Centaurium erythraea					1		1					
Centaurium spicatum										1		
Geraniaceae												
* Erodium botrys											1	
Goodeniaceae												
Anthotium junciforme					1							
Dampiera alata	1		1									
Dampiera fasciculata	1											
Dampiera linearis	1		1									
Goodenia micrantha				1								
Goodenia pulchella				1								

1

Map Units

Epilobium billardierianum										1
Orchidaceae										
Caladenia flava		1						1		
Cyrtostylis robusta								1		
Elythranthera brunonis		1								
Microtis atrata						1				
Microtis media			1					1		
Microtis orbicularis						1				
* Monadenia bracteata			1					1		
Praecoxanthus aphyllus MS								1		
Thelymitra benthamiana							1		1	
Thelymitra crinita		1								
Thelymitra flexuosa							1			
Thelymitra pauciflora									1	
Orobanchaceae										
* Orobanche minor		1								
Papilionaceae										
Aotus intermedia										1
Bossiaea eriocarpa		1								
Bossiaea linophylla		1							1	
Bossiaea ornata			1						1	
Bossiaea praetermissa				1						
Brachysema melanopetalum									1	
Chorizema aciculare		1							1	
Daviesia ?physodes		1								
Gompholobium confertum		1		1						
Gompholobium knightianum								1		
Gompholobium marginatum		1							1	
Gompholobium preissii		1								
Gompholobium tomentosum		1								
Hovea chorizemifolia		1								
Hovea trisperma		1								
Jacksonia furcellata			1						1	
Kennedia coccinea		1								
Kennedia prostrata		1								
* Ornithopus compressus										1
Pultenaea ochreatea									1	
Viminaria juncea						1				
Phormiaceae										
Dianella revoluta								1	1	
Stypandra glauca		1							1	
Pittosporaceae										
Billardia variaefolia									1	
Pronaya fraseri		1								
Sollya heterophylla								1		
Poaceae										
Agrostis avenacea										1
* Aira caryophyllea						1		1		
Amphipogon turbinatus		1								
* Briza minor						1				
* Bromus diandrus										
Danthonia occidentalis			1					1		
Deyeuxia quadriseta										1
Hemarthria uncinata										1
* Hordeum leporinum										
Neurachne alopecuroidea		1								
Stipa pycnostachya								1		
Tetrarrhena laevis		1	1							
* Vulpia myuros						1		1		
Polygalaceae										
Comesperma calymega		1								
Comesperma volubile									1	
Polygonaceae										
Persicaria prostrata										1
* Rumex acetosella										
* Rumex pulcher										
Primulaceae										
Samolus junceus						1				
Proteaceae										
Adenanthes obovatus							1			
Banksia grandis		1								
Banksia illicifolia				1						
Banksia littoralis									1	
Dryandra armata		1								

<i>Family</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>
Dryandra lindleyana	1				1							
Grevillea ?diversifolia				1						1		
Hakea corymbosa	1											
Hakea lissocarpa	1				1							
Hakea prostrata					1							
Hakea sulcata				1								
Hakea trifurcata	1											
Hakea varia					1							
Persoonia longifolia	1											
Petrophile acicularis		1										
Petrophile serruriae	1											
Synaphea ?petiolaris	1											
Ranunculaceae												
Clematis pubescens	1											
Restionaceae												
Anarthria prolifera	1				1							
Anarthria scabra			1									
Desmocladius fasciculatus MS	1					1						
Desmocladius flexuosus MS		1										
Hypolaena exsulca	1											
Lepyrodia muirii				1								
Lyginia barbata		1										
Meeboldina ?coangustata MS								1				
Meeboldina ?tephrina MS							1	1				
Meeboldina cana MS				1								
Meeboldina roycei MS							1					
Restio sp.				1								
Stenopa ramosissima MS				1								
Rhamnaceae												
Trymalium ledifolium	1			1		1						
Rubiaceae												
Opercularia apiciflora		1										
Opercularia hispidula	1											
Opercularia vaginata	1											
Rutaceae												
Boronia crenulata	1											
Boronia ramosa				1								
Boronia sp.					1							
Boronia spathulata		1										
Santalaceae												
Leptomeria spinosa				1								
Leptomeria squarrolosa	1											
Selaginellaceae												
Selaginella gracillima				1								
Solanaceae												
* Solanum nigrum												1
Stackhousiaceae												
Stackhousia monogyna	1											
Tripterooccus brunonis			1									
Sterculiaceae												
Thomasia grandiflora										1		
Thomasia pauciflora		1				1						
Stylidiaceae												
Levenhookia pusilla	1											
Levenhookia stipitata						1						
Stylidium brunonianum subsp. minor	1				1							
Stylidium caespitosum				1								
Stylidium corymbosum				1								
Stylidium repens		1										
Stylidium schoenoides	1											
Stylidium spathulatum					1	1						
Thymelaeaceae												
Pimelea angustifolia		1										
Pimelea ciliata	1											
Pimelea sulphurea	1											
Tremandraceae												
Tetratheca affinis	1											
Xanthorrhoeaceae												
Xanthorrhoea gracilis	1											
Xanthorrhoea preissii	1					1						
Zamiaceae												
Macrozamia riedlei	1											
Zannichelliaceae												
Lepilaena australis												1



Pinticup Nature Reserve

Reserve number: 26682

Class: A

Location: 34 27 59S 116 48 27E;

Land tenure : Nature Reserve

Purpose : Water & Conservation of flora and fauna

Area: 75 ha

Biological values

Flora: A total of 297 taxa have been recorded from the reserve (Table 10). This included six priority taxa (*Anthotium junciforme* (Priority 4), *Apodasmia ceramophila* ms (Priority 2), *Jacksonia sparsa* ms (Priority 3), *Rhodanthe pyrethrum* (Priority 3), *Stylidium mimeticum* (Priority 3), *Villarsia submersa* (Priority 4)).

Vegetation description: Fourteen vegetation units were identified in Pinticup Nature Reserve, two of these (Jarrah - Marri woodland on laterite - unit 13; and the disturbed areas - unit 14) were too small to map (Map 9).

- 1) **Jarrah - Marri open woodland** on sand occurs on the sandy rises and the better drained flats. This community is essentially similar to sandy Jarrah - Marri in Gamalup and Noobijup Nature Reserves. The understorey being diverse in shrubs and herbs with *Leucopogon* spp., *Acacia* spp., *Melaleuca thymoides*, *Gompholobium* spp. and *Hakea ruscifolia* being obvious components. In the dampest areas *Hypocalymma angustifolium* and *Kunzea micrantha* become more common.
- 2) **Logged Jarrah - Marri open woodland** on sand occurs near the western boundary of the reserve. The result has been an opening up of the canopy, species composition is same as vegetation unit 1.
- 3) **Jarrah - Marri - Yate open woodland** occurs on the sand dune on the eastern side of Pinticup Swamp. It has a similar species composition to the Jarrah - Marri open woodland with the addition of Yate as a canopy co-dominant.
- 4) ***Banksia ilicifolia* woodland** occurs on poorly drained sandy flats in the western part of the reserve. Common understorey elements include *Adenanthos obovatus*, *Hakea sulcata*, *Brachysema melanopetalum* and *Lysinema ciliatum*. *Franklandia fucifolia* was also found in this unit. In the wettest sites this community grades into *Melaleuca preissiana* - *Banksia littoralis* woodland (vegetation unit 6).
- 5) ***Melaleuca cuticularis* woodland** occupies most of a small basin wetland in the north west of the reserve. The understorey is dominated by *Gahnia trifida* with other common taxa including *Astartea*, *Melaleuca lateritia*, *Melaleuca viminea*, *Chaetanthus aristatus*, and *Meeboldina cana*. The soil in this area having a higher clay content than the surrounding areas.
- 6) ***Melaleuca preissiana* - *Banksia littoralis* woodland** occurs on the poorest drained areas of sandy soil. As a consequence the understorey is variously dominated by *Anigozanthos flavidus*, *Agonis juniperina*, *Calothamnus lateralis*, *Hypocalymma angustifolium*, *Melaleuca* spp. (including *Melaleuca densa* and *Melaleuca viminea*), *Pericalymma ellipticum*, *Hakea varia*, and the perennial rushes *Lepyrodia muirii*, *Meeboldina tephрина*, *Tremulina tremula*. *Eucalyptus rudis* occasionally occurs in the canopy layer.
- 7) ***Eucalyptus decipiens* open woodland** occurs on the wet clay flats on the southern boundary of the reserve. It is a diverse community with rich shrub layer and large numbers of annual herbs as has been described for Noobijup Nature Reserve.
- 8) ***Melaleuca raphiophylla* low forest** occurs in areas of the longest inundation and as the fringing vegetation on the western shore of Pinticup Swamp. It typically has a sparse understorey of *Lepidosperma longitudinale*, *Baumea articulata*, *Baumea vaginalis*, *Villarsia albiflora*, and where gaps in canopy occur *Astartea fascicularis* and *Callistachys lanceolata* occur.
- 9) ***Hakea prostrata* heath** occurs in a small area in the south west corner of the reserve. This is an equivalent unit to that described in Galamup Nature Reserve.
- 10) **Wet heath** occurs on the wettest parts of the clay flats in the south eastern corner of the reserve. This flat is dominated by *Melaleuca* spp. and perennial rushes (*Apodasmia ceramophila* and *Harperia lateriflora*). In late winter the flats are completely flooded and aquatic taxa such as *Villarsia submersa* are conspicuous as the wetland dries a diverse suite

of annual herbs emerges. These include annual *Schoenus* spp., *Tribonanthes violacea*, and an array of orchids.

- 11) **Baumea sedgeland** occur in the two basin wetlands, the deepest parts being dominated by *Baumea articulata* while toward the shore *Triglochin huegelii* and *Villarsia albiflora* co-dominate.
- 12) ***Lepidosperma longitudinale* sedgeland** occurs in a small patch in the south west corner of the reserve in a winter wet drainage line.
- 13) **Disturbed areas** occur associated with firebreaks, these areas are too small to map but are a major source of weed concentration
- 14) **Jarrah - Marri woodland** on laterite occurs as small patches within the sandy Jarrah-Marri unit (vegetation unit 1). This unit was also too small to map but did show significant change in understorey species as has been described for other reserves.

Vegetation change: Oblique air photos from February and April 1980 (Photo 25 & 26 - JAK Lane, unpub data) showed no obvious changes in the vegetation.

Disturbance or threats: No obvious threat is apparent at this time, run off from tree farm which occur on three sides of the reserve should be monitored.

Aizoaceae

[illegible]

Family

Map Units

	1	3	4	5	6	7	8	10	11	13	14
Lepidosperma tenue											1
Mesomelaena stygia					1						
Mesomelaena tetragona											1
Schoenus curvifolius	1										
Schoenus efoliatus			1		1						
Schoenus elegans								1			
Schoenus humilis								1			
Schoenus tenellus				1							
Tetraria capillaris											1
Tetraria octandra					1						1
Tricostularia neesii	1				1						
Dasyopogonaceae											
Dasyopogon bromeliifolius	1										
Lomandra collina	1										
Lomandra sericea											1
Lomandra sonderi	1		1								
Lomandra suaveolens	1										1
Dennstaedtiaceae											
Pteridium esculentum							1				
Dilleniaceae											
Hibbertia amplexicaulis											1
Hibbertia cunninghamii											1
Hibbertia racemosa	1										
Hibbertia stellaris					1						
Droseraceae											
Drosera gigantea					1						
Drosera glanduligera	1										
Drosera menziesii					1						
Epacridaceae											
Andersonia sp.	1										
Astroloma baxteri	1										1
Astroloma ciliatum											1
Astroloma pallidum								1			1
Leucopogon australis	1				1						
Leucopogon capitellatus	1										
Leucopogon glabellus	1										
Leucopogon oxycedrus	1							1			
Lysinema ciliatum		1									
Sphenotoma gracile					1						
Euphorbiaceae											
Monotaxis occidentalis	1										
Phyllanthus calycinus											1
Poranthera microphylla	1										
Goodeniaceae											
Anthotium junciforme								1			
Dampiera alata											1
Dampiera diversifolia							1				
Dampiera hederacea	1										
Dampiera linearis	1										
Goodenia claytoniacea								1			
Goodenia micrantha				1							
Goodenia mimuloides								1			
Goodenia pulchella					1						
Scaevola phlebotetala											1
Velleia trinervis		1					1				1
Haemodoraceae											
Anigozanthos bicolor					1						
Anigozanthos flavidus	1				1						
Anigozanthos manglesii					1						1
Conostylis aculeata	1										
Haemodorum laxum											1
Haemodorum simplex								1			
Haemodorum sparsiflorum								1			
Haemodorum spicatum	1				1						

Family**Map Units**

1 3 4 5 6 7 8 10 11 13 14

Juncaceae

- * Juncus bufonius
- Juncus pallidus
- Juncus sp.

Juncaginaceae

- Triglochin huegelii

Lamiaceae

- Hemiandra pungens

Lauraceae

- Cassytha glabella
- Cassytha micrantha
- Cassytha racemosa

Lentibulariaceae

- Polypompholyx multifida

Lindsaeaceae

- Lindsaea linearis

Lobeliaceae

- Lobelia alata

Loganiaceae

- Logania campanulata
- Logania serpyllifolia

Loranthaceae

- Nuytsia floribunda

Menyanthaceae

- Villarsia albiflora
- Villarsia submersa

Mimosaceae

- Acacia biflora
- Acacia extensa
- Acacia incurva
- Acacia stenoptera

Myoporaceae

- Myoporum caprarioides

Myrtaceae

- Agonis juniperina
- Astartea fascicularis
- Astartea sp. (pink weeping)
- Baeckea camphorosmae
- Callistemon phoeniceus
- Calothamnus lateralis
- Calothamnus ?schaueri
- Calytrix angulata
- Calytrix leschenaultii
- Eucalyptus calophylla
- Eucalyptus cornuta
- Eucalyptus decipiens
- Eucalyptus marginata
- Eucalyptus occidentalis
- Eucalyptus rudis
- Hypocalymma angustifolium
- Kunzea micrantha
- Melaleuca cuticularis
- Melaleuca densa
- Melaleuca lateritia
- Melaleuca leptoclada
- Melaleuca preissiana
- Melaleuca raphiophylla
- Melaleuca thymoides
- Melaleuca viminea
- Pericalymma ellipticum
- Verticordia sp.

Orchidaceae

- Caladenia flava
- Caladenia longicauda
- Caladenia radialis
- Drakea sp.
- Elythranthera brunonis
- Elythranthera emarginata
- Microtis atrata
- Microtis media
- Microtis orbicularis
- * Monadenia bracteata
- Paracaleana nigrita
- Prasophyllum drummondii
- Prasophyllum macrostachyum

Map Units

	1	3	4	5	6	7	8	10	11	13	14
Pterostylis recurva											1
Pterostylis vittata											1
Pyrorchis nigricans	1										
Thelymitra crinita											1
Thelymitra pauciflora											1
Papilionaceae											
Bossiaea linophylla					1						1
Bossiaea ornata											1
Bossiaea praetermissa	1		1								
Brachysema melanopetalum			1		1						
Callistachys lanceolata					1		1				
Daviesia hakeoides					1						
Daviesia incrassata			1								
Daviesia physodes											1
Daviesia preissii	1										
Gompholobium capitatum	1		1		1						
Gompholobium confertum	1										
Gompholobium marginatum					1						1
Gompholobium polymorphum	1										
Gompholobium preissii	1										1
Gompholobium scabrum					1						
Gompholobium tomentosum	1										
Hovea chorizemifolia											1
Hovea trisperma	1										
Jacksonia furcellata											1
Jacksonia sparsa MS	1										
Kennedia prostrata	1										
Oxylobium lineare					1						
Sphaerolobium vimineum											1
Philydraceae											
Philydrella pygmaea								1			
Phormiaceae											
Dianella revoluta											1
Pittosporaceae											
Billardiera candida											1
Billardiera parviflora											1
Sollya heterophylla	1						1				
Poaceae											
Agrostis avenacea							1				
Amphipogon debilis											1
Amphipogon turbinatus					1						
* Briza maxima	1				1					1	
* Briza minor							1			1	
Danthonia setacea	1										
Deyeuxia quadriseta							1				
Hemarthria uncinata					1		1				
* Holcus lanatus										1	
Neurachne alopecuroidea	1							1			
Stipa compressa	1										
Stipa pycnostachya	1										
Stipa trichophylla	1										
Tetrarrhena laevis											1
* Vulpia myuros	1										
Polygalaceae											
Comesperma calymega	1										
Comesperma flavum							1				
Comesperma virgatum											1
Comesperma volubile	1										
Primulaceae											
Samolus junceus							1				
Proteaceae											
Adenanthos obovatus			1		1						
Banksia grandis	1										
Banksia ilicifolia	1		1								
Banksia littoralis					1						
Dryandra bipinnatifida											1
Dryandra lindleyana								1			
Franklandia fucifolia			1								
Grevillea depauperata	1										
Grevillea fasciculata											1
Hakea lissocarpa											1
Hakea prostrata											1
Hakea ruscifolia	1										
Hakea sulcata			1		1						
Hakea undulata											1

Family

Map Units

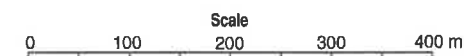
[illegible]

Salinity Action Plan Lake Muir-Unicup Recovery Catchment

Pinticup Nature Reserve Res 26682

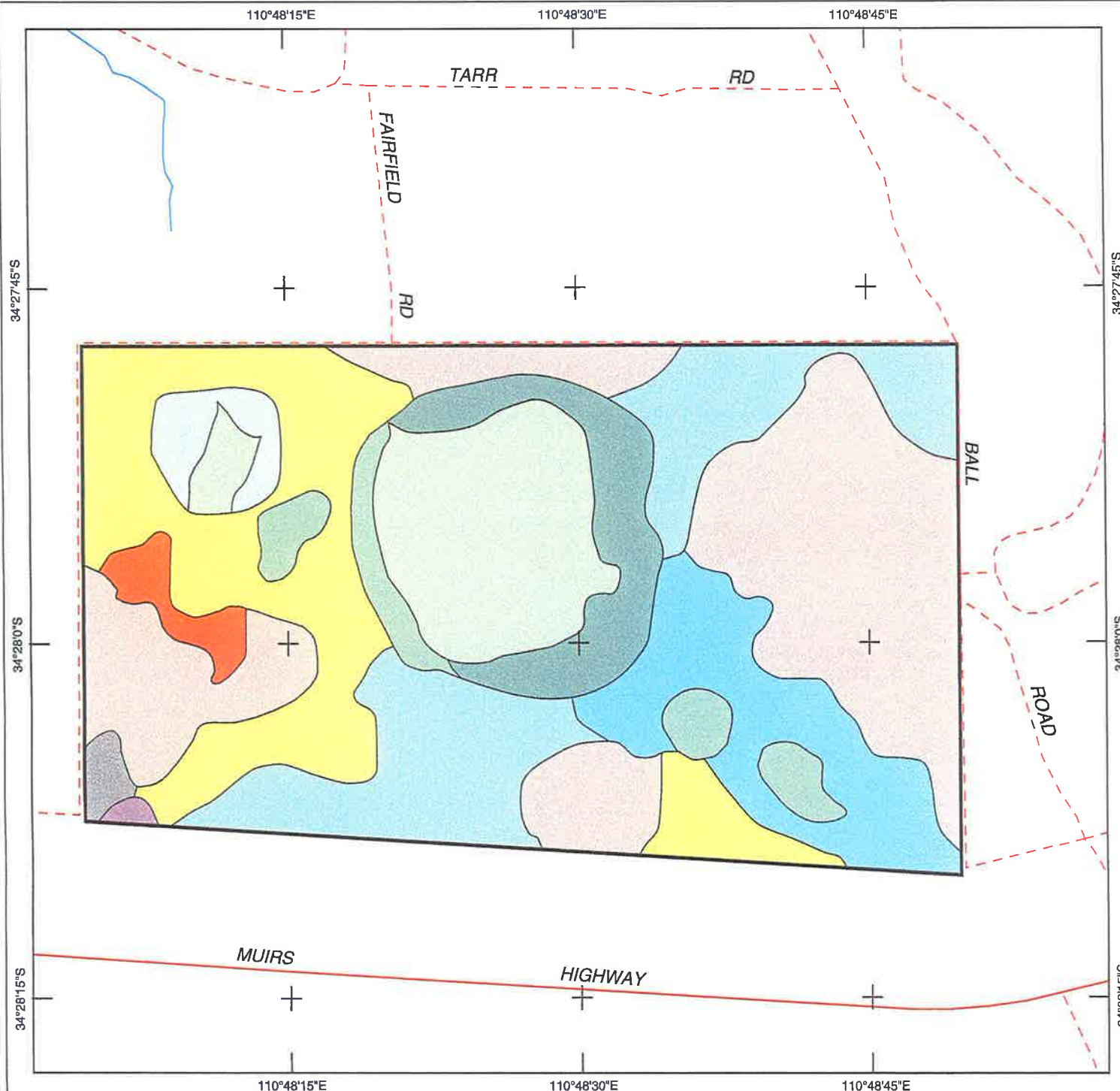
- | | |
|----|--|
| 1 | Jarrah - Marri open woodland on sand |
| 2 | Logged Jarrah - Marri open woodland on sand |
| 3 | Jarrah - Marri - Yate open woodland on sand dune |
| 4 | Banksia ilicifolia woodland |
| 5 | Melaleuca cuticularis woodland |
| 6 | Melaleuca preissiana - Banksia littoralis woodland |
| 7 | Eucalyptus decipiens open woodland |
| 8 | Melaleuca raphiophylla low forest |
| 9 | Hakea prostrata heath |
| 10 | Wet heath |
| 11 | Baumea sedgeland |
| 12 | Lepidosperma longitudinale sedgeland |

- Sealed Road
- Vehicular Track
- Minor Intermittent Watercourse



Produced by INFORMATION MANAGEMENT BRANCH, April 1998
DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Job Number: IMB 98017127



Quindinup Nature Reserve

Reserve number: 25506

Class: C

Location: 34 24 41S 116 52 41E;

Land tenure : Nature Reserve

Purpose : Conservation of flora and fauna

Area: 2653 ha

Biological values

Flora: A brief survey was undertaken of Quindinup Reserve, this found 276 taxa. This list should be considered preliminary (Table 11). One priority flora species (*Eucalyptus aspersa* (Priority 4)) were recorded from the reserve.

Vegetation description: No vegetation mapping was undertaken for this reserve. Six major habitat types were defined while compiling the flora list (Table 10).

- 1) *Melaleuca raphiophylla* - *Melaleuca preissiana* woodland along creek lines.
- 2) Disturbed areas
- 3) Lateritic heath
- 4) Jarrah - Marri woodland on sand.
- 5) Jarrah - Marri woodland on laterite
- 6) Wandoo woodland.

Vegetation change: This reserve was not photographed in 1980.

Disturbance or threats: Upland areas are in excellent condition. Increases in salinity in some of the creek lines is causing impacts to the riparian vegetation.

Family

Mr/Mp Dist Heath Vegetation Units
J/M(s) J/M(l) Wandoo

Table 11 - Quindinup Nature Reserve flora list

Amaranthaceae					
Ptilotus manglesii					1
Anthericaceae					
Agrostocrinum scabrum					1
Borya scirpoidea	1				
Caesia micrantha			1		
Caesia occidentalis					1
Chamaescilla corymbosa			1		
Johnsonia acaulis			1		
Johnsonia lupulina			1		
Laxmannia sessiliflora			1		1
Sowerbaea laxiflora					1
Thysanotus manglesianus					1
Thysanotus multiflorus	1				
Thysanotus thyrsoides			1		
Tricoryne elatior			1		
Tricoryne tenella	1				
Apiaceae					
Daucus glochidiatus			1		
Eryngium pinnatifidum			1		
Homalosciadium homalocarpum					1
Hydrocotyle pilifera			1		
Platysace juncea					1
Schoenolaena tenuior	1				
Trachymene pilosa			1		
Xanthosia atkinsoniana			1		
Xanthosia candida			1		
Asteraceae					
* Arctotheca calendula		1			
* Conyza albida			1		
Cotula coronopifolia		1			
Craspedia variabilis			1		
Euchiton sphaericus			1		
Hyalosperma cotula			1		
* Hypochaeris glabra			1		
Lagenifera huegelii	1		1		1
Millotia myosotidifolia			1		
Olearia paucidentata			1		
Picris angustifolia			1		
Podolepis gracilis	1				
Pterochaeta paniculata			1		
Quinetia urvillei	1				
Senecio minimus			1		
* Sonchus oleraceus		1			
Trichocline spathulata			1		
Waitzia nitida			1		
Waitzia suaveolens			1		
Campanulaceae					
Wahlenbergia multicaulis			1		
Wahlenbergia preissii			1		
Caryophyllaceae					
* Cerastium glomeratum		1			
* Petrorhagia velutina		1			
Casuarinaceae					
Allocauarina ?microstachya					1
Centrolepidaceae					
Aphelia cyperoides	1				
Centrolepis aristata			1		
Centrolepis drummondiana			1		
Centrolepis pilosa					1
Colchicaceae					
Burchardia congesta			1		
Burchardia multiflora	1				
Crassulaceae					
Crassula colorata			1		
Cyperaceae					
Baumea juncea	1				
Chorizandra enodis	1				
Cyathochaeta avenacea					1
* Cyperus tenellus	1				
Gahnia drummondii				1	
Isolepis cernua	1				

Family

	Mr/Mp	Dist	Heath	Vegetation Units		
				J/M(s)	J/M(l)	Wandoo
* <i>Isolepis marginata</i>						1
<i>Isolepis oldfieldiana</i>	1					
<i>Isolepis stellata</i>				1		
<i>Lepidosperma angustatum</i>						1
<i>Lepidosperma tenue</i>				1		
<i>Mesomelaena tetragona</i>						1
<i>Schoenus nanus</i>						1
<i>Tetraria capillaris</i>				1		
<i>Tetraria octandra</i>				1		
Dasyopogonaceae						
<i>Chamaexeros serra</i>						1
<i>Lomandra caespitosa</i>				1		
<i>Lomandra micrantha</i>				1		
<i>Lomandra purpurea</i>				1		
<i>Lomandra sericea</i>						1
<i>Lomandra sonderi</i>				1		1
<i>Lomandra suaveolens</i>						1
Dennstaedtiaceae						
<i>Pteridium esculentum</i>				1		
Dilleniaceae						
<i>Hibbertia ?amplexicaulis</i>				1		
<i>Hibbertia commutata</i>				1		
<i>Hibbertia racemosa</i>				1		
<i>Hibbertia vaginata</i>				1		
Droseraceae						
<i>Drosera bulbosa</i>						1
<i>Drosera erythrorhiza</i>	1					
<i>Drosera gigantea</i>	1			1		
<i>Drosera glanduligera</i>				1		
<i>Drosera macrantha</i>						1
<i>Drosera stolonifera</i>			1			
Epacridaceae						
<i>Astroloma ciliatum</i>				1		
<i>Astroloma pallidum</i>						1
<i>Astroloma prostratum</i>						1
<i>Leucopogon australis</i>	1					
<i>Leucopogon capitellatus</i>	1					
<i>Leucopogon pendulus</i>				1		
<i>Leucopogon propinquus</i>				1		
<i>Leucopogon sp.</i>				1		
<i>Leucopogon verticillatus</i>				1		
<i>Styphelia tenuiflora</i>				1		
Euphorbiaceae						
<i>Monotaxis occidentalis</i>				1		
<i>Phyllanthus calycinus</i>				1		
<i>Poranthera microphylla</i>	1			1		1
Gentianaceae						
* <i>Centaurium erythraea</i>						1
Geraniaceae						
<i>Geranium solanderi</i>				1		
Goodeniaceae						
<i>Dampiera ?alata</i>				1		
<i>Dampiera linearis</i>				1		
<i>Goodenia micrantha</i>						1
<i>Goodenia pulchella</i>	1					
<i>Lechenaultia biloba</i>				1		1
<i>Lechenaultia expansa</i>			1			
<i>Scaevola phlebopetala</i>				1		
<i>Velleia trinervis</i>	1					
Haemodoraceae						
<i>Anigozanthos manglesii</i>				1		
<i>Conostylis aculeata</i>	1					
<i>Conostylis setigera</i>						1
<i>Haemodorum laxum</i>				1		
<i>Haemodorum simplex</i>	1					
<i>Haemodorum sparsiflorum</i>				1		
<i>Haemodorum spicatum</i>				1		
Haloragaceae						
<i>Glischrocaryon aureum</i>				1		
<i>Gonocarpus paniculatus</i>				1		
Hypoxidaceae						
<i>Hypoxis glabella</i>						1
Iridaceae						
<i>Patersonia juncea</i>				1		

Family**Vegetation Units**

Mr/Mp Dist Heath J/M(s) J/M(l) Wandoo

Patersonia occidentalis				1		
Patersonia umbrosa				1		
Juncaceae						
* Juncus acutus		1				
* Juncus bufonius		1				
* Juncus capitatus	1					
Luzula meridionalis	1					
Lauraceae						
Cassytha glabella				1		
Cassytha racemosa	1					
Lentibulariaceae						
Polypompholyx multifida	1					
Lindsaeaceae						
Lindsaea linearis	1					
Lobeliaceae						
Lobelia tenuior				1		
Loganiaceae						
Logania serpyllifolia				1		
Phyllangium paradoxum				1		1
Mimosaceae						
Acacia extensa	1			1		
Acacia incurva	1					
Acacia myrtifolia				1		
Acacia nervosa				1		
Acacia pulchella				1		
Acacia saligna				1		
Acacia stenoptera				1		
Acacia willdenowiana				1		
Myrtaceae						
Agonis juniperina	1					
Astartea sp. (pink weeping)	1					
Baeckea camphorosmae						1
Eucalyptus aspersa				1		
Eucalyptus calophylla				1		
Eucalyptus marginata				1		
Eucalyptus wandoo						1
Hypocalymma angustifolium				1		
Kunzea ?micrantha	1					
Kunzea recurva	1					
Melaleuca preissiana	1					
Melaleuca raphiophylla	1					
Melaleuca thymoides				1		
Melaleuca viminea	1					
Verticordia densiflora						1
Olacaceae						
Olax benthamiana				1		
Onagraceae						
Epilobium billardierianum		1				
Orchidaceae						
Caladenia flava				1		
Caladenia longiclavata				1		
Caladenia marginata						1
Caladenia nana						1
Caladenia varians MS			1			
Cryptostylis ovata				1		
Cyanicula deformis MS				1		
Diuris longifolia						1
Elythranthera brunonis						1
Elythranthera emarginata						1
Eriochilus dilatatus				1		
Eriochilus scaber			1			
Leporella fimbriata			1			
Microtis media						1
* Monadenia bracteata				1		1
Pterostylis barbata				1		
Pterostylis recurva				1		
Pterostylis vittata				1		
Thelymitra antennifera						1
Thelymitra crinita				1		
Orobanchaceae						
* Orobanche minor						1
Oxalidaceae						
Oxalis perennans				1		
Papilionaceae						

Family

	<i>Mr/Mp</i>	<i>Dist</i>	<i>Heath</i>	<i>Vegetation Units</i>		
				<i>J/M(s)</i>	<i>J/M(l)</i>	<i>Wandoo</i>
Aotus intermedia	1					
Bossiaea linophylla				1		
Bossiaea ornata				1		
Bossiaea praetermissa	1					
Daviesia cordata				1		
Daviesia preissii					1	
Gastrolobium bilobum				1		
Gompholobium confertum				1		
Gompholobium knightianum				1		
Gompholobium marginatum				1		
Gompholobium preissii				1		
Gompholobium tomentosum	1					
Hardenbergia comptoniana				1		
Hovea chorizemifolia				1		
Hovea trisperma				1		
Isotropis cuneifolia						1
Jacksonia furcellata				1		
Kennedia prostrata				1		
Sphaerolobium medium				1		
* Trifolium campestre		1				1
* Trifolium dubium		1				1
* Trifolium subterraneum	1					1
Philydraceae						
Philydrella pygmaea	1					1
Phormiaceae						
Dianella brevicaulis				1		
Dianella revoluta					1	
Pittosporaceae						
Billardiera ?variifolia				1		
Sollya heterophylla				1		
Poaceae						
Agrostis avenacea	1					
* Aira caryophyllea		1				1
Amphipogon turbinatus				1		
* Briza minor						1
Danthonia occidentalis				1		1
* Holcus lanatus	1					
Microlaena stipoides				1		
Neurachne alopecuroidea				1		
* Polypogon monspeliensis	1					
Stipa compressa				1		
Stipa pycnostachya				1		
Tetrarrhena laevis				1		
* Vulpia myuros						1
Polygalaceae						
Comesperma virgatum				1		
Primulaceae						
* Anagallis arvensis		1				1
Proteaceae						
Banksia grandis				1		
Banksia littoralis				1		
Dryandra armata						1
Dryandra lindleyana				1		
Dryandra sessilis				1		
Grevillea fasciculata				1		
Hakea amplexicaulis				1		
Hakea lissocarpa				1		
Hakea prostrata	1					
Hakea undulata				1		
Hakea varia	1					
Persoonia longifolia				1		
Petrophile serruriae						1
Stirlingia tenuifolia			1			
Synaphea petiolaris				1		
Ranunculaceae						
Clematis aristata				1		
Ranunculus colonorum				1		
Restionaceae						
Anarthria prolifera	1					
Desmocladius fasciculatus MS				1		
Desmocladius flexuosus MS				1		
Hypolaena exsulca	1					
Lyginia barbata	1					
Rhamnaceae						

*Family**Vegetation Units*

	<i>Mr/Mp</i>	<i>Dist</i>	<i>Heath</i>	<i>J/M(s)</i>	<i>J/M(l)</i>	<i>Wandoo</i>
<i>Trymalium ledifolium</i>	1					
Rubiaceae						
<i>Opercularia apiciflora</i>				1		
<i>Opercularia hispidula</i>				1		
Rutaceae						
<i>Boronia ramosa</i>						1
<i>Boronia spathulata</i>				1		
Santalaceae						
<i>Leptomeria scrobiculata</i>	1					
<i>Leptomeria squarrolosa</i>				1	1	
Scrophulariaceae						
* <i>Bellardia trixago</i>				1		
* <i>Parentucellia latifolia</i>						1
Selaginellaceae						
<i>Selaginella gracillima</i>	1					
Stackhousiaceae						
<i>Stackhousia monogyna</i>	1					
<i>Tripterococcus brunonis</i>						1
Stylidiaceae						
<i>Levenhookia pusilla</i>				1		
<i>Levenhookia stipitata</i>				1		1
<i>Stylidium amoenum</i>				1		1
<i>Stylidium brunonianum</i> subsp. minor				1		
<i>Stylidium calcaratum</i>				1		
<i>Stylidium junceum</i>				1		
<i>Stylidium luteum</i>				1		
<i>Stylidium piliferum</i>				1		
<i>Stylidium repens</i>	1					
<i>Stylidium schoenoides</i>				1		
<i>Stylidium spathulatum</i>				1		1
Thymelaeaceae						
<i>Pimelea angustifolia</i>				1		
<i>Pimelea rosea</i>			1			
Tremandraceae						
<i>Tetralthea ?hirsuta</i>				1		
Violaceae						
<i>Hybanthus floribundus</i>	1					
Xanthorrhoeaceae						
<i>Xanthorrhoea gracilis</i>				1		
<i>Xanthorrhoea preissii</i>				1		
Zamiaceae						
<i>Macrozamia riedlei</i>				1		

Unicup Nature Reserve

Reserve number: 25798

Class: A

Location: 34 21 35S 116 43 18E;

Land tenure : Nature Reserve

Purpose : Conservation of flora and fauna

Area: 3296 ha

Biological values

Flora: Using Griffin (1984) data as a basis, a flora list of 512 taxa was compiled from the reserve (Table 12). This included ten priority taxa (*Anthotium junciforme* (Priority 4), *Dryandra porrecta* (Priority 4), *Eucalyptus latens* (Priority 4), *Hibbertia silvestris* (Priority 4), *Opercularia rubioides* (Priority 2), *Pithocarpa corymbulosa* (Priority 2), *Schoenus loliaceus* (Priority 2), *Schoenus natans* (Priority 4), *Stylidium mimeticum* (Priority 3), *Synaphea decumbens* (Priority 1)).

Vegetation description: Griffin (1984) mapped the reserve and described 12 vegetation units. Brief descriptions of these units are given below.

- 2) *Eucalyptus marginata* (Jarrah) Forest (Type 1). Jarrah / Marri forest of the top and upper slopes of the lateritic ridges.
 - 3/9) *Eucalyptus marginata* (Jarrah) Forest (Type 2) / *Agonis parviceps* Thicket. Variable unit similar to Kodjinup vegetation unit 2, common on low lying sandy substrates.
 - 5) *Eucalyptus wandoo* Forest occurs as small patches in Jarrah forest on loamy gravels or clayey soils.
 - 7) *Eucalyptus decipiens* Open Low Woodland B (Type 1) occurs on loamy sand usually on terraces above drainage lines. It is essentially similar to the Lake Muir vegetation unit 6.
 - 9) *Agonis parviceps* Thicket. A variable unit which may have an overstorey of Jarrah and / *Banksia ilicifolia*. Appears essentially similar to Muir vegetation unit 3.
 - 10) *Melaleuca preissiana* - *Banksia littoralis* Open Low Woodland A. A complex unit essentially similar to Kodjinup vegetation unit 6.
 - 12) *Melaleuca lateritia* Dense Low Heath Essentially similar to Galamup vegetation unit 6, these are small basin wetlands on loamy clays.
 - 13). *Melaleuca raphiophylla* Dense Low Forest B. Occurs as circular or ring shaped areas in centre of some basin wetlands. This unit is equivalent to Muir vegetation unit 15.
 - 15) *Melaleuca cuticularis* Complex. *Melaleuca cuticularis* woodlands to forests with an understorey variously dominated by *Melaleuca densa*, *Kunzea recurva*, *Pericalymma ellipticum* or *Gahnia trifida* giving way to very little understoreys under the densest canopies
 - 17) *Halosarcia* - *Wilsonia* Mat Plants. Form areas of herbland around several of the salt lakes. Similar in many respects to Muir vegetation unit 27.
 - 19) *Baumea* Sedges. Occupying basin wetlands, essentially same as Kodjinup vegetation units 10 and 11.
 - 24) *Leptocarpus* Sedges. Clay flats dominated by *Apodasmia ceramophila* ms. Griffin (1984) states that there are few herbs, however these winter wet flats have a diverse annual herb flora in spring and early summer as these seasonally inundated wetlands dry.
- Disturbed areas)** Not mapped by Griffin (1984) but used in compiling species lists.

Vegetation change: This reserve was not photographed in 1980.

Disturbance or threats: Inundation of small wetland on eastern side of reserve due to rising water table. Destruction of woodland communities on eastern boundary due to rising saline water table.

Family

Map Units

2 3/9 5 7 9 10 12 13 15 17 19 24 Dist

Table 12 - Unicap Nature Reserve flora list

Aizoaceae

Carpobrotus modestus

1 1

Amaranthaceae

Ptilotus manglesii

1 1

Anthericaceae

Agrostocrinum scabrum

1 1

Arthropodium preissii

1

Borya scirpoidea

1

Caesia micrantha

1

Caesia occidentalis

1

Chamaescilla corymbosa

1

Chamaescilla spiralis

1

Johnsonia acaulis

1

Johnsonia lupulina

1

Laxmannia minor

1

Laxmannia sessiliflora

1

Sowerbaea laxiflora

1

Thysanotus manglesianus

1

Thysanotus patersonii

1

Thysanotus tenellus

1

Thysanotus thyrsoides

1

Tricoryne elatior

1

Tricoryne humilis

1

Apiaceae

Daucus glochidiatus

1 1 1

Homalosciadium homalocarpum

1

Hydrocotyle alata

1

Hydrocotyle pilifera

1

Platysace filiformis

1

Platysace juncea

1

Schoenolaena tenuior

1

Trachymene pilosa

1

Xanthosia candida

1

Xanthosia huegelii

1

Aspleniaceae

Asplenium flabellifolium

1

Asteraceae

Angianthus preissianus

1

Angianthus tomentosus

1

* Arctotheca calendula

1

Asteridea pulverulenta

1

Brachyscome ciliaris

1

Brachyscome iberidifolia

1

Cotula coronopifolia

1

Cotula cotuloides

1

Craspedia variabilis

1

Euchiton sphaericus

1

Gnephosis tenuissima

1

Hyalosperma cotula

1

* Hypochaeris glabra

1

Lagenifera huegelii

1

Millotia tenuifolia

1

Olearia paucidentata

1

Pithocarpa corymbulosa

1

Podolepis gracilis

1

Podolepis lessonii

1

Podotheca angustifolia

1

Pogonolepis stricta

1

* Pseudognaphalium luteoalbum

1

Pterochaeta paniculata

1

Quinetia urvillei

1

Rhodanthe citrina

1

Rutidosia multiflora

1

Senecio glomeratus

1

Senecio minimus

1

Siloxerus humifusus

1

* Vellereophyton dealbatum

1

Vittadinia australasica

1

Campanulaceae

Wahlenbergia multicaulis

1

Wahlenbergia preissii

1

Wahlenbergia stricta

1

Family

Map Units

2 3/9 5 7 9 10 12 13 15 17 19 24 Dist

Caryophyllaceae

- * *Cerastium glomeratum*
- Petrorhagia prolifera*
- * *Silene gallica*

Casuarinaceae

- Allocasuarina humilis*
- Allocasuarina microstachya*
- Allocasuarina thuyoides*

Centrolepidaceae

- Aphelia cyperoides*
- Centrolepis alepyroides*
- Centrolepis aristata*
- Centrolepis drummondiana*
- Centrolepis glabra*
- Centrolepis pilosa*
- Centrolepis polygyna*

Chenopodiaceae

- Dysphania glomulifera* subsp. *glomulifera*
- Dysphania plantaginella*
- Halosarcia ?indica*
- Sarcocornia quinqueflora*

Colchicaceae

- Burchardia congesta*
- Burchardia monantha*
- Burchardia multiflora*

Convolvulaceae

- Wilsonia backhousei*
- Wilsonia humilis*

Crassulaceae

- Crassula colorata*
- Crassula pedicellosa*

Cupressaceae

- Actinostrobus pyramidalis*

Cyperaceae

- Baumea articulata*
- Baumea juncea*
- Baumea rubiginosa*
- Baumea vaginalis*
- Caustis dioica*
- Chorizandra enodis*
- Cyathochaeta avenacea*
- Cyathochaeta clandestina*
- Gahnia trifida*
- Isolepis cernua*
- Isolepis fluitans*
- * *Isolepis marginata*
- Isolepis oldfieldiana*
- Isolepis stellata*
- Lepidosperma angustatum*
- Lepidosperma longitudinale*
- Lepidosperma squamatum*
- Lepidosperma ?tenua*
- Mesomelaena graciliceps*
- Mesomelaena stygia*
- Mesomelaena tetragona*
- Schoenus curvifolius*
- Schoenus efoliatus*
- Schoenus elegans*
- Schoenus grandiflorus*
- Schoenus humilis*
- Schoenus loliaceus*
- Schoenus nanus*
- Schoenus natans*
- Schoenus odontocarpus*
- Schoenus subbulbosus*
- Schoenus subflavus*
- Schoenus sublateralis*
- Schoenus submicrostachyus*
- Schoenus tenellus*
- Tetraria capillaris*
- Tetraria octandra*
- Tricostularia neesii*

Dasypogonaceae

- Chamaexeros serra*

	2	3/9	5	7	9	10	12	13	15	17	19	24	Dist
Lomandraceae													
Dasypogon bromeliifolius	1												
Lomandra caespitosa		1											
Lomandra collina		1	1										
Lomandra hermaphrodita		1											
Lomandra micrantha	1	1	1										
Lomandra nigricans	1				1								
Lomandra purpurea	1												
Lomandra sericea	1												
Lomandra suaveolens		1											
Dilleniaceae													
Hibbertia acerosa		1	1										
Hibbertia commutata			1										
Hibbertia cunninghamii		1			1								
Hibbertia ?polystachya	1												
Hibbertia pulchra		1											
Hibbertia racemosa		1			1								
Hibbertia silvestris		1											
Hibbertia stellaris		1					1						
Hibbertia subvaginata		1											
Hibbertia vaginata		1											
Droseraceae													
Drosera bulbigena			1										
Drosera erythrorhiza		1	1			1							
Drosera gigantea		1										1	
Drosera glanduligera		1			1				1				
Drosera macrantha		1	1										
Drosera menziesii			1			1							
Drosera paleacea		1											
Drosera pallida		1											
Drosera stolonifera		1	1										
Epacridaceae													
Andersonia ?caerulea						1							
Astroloma ?baxteri		1											
Astroloma ciliatum		1											
Astroloma pallidum		1											
Astroloma prostratum		1	1										
Leucopogon australis		1											
Leucopogon capitellatus		1											
Leucopogon conostephioides					1								
Leucopogon ?elator		1											
Leucopogon gibbosus		1											
Leucopogon pendulus		1											
Leucopogon propinquus	1	1											
Leucopogon verticillatus	1												
Lysinema ciliatum		1											
Euphorbiaceae													
Monotaxis occidentalis	1												
Phyllanthus calycinus		1	1										
Poranthera huegelii						1							
Poranthera microphylla		1	1										
Pseudanthus virgatus	1												
Gentianaceae													
* Centaurium erythraea												1	
* Cicendia filiformis									1			1	
Sebaea ovata			1										
Geraniaceae													
Geranium solanderi		1	1										
Pelargonium littorale			1										
Goodeniaceae													
Anthotium junciforme		1											
Dampiera ?alata		1			1								
Dampiera linearis		1											
Dampiera trigona								1					
Goodenia micrantha									1				
Goodenia pulchella									1				
Velleia trinervis				1									
Haemodoraceae													
Anigozanthos humilis		1											
Anigozanthos manglesii		1											
Conostylis aculeata		1	1										
Conostylis setigera		1											
Haemodorum laxum				1									
Haemodorum simplex				1									
Haemodorum sparsiflorum				1									

Family	Map Units														Dist
	2	3/9	5	7	9	10	12	13	15	17	19	24			
Haemodorum spicatum		1													
Tribonanthes sp Lake Muir									1						
Haloragaceae															
Glischrocaryon aureum		1		1											
Hydatellaceae															
Hydatella sp									1						
Trithuria submersa									1						
Hypoxidaceae															
Hypoxis occidentalis		1	1												
Iridaceae															
Patersonia juncea	1														
Patersonia occidentalis		1	1												
Patersonia occidentalis (swamp form)											1				
* Romulea rosea			1										1		
Juncaceae															
* Juncus bufonius									1						
Juncus pallidus											1				
Juncaginaceae															
Triglochin calcitrapum									1						
Triglochin centrocarpum					1				1						
Triglochin huegelii											1				
Triglochin mucronatum									1		1				
Lamiaceae															
Hemiandra pungens		1		1											
Lauraceae															
Cassytha glabella		1													
Cassytha racemosa		1													
Lentibulariaceae															
Polypompholyx multifida									1	1					
Polypompholyx tenella										1					
Utricularia volubilis											1				
Lindsaeaceae															
Lindsaea linearis		1		1											
Lobeliaceae															
Grammatotheca bergiana		1													
Isotoma hypocrateriformis			1	1											
Lobelia alata				1							1				
Lobelia gibbosa		1													
Lobelia heterophylla		1													
Loganiaceae															
Logania serpyllifolia		1													
Phyllangium paradoxum			1												
Loranthaceae															
Nuytsia floribunda		1		1											
Lycopodiaceae															
Phylloglossum drummondii										1					
Lythraceae															
* Lythrum hyssopifolia													1		
Menyanthaceae															
Villarsia albiflora		1													
Villarsia parnassifolia		1													
Mimosaceae															
Acacia biflora	1														
Acacia cyclops				1											
Acacia extensa						1									
Acacia huegelii		1		1											
Acacia larinica var. larinica			1												
Acacia latipes							1								
Acacia pulchella				1	1										
Acacia rostellifera					1										
Acacia saligna			1	1											
Acacia stenoptera		1		1											
Acacia tetragonocarpa		1													
Acacia varia			1												
Myoporaceae															
Myoporum caprarioides				1											
Myrtaceae															
Actinodium cunninghamii					1										
Agonis parviceps		1					1								
Astartea sp. (pink weeping)		1					1								
Astartea sp. (pink weeping)		1					1								
Baeckea camphorosmae	1		1												
Calothamnus lateralis									1						
Calothamnus lehmannii							1								

Family

Map Units

	2	3/9	5	7	9	10	12	13	15	17	19	24	Dist
Calothamnus ?preissii			1			1							
Calytrix flavescens		1											
Calytrix leschenaultii		1											
Calytrix ?tenuiramea		1											
Darwinia ?vestita						1							
Eremaea pauciflora		1											
Eucalyptus calophylla		1											
Eucalyptus cornuta				1									
Eucalyptus decipiens				1									
Eucalyptus ?latens				1									
Eucalyptus occidentalis				1									
Eucalyptus rudis						1							
Eucalyptus wandoo			1										
Hypocalymma angustifolium			1										
Hypocalymma strictum						1							
Kunzea ericifolia		1											
Kunzea recurva						1							
Leptospermum erubescens		1											
Melaleuca cuticularis									1		1		
Melaleuca densa						1							
Melaleuca lateritia							1						
Melaleuca pauciflora						1			1				
Melaleuca preissiana						1							
Melaleuca raphiophylla						1		1					
Melaleuca thymoides		1											
Melaleuca viminea						1			1				
Pericalymma ellipticum						1							
Verticordia densiflora						1							
Verticordia habrantha	1												
Olacaceae													
Olax phyllanthi	1	1	1										
Onagraceae													
Epilobium billardierianum											1		
Ophioglossaceae													
Ophioglossum lusitanicum							1						
Orchidaceae													
Caladenia cairnsiana			1										
Caladenia flava		1	1										
Caladenia latifolia				1									
Caladenia longicauda		1											
Caladenia macrostylis	1												
Caladenia magniclavata	1												
Caladenia marginata		1	1										
Caladenia radiata											1		
Caladenia reptans		1											
Caladenia rhomboidiformis			1										
Caladenia splendens MS		1											
Corybas recurvus		1						1					
Cryptostylis ovata		1											
Cyrtostylis robusta		1											
Drakaea livida		1											
Elythranthera brunonis		1	1										
Elythranthera emarginata			1										
Leporella fimbriata			1										
Lyperanthus serratus		1											
Microtis atrata									1			1	
Microtis media						1							
Microtis orbicularis												1	
* Monadenia bracteata		1	1										
Paracaleana nigrita		1											
Praecoxanthus aphyllus MS		1											
Prasophyllum macrostachyum								1					
Pterostylis barbata		1											
Pterostylis nana		1											
Pterostylis recurva		1											
Pterostylis sanguinea		1											
Pyrorchis nigricans		1	1	1									
Thelymitra antennifera			1										
Thelymitra benthamiana		1											
Thelymitra crinita		1											
Thelymitra flexuosa			1						1				
Thelymitra pauciflora		1	1										
Orobanchaceae													
* Orobanche minor					1								

Family

Map Units

2 3/9 5 7 9 10 12 13 15 17 19 24 Dist

Oxalidaceae

Oxalis perennans

1

* Oxalis purpurea

1

Papilionaceae

Bossiaea eriocarpa

1 1 1

Bossiaea linophylla

1

Bossiaea ornata

1

Bossiaea praetermissa

1 1

Brachysema melanopetalum

1

Brachysema praemorsum

1

Chorizema aciculare

1

Chorizema ?ilicifolium

1

Daviesia cordata

1 1

Daviesia hakeoides

1

Daviesia ?incrassata

1

Daviesia preissii

1

Gompholobium aristatum

1

Gompholobium burtonioides

1

Gompholobium capitatum

1

Gompholobium confertum

1 1

Gompholobium knightianum

1

Gompholobium marginatum

1 1

Gompholobium ovatum

1 1

Gompholobium polymorphum

1 1

Gompholobium preissii

1

Gompholobium scabrum

1 1

Hovea chorizemifolia

1

Hovea trisperma var. grandiflora

1

Isotropis cuneifolia

1 1

Jacksonia ?furcellata

1

Kennedia prostrata

1

Pultenaea ericifolia

1

Pultenaea ochreatea

1

Pultenaea reticulata

1

Sphaerolobium drummondii

1

Sphaerolobium linophyllum

1

Sphaerolobium medium

1

* Trifolium campestre

1

* Trifolium cernuum

1

Viminaria juncea

1

Phylodraceae

Phylidrella pygmaea

1

Phormiaceae

Dianella brevicaulis

1

Dianella revoluta

1

Stypandra glauca

1

Pittosporaceae

Billardiera candida

1 1

Billardiera drummondiana var.

1

Billardiera erubescens

1

Billardiera parviflora var. parviflora

1

Sollya heterophylla

1 1

Poaceae

Agrostis avenacea

1

* Aira caryophyllea

1

Amphipogon debilis

1

Amphipogon strictus

1

* Anthoxanthum odoratum

1

* Briza maxima

1

* Briza minor

1 1

* Bromus diandrus

1

Danthonia occidentalis

1

Deyeuxia quadriseta

1

Dichelachne crinita

1

Hemarthria uncinata

1

* Holcus lanatus

1

* Holcus setiger

1

* Lolium multiflorum

1

Microlaena stipoides

1

Neurachne alopecuroidea

1 1

Poa drummondiana

1

Poa poiiformis

1

* Polypogon monspeliensis

1

Polypogon tenellus

1

Family

Map Units

Dist

Lepyrodia muirii
Lyginia barbata
Meeboldina coangustata MS
Meeboldina scariosa MS
Meeboldina tephрина MS
Tremulina tremula MS

Rhamnaceae

Cryptandra sp.
Trymalium ?ledifolium

Rubiaceae

* Galium murale	1	1
Opercularia apiciflora	1	1
Opercularia hispidula	1	
Opercularia ?rubioides		1
Opercularia vaginata	1	1

Rutaceae

<i>Boronia crenulata</i>	1	1		
<i>Boronia megastigma</i>				1
<i>Boronia nematophylla</i>				1
<i>Boronia ramosa</i>			1	
<i>Boronia spathulata</i>	1	1		

Santalaceae

Leptomeria cunninghamii
Leptomeria spinosa
Leptomeria squarrolosa

Scrophulariaceae

Gratiola peruviana			1
* Parentucellia latifolia	1	1	
* Parentucellia viscosa		1	

Selaginellaceae

<i>Selaginella gracillima</i>	1	1	1
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Stackhousiaceae

Stackhousia monogyna
Tripterococcus brunonis

Sterculiaceae

Thomasia foliosa
Thomasia pauciflora

Stylidiaceae

Levenhookia pusilla
Levenhookia stipitata
Stylidium amoenum
Stylidium assimile
Stylidium brunonianum subsp. *minor*
Stylidium calcaratum
Stylidium guttatum
Stylidium inundatum
Stylidium junceum subsp. *brevius*
Stylidium mimeticum
Stylidium perpusillum
Stylidium petiolare
Stylidium repens
Stylidium roseonanum
Stylidium scandens
Stylidium schoenoides
Stylidium spatulatum

Thymelaeaceae

Pimelea angustifolia
Pimelea rosea
Pimelea suaveolens

Tremandraceae

<i>Tetratheca setigera</i>	1		
<i>Tetratheca virgata</i>		1	
<i>Tremandra diffusa</i>			1

Typhaceae

* *Typha orientalis*

Violaceae

Hybanthus floribundus 1

Xanthorrhoeaceae

<i>Xanthorrhoea gracilis</i>		1
<i>Xanthorrhoea preissii</i>	1	1

Zamiaceae

<i>Macrozamia riedlei</i>	1	1	1
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Zannichelliaceae

Lepilaena australis

Yarnup Nature Reserve

Reserve number: 29601

Class: A

Location: 34 22 34S 116 51 53E;

Land tenure : Nature Reserve

Purpose : Water & Conservation of flora and fauna

Area: 62 ha

Biological values

Flora: Using Griffin (1984) data as a basis, a flora list of 272 taxa was compiled from the reserve (Table 13). This included 3 priority taxa (*Euchiton gymnocephalus* (Priority 3), *Hydatella australis* (Priority 1), *Stylidium mimeticum* (Priority 3))

Vegetation description: Griffin (1984) mapped the reserve and described six vegetation units. Brief descriptions of these units are given below.

- 2) *Eucalyptus marginata* (Jarrah) Forest (Type 1). Jarrah / Marri forest of the top and upper slopes of the lateritic ridges.
- 3/9) *Eucalyptus marginata* (Jarrah) Forest (Type 2) / *Agonis parviceps* Thicket. Variable unit similar to Kodjinup vegetation unit 2, common on low lying sandy substrates.
- 10) *Melaleuca preissiana* - *Banksia littoralis* Open Low Woodland A. A complex unit essentially similar to Kodjinup vegetation unit 6.
- 13). *Melaleuca raphiophylla* Dense Low Forest B. Occurs as circular or ring shaped areas in centre of some basin wetlands. This unit is equivalent to Muir vegetation unit 15.
- 17) *Halosarcia* - *Wilsonia* Mat Plants. Form areas of herbland around several of the salt lakes. Similar in many respects to Muir vegetation unit 27.
- 19) *Baumea* Sedges. Occupying basin wetlands, essentially same as Kodjinup vegetation units 10 and 11.

Disturbed areas) Not mapped by Griffin (1984) but used in compiling species lists.

Vegetation change: Oblique air photos from April 1980 (Photo 27 - JAK Lane, unpub data) shows extensive recent (1980) clearing to the south of the reserve. The area of salt scald crossing the road on the south side of the swamp is not visible on the 1980 photography. Halse *et al.* (1993) reported that the salt scalding had been noted since 1988. The area of open water visible in the swamp in 1980 is comparable to that mapped in 1984 Griffin and to the 1995 aerial photography (WA3619-5172).

Disturbance or threats: Death of woodland communities on western boundary, south of the swamp appears to be the result of saline run off from private property.

Family**Map Units**

2 3/9 10 13 19 Dist

Table 13 - Yarnup Nature Reserve flora list**Aizoaceae**

Carpobrotus modestus 1

Amaranthaceae

Ptilotus manglesii 1

Anthericaceae

Agrostocrinum scabrum 1

Arthropodium preissii 1

Borya scirpoidea 1

Caesia micrantha 1

Caesia occidentalis 1

Chamaescilla corymbosa 1

Chamaescilla sp. 1

Johnsonia lupulina 1

Sowerbaea laxiflora 1 1

Thysanotus manglesianus 1

Tricoryne elatior 1

Tricoryne tenella 1

Apiaceae

Daucus glochidiatus 1

Eryngium pinnatifidum 1

Homalosciadium homalocarpum 1 1

Hydrocotyle alata 1

Hydrocotyle callicarpa 1

Schoenolaena tenuior 1

Trachymene pilosa 1

Xanthosia candida 1

Xanthosia huegelii 1

Asteraceae

Blennospora drummondii 1

Cotula coronopifolia 1 1

Craspedia variabilis 1 1

* Dittrichia graveolens 1

Euchiton gymnocephalus 1

Hyalosperma cotula 1

* Hypochaeris glabra 1 1

Lagenifera huegelii 1

Millotia myosotidifolia 1

Myriocephalus occidentalis 1

Podolepis gracilis 1

* Pseudognaphalium luteoalbum 1

Rhodanthe citrina 1

Senecio glomeratus 1

Siloxerus humifusus 1

* Sonchus asper 1 1 1

* Sonchus oleraceus 1 1

Trichocline sp. 1

* Vellereophyton dealbatum 1

Centrolepidaceae

Aphelia cyperoides 1

Centrolepis aristata 1

Centrolepis glabra 1

Centrolepis humillima 1

Centrolepis polygyna 1

Chenopodiaceae

* Atriplex prostrata 1

Colchicaceae

Burchardia congesta 1 1

Burchardia monantha 1

Burchardia multiflora 1

Cyperaceae

Baumea articulata 1

Baumea juncea 1

Baumea vaginalis 1

Chorizandra enodis 1

Cyathochaeta avenacea 1

* Cyperus tenellus 1

Isolepis cernua 1

Isolepis oldfieldiana 1

Lepidosperma angustatum 1

Lepidosperma longitudinale 1 1

Lepidosperma squamatum 1

Lepidosperma tenue 1

*Family**Map Units*

	2	3/9	10	13	19	Dist
Mesomelaena stygia	1					
Mesomelaena tetragona		1	1			
Schoenus brevisetis			1			
Schoenus efolius			1			
Schoenus laevigatus			1			
Tetraria capillaris		1	1			
Tetraria octandra	1	1				
Tricostularia neesii var. neesii		1				
Dasyopogonaceae						
Chamaexeros serra	1					
Lomandra caespitosa			1			
Lomandra sericea		1				
Lomandra suaveolens		1	1			
Dilleniaceae						
Hibbertia ?amplexicaulis		1				
Hibbertia commutata		1				
Hibbertia cunninghamii	1					
Hibbertia racemosa	1	1	1			
Hibbertia spicata subsp. spicata	1					
Hibbertia stellaris		1	1			
Droseraceae						
Drosera erythrorhiza	1					
Drosera gigantea			1			
Drosera glanduligera	1					
Drosera macrantha	1					
Drosera neesii			1			
Epacridaceae						
Astroloma baxteri		1				
Astroloma ciliatum	1					
Astroloma pallidum	1					
Leucopogon capitellatus		1				
Leucopogon parviflorus				1		
Leucopogon propinquus	1	1				
Leucopogon verticillatus		1				
Euphorbiaceae						
Phyllanthus calycinus		1				
Poranthera microphylla		1				
Gentianaceae						
* Centaurium erythraea			1			1
* Cicendia filiformis			1			
Geraniaceae						
Geranium solanderi	1					
Goodeniaceae						
Dampiera alata	1					
Dampiera linearis	1		1			
Lechenaultia formosa	1		1			
Scaevola platyphylla		1				
Haemodorumaceae						
Anigozanthos manglesii		1	1			
Conostylis aculeata		1				
Conostylis aurea		1				
Haemodorum laxum	1					
Haemodorum simplex			1	1		
Haemodorum spicatum		1				
Tribonanthes australis			1			
Tribonanthes longipetala			1			
Tribonanthes violacea			1			
Haloragaceae						
Glischrocaryon aureum	1					
Gonocarpus paniculatus			1			
Myriophyllum limnophilum			1			
Hydatellaceae						
Hydatella australis			1			
Hypoxidaceae						
Hypoxis occidentalis			1			
Iridaceae						
Patersonia juncea	1					
Patersonia occidentalis		1	1			
Isoetaceae						
Isoetes drummondii			1			
Juncaceae						
* Juncus bufonius						1
* Juncus capitatus			1			
Juncaginaceae						

Family**Map Units**

	2	3/9	10	13	19	Dist
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Triglochin centrocarpum			1			
Triglochin huegelii					1	
Lauraceae						
Cassytha racemosa			1			
Lentibulariaceae						
Polypompholyx multifida			1			
Utricularia hookeri			1			
Linaceae						
Linum marginale	1		1			
Lindsaeaceae						
Lindsaea linearis	1	1	1			
Lobeliaceae						
Lobelia alata			1			
Lobelia gibbosa		1				
Loganiaceae						
Logania serpyllifolia	1	1				
Lycopodiaceae						
Phylloglossum drummondii			1			
Menyanthaceae						
Villarsia albiflora					1	
Mimosaceae						
Acacia alata	1					
Acacia extensa		1	1			
Acacia huegelii		1	1			
Acacia incurva			1			
Acacia nervosa	1					
Acacia pulchella	1	1				
Acacia saligna	1	1	1			
Acacia stenoptera		1				
Myrtaceae						
Agonis parviceps		1	1			
Calothamnus preissii		1				
Eucalyptus calophylla		1				
Eucalyptus cornuta			1			
Eucalyptus decipiens			1			
Eucalyptus marginata		1				
Eucalyptus rudis			1			
Hypocalymma angustifolium		1				
Kunzea ?micrantha		1	1			
Kunzea recurva			1			
Melaleuca lateritia			1		1	
Melaleuca preissiana			1			
Melaleuca raphiophylla			1	1		
Melaleuca thymoides		1	1			
Melaleuca viminea			1	1		
Pericalymma ellipticum		1	1			
Onagraceae						
Epilobium billardierianum				1		1
Orchidaceae						
Caladenia flava		1				
Caladenia longicauda		1	1			
Caladenia marginata			1			
Caladenia radialis			1			
Cyrtostylis robusta			1			
Diuris carinata			1			
Diuris laxiflora		1				
Elythranthera brunonis		1				
Elythranthera emarginata		1				
Microtis media			1			
* Monadenia bracteata		1	1			
Pterostylis nana		1				
Pterostylis recurva		1	1			
Pterostylis vittata	1					
Pyrorchis nigricans		1				
Thelymitra antennifera			1			
Thelymitra crinita		1				
Thelymitra flexuosa		1				
Thelymitra pauciflora		1				
Papilionaceae						
Bossiaea eriocarpa		1	1			
Bossiaea linophylla	1					
Bossiaea ornata	1					
Brachysema praemorsum			1			
Chorizema aciculare	1					

Family**Map Units**

	2	3/9	10	13	19	Dist
Daviesia preissii		1				
Gompholobium marginatum		1				
Gompholobium ovatum	1					
Gompholobium preissii	1					
Gompholobium tomentosum		1				
Jacksonia furcellata		1				
Kennedia prostrata	1	1				
* Lotus angustissimus						1
Sphaerolobium medium	1					
Viminaria juncea			1			
Philydraceae						
Philydrella drummondii			1			
Philydrella pygmaea			1			
Phormiaceae						
Dianella brevicaulis			1			
Dianella revoluta	1		1			
Stypandra glauca	1					
Pittosporaceae						
Sollya heterophylla		1				
Plantaginaceae						
Plantago debilis	1					
Poaceae						
* Aira caryophyllea			1			
* Briza maxima	1		1			
* Briza minor	1		1			
* Bromus diandrus						1
Deyeuxia quadriseta			1	1		
Hemarthria uncinata			1			
* Hordeum leporinum						1
* Hordeum ?murinum						1
* Lolium rigidum						1
Microlaena stipoides	1					
Neurachne alopecuroidea		1	1			
Poa poiformis				1		
* Polypogon monspeliensis						1
Stipa compressa			1			
Stipa pycnostachya	1					
Tetrarrhena laevis		1				
* Vulpia myuros			1			
Polygalaceae						
Comesperma virgatum		1				
Comesperma volubile	1					
Polygonaceae						
* Rumex pulcher						1
Primulaceae						
Samolus junceus			1	1		
Proteaceae						
Banksia grandis		1				
Banksia littoralis			1			
Dryandra lindleyana	1	1				
Grevillea fasciculata	1					
Grevillea pilulifera		1				
Hakea corymbosa		1				
Hakea lissocarpa	1					
Hakea prostrata		1				
Hakea ruscifolia		1				
Hakea varia			1			
Persoonia longifolia		1				
Petrophile media	1					
Synaphea aff. petiolaris		1				
Synaphea petiolaris		1				
Restionaceae						
Anarthria prolifera		1	1			
Chordifex laxus MS			1			
Desmocladius fasciculatus MS	1	1				
Desmocladius flexuosus MS	1					
Harperia lateriflora		1	1			
Hypolaena exsulca		1	1			
Lepyrodia macra			1			
Lyginia barbata		1	1			
Meeboldina cana MS			1	1		
Rosaceae						
* Acaena echinata	1					
Rubiaceae						

*Family**Map Units*

	2	3/9	10	13	19	Dist
Opercularia hispidula		1	1			
Rutaceae						
Boronia spathulata		1				
Santalaceae						
Leptomeria squarrulosa		1				
Scrophulariaceae						
* Parentucellia latifolia			1			
* Parentucellia viscosa			1			
Selaginellaceae						
Selaginella gracillima			1			
Stackhousiaceae						
Stackhousia monogyna	1					
Stylidiaceae						
Stylidium brunonianum subsp. minor	1					
Stylidium calcaratum	1					
Stylidium ecorne			1			
Stylidium inundatum			1			
Stylidium junceum	1					
Stylidium mimeticum			1			
Stylidium petiolare		1				
Stylidium pulchellum			1			
Stylidium repens	1	1				
Stylidium sp.			1			
Stylidium spathulatum	1	1	1			
Thymelaeaceae						
Pimelea angustifolia		1	1			
Pimelea lehmanniana	1					
Tremandraceae						
Platytheca galioides			1			
Tetralthea affinis	1					
Tetralthea setigera	1					
Tetralthea virgata			1			
Violaceae						
Hybanthus floribundus	1					
Xanthorrhoeaceae						
Xanthorrhoea gracilis	1					
Xanthorrhoea preissii		1				
Zamiaceae						
Macrozamia riedlei	1	1				

Appendix 2

Total flora list for the 13 reserves of the Byenup - Muir wetland system

(* indicates an introduced taxon)

Aizoaceae

- * *Carpobrotus edulis*
- Carpobrotus modestus*

Amaranthaceae

- Alternanthera nodiflora*
- Hemichroa diandra*
- Ptilotus drummondii*
- Ptilotus manglesii*

Amaryllidaceae

- * *Amaryllis belladonna*

Anthericaceae

- Agrostocrinum scabrum*
- Arthropodium capillipes*
- Arthropodium preissii*
- Borya scirpoidea*
- Borya sphaerocephala*
- Caesia micrantha*
- Caesia occidentalis*
- Chamaescilla corymbosa*
- Chamaescilla spiralis*
- Johnsonia acaulis*
- Johnsonia lupulina*
- Laxmannia minor*
- Laxmannia sessiliflora*
- Sowerbaea laxiflora*
- Thysanotus arenarius*
- Thysanotus manglesianus*
- Thysanotus multiflorus*
- Thysanotus patersonii*
- Thysanotus sparteus*
- Thysanotus tenellus*
- Thysanotus thyrsoides*
- Thysanotus triandrus*
- Tricoryne elatior*
- Tricoryne humilis*
- Tricoryne tenella*

Apiaceae

- Actinotus glomeratus*
- Apium annuum*
- Apium prostratum*
- Centella cordifolia*
- Daucus glochidiatus*
- Eryngium pinnatifidum*
- Eryngium* sp. Lake Muir (E. Wittwer 2293) PN
- Homalosciadium homalocarpum*
- Hydrocotyle alata*
- Hydrocotyle callicarpa*
- Hydrocotyle diantha*
- Hydrocotyle pilifera* var. *glabrata*
- Lilaeopsis polyantha*
- Platysace filiformis*
- Platysace juncea*
- Schoenolaena juncea*
- Schoenolaena tenuior*
- Trachymene pilosa*
- Xanthosia atkinsoniana*
- Xanthosia candida*
- Xanthosia ciliata*
- Xanthosia huegelii*

Aspleniaceae

- Asplenium flabellifolium*

Asteraceae

- Angianthus preissianus*
- Angianthus* sp.
- Angianthus tomentosus*
- * *Arctotheca calendula*
- * *Aster subulatus*
- Asteridea athrixioides*
- Asteridea pulverulenta*
- Blennospora drummondii*
- Brachyscome bellidioides*
- Brachyscome ciliaris*
- Brachyscome iberidifolia*
- Calotis erinacea*
- * *Carduus pycnocephalus*

- * *Centaurea melitensis*
- * *Cirsium vulgare*
- * *Conyza albida*
- Cotula australis*
- Cotula coronopifolia*
- Cotula cotuloides*
- * *Cotula turbinata*
- Craspedia variabilis*
- * *Dittrichia graveolens*
- Euchiton gymnocephalus*
- Euchiton sphaericus*
- Gnephosis tenuissima*
- * *Hedypnois rhagadioloides*
- Hyalosperma cotula*
- Hyalosperma simplex*
- * *Hypochaeris glabra*
- Ixiolaena viscosa*
- * *Lactuca serriola*
- Lagenifera huegelii*
- Millotia myosotidifolia*
- Millotia tenuifolia*
- Myriocephalus occidentalis*
- Olearia axillaris*
- Olearia elaeophila*
- Olearia paucidentata*
- Picris angustifolia*
- Pithocarpa corymbulosa*
- Pithocarpa pulchella*
- Podolepis gracilis*
- Podolepis lessonii*
- Podotheca angustifolia*
- Pogonolepis stricta*
- * *Pseudognaphalium luteoalbum*
- Pterochaeta paniculata*
- Quinetia urvillei*
- Rhodanthe citrina*
- Rhodanthe pyrethrum*
- Rutidosia multiflora*
- Senecio glomeratus*
- Senecio lautus*
- Senecio minimus*
- Senecio picridioides*
- Senecio quadridentatus*
- Siloxerus humifusus*
- * *Sonchus asper*
- * *Sonchus hydrophilus*
- * *Sonchus oleraceus*
- * *Tolpis barbata*
- Trichocline* sp. wheat
- Trichocline spatulata*
- * *Ursinia anthemoides*
- * *Vellereophyton dealbatum*
- Vittadinia australasica* var. *australasica*
- Waitzia nitida*
- Waitzia suaveolens*

Brassicaceae

- * *Cardamine paucijuga*
- * *Lepidium africanum*
- * *Sisymbrium officinale*

Caesalpinaceae

- Labichea punctata*

Callitricaceae

- * *Callitriche stagnalis*

Campanulaceae

- Wahlenbergia gracilentia*
- Wahlenbergia multicaulis*
- Wahlenbergia preissii*
- Wahlenbergia stricta*

Caryophyllaceae

- * *Cerastium glomeratum*
- * *Corrigiola litoralis*
- Petrorhagia prolifera*
- * *Petrorhagia velutina*
- * *Silene gallica*
- * *Spergularia salina*

Casuarinaceae

Allocasuarina humilis
Allocasuarina lehmanniana
Allocasuarina microstachya
Allocasuarina thuyoides

Centrolepidaceae

Aphelia cyperoides
Brizula drummondii
Centrolepis alepyroides
Centrolepis aristata
Centrolepis drummondiana
Centrolepis glabra
Centrolepis humillima
Centrolepis mutica
Centrolepis pilosa
Centrolepis polygyna

Chenopodiaceae

* *Atriplex prostrata*
 * *Chenopodium murale*
Dysphania glomulifera subsp. *glomulifera*
Dysphania plantaginella
Halosarcia indica
Halosarcia leptoclada
Rhagodia baccata
Sarcocornia quinqueflora
Suaeda australis

Clusiaceae

Hypericum gramineum

Colchicaceae

Burchardia congesta
Burchardia monantha
Burchardia multiflora
Wurmbea dioica subsp. *alba*

Convolvulaceae

Dichondra repens
Pronaya fraseri
Wilsonia backhousei
Wilsonia humilis

Crassulaceae

Crassula colorata
Crassula decumbens var. *decumbens*
Crassula exserta
 * *Crassula natans*
Crassula pedicellosa
Crassula peduncularis

Cupressaceae

Actinostrobus acuminatus
Actinostrobus pyramidalis

Cyperaceae

Baumea arthropphylla
Baumea articulata
Baumea juncea
Baumea rubiginosa
Baumea vaginalis
Carex appressa
Carex preissii
Caustis dioica
Caustis sp. *Boyanup* (G.S.McCutcheon 1706)
Chorizandra enodis
Cyathochaeta avenacea
Cyathochaeta clandestina
 * *Cyperus eragrostis*
 * *Cyperus tenellus*
Eleocharis sphacelata
Gahnia ancistrophylla
Gahnia aristata
Gahnia drummondii
Gahnia trifida
Isolepis cernua
Isolepis congrua
Isolepis cyperoides
Isolepis fluitans
 * *Isolepis marginata*
Isolepis nodosa
Isolepis oldfieldiana

Isolepis producta
 * *Isolepis prolifera*
Isolepis stellata
Lepidosperma angustatum
Lepidosperma gladiatum
Lepidosperma ?gracile
Lepidosperma longitudinale
Lepidosperma squamatum
Lepidosperma tenue
Mesomelaena graciliceps
Mesomelaena stygia
Mesomelaena tetragona
Schoenus asperocarpus
Schoenus benthamii
Schoenus bifidus
Schoenus brevisetis
Schoenus capillifolius
Schoenus curvifolius
Schoenus efoliatus
Schoenus elegans
Schoenus grandiflorus
Schoenus humilis
Schoenus laevigatus
Schoenus loliaceus
Schoenus maschalinus
Schoenus nanus
Schoenus natans
Schoenus obtusifolius
Schoenus odontocarpus
Schoenus plumosus
Schoenus rigens
Schoenus sculptus
Schoenus subbulbosus
Schoenus subflavus
Schoenus ?sublateralis
Schoenus submicrostachyus
Schoenus tenellus
Schoenus unispiculatus
Tetraria capillaris
Tetraria octandra
Tricostularia compressa
Tricostularia neesii var. *elatio*
Tricostularia neesii var. *neesii*

Dasyopogonaceae

Chamaexeros serra
Dasyopogon bromeliifolius
Lomandra caespitosa
Lomandra collina
Lomandra hermaphrodita
Lomandra micrantha
Lomandra nigricans
Lomandra purpurea
Lomandra sericea
Lomandra sonderi
Lomandra suaveolens

Dennstaedtiaceae

Pteridium esculentum

Dilleniaceae

Hibbertia acerosa
Hibbertia amplexicaulis
Hibbertia commutata
Hibbertia cunninghamii
Hibbertia glomerata
Hibbertia gracilipes
Hibbertia microphylla
Hibbertia ?polystachya
Hibbertia pulchra
Hibbertia racemosa
Hibbertia silvestris
Hibbertia spicata subsp. *spicata*
Hibbertia stellaris
Hibbertia subvaginata
Hibbertia vaginata

Droseraceae

Drosera bulbigena

- Drosera bulbosa*
Drosera erythrorhiza
Drosera gigantea
Drosera glanduligera
Drosera heterophylla
Drosera macrantha
Drosera menziesii
Drosera neesii
Drosera paleacea
Drosera pallida
Drosera pulchella
Drosera rosulata
Drosera stolonifera
- Epacridaceae**
- Andersonia caerulea*
Astroloma baxteri
Astroloma ciliatum
Astroloma microcalyx
Astroloma pallidum
Astroloma prostratum
Leucopogon australis
Leucopogon capitellatus
Leucopogon conostephioides
Leucopogon ?elator
Leucopogon gibbosus
Leucopogon glabellus
Leucopogon lasiophyllus
Leucopogon oxycedrus
Leucopogon parviflorus
Leucopogon pendulus
Leucopogon ?polymorphus
Leucopogon propinquus
Leucopogon pulchellus
Leucopogon ?sprengelioides
Leucopogon tamariscinus
Leucopogon unilateralis
Leucopogon verticillatus
Lysinema ciliatum
Needhamiella pumilio
Sphenotoma capitatum
Sphenotoma gracile
Styphelia tenuiflora
- Euphorbiaceae**
- Amperea simulans*
Amperea volubilis
Monotaxis occidentalis
Phyllanthus calycinus
Poranthera huegelii
Poranthera microphylla
Pseudanthus virgatus
- Fumariaceae**
- * *Fumaria capreolata*
- Gentianaceae**
- * *Centaurium erythraea*
Centaurium spicatum
 * *Cicendia filiformis*
Sebaea ovata
- Geraniaceae**
- * *Erodium botrys*
 * *Erodium cicutarium*
 * *Erodium moschatum*
Geranium solanderi
Pelargonium littorale
- Goodeniaceae**
- Anthotium humile*
Anthotium junciforme
Dampiera alata
Dampiera cuneata
Dampiera diversifolia
Dampiera fasciculata
Dampiera hederacea
Dampiera ?juncea
Dampiera linearis
Dampiera pedunculata
Dampiera trigona
- Goodenia claytoniacea*
Goodenia micrantha
Goodenia mimuloides
Goodenia pulchella
Lechenaultia biloba
Lechenaultia expansa
Lechenaultia formosa
Scaevola globulifera
Scaevola lanceolata
Scaevola phlebopetala
Scaevola platyphylla
Velleia trinervis
- Haemodoraceae**
- Anigozanthos bicolor*
Anigozanthos flavidus
Anigozanthos humilis
Anigozanthos manglesii
Anigozanthos viridis
Conostylis aculeata
Conostylis aurea
Conostylis laxiflora
Conostylis setigera
Haemodorum laxum
Haemodorum simplex
Haemodorum sparsiflorum
Haemodorum spicatum
Phlebocarya ciliata
Tribonanthes australis
Tribonanthes brachypetala
Tribonanthes longipetala
Tribonanthes sp Lake Muir (GJK & NG 2387)
Tribonanthes violacea
- Haloragaceae**
- Glischrocaryon aureum*
Gonocarpus cordiger
Gonocarpus hexandrus subsp. *integrifolius*
Gonocarpus paniculatus
Gonocarpus pithyoides
Haloragis brownii
Myriophyllum crispatum
Myriophyllum drummondii
Myriophyllum limnophilum
Myriophyllum tillaeoides
Myriophyllum verrucosum
- Hydatellaceae**
- Hydatella australis*
Hydatella sp wheat
Trithuria bibracteata
Trithuria submersa
- Hypoxidaceae**
- Hypoxis glabella*
Hypoxis occidentalis
- Iridaceae**
- * *Gladiolus undulatus*
 * *Homeria flaccida*
 * *Iris germanica*
Patersonia juncea
Patersonia occidentalis
Patersonia occidentalis (swamp form)
Patersonia umbrosa
 * *Romulea rosea*
 * *Watsonia bulbillifera*
- Isoetaceae**
- Isoetes drummondii*
- Juncaceae**
- * *Juncus acutus*
 * *Juncus articulatus*
 * *Juncus bufonius*
 * *Juncus capitatus*
Juncus holoschoenus
Juncus kraussii
Juncus pallidus
Juncus planifolius
Juncus radula
Luzula meridionalis

Juncaginaceae

Triglochin calcitrapum
 Triglochin centrocarpum
 Triglochin huegelii
 Triglochin lineare
 Triglochin minutissimum
 Triglochin mucronatum
 Triglochin striatum

Lamiaceae

Hemiandra pungens
 * Mentha pulegium

Lauraceae

Cassytha flava
 Cassytha glabella
 Cassytha micrantha
 Cassytha racemosa

Lentibulariaceae

Polypompholyx multifida
 Utricularia australis
 Utricularia hookeri
 Utricularia inaequalis
 Utricularia simplex
 Utricularia sp.
 Utricularia violacea
 Utricularia volubilis

Linaceae

Linum marginale

Lindsaeaceae

Lindsaea linearis

Lobeliaceae

Grammatotheca bergiana
 Isotoma hypocrateriformis
 Isotoma scapigera
 Lobelia alata
 Lobelia gibbosa
 Lobelia heterophylla
 Lobelia rhombifolia
 Lobelia tenuior

Loganiaceae

Logania campanulata
 Logania serpyllifolia
 Phyllangium palustre
 Phyllangium paradoxum

Loranthaceae

Amyema miquelii
 Nuytsia floribunda

Lycopodiaceae

Phylloglossum drummondii

Lythraceae

* Lythrum hyssopifolia

Malvaceae

Lawrenzia spicata
 * Malva parviflora
 Sida hookeriana

Marsileaceae

Pilularia novae-hollandiae

Menyanthaceae

Villarsia albiflora
 Villarsia capitata
 Villarsia parnassifolia
 Villarsia submersa
 Villarsia violifolia

Mimosaceae

Acacia alata
 Acacia biflora
 Acacia browniana
 Acacia cochlearis
 Acacia cyclops
 * Acacia dealbata
 Acacia extensa
 Acacia huegelii
 Acacia incurva
 Acacia loricata var. loricata
 Acacia latipes subsp. latipes MS
 * Acacia longifolia subsp. longifolia MS

Acacia myrtifolia
 Acacia nervosa
 Acacia pentadenia
 Acacia pulchella var. goadbyi
 Acacia pulchella var. pulchella
 Acacia rostellifera
 Acacia saligna
 Acacia stenoptera
 Acacia tetragonocarpa
 Acacia urophylla
 Acacia varia
 Acacia willdenowiana

Molluginaceae

Macarthuria apetala

Myoporaceae

Myoporum caprarioides

Myrtaceae

Actinodium cunninghamii
 Agonis hypericifolia
 Agonis juniperina
 Agonis linearifolia
 Agonis parviceps
 Astartea fascicularis
 Astartea sp. (pink weeping)
 Astartea sp. (white erect)
 Baeckea camphorosmae
 Baeckea aff. preissiana
 Baeckea pygmaea
 Callistemon phoeniceus
 Calothamnus lateralis
 Calothamnus lehmannii
 Calothamnus preissii
 Calothamnus sanguineus
 Calothamnus schaueri
 Calytrix angulata
 Calytrix flavescens
 Calytrix leschenaultii
 Calytrix ?tenuiramea
 Darwinia oederoides
 Darwinia vestita
 Eremaea pauciflora
 Eucalyptus aspersa
 Eucalyptus calophylla
 Eucalyptus cornuta
 Eucalyptus decipiens
 Eucalyptus latens
 Eucalyptus marginata
 Eucalyptus megacarpa
 Eucalyptus occidentalis
 Eucalyptus patens
 Eucalyptus rudis
 Eucalyptus wandoo
 Hypocalymma angustifolium
 Hypocalymma strictum
 Kunzea ericifolia
 Kunzea micrantha
 Kunzea recurva
 Kunzea sulphurea
 Leptospermum erubescens
 Melaleuca cordata
 Melaleuca cuticularis
 Melaleuca densa
 Melaleuca lateriflora
 Melaleuca lateritia
 Melaleuca leptoclada
 Melaleuca pauciflora
 Melaleuca preissiana
 Melaleuca pritzelii
 Melaleuca raphiophylla
 Melaleuca spathulata
 Melaleuca thymoides
 Melaleuca viminea
 Melaleuca violacea
 Pericalymma ellipticum
 Verticordia densiflora subsp. caespitosa

- Verticordia habrantha*
Verticordia plumosa
Olacaceae
Olax benthamiana
Olax phyllanthi
Onagraceae
Epilobium billardierianum
Epilobium hirtigerum
Ophioglossaceae
Ophioglossum lusitanicum
Orchidaceae
Caladenia caesarea subsp. *caesarea* MS
Caladenia cairnsiana
Caladenia christineae MS
Caladenia drummondii
Caladenia ferruginea
Caladenia flava
Caladenia harringtoniae
Caladenia latifolia
Caladenia longicauda
Caladenia longiclavata
Caladenia macrostylis
Caladenia magniclavata
Caladenia marginata
Caladenia nana
Caladenia radialis
Caladenia radiata
Caladenia reptans
Caladenia rhomboidiformis
Caladenia splendens MS
Caladenia starteorum MS
Caladenia varians subsp. *variens* MS
Corybas dilatatus
Corybas recurvus
Cryptostylis ovata
Cyanicula deformis MS
Cyanicula ?gemmata MS
Cyrtostylis huegelii
Cyrtostylis robusta
Diuris carinata
Diuris drummondii
Diuris laxiflora
Diuris longifolia
Drakaea glyptodon
Drakaea livida
Drakonorchis barbarossa MS
Elythranthera brunonis
Elythranthera emarginata
Eriochilus dilatatus subsp. *undulatus* MS
Eriochilus scaber
Gastrodia lacista
Leporella fimbriata
Leptoceras menziesii
Lyperanthus serratus
Microtis atrata
Microtis media
Microtis orbicularis
* *Monadenia bracteata*
Paracaleana nigrita
Praecoxanthus aphyllus MS
Prasophyllum drummondii
Prasophyllum elatum
Prasophyllum fimbria
Prasophyllum macrostachyum
Prasophyllum plumiforme
Pterostylis barbata
Pterostylis nana
Pterostylis pyramidalis
Pterostylis recurva
Pterostylis sanguinea
Pterostylis turfosa
Pterostylis vittata
Pyrorchis nigricans
Thelymitra antennifera
Thelymitra benthamiana
Thelymitra crinita
Thelymitra cucullata
Thelymitra flexuosa
Thelymitra fuscolutea
Thelymitra macrophylla
Thelymitra nuda
Thelymitra pauciflora
Orobanchaceae
* *Orobanche minor*
Oxalidaceae
Oxalis perennans
* *Oxalis purpurea*
Papilionaceae
Aotus intermedia
Bossiaea aquifolium
Bossiaea eriocarpa
Bossiaea linophylla
Bossiaea ornata
Bossiaea praetermissa
Bossiaea rufa
Brachysema melanopetalum
Brachysema praemorsum
Callistachys lanceolata
Chorizema aciculare
Chorizema ilicifolium
Chorizema nanum
Daviesia cordata
Daviesia hakeoides
Daviesia incrassata
Daviesia physodes
Daviesia preissii
Eutaxia virgata
Gastrolobium bilobum
Gompholobium aristatum
Gompholobium burtonioides
Gompholobium capitatum
Gompholobium confertum
Gompholobium knightianum
Gompholobium marginatum
Gompholobium ovatum
Gompholobium polymorphum
Gompholobium preissii
Gompholobium scabrum
Gompholobium tomentosum
Goodia lotifolia
Hardenbergia comptoniana
Hovea chorizemifolia
Hovea elliptica
Hovea trisperma var. *grandiflora*
Isotropis cuneifolia
Jacksonia furcellata
Jacksonia sparsa MS
Kennedia coccinea
Kennedia prostrata
Latrobea tenella
* *Lotus angustissimus*
* *Lotus suaveolens*
* *Lotus uliginosus*
* *Ornithopus compressus*
Oxylobium lineare
Pultenaea ericifolia
Pultenaea ochreatea
Pultenaea reticulata
Sphaerolobium drummondii
Sphaerolobium linophyllum
Sphaerolobium macranthum
Sphaerolobium medium
Sphaerolobium vimineum
* *Trifolium arvense*
* *Trifolium campestre*
* *Trifolium cernuum*
* *Trifolium dubium*
* *Trifolium fragiferum*
* *Trifolium glomeratum*
* *Trifolium repens*

- * *Trifolium subterraneum*
- Viminaria juncea*
- Phylodraceae**
 - Phylodrella drummondii*
 - Phylodrella pygmaea*
- Phormiaceae**
 - Dianella brevicaulis*
 - Dianella revoluta*
 - Styandra glauca*
- Pinaceae**
 - * *Pinus pinaster*
- Pittosporaceae**
 - Billardiera candida*
 - Billardiera drummondiana* var. *drummondiana*
 - Billardiera erubescens*
 - Billardiera parviflora* var. *parviflora*
 - Billardiera variifolia*
 - Sollya heterophylla*
- Plantaginaceae**
 - Plantago debilis*
 - Plantago exilis*
- Poaceae**
 - Agrostis avenacea*
 - * *Aira caryophylla*
 - Amphibromus nervosus*
 - Amphibromus vickeryae*
 - Amphipogon amphipogonoides*
 - Amphipogon debilis*
 - Amphipogon laguroides*
 - Amphipogon strictus*
 - Amphipogon turbinatus*
 - * *Anthoxanthum odoratum*
 - * *Avena barbata*
 - * *Avena fatua*
 - * *Briza maxima*
 - * *Briza minor*
 - * *Bromus diandrus*
 - * *Cynodon dactylon*
 - * *Cynosurus echinatus*
 - Danthonia caespitosa*
 - Danthonia occidentalis*
 - Danthonia setacea*
 - Deyeuxia quadriseta*
 - Dichelachne crinita*
 - Eragrostis ?brownii*
 - Eragrostis elongata*
 - Hemarthria uncinata*
 - * *Holcus lanatus*
 - * *Holcus setiger*
 - * *Hordeum geniculatum*
 - * *Hordeum leporinum*
 - * *Hordeum murinum*
 - * *Lolium multiflorum*
 - * *Lolium rigidum*
 - Microlaena stipoides*
 - Neurachne alopecuroides*
 - * *Parapholis incurva*
 - * *Poa annua*
 - Poa drummondiana*
 - Poa poiformis*
 - * *Polypogon monspeliensis*
 - Polypogon tenellus*
 - Sporobolus virginicus*
 - * *Stenotaphrum secundatum*
 - Stipa compressa*
 - Stipa juncifolia*
 - Stipa pycnostachya*
 - Stipa trichophylla*
 - Tetrarrhena laevis*
 - * *Vulpia bromoides*
 - * *Vulpia myuros*
- Podocarpaceae**
 - Podocarpus drouynianus*
- Polygalaceae**
 - Comesperma calymega*
 - Comesperma ciliatum*
 - Comesperma drummondii*
 - Comesperma flavum*
 - Comesperma virgatum*
 - Comesperma volubile*
 - * *Polygala myrtifolia*
- Polygonaceae**
 - Muehlenbeckia adpressa*
 - Persicaria prostrata*
 - * *Polygonum arenastrum*
 - * *Rumex acetosella*
 - * *Rumex brownii*
 - * *Rumex conglomeratus*
 - * *Rumex crispus*
 - * *Rumex pulcher*
- Portulacaceae**
 - Calandrinia ?composita*
 - Calandrinia granulifera*
 - Montia australasica*
- Potamogetonaceae**
 - Potamogeton drummondii*
 - Potamogeton tricarlinatus*
 - Ruppia megacarpa*
- Primulaceae**
 - * *Anagallis arvensis* var. *arvensis*
 - * *Anagallis arvensis* var. *caerulea*
 - Samolus caespitosus*
 - Samolus junceus*
- Proteaceae**
 - Adenanthos obovatus*
 - Banksia grandis*
 - Banksia ilicifolia*
 - Banksia littoralis*
 - Banksia meisneri* subsp. *meisneri*
 - Conospermum capitatum*
 - Conospermum flexuosum* subsp. *laevigatum*
 - Dryandra armata*
 - Dryandra bipinnatifida*
 - Dryandra lindleyana*
 - Dryandra porrecta*
 - Dryandra sessilis*
 - Franklandia fucifolia*
 - Grevillea brownii*
 - Grevillea depauperata*
 - Grevillea ?diversifolia*
 - Grevillea fasciculata*
 - Grevillea leptobotrys*
 - Grevillea pilulifera*
 - Grevillea pulchella*
 - Grevillea quercifolia*
 - Hakea amplexicaulis*
 - Hakea ceratophylla*
 - Hakea corymbosa*
 - Hakea gilbertii*
 - Hakea lissocarpa*
 - Hakea oleifolia*
 - Hakea prostrata*
 - Hakea ruscifolia*
 - Hakea sulcata*
 - Hakea trifurcata*
 - Hakea undulata*
 - Hakea varia*
 - Isopogon ?attenuatus*
 - Isopogon polycephalus*
 - Isopogon teretifolius*
 - Persoonia longifolia*
 - Petrophile acicularis*
 - Petrophile divaricata*
 - Petrophile ?longifolia*
 - Petrophile media*
 - Petrophile rigida*
 - Petrophile serruriae*
 - Petrophile squamata*
 - Stirlingia anethifolia*
 - Stirlingia ?seselifolia*

Tremandraceae

Platytheca galioides
Tetratheca affinis
Tetratheca hirsuta
Tetratheca hispidissima
Tetratheca nuda
Tetratheca setigera
Tetratheca virgata
Tremandra diffusa

Typhaceae

Typha domingensis
* Typha orientalis

Urticaceae

Parietaria debilis

Violaceae

Hybanthus debilissimus
Hybanthus floribundus

Xanthorrhoeaceae

Xanthorrhoea gracilis
Xanthorrhoea preissii

Zamiaceae

Macrozamia riedlei

Zannichelliaceae

Lepilaena australis

Appendix 3

Monitoring site data

- Sites established 18-19 March 1997 & 20-28 October 1997, all sites visited on two occasions.
- Sites are 10 x 5 m plots with corners marked with galvanised fence droppers.
- Latitude & Longitude GPS fixes ($\pm 100\text{m}$).
- Semeniuk classification (Semeniuk & Semeniuk 1997)
 - Lake - permanently inundated basin
 - Sumpland - seasonally inundated basin
 - Floodplain - seasonally inundated flat
 - Palusplain - seasonally waterlogged flat
 - (* indicates inferred group)
- Ramsar classification (ANCA 1996)
 - B5 Permanent freshwater lakes (>8 ha); includes large oxbow lakes
 - B8 Seasonal / intermittent saline lakes
 - B9 Permanent freshwater ponds (<8 ha), marshes and swamps on inorganic soils; with emergent vegetation waterlogged for at least most of the growing season
 - B10 Seasonal / intermittent freshwater ponds and marshes on inorganic soils; includes sloughs, potholes; seasonally flooded meadows, sedge marshes
 - B12 Seasonal saline marshes
 - B13 Shrub swamps; shrub-dominated freshwater marsh, shrub carr, alder thicket on inorganic soils.
 - B14 Freshwater swamp forest; seasonally flooded forest, wooded swamps; on inorganic soils
 - B15 Peatlands; forest, shrub or open bogs
- Vegetation structural description of general area in which the plot is located (Muir 1977).
- Plot description include slope aspect and soil type.

01 Poorginup Swamp

Location: 34 30 38S 116 44 33E

Type(s):

Permanent/seasonal	- P
Semeniuk classification	- Sumpland
Ramsar classification	- B5, B15

Plot: 01-1

Vegetation: Emergent *Astartea fascicularis* open scrub, over *Baumea articulata*, *Meeboldina scariosa* open tall sedges.

Plot description: Flat with black clayey peat.

<i>Taxa</i>	<i>Cover (%)</i>
<i>Amperea volubilis</i>	<2
<i>Astartea fascicularis</i>	<2
<i>Baumea articulata</i>	10-30
<i>Meeboldina scariosa</i> MS	>70

02 Tordit-Gurruup Lagoon**Location:** 34 31 36S 116 44 29E**Type(s):**

Permanent/seasonal	- P
Semeniuk classification	- Lake
Ramsar classification	- B5, B15

Plot: 02-1*Vegetation:* *Baumea juncea* open low sedges.*Plot description:* Very gentle slope on washline with yellow sand and coffee rock.

<i>Taxa</i>	<i>Cover (%)</i>
<i>Baumea articulata</i>	<2
<i>Baumea juncea</i>	10-30
<i>Baumea</i> sp.	<2
<i>Chenopodium</i> sp.	<2

05 Yarnup Swamp

Location: 34 22 22S 116 51 40E

Type(s):

Permanent/seasonal - P
 Semeniuk classification - Lake
 Ramsar classification - B9, B15

Plot: 05-1

Vegetation: Emergent *Melaleuca lateritia* open low woodland A, over *Triglochin huegelii* very open herbs, over *Baumea articulata* tall sedges.

Plot description: Flat with black peat.

<i>Taxa</i>	<i>Cover (%)</i>
<i>Baumea articulata</i>	30-70
<i>Melaleuca lateritia</i>	<2
<i>Triglochin huegelii</i>	2-10

Plot: 05-2

Vegetation: Emergent *Eucalyptus cornuta* open woodland, over *Melaleuca preissiana* open low woodland A, over *Hemarthria uncinata* very open grass, over *Baumea juncea* dense low sedges.

Plot description: Gentle lower slope with black sandy clay.

<i>Taxa</i>	<i>Cover (%)</i>
<i>Baumea articulata</i>	<2
<i>Baumea juncea</i>	>70
<i>Bossiaea linophylla</i>	2-10
<i>Epilobium billardierianum</i>	<2
<i>Eucalyptus calophylla</i>	<2
<i>Eucalyptus cornuta</i>	<2
<i>Hemarthria uncinata</i>	2-10
<i>Lepidosperma longitudinale</i>	<2
<i>Melaleuca preissiana</i>	2-10
<i>Myoporum caprarioides</i>	<2
<i>Opercularia hispidula</i>	<2
<i>Poa poiformis</i>	<2
<i>Samolus junceus</i>	<2
<i>Sollya heterophylla</i>	2-10
<i>Sonchus oleraceus</i>	<2
<i>Triglochin huegelii</i>	<2

06 Bokarup Swamp**Location:** 34 19 59S 116 49 54E**Type(s):**

Permanent/seasonal	- S
Semeniuk classification	- Sumpland*
Ramsar classification	- B5, B14, B15

Plot: 06-1

Vegetation: *Melaleuca raphiophylla* open low woodland A, over *Baumea articulata* tall sedges, over *Baumea juncea* low sedges.

Plot description: Gentle lower slope with black peaty mud.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea articulata</i>	30-50
<i>Baumea juncea</i>	30-50
<i>Lepidosperma longitudinale</i>	<2
<i>Melaleuca raphiophylla</i>	2-10
<i>Triglochin huegelii</i>	<2

07 Cobertup Swamp

Location: 34 27 27S 116 50 7E

Type(s):

Permanent/seasonal - ?P
 Semeniuk classification - Sumpland
 Ramsar classification - B13, B15

Plot: 07-1

Vegetation: Emergent *Triglochin huegelii* very open herbs, over *Baumea articulata*, *Baumea vaginalis* dense tall sedges.

Plot description: Flat with black peat.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea articulata</i>	30-70
<i>Baumea</i> sp.	2-10
<i>Baumea vaginalis</i>	30-70
<i>Triglochin huegelii</i>	<2

08 Noobijup Lake

Location: 34 23 53S 116 47 23E

Type(s):

Permanent/seasonal - P
 Semeniuk classification - Sumpland
 Ramsar classification - B9, B15

Plot: 08-1

Vegetation: *Melaleuca raphiophylla* open low woodland A, over *Villarsia* sp., *Triglochin huegelii* very open herbs, over *Baumea articulata* tall sedges, over *Baumea juncea* very open low sedges.

Plot description: Gentle lower slope with black clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea articulata</i>	30-70
<i>Baumea juncea</i>	2-10
<i>Melaleuca raphiophylla</i>	2-10
<i>Triglochin huegelii</i>	2-10
<i>Villarsia</i> sp.	2-10

Plot: 08-2

Vegetation: *Melaleuca raphiophylla*, *Eucalyptus calophylla*, *Callistachys lanceolata* low forest A, over *Lepidosperma longitudinale* tall sedges.

Plot description: Gentle lower slope with a S aspect, on black peaty sand.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea juncea</i>	10-30
<i>Callistachys lanceolata</i>	30-70
<i>Eucalyptus calophylla</i>	30-70
<i>Eucalyptus rudis</i>	<2
<i>Galium murale</i>	<2
<i>Lepidosperma longitudinale</i>	30-70
<i>Melaleuca preissiana</i>	2-10
<i>Melaleuca raphiophylla</i>	10-30
<i>Triglochin huegelii</i>	<2
<i>Villarsia</i> sp.	<2
<i>Vulpia myuros</i>	<2

11 Kululinup Lake

Location: 34 20 23S 116 47 3E

Type(s):

Permanent/seasonal	- P
Semeniuk classification	- Lake*
Ramsar classification	- B5, B15

Plot: 11-1

Vegetation: *Melaleuca raphiophylla* open low woodland A, over *Baumea articulata* dense tall sedges.

Plot description: Flat washline/lake edge with black peaty sand.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea articulata</i>	>70
<i>Baumea juncea</i>	2-10
<i>Potamogeton drummondii</i>	2-10
<i>Melaleuca raphiophylla</i>	2-10
<i>Triglochin huegelii</i>	<2

12 Mulgarnup Lagoon

Location: 34 27 20S 116 42 59E

Type(s):

Permanent/seasonal - ?S
 Semeniuk classification - Lake
 Ramsar classification - B13, B14, B15

Plot: 12-1

Vegetation: *Melaleuca raphiophylla* low forest A, over *Baumea articulata*, *Baumea vaginalis* tall sedges.

Plot description: Flat with black peaty clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea articulata</i>	30-70
<i>Baumea vaginalis</i>	2-10
<i>Melaleuca raphiophylla</i>	30-70
<i>Triglochin huegelii</i>	2-10

Plot: 12-2

Vegetation: *Baumea articulata* tall sedges.

Plot description: Flat with black peat.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea articulata</i>	30-70

14 Byenup Lagoon

Location: 34 29 58S 116 54 36E

Type(s):

Permanent/seasonal	- P
Semeniuk classification	- Lake
Ramsar classification	- B5, B14, B15

Plot: 14-1

Vegetation: *Samolus junceus* very open herbs, over *Baumea articulata* dense tall sedges.

Plot description: Gentle lower slope with black peaty sand.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea articulata</i>	>70
<i>Baumea juncea</i>	30-70
<i>Melaleuca raphiophylla</i>	<2
<i>Samolus junceus</i>	<2
<i>Triglochin striatum</i>	<2

15 North Byenup Lagoon

Location: 34 27 56S 116 43 9E

Type(s):

Permanent/seasonal - ?S
 Semeniuk classification - Sumpland
 Ramsar classification - B14, B15

Plot: 15-1

Vegetation: Emergent *Eucalyptus rudis* open woodland, over *Melaleuca raphiophylla* low woodland A, over *Acacia cyclops*, *Melaleuca densa* open scrub, over *Baumea juncea*, *Lepidosperma longitudinale* dense tall sedges.

Plot description: Gentle lower slope with black peat.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Acacia cyclops</i>	2-10
<i>Baumea articulata</i>	<2
<i>Baumea juncea</i>	30-70
<i>Caesia micrantha</i>	<2
<i>Eucalyptus rudis</i>	<2
<i>Gahnia trifida</i>	<2
<i>Hemarthria uncinata</i>	<2
<i>Isolepis nodosa</i>	<2
<i>Lepidosperma longitudinale</i>	30-70
<i>Lobelia alata</i>	2-10
<i>Meeboldina tephрина MS</i>	<2
<i>Melaleuca densa</i>	2-10
<i>Melaleuca raphiophylla</i>	10-30
<i>Samolus junceus</i>	<2
<i>Sonchus hydrophilus</i>	<2
<i>Stipa juncifolia</i>	2-10
<i>Thelymitra</i> sp.	<2

Plot: 15-2

Vegetation: *Baumea articulata*, *Baumea juncea* dense tall sedges.

Plot description: Flat with black peat.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea articulata</i>	>70
<i>Baumea juncea</i>	2-10

16 Geordinup Lagoon

Location: 34 29 34S 116 46 10E

Type(s):

Permanent/seasonal - ?P
 Semeniuk classification - Lake
 Ramsar classification - B14, B15

Plot: 16-1

Vegetation: *Eucalyptus rudis*, *Melaleuca raphiophylla* open low woodland A, over *Meeboldina tephрина* tall sedges.

Plot description: Flat with brown sandy clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Anagallis arvensis</i>	<2
<i>Baumea articulata</i>	<2
<i>Baumea juncea</i>	<2
<i>Deyeuxia quadriseta</i>	<2
<i>Eucalyptus rudis</i>	2-10
<i>Hemarthria uncinata</i>	<2
<i>Lepidosperma longitudinale</i>	<2
<i>Lobelia alata</i>	<2
<i>Meeboldina tephрина</i> MS	30-70
<i>Melaleuca densa</i>	<2
<i>Melaleuca raphiophylla</i>	2-10
<i>Samolus junceus</i>	<2
<i>Villarsia albiflora</i>	<2

Plot: 16-2

Vegetation: *Baumea articulata* tall sedges.

Plot description: Flat with black peat.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea articulata</i>	30-70
<i>Triglochin huegelii</i>	<2

18 Large Swamp in SW of Kodjinup Nature Reserve

Location: 34 23 40S 116 39 10E

Type(s):

Permanent/seasonal - S
 Semeniuk classification - Sumpland
 Ramsar classification - B14

Plot: 18-1

Vegetation: *Melaleuca raphiophylla* low forest A, over *Melaleuca lateritia* open low scrub A, over *Lepidosperma longitudinale* open low sedges.

Plot description: Gentle slope with black peaty sand.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea vaginalis</i>	<2
<i>Eucalyptus rudis</i>	<2
<i>Lepidosperma longitudinale</i>	10-30
<i>Lepyrodia</i> sp.	<2
<i>Melaleuca lateritia</i>	2-10
<i>Melaleuca raphiophylla</i>	30-70

Plot: 18-2

Vegetation: *Baumea articulata* dense tall sedges.

Plot description: Flat with black peat.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea articulata</i>	>70
<i>Triglochin huegelii</i>	<2

19 Galamup Swamp

Location: 34 26 25S 116 45 41E

Type(s):

Permanent/seasonal - P
Semeniuk classification - Sumpland
Ramsar classification - B9, B15

Plot: 19-1

Vegetation: *Baumea juncea*, *Baumea arthropphylla*, *Baumea articulata* tall sedges.

Plot description: Flat with grey-black clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea arthropphylla</i>	30-70
<i>Baumea articulata</i>	2-10
<i>Baumea juncea</i>	30-70
<i>Triglochin huegelii</i>	2-10

Plot: 19-2

Vegetation: *Villarsia albiflora* open herbs, over *Baumea juncea*, *Baumea arthropphylla* dense low sedges.

Plot description: Gentle lower slope with black peaty sand.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea arthropphylla</i>	30-70
<i>Baumea juncea</i>	>70
<i>Gratiola peruviana</i>	2-10
<i>Microtis atrata</i>	<2
<i>Microtis orbicularis</i>	<2
<i>Prasophyllum macrostachyum</i>	<2
<i>Triglochin huegelii</i>	<2
<i>Villarsia albiflora</i>	30-70

Plot: 19-3

Vegetation: *Hakea varia* low scrub A, over *Villarsia albiflora*, *Gratiola peruviana*, *Velleia trinervis* herbs, over *Baumea juncea* low sedges.

Plot description: Flat with grey-black clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Aira caryophyllea</i>	<2
<i>Aphelia cyperoides</i>	<2
<i>Baumea juncea</i>	30-70
<i>Bossiaea linophylla</i>	2-10
<i>Briza minor</i>	<2
<i>Caesia micrantha</i>	<2
<i>Centaurium spicatum</i>	<2

<i>Centella cordifolia</i>	<2
<i>Centrolepis aristata</i>	<2
<i>Cyperus tenellus</i>	<2
<i>Dampiera</i> sp.	2-10
<i>Deyeuxia quadriseta</i>	<2
<i>Gratiola peruviana</i>	<2
<i>Hakea varia</i>	30-70
<i>Hibbertia cunninghamii</i>	2-10
<i>Hydrocotyle</i> sp.	<2
<i>Hypochaeris glabra</i>	<2
<i>Lagenifera huegelii</i>	<2
<i>Lepyrodia</i> sp.	<2
<i>Microtis atrata</i>	<2
<i>Neurachne alopecuroidea</i>	<2
<i>Parietaria debilis</i>	<2
<i>Podolepis gracilis</i>	<2
<i>Schoenus</i> sp.	<2
<i>Selaginella gracillima</i>	<2
<i>Siloxerus humifusus</i>	<2
<i>Sphaerolobium vimineum</i>	2-10
<i>Stylidium assimile</i>	<2
<i>Stylidium spathulatum</i>	<2
<i>Velleia trinervis</i>	30-70
<i>Villarsia albiflora</i>	<2

24 Lake Unicup

Location: 34 20 27S 116 43 17E

Type(s):

Permanent/seasonal	- P
Semeniuk classification	- Lake
Ramsar classification	- B5, B15

Plot: 24-1

Vegetation: Emergent *Villarsia parnassifolia* very open herbs, over *Baumea articulata* tall sedges.

Plot description: Flat with peaty sand.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea articulata</i>	30-70
<i>Baumea juncea</i>	2-10
<i>Schoenus subfascicularis</i>	2-10
<i>Villarsia parnassifolia</i>	<2

29 Creekline in Location 12676

Location: 34 22 44S 116 45 34E

Type(s):

Permanent/seasonal - S
Semeniuk classification - Sumpland
Ramsar classification - B10

Plot: 29-1

Vegetation: *Banksia littoralis*, *Melaleuca preissiana* low woodland A, over *Baumea juncea* very open low sedges.

Plot description: Gentle slope with black peat.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Banksia littoralis</i>	10-20
<i>Baumea juncea</i>	10-30
<i>Lepidosperma longitudinale</i>	<2
<i>Melaleuca preissiana</i>	10-20

Plot: 29-2

Vegetation: *Banksia littoralis*, *Melaleuca raphiophylla* open low woodland B, over *Agonis juniperina* open scrub, over *Baumea juncea*, *Lepidosperma longitudinale* tall sedges.

Plot description: Gentle lower slope/washline with black sandy clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Agonis juniperina</i>	2-10
<i>Banksia littoralis</i>	10-30
<i>Baumea articulata</i>	<2
<i>Baumea juncea</i>	30-70
<i>Cassutha racemosa</i>	<2
<i>Centella cordifolia</i>	2-10
<i>Juncus pallidus</i>	<2
<i>Lepidosperma longitudinale</i>	10-30
<i>Leptocarpus sp.</i>	<2
<i>Melaleuca preissiana</i>	2-10
<i>Melaleuca raphiophylla</i>	2-10
<i>Opercularia hispidula</i>	2-10
<i>Senecio glomeratus</i>	<2
<i>Sonchus oleraceus</i>	<2

30 Pindicup Lake

Location: 34 24 28S 116 42 50E

Type(s):

Permanent/seasonal - S
Semeniuk classification - Sumpland
Ramsar classification - B8

Plot: 30-1

Vegetation: *Baumea juncea*, *Baumea arthropphylla* dense tall sedges.

Plot description: Flat with black peaty clay.

<i>Baumea arthropphylla</i>	30-70
<i>Baumea juncea</i>	30-70
<i>Melaleuca cuticularis</i>	2-10
<i>Triglochin huegelii</i>	2-10

Plot: 30-2

Vegetation: Emergent *Melaleuca cuticularis* open scrub, over emergent *Melaleuca densa* open low scrub A, over *Gahnia trifida* dense tall sedges.

Plot description: Flat with black peaty clay.

Taxa	Cover(%)
<i>Gahnia trifida</i>	>70
<i>Hydrocotyle alata</i>	<2
<i>Melaleuca cuticularis</i>	2-10
<i>Melaleuca densa</i>	2-10
<i>Melaleuca viminea</i>	<2
<i>Phyllangium paradoxum</i>	<2
<i>Schoenus</i> sp.	<2
<i>Stylidium</i> sp.	<2
<i>Stylidium spathulatum</i>	<2
<i>Thysanotus manglesianus</i>	<2
<i>Thysanotus tenellus</i>	<2
<i>Villarsia parnassifolia</i>	<2

Plot: 30-3

Vegetation: *Eucalyptus decipiens* low forest A, over *Bossiaea linophylla* scrub, over *Baumea juncea*, *Lepidosperma angustatum*, *Tetraria capillaris* open tall sedges.

Plot description: Gentle lower slope with a E aspect, on dark brown loam.

Taxa	Cover(%)
<i>Astroloma ciliatum</i>	<2
<i>Astroloma pallidum</i>	<2
<i>Baumea juncea</i>	10-30
<i>Baumea vaginalis</i>	<2

<i>Billardiera variifolia</i>	<2
<i>Bossiaea linophylla</i>	10-30
<i>Caesia micrantha</i>	<2
<i>Caladenia flava</i>	<2
<i>Chamaescilla corymbosa</i>	<2
<i>Dampiera alata</i>	<2
<i>Daucus glochidiatus</i>	<2
<i>Desmocladius fasciculatus</i> MS	<2
<i>Drosera macrantha</i>	<2
<i>Eucalyptus decipiens</i>	30-70
<i>Gahnia trifida</i>	<2
<i>Gompholobium marginatum</i>	<2
<i>Hakea lissocarpa</i>	<2
<i>Hibbertia cunninghamii</i>	<2
<i>Lagenifera huegelii</i>	<2
<i>Lepidosperma angustatum</i>	2-10
<i>Lepidosperma longitudinale</i>	<2
<i>Lomandra micrantha</i>	<2
<i>Opercularia hispidula</i>	<2
<i>Patersonia occidentalis</i>	2-10
<i>Phyllanthus calycinus</i>	<2
<i>Stipa</i> sp.	<2
<i>Stylidium spathulatum</i>	<2
<i>Synaphea petiolaris</i>	<2
<i>Tetraria capillaris</i>	2-10
<i>Thelymitra benthamiana</i>	<2
<i>Thysanotus manglesianus</i>	<2
<i>Tricoryne elatior</i>	<2
<i>Trymalium ledifolium</i>	<2

31 Swamp in Location 12686, Lake Unicup Nature Reserve

Location: 34 22 13S 116 42 9E

Type(s):

Permanent/seasonal	- S
Semeniuk classification	- Sumpland
Ramsar classification	- B8

Plot: 31-1

Vegetation: *Melaleuca raphiophylla* open low woodland A, over *Gahnia trifida* very open tall sedges, over *Baumea juncea* low sedges.

Plot description: Gentle lower slope with black peaty sandy clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Acacia myrtifolia</i>	<2
<i>Baumea juncea</i>	30-70
<i>Baumea vaginalis</i>	<2
<i>Gahnia trifida</i>	2-10
<i>Lepidosperma longitudinale</i>	<2
<i>Melaleuca raphiophylla</i>	10-30
<i>Samolus junceus</i>	<2
<i>Villarsia parnassifolia</i>	<2

Plot: 31-2

Vegetation: *Melaleuca cuticularis* open low woodland B, over *Gahnia trifida* very open tall sedges, over *Baumea juncea* low sedges.

Plot description: Flat with grey-black mud.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Baumea juncea</i>	30-70
<i>Gahnia trifida</i>	2-10
<i>Melaleuca cuticularis</i>	2-10

33 Lake in Location 12561**Location:** 34 29 40S 116 48 0E**Type(s):**

- Permanent/seasonal - S
- Semeniuk classification - Sumpland
- Ramsar classification - B8, B12

Plot: 33-1**Vegetation:** *Baumea juncea*, *Schoenus submicrostachyus* open low sedges.**Plot description:** Gentle lower slope with a N aspect, on cream-white clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Angianthus micropodioides</i>	<2
<i>Baumea juncea</i>	10-30
<i>Leptocarpus</i> sp.	<2
<i>Melaleuca cuticularis</i> (seedling)	2-10
<i>Polypompholyx multifida</i>	<2
<i>Schoenus submicrostachyus</i>	2-10
<i>Wilsonia backhousei</i>	<2

Plot: 33-2**Vegetation:** *Melaleuca cuticularis* low forest B, over *Melaleuca densa*,
Brachysema melanopetalum low scrub A, over *Meeboldina tephрина*
dense tall sedges.**Plot description:** Gentle lower slope with a N aspect, on white sandy clay

<i>Taxa</i>	<i>Cover(%)</i>
<i>Angianthus micropodioides</i>	<2
<i>Baumea juncea</i>	2-10
<i>Brachysema melanopetalum</i>	10-30
<i>Centrolepis aristata</i>	<2
<i>Centrolepis polygyna</i>	<2
<i>Crassula natans</i>	<2
<i>Gahnia trifida</i>	2-10
<i>Hydrocotyle alata</i>	<2
<i>Meeboldina tephрина</i> MS	>70
<i>Melaleuca cuticularis</i>	30-70
<i>Melaleuca densa</i>	<2
<i>Polypompholyx multifida</i>	<2
<i>Schoenus plumosus</i>	<2
<i>Schoenus submicrostachyus</i>	2-10
<i>Utricularia violacea</i>	<2

35 Small lake north east of Lake Unicup

Location: 34 20 1S 116 44 46E

Type(s):

- Permanent/seasonal - P
- Semeniuk classification - Sumpland
- Ramsar classification - B9, B14, B15

Plot: 35-1

Vegetation: *Melaleuca preissiana* open low woodland A, over *Banksia littoralis* open low woodland B, over *Acacia myrtifolia*, *Kunzea ericifolia*, *Melaleuca densa* open scrub, over *Baumea juncea* low sedges.

Plot description: Flat with black peaty sandy clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Acacia myrtifolia</i>	2-10
<i>Banksia littoralis</i>	2-10
<i>Baumea juncea</i>	>70
<i>Baumea vaginalis</i>	2-10
<i>Cotula coronopifolia</i>	<2
<i>Dichelachne crinita</i>	<2
<i>Juncus pallidus</i>	<2
<i>Kunzea ericifolia</i>	2-10
<i>Lobelia alata</i>	2-10
<i>Melaleuca densa</i>	2-10
<i>Melaleuca preissiana</i>	<2
<i>Melaleuca raphiophylla</i>	2-10
<i>Potamogeton drummondii</i>	<2
<i>Samolus junceus</i>	2-10
<i>Senecio glomeratus</i>	<2
<i>Thomasia pauciflora</i>	<2

37 Wet flat in Kululinup Nature Reserve

Location: 34 20 41S 116 47 7E

Type(s):

- Permanent/seasonal - S
- Semeniuk classification - Sumpland*
- Ramsar classification - B13

Plot: 37-1

Vegetation: *Melaleuca densa* low scrub A, over *Pericalymma elliptica*, *Calothamnus lateralis*, *Astartea* sp. dense heath B, over *Lepidosperma longitudinale* low sedges.

Plot description: Flat washline with black peaty sand.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Astartea</i> sp.	10-30
<i>Calothamnus lateralis</i>	30-70
<i>Cyathochaeta avenacea</i>	<2
<i>Drosera erythrorhiza</i>	<2
<i>Lepidosperma longitudinale</i>	30-70
<i>Lepyrodia muirii</i>	<2
<i>Lyginia barbata</i>	2-10
<i>Melaleuca densa</i>	2-10
<i>Pericalymma ellipticum</i>	30-70
<i>Schoenus efolius</i>	<2

38 Clay flat in Kululinup Nature Reserve

Location: 34 20 28S 116 46 56E

Type(s):

- Permanent/seasonal - S
- Semeniuk classification - Sumpland*
- Ramsar classification - B10

Plot: 38-1

Vegetation: *Melaleuca raphiophylla* open low woodland A, over mixed very open herbs, over *Apodasmia ceramophila* dense low sedges.

Plot description: Flat valley/washline with grey clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Apodasmia ceramophila</i> MS	>70
<i>Chorizandra enodis</i>	2-10
<i>Danthonia setacea</i>	2-10
<i>Hypoxis occidentalis</i>	2-10
<i>Microtis orbicularis</i>	2-10
<i>Myriophyllum limnophilum</i>	2-10
<i>Prasophyllum macrostachyum</i>	2-10
<i>Rhodanthe pyrethrum</i>	2-10
<i>Schoenolaena tenuior</i>	2-10
<i>Tribonanthes</i> sp. nov.	2-10
<i>Tribonanthes violacea</i>	2-10
<i>Utricularia hookeri</i>	2-10
<i>Villarsia submersa</i>	2-10
<i>Wurmbea dioica</i>	2-10

43 Wet flats in NE of Kodjinup Nature Reserve

Location: 34 22 35S 116 40 25E

Type(s):

Permanent/seasonal - S
Semeniuk classification - Palusplain
Ramsar classification - B13

Plot: 43-1

Vegetation: *Melaleuca raphiophylla* low woodland A, over *Melaleuca viminea*, *Melaleuca densa* scrub, over *Hydatella australis* open herbs, over *Gahnia trifida*, *Anarthria laevis* very open tall sedges, over *Juncus kraussii*, *Baumea juncea* low sedges.

Plot description: Winter wet washline, flat with red-brown clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Anarthria laevis</i>	2-10
<i>Baumea juncea</i>	30-70
<i>Boronia megastigma</i>	<2
<i>Brachysema melanopetalum</i>	2-10
<i>Cassytha racemosa</i>	<2
<i>Gahnia trifida</i>	2-10
<i>Hakea varia</i>	2-10
<i>Hydatella australis</i>	10-30
<i>Hypocalymma angustifolium</i>	2-10
<i>Juncus kraussii</i>	2-10
<i>Lepidosperma longitudinale</i>	30-70
<i>Melaleuca densa</i>	2-10
<i>Melaleuca raphiophylla</i>	10-30
<i>Melaleuca viminea</i>	10-30
<i>Samolus junceus</i>	<2
<i>Stenopa ramosissima</i> MS	30-70
<i>Trithuria submersa</i>	<2

Plot: 43-2

Vegetation: *Banksia littoralis* - *Melaleuca cuticularis* open low woodland A, over *Viminaria juncea*, *Melaleuca densa*, *Hakea varia* thicket, over *Hibbertia stellaris*, *Astartea* sp. open dwarf scrub D, over *Baumea juncea*, *L. longitudinale* open low sedges

Plot description: Winter wet washline, flat with red sandy clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Anthotium junciforme</i>	<2
<i>Aphelia cyperoides</i>	<2
<i>Astartea</i> sp.	<2
<i>Astartea</i> sp.	2-10
<i>Banksia littoralis</i>	2-10
<i>Baumea juncea</i>	10-30
<i>Burchardia monantha</i>	<2

<i>Centrolepis aristata</i>	<2
<i>Chordifex laxus</i> MS	<2
<i>Cyathochaeta avenacea</i>	<2
<i>Dampiera pedunculata</i>	<2
<i>Daviesia incrassata</i>	<2
<i>Hakea sulcata</i>	<2
<i>Hakea varia</i>	<2
<i>Hibbertia stellaris</i>	2-10
<i>Hypocalymma angustifolium</i>	2-10
<i>Isolepis cernua</i>	<2
<i>Lepidosperma angustatum</i>	<2
<i>Lepidosperma longitudinale</i>	<2
<i>Melaleuca aff scabra</i>	2-10
<i>Melaleuca cuticularis</i>	2-10
<i>Melaleuca densa</i>	10-30
<i>Melaleuca violacea</i>	2-10
<i>Patersonia occidentalis</i>	<2
<i>Philydrella pygmaea</i>	<2
<i>Polypogon monspeliensis</i>	<2
<i>Polypompholyx multifida</i>	<2
<i>Schizaea dichotoma</i>	<2
<i>Schoenolaena tenuior</i>	<2
<i>Schoenus bifidus</i>	<2
<i>Schoenus submicrostachyus</i>	2-10
<i>Sphaerolobium vimineum</i>	<2
<i>Stenopa ramosissima</i> MS	<2
<i>Stylidium spathulatum</i>	<2
<i>Tremulina tremula</i> MS	<2
<i>Triglochin calcitrapum</i>	<2
<i>Villarsia parnassifolia</i>	<2
<i>Viminaria juncea</i>	10-30

44 Myalgelup Rd Swamp

Location: 34 33 0S 116 44 7E

Type(s):

Permanent/seasonal - S
 Semeniuk classification - Palusplain
 Ramsar classification - B13, B14

Plot: 44-1

Vegetation: *Melaleuca densa*, *Melaleuca raphiophylla*, *Brachysema melanopetalum* dense thicket, over *Lepyrodia muirii*, *Meeboldina coangustata* tall sedges, over *Lepidosperma longitudinale* very open low sedges.

Plot description: Flat washline with grey clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Brachysema melanopetalum</i>	30-70
<i>Cassytha racemosa</i>	<2
<i>Lepidosperma longitudinale</i>	2-10
<i>Lepyrodia muirii</i>	2-10
<i>Meeboldina coangustata</i> MS	10-30
<i>Melaleuca densa</i>	>70
<i>Melaleuca lateritia</i>	2-10
<i>Melaleuca raphiophylla</i>	2-10
<i>Melaleuca viminea</i>	2-10
<i>Pterostylis</i> sp.	<2
<i>Stenopa ramosissima</i> MS	<2
<i>Villarsia</i> sp.	<2

49 Drainage line S of Kodjinup Swamp

Location: 34 23 39S 116 40 5E

Type(s):

Permanent/seasonal	- S
Semeniuk classification	- Palusplain
Ramsar classification	- B13

Plot: 49-1

Vegetation: *Melaleuca densa* low heath C, over *Meeboldina coangustata* open tall sedges, over *Lepidosperma longitudinale* low sedges.

Plot description: Flat washline with black sandy clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Astartea</i> sp.	2-10
<i>Brachysema melanopetalum</i>	<2
<i>Calothamnus lateralis</i>	10-30
<i>Cyathochaeta avenacea</i>	2-10
<i>Lepidosperma longitudinale</i>	30-70
<i>Leptocarpus tenax</i>	2-10
<i>Meeboldina cana</i> MS	<2
<i>Meeboldina coangustata</i> MS	10-30
<i>Melaleuca densa</i>	30-70
<i>Melaleuca incana</i>	2-10
<i>Villarsia parnassifolia</i>	10-30

50 Small Swamp in SW of Kodjinup Nature Reserve

Location: 34 23 43S 116 38 40E

Type(s):

Permanent/seasonal - S
 Semeniuk classification - Palusplain
 Ramsar classification - B14

Plot: 50-1

Vegetation: *Melaleuca raphiophylla*, *Eucalyptus rudis* dense low forest A, over *Baumea articulata* open tall sedges, over *Lepidosperma longitudinale* low sedges.

Plot description: Flat washline with black peaty sandy clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Astartea fascicularis</i>	<2
<i>Baumea articulata</i>	10-30
<i>Baumea vaginalis</i>	2-10
<i>Lepidosperma longitudinale</i>	30-70
<i>Melaleuca raphiophylla</i>	>70

52 **Wet clay flat on Wimbalup Rd**

Location: 34 30 34S 116 46 58E

Type(s):

Permanent/seasonal	- S
Semeniuk classification	- Sumpland*
Ramsar classification	- B13

Plot: 52-1

Vegetation: *Melaleuca viminea*, *Melaleuca densa* dense heath A, over *Melaleuca lateritia* open low scrub B, over *Leptocarpus* sp. open tall sedges, over *Lepidosperma longitudinale* open low sedges.

Plot description: Flat washline with black sandy clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Lepidosperma longitudinale</i>	10-30
<i>Leptocarpus</i> sp.	2-10
<i>Melaleuca densa</i>	2-10
<i>Melaleuca lateritia</i>	10-30
<i>Melaleuca viminea</i>	30-70
<i>Villarsia</i> sp.	<2

53 Wet flats in NW of Red Lake Reserve

Location: 34 25 2S 116 40 19E

Type(s):

Permanent/seasonal - S
Semeniuk classification - Floodplain
Ramsar classification - B14

Plot: 53-1

Vegetation: *Melaleuca cuticularis* open low woodland A, over *Melaleuca spathulata*, *Astartea* sp., *Melaleuca densa* heath B, over *Polypompholyx multifida*, *Utricularia hookeri* open herbs, over *Meeboldina* aff. *cana*, *Lepidosperma longitudinale* open low sedges.

Plot description: Flat washline with grey sandy clay.

<i>Taxa</i>	<i>Cover(%)</i>
<i>Astartea</i> sp.	10-30
<i>Brizula drummondii</i>	10-30
<i>Cassytha</i> sp.	<2
<i>Isoetes</i> sp.	<2
<i>Lepidosperma longitudinale</i>	2-10
<i>Meeboldina</i> aff. <i>cana</i>	10-30
<i>Lotus angustissimus</i>	<2
<i>Meeboldina denmarkica</i>	2-10
<i>Melaleuca cuticularis</i>	2-10
<i>Melaleuca densa</i>	2-10
<i>Melaleuca spathulata</i>	10-30
<i>Polypompholyx multifida</i>	2-10
<i>Samolus caespitosus</i>	<2
<i>Schoenolaena tenuior</i>	2-10
<i>Schoenus natans</i>	<2
<i>Schoenus tenellus</i>	2-10
<i>Selaginella gracillima</i>	<2
<i>Utricularia hookeri</i>	10-30
<i>Villarsia submersa</i>	<2

Appendix 4

Photo index

Images of all photos referred to in the text are located as either bitmap or jpeg files on the attached CD. Photos are indexed by number, file name, photographer and date. Images should not be copied or reproduced without the permission of the copyright holders.

Photos 28 - 45 are not referenced in the text but are included so that future change can be monitored.

Photo Number	Folder	File Name	Caption
Photo 1	Lane 1980	Bokarup1.bmp	View looking south east with Bokarup Swamp showing complete cover of <i>Baumea</i> sedgeland and eastern wetland showing wet heath dying from centre. (Photo JAKL - 30/04/1980)
Photo 2	Lane 1980	Bokarup2.bmp	View looking eastern wetland looking south and of Bokarup Swamp looking east. (Photo JAKL - 30/04/1980)
Photo 3	Lane 1980	Cobertup1.bmp	View across Cobertup Swamp (upper image) and across basin wetland in north west corner of Cobertup Nature Reserve (lower image) (Photo JAKL - 21/02/1980).
Photo 4	Lane 1980	Cobertup2.bmp	Aerial views of the two major basin wetlands in Cobertup Nature Reserve. (Photo JAKL - 30/04/1980)
Photo 5	Lane 1980	Cobertup3.bmp	Aerial views of the two major basin wetlands in Cobertup Nature Reserve. (Photo JAKL - 30/04/1980)
Photo 6	Lane 1980	Galamup1.bmp	Aerial views of Galamup Swamp. (Photo JAKL - 30/04/1980)
Photo 7	Lane 1980	Galamup2a.bmp	Northern quadrant of view across Galamup Swamp looking east. (Photo JAKL - 21/02/1980)
Photo 8	Lane 1980	Galamup2b.bmp	Southern quadrant of view across Galamup Swamp looking east. (Photo JAKL - 21/02/1980)
Photo 9	Lane 1980	Kodjinup.bmp	Aerial view of Kodjinup Swamp (upper image) and basin wetland in south western corner of Kodjinup Nature Reserve. (Photo JAKL - 30/04/1980)
Photo 10	Keighery 1997	Drain_0m.jpg	View to east along drain at start of a transect running perpendicular to drain. (Photo GJK 22/03/97)
Photo 11	Keighery 1997	Drain_10m.jpg	View to east (parallel to drain) from 10m mark on transect, Kodjinup Nature Reserve. (Photo GJK 22/03/97)
Photo 12	Keighery 1997	Drain_20m.jpg	View to east (parallel to drain) from 20m mark on transect, Kodjinup Nature Reserve. (Photo GJK 22/03/97)
Photo 13	Keighery 1997	Drain_30m.jpg	View to east (parallel to drain) from 30m mark on transect, Kodjinup Nature Reserve. (Photo GJK 22/03/97)
Photo 14	Keighery 1997	Drain_40m.jpg	View to east (parallel to drain) from 40m mark on transect, Kodjinup Nature Reserve. (Photo GJK 22/03/97)
Photo 15	Keighery 1997	Drain_50m.jpg	View to east (parallel to drain) from 50m mark on transect, Kodjinup Nature Reserve. (Photo GJK 22/03/97)
Photo 16	Keighery 1997	S_drain.jpg	Small drain emptying water into Kodjinup Nature Reserve across southern boundary. (Photo GJK 22/03/97)
Photo 17	Lane 1980	Kulunilup1.bmp	Aerial views of Kulunilup Nature Reserve upper image looking toward east across reserve, lower images of Kulunilup Swamp, showing <i>Eleocharis sphacelata</i> in centre of swamp. (Photo JAKL - 30/04/1980)
Photo 18	Lane 1980	Kulunilup2.bmp	View looking across Kulunilup Swamp (Photo JAKL - 20/02/1980)
Photo 19	Lane 1980	East Muir.bmp	Aerial views of wetlands to north east and north of Lake Muir. North Byenup Lagoon is bottom image. (Photo JAKL - 30/04/1980)
Photo 20	Lane 1980	Byenup.bmp	Aerial view of Byenup Lagoon looking south east. Dense sedgelands around the open water body becoming more open on western side. (Photo JAKL - 30/04/1980)
Photo 21	Lane 1980	Noobijup.bmp	Aerial view of Lake Noobijup Nature Reserve looking south east. Note recent clearing on western side. (Photo JAKL - 30/04/1980)
Photo 22	Lane 1980	Bodjinup1.bmp	Aerial view of Bodjinup Swamp on southern border of Pindicup Nature Reserve. (Photo JAKL - 30/04/1980)
Photo 23	Lane 1980	Bodjinup2.bmp	View looking across Bodjinup Swamp, Pindicup Nature Reserve. (Photo JAKL - 21/02/1980)
Photo 24	Lane 1980	Pindicup.bmp	Aerial views of Lake Pindicup. Left image looking east across northern section of Lake Pindicup, right image looking east across southern section of Lake Pindicup. (Photo JAKL - 30/04/1980)
Photo 25	Lane 1980	Pinticup1.bmp	View across Pinticup swamp (upper image) and photo of adjoining swamp in Pinticup Nature Reserve. (Photo

Photo 26	Lane 1980	Pinticup2.bmp	JAKL - 22/02/1980)
Photo 27	Lane 1980	Yarnup.bmp	Aerial view Pinticup Swamp looking east. (Photo JAKL - 30/04/1980)
Photo 28	Lane 1980	Poorginup.bmp	Aerial view of Yarnup Swamp. (Photo JAKL - 30/04/1980)
Photo 29	Keighery 1999	Byenup1.jpg	Aerial view of Poorginup Swamp. (Photo JAKL - 30/04/1980)
Photo 30	Keighery 1999	Byenup2.jpg	View across northern end of Byenup Lagoon to west. (Photo GJK 12/01/1999)
Photo 31	Keighery 1999	Byenup3.jpg	View across Byenup Lagoon to west. (Photo GJK 12/01/1999)
Photo 32	Keighery 1999	Byenup4.jpg	View across Byenup Lagoon to north west. (Photo GJK 12/01/1999)
Photo 33	Keighery 1999	LkMuir1.jpg	Looking north across Byenup Lagoon. (Photo GJK 12/01/1999)
Photo 34	Keighery 1999	LkMuir2.jpg	Looking north up the eastern edge of Lake Muir showing the parallel dunes and <i>Melaleuca</i> swamps which dominate the landscape. (Photo GJK 12/01/1999)
Photo 35	Keighery 1999	Mulgarnup1.jpg	<i>Baumea</i> sedgeland near edge of Lake Muir, west of Tordit-Gurrup Lagoon. (Photo GJK 12/01/1999)
Photo 36	Keighery 1999	Mulgarnup2.jpg	View west across Mulgarnup Lagoon. (Photo GJK 12/01/1999)
Photo 37	Keighery 1999	Neeranup1.jpg	View to north west across Mulgarnup and adjoining Lagoons. (Photo GJK 12/01/1999)
Photo 38	Keighery 1999	Neeranup2.jpg	View across Neeranup Swamp toward Byenup Lagoon. (Photo GJK 12/01/1999)
Photo 39	Keighery 1999	Tordit1.jpg	View across Neeranup Swamp toward Byenup Lagoon showing extensive sedgelands. (Photo GJK 12/01/1999)
Photo 40	Keighery 1999	Tordit2.jpg	<i>Baumea</i> swamp at northern end of the beach on Tordit-Gurrup Lagoon. (Photo GJK 12/01/1999)
Photo 41	Keighery 1999	Tordit3.jpg	Northern end of beach on Tordit-Gurrup Lagoon showing <i>Baumea</i> swamps behind dune. (Photo GJK 12/01/1999)
Photo 42	Keighery 1999	Tordit4.jpg	<i>Baumea</i> sedgeland in south west of Tordit-Gurrup Lagoon showing revegetating private block. (Photo GJK 12/01/1999)
Photo 43	Keighery 1999	Tordit5.jpg	Looking north up western side of Tordit-Gurrup Lagoon. (Photo GJK 12/01/1999)
Photo 44	Keighery 1999	Tordit6.jpg	Looking north between Tordit-Gurrup Lagoon and Lake Muir showing <i>Baumea</i> sedgelands. (Photo GJK 12/01/1999)
Photo 45	Keighery 1999	Wimbelup1.jpg	Looking north between Tordit-Gurrup Lagoon and Lake Muir showing <i>Baumea</i> sedgelands in detail. (Photo GJK 12/01/1999)
			View to north across Wimbelup Swamp. (Photo GJK 12/01/1999)



BOKARUP

~~SWAMP~~

SWAMP

WED 30 APR 1980





A ↑ 14739 82:8A
 (PW 226) Bokerns Swamp
 20 Feb 80



82:9A



83: 12A



83: 11A

East Pinyon Swamp

— A126681

(PW 179)



83: 10A

21 Feb 1980

Cobart-f



83: 15A



83: 14A

Swamp to NW of East Pinyon Swamp

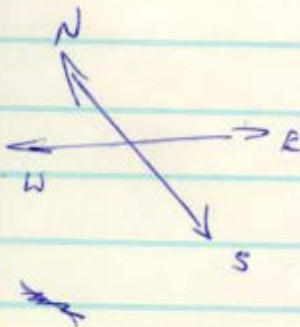


83: 13A

21 Feb 1980

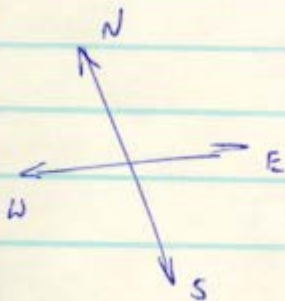
87:14

→
North Western
Swamp



87:15

→
East Western
Swamp



East Pigeon Swamp Reserve. (Plotting on 1:250,000 Topo)
(AT 26681 - PU 179)

30 April 1980

87:17



North Western Swamp



87:16



South Eastern Swamp



(LWNR A126681 - PW179)

30 April 1980



CTALAMUP SWAMP

30 APR 1980



83:9A



83:8A



83:7A

GALAMUP SWAMP

21 Feb 80



83:7A



83:6A

21 Feb 1980



Eastern Swamp

(Kodjiny S
Itself)



Western Swamp



Western Swamp

30 April 1980

















86:16



86:17



86:18



86:15



~~KULUNDEP~~

KULUNDEP SWAMP

30 APR 1980 -



82:12A

Kulundus Lake A126677 (PH 173)



82:11A

20 Feb 1980



82:10A



N
W
← Wetland on
N. side
of Min
lary



E
N
Wetland on
S. side of
← Min lary

Mulgarnup
Lagoon



Further south.

E
N
W

Nth Byenup
Lagoon

87:23



87:24



87:25

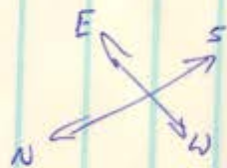


30 April 1980

86:5



30 April 1980



87:20

Bodjiniip Swamp (also on ↑ 26679)



30 April 1980



83:5A



83:4A



83:3A

~~Bodjina~~ Bodjina Swamp - A ↑ 26679
 (Pindjina lake is also on A ↑ 26679.)

Thurs 21 Feb 80

87:18



PINDICUP
(KWR A 126679)
PLW 175'

87:19.



LAKE .
30 APR 1980



83:16A



83:17A



83:18A

↖ Pinticup Swamp
22nd Feb 80

AT 2668
(PW)

← adjoining swamp on same
- Covent River



30 April 1980

86:7



86:8



86:9



Harpur Swamp

30 APR 1980

88:4



88:3



Pooging Swamp

30 April 1980



































