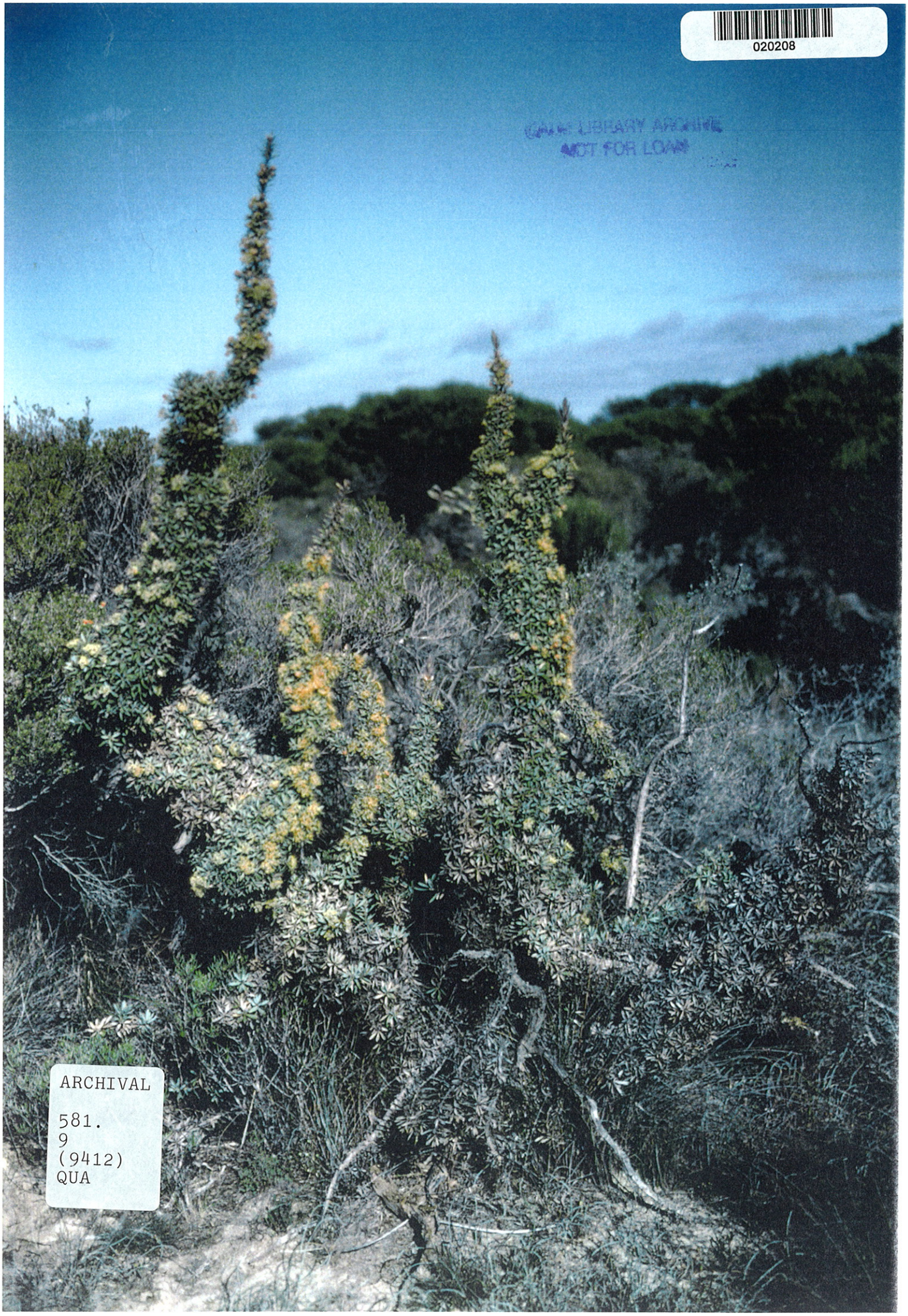

The Vegetation and Flora of the Quairading Nature Reserve, Shire of Quairading

by

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BACKGROUND

INTRODUCTION

The Wildflower Society's Bushland Plants Survey Project is a community based program that has been in existence since 1988. The Project aims to help communities, community groups and individual land owners know and conserve their bushland by providing training and help to survey, document and monitor the bushland plants (flora) and plant communities (vegetation) of local bushland. A knowledge of the bushland plants and plant communities in local bushland is essential for good management.

Since the inception of the Wildflower Society's Bushland Plants Survey Project it has been supported by a series of federal grants. This survey was supported by the Bushcare Program of the National Heritage Trust (1997 – 1998) and the Western Australian Departments of Conservation and Land Management (Wildlife Research) and Environmental Protection (Conservation Branch).

The subject of this report is the 527.5 hectare (ha) Crown Reserve 16405, Quairading Nature Reserve[1] , which straddles the York-Quairading Road as you enter Quairading from York (see Map 1). In 1998 the Landcare Coordinator for the Quairading Land Conservation District Committee (LCDC), Keith Boase, applied to the Wildflower Society to have the Reserve surveyed as part of the 1998 program for the Bushland Plants Survey Project. As the Quairading Nature Reserve is found in a predominantly cleared landscape (see Size of Remnant on page 10), the bushland was generally in excellent condition, contained a variety of plants and plant communities and was being managed for conservation by the Shire of Quairading (Shire of Quairading 1998), it was selected for survey.

The focus of the bushland survey of the Quairading Nature Reserve (Reserve) was a three day weekend program in Quairading and the Reserve that brought together Wildflower Society registered Bushland Plants Survey volunteers and the local Quairading community. A series of groups from the Quairading community are involved in the management of the Reserve as member groups of the Reserve Management Committee (Shire of Quairading 1998). These groups are – the Shire (officers and councillors), Agricultural Society, District High School, LCDC, Golf Club, P&C, Progress Association, Rotary Club, Rural Youth and Tidy Town Committee (Shire of Quairading 1998).

The weekend program was run from Friday 18th September to Sunday 20th September 1998. Friday's program was organised in the Reserve with students from the Quairading District High School. On Saturday and Sunday over 40 volunteers from the local Quairading community and the Bushland Plants Survey group and the coordinating botanists (authors of this report) worked together to survey the plants and plant communities in the Reserve.

At the request of the Quairading LCDC (outlined in their application for survey) the information collected in the weekend survey, and subsequent survey by the coordinating botanists, has been collated to prepare this report on the flora, vegetation and conservation significance of the Reserve.

During this same weekend the group also visited the Tammin Road Bushland (including Crown Reserve 21459 and adjacent Vacant (Unallocated) Crown Land, see Map 1). In

[1] Quairading Nature Reserve is Crown Reserve No 16405 and is vested in the Shire of Quairading for Water Catchment and Landscape Protection. Generally reserves called 'Nature Reserves' are vested in the National Parks and Nature Conservation Authority (NPNCA) for the purpose of Conservation of Flora and Fauna and managed by the Department of Conservation and Land Management.

1997 Keith Boase, applied to the Wildflower Society to have the Tammin Road Bushland surveyed as part of the 1997 program for the Bushland Plants Survey Project. It was not possible to survey the area in 1997 as the bushland in the Reserve was recovering from a fire in 1996. It was hoped that this area could also be surveyed as part of the work in 1998 but there was insufficient time in the September weekend to do detailed survey on both areas. However sufficient information was collected by the coordinating botanists to allow for a comparison between the two bushland areas, Tammin Road Bushland and the Quairading Nature Reserve.

LOCATION AND CLIMATE

Quairading townsite is located 164 kilometres east south-east of Perth and is the administration centre of the Shire of Quairading, which comprises 1,696 square kilometres (Map 1). The area has a dry warm Mediterranean climate with cool winters (average winter temperatures exceed 10^0 C) and hot dry summers (average temperatures of the hottest month exceeds 25^0 C). The annual average rainfall for Quairading town is 376 mm (Bureau of Meteorology 1999).

LANDFORM, SOILS AND VEGETATION

The study area is within the zone of Ancient Drainage, but close to the eastern margin of the zone of 'Rejuvenated Drainage' (Lantzke and Fulton 1994). This 'Ancient Drainage' zone includes all the land east of the Meckering Line (Mulchay 1967) and extends beyond the eastern edge of the Wheatbelt and corresponds to the 'Zone of salt lakes and sandplain' as defined by Mulchay (1967). The landscape of this system has a gently undulating plateau, with wide convex divides, long gentle slopes and broad valleys that contain salt lakes at their lowest point. Large areas of yellow sandplain and gravelly soils are found on the uplands forming the Ulva Landform Unit. Dissection of the lateritic profile on the gently sloping hillsides has lead to the formation of grey duplex soils on lower slopes forming the Booran Landscape Unit and emergent through these units are areas of exposed bedrock with their associated soils forming the Danberrin and Collgar Landscape Units respectively. These four units are found in Quairading Nature Reserve (Mulchay and Hingston 1961).

Quairading Shire falls in the Avon Phytogeographical Region of Beard (1980, 1981). The Avon Phytogeographical Region corresponds to the Avon Wheatbelt Region as mapped in the Interim Biogeographic Regionalisation of Australia[2] (Thackway and Creswell 1995).

Each of the Phytogeographical Regions contains a series of vegetation systems. The Reserve falls in the York vegetation system within the Avon Phytogeographical Region (Beard 1980). The characteristic landscape and vegetation units identified in this system are:

- sinuous lateritic ridges with their associated breakaways, covered by woodland of Mallet (*Eucalyptus astringens*);
- slopes and valleys covered by woodlands of York Gum (*E. loxophleba*) or Wandoo (*E. capillosa* subsp. *capillosa*, now called Wheatbelt Wandoo);
- valley floors Salmon Gum (*E. salmonophloia*) woodlands;
- on grey sand sheets and hills heath occurs; and
- on low level sandplains *Banksia* woodland.

[2] The Interim Biogeographic Regionalisation of Australia identifies biogeograhic units across Australia (Thackway and Cresswell 1995). Eighty Interim Biogeograhic Regions (commonly called IBRA Regions) were mapped in in Austrlia, with 26 in WA. In Western Australia the boundaries broadly match those of the Phytogeographical Regions in Beard (1980, 1981). The South West of WA encompasses seven IBRA regions – the Geraldton Sandplains, Swan Coastal Plain, Jarrah Forest, Avon Wheatbelt, Mallee, Jarrah Forest, Warren and Esperance Plains.

The eastern boundary of the York vegetation system and the adjacent Pikaring vegetation system is formed by the salt lake chain stretching from near Quairading to the Yenyening Lakes. As the Reserve lies on the eastern margin of the York vegetation system it contains large granite outcrops, a landform and vegetation unit considered characteristic of the Pikaring vegetation system.

SURVEY METHODS

Survey work at the Quairading Shire Nature Reserve was performed over two years from September 1998 to October 1999.

Seventeen 100 m^2 quadrats were located and described in the Reserve (Map 2, Appendix 1) to sample the range of plant communities identified using aerial photographs and field interpretation. Quadrats were located in the areas of bushland that were least disturbed. All study sites were permanently located using four steel pegs. Groups of volunteers from the Wildflower Society Bushland Survey group and the members of the Quairading community each led by a botanist or experienced volunteer, recorded information in a set format on physical location, vegetation structure and density and the total flora of the permanent study sites (after Keighery1994). The sites were sampled on at least three occasions. These quadrats are listed and described in Appendix 1. Vegetation structural descriptions and vegetation condition follow Keighery (1994) (see Appendix 3, Tables 1 and 2)

The 17 permanent sites will be included in a detailed regional floristic survey of the Wheatbelt being conducted by the Department of Conservation and Land Management as part of the Salinity Action Plan.

Opportunistic plant collections, that is collections from outside the quadrats, were made during foot transects of the bushland areas at various times of the year over the two years of survey.

An initial plant identification session was carried out on fresh specimens on the Saturday afternoon and evening in the Community Building in Quairading. Identification of plant collections was made by the Wildflower Society Bushland Survey volunteers and the authors and verified in regular sessions at the Western Australian Herbarium. A Field Herbarium has been prepared for the area. The Field Herbarium is lodged with the Quairading District High School where it will be accessible to the local community. Specimens of unusual, rare and interesting species located in the reserve have been lodged in the Western Australian Herbarium.

Herbarium records were also checked for additional records for the Reserve. It is considered that approximately 90% of the flora has been documented (Appendix 2).

Opportunistic collections were also made within the Tammin Road Bushland both at the time of the initial survey and at various times of the year over the next two years. A preliminary list for this Reserve has been prepared and can be obtained from GJ Keighery.

RESULTS

PLANT COMMUNITIES AND THE VEGETATION MAP

Introduction

The vegetation of the Quairading Reserve forms a complex mosaic of structural units correlated to soil type and position in the landscape (Map 2). The major units encountered were

- Salmon Gum (*Eucalyptus salmonophloia)* - Wandoo (*Eucalyptus capillosa* subsp. *capillosa*) Woodlands on the valley floors (vegetation units 1-3);
- York Gum (*Eucalyptus loxophleba)* -Jam (*Acacia acuminata)* and York Gum - Jam (*Acacia acuminata*)– Rock Sheoak (*Allocasuarina huegeliana*) Woodlands on fertile brown loams associated with the granites (vegetation units 4-6);
- Acorn Banksia *(Banksia prionotes)* and Sandplain Woody Pear (*Xylomelum angustifolium)* Woodlands on deep yellow sands (vegetation unit 15), and
- a series of Shrublands (generally dominated by Tamar[3] (*Allocasuarina campestris*)) on sands and gravelly soils (vegetation units 9-14). These shrubland units showed significant degree of intergradation across the reserve.

Herblands develop on the shallowest of the granite soils but quickly grade into shrublands on deeper soils. These units have been mapped as a complex (vegetation unit 8). The vegetation map also shows bare areas of granite (unit 7) and badly disturbed areas, including the golf course (unit 16).

Each of the 14 native vegetation units distinguished and the two other mapped units are described below in more detail. The quadrats located in each of these units (Map 2 and Appendix 1) and the broader units used in listing the flora of the Reserve (Appendix 2) are also indicated.

Plant Communities

Woodlands

1) Salmon Gum Woodlands (S, Quadrats 6, 17)

These are most common in lower areas of the broad valleys. These Woodlands (to 25 m in height) intergrade into the Wandoo Woodlands (vegetation unit 2) which also occupy the clay soils of the lower slopes. The understorey of the Salmon Gum Woodlands is generally quite open being dominated by such species as *Acacia erinacea, Olearia axillaris, Enchylaena tomentosa* and *Rhagodia drummondii.* In some places large drifts of annuals are seen these included *Goodenia berardiana, Blennospora drummondii, Erymophyllum ramosum* subsp. *ramosum* and *Podolepis tepperi.* The Salmon Gum Woodland associated with the dam on the eastern boundary, south of the road, has a high proportion of weedy grasses in the understorey.

2) Wandoo Woodlands (W, Quadrats 2, 22)

These Woodlands grade into the Salmon Gum Woodlands occupying the lower valley slopes especially in the north western part of the reserve on duplex clay soils. The Wandoo Woodlands tend to be lower (commonly around 15 m) than the Salmon Gum but the composition of the understorey was essentially similar to that described above.

3) Wandoo Woodlands on laterite (W)

This type of Wandoo Woodlands occurred on a ridge in the north west corner of the reserve. A shallow orange gravelly soil had developed over the laterite and the understorey was generally dominated by *Allocasuarina campestris* to 2m high.

[3] The spelling of Tamar used here is after Bindon and Chadwick (1992).

4) York Gum - Jam Woodlands (Y, Quadrats 7, 8, 9, 14, 20)
These mixed Woodlands are found on the deeper brown gritty loam soils below the granites (Plate 1). Occasionally Jam becomes the sole dominant. The understorey is dominated by a rich annual flora that carpets the ground in spring. The most conspicuous species of this annual flora are: *Podolepis canescens, Podolepis lessonii, Rhodanthe manglesii, Waitzia acuminata, Lawrencella rosea* and *Trachymene* species. This community is relatively poor in shrubs but grasses and sedges are common components.

5) Degraded York Gum Woodland (Y)
Degraded York Gum Woodlands occur along the edge of the golf course, annual weeds especially grasses have invaded into the woodland.

6) York Gum - Jam – Rock Sheoak Woodlands (Y)
These are found on the shallower soils associated with the main granite body. In some areas Rock Sheoak becomes a common element of the overstorey and may completely dominate in small groves. The understorey is essentially similar to the York Gum - Jam Woodlands found below the granites with species such as *Borya sphaerocephala* and the climbing *Drosera* species becoming more apparent. In places *Allocasuarina campestris* forms a significant layer in the understorey.

15) Acorn Banksia and Sandplain Woody Pear Low Woodlands
(B, Quadrats 3,4, 12)
These Low Woodlands occur on the large yellow sand dunes to the south of the York - Quairading Road (Plate 2). This community has a species rich shrubby understorey including such species as *Grevillea eriostachya, Melaleuca leptospermoides, Verticordia roei, Calytrix leschenaultii, Dampiera* spp., *Baeckea preissiana,* and *Borya constricta.* Herbs are much less dominant than in the York Gum Woodlands, nonetheless species such as *Podotheca gnaphalioides* and *Podolepis canescens* are still spectacular in the spring. *Banksia attenuata* and *Nuytsia floribunda* occasionally occur as canopy species in this community.

Shrublands

9) Tamar Shrubland on sandy gravels (T/H, Quadrat 11)
These Shrublands occur along the main road and the southern end of the reserve. The community is dominated by Tamar (*Allocasuarina campestris)* generally 1.5 to 2 m tall, a few other shrubs are seen including *Dryandra armata* and *Borya sphaerocephala.* Clumps of *Lepidosperma* sp. 1 are also obvious, and in places (to the south of the main road), *Mesomelaena preissii* and *Lepidobolus preissianus* are common understorey elements.

10) Tamar Shrubland on lateritic gravels (T/H)
These Shrublands occur on the laterite ridge in the north west corner of the reserve. The Shrubland is up to 3 m tall and in some places entirely dominated by Tamar, in more open areas dominance is shared with shrubs as *Grevillea insignis* and *Melaleuca radula.* Over most of this area there few if any herbs apparent.

11) Tamar Shrubland on yellow sandy clays (T/H)
These Shrublands are found midway along the northern boundary extending south into the reserve. Again *Allocasuarina campestris* dominates generally to the exclusion of other shrubs, generally being 1 to 2 m tall and with greater than 70% cover with patches of *Lepidosperma* sp. 1 forming large clumps and occasional small patches of *Borya constricta.*

12) Heaths on deep grey sands (T/H, Quadrat 1)
The Heaths in deep grey sands are found on either side of the main road on the western boundary of the reserve. The Heaths (generally 1 - 1.5 m tall) are variously dominated

by *Melaleuca leptospermoides, Leptospermum erubescens, Eremaea pauciflora* and *Hakea lissocarpha* over herbs.

13) Tamar - *Dryandra - Eremaea* Shrubland on cream sands (T/H, Quadrat 5)
These mixed Shrublands occur in the southern half of the reserve. This community grades into the Heaths (vegetation unit 12) but occupies a higher position in the landscape. This shrub rich community is also diverse in terms of herbs, grasses and sedges, the most obvious being *Mesomelaena preissii* and the rush *Lepidobolus preissianus*. The Declared Rare *Hakea aculeata* is common in and restricted to this community.

14) Tamar- *Eucalyptus macrocarpa* Shrubland on yellow sand (T/H)
On the northern boundary of the reserve where the soil looks very similar to that of the Acorn Banksia and Sandplain Woody Pear Low Woodland a very different community is found. Tamar *(Allocasuarina campestris)* co-dominates with *Eucalyptus macrocarpa.* A small sand pit has been developed on the northern boundary of the Reserve to access these yellow sands.

Herbland - Shrubland mosaic

8) Lithic Complex (G, Quadrat 18)
This vegetation unit is an mosaic of Herblands on shallow granitic soils grading into Shrublands over herbs on deeper soils (Plate 3). The typical Herbland on shallow granite soils is dominated by *Borya sphaerocephala* and a rich herb layer including *Hyalosperma glutinosa* subsp. *glutinosa, Velleia cycnopotamica, Podolepis lessonii, Caesia alfordii, Waitzia acuminata,* and *Hyalosperma demissum.* On deeper soil this community intergrades into a Jam *(Acacia acuminata)* and / or Rock Sheoak *(Allocasuarina huegeliana)* shrubland.

Other mapped units

7) Granite outcrop (G)
In the north east of the reserve is almost completely devoid of vegetation and provides a spectacular lookout over the reserve (Plate 4). Small granite pool and minor areas of herbland develop where small hollows and soil accumulates on the side slopes.

16) Cleared / Disturbed areas (D)
Much of the golf course under the granite is mapped as cleared/disturbed. Smaller areas are also mapped these are the borrow pits along the main road, a small sand pit on the northern boundary and in a small patch in the south east corner of the reserve.

FLORA

Introduction

A total of 508 vascular plant taxa (species, subspecies and varieties) are recorded from Quairading Nature Reserve (Appendix 2). Of these 457 were native taxa and 51 non-native weed taxa.

The most species rich families are:

Asteraceae	- 45 taxa, including 7 weed taxa;
Proteaceae	- 41 taxa;
Papilionaceae	- 31 taxa , including 6 weed taxa;
Myrtaceae	- 29 taxa;
Orchidaceae	- 28 taxa;
Poaceae	- 27 taxa, including 13 weed taxa;
Cyperaceae	- 21taxa, including 1 weed taxon;

Mimosaceae - 20 taxa; and
Anthericaceae - 19 taxa.

The largest genera were *Acacia* with 20 taxa, *Hakea* and *Drosera* with 12, *Stylidium* with 11 and *Schoenus* with 10 taxa.

The diversity of plants in the communities present in the Reserve is generally high, the native taxa in the 10 X 10 metre quadrats (100 m^2) ranging from 27 (QNR 20) to 63 (QNR. 5) (Appendix 2). The most species rich communities were the Tamar - *Dryandra* - *Eremaea* Shrubland and the Acorn Banksia and Sandplain Woody Pear Woodlands, these communities having a high diversity of both shrubs and herbs. The *Eucalyptus* Woodlands generally have lower species diversity as they contain fewer shrub species. The highest plant diversity in these Woodlands is related to the diversity of herb species. These herbs which are from principally the Asteraceae and Apiaceae are often quite dense and form carpets of colour in spring (Plate 1).

Significant Flora – Species of Special Interest

Declared Rare and Priority Flora
Eleven rare taxa (priority taxa, that is taxa under consideration for declaration as Declared Rare Flora, see Appendix 3, Table 3), and one species of Declared Rare Flora were located in the Reserve.

Declared Rare Flora
Hakea aculeata (Proteaceae) (Plate 7 and 8)
Hakea aculeata is Declared Rare Flora under the *Wildlife Conservation Act 1950*. This *Hakea* is presently known from 10 small populations most of which are on road verges between Cunderdin and Brookton. The Quairading population is of crucial significance in the protection of this species in the wild as

- it is the largest known population,
- the population contains mature and juvenile individuals, and
- the population is located in a large intact bushland area.

Priority Flora (listed in priority category groups then alphabetically by family)
Conospermum galeatum (Proteaceae) – Priority 1 (Plate 9)
This delicate blue-grey flowered Smokebush is only known from Kellerberrin, Bruce Rock and Tammin. While this species was very uncommon in the Reserve (only one plant seen) there was a larger population in the Tammin Road Bushland to the east of the cemetery. This species has a very localised distribution and is very poorly reserved so it is listed as a Priority 1 species.

Austrostipa ?exilis (G Keighery 15557) (Poaceae) – Priority 2
This bunch grass with very dark green almost black inflorescences was only found around breakaways. *Austrostipa exilis* has a very restricted range around Needilup (near Ongerup) and is a Priority 2 species. This population was unusual in that it is a long way north of the recorded range of *Austrostipa exilis* and it is not a very good match for the species and may prove to be a new taxon.

Opercularia rubioides (Rubiaceae) - Priority 2
This species is a small erect sub-shrub and is normally found in the southern Wheatbelt between the Stirling Ranges and Esperance. The Quairading population is north of previously recorded occurrences of this poorly collected species. At Quairading both *Opercularia rubioides* and *O. vaginata*, which replaces *O. rubioides* to the west, occur. There is only one other known co-occurrence.

Thysanotus tenuis (Anthericaceae) - Priority 3
This tuberous Fringed Lily is found from Brookton to Dumbleyung, Quairading being in the northern area of its range. This taxon is relatively uncommon in this area and for this reason is a Priority 3 taxon.

Hemiandra coccinea (Lamiaceae) - Priority 3 (Plate 10)
This species is a low spreading shrub and was present in both the Reserve and the Tammin Road Bushland. There were two forms present, one with grey leaves and deep red flowers the other with green leaves and pale red flowers. The species ranges from Mingenew, Eneabba, Wongan Hills to Tammin but is uncommon over its range. The populations at Quairading are the southernmost known.

Acacia lirellata subsp. *lirellata* (Mimosaceae) - Priority 3
This low spreading shrub which flowers in late winter and early spring is found in scattered populations from Coorow to Northam and Tammin. The Quairading population is on the southern limit of this subspecies range. This taxon is relatively uncommon in this area and for this reason is a Priority 3 taxon.

Acacia lullfitziorum (Mimosaceae) - Priority 3
This is another low spreading shrub wattle, found in the central Wheatbelt from Ongerup west to Boyup Brook and York and north to Badgingarra and Goomalling. This taxon is relatively uncommon in this area and for this reason is a Priority 3 taxon.

Stenanthemum tridentatum (Rhamnaceae) - Priority 3
A prostrate spreading shrub with heads of small inconspicuous flowers found in the Wheatbelt between Gunyidi, Darkan, Narembeen and Wagin. This taxon is relatively uncommon in this area.

Daviesia costata (Papilionaceae) - Priority 4
The distribution of this *Daviesia* is centred in the Jarrah and Wandoo forests and woodlands to the west of Quairading. It is here at the eastern limit of the range of the species.

Daviesia hamata (Papilionaceae) - Priority 4
This *Daviesia* is a multi-stemmed shrub to 50 cm with red-orange flowers in spring which occurs in scattered populations between Marchagee, Tammin, Gnarlbine Rock and Jingaring. The populations at Quairading are the southern limit of the range of the species. This *Daviesia* was named from specimens collected at this locality (that is the Reserve is the type locality for this species). This taxon is uncommon and restricted in range.

Dryandra cynaroides (Proteaceae) - Priority 4
Dryandra cynaroides occurs between Pingelly, Boyagin, Harrismith and Lake Grace. The population at Quairading is the northernmost recorded. This taxon is relatively uncommon in this area.

Newly recognised species (listed alphabetically by family)
Two previously unknown, unnamed taxa were located in the Reserve.

Platysace sp. Quairading (G Keighery 15624) (Apiaceae) (Plate 11)
This appears to be a new species of *Platysace*. There are no other collections of this species in the Western Australian Herbarium.

The *Platysace* is an almost leafless low shrub with erect succulent stems. The species is apparently short lived growing rapidly after seed germination. Germination of seeds appears to be stimulated by fire the species taking advantage of the abundance of light and nutrients available after fire. Flowering occurs within two years of germination.

Heads of small white flowers are produced in summer. The species is unusual in the genus as it apparently stores water and nutrients in it' s stems rather in root tubers.

Only one plant was noted in the Reserve alongside a track. However it was abundant in the burnt area of the Tammin Road Bushland beside the cemetery.

Schoenus sp. Quairading (G Keighery 15694) Cyperaceae
This appears to be a new species of *Schoenus*. There are no other collections of this species in the Western Australian Herbarium.

This *Schoenus* was found in Shrublands in the Reserve. The *Schoenus* can be readily distinguished from other members of the genus by it' s grey hairy leaves.

Geographically Significant Flora (listed alphabetically by family)
Millotia perpusilla (Asteraceae)
This small annual daisy with inconspicuous heads of cream coloured flowers has recently shifted from the genus *Toxanthes*. Generally this daisy is found well east of Quairading the closest population being at Moorine Rock to the north east. The Quairading population is of some interest as it is disjunct from its typical range.

Actinostrobus arenarius (Cupressaceae)
This native cypress is a very distinctive small conical shaped tree that often looks out of place in the Western Australian bushland. The population at Quairading is one of a series of scattered populations (Tammin, Narembeen, Arthur River and Kulin) that lie south of its main range between Coorow and Shark Bay.

Callitris tuberculata (Cupressaceae)
This species was previously part of the widespread species *Callitris preissii*. All three subspecies which were recognised in *Callitris preissii* have been elevated to species (Hill 1998). *Callitris tuberculata* is a widespread species growing from Geraldton, through the eastern Wheatbelt and south to the Roe Plains.

Eucalyptus macrocarpa subsp. *macrocarpa* (Myrtaceae)
A spectacular mallee recorded in scattered populations from Calingiri, Piawanning, Bolgart, Wongamine, Dalwallinu, Cunderdin, Corrigin, east of Beverley, Jitarning and Wagin. Large populations are present in Quairading area, mostly to east of the town in the Tammin Road Bushland. Only a few plants are recorded on the northern margins of the Reserve.

Hakea corymbosa (Proteaceae)
A dense shrub with needle like ends to erect rigid leaves. Occurs along the south coast inland to Chinnocup and the Stirling Ranges with scattered populations west to the Lake Muir area and near Darkan and previously north to Dongolocking (south-east of Narrogin). The Quairading record is the northernmost known.

Significant Species Co-occurrences (listed alphabetically by family)
At times some species are difficult to tell apart as they appear quite similar. This may be because they are closely related or have evolved in a similar way. The co-occurrence of such species with no intermediates is good evidence that they are distinct species.

Hibbertia eatoniae, *H. rostellata* and *H. uncinata* (Dilleniaceae)
Hibbertia eatoniae occurs mainly east of Bruce Rock and the Quairading population is the western margin of this species range. The other species are within their known ranges. The co-occurrence of these three species which are members of the *Hibbertia uncinata* complex (a series of similar *Hibbertia* species which are often difficult to distinguish) shows that they are good taxa (Grieve 1998, illustrates the differences). There are no other known co-occurrences.

Grevillea eriostachya and *G. excelsior* (Proteaceae) (Plate 12)
These two species previously combined co-occur and flower at the same time at Quairading with no signs of intergradation or hybridisation. There are reports that the two species hybridise when they co-occur (Mackinson 2000). Both species are also present in the Tammin Road Bushland, especially near the northern boundary.

Weeds
Fifty one weeds are recorded for the Reserve (Appendix 2). The majority of these are annual species. Most of the weeds are confined to and/or occur in significant densities on the edges of the tracks in the Reserve or are found in areas which have been partially cleared and/or grossly disturbed in the past. Most of the species recorded are not known to become established in significant densities in intact bushland (Dixon and Keighery 1995). However some of the grass species reach high densities in the disturbed areas and have the potential to be invasive. The grassy weeds of greatest concern are Wild Oats (*Avena barbata*) and Annual Veldt Grass (*Ehrharta longiflora*). Disturbances such as increased clearing, excess nutrient levels and increased water availability have the potential to encourage the growth of these species to the detriment of the native grasses and herbs. Other grasses that are presently in low numbers that could become established are Perennial Veldt Grass (*Ehrharta calycina*) on the sandy soils and Love Grass (*Eragrostis curvula).*

VEGETATION CONDITION

The vegetation of the majority of the Reserve is in Excellent Condition (Appendix 1 and 3) with much of the area considered to be in "pristine" condition by visitors to the Reserve. While 51 weeds are recorded for the bushland this is only 10% of the total flora and together with their general restriction to disturbed areas, weed invasion of the Reserve is low.

Disturbance of the bushland is associated with:

- the edges of the Reserve where increased light, nutrient and water levels (and possible past grazing) contribute to the success of weeds over the native species;
- past clearing for tracks and a series of other uses such as the golf course, borrow pits along the main road, a small sand pit on the northern boundary and a small patch in the south east corner of the reserve; and
- uncontrolled track usage.

Generally this clearing appears to have occurred some years ago before the effect of such degradation on the adjacent bushland was clearly understood. The smaller areas that have been cleared are regenerating and it would be expected that if weeds are controlled in these areas regeneration will occur naturally from the adjacent intact vegetation. Such a regeneration approach could also be used for closing unnecessary tracks in an access control plan within a management plan for the Reserve.

The patches of bushland between the fairways in the golf course however require active management if they are to be maintained as the large edge to area ratio of these patches favours weed growth due to uniformly increased light, nutrient and water levels.

Recent work undertaken by Westrail to replace sleepers and some culverts along the railway line that runs parallel to, and on the southern side of the main York - Quairading Road is of concern. Much of the access track on the southern side of the railway has been opened up and widened by Westrail. Large sections of regenerating bushland between the access track and the railway line have been cleared and the spoil material from all of these works has been pushed up into the Reserve (Plates 5 and 6). Clearing and disturbance such as this is unnecessary and encourages the proliferation of weeds

in the cleared areas. Of particular concern are the spoil material from the tracks which will contain much weed seed. The spoil piles will become nodes for weed establishment in the bushland. Any track work should be designed to avoid forming hummocks of soil alongside the tracks and spoil dumps.

DISCUSSION

CONSERVATION VALUES

A series of factors contribute to the conservation values of bushland areas. A consideration of these values in relation to the Quairading Nature Reserve clearly illustrates that the Reserve is a highly significant natural heritage area of outstanding nature conservation value.

Habitat or plant communities typical and representative of the region
A principal aim of conservation is to keep, in each local area and region, representations of the communities and species typical of, and associated with, the local area regardless of their rarity at a regional level. It is this typical bushland that contributes to each places 'sense of locality' (Keighery and Gray 1993).

Woodlands dominated by York Gum, Wheatbelt Wandoo and Salmon Gum have been considered typical of the area (see Background from Beard, 1980). Six of the 15 mapped vegetation units (Map 2) in the Reserve are dominated by these species. These vegetation units cover over half of the Reserve. As a consequence the Quairading Nature Reserve has significant value as it contains communities typical of the area and region and populations of many taxa that represent a significant number of the known individuals of these taxa in the region and/or populations of a mixture of different-aged individuals — mature adults to seedlings.

Perimeter to area ratio
Overall the Reserve has a compact shape. Compact shapes have larger area to edge ratios making them less prone to degrading edge effects such as fertilizer drift, increased water run - off (often nutrient enriched), exposure to wind and weed invasion. Unfortunately the main road and numerous tracks create additional edges within the Reserve, effectively decreasing the area to edge ratio and increasing the penetration of the degrading edge effects.

Size of Remnant
Quairading Nature Reserve with an area of 527.47 hectares is:

- a large reserve when compared with other reserves in the central wheatbelt;
- contains a large proportion of the remnant native vegetation in the Shire; and
- is one of the largest recognised conservation areas in the Shire

Beeston *et al.* (1994) found that only 3548 hectares or 5.53% of the 200,489 hectares Quairading Shire remains with a cover of remnant native vegetation. About half of this remnant native vegetation (2.76%) was on private land. Environs Consulting (1999) identifies 5712.4 hectares of public lands in the Shire. However Environs Consulting mistakenly considers these to be from 120 CALM reserves when they are actually the total for all reserves/public lands in the Shire and they are not necessarily bushland. There are only 23 CALM Nature Reserves in the Shire, 17 of which are less than 100 hectares in area. The largest CALM Reserve is Yenyening Nature Reserve of 2424 hectares which straddles the border between Beverly, Brookton and Quairading Shires. Also as the Yenyening Nature Reserve is low in the landscape and contains different communities than the Reserve it is not comparable, in conservation terms, to the Quairading Nature Reserve (see below).

Diversity of plant communities and flora
With fourteen plant communities mapped in the Reserve and 457 native vascular plants listed the Quairading Nature Reserve supports a highly diverse assemblage of plant communities and native plant species.

Habitat or plant communities not well conserved elsewhere
Quairading Nature Reserve, with an area of 527.47 hectares, is the largest upland remnant in the Shire. The only larger Nature Reserve in the Shire, the Yenyening Nature Reserve, is mostly saline flats and associated rises of the Yenyening Lakes. Furthermore the Reserve's position high in the landscape helps protect it from rising water tables that are threatening the Yenyening Nature Reserve.

Presence of rare, threatened or significant species and plant communities
The population of the Declared Rare Flora, *Hakea aculeata*, is the largest known population of this species. In addition this *Hakea aculeata* population is found in the most intact plant community in the largest remnant of any of the known populations of the *Hakea*. Eleven rare taxa with restricted distributions are also found in the Reserve.

The Reserve also contains a series of regionally significant populations of more widespread species. It contains

- distinctive forms of two, and possibly three taxa, that have not been previously recognised taxonomically and are expected to be recognised at the level of species or subspecies (*Platysace* sp. Quairading (G Keighery 15624), *Schoenus* sp. Quairading (G Keighery 15694) and *Austrostipa ?exilis* (G Keighery 15557));
- populations of two species that are outside the main geographic range, ie. disjunct populations (*Millotia perpusilla* and *Actinostrobus arenarius*); and
- populations of ten species at the ends of the plant's geographic range (*Hakea corymbosa*, *Hibbertia eatoniae*, *Austrostipa ?exilis* (G Keighery 15557), *Opercularia rubioides*, *Thysanotus tenuis*, *Hemiandra coccinea*, *Acacia lirellata* subsp. *lirellata*, *Daviesia costata*, *D. hamata* and *Dryandra cynaroides*).

Two of the plant communities identified in Quairading Nature Reserve that are not known elsewhere in the Shire.

- Acorn Banksia and Sandplain Woody Pear Low Woodlands (vegetation unit 15, Plate 2) present on the yellow sands of the Ulva Landform Unit. This species rich community has not been recorded elsewhere in the Shire or elsewhere in a reserve in the Wheatbelt. Beard (1990. page 117) refers to this community as a specific unit in his York vegetation system
  "Rarely, sheets of transported sand lie in the valleys and form 'low level sandplains'. An example of this kind, now completely cleared stretches from Bolgart to Meckering. There is another smaller example, still vegetated, adjacent to the township of Quairading."
  The stand of this plant community present around the town appears to be the largest surviving remnant of this plant community which once was probably characteristic of the yellow sandplains of the western wheatbelt. *Banksia prionotes* is now normally only found as the dominant on species poor sites on dunes along rivers or lakes in the Wheatbelt.

- Tamar - *Dryandra* - *Eremaea* Shrubland (vegetation unit 13) on cream sands of the Ulva Landform Unit. This unit contains the population of *Hakea aculeata* and is also floristically distinct from the other units.

Over recent years the Department of Conservation and Land Management's Western Australian Threatened Species and Communities Unit (WATSCU), with financial help from Environment Australia, has developed a procedure for identifying 'threatened ecological communities' (English and Blyth 1997). Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat'.

Information on the geographic extent of each ecological community and the threatening processes that may be operating on the community is used to determine if an ecological community is 'threatened'. Threatened ecological communities are those that have been assessed and assigned to one of four categories related to the status of the threat to the community. The categories are 'Presumed Totally Destroyed', 'Critically Endangered', 'Endangered' or 'Vulnerable' (Appendix 3, Table 4). Two further categories — 'Data Deficient' and 'Lower Risk' — are also distinguished. Ecological communities identified as 'data deficient' are usually communities with poorly known distributions which are suspected of belonging to one of the threatened categories. The 'lower risk' category describes communities that are well enough known and surveyed and not considered to be under threat.

At this stage there is insufficient regional information on the Wheatbelt to generally recognise threatened ecological communities in the Reserve. The completion of the detailed regional floristic survey of the Wheatbelt being conducted by the Department of Conservation and Land Management as part of the Salinity Action Plan will allow for the definition of the threatened ecological communities in the region. The two plant communities described above may well be identified as threatened ecological communities.

The conservation values of the Reserve highlight the importance of other remnant native vegetation in and adjacent to the Quairading Townsite (in particular the Tammin Road Bushland). The plants and plant communities of the bushland to the north and east of the town are complimentary to the bushland in the Quairading Nature Reserve being predominantly communities of deep sandy soils dominated by species of mallee eucalypts, *Eucalyptus macrocarpa*, *Xylomelum angustifolium* or *Banksia prionotes* and combinations of these. There is only one small area of comparable vegetation in the Quairading Nature Reserve (Tamar - *Eucalyptus macrocarpa* on sand, unit 14, Map 2). This bushland area also contains large populations of the rare *Conospermum galeatum* and the newly recognised and rare *Platysace* sp. that are uncommon in the Quairading Nature Reserve as well as the only known populations of the Declared Rare Flora *Jacksonia* sp. Quairading (Plates13 and 14). As a consequence all bushland in and around the Quairading Townsite can be considered of outstanding conservation value forming one of the largest, more diverse upland bushland remnants outside a Nature Reserve (vested in the NPNCA) in the central Wheatbelt.

BUSHLAND MANAGEMENT FOR THE MAINTENANCE OF CONSERVATION VALUES

This study clearly identifies that the Quairading Nature Reserve is of outstanding flora conservation value and establishes that of the four purposes identified for the Reserve in the Management Guidelines (Shire of Quairading 1998) - 'recreation, conservation, cultural and educational purposes' the Reserve's conservation values are the most significant. The conservation values of the Reserve should not be compromised by inappropriate use of the Reserve for cultural activities, recreation or education. Appropriate recognition of these values in the management of the Reserve can be achieved through the preparation of a detailed Management Plan for the Reserve as proposed in the Quairading Nature Reserve Management Guidelines (Shire of Quairading 1998). The Management Plan should address the Reserve's:

- conservation (natural heritage), recreation, cultural (cultural heritage) and educational values;
- threats to these values
- management practices to control the threats; and
- promotion of these values.

Further discussion in this section considers some of the issues that there is a need to be address in through a comprehensive Management Plan.

A principal aim of bushland conservation and management is to conserve in perpetuity representations of the communities and species typical of and associated with the local area. The total bushland area has value and the priority is to manage the Reserve as a whole. With this clear understanding of the values of all of the bushland consideration of individual mapped plant communities or sections of these communities can be used to rank areas for management effort. This ranking should consider combinations of the following

- disturbance - the least disturbed having greatest value
- community diversity - the most diverse having greatest value
- maturity of the community and individual species in the community - mature individuals or communities having particular value.

Alongside this ranking should be the identification of threatening processes (those disturbance activities/events that threaten the self maintenance of the bushland) as these may be of a scale where alleviation of these is the primary concern. All disturbance activities should be considered to determine which current or proposed disturbances constitute the greatest threats to the conservation of plants, plant communities and fauna of the Reserve. The disturbances observed in the Reserve that are of most concern and in need of active intervention to alleviate are:

- the degrading external edge and road/track edge effects leading to increased light, nutrient and water levels that favour weeds over native plants;
- clearing for tracks and a series of other uses and
- track usage.

Most of the clearing observed in the Reserve relates to historical uses of the Reserve but continued clearing associated with the misuse of tracks by off-road vehicles and 'maintenance' of tracks is resulting in unnecessary disturbance. The managers of the Reserve need to take a more proactive role in the management of these types of activities. For example Westrail should be made aware of the damage to the Reserve caused by their operations and action taken to address the damage and ensure it does not occur again. Any proposal to clear bushland in the Reserve should be part of the detailed Management Plan.

As a consequence of the recognition that management effort should focus on limiting or alleviating disturbance, management work necessarily promotes augmenting natural regeneration. In general the most needed activity is weeding, weeding in a manner that allows for natural regeneration. For example the control of Wild Oats in the woodlands should be done in a manner that allows for natural regeneration of the native herbs that the weedy grass is smothering.

Revegetation may be necessary in some completely degraded areas however, planting should not become a focus of restoration related activities in the Reserve. The type and quality of the bushland is such that the focus for bushland management should be control of the relevant disturbances to augment natural regeneration.

The presence of threatened species and communities in an area of bushland effectively establishes a series of management practices. Obviously DRF has special consideration as permission is required from the Minister for the Environment to take in any way part or all of any DRF. The Department of Conservation and Land Management (CALM) is responsible for enforcing the *Wildlife Conservation Act 1950* under which DRF is gazetted on a yearly basis. CALM notifies affected land managers (owners, vesting authorities) of known populations of DRF and their responsibilities under the *Act*.

CALM also takes responsibility for management of threatened ecological communities. The two plant communities present on Quairading Nature Reserve that are not known elsewhere in the Shire, the species rich Acorn Banksia and Sandplain Woody Pear Low Woodlands and the Tamar - *Dryandra* - *Eremaea* Shrubland on cream sands, may well

be identified as threatened ecological communities. In areas where threatened communities are identified CALM will give advice in management.

Both threatened species and communities are expected to be managed according to the principles outlined in 'recovery plans' prepared for the entire range of the species or community. These plans essentially identify the threatening processes operating on the species or community and develop strategies to alleviate or minimise these threats.

CONCLUSION

This flora and vegetation survey of the Quairading Nature Reserve has found that the Quairading Nature Reserve is of outstanding conservation value being

- a relatively large bushland area in a predominantly cleared landscape;
- bushland in generally in excellent condition;
- bushland containing a variety of plants and plant communities which are typical of the Wheatbelt vegetation of the region; and
- bushland containing plants and plant communities some of which are rare in the Wheatbelt.

In keeping with the Quairading Nature Reserve Management Guidelines (Shire of Quairading 1998) and in recognition bushland's outstanding conservation value a detailed Management Plan for the Reserve should be prepared as a matter of urgency. The Management Plan should address the Reserve's values - conservation (natural heritage), recreation, cultural (cultural heritage) and educational; threats to these values and management practices to control the threats and; promotion of these values.

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REFERENCES

Aplin TEH 1979 The Flora. IN: BJ O'Brien (Ed.) Environment and Science. University of Western Australia Press, Nedlands, Western Australia.

Atkins KJ 1999 Declared Rare and Priority Flora list for Western Australia. Department of Conservation and Land Management, Como, Western Australia.

Beard JS 1980 The Vegetation of the Corrigin Area: Vegetation Map and Explanatory Memoir (1: 250 000 series). Vegmap Publications, Perth.

Beard JS 1981 Vegetation Survey of Western Australia: Swan. 1:1 000 000 Vegetation Series. Explanatory Notes to Sheet 7. University of Western Australia Press, Perth.

Beard JS 1990 Plant Life of Western Australia. Kangaroo Press, Kenhurst, New South Wales.

Beeston GR, Mlodawaski G, Saunders A and True D 1994 Remnant Vegetation inventory in the southern agricultural areas of Western Australia. Agriculture Western Australia, Perth, Western Australia.

Bennett EM 1991 Common and Aboriginal Names of Western Australian Plant Species. Wildflower Society of Western Australian (Inc.), Western Australia

Bindon P and Chawick R 1992 A Nyoongar Word List from the South West of Western Australia. Western Australian Museum Perth, Western Australia.

Bureau of Meteorology 1999 Western Australia Monthly weather review (December)

Dixon IR and Keighery GJ 1995 Weeds and their control. IN Managing Perth's Bushlands. Edited by M Scheltema and J Harris. Greening Western Australia, Perth, Western Australia.

English VJ and Blyth J 1997 Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province. Project Number N702, Final Report to Environment Australia. Department of Conservation and Land Management, Como, Western Australia.

Environs Consulting Pty Ltd 1999 The Current State of Biodiversity in the Avon River Basin. Unpublished report for the Avon Working Group, Western Australia.

Grieve BJ 1998 How to Know Western Australian Wildflowers. Part II. University of Western Australia Press, Nedlands, Western Australia.

Hill KD 1998 Cupressaceae Flora Australia Vol 48: 569-587 ABRS/CSIRO. Melbourne, Victoria.

Keighery BJ 1994 Bushland Plant Survey. A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc), Nedlands, Western Australia.

Keighery BJ & Gray M 1993 Towards an Urban Bushland Policy for the National Trust (WA). A Discussion Paper. IN: National Trust of Australia (WA) Urban Bushland Policy. National Trust of Australia (WA), Wildflower Society of Western Australia (Inc) and The Tree Society (Inc), Perth, Western Australia.

Lantzke N and Fulton I 1994 Land Resources of the Northam region. Land Resource Series No. 11, Department of Agriculture Western Australia, Perth, Western Australia..

Mackinson, RO. 2000 Grevillea Flora of Australia Vol. 17A. ABRS/CSIRO. Melbourne, Victoria.

Muir BG 1977 Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bendering Reserve. Records of the Western Australian Museum, Supplement No 3.

Mulchay MJ 1967 Landscapes, laterites and soils in south-western Australia. In Jennings JN and Mabbutt JA (eds). "Landform studies from Australia and New Guinea" pp. 211-230. Australian University Press, Canberra, ACT.

Mulchay MJ and Hingston FJ 1961 The development and distribution of the soils of the York-Quairading area, Western Australia, in relation to landscape evolution. CSIRO Soil Publication No. 17.

Shire of Quairading 1998 Quairading Nature Reserve Management Guidelines Unpublished report for the Shire of Quairading, Western Australia.

Thackway R. and Creswell JD 1995 An Interim Biogeographic Regionalisation for Australia. Australian Nature Conservation Agency, Canberra, ACT.

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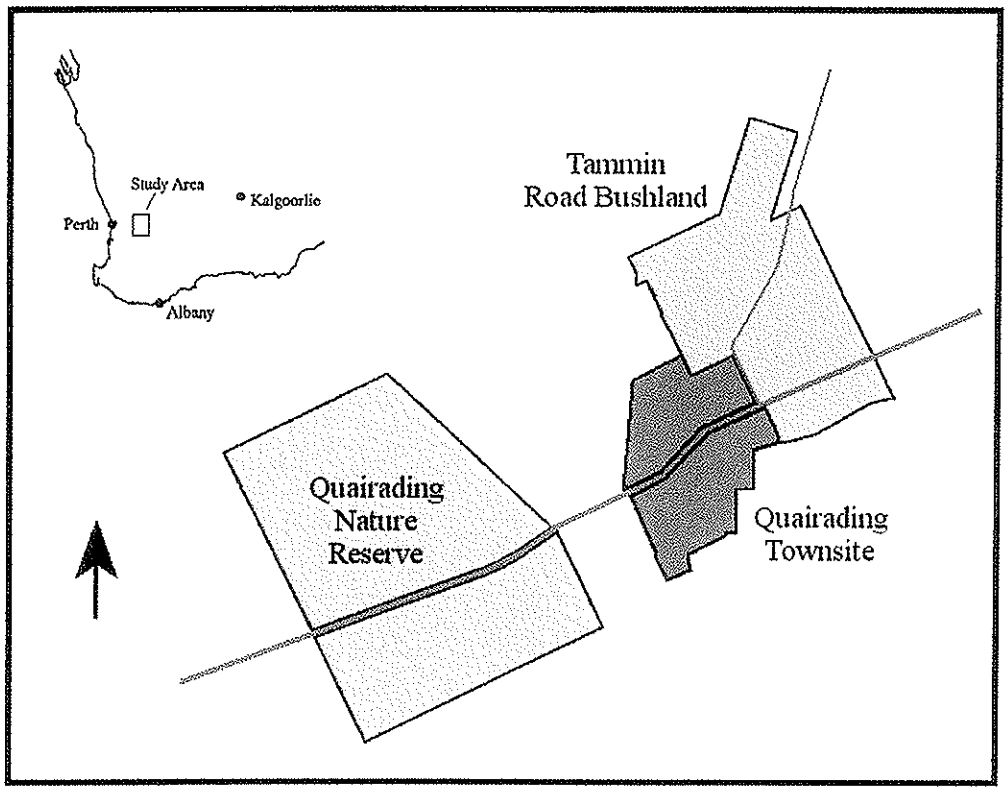
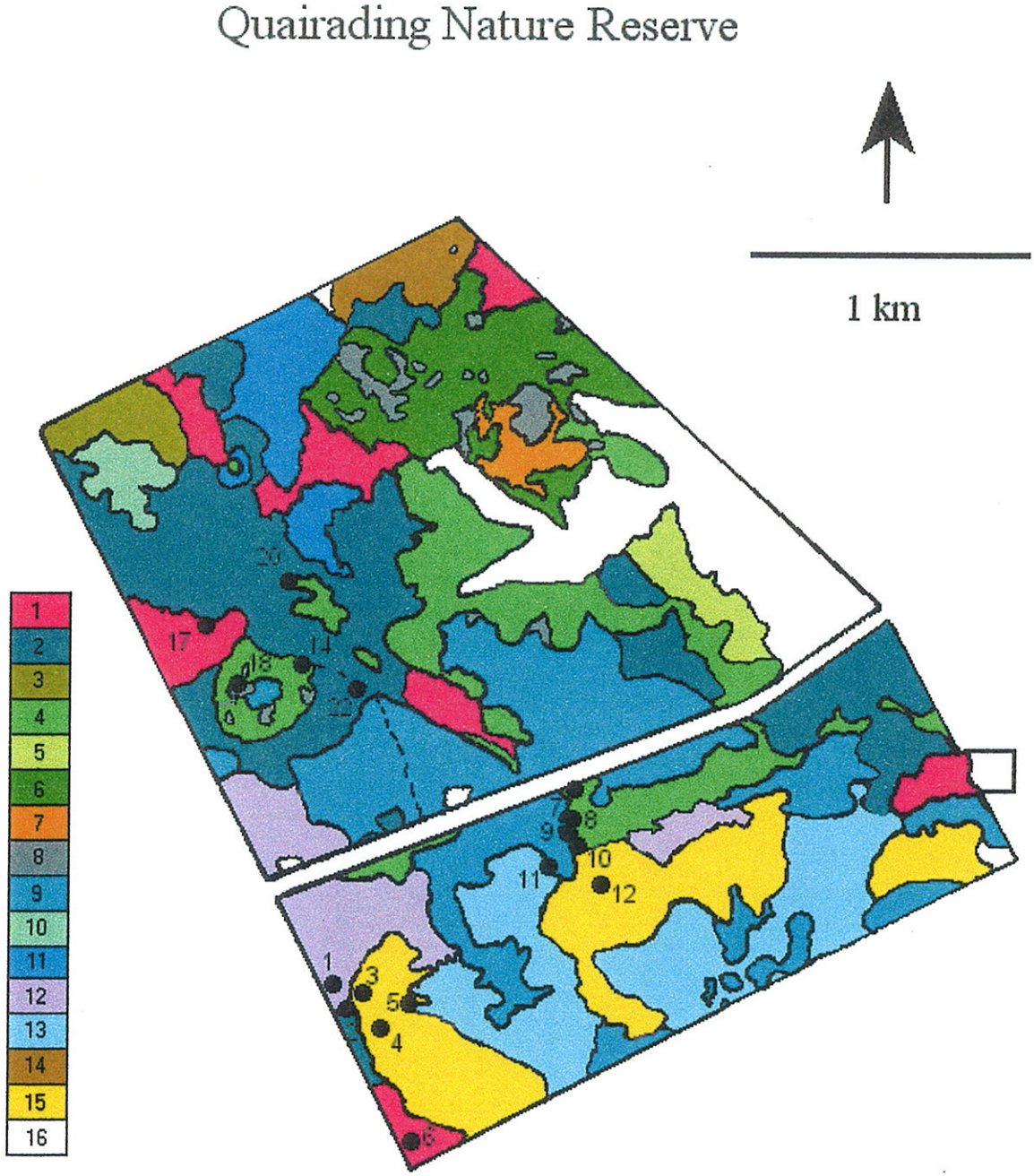


Map 1. Location of study area showing Quairding, Quairading Nature Reserve and Tammin Road Bushland.



Map 2: Vegetation map of Quairading Nature Reserve. Vegetation units 1) Salmon Gum Woodland; 2) Wandoo Woodland; 3) Wandoo Woodland on laterite; 4) York Gum - Jam Woodland; 5) Degraded York Gum Woodland; 6) York Gum - Jam - Rock Sheoak Woodland; 7) Granite outcrop; 8) Lithic Complex; 9) Tamar Woodland on sandy gravels; 10) Tamar Shrubland on lateritic gravel; 11) Tamar Shrubland on sandy clay; 12) Heaths on deep grey sand; 13) Tamar - Dryandra - Eremaea Shrubland on cream sand; 14) Tamar - Eucalyptus macrocarpa Shrubland on yellow sand; 15) Banksia prionotes - Sandplain Woody Pear Low Woodland; 16) Cleared.

Plate 1 York gum - Jam Woodland (vegetation unit 4) in early spring showing drifts of everlastings in middle ground.

Plate 2. *Banksia prionotes* – Sandplains Woody Pear Low Woodland (vegetation type 15) on deep yellow sand dunes in southern part of the reserve.

Plate 3. Lithic Herbland - Shrubland mosaic (vegetation unit 8). *Borya* Herbland on thin granite soils in foreground giving way to a Jam Shrubland. Canopy of Salmon Gum Woodland seen on skyline.

Plate 4. Volunteers standing on the main granite looking out over the reserve.

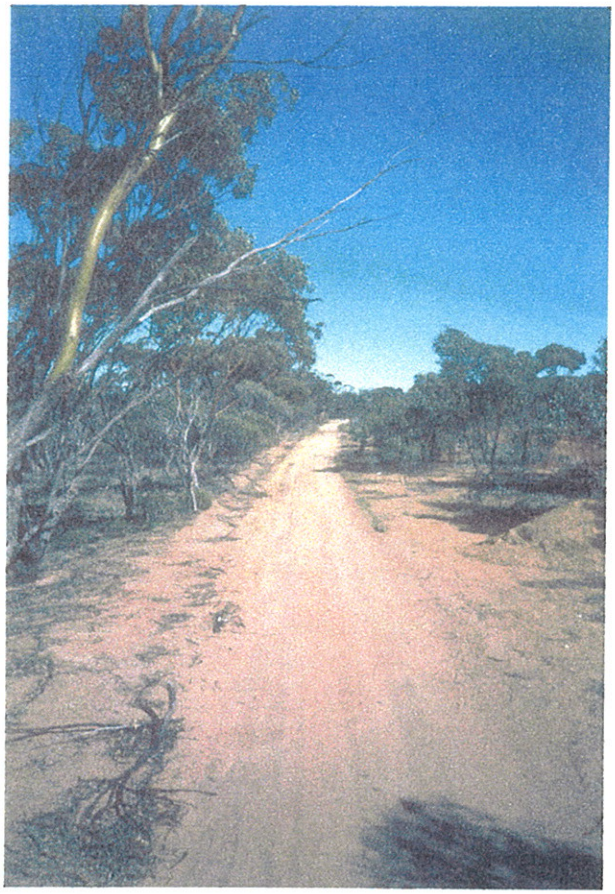


Plate 5. Track along railway line in largely undamaged section, railway line to right beyond shrubs.

Plate 6. Track along railway line showing extensive clearing and widening to relay sleepers and replace culverts. Note total clearance of vegetation between railway line and access track and material push up into reserve.

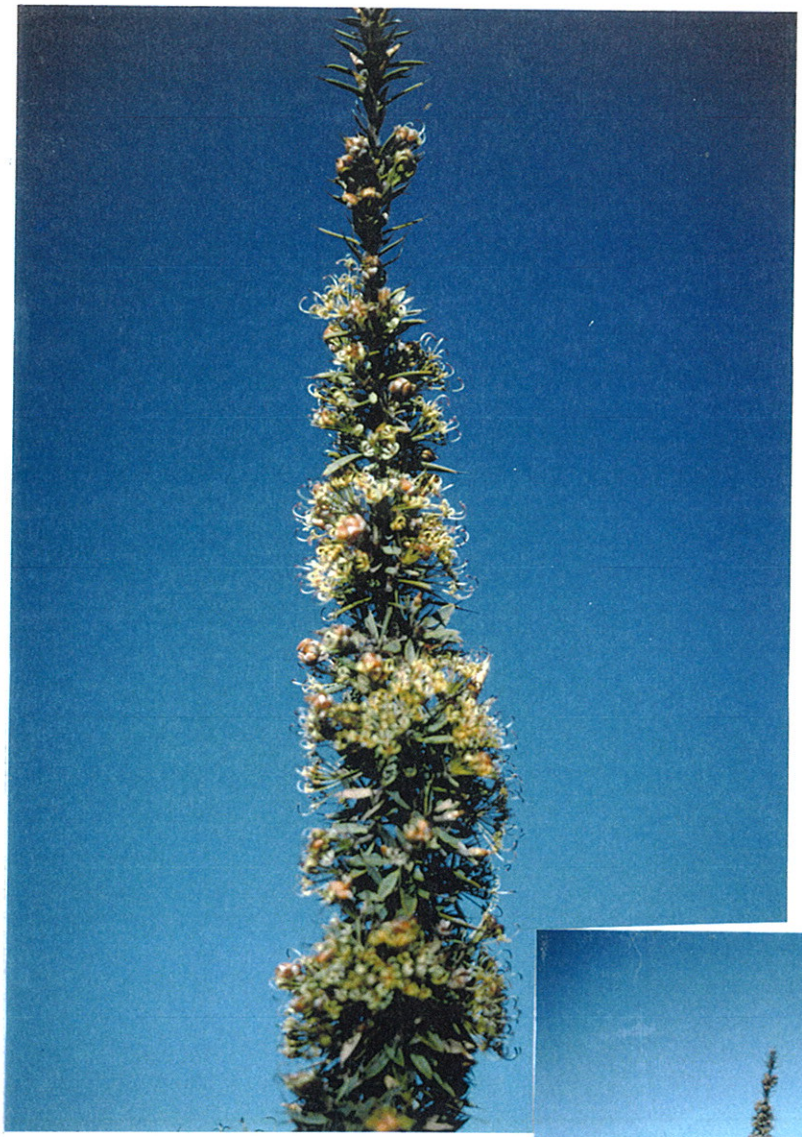


Plate 7
The triffid –like *Hakea aculeata* growing in the Tamma - *Dryandra* - *Eremaea* Shrubland on cream sands 'Quairading Nature Reserve'. This new population of Declared Rare Flora found in this study is the largest known population located in an intact bushland area.

Plate 8
Flowering *Hakea aculeata,* October 1998.

Plate 9
The delicate pale blue flowers of the Smokebush, *Conospermum galeatum*, September 1998.

Plate 10
The two forms of *Hemiandra coccinea* – on the left one with grey leaves and deep red flowers and on the right the other with green leaves and pale red flowers (September 1998).

Plate 11
Platysace sp. Quairading (GK 15624) a new species of summer flowering *Platysace* found in this study (December 1998).

Plate 12
Grevillea eriostachya and *G. excelsior* co-occur and co-flower at 'Quairading Nature Reserve' (September 1998).

Plate 13 and 14
Flowering plants of the Declared Rare Flora *Jacksonia* sp. Quairading (September 1998).

APPENDIX 1 QUADRAT VEGETATION DESCRIPTIONS

The quadrats are grouped according to the mapped vegetation units (Map 2) and the broader units used in listing the flora of the Reserve (Appendix 2) are also indicated.

WOODLANDS

Mapped Woodland Unit 1
Salmon Gum Woodlands (S, Quadrats 6 & 17)

Quadrat QNR 6
Eucalyptus salmonophloia and *Eucalyptus capillosa* Woodland over *Melaleuca undulata* and *Allocasuarina campestris* Shrubland, over *Lawrencella rosea* Very Open Herbland.

Location:	32° 01.805' 117°22.585'		
Sampled:	19/9/1998		
No taxa:	57 (46 natives, 11 weeds)		
Condition:	Excellent, same weeds on fenceline		
Soil:	Pink brown clay over clay		
Drainage:	Well	Aspect:	Hilltop, gentle SW slope
Litter:	15/20%, loam	Bare Ground	20%

Trees *Eucalyptus salmonophloia, Eucalyptus capillosa* subsp. *capillosa*
Shrubs *Melaleuca undulata, Dodonaea divaricata, Enchylaena tomentosa, Eriochiton sclerolaenoides*
Grasses *Austrostipa elegantissima, Austrodanthonia caespitosa, Austrostipa exilis, *Briza maxima, *Bromus madritensis, *Vulpia myuros, *Aira caryophyllea*
Herbs *Phyllangium paradoxum, Millotia myosotidifolia, *Mesembryanthemum nodiflorum, Drosera macrantha, Lawrencella rosea, Goodenia beardiana, Comesperma volubile, Podolepis tepperi, Trachymene cyanopetala, Diuris porrifolia, Plantago* aff. *hispidula* (or *drummondii*), *Blennospora drummondii, Triglochin calcitrapa, Rhodanthe laevis, Lobelia tenuior, Calandrinia corrigioloides, Lomandra effusa, Opercularia vaginata, Trachymene ornata, Gnephosis tenuissima, Hydrocotyle medicaginoides, Actinobole uliginosa, Crassula closiana, Crassula sieberiana* subsp *tetramera, Crassula colorata, Levenhookia stipitata, Calotis hispidula, Podolepis capillaris, Calandrinia calyptrata, Podolepis canescens, Gnephosis drummondii, Drosera neesii, Phyllangium paradoxum, Millotia myosotidifolia, Drosera macrantha, *Ursinia anthemoides, *Arctotheca calendula, *Sonchus oleraceus, *Anagallis arvensis, *Osteospermum clandestinum, *Hypochaeris glabra*
Sedges *Schoenus nanus, Centrolepis aristata, Centrolepis drummondiana*

Quadrat QNR 17
Eucalyptus salmonophloia and *E. loxophleba* Open Forest over scattered *Acacia acuminata* over *Olearia axillaris* Open Shrubland over *Neurachne alopecuroide*a and *Austrostipa elegantissima* Grassland and *Waitzia acuminata* Open Herbland

Location:	32° 01.707' 117° 21.709'		
Sampled:	20/9/1998		
No taxa:	50 (42 Natives, 8 weeds)		
Condition:	Excellent		
Soils:	Brown loamy sand over pale brown loamy clay with granite pebbles		
Drainage:	Well	Aspect:	Very gentle SE slope
Litter:	30/70%, 2-5cm	Bare Ground	1-2% bare

Trees *Eucalyptus salmonophloia, Eucalyptus loxophleba*
Shrubs *Olearia axillaris, Acacia lasiocarpa, Rhagodia preissii, Bossiaea spinescens, Enchylaena tomentosa, Dampiera teres, Comesperma integerrimum*
Grasses *Neurachne alopecuroidea, *Briza maxima, Austrostipa elegantissima, *Avena fatua, Austrodanthonia setacea, Austrostipa pycnostachya, *Ehrharta longiflora, Austrostipa trichophylla*
Herbs *Thysanotus patersonii, Waitzia acuminata, Goodenia berardiana, Blennospora drummondii, Hydrocotyle pilifera, *Anagallis arvensis, *Ursinia anthemoides, Drosera macrantha, *Hypochaeris glabra, Helichrysum leucopsideum, Trachymene ornata, Daucus glochidiatus, Lomandra effusa, Calandrinia calyptrata, Podolepis canescens, Rhyncharrhena linearis, Dianella revoluta, *Arctotheca calendula, Oxalis perennans, Trachymene cyanopetala, Podolepis capillaris, Rhodanthe manglesii, Crassula colorata, Wahlenbergia gracilenta, Rhodanthe laevis, Thelymitra macrophylla, Erodium cygnorum, Brachycome perpusilla, Phyllangium paradoxum, *Parentucellia latifolia, Ptilotus drummondii*
Sedges *Schoenus nanus, Lepidosperma tenue*

Mapped Woodland Unit 2
Wheatbelt Wandoo Woodlands (W, Quadrats 2 & 22)

Quadrat QNR 2
Eucalyptus capillosa subsp. *capillosa* Low Open Woodland over *Podotheca gnaphaloides* Open Herbland and *Desmocladus asper* and *Mesomelaena preissii* Open Sedgeland

Location:	32° 01.813 117°21.968'		
Sampled :	19/9/1998; 5/12/1998		
No taxa	40 (31 natives, 9 weeds)		
Condition:	Very Good to Excellent (rabbits, some grassy weeds)		
Soil:	yellow sand, loam over clay.		
Drainage:	Moderate	Aspect:	gentle, NW slope
Litter:	30% cover	Bare Ground:	30-40%

Trees *Eucalyptus capillosa* subsp. *capillosa*
Shrubs *Keraundrinia integrifolia, Acacia saligna, Dampiera lavandulacea.*
Grasses *Austrostipa elegantissima, Austrostipa trichophylla, Neurachne alopecuroidea, Monachather paradoxa, *Avena barbata, *Aira caryophyllea, *Vulpia myuros, *Pentaschistis airoides*
Herbs *Podotheca gnaphaloides, Calandrinia granulifera, Calandrinia calyptrata, Crassula sieberiana* subsp. *tetramera, Erodium cygnorum, Podolepis canescens, Actinobole uliginosum, Lomandra effusa, Caladenia hirta* subsp. *rosea, Gnephosis pusilla, Calandrinia corrigioloides, Trachymene cyanopetala, Dianella revoluta, Wahlenbergia preissii, Ceratogyne obionoides, Podotheca angustifolia, Ptilotus humilis, Thysanotus patersonii, Diuris porrifolia, *Osteospermum clandestinum, *Ursinia anthemoides, *Brassica tournefortii, *Hypochaeris glabra, *Arctotheca calendula*
Sedges *Schoenus* sp "hairy", *Lepidobolus preissianus, Desmocladus asper, Mesomelaena preissii.*

Quadrat QNR 22
Eucalyptus capillosa subsp *capillosa* Woodland over scattered *Acacia acuminata* over Very Open Grassland and Very Open Herbland

Location:	32° 01.165' 117° 21.953'
Sampled:	20/9/1998

No taxa: 39 (33 natives, 6 weeds)
Condition: Very good, heavily logged in past, regrowing
Soils: Grey clay loam over clay loam
Aspect: gentle NE slope
Drainage: Well drained
Litter: 50% cover of 2-5cm, 30% bare

Trees *Eucalyptus capillosa* subsp *capillosa, Acacia acuminata*
Shrubs *Acacia erinacea, Chenopodium desertorum, Enchylaena lanata*
Grasses *Austrostipa elegantissima, Austrostipa trichophylla, Austrodanthonia setacea, *Aira caryophyllea, Monachather paradoxa, *Avena barbata, *Bromus diandrus, *Briza maxima, *Vulpia myuros*
Herbs *Erymophyllum ramosum* subsp *ramosum, Hyalospermum glutinosum, Hydrocotyle medicaginoides, Erodium cygnorum, Trachymene cyanopetala, Rhodanthe laevis, Wahlenbergia preissii, Plantago* aff *hispidula, Ptilotus drummondii, Phyllangium paradoxum, Daucus glochidiatus, Lomandra effusa, Erodium cygnorum, Arthropodium curvipes, Brachycome perpusilla, Goodenia berardiana, Velleia cycnopotamica, Hyalosperma demissum, Calandrinia calyptrata, Crassula closiana, Podolepis lessonii, Podolepis tepperi, Chamaescilla corymbosa, Bulbine semibarbata, *Arctotheca calendula*

Mapped Woodland Unit 4
York Gum - Jam Woodlands (Y, Quadrat 7, 8, 9, 14 & 20)

Quadrat QNR 7
Eucalyptus loxophleba Open Forest over open *Acacia. acuminata* Low Open Woodland over Mixed Asteraceae (Everlastings) Open Herbland

Location: 32° 01.384' 117°22.585'
Sampled: 19/9/1998
No taxa: 43 (36 natives, 7 weeds)
Condition: Very good to excellent
Soil: Brown sandy loam over sandy clay loam
Drainage: Well to moderate Aspect: Very gentle S W
Litter: 90% cover, 2-5cm deep Bare Ground 12%

Trees *Eucalyptus loxophleba, Acacia acuminata*
Shrubs *Allocasuarina campestris, Stenanthemum tridentatum, Dampiera lavandulacea, Grevillea paniculata, Dampiera incana, Rhagodia preissii, Acacia lasiocarpa*
Grasses *Neurachne alopecuroidea, Austrostipa elegantissima, Austrostipa pycnostachya, Austrostipa trichophylla, *Briza maxima, *Avena barbata*
Herbs *Podolepis canescens, Goodenia berardiana, Lawrencella rosea, Drosera macrantha, Waitzia acuminata, Trachymene ornata, Blennospora drummondii, Poranthera microphylla, Arthropodium capillipes, Dianella revoluta, Cyanicula gemmata, Opercularia vaginata, Caesia alfordii, Hydrocotyle pilifera* var *glabrata, Rhodanthe laevis, Phyllangium paradoxum, Rhodanthe manglesii, Stypandra glauca, Thysanotus patersonii, Ptilotus humilis, *Brassica tournefortii, *Ursinia anthemoides, *Arctotheca calendula, *Sonchus oleraceus, *Osteospermum clandestinum*
Sedges *Schoenus nanus, Lepidosperma viscidulum, Desmocladus asper*

Quadrat QNR 8
Eucalyptus loxophleba Low Woodlands over scattered *Acacia acuminata* over *Hakea trifurcata* Open Shrubland over *Austrostipa trichophylla* Open Grassland and *Rhodanthe manglesii* and *Waitzia acuminata* Herbland

Location:	32° 01.381' 117°27.531'		
Sampled:	19/9/1998		
No taxa:	32 (28 natives, 8 weeds)		
Condition:	Very good, weedy grasses 2%		
Soil:	Orange sandy gravelly loam over orange clay		
Drainage:	Well	Aspect:	Very gentle, SW
Litter:	10/30% of 1cm	Bare Ground	2-10% bare

Trees *Eucalyptus loxophleba, Acacia acuminata*
Shrubs *Grevillea paniculata, Eremophila sargentii*
Grasses *Austrostipa trichophylla, Amphipogon turbinatus, *Avena barbata, *Briza maxima*
Herbs *Daucus glochidiatus, Rhodanthe manglesii, Waitzia acuminata, Podolepis canescens, Erodium cygnorum, Trachymene ornata, Dianella revoluta, Trachymene cyanopetala, Phyllangium sulcatum, Hydrocotyle medicaginoides, Arthropodium curvipes, Actinobole uliginosum, Arthropodium capillipes, Lawrencella davenportii, Plantago* aff *hispidulus, Rhodanthe laevis, Crassula closiana, Goodenia berardiana, *Ursinia anthemoides,* *Arctotheca *calendula, *Hypochaeris glabra, *Osteospermum clandestinum, *Anagallis arvensis*

Quadrat QNR 9
Eucalyptus loxophleba Open forest over scattered *Acacia acuminata* over scattered *Grevillea paniculata* over *Austrostipa trichophylla* Open Grassland and *Waitzia acuminata* and *Trachymene cyanopetala* Very Open Herbland

Location:	32° 01.417' 117°22.533'		
Sampled:	19/9/1998		
No taxa:	36 (28 natives, 8 weeds)		
Condition:	Very good - excellent		
Soil:	Red Brown clay loam over gravelly clay		
Drainage:	Well	Aspect:	Flat
Litter:	30% cover, 2cm deep,	Bare ground	30%

Trees *Eucalyptus loxophleba, Acacia acuminata*
Shrubs *Grevillea paniculata, Eremophila lehmanniana*
Grasses *Austrostipa trichophylla, Neurachne alopecuroidea, Austrostipa elegantissima, Austrostipa pycnostachya, Austrodanthonia. setacea, *Avena barbata, *Briza maxima,*
Herbs *Trachymene ornata, Goodenia berardiana, Waitzia acuminata, Trachymene cyanopetala, Rhodanthe manglesii, Podolepis lessonii, Hydrocotyle pilifera* var. *glabrata, Phyllangium sulcatum, Calandrinia calyptrata, Arthropodium capillipes, Daucus glochidiatus, Borya sphaerocephala, Bulbine semibarbata, Wahlenbergia preissii, *Ursinia anthemoides, *Brassica tournefortii, Erodium cygnorum, Lomandra effusa, Chthonocephalus pseudevax, Actinobole uliginosum, Calotis hispidula, *Osteospermum clandestinum, *Hypochaeris glabra, *Arctotheca calendula, *Anagallis arvensis* var. *caerulea*

Quadrat QNR 14
Eucalyptus loxophleba and *Acacia acuminata* Low Open Woodland over *Amphipogon debilis* and *Austrostipa elegantissima* Very Open Grassland and *Rhodanthe manglesii*, *Borya sphaerocephala* and *Waitzia acuminata* Closed Herbland

Location: 32° 01.141 171° 21.861
Sampled: 20/9/1998
No taxa: 42 (35 natives, 7 weeds)
Condition: Excellent
Soils: Red brown loam over clay loan over granite
Drainage: Well Aspect: Gentle Easterly slope
Litter: 40% cover, 1-2cm, Bare Ground 2%

Trees *Eucalyptus loxophleba, Acacia acuminata*
Shrubs *Stenanthemum tridentatum*
Grasses *Amphipogon debilis, Austrostipa elegantissima, Austrostipa tenuifolia, Austrostipa pycnostachya, Neurachne alopecuroidea, Aristida contorta, *Briza maxima, *Avena barbata, *Pentaschistis airoides, *Vulpia myuros*
Herbs *Rhodanthe manglesii, Waitzia acuminata, Hyalospermum glutinosum, Trachymene ornata, Lawrencella rosea, Borya sphaerocephala, Velleia cycnopotamica, Goodenia berardiana, Drosera pallida, Stylidium calcaratum, Caesia alfordii, Erodium cygnorum, Trachymene cyanopetala, Phyllangium paradoxum, Arthropodium capillipes, Arthropodium curvipes, Podolepis lessonii, Drosera glanduligera, Levenhookia stipitata, Rutidosis multiflorus, Centrolepis aristata, Gonocarpus nodulosus, Hydrocotyle medicaginoides, Crassula closiana, Podotheca angustifolia, *Parentucellia latifolia, *Ursinia anthemoides, *Hypochaeris glabra*
Sedges *Schoenus nanus*

Quadrat QNR 20
Eucalyptus capillosa subsp *capillosa* and *Eucalyptus loxophleba* Open Forest over *Neurachne alopecuroidea* and *Austrostipa elegantissima* Very Open Grassland and *Trachymene* species and *Waitzia acuminata* Open Herbland

Location: 32° 01.066' 117° 21.813'
Sampled: 20/9/1998
No taxa: 29 (27 natives, 2 weeds)
Condition: Very good - grassy weeds
Soils: Red brown sandy loam with Quartz over sandy clay
Slope/Aspect: Flat Drainage: Well
Litter: 30/70% covered, 1-2cm deep Bare Ground 2/10%

Trees *Eucalyptus loxophleba, Eucalyptus capillosa* subsp *capillosa*
Shrubs *Acacia erinacea, Eremophila lehmanniana, Enchylaena tomentosa*
Grasses *Austrodanthonia setacea, Austrostipa elegantissima, Neurachne alopecuroidea, Austrostipa pycnostachya, *Vulpia myuros*
Herbs *Trachymene ornata, Trachymene cyanopetala, Podolepis lessonii, Goodenia berardiana, Rhodanthe laevis, Daucus glochidiatus, Erymophyllum ramosum, Rhodanthe manglesii, Brachycome perpusillum, Podolepis tepperi, Lepidium rotundum, Wahlenbergia preissii, Calotis hispidula, Crassula colorata, Hyalospermum demissum, Lomandra effusa, Podolepis capillaris, Waitzia acuminata, *Hypochaeris glabra*

Mapped Woodland Unit 15
Acorn Banksia and Sandplain Woody Pear Low Woodlands (B, Quadrats 3,4 & 12)

Quadrat QNR 3
Banksia prionotes and *Xylomelum angustifolium* Low Open Woodland over *Grevillia eriostachya* Shrubland over *Verticordia roei* and *Verticordia plumosa* Low Open Shrubland over Very Open Herbland and *Mesomelaena preissii* Very Open Sedgeland

Location:	not determined		
Sampled:	19/9/1998		
No taxa:	49 (45 natives, 4 weeds)		
Condition:	Excellent		
Soil:	deep yellow sand		
Drainage:	Well	Aspect:	Gentle NE slope
Litter:	70%	Bare ground:	5-10% clear

Trees *Banksia prionotes, Xylomelum angustifolium*
Shrubs *Grevillea eriostachya, Acacia pulchella* var *goadbyi, Melaleuca leptospermoides, Verticordia roei, Verticordia plumosa, Calytrix leschenaultii, Baeckea ovalifolia, Verreauxia reinwardtii, Baeckea preissiana, Comesperma scoparium, Stenanthemum tridentatum, Dampiera lavandulacea, Cryptandra pungens, Santalum spicatum, Baeckea crispiflora.*
Grasses *Austrostipa elegantissima, Austrostipa macalpinei, Austrostipa pycnostachya, Neurachne alopecuroidea, Amphipogon strictus, Austrodanthonia setacea, Monachather paradoxa, *Aira caryophyllea, *Briza maxima,*
Sedges *Mesomelaena preissii, Schoenus pleiostemoneus, Lepidobolus preissianus, Schoenus latitans*
Herbs *Conostylis setigera, Lobelia tenuior, Stylidium leptophyllum, Agrostocrinum scabrum, Dianella revoluta, Drosera macrantha, Podolepis canescens, Schoenus nanus, Podotheca gnaphaloides, Trachymene pilosa, Levenhookia pusilla, Brachycome iberidifolia, Blennospora drummondii, Gnephosis tenuissima, Ceratogyne obionoides, Borya constricta, Laxmannia grandiflora, *Hypochaeris glabra, * Ursinia anthemoides*

Quadrat QNR 4
Banksia prionotes and *Xylomelum angustifolium* Low Open Woodland over scattered *Grevillea eriostachya* and *Allocasuarina campestris* over *Daviesia benthamii* subsp. *acanthoclona* and *Gompholobium obcordatum* Low Shrubland over *Amphipogon strictus* Open Grassland, *Podolepis canescens* and *Glischrocaryon aureum* Very Open Herbland and *Mesomelaena preissii* and *Lepidosperma viscidulum* Very Open Sedgeland.

Location:	32° 01.869' 117°22.119'		
Sampled:	19/9/1998, 12/1998		
No taxa:	61 (57 natives, 4 weeds)		
Condition:	Excellent		
Soil:	Deep yellow sand		
Drainage:	Well	Aspect:	gentle, N slope
Litter:	30/70%, 2cm	Bare ground:	2-10%

Trees *Banksia prionotes, Xylomelum angustifolium*
Shrubs *Allocasuarina campestris, Grevillea eriostachya, Daviesia benthamii* subsp. *acanthoclona, Gompholobium obcordatum, Calytrix leschenaultii, Melaleuca cordata, Stenanthemum stipulosum, Dodonaea ceratocarpa, Calytrix strigosa, Hibbertia aurea, Verticordia picta, Baeckea preissiana, Comesperma scoparium,*

Dampiera lavandulacea, Stypandra glauca, Stenanthemum tridentatum, Dampiera incana, Verreauxia reinwardtii, Baeckea crispiflora, Verticordia plumosa
Grasses *Amphipogon strictus, Neurachne alopecuroidea, Austrodanthonia caespitosa, Austrostipa elegantissima, Austrostipa macalpinei, Austrostipa trichophylla, *Briza maxima.*
Herbs *Ceratogyne obionoides, Glischrocaryon aureum, Borya constricta, Borya sphaerocephala, Podolepis canescens, *Hypochaeris glabra, *Ursinia anthemoides, *Arctotheca calendula, Brachycome iberidifolia, Crassula sieberiana* subsp *tetramera, Podotheca angustifolium, Blennospora drummondii, Phyllangium paradoxum, Wahlenbergia preissii, Trachymene pilosa, Lobelia tenuior, Opercularia Vaginata, Thysanotus* sp, *Drosera macrantha, Drosera neesii, Poranthera microphylla, Gnephosis tenuissima, Crassula closiana, Velleia cycnopotamica, Calandrinia granulifera, Millotia tenuifolia, Ptilotus spathulatus.*
Sedges *Schoenus subflavus, Schoenus clandestinus, Lepidobolus preissianus, Lepidosperma viscidulum, Mesomelaena preissii.*

Quadrat QNR 12
Banksia prionotes and *Xylomelum angustifolium* Low Open Forest over *Baeckea crispiflora* Tall Shrubland over *Borya sphaerocephala* and *Waitzia acuminata* Very Open Herbland and *Mesomelaena preissii* Open Sedgeland

Location:	32° 01.603' 117°22.626'		
Sampled:	19/9/1998		
No taxa:	61 (53 natives, 8 weeds)		
Condition:	Excellent		
Soils:	Deep yellow sand		
Drainage:	Well	Aspect:	Gentle NE slope
Litter:	15% cover, 1-2cm deep	Bare ground	45%

Trees *Banksia prionotes, Xylomelum angustifolium*
Shrubs *Verticordia plumosa, Comesperma scoparium, Melaleuca leptospermoides, Mirbelia spinosa, Calytrix leschenaultii, Eremaea pauciflora, Verticordia roei, Verticordia huegelii, Grevillea didymobotrya, Baeckea crispiflora, Verticordia picta, Baeckea ovalifolia*
Grasses *Austrostipa macalpinei, Amphipogon strictus, Austrostipa elegantissima, Neurachne alopecuroidea, *Pentaschistis airoides, *Briza maxima, *Aira caryophyllea, *Vulpia myuros*
Herbs *Levenhookia stipitata, Borya constricta, Borya sphaerocephala, Conostylis setigera, Waitzia acuminata, Drosera macrantha, Caladenia reptans, Dianella revoluta, Podotheca angustifolia, Drosera stolonifera, Ceratogyne obionoides, Actinobole uliginosum, Brachycome iberidifolia, Blennospora drummondii, Crassula colorata, Hyalospermum demissum, Trachymene cyanopetala, Trachymene pilosa, Goodenia berardiana, Velleia cycnopotamica, Pterostylis vittata, Podolepis canescens, Crassula closiana, Rhodanthe laevis, Lobelia tenuior, Stylidium ?bulbiferum, Opercularia vaginata, Trachymene ornata, Thysanotus thyrsoideus, Cyanicula sericea, Drosera pallida, *Arctotheca calendula, *Hypochaeris glabra, *Wahlenbergia capensis, *Ursinia anthemoides*
Sedges *Lepidobolus preissianus, Mesomelaena preissii, Schoenus subflavus, Schoenus pleiostemoneus.*

SHRUBLANDS

Mapped Shrubland Unit 9
Tamar Shrubland on sandy gravels (T/H, Quadrat 11)

Quadrat QNR 11
Scattered *Eucalyptus capillosa* subsp *capillosa* over *Allocasuarina campestris* and *Leptospermum erubescens* Open Heath over *Dryandra armata* Low Shrubland

Location:	32° 01.485' 117°22.541'		
Sampled:	19/9/1998		
No taxa:	58 (55 natives, 3 weeds)		
Condition:	Excellent		
Soils:	Coarse quartz cream gravelly sand over clay		
Drainage:	Well to moderate	Aspect:	Gentle North slope
Litter:	>70% cover 1cm deep,	Bare ground	22%

Trees *Eucalyptus capillosa* subsp *capillosa*
Shrubs *Dryandra armata, Allocasuarina campestris, Leptospermum erubescens, Verticordia chrysantha, Baeckea preissiana, Melaleuca leptospermoides, Xanthorrhoea drummondii, Calytrix leschenaultia, Hakea incrassata, Cryptandra myriantha, Leucopogon tamminensis, Hibbertia polystachya, Astroloma serratifolium, Acacia stenoptera, Baeckea crispiflora, Hakea invaginata, Acacia saligna, Dodonaea ceratocarpa, Dampiera alata, Comesperma scoparium, Dampiera juncea, Hemigenia sericea*
Grasses *Amphipogon turbinatus, Neurachne alopecuroidea, Austrostipa elegantissima, Amphipogon strictus, *Briza maxima*
Herbs *Borya sphaerocephala, Conostylis setigera, Stylidium petiolare, Thysanotus patersonii, Drosera zonaria, Dianella revoluta, Drosera macrantha, Levenhookia pusilla, Phyllangium sulcatum, Stylidium ?bulbiferum, Trachymene pilosa, Drosera glanduligera, Millotia tenuifolia, Ceratogyne obionoides, Blennospora drummondii, Leporella fimbriata, Chamaescilla spiralis, Caesia alfordii, Stylidium dichotomum, Podotheca angustifolia, Drosera pulchella, Trachymene ornata, * Ursinia anthemoides, * Hypochaeris glabra*
Sedges *Schoenus subflavus, Schoenus elegans, Schoenus pleiostemoneus, Lepidosperma tenue, Lepidobolus preissianus, Mesomelaena preissii*

Mapped Shrubland Unit 12
Heaths on deep grey sands (T/H, Quadrat 1)

Quadrat QNR 1
Scattered emergent *Xanthorrhoea drummondii* over *Eremaea pauciflora* Open Heath over *Melaleuca leptospermoides* Low Shrubland over *Neurachne alopecuroidea* Very Open Grassland and *Brachycome iberidifolia* Herbland.

Location:	32° 01.712 117°21.988'		
Sampled :	19/9/1998; 5/12/1998		
No taxa	46 (40 natives, 6 weeds)		
Condition:	Excellent		
Soil:	Grey-white sand		
Drainage:	Well drained	Aspect:	gentle slope
Litter:	10/30cm	Bare Ground	30-70%

Shrubs *Xanthorrhoea drummondii, Eremaea pauciflora, Leptospermum erubescens, Melaleuca leptospermoides, Hakea incrassata,*

Allocasuarina humilis, Hakea lissocarpha, Calytrix leschenaultii, Comesperma scoparia, Keraundrinia integrifolia, Conospermum stoechadis
Grasses *Neurachne alopecuroidea, Austrostipa macalpinei, Austrostipa elegantissima, Amphipogon turbinatus, Amphipogon strictus, *Briza maxima, *Pentaschistis airoides*
Herbs *Dianella revoluta, Drosera neesii, Stylidium ?bulbiferum, Podolepis canescens, Brachycome iberidifolia, Trachymene cyanopetala, Drosera zonaria, Caladenia flava, Thysanotus patersonii, Opercularia vaginata, Parentucellia latifolia, Podotheca angustiflora, Crassula sieberiana, Blennospora drummondii, Chamaescilla spiralis, Drosera menziesii, Podotheca gnaphalioides, Stylidium leptophyllum, Trachymene pilosa, *Romulea rosea, *Arctotheca calendula, *Hypochaeris glabra, *Ursinia anthemoides*
Sedges *Mesomelaena preissii, Lepidobolus chaetocephalus, Harperia lateriflora, Schoenus subflavus, Lepidosperma* sp (thin flat)

Mapped Shrubland Unit 13
Tamar - *Dryandra* - *Eremaea* Shrubland on cream sands (T/H, Quadrat 5)

Quadrat QNR 5
Scattered *Acacia lasiocalyx* and *Allocasuarina campestris* over *Eremaea pauciflora, Dryandra armata, Hakea aculeata* and *Dryandra erythrocephala* Open Heath over *Neurachne alopecuroidea* Very Open Grassland

Location:	32° 01.805' 117°22.585'		
Sampled:	19/9/1998, 12/1998		
No taxa:	67 (63 natives, 4 weeds)		
Condition:	Excellent		
Soil:	Yellow - light grey sand over sandy clay		
Drainage:	Gentle N slope	Aspect:	Well
Litter:	2-10% litter, low.	Bare Ground	30/70%

Shrubs *Acacia lasiocalyx, Allocasuarina campestris, Dryandra armata, Dryandra erythrocephala, Hakea aculeata, Leptospermum erubescens, Eremaea pauciflora, Hibbertia polystachya, Hakea candolleana, Melaleuca leptospermoides, Verticordia picta, Hibbertia rostellata, Allocasuarina humilis, Verticordia* sp, *Comesperma scoparium, Calytrix leschenaultii, Acacia stenoptera, Dampiera lavandulacea, Verticordia chrysantha, Allocasuarina microstachya, Gompholobium obcordatum, Dampiera alata, Isotropis drummondii, Daviesia costata, Cassytha flava, Cassytha glabella, Leucopogon tamminensis*
Grasses *Austrostipa macalpinei, Austrostipa elegantissima, Neurachne alopecuroidea, Amphipogon strictus, Amphipogon turbinatus, *Pentaschistis airoides, *Vulpia myuros*
Herbs *Conostylis setigera, Laxmannia paleacea, Glischrocaryon aureum, Borya constricta, Blennospora drummondii, Drosera macrantha, Drosera subhirtella, Opercularia vaginata, Drosera menziesii, Stylidium petiolare, Trachymene cyanopetala, Podotheca angustifolia, Monotaxis grandiflora, Crassula colorata, Rhodanthe laevis, Millotia tenuifolia, Ceratogyne obionoides, Podolepis canescens, Drosera stolonifera, Cyanicula gemmata, Thelymitra* sp, *Pterochaeta paniculata, *Ursinia anthemoides, *Hypochaeris glabra,*
Sedges *Schoenus subflavus, Mesomelaena priessii, Lepidobolus preissianus, Schoenus pleiostemoneus, Caustis dioica, Lepidosperma* sp II (flat), *Schoenus nanus, Schoenus clandestinus, Schoenus hexandrus*

HERBLAND - SHRUBLAND MOSAIC

Mapped Unit 8
Lithic Complex (G, Quadrat 18)

Quadrat QNR 18 (Lithic Complex, Vegetation Unit 8)
Borya sphaerocephala and *Hyalospermum glutinosa* Closed Herbland over Mixed Very Open Grassland

Location:	32° 01.139' 117° 21.745'		
Sampled:	20/9/1998		
No taxa:	43 (35 natives, 8 weeds)		
Condition:	Very good to excellent		
Soils:	Red brown loamy clay over granite clay		
Slope/Aspect:	Flat	Drainage:	Well drained
Litter:	22%	Bare Ground	20% bare ground

Trees Nil
Shrubs Nil
Grasses *Neurachne alopecuroidea, Aristida contorta, Amphipogon strictus, *Avena barbata, *Aira caryophyllea, *Pentaschistis airoides, *Vulpia myuros*
Herbs *Borya sphaerocephala, Velleia cycnopotamica, Rhodanthe manglesii, Podolepis lessonii, Caesia alfordii, Arthropodium capillipes, Waitzia acuminata, Hyalosperma glutinosa* subsp *glutinosa, Prasophyllum macrostachyum, Drosera pulchella, Trachymene ornata, Stylidium petiolare, Levenhookia pusilla, Erodium cygnorum, Velleia cycnopotamica, Drosera subhirtella, Crassula colorata, Crassula closiana, Wahlenbergia preissii, Hyalosperma demissum, Chthonocephalus pseudovax, Quinetia urvillei, Hydrocotyle pilifera* var *glabrata, Borya constricta, Stylidium petiolare, Ophioglossum lusitanicum* subsp *coriaceum, Calandrinia eremaea, Hydrocotyle medicaginoides, Trachymene pilosa, Actinobole uliginosum, Stylidium calcaratum* (Pink), **Arctotheca calendula, *Parentucellia latifolia, *Hypochaeris glabra, *Ursinia anthemoides*
Sedges *Schoenus nanus*

This quadrat is at the interface of Vegetation Unit 15 and Unit 4
Quadrat QNR 10
Eucalyptus capillosa subsp *capillosa* Woodland over Mixed Open Low Heath over and *Waitzia acuminata* Very Open Herbland.

Location:	32° 01.485' 117°22.541'		
Sampled:	19/9/1998		
No taxa:	45 (41 natives, 4 weeds)		
Condition:	Excellent		
Soils:	Gravelly brown sand over sandy clay		
Drainage:	Well drained	Aspect:	Very gently NW slope
Litter:	30-70% cover, 2cm depth	Bare Ground	2-10%

Trees *Eucalyptus capillosa* subsp *capillosa*
Shrubs *Acacia lasiocarpha, Calytrix leschenaultii, Dampiera lavandulacea, Xanthorrhoea drummondii*
Grasses *Neurachne alopecuroidea, Austrostipa elegantissima, Austrostipa trichophylla, Amphipogon strictus, *Pentaschistis airoides,*
Herbs *Drosera macrantha, Millotia myosotidifolia, Waitzia acuminata, Helichrysum leucopsideum, Podotheca angustiflora, Goodenia berardiana, Chamaescilla spiralis, Laxmannia squarrosa, Opercularia vaginata, Trachymene ornata, Oxalis perennans, Drosera zonaria, Blennospora drummondii, Dianella*

*revolut*a, *Stylidium petiolare*, *Hyalospermum demissum*, *Stylidium dichotomum*, *Crassula sieberiana* subsp *tetramera*, *Caladenia flava*, *Caesia alfordii*, *Borya sphaerocephala*, *Actinobole uliginosa*, *Lomandra effusa*, *Lomandra caespitosa*, *Thysanotus patersonii*, **Hypochaeris glabra*, **Ursinia anthemoides*, **Anagallis arvensis* var. *caerulea*

Sedges *Schoenus nanus*, *Schoenus clandestinus*, *Lepidobolus preissianus*, *Lepidosperma tenue*, *Desmocladus asper*, *Isolepis marginata*, *Schoenus subflavus*.

APPENDIX 2 FLORA LIST FOR QUAIRADING NATURE RESERVE, SHIRE OF QUAIRADING.

Key

Column 1 **Plant Taxa** (species, sub-species and varieties)
(listed alphabetically in family groups which are also listed alphabetically)
* Weed species
ms manuscript name, (shown after the name)

Column 2 **Family group** (listed alphabetically)

Column 3 **Common Names** After Bennet (1991)

Column 4 **Department of Conservation and Land Management Species Conservation Codes (Atkins 1999)**

R: Declared Rare Flora - Extant Taxa
1: Priority One - Poorly Known Taxa
2: Priority Two - Poorly Known Taxa
3: Priority Three - Poorly Known Taxa
4: Priority Four - Rare Taxa

Column 5 **Life Form**
P Perennial
A Annual

Column 6 **Growth Form**

Column 7-13 Plant Communities (see Map)

• Found in this unit

D Disturbed areas along tracks, margins of the reserve and cleared areas (includes Vegetation Map unit 16)

Woodlands

Y York Gum (*Eucalyptus loxophleba*) Woodlands
Vegetation Map units 4, 5 and 6

W Wandoo (*Eucalyptus capillosa*) Woodlands
Vegetation Map units 2 and 3

S Salmon Gum (*Eucalyptus salmonophloia*) Woodlands
Vegetation Map unit 1

B Acorn Banksia (*Banksia prionotes*) and
Wheatbelt Woody Pear (*Xylomelum angustifolium*)
Low Woodlands Vegetation Map unit 15

Shrublands

T/H Tamar (*Allocasuarina campestris*) Shrublands/Heaths
Vegetation Map units 10 to 14

Granites

G Plant communities on shallow soil on granite (Lithic complex)
Vegetation Map units 8 and 16

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SPECIES	FAMILY	COMMON NAME	CONS CODE	LIFE FORM	GROWTH FORM	D	Y	W	S	B	T/H	G
Cheilanthes austrotenuifolia	Adiantaceae	Rock Fern		P/A	fern	•	•				•	•
**Allium orientale*	Alliaceae	Wild Onion		P/A	herb	•						
Gunniopsis rubra	Aizoaceae		1	A	herb				•			
Carpobrotus modestus	Aizoaceae	Inland Pigface		P	herb			•	•			
**Mesembryanthemum nodiflorum*	Aizoaceae	Slender Iceplant		P	herb	•		•	•			
Ptilotus declinatus	Amaranthaceae	Curved Mulla Mulla		P	herb							
Ptilotus divaricatus	Amaranthaceae	Climbing Mulla Mulla		S	shrub				•			
Ptilotus drummondii	Amaranthaceae	Narrow-leaf Mulla Mulla		P	herb			•		•		
Ptilotus gaudichaudii	Amaranthaceae	Mulla Mulla		A	herb				•			
Ptilotus humilis	Amaranthaceae	Mulla Mulla		A	herb		•	•	•			
Ptilotus manglesii	Amaranthaceae	Pom Poms		P	herb		•	•	•		•	
Ptilotus polystachyus	Amaranthaceae	Prince of Wales Feather		A/P	herb			•		•	•	
Ptilotus spathulatus	Amaranthaceae	Mulla Mulla		P/A	herb			•	•			
Agrostocrinum scabrum	Anthericaceae			P	herb					•		
Arthropodium curvipes	Anthericaceae			P/A	herb		•	•	•		•	
Caesia alfordii	Anthericaceae	Grass-lily		P/A	herb		•	•	•		•	
Caesia micrantha	Anthericaceae	Pale Grass-lily		P/A	herb					•		
Chamaescilla corymbosa	Anthericaceae	Blue Squill		P/A	herb			•	•			•
Chamaescilla spiralis	Anthericaceae			P/A	herb				•		•	•
Dichopogon capillipes	Anthericaceae	Chocolate Lily		P/A	herb		•	•			•	
Laxmannia grandiflora	Anthericaceae	Paper-lily, Wire-lily		P	herb			•				
Laxmannia paleacea	Anthericaceae	Paper-lily, Wire-lily		P	herb					•		
Laxmannia squarrosa	Anthericaceae	Paper-lily, Wire-lily		P	herb			•				
Sowerbaea laxiflora	Anthericaceae	Purple Tassels		P/A	herb		•	•				
Thysanotus manglesianus	Anthericaceae	Fringed Lily		P/A	herb				•		•	
Thysanotus patersonii	Anthericaceae	Twining Fringe Lily		P/A	herb		•			•		
Thysanotus rectantherus	Anthericaceae			P/A	herb				•			
Thysanotus sparteus	Anthericaceae	Fringed Lily		P/A	herb					•		
Thysanotus tenuis	Anthericaceae	Fringed Lily	3	P/A	herb						•	
Thysanotus thyrsoideus	Anthericaceae	Fringed Lily		P/A	herb			•			•	

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Thysanotus triandrus	Anthericaceae	Fringed Lily		P/A	herb					•		
Tricoryne tenella	Anthericaceae			P/A	herb					•	•	
Daucus glochidiatus	Apiaceae	Austral Carrot		A	herb			•	•			
Hydrocotyle medicaginoides	Apiaceae	Trefoil Pennywort		A	herb		•	•	•			
Hydrocotyle pilifera var. glabrata	Apiaceae	Pennywort		A	herb		•			•	•	•
Platysace commutata	Apiaceae			P	shrub						•	
Platysace maxwellii	Apiaceae			P	shrub			•				
Platysace sp. (GK 15624)	Apiaceae			P	shrub					•		
Trachymene cyanopetala	Apiaceae			A	herb		•	•	•		•	•
Trachymene ornata	Apiaceae	Spongefruit		A	herb		•	•	•		•	•
Trachymene pilosa	Apiaceae	Native Parsnip		A	herb					•		•
Rhyncharrhena linearis	Asclepiadaceae	Bush Bean		P	woody twiner		•	•				
Bulbine semibarbata	Asphodeleaceae	Leek Lily		A	herb		•					•
Actinobole uliginosum	Asteraceae	Flannel Cudweed		A	herb			•		•		
**Arctothecacalendula*	Asteraceae	Capeweed		A	herb	•		•	•			•
Blennospora drummondii	Asteraceae	Dwarf Beauty-heads		A	herb			•		•	•	•
Brachyscome iberidifolia	Asteraceae	Swan River Daisy		A	herb					•		
Brachyscome perpusilla	Asteraceae	Tiny Daisy		A	herb		•					
Calotis hipidula	Asteraceae	Bindy Eye		A	herb		•		•			
Ceratogyne obionoides	Asteraceae	Wingwort		A	herb		•	•	•	•	•	•
**Cotula bipinnata*	Asteraceae	Ferny Cotula		A	herb	•	•					•
Cthonocephalus pseudevax	Asteraceae			A	herb		•				•	•
Erymophyllum ramosum	Asteraceae			A	herb		•	•	•			
**Gazania linearis*	Asteraceae	Gazania		P	herb	•						
Gnephosis drummondii	Asteraceae			A	herb		•	•	•			
Gnephosis tenuissima	Asteraceae	Gnephosis		A	herb		•			•	•	
Helichrysum leucopsideum	Asteraceae	Shining Everlasting		P	herb			•	•			
Hyalosperma demissum	Asteraceae			A	herb					•		
Hyalosperma glutinosum	Asteraceae			A	herb		•	•	•			

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SPECIES	FAMILY	COMMON NAME	CONS CODE	LIFE FORM	GROWTH FORM	D	Y	W	S	B	T/H	G
**Hypochaeris glabra*	Asteraceae	Flatweed, Cat's-ear		A	herb	•	•	•		•	•	•
Isoetopsis graminifolia	Asteraceae			A	herb				•			
Lagenifera huegelii	Asteraceae	Coarse Lagenophora		A	herb			•		•		
Lawrencella rosea	Asteraceae	Pink Everlasting		A	herb		•	•			•	
Millotia myosotidifolia	Asteraceae			A	herb					•	•	
Millotia perpusilla	Asteraceae			A	herb							•
Millotia tenuifolia	Asteraceae	Soft Millota		A	herb		•	•	•			
Olearia arenicola	Asteraceae			P	shrub					•		
Olearia axillaris var. eremicola	Asteraceae	Daisy Bush		P	shrub				•			
Olearia rudis	Asteraceae	Rough Daisy Bush		P	shrub				•			
**Osteospermum clandestinum*	Asteraceae	Stinking Roger		A	herb	•	•	•	•		•	
Podolepis canescens	Asteraceae			P/A	herb		•	•	•		•	•
Podolepis capillaris	Asteraceae	Wiry Podolepis		P	herb			•	•			
Podolepis lessonii	Asteraceae			A	herb		•	•			•	
Podolepis tepperi	Asteraceae			A	herb			•	•			
Podotheca angustifolium	Asteraceae	Sticky Longheads		A	herb		•			•	•	•
Podotheca chrysantha	Asteraceae	Yellow Podotheca		A	herb			•		•		
Podotheca gnaphalioides	Asteraceae	Golden Longheads		A	herb			•				
Pterochaeta paniculata	Asteraceae	Woolly 'Waitzia'		A	herb			•	•	•	•	
Quinetia urvillei	Asteraceae			A	herb		•			•	•	
Rhodanthe corymbosa	Asteraceae	Corymb Sunray		A	herb		•		•		•	
Rhodanthe laevis	Asteraceae	Smooth Sunray		A	herb			•	•			
Rhodanthe manglesii	Asteraceae	Pink Sunray		A	herb		•					
Senecio glossanthus	Asteraceae	Slender Groundsel		A	herb		•	•	•		•	
Siloxerus multiflorus	Asteraceae	Small Wrinklewort		A	herb		•			•	•	•
**Sonchus oleraceus*	Asteraceae	Sowthistle		A	herb	•	•		•		•	
**Ursinia anthemoides*	Asteraceae	Ursinia		A	herb	[a]		•		•	•	•
Waitzia acuminata var. acuminata	Asteraceae	Orange Immortelle		A	herb		•	•				
Waitzia nitida	Asteraceae	Golden Waitzia		A	herb		•	•			•	
**Echium plantagineum*	Boraginaceae	Paterson's Curse		A	herb	•			•			

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SPECIES	FAMILY	COMMON NAME	CONS CODE	LIFE FORM	GROWTH FORM	D	Y	W	S	B	T/H	G
Halgania anagalloides var. preissiana	Boraginaceae			P	shrub			•			•	
Borya constricta	Boryaceae	Pincushions		P	herb			•			•	
Borya laciniata	Boryaceae	Pincushions		P	herb		•	•				
Borya nitida	Boryaceae	Pincushions		P	herb							•
Borya sphaerocephala	Boryaceae	Pincushions		P	herb						•	•
**Brassica tournefortii*	Brassicaceae	Mediterranean Turnip		A	herb	•		•				
Lepidium rotundum	Brassicaceae	Veined Peppercress		A	herb				•			
**Raphanus raphanistrum*	Brassicaceae	Wild Radish		A	herb	•	•					
Stenopetalum sphaerocarpum	Brassicaceae	Thread Petal		A	herb				•			
**Wahlenbergia capensis*	Campanulaceae	Cape Bluebell		A	herb	•			•	•		
Wahlenbergia preissii	Campanulaceae	Annual Bluebell		A	herb		•	•	•		•	
**Petrohagia velutina*	Caryophyllaceae	Velvet Pink		A	herb	•	•					•
**Silene nocturna*	Caryophyllaceae	Night-Flowering Catchfly		A	herb	•	•					•
Allocasuarina campestris	Casuarinaceae	Tamar		P	shrub						•	
Allocasuarina huegeliana	Casuarinaceae	Rock Sheoak		P	tree						•	•
Allocasuarina humilis	Casuarinaceae	Scrub Sheoak		P	shrub					•	•	
Allocasuarina microstachya	Casuarinaceae	Sheoak		P	shrub						•	
Psammamoya choretroides	Celastraceae			P	shrub					•	•	
Aphelia cyperoides	Centrolepidaceae			A	sedge		•			•		
Centrolepis aristata	Centrolepidaceae	Pointed Centrolepis		A	sedge			•		•	•	
Centrolepis drummondiana	Centrolepidaceae	Centrolepis		A	sedge					•		
Centrolepis glabra	Centrolepidaceae	Smooth Centrolepis		A	sedge		•					
Centrolepis humillima	Centrolepidaceae	Dwarf Centrolepis		A	sedge		•					•
Centrolepis polygyna	Centrolepidaceae	Wiry Centrolepis		A	sedge		•					
Atriplex ?semibaccata.	Chenopodiaceae	Ruby Saltbush		P	shrub				•			
Atriplex vesicaria	Chenopodiaceae	Bladder Saltbush		P	shrub				•			
Chenopodium desertorum	Chenopodiaceae	Frosted Goosefoot		P	shrub				•			
Enchylaena lanata	Chenopodiaceae			P	shrub				•			
Enchylaena tomentosa	Chenopodiaceae	Ruby or Barrier Saltbush		P	shrub				•			
Eriochiton sclerolaenoides	Chenopodiaceae	Wooly Bindi		P	shrub			•			•	

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Maireana brevifolia	Chenopodiaceae	Small Leaf Saltbush		P	shrub				•			
Rhagodia drummondii	Chenopodiaceae			P	shrub				•			
Rhagodia preissii	Chenopodiaceae	Saltbush		P	shrub		•		•			
Salsola kali	Chenopodiaceae	Roly Poly		A	herb				•			
Hypericum gramineum	Clusiaceae	Small St John's Wort		P	herb		•					
Wurmbea tenella	Colchicaceae	Eight Nancy		A	herb							•
Wilsonia humilis	Convolvulaceae	Silky Wilsonia		P	semi-shrub				•			
**Crassula alata*	Crassulaceae	Stonecrop		A	herb		•	•				
Crassula closiana	Crassulaceae	Stonecrop		A	herb				•	•		
Crassula colorata	Crassulaceae	Dense Stonecrop		A	herb		•	•		•	•	•
Crassula decumbens	Crassulaceae	Rufous Stonecrop		A	herb					•	•	
Crassula natans	Crassulaceae			A	herb		•					•
Crassula peduncularis	Crassulaceae	Purple Stonecrop		A	herb			•				•
Crassula sieberiana subsp. tetramera	Crassulaceae	Australian Crassula		A	herb		•	•	•		•	
Actinostrobus arenarius	Cupressaceae	Sand Plain Cypress		P	shrub/tree					•		
Callitris tuberculata	Cupressaceae	Mallee Pine		P	tree						•	
Caustis dioica	Cyperaceae	Curly Locks		P	sedge					•	•	
**Cyperus tenellus*	Cyperaceae	Tiny Flat-sedge		A	sedge		•					
Isolepis cernua	Cyperaceae	Nodding Club-rush		A	sedge		•					
Isolepis marginata	Cyperaceae	Coarse Club-rush		A	sedge		•					
Lepidosperma angustatum	Cyperaceae	Sword Sedge		P	sedge			•	•	•	•	
Lepidosperma sp. I (flat)	Cyperaceae			P	sedge							•
Lepidosperma sp. II	Cyperaceae			P	sedge					•	•	
Lepidosperma tenue	Cyperaceae	Rapier Sedge		P	sedge			•	•	•	•	
Lepidosperma viscidum	Cyperaceae	Sticky Sword Sedge		P	sedge							•
Mesomelaena preissii	Cyperaceae	Semaphore Sedge		P	sedge					•	•	
Schoenus clandestinus	Cyperaceae			P	sedge			•		•	•	
Schoenus elegans	Cyperaceae			A	sedge		•					
Schoenus globifer	Cyperaceae			P	sedge			•			•	
Schoenus hexandrus	Cyperaceae			P	sedge					•	•	

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Schoenus latitans	Cyperaceae			P	sedge						•	
Schoenus nanus	Cyperaceae	Tiny Bog-rush		A	sedge		•		•			•
Schoenus odontocarpus	Cyperaceae			A	sedge		•					
Schoenus pleiostemoneus	Cyperaceae			P	sedge			•			•	
Schoenus sp. aff. pleiostemoneus	Cyperaceae			P	sedge				•			
Schoenus sp. Quairading (GK 15694)	Cyperaceae			P	sedge						•	
Schoenus subflavus	Cyperaceae	Yellow Bog-rush		P	sedge			•			•	
Chamaexeros fimbriata	Dasypogonaceae	Fringe-leaf		P	herb					•	•	
Chamaexeros serra	Dasypogonaceae	Little Fringe-leaf		P	herb					•		
Lomandra caespitosa	Dasypogonaceae	Matrush		P	herb		•	•			•	
Lomandra effusa	Dasypogonaceae	Scented Matrush		P	herb		•	•	•			
Lomandra micrantha	Dasypogonaceae	Small-flower Matrush		P	herb			•				
Hibbertia drummondii	Dilleniaceae	Guinea Flower		P	shrub					•	•	
Hibbertia eatoniae	Dilleniaceae	Guinea Flower		P	shrub			•			•	
Hibbertia enervia	Dilleniaceae	Guinea Flower		P	shrub					•		
Hibbertia polystachya	Dilleniaceae	Guinea Flower		P	shrub					•	•	
Hibbertia rostellata	Dilleniaceae	Guinea Flower		P	shrub						•	
Hibbertia uncinata	Dilleniaceae	Guinea Flower		P	shrub						•	
Drosera bulbosa	Droseraceae	Red Leaved Sundew		P/A	herb		•	•				
Drosera glanduligera	Droseraceae	Pimpernel Sundew		A	herb		•			•	•	•
Drosera macrantha subsp. macrantha	Droseraceae	Bridal Rainbow		P/A	herb		•	•			•	•
Drosera macrophylla	Droseraceae	Showy Sundew		P/A	herb		•					
Drosera menziesii	Droseraceae	Pink Rainbow		P/A	herb		•	•			•	
Drosera miniata	Droseraceae	Orange Sundew		P/A	herb						•	
Drosera neesii	Droseraceae	Jewel Rainbow		P/A	herb						•	
Drosera pallida	Droseraceae	Pale Rainbow		P/A	herb			•		•		
Drosera pulchella	Droseraceae	Pretty Sundew		P/A	herb		•	•			•	
Drosera stolonifera	Droseraceae	Leafy Sundew		P/A	herb		•	•	•			•
Drosera subhirtella	Droseraceae	Sunny Rainbow		P/A	herb						•	•
Drosera zonaria	Droseraceae	Painted Sundew		P/A	herb			•		•		

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SPECIES	FAMILY	COMMON NAME	CONS CODE	LIFE FORM	GROWTH FORM	D	Y	W	S	B	T/H	G
Andersonia brevifolia	Epacridaceae			P	shrub					•		
Andersonia lehmanniana var. pubescens	Epacridaceae			P	shrub						•	
Astroloma epacridis	Epacridaceae			P	shrub			•	•			
Astroloma pallidum	Epacridaceae	Kick Bush		P	shrub			•		•	•	
Astroloma serratifolium	Epacridaceae	Kondrung		P	shrub			•				
Leucopogon conostephioides	Epacridaceae	Beard-heath		P	shrub					•		
Leucopogon planifolius	Epacridaceae	Beard-heath		P	shrub						•	
Leucopogon tamminensis	Epacridaceae	Beard-heath		P	shrub						•	
Euphorbia drummondii	Euphorbiaceae	Caustic Weed		P	shrub		•					
Monotaxis grandiflora	Euphorbiaceae	Diamond of the Desert		P	shrub						•	
Poranthera microphylla	Euphorbiaceae	Small Poranthera		A	herb			•		•	•	
Stachystemon brachyphyllus	Euphorbiaceae			P	shrub					•	•	
**Fumaria bastardii*	Fumariaceae	Fumaria		A	herb	•				•		
**Cicendia quadrangularis*	Gentianaceae	Cicendia		A	herb		•					
Sebaea ovata	Gentianaceae	Yellow Sebaea		A	herb		•					•
**Erodium botrys*	Geraniaceae	Long Storksbill		A	herb	•	•					•
Erodium cygnorum	Geraniaceae	Blue Heronsbill		A	herb		•	•	•		•	
**Erodium cicutarium*	Geraniaceae	Common Storkesbill		A	herb	•						
Pelargonium havlasae	Geraniaceae			P/A	herb		•					
Dampiera alata	Goodeniaceae			P	semi-shrub		•	•				
Dampiera incana	Goodeniaceae	Hoary Dampiera		P	s/shrub						•	
Dampiera lavandulacea	Goodeniaceae	Lavender Dampiera		P	s/shrub			•		•	•	
Dampiera teres	Goodeniaceae	Terete-leaved Dampiera		P	s/shrub		•					
Goodenia affinis	Goodeniaceae			A	herb		•					
Goodenia berardiana	Goodeniaceae			A	herb			•	•			
Goodenia glareicola	Goodeniaceae			P	s/shrub					•	•	
Goodenia micrantha	Goodeniaceae			A	herb		•					
Goodenia ?pusilliflora	Goodeniaceae			A	herb		•					
Lechenaultia tubiflora	Goodeniaceae			P	herb					•	•	

SPECIES	FAMILY	COMMON NAME	CONS CODE	LIFE FORM	GROWTH FORM	D	Y	W	S	B	T/H	G
Scaevola spinescens	Goodeniaceae	Currant Bush		P	shrub				●			
Velleia cycnopotamica	Goodeniaceae			A	herb		●	●	●		●	●
Verreauxia reinwardtii	Goodeniaceae	Common Verreauxia		P	semi-shrub					●		
Codonocarpus cotinifolius	Gyrostemonaceae	Native Poplar		P	tree					●	●	
Gyrostemon ramulosus	Gyrostemonaceae	Camel Poison		P	shrub						●	
Gyrostemon subnudus	Gyrostemonaceae			P	shrub						●	
Anigozanthos humilis	Haemodoraceae	Catspaw		P	herb					●		
Conostylis setigera	Haemodoraceae	Bristly Cottonhead		P	herb			●		●	●	
Conostylis villosa	Haemodoraceae				herb			●			●	
Haemodorum discolor	Haemodoraceae	Blood Root		P	herb		●	●		●		
Glischrocaryon aureum	Haloragaceae	Common Popflower		P	herb			●	●	●	●	
Glischrocaryon flavescens	Haloragaceae							●				
Gonocarpus nodulosus	Haloragaceae			A	herb		●	●	●			●
Hypoxis glabella	Hypoxidaceae	Tiny Star		A	herb		●					
Hypoxis occidentalis	Hypoxidaceae			A	herb		●					●
**Moraea setifolia*	Iridaceae	Thread Iris		P/A	herb	●	●					
**Homeria flaccida*	Iridaceae	One-leaf Cape Tulip		P/A	herb	●	●				●	
**Homeria miniata*	Iridaceae	Two-leaf Cape Tulip		P/A	herb	●	●				●	
Orthrosanthus laxus	Iridaceae	Morning Iris		P	herb		●					
Patersonia drummondii	Iridaceae	Drummond's Patersonia		P	herb			●			●	
Patersonia juncea	Iridaceae	Rush-leaved Patersonia		P	herb			●			●	
**Romulea rosea*	Iridaceae	Guildford Grass		P/A	herb	●	●	●			●	●
Isoetes drummondii	Isoetaceae	Quillwort		P	fern ally		●					
Juncus bufonius	Juncaceae	Toad Rush		A	rush		●					
**Juncus capitatus*	Juncaceae	Capitate Rush		A	rush		●					
Juncus subsecundus	Juncaceae	Finger Rush					●					
Triglochin calcitrapa	Juncaginaceae	Spurred Arrowgrass		A	herb		●	●			●	●
Triglochin centrocarpa	Juncaginaceae	Dwarf Arrowgrass		A	herb		●					
Triglochin lineare	Juncaginaceae	Arrowgrass		A	herb		●					
Hemiandra coccinea	Lamiaceae		3	P	shrub					●		

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Hemiandra pungens	Lamiaceae	Snakebush		P	semi-shrub					•		
Hemigenia sericea	Lamiaceae			P	shrub			•	•			•
Westringia rigida	Lamiaceae			P	shrub				•	•		
Cassytha flava	Lauraceae	Dodder Laurel		P	parasitic twiner					•	•	
Cassytha glabella	Lauraceae	Tangled Dodder Laurel		P	parasitic twiner					•	•	
Cassytha racemosa	Lauraceae	Dodder Laurel		P	parasitic twiner		•	•				
Lobelia gibbosa	Lobeliaceae			A	herb				•		•	
Lobelia tenuior	Lobeliaceae	Slender Lobelia		A	herb		•	•				•
Logania flaviflora	Loganiaceae	Yellow Logania		P	shrub						•	
Phyllangium paradoxum	Loganiaceae	Wiry Mitrewort		A	herb							•
Phyllangium sulcatum	Loganiaceae	Mitrewort		A	herb		•	•			•	
Amyema miquelii	Loranthaceae	Stalked Mistletoe		P	parasite		•	•				
Nuytsia floribunda	Loranthaceae	Christmas Tree		P	parasitic tree					•	•	
Lythrum hyssopifolia	Lythraceae	Lesser Loosestrife		A	herb		•					
Acacia acuaria	Mimosaceae			P	shrub			•			•	
Acacia acuminata	Mimosaceae	Jam		P	tree		•					•
Acacia bidentata	Mimosaceae			P	shrub						•	
Acacia celastrifolia	Mimosaceae	Glowing Wattle		P	shrub			•				
Acacia dielsii	Mimosaceae			P	shrub			•			•	
Acacia erinacea	Mimosaceae			P	shrub		•	•				
Acacia hemiteles	Mimosaceae	Tan Wattle		π	shrub			•	•			
Acacia lasiocalyx	Mimosaceae	Wilyurwur, Silver Wattle		P	shrub					•		•
Acacia lasiocarpa	Mimosaceae	Panjang		P	shrub			•	•	•	•	
Acacia lirellata subsp. lirellata	Mimosaceae		3	P	shrub			•			•	
Acacia lullfitziorum	Mimosaceae	Lullfitz Wattle	3	P	shrub						•	
Acacia microbotrya	Mimosaceae	Manna Wattle		P	tree			•	•	•		

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Acacia multispicata	Mimosaceae			P	shrub						•	
Acacia pulchella var. goadbyi	Mimosaceae	Prickly Moses		P	shrub					•	•	
Acacia rostellata	Mimosaceae			P	shrub						•	
Acacia saligna	Mimosaceae	Kudjong		P	shrub/ tree						•	•
Acacia sessilis	Mimosaceae			P	shrub			•		•		
Acacia shuttleworthii	Mimosaceae			P	shrub						•	
Acacia stenoptera	Mimosaceae	Narrow Winged Wattle		P	shrub						•	
Acacia unifissilis	Mimosaceae			P	shrub						•	
Eremophila glabra subsp. elegans	Myoporaceae	Tar Bush		P	shrub				•			
Eremophila lehmanniana	Myoporaceae			P	shrub				•			
Eremophila subfloccosa subsp. subfloccosa	Myoporaceae	Dense-felted Eremophila		P	shrub				•			
Baeckea crispiflora	Myrtaceae			P	shrub			•		•	•	
Baeckea ovalifolia	Myrtaceae			P	shrub			•				
Baeckea preissiana	Myrtaceae			P	shrub			•	•		•	
Beaufortia bracteosa	Myrtaceae			P	shrub					•	•	
Calothamnus quadrifidus	Myrtaceae	One-sided Bottlebrush		P	shrub					•	•	
Calytrix leschenaultii	Myrtaceae			P	shrub			•		•	•	
Calytrix sapphirina	Myrtaceae			P	shrub			•			•	
Calytrix strigosa	Myrtaceae			P	shrub			•			•	
Eremaea pauciflora	Myrtaceae			P	shrub					•		
Eucalyptus capillosa subsp. capillosa	Myrtaceae	Wheatbelt Wandoo, Inland Wandoo		P	tree			•	•			
Eucalyptus loxophleba	Myrtaceae	York Gum		P	tree	•	•					•
Eucalyptus macrocarpa	Myrtaceae	Mottlecah, Rose of the West		P	tree						•	
Eucalyptus pileata	Myrtaceae	Capped Mallee		P	mallee			•			•	
Eucalyptus salmonophloia	Myrtaceae	Salmon Gum		P	tree	•		•	•			
Leptospermum erubescens	Myrtaceae	Roadside Tea-tree		P	shrub					•	•	
Leptospermum spinescens	Myrtaceae	Spiny Tea-tree		P	shrub					•	•	
Melaleuca leptospermoides	Myrtaceae			P	shrub			•		•	•	
Melaleuca platycalyx	Myrtaceae			P	shrub						•	
Melaleuca pungens	Myrtaceae			P	shrub					•	•	

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Melaleuca steedmanii	Myrtaceae			P	shrub			•				•
Melaleuca uncinata	Myrtaceae	Broombush, Honeymyrtle		P	shrub			•			•	
Melaleuca undulata	Myrtaceae	Hidden Honey-myrtle		P	shrub						•	
Micromyrtus rosea	Myrtaceae			P	shrub			•			•	
Verticordia chrysantha	Myrtaceae	Featherflower		P	shrub					•	•	
Verticordia huegelii	Myrtaceae	Variegated Featherflower		P	shrub			•				•
Verticordia pennigera	Myrtaceae										•	
Verticordia picta	Myrtaceae	Painted Featherflower		P	shrub					•		
Verticordia plumosa	Myrtaceae	Plumed Featherflower		P	shrub					•		
Verticordia roei	Myrtaceae	Roe's Featherflower		P	shrub					•		
Ophioglossum lusitanicum	Ophioglossaceae	Adder's Tongue		P	fern		•					•
Caladenia cairnsiana	Orchidaceae	Zebra Orchid		P/A	herb		•	•				•
Caladenia drummondii	Orchidaceae	Winter Spider Orchid						•	•			
Caladenia falcata	Orchidaceae	Fringed Mantis Orchid						•	•			
Caladenia flava	Orchidaceae	Cowslip Orchid		P/A	herb					•	•	
Caladenia hirta subsp. rosea	Orchidaceae	Pink Candy Orchid		P/A	herb		•	•			•	•
Caladenia longicauda	Orchidaceae	Common White Spider Orchid		P/A	herb		•					•
Caladenia reptans	Orchidaceae	Little Pink Fairy Orchid		P/A	herb		•	•				•
Caladenia roei	Orchidaceae	Ant Orchid		P/A	herb		•	•				•
Caladenia saccharata	Orchidaceae	Sugar Orchid									•	•
Caladenia varians subsp varians	Orchidaceae	Spider Orchid		P/A	herb			•				
Cyanicula deformis	Orchidaceae	Blue Fairy Orchid		P/A	herb			•			•	
Cyanicula gemmata	Orchidaceae	Blue China Orchid		P/A	herb			•			•	
Cyanicula sericea	Orchidaceae	Silky Blue Orchid		P/A	herb			•		•		
Diuris porrifolia	Orchidaceae	Rosy-cheeked Donkey Orchid		P/A	herb			•		•	•	•
Elythranthera brunonis	Orchidaceae	Purple Enamel Orchid		P/A	herb			•			•	
Eriochilus dilatatus	Orchidaceae	White Bunny Orchid		P/A	herb		•	•			•	•
Leporella fimbriata	Orchidaceae	Hare Orchid		P/A	herb		•	•	•	•	•	
Prasophyllum elatum	Orchidaceae	Tall Leek Orchid						•				
Prasophyllum macrostachyum	Orchidaceae	Laughing Leek Orchid		P/A	herb		•					•

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Pterostylis nana	Orchidaceae	Snail Orchid, Dwarf Greenhood		P/A	herb			•				
Pterostylis recurva	Orchidaceae	Jug Orchid		P/A	herb		•	•				
Pterostylis rufa	Orchidaceae	Rusty Hood		P/A	herb		•	•	•			
Pterostylis vittata	Orchidaceae	BandedGreenhood		P/A	herb			•		•	•	•
Pyrorchis nigricans	Orchidaceae	Red Beaks		P/A	herb					•	•	
Spiculaea ciliata	Orchidaceae	Elbow Orchid		P/A	herb							•
Thelymitra antennifera	Orchidaceae	Vanilla Orchid		P/A	herb							•
Thelymitra crinita	Orchidaceae	Blue Lady Orchid		P/A	herb			•				
Thelymitra macrophylla	Orchidaceae	Scented Sun Orchid		P/A	herb		•					•
Oxalis perennans	Oxalidaceae	Wood Sorrel		P	herb		•		•			
**Oxalis pes-caprae*	Oxalidaceae	Sour Sob		P/A	herb	•						
Bossiaea spinescens	Papilionaceae			P	shrub		•	•				
Chorizema aciculare	Papilionaceae	Needle-leavedChorizema		P	shrub						•	
Daviesia benthamii subsp. acanthoclona	Papilionaceae			P	shrub			•	•			
Daviesia cardiophylla	Papilionaceae			P	shrub			•		•	•	
Daviesia costata	Papilionaceae			P	shrub			•		•	•	
Daviesia hakeoides subsp. subnuda	Papilionaceae			P	shrub			•		•	•	
Daviesia hamata	Papilionaceae			P	shrub					•		
Daviesia incrassata	Papilionaceae			P	shrub						•	
Eutaxia microphylla	Papilionaceae			P	shrub					•	•	
Gastrolobium parviflorum	Papilionaceae			P	shrub			•				
Gastrolobium spinosum	Papilionaceae	Prickly Poison		P	shrub			•			•	•
Gastrolobium trilobum	Papilionaceae	Bullock Poison		P	shrub			•			•	
Gompholobium obcordatum	Papilionaceae			P	shrub					•	•	
Gompholobium shuttleworthii	Papilionaceae			P	shrub						•	
Gompholobium viscidulum	Papilionaceae			P	shrub					•		
Isotropis drummondii	Papilionaceae	Lamb Poison		P/A	herb				•			•
Jacksonia condensata	Papilionaceae			P	shrub					•	•	
Jacksonia racemosa	Papilionaceae			P	shrub						•	
** Lupinus cosentinii*	Papilionaceae	Sandplain Blue Lupin		A	herb	•						

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Mirbelia ramulosa	Papilionaceae			P	shrub				•			•
Mirbelia trichocalyx	Papilionaceae			P	shrub			•		•	•	
Nemcia carinata	Papilionaceae			P	shrub						•	
Nemcia obovata	Papilionaceae	Boat Leaved Poison		P	shrub						•	
Templetonia aculeata	Papilionaceae			P	shrub					•	•	
Templetonia sulcata	Papilionaceae	Centipede Bush		P	shrub				•			
**Trifolium arvense*	Papilionaceae	Hare's Foot Clover		A	herb	•					•	
**Trifolium campestre*	Papilionaceae	Hop Clover		A	herb	•						•
**Trifolium hirtum*	Papilionaceae	Rose Clover		A	herb	•						
**Trifolium subterraneum*	Papilionaceae	Subterraneum Clover		A	herb	•						
**Trifolium tomentosum*	Papilionaceae	Wooly Clover		A	herb	•					•	•
Urodon dasyphylla	Papilionaceae			P	shrub				•			
Dianella revoluta	Phormiaceae	Blue Flax Lily		P	herb		•	•	•	•	•	
Stypandra glauca	Phormiaceae	Blind Grass		P	herb						•	•
Pittosporum phylliraeoides var microcarpa	Pittosporaceae	Weeping Pittosporum		P	tree				•			
Sollya heterophylla	Pittosporaceae	Australian Bluebell		P	vine or shrub		•	•				
**Plantago coronopus*	Plantaginaceae	Buckshorn Plantain		A	herb	•	•					
Plantago sp. aff. hispidula	Plantaginaceae	Plantain		A	herb		•	•	•			
**Aira caryophyllea*	Poaceae	Silvery Hairgrass		A	grass	•	•	•	•	•	•	•
Amphipogon strictus	Poaceae	Greybeard Grass		P	grass		•	•	•			•
Amphipogon turbinatus	Poaceae			P	grass					•	•	
Aristida contorta	Poaceae	Bunched Kerosene Grass		A	grass							•
Austrodanthonia caespitosa	Poaceae	Common Wallaby Grass		P	grass							•
Austrodanthonia setacea	Poaceae	Small-flower Wallaby Grass		P	grass			•				
Austrostipa compressa	Poaceae	Speargrass		A	grass					•	•	
Austrostipa elegantissima	Poaceae	Feather Speargrass		P	grass		•	•	•	•	•	
Austrostipa ? exilis	Poaceae	Speargrass		A	grass						•	
Austrostipa macalpinei	Poaceae	Golden Speargrass		A	grass		•	•	•		•	•
Austrostipa tenuifolia	Poaceae	Speargrass		P	grass		•	•	•			

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Austrostipa trichophylla	Poaceae	Speargrass		P	grass		•	•	•	•	•	•
**Avena barbata*	Poaceae	BeardedOat		A	grass	•	•	•	•		•	•
**Avena fatua x sativa*	Poaceae	Wild Oat		A	grass	•	•					
**Briza maxima*	Poaceae	Blowfly Grass		A	grass	•	•					•
**Briza minor*	Poaceae	Shivery Grass		A	grass	•	•					
**Bromus diandrus*	Poaceae	Great Brome		A	grass	•		•				•
**Bromus hordeaceus*	Poaceae	Soft Brome		A	grass	•		•				
**Bromus madritensis*	Poaceae	Madrid or Lesser Brome		A	grass	•	•	•	•			
**Ehrhartacalycina*	Poaceae	Perennial Veldt Grass		P	grass	•					•	
**Ehrharta longiflora*	Poaceae	Annual Veldt Grass		A	grass	•					•	
**Eragrostis curvula*	Poaceae	African Lovegrass		P	grass	•						
Eriachne ovata	Poaceae	Wanderrie Grass		P	grass							•
Monachather paradoxus	Poaceae	Bandicoot Grass		P	grass			•				•
Neurachne alopecuroidea	Poaceae	Foxtail Mulga Grass		P	grass		•	•		•	•	
**Pentaschistis airoides*	Poaceae	False Hairgrass		A	grass	•	•		•		•	•
**Vulpia myuros*	Poaceae	Silver Grass, Rat's Tail Fescue		A	grass	•	•	•			•	•
Comesperma integerrimum	Polygalaceae	Milkwort		P	twining shrub		•	•	•			
Comesperma scoparium	Polygalaceae	Broom Milkwort		P	shrub					•	•	
Comesperma volubile	Polygalaceae	Love Creeper		P	twining shrub					•		
Muehlenbeckia adpressa	Polygonaceae	Climbing Lignum		P	twining shrub		•	•			•	•
Calandrinia calyptrata	Portulacaceae	Pink Purslane		A	herb		•			•	•	
Calandrinia corrigioloides	Portulacaceae	Strap Purslane		A	herb					•		
Calandrinia eremaea	Portulacaceae	Small Purslane		A	herb		•	•	•			
Calandrinia granulifera	Portulacaceae	Pygmy Purslane		A	herb					•		
**Anagallis arvensis*	Primulaceae	Pimpernel		A	herb	•	•					•
Adenanthos cygnorum	Proteaceae	Common Woollybush		P	shrub					•		
Banksia attenuata	Proteaceae	Piara, Slender Banksia		P	tree, tall					•		

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					shrub							
Banksia prionotes	Proteaceae	Acorn Banksia		P	tree, tall shrub					•		
Conospermum eatoniae	Proteaceae	Smokebush		P	shrub					•		
Conospermum galeatum Proteaceae	Proteaceae	Smokebush	1	P	shrub					•	•	
Conospermum stoechadis	Proteaceae	Common Smokebush		P	shrub					•		
Dryandra armata	Proteaceae	Prickly Dryandra		P	shrub						•	
Dryandra cynaroides	Proteaceae		4	P	shrub						•	
Dryandra fraseri var fraseri	Proteaceae			P	shrub			•				
Dryandra lindleyana	Proteaceae			P	shrub					•	•	
Grevillea didymobotrya	Proteaceae			P	shrub					•	•	
Grevillea eriostachya	Proteaceae	Flame Grevillea		P	shrub					•	•	
Grevillea eryngioides	Proteaceae	Curly Grevillea		P	shrub					•		
Grevillea excelsior	Proteaceae	Orange Flame Grevillea		P	shrub			•		•	•	
Grevillea insignis	Proteaceae	Wax Grevillea		P	tall shrub						•	
Grevillea paniculata	Proteaceae			P	shrub		•	•			•	
Grevillea uncinulata	Proteaceae	Hook-leaf Grevillea		P	shrub					•	•	
Hakea aculeata	Proteaceae	Column Hakea	R	P	shrub						•	
Hakea circumalata	Proteaceae			P	shrub						•	
Hakea corymbosa	Proteaceae	Cauliflower Hakea		P	shrub					•	•	
Hakea cygna subsp. cygna	Proteaceae	Swan Fruit Hakea		P	shrub						•	
Hakea erecta	Proteaceae			P	shrub					•	•	
Hakea incrassata	Proteaceae	Marble Hakea		P	shrub						•	
Hakea invaginata	Proteaceae			P	shrub						•	
Hakea lissocarpha	Proteaceae	Honey Bush		P	shrub			•	•	•	•	
Hakea platysperma	Proteaceae	Cricket Ball Hakea		P	shrub					•	•	
Hakea preissii	Proteaceae	NeedleTree		P	tall shrub		•	•				
Hakea scoparia	Proteaceae			P	shrub			•			•	
Hakea trifurcata	Proteaceae	Two-leaf Hakea		P	shrub			•			•	
Isopogon divergens	Proteaceae	Spreading Coneflower		P	shrub						•	

APPENDIX 2: FLORA LIST FOR QUAIRADING NATURE RESERVE

The Vegetation and Flora of the Quairading Nature Reserve, Shire of Quairading by GJ Keighery BJ Keighery, N Gibson and AG Gunness Wildflower Society of Western Australia (Inc.), Nedlands.

SPECIES	FAMILY	COMMON NAME	CONS CODE	LIFE FORM	GROWTH FORM	D	Y	W	S	B	T/H	G
Isopogon dubius	Proteaceae	Pincushion Coneflower		P	shrub						•	
Isopogon scabriusculus subsp. scabriusculus	Proteaceae			P	shrub					•		
Persoonia angustiflora	Proteaceae			P	shrub						•	
Persoonia quinquinervia	Proteaceae	Kauberry		P	shrub					•	•	
Persoonia saundersiana	Proteaceae			P	shrub					•		
Persoonia trinervis	Proteaceae			P	shrub					•		
Petrophile brevifolia	Proteaceae			P	shrub						•	
Petrophile ericifolia	Proteaceae			P	shrub			•				
Petrophile misturata	Proteaceae			P	shrub					•		
Petrophile squamata	Proteaceae			P	shrub						•	
Synaphea interioris	Proteaceae			P	shrub			•		•	•	
Xylomelum angustifolium	Proteaceae	Sandplain Woody Pear		P	tree					•		
Desmocladus asper	Restionaceae			P	sedge					•	•	
Desmocladus fasciculatus	Restionaceae			P	sedge					•	•	
Harperia lateriflora	Restionaceae			P	sedge			•			•	
Lepidobolus preissianus	Restionaceae	Chaff Rush		P	sedge			•		•	•	
Lyginia barbata	Restionaceae			P	sedge						•	
Cryptandra leucopogon	Rhamnaceae			P	shrub						•	
Cryptandra myriantha	Rhamnaceae			P	shrub						•	
Cryptandra pungens	Rhamnaceae			P	shrub						•	
Cryptandra whicherae	Rhamnaceae			P	shrub			•				
Stenanthemum stipulosum	Rhamnaceae			P	shrub						•	
Stenanthemum tridentatum	Rhamnaceae		3	P	shrub			•	•	•	•	
Trymalium daphnifolium	Rhamnaceae			P	shrub			•	•			
**Galium divaricatum*	Rubiaceae			A	herb			•	•			•
Opercularia rubioides	Rubiaceae		2	P	semi-shrub			•				
Opercularia vaginata	Rubiaceae	Dog Weed		P	semi-shrub		•	•		•	•	
Boronia caerulescens	Rutaceae			P	shrub						•	
Santalum acuminatum	Santalaceae	Quandong		P	small tree					•	•	

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SPECIES	FAMILY	COMMON NAME	CONS CODE	LIFE FORM	GROWTH FORM	D	Y	W	S	B	T/ H	G
Santalum murrayanum	Santalaceae	Bitter Quandong		P	small tree		•					
Santalum spicatum	Santalaceae	Sandalwood		P	tree			•	•		•	
Dodonaea bursariifolia	Sapindaceae	Hopbush		P	shrub			•	•		•	
Dodonaea ceratocarpa	Sapindaceae	Hopbush		P	shrub			•			•	
Dodonaea divaricata	Sapindaceae	Hopbush		P	shrub						•	
Dodonaea viscosa	Sapindaceae	Sticky Hopbush		P	shrub						•	•
**Dischisma capitata*	Scrophulariaceae	Wooly-Headed Dischisma				•						
Glossostigma drummondii	Scrophulariaceae			A	herb							•
**Parentucellia latifolia*	Scrophulariaceae	Common Bartsia		A	herb	•	•					•
**Zaluzianskya divaricata*	Scrophulariaceae	Spreading Night Phlox		A	herb	•				•	•	
Nicotiana occidentalis	Solanaceae	Native Tobacco		A	herb							•
**Solanum nigrum*	Solanaceae	Black Berry Nightshade		A	herb	•			•			
Stackhousia monogyna	Stackhousiaceae	Candles		A	herb					•	•	
Tripterococcus brunonis	Stackhousiaceae	Winged Stackhousia		A	herb					•		
Guichenotia sarotes	Sterculiaceae			P	shrub						•	
Keraudrenia integrifolia	Sterculiaceae	Common Firebush		P	shrub			•		•		
Levenhookia dubia	Stylidiaceae			A	herb							•
Levenhookia pusilla	Stylidiaceae	Midget Stylewort		A	herb		•	•	•	•		•
Levenhookia stipitata	Stylidiaceae	Common Stylewort		A	herb			•			•	•
Stylidium eriopodum	Stylidiaceae	Wheatbelt Boomerang Triggerplant		P	herb			•			•	
Stylidium bulbiferum	Stylidiaceae	Circus Triggerplant		P	herb					•	•	•
Stylidium calcaratum	Stylidiaceae	Book Triggerplant		P	herb					•	•	
Stylidium dichotomum	Stylidiaceae	Pins-and-needles		P	herb						•	
Stylidium ecorne	Stylidiaceae	Foot Triggerplant		P	herb		•					•
Stylidium emarginatum	Stylidiaceae	Biddy-four-legs		P	herb							•
Stylidium hispidum	Stylidiaceae	White Butterfly Triggerplant		P	herb			•		•	•	
Stylidium leptophyllum	Stylidiaceae	Needle-leaved Triggerplant		P	herb						•	
Stylidium petiolare	Stylidiaceae	Horn Triggerplant		P	herb							•
Stylidium pseudosacculatum	Stylidiaceae			P	herb			•			•	
Stylidium repens	Stylidiaceae	Creeping Triggerplant		P	herb					•		

SPECIES	FAMILY	COMMON NAME	CONS CODE	LIFE FORM	GROWTH FORM	D	Y	W	S	B	T/ H	G
Pimelea argentea	Thymeleaceae	Silvery Leaved Pimelea		P	shrub				•			
Pimelea villifera	Thymeleaceae			P	shrub							•
Parietaria debilis	Urticaceae	Pellitory		A	herb				•			•
Xanthorrhoea drummondii	Xanthorrhoeaceae	Grass tree		P	shrub					•	•	
Macrozamia riedlei	Zamiaceae	Zamia		P	cycad			•		•		

APPENDIX 3 KEYS TO VEGETATION STRUCTURAL CLASS AND VEGETATION CONDITION

TABLE 1: Vegetation Structural Classes
(Keighery, BJ, 1994 (Adapted from Muir, 1977, and Aplin, 1979))

Life Form/ Height Class	Cover (percentage)			
	100 - 70%	70 - 30%	30 - 10%	10 - 2%
Trees >30m	Tall Closed Forest	Tall Open Forest	Tall Woodland	Tall Open Woodland
Trees 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees < 10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland
Tree Mallee	Closed Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Shrub Mallee	Closed Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs > 2m	Closed Tall Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland
Shrubs 1-2m	Closed Heath	Open Heath	Shrubland	Open Shrubland
Shrubs < 1m	Closed Low Heath	Open Low Heath	Low Shrubland	Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland

TABLE 2: Vegetation Condition Scale (Keighery B J 1994)

Pristine (1)
Pristine or nearly so, no obvious signs of disturbance.

Excellent (2)
Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.

Very Good (3)
Vegetation structure altered, obvious signs of disturbance.
For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

Good (4)
Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it.
For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing

Degraded (5)
Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.
For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

Completely Degraded (6)
The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.
These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

TABLE 3: Definitions of Declared Rare Flora and Priority Flora (after CALM 1997 and Atkins 1998):

'**Declared Rare Flora — Extant Taxa** (R): Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been declared under section 23F of the *Wildlife Conservation Act 1950* to be "rare flora".

'**Declared Rare Flora — Presumed Extinct Taxa** (X): Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been declared under section 23F of the *Wildlife Conservation Act 1950* to be "rare flora".'

A 'Declared Rare Flora and Priority Flora List' is published each year by CALM (Atkins 1998). Priority Flora are taxa that are under consideration for declaration as 'rare flora' but are in need of further survey or continued monitoring. The list recognises four categories of Priority Flora:

'**Priority One — Poorly Known Taxa** (1): Taxa which are known from one or a few (generally < 5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as "rare flora", but are in urgent need of further survey.

'**Priority Two — Poorly Known Taxa** (2): Taxa which are known from one or a few (generally < 5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as "rare flora", but are in urgent need of further survey.

'**Priority Three — Poorly Known Taxa** (3): Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as "rare flora", but are in urgent need of further survey.

'**Priority Four — Rare Taxa** (4): Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5–10 years.'

TABLE 4: Definitions of the status of the threat to ecological communities (English and Blyth, 1997)

Category 1
Presumed Totally Destroyed
An ecological community which has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

Category 2
Critically Endangered
An ecological community which has been adequately surveyed and found to have been subject to a major contraction in area and/or which was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

Category 3
Endangered
An ecological community which has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

Category 4
Vulnerable
An ecological community which has been adequately surveyed and found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not been assured and/or a community which is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

Category 5
Data Deficient
An ecological community for which there is inadequate data to assign it to one of the above categories and/or which is not yet evaluated with respect to status of threat.
(Usually an ecological community with poorly known distribution or biology that is suspected to belong to any of the above categories. These ecological communities have a high priority for survey and/or research.)

Category 6
Lower Risk
A community which has been adequately surveyed and evaluated and available information suggests that it does not qualify for one of the above categories of threat.