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# Declared rare and poorly known flora

in the Warren Region



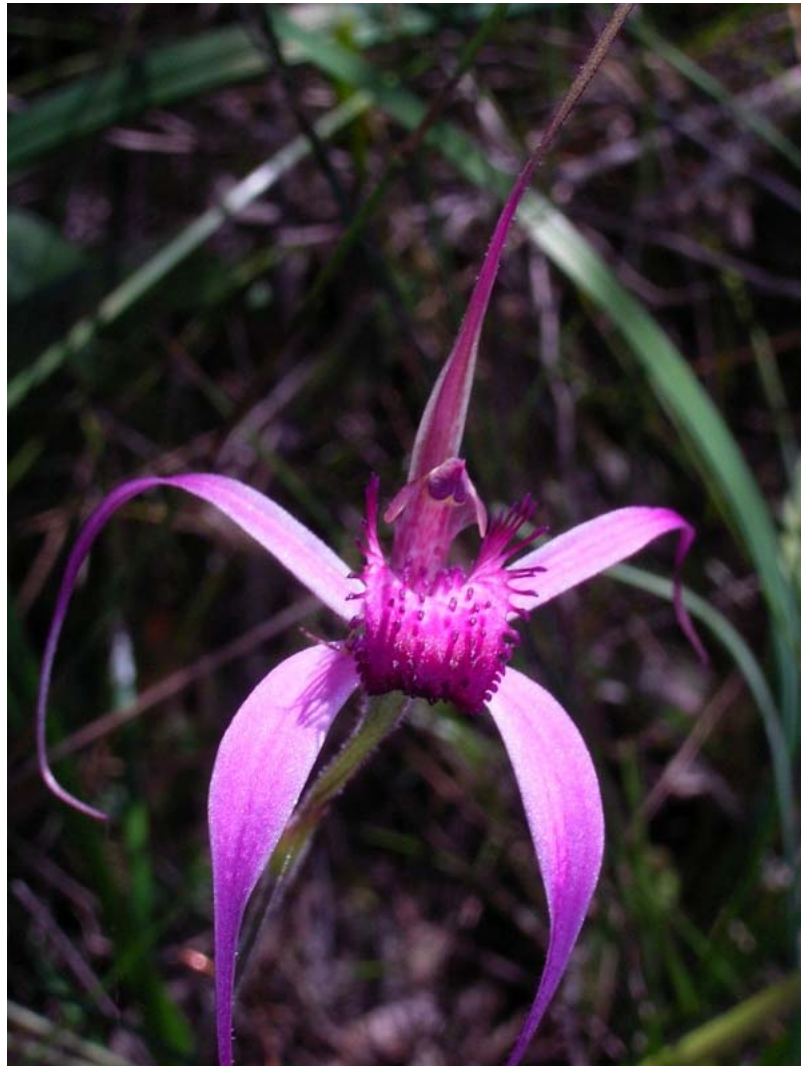
Department of  
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# Declared Rare and Poorly Known Flora in the Warren Region

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Terry D. Macfarlane and Tony R. Annels



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Cover Photograph by Erica Shedley – the declared rare flora species *Caladenia winfieldii* which is  
known from a single population in the Warren Region. Other photographs by Roger Hearn.

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## **FOREWORD**

Western Australian Wildlife Management Programs are a series of publications produced by the Department of Conservation and Land Management (CALM). The programs are prepared in addition to Regional Management Plans, and species Recovery and Interim Recovery Plans to provide information and guidance for the management and protection of certain exploited or threatened species.

This program provides a brief description of the appearance, distribution, habitat and conservation status of flora declared as rare under the Western Australian Wildlife Conservation Act (Threatened Flora) and possibly threatened poorly known flora (Priority Flora) in CALM's Warren Region and makes recommendations for research and management actions that are necessary to ensure their continued survival. By ranking Threatened Flora in priority order for recovery action, Departmental staff and resources can be allocated to taxa most urgently in need of attention.

Priority Flora that are under consideration for declaration are dealt with to a lesser extent than Declared Rare Flora, however, the information provided here should assist in the ongoing work of assessing the conservation status of these taxa.

## ACKNOWLEDGMENTS

There are many people to be thanked for their assistance in this review of the declared rare and poorly known flora of the Warren Region.

We are indebted to community members of the Warren Region Threatened Flora Recovery Team and CALM volunteers, Betty Carpenter, Ted Middleton, Gloria Jackson and the late Brenda Hammersley and Bill Jackson, for their enthusiastic contributions to team meetings, their knowledgeable field observations and taxonomic contributions, and for their years of assistance with the field work that has gone into the review; to volunteers, Cynthia Annels for assistance with field work, George Gardner, and Steve and Ryan Phillips for their contribution to locating populations of taxa of interest and to Brian Best (WA Herbarium volunteer) for his assistance with mosses and liverworts.

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Finally thanks to Verna Tunsell for her assistance with databasing and preparation of voucher specimens for lodging at the herbarium and editing of the first draft of this document.

## ABBREVIATIONS

Non standard abbreviations used through the document:

5g	CALM Act Section 5 g Reserve
CLM	CALM
DoE	Department of Environment
DON	Donnelly District
FRA	Frankland District
MRWA	Main Roads Western Australia
ms	manuscript (unpublished name)
na	not assessed
NP	National Park
NR	Nature Reserve
PP	Private Property
River R	River Reserve
RR	Road Reserve
SHRes	Shire Reserve
SCR	South Coast Region
SF	State Forest
TR	Timber Reserve
UCL	Unallocated Crown Land
WR	Water Reserve
VCL	Vacant Crown Land

Other abbreviations retain their standard usage.

In population tables, items appearing under the Land Status column in brackets indicate the intended land status under the 1994 Forest Management Plan; all others are current tenure.

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# PART ONE - INTRODUCTION

## 1. THE NEED FOR MANAGEMENT

Western Australia (WA) has a unique flora world renowned for its diversity and high level of endemism. As at June 2004 the WA herbarium lists 12,672 vascular plant taxa (including alien taxa) with the total likely to exceed 14,000 once botanists have completed surveying, searching and describing the flora. A significant proportion of the WA total is concentrated in the south-west of the state which has a high level of endemism due to a long history of effective genetic isolation, combined with climatic and geologic stability through the Tertiary, followed by climatic fluctuation and active landscape evolution in the Quaternary (Hopper, 1979). According to Briggs and Leigh (1995), the state has 46% of the Australian total of threatened, rare or poorly known plant species with 82% restricted to the south-west.

Rareness of a species in any community or locality is a natural phenomenon and an integral part of evolutionary processes in the landscape. Rareness may be exhibited in any one or combination of low total numbers, low numbers of populations, confinement to restricted habitats, or simply through having a restricted distribution (narrow endemics). Many plant species in WA are naturally rare and some of these are being threatened by natural processes.

Many of WA's rare species, and some others that would not have been considered rare prior to European colonisation in 1750, are now threatened due to the activities of European colonisation. Extensive land clearing and modification of the environment have resulted in the extinction of some species and threatens the survival of many others. Continued land clearing, the presence of disease (particularly *Phytophthora* species), exotic weeds and pests, road works, domestic grazing and salinity continue to threaten many flora species.

The Wildlife Conservation Act 1950, Conservation and Land Management Act 1984, and Department of Conservation and Land Management (CALM) policies relevant to flora and fauna provide the legislative basis and guidelines for the conservation of the State's indigenous plant and animal species. Under the Wildlife Conservation Act, CALM is responsible for the protection of flora and fauna on all lands and waters throughout the State. Section 23F of the Act (Appendix I) gives the Minister responsible for the Act (currently Minister for the Environment) statutory responsibility for the protection of those plant taxa declared to be rare (defined as "threatened taxa" under IUCN criteria).

In 2004, 357 extant taxa were listed as Declared Rare Flora (DRF) and a further 15 taxa were listed on the schedule as presumed extinct (Appendix II). Brown *et al.* (1998) provide illustrations of all DRF known at that time, discuss the conservation of WA's threatened species and review the relevant legislation, policy, research and management activities of CALM. In addition to those with legislative protection, 2,124 taxa were listed on CALM's priority flora list (Atkins 2004) as requiring further detailed survey to accurately assess their conservation status.

This Wildlife Management Program collates the available biological, Ecological and management information for the majority of DRF and Priority One, Two and Three flora in CALM's Warren Region, as at the 30<sup>th</sup> September 2004. Several taxa were collected for the first time during fieldwork associated with this review.

In the time that has elapsed since the first draft of this Wildlife Management Program, several new taxa have been added to the regions priority flora list. However, these taxa have not been added to this final document due to time limitations (see Table 4). As the program is a working document that will be available in loose leaf and bound format it is intended that the additional priority taxa, and any newly identified declared rare taxa, will be added as a Supplement in the same format as the present version of the plan.

**Figure 1.** Location of the Warren Region in relation to other CALM Regions in Western Australia



The Warren Region (also referred to as the Region, Figure 1) covers about 14,230 km<sup>2</sup> of which about 66% is managed by CALM. Much of this is made up of contiguous tracts of land of varying tenure and management purpose, but significant 'island' reserves within the cleared agricultural landscape also exist to the north-east, east and south-east, many of these under threat from salination and weed invasion. *Phytophthora dieback* is also a serious threat to many important plant communities in the Region. Climate change, resulting from global warming associated with the greenhouse effect, is a further significant threat to the Region's flora.

## **2. OBJECTIVE OF THE PROGRAM**

The objective of this Wildlife Management Program (flora) is:

To ensure and enhance, by appropriate management, the continued survival in the wild of populations of Declared Rare Flora and other flora species that are potentially at risk, or otherwise of conservation interest.

It aims to achieve this by:

- providing a useful reference for CALM staff and other land managers for the day to day management and protection of Declared Rare Flora populations and populations of other flora that are poorly known and may be at risk;
- directing Departmental resources within the Region to those flora species that are most urgently in need of attention;
- assisting in the identification of Declared Rare Flora and other flora species that are potentially at risk, and their likely habitats; and
- fostering an appreciation and increased awareness of the importance of protecting and conserving Declared Rare Flora and other flora species potentially at risk, or otherwise of conservation interest.

## **3. RARE FLORA LEGISLATION AND GUIDELINES FOR GAZETTAL**

### **Wildlife Conservation Act**

The *Wildlife Conservation Act 1950* protects all classes of indigenous flora throughout the State. Protected flora includes:

Spermatophyta - flowering plants, conifers and cycads

Pteridophyta - ferns and fern allies

Bryophyta - mosses and liverworts

Thallophyta - algae, fungi and lichens

Section 23F of the Act (Appendix I) provides special protection to those taxa (species, subspecies, varieties, hybrids) considered by the Minister to be:

- likely to become extinct;
- is rare; or
- is otherwise in need of special protection.;

Protection under section 23F is achieved by declaring taxa to be 'rare' by notice published in the Government Gazette (Appendix II). CALM's Policy Statement No. 9 (Appendix III) discusses the legislation relating to declared rare flora (DRF) and outlines the criteria for gazettal.

Under the provisions of Section 23F, the 'taking', by any person, of DRF is prohibited by any person on any category of land throughout the State without the written consent of the Minister. A breach of the Act is liable to a penalty of up to \$10,000. The legislation refers only to wild growing populations and applies equally to Government officers and private citizens on Crown and private land.

To 'take' in relation to any flora includes 'to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means'. This includes not only direct destruction or injury by human hand or machine but also such activities as allowing grazing by stock, introducing pathogens, altering water tables so as to inundate or deprive the flora of adequate soil moisture, allowing air pollutants to harm foliage, and burning.

## Policy 9

The schedule published in the Government Gazette is revised annually to accommodate additions and deletions to the DRF list. To qualify for gazettal, plants must satisfy the following criteria as defined in Policy Statement No. 9 (Appendix III):

- The species occurs naturally in Western Australia, is well defined and represented by a voucher specimen in a State or National Herbarium. While it need not necessarily be formally described under conventions in the International Code of Botanical Nomenclature, such a description is preferred and should be undertaken as soon as possible after listing on the schedule.
- It has been established that the species in the wild:
  - a) is extinct, i.e., there is no reasonable doubt that the last individual has died, or
  - b) meets criteria for listing as threatened in the current version of *IUCN Red List Categories Prepared by the IUCN Species Survival Commission*.

In addition hybrids, or suspected hybrids, which satisfy the above criteria also must be:

- a distinct entity, that is, the progeny are consistent with the agreed taxonomic limits for that taxon group;
- capable of being self perpetuating, that is, not reliant on the parental taxa for replacement; and
- the product of a natural event, that is, both parents are naturally occurring and cross fertilisation was by natural means.

The list of rare flora is gazetted in two sections: taxa that are still extant (Threatened – Schedule 1); and those which are presumed to be extinct (Schedule 2). The status of a threatened plant species in cultivation has no bearing on this matter. The status of translocated populations will be considered five years after establishment.

Plants may be deleted from the Rare Flora schedule where:

- Recent botanical survey has shown that the taxon is no longer rare, endangered or in need of special protection;
- The taxon is no longer in danger of extinction because it has been adequately protected by reservation of land on which it occurs or because population numbers have increased beyond the danger point.

### Western Australian Threatened Species Scientific Committee

Recommendations for adding or removing flora to or from the list of Declared Rare Flora are made to the Western Australia Threatened Species Scientific Committee (WATSSC).

WATSSC has the responsibility for:

- Reviewing and making recommendations at least annually to the Minister, via the Executive Director of the Department of Conservation and Land Management and the Conservation Commission of Western Australia and/or the Marine Parks and Reserves Authority, on listings of threatened flora and of threatened and specially protected fauna under the *Wildlife Conservation Act 1950*;
- Allocating threatened flora and fauna to IUCN categories of threat or to ‘Conservation Dependent’ at least annually, for endorsement by the Minister;
- Recommending to the Executive Director species of fauna and flora for addition to or deletion from the priority fauna and flora lists; and
- providing advice and recommendations to the Executive Director in respect of research and management needs arising from its reviews of threatened species lists, threat categories and priority species lists.

In carrying out the above, WATSSC will consider the status of Western Australian species throughout their total natural range in Australia, and where appropriate their range and status outside Australia.

#### **4. CALM'S PRIORITY FLORA LIST**

CALM maintains a priority flora list to determine priorities for survey of plants of uncertain conservation status. In 2004 the list comprised 2,124 taxa that are poorly known and in need of high priority survey, or are adequately surveyed but in need of monitoring. Poorly known taxa are possibly at risk but do not meet the survey requirements for gazettal as DRF, as outlined in Policy Statement No. 9. Only those plants considered on the basis of thorough survey to be rare, threatened, or presumed extinct, can be included on the DRF schedule.

Possibly threatened flora species that do not meet survey criteria are added to the Priority Flora lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora. Species that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation Dependent species are placed in Priority 5.

##### **Priority One - Poorly known Species**

Species which are known from one or a few (generally less than five) populations or collections 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 Species**

Species which are known from one or a few (generally less than five) populations or collections, 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 Species**

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

##### **Priority Four - Rare Species**

Species that have been adequately surveyed and while being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years. Priority four species are:

- Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
- Near Threatened. Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
- Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

##### **Priority Five: Conservation Dependent species**

Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

#### **5. RESPONSIBILITIES WITHIN THE DEPARTMENT**

- Reviewing Departmental policy on Declared Rare Flora is the responsibility of the CALM Corporate Executive;



- Nomination of flora for Declaration as Threatened Flora is the responsibility of the Warren Region, including the Frankland and Donnelly Districts, and Species and Communities Branch (SCB);
- Identification of Declared Rare Flora is the initial responsibility of the WA Herbarium and other specialist CALM staff, but should, with appropriate training, also become a Regional responsibility;
- Overall coordination of, and general assistance with, recovery of threatened species and ecological communities is provided by SCB;
- Locating Declared Rare Flora is the responsibility of the CALM's Science, Nature Conservation and Regional Services Divisions;
- Determination of land status and preparation of material for notification to landowners is the responsibility of SCB;
- Hand-delivered notification to landowners of Declared Rare Flora populations is the responsibility of Regional staff and SCB;
- Maintenance of Declared Rare Flora information and database, and dissemination of these data are the responsibility of SCB;
- Advice on management prescriptions is the responsibility of CALM's Science Division staff, Program leaders (Regional Services Division), and specialist staff in SCB (Nature Conservation Division);
- Coordination of Recovery Plans and Interim Recovery Plans for threatened taxa is the responsibility of SCB;
- Management, protection and regular inspection of Declared Rare Flora populations are the responsibility of staff of the Warren Region, and the Frankland and Donnelly Districts;
- Enforcement matters relating to the provisions of the Wildlife Conservation Act are the responsibility of Wildlife and Regional Services staff in the Warren Region;
- Convening Regional or District Threatened Flora Recovery Teams, reporting on their activities and the implementation of Regional recovery plans are the responsibility of Warren Region.
- Implementation and revision of the management program are the responsibility of the Warren Region and the Frankland and Donnelly Districts through the Warren Region Threatened Flora Recovery Team.

## **6. THE WARREN REGION**

CALM's Warren Region lies on the western south coast of Western Australia, extending 240 km from the Wilson Inlet (Denmark) west to Black Point (45 km west of Pemberton), inland to just south of Nannup, to Bridgetown, Frankland, Rocky Gully, Cranbrook, Mount Barker, and south to Denmark along the Hay River. It is bounded by CALM's South Coast Region (Albany District) to the east, the Wheatbelt Region (Katanning District) to the north-east, and the South West Region (Blackwood District) to the north and west.

The Warren Region includes parts of the Shires of Plantagenet, Cranbrook, Boyup Brook, Bridgetown-Greenbushes and Nannup, and the entire area of the Manjimup and Denmark Shires. Manjimup is the largest town of the Region, with Pemberton, Walpole, Denmark, Mount Barker, Bridgetown, Northcliffe, Nornalup and Rocky Gully making up the other significant population centres in or surrounding the Region.

The Region covers an area of about 14,230 km<sup>2</sup> (1,423,000 ha.), and is managed as two Districts, Frankland and Donnelly. When the Forest Management Plan (1994), the WA Regional Forest Agreement (1999) and the "Protecting our Old Growth Forests Policy" (2001) have been fully implemented, CALM will manage 66% of the Region (18% State Forest, 46% National Park, Conservation Park and Nature Reserve, and 2% as 5g CALM Act Reserve, Forest Conservation Area and Unallocated Crown Land). Private landowners, Shires and other Agencies will manage the remaining 34% of the Region.

The Region contains a relatively high proportion of the State's relictual and Gondwanan flora (Hopper *et al.* 1996). There is also a high incidence of narrow endemism associated with wetlands and with

granitic and gneissic outcrops and peaks, Mount Lindesay being an outstanding example. Many of these narrow endemics are rare, potentially at risk or otherwise of conservation interest. Many families and genera in the lower relief wetland complexes also show evidence of recent speciation that are proving difficult to resolve taxonomically. These include taxa which are already known to be, or may prove to be rare.

## **6.1 Climate**

The Warren Region has a Mediterranean climate with relatively mild, wet winters and warm, dry summers. Rainfall varies from over 1400 mm in a belt from Northcliffe to Walpole, to about 1100 mm between Manjimup and Denmark, tapering off in the north-east to about 650 mm in the Rocky Gully, Tonebridge and Perup area. Occasional summer rainfall is a feature of coastal areas in the Region.

The climate is also characterised by short summer droughts and relatively low evapo-transpiration rates, ranging from less than 400mm around Walpole, to 450mm between Mt. Barker and Pemberton, 500mm from Rocky Gully to Manjimup, and 500 - 550mm in the Manjimup, Bridgetown and Nannup area. Gentilli (1989) has demonstrated that the interaction between total annual rainfall and summer evapo-transpiration rates largely accounts for the distribution of forest types (based on overstorey species and structure) in the south-west.

Climate change across the Region has significant implications for rare flora, particularly the relictual and Gondwana flora. There has been a strong reducing trend in annual rainfall over the last century in the Walpole and Denbarker area, with a milder trend for the remainder of the Region (Tapp 1997). The changes in moisture regimes act directly on some plant communities, and indirectly on others through changes in fire intensity and frequency associated with drier regimes. These changes provide a challenge to managers to develop methods to conserve sensitive taxa, and in some cases whole plant communities.

## **6.2 Geology**

The four tectonic units recognised in Warren Region are the Yilgarn Craton, the Albany-Fraser Orogen, the Stirling Range Formation, and the Perth Basin. The Tamala Limestone Formation, which overlays the southern margin of the latter three, has also had significant impact on the present landforms and soils of the Region. (Johnstone *et al.* 1973).

Geological events, such as upward flexure and downward warping, began shaping the landscape during and after the separation and northward drift from Antarctica. In addition, erosion, weathering and laterisation, ocean incursions and the changing climate have all acted on the four basic tectonic units to form the landscape seen today.

### **Yilgarn Craton**

The ancient rocks from the Archaean (2,600-3,100 million years ago) are largely composed of gneiss and granite with enclaves of highly metamorphosed and deformed sedimentary deposits. The underlying granite is covered by the products of weathering, but may occasionally surface as rounded hills.

The Yilgarn Craton lies north of the Albany-Fraser Orogen and east of the Perth Basin. It includes the Warrup, Kingston and north Perup areas in the north of the Region, and the Donnelly and Fly Brook areas in the west.

### **Albany-Fraser Orogen**

The majority of the Warren Region is situated on the western portion of the Albany-Fraser Orogen. This unit is composed of Proterozoic gneisses and granites that are 1,100-1,400 million years old, and is generally overlain with the products of weathering, erosion and laterisation. The underlying bedrock material occasionally appears as low outcropping surfaces of gneiss or granite, or on the more southerly and recently incised slopes, as granite hills, ridges and monadnocks of the Burnside Batholith.

Recent hydrogeological investigations near Lake Muir have encountered highly metamorphosed and deformed sediments, similar to those of the Stirling Range Formation, embedded within this unit.

The Albany-Fraser Orogen abuts the Stirling Range Formation to the east, and the Yilgarn Craton to the north and west.

### **Stirling Range Formation**

Slightly younger than the Albany-Fraser Orogen, the Stirling Range Formation is presumed to be Middle Proterozoic (1,100 million year old), with sequences of highly metamorphosed and deformed sediments (sandstones and shale) forming schist, phyllite and quartzite. The Stirling Range Formation occurs in the south-east corner of the Region, taking in Denmark, William Bay, Mount Lindesay and Mount Barker.

### **Perth Basin**

The Perth Basin is of Palaeozoic and Mesozoic sedimentary origin (65 - 300 million years old), and includes intrusions of Bunbury Basalt dated at about 115 million years old. The Donnybrook Sunklands and the Blackwood Plateau in the adjoining South West CALM Region form part of the Perth Basin.

In the Warren region, the Perth Basin includes the area of the Donnelly Valley west of the Darling Scarp, and the Lake Jasper to Black Point area.

### **Tamala Limestone Formation**

The Tamala Limestone Formation fringes much of the coastline. This was laid down relatively recently during a period of ocean incursion during the Pleistocene, and is only a few hundred thousand years old.

## **6.3 Landforms and Soils**

The landforms and soils have been mapped for most of the Warren Region by Churchward *et al.* (1988) and Churchward (1992). The area east of the Perup River and north of Lake Muir was completed during 1997 as part of the RFA, and further refined in 1999, including the Tonebridge area (Smolinski, 1999). About 110 landform units and sub-units are now recognised in the Region. The high correlation between these landform units, habitat type and vegetation community provides a useful planning tool for flora surveys and other work with rare flora.

A number of major geomorphic units are recognised and are based on the four geological units above and include a wide range of landforms and soils.

One of the major geomorphic units in the Region is the Darling Plateau, which prior to the time of separation from Antarctica, was an old highly weathered landscape of low relief. There was a general uplifting of the plateau to an elevation of about 300 meters when it rifted along its southern margin. This uplifted Darling Plateau is seen both east and north of Manjimup.

Thin marine sediments (late Tertiary) of the Plantagenet Group, dominated by Pallinup Siltstone, but including some sandstone and limestone, were later deposited up to 200 m thick following marine transgressions of the Bremer Basin (Hocking 1990). Erosion of the Plantagenet Siltstone covering the Stirling Range Formation has resulted in the formation of a low plateau in the south east of the region.

Down warping of the southern parts of this plateau resulted in development of the Ravensthorpe Ramp, which gradually falls to sea level, and led to partial dissection by new, relatively short, south-flowing drainages. Activation of drainage and erosion processes on this Ramp has resulted in the development of complex belts of hills and sandy, swampy corridors across its southern parts, while much of its northern parts retain the character of the old plateau.

Coastal limestone lain down during the Pleistocene, and dune systems of more recent age, have acted as barriers to south flowing drainage systems, leading to the development of low swampy plains between the coastline and the Ravensthorpe Ramp.

Drainage lines make up the last major geomorphic unit, and these vary in age and form across the Region.

### **Landform units on the Darling Plateau**

The Darling Plateau is characterised by broad shallow drainage floors and broad flat interfluves, with some local relief being provided by low hills with varying amounts of duricrust present. Two major groups of units exist, those that have developed on crystalline rock basements and those on quartzite and unconsolidated sediments.

In the lower rainfall zone, internally drained excavation basins of low relief, and with a fill of aeolian and fluvial sediments become significant, such as Lake Muir and Unicup basins. These basins are commonly complex fresh and salt lake systems.

Drainage from these swampy tracts is by shallow creek valleys feeding 'old' rivers of the Darling Drainage System, such as the Blackwood River, and by 'young' rivers that arise in and dissect this area, and which drain generally southward.

Soils range from duplex to gradational soils, loamy sands, gravelly sands, gravels, podzols, humic podzols, red and yellow earths, cracking and non cracking clays, and solonetzic soils.

#### **Landform units on the hill and swamp corridor complex**

This complex is characterised by a pattern of prominent ridges and hills, often with exposed granite peaks and surfaces, and swampy corridors. While the complex's origins are in the deep erosion of the older deeply weathered mantle, the corridors have low gradient and as a consequence are waterlogged for long periods. Marine sediments from the Eocene have been found in the corridors.

Soils on the ridges and hills vary through a range of duplex soils of different origin and composition and degree of laterisation, to granite outcrops, areas of duricrust, and occasional deep sands and podzols.

Soils in the swampy corridors include podzols, humic and peaty podzols, deep sands, and solonetzic soils, with red earths and duplex soils on slight rises with improved drainage.

#### **Landform units on Plantagenet siltstones**

This area is characterised by a gently sloping sandy plain of generally poor drainage, often internally drained to circular swamps, with a number of prominent granite ridges and monadnocks (for example the Bennett Range and Mount Lindesay) rising from its surface.

Soils include duplex soils with laterite, solonetzic soils, sands, lateritic and gravelly sands, and podzols.

#### **Landform units on coastal aeolian and fluvial sediments and Tamala Limestone**

The coastal strip is generally characterised by a seaward barrier of outcropping limestone overlaid with shallow soils, and broken with blocks of granite, estuary outfalls, sand dunes, and at Black Point, by Bunbury Basalt. A complex of parabolic dunes, variously consolidated or of unstable sand, and interdune plains lie inland from this barrier. Between these dunes and the exposed parts of the Ravensthorpe Ramp are a complex series of low relief sandy, swampy plains, lakes and estuaries.

Soils range from shallow brown sand on the limestone, to calcareous and siliceous sands and podzols on the dune formations, to peat, humic podzols, podzols, deep sands, gley duplex and solonetzic soils on the low plains.

#### **Landform units on the Darling Scarp**

The Darling Scarp in the Region lacks the steep irregular slopes and exposed rock as seen to the north; it is characterised by smooth gentle valley slopes and dissections mantled by lateritic gravels and duricrust on ridges, with sands in the valleys. As a result of the down warping, the Darling Scarp disappears under the swampy plains in the vicinity of the confluence of the Donnelly River and the Carey Brook.

Soils vary from gradational loamy sands, duplex soils and gravelly sands.

#### **Landform units on the Blackwood Plateau**

Due to the lower elevation, Blackwood Plateau elements have graded into the Scott Plains in the lake Jasper area, and only intrude into the Warren Region as pockets along the plateau's eastern margins at the base of the Darling Scarp. These pockets have similar characteristics as the Donnybrook Sunkland.

While landforms are similar to the low relief areas of the Darling Plateau, their Mesozoic origins have produced slightly different landforms and soils. Soils range from duplex soils with sandy A horizons to humic podzols, gravelly earths, clayey loams, and grey sands.

#### **Landform units associated with drainage lines**

As noted above, drainage from the swampy tracts of the Darling Plateau is by shallow creek valleys feeding the 'old' rivers of the Darling Drainage system, generally draining west and sharply truncated at the Darling Scarp, and by a number of the 'young' rivers which also arise in and dissect this area, but drain generally southward.

The 'young' rivers are the major drainage lines cutting across the general west-north-west grain of the country. With shallow valleys in their headwaters, they become more incised in their middle reaches, becoming narrow defiles, often rocky, as they pass through the ridges associated with this grain. Broad perched swampy tracts are typically left on the interfluvies adjacent to these young rivers. Most of these rivers terminate in coastal lakes and inlets.

There are a large number of landforms and soils within this group which differ significantly between river systems and these are described in Churchward *et al.* (1988) and Churchward (1992). The landform units and soils associated with drainage lines are important, as a number of rare taxa are restricted to them.

#### 6.4 Vegetation

The majority of the Region lies within the Menzies and Warren subdistricts of the Darling botanical district.

Different systems of classification have been developed by various authors to describe the vegetation systems and associations across the region (Smith, 1972; Beard, 1980; Christensen *et al.* 1985; Christensen, 1992), and at a community level based on floristics (Strelein 1988; Wardell-Johnson *et al.*, 1989; Inions *et al.*, 1990; Wardell-Johnson and Williams, 1996; Lyons *et al.*, 2000). Extensive mapping has also been conducted in the Byenup-Muir reserve system (Gibson and Keighery, 2000).

Gentilli (1989) has demonstrated that the interaction between total annual rainfall and summer evapo-transpiration rates largely accounts for the distribution of forest types in the south-west. Landform and soils then define vegetation pattern at a more local level. Field observations, and patterns in the distribution of threatened flora in the Region, indicate this model can be generalised and extended to non forest types (J. Havel, personal communication).

Work to integrate these separate studies and fill in gaps in data and knowledge was undertaken by Mattiske and Havel. (1998) for the Regional Forest Agreement (RFA) in Western Australia. The result was the production of a series of maps of Vegetation Complexes of the RFA Region (1:250,000), with most of the CALM Warren Region being covered. The approach used a broad scale environmental framework, based upon climate and landform, within which the finer scale vegetation patterns were then mapped. Ecological vegetation systems were subsequently mapped by Mattiske and Havel (1999) at a scale of 1:500,000.

Structurally, the vegetation of the Warren Region can be classified into nine major groups (after Christensen, 1992):

1. High open forests generally occupy suitable landforms within a high rainfall zone defined by the 1100 mm rainfall limit and summer evapo-transpiration rates below about 500 mm. Typically karri (*Eucalyptus diversifolia*), jarrah (*E. marginata*) and marri (*Corymbia calophylla*) occur in various combinations across the range. Tingle (*Eucalyptus guilfoylei*, *E. jacksonii* and *E. brevistylis*) become significant where summer evapo-transpiration is below 420 mm. High open forest occurs principally as a belt from south of Nannup, through the area between Northcliffe and Manjimup to Walpole and east to Denmark.
2. Open forests, predominantly jarrah, marri and yarri (*Eucalyptus patens*) in various mixtures occupy most of the remainder of the Region where soils are suitable. Usually the limits of this vegetation group can be defined by rainfall, but extensive tracts also occur within the high open forest belt where soils will only support forests of lower stature.
3. Woodlands, predominantly composed of wandoo (*Eucalyptus wandoo*), jarrah, marri and yate (*E. cornuta*) occur to a limited extent in the north east of the region, with significant occurrences of Albany blackbutt (*E. staeri*) and red flowering gum (*E. ficifolia*) woodlands in the south. Again, the pattern of distribution of this group appears to be controlled by the combination of rainfall and summer evapo-transpiration.
4. Low woodlands occur throughout the Region, these varying greatly in species composition and site type. They grade into low forest at times and generally occupy sites unable to sustain forest, such as dry sandy, or wetter sandy sites, coastal dunes or shallow soils over rock. Coastal banksia woodlands may need assessment and consideration for listing as a threatened ecological community.
5. Closed heaths are common on permanently moist sites and are typified by occurrences of *Melaleuca*, *Kunzea*, *Agonis*, *Taxandria* and *Homalospermum*. A number of community types can

be distinguished within the group. Indications are that they are important communities for rare and threatened flora.

6. Open heath occurs in limited areas in the east, usually with scattered occurrences of flat-topped yate (*Eucalyptus occidentalis*) and redheart (*E. decipiens*). Again a number of community types can be distinguished within the group.
7. Sedgeland make up a major part of the vegetation of the Region, usually on sites low in the landscape and typically inundated for extended periods during the year. Wardell-Johnson and Williams (1996) and unpublished work by Gibson suggest a large number of community types exist within this group, and indications are that they will demonstrate a high degree of association between geology, rainfall and summer evapo-transpiration rates. Furthermore, they are also important communities for rare and threatened flora as endemism in this group of community types is high.
8. Granitic monadnocks, and to a lesser extent gneissic and basaltic outcrops, are important but variable communities within the Region. Most occur across the south and are associated with the Albany - Fraser Orogen and are very significant for rare and threatened flora. Mt. Lindesay is the largest single complex and possibly the most significant granitic monadnock for threatened flora. Endemism within this group is high at a very local scale.
9. Rivers and wetlands also form an important vegetation group, and include inland and coastal lakes and wetlands, rivers, estuaries and inlets. They contain a diverse group of important communities that are significant for rare and threatened flora.

Observations during field work and review of habitat of the Region's rare and priority flora indicate the greatest number of taxa investigated occur in communities at the extremes in the landscape, the swamps and wet margins of rivers and ocean, and in association with exposed granitic and gneissic features, including isolated inselbergs. Mount Lindesay is particularly rich in rare and priority flora taxa.

Evidence is also strong that most rare taxa are either Gondwanan relicts or are recently evolved, and are closely associated with rare and threatened communities in the Region, such as the Sphagnum bog community. Further work is needed to identify these threatened communities for protection, not at the community level as in the recent floristic studies, but as sub-units within vegetation groups at the extremes noted above.

## **7. BOTANICAL HISTORY OF THE WARREN REGION**

The botanical history of the Warren Region is relatively recent and poorly documented. Areas near Albany, Busselton and Augusta were visited by the French and English long before European settlement in Western Australia. However, the coast and hinterland between Augusta and Albany were largely inaccessible to these early European visitors, due to lack of any significant natural harbours or safe moorings.

Even after settlement, visitors such as Drummond (1840-1851) and Preiss (1838-1844) explored the edges of the region but did not proceed further within it.

One of the first significant collectors to visit the area was Oldfield during the late 1850's. While his locality data are poor (and a problem in relation to a number of taxa addressed in this study), it is apparent he traversed the northern and eastern parts of the region. Among his collections was the type collection of karri, *Eucalyptus diversicolor*, a dominant forest tree in the Region.

The second significant collector to venture into the Region in the 1870's was Maxwell, an associate of Drummond, who ventured west from Albany to the vicinity of the Frankland River.

Mueller visited the area in late 1877 (Broke, Shannon, Upper Blackwood, Burrabunup and Mt. Lindesay are mentioned) accompanied by Muir, a local settler who subsequently became a major collector in the region for Mueller. Another local, Mrs McHard, likewise became a significant collector for Mueller across the Blackwood and the northern parts of the Region in the 1880's.

In 1901 Diels ventured west into the Denmark and eastern parts of the Region, as did Dorrien-Smith during 1905. In the spring and summer of 1912-13, S.W. Jackson (and F. Thompson) visited the Bow River - Walpole/Nornalup area, primarily to collect birds, but made major botanical collections at the same time. A number of Jackson's collections have been at the centre of this study, including the previously presumed extinct taxa, *Tetratheca elliptica* and *Chordifex jacksonii*.

In 1916 and 1917, F.M.C. Schock visited the region making significant collections. In 1920, Charles Gardner made the first of many collections.

There were a number of other collectors in addition to Gardner during the 1920's. These included Miss Knox-Peden, Max Koch and W.M. Carne, who were all active in the Manjimup - Pemberton area, usually sending material on to Melbourne. In 1928 Meebold visited the Denmark area, his collections being significant when sent back to Europe.

The depression and war years were lean botanically, though a couple of notable collectors, W.E. Blackall and Erickson (both of whom had a significant impact on botany in the State), were active in the area.

While there was a slight increase post-war in botanical collecting in the Region, activity was generally low until the 1960's. A number of collectors and botanists destined to have a major impact on Australian botany began visiting the Region during this period, notably Royce, Powell, George, Green, Erickson and G.G. Smith.

During the post-war period there was limited activity in the Region other than two exceptions. A burst of activity occurred in 1947-48, the years immediately following the sealed road reaching Manjimup. In addition, Churchill collected plants in association with his palynological studies in the Walpole area. The debate over his work is ongoing and work flowing from these studies has been significant in the botanical history of the area, and in this current review.

Since the 1950's the region has been on the travel route for many 'itinerant' botanists, local, interstate and from overseas, all of whom have contributed through their collections.

Notable individual contributions have been made by a number of residents of the region. From the mid 1970's, Albany Wildflower Society members, Eileen Croxford and her sister, Mary Sherwood, made substantial collections in the eastern parts of the region over the years. Mary McCallum-Webster, a recurrent visitor from the United Kingdom, collected in the Denmark area and played a pivotal role in setting up the Albany Herbarium. Much of their work has now come to fruition with incorporation of their collection label data into the WA Herbarium database. More recently, collecting carried out by the late Brenda Hammersley across the Denmark Shire has led to expansion of the botanical knowledge of that part of the region, including the first collections of a number of taxa, several of which are dealt with in this study. Her contribution to our knowledge of the Bryophyte flora of the region is inestimable.

A number of other people have made significant contributions through their extensive knowledge of and interest in the flora. For over 40 years, the late George Gardner made collections, and together with Hazel Mason, published a booklet on the flora of the Northcliffe area in 1984. Hazel Dempster (daughter of Eileen Croxford of the Albany Wildflower Society) collected across the region through the 1970's and 1980's and published a booklet on the flora of the Manjimup area.

The Native Orchid Study and Conservation Group members have made major contributions to collections and to expanding knowledge of this family in the Region, but many taxa remain unresolved. Walpole residents, Gloria and the late Bill Jackson, have been notable in this regard, identifying problems and forwarding material to taxonomists around Australia. Ted Middleton, as CALM volunteer, has made a considerable contribution to our knowledge of rare and threatened taxa both around Walpole and across the Region.

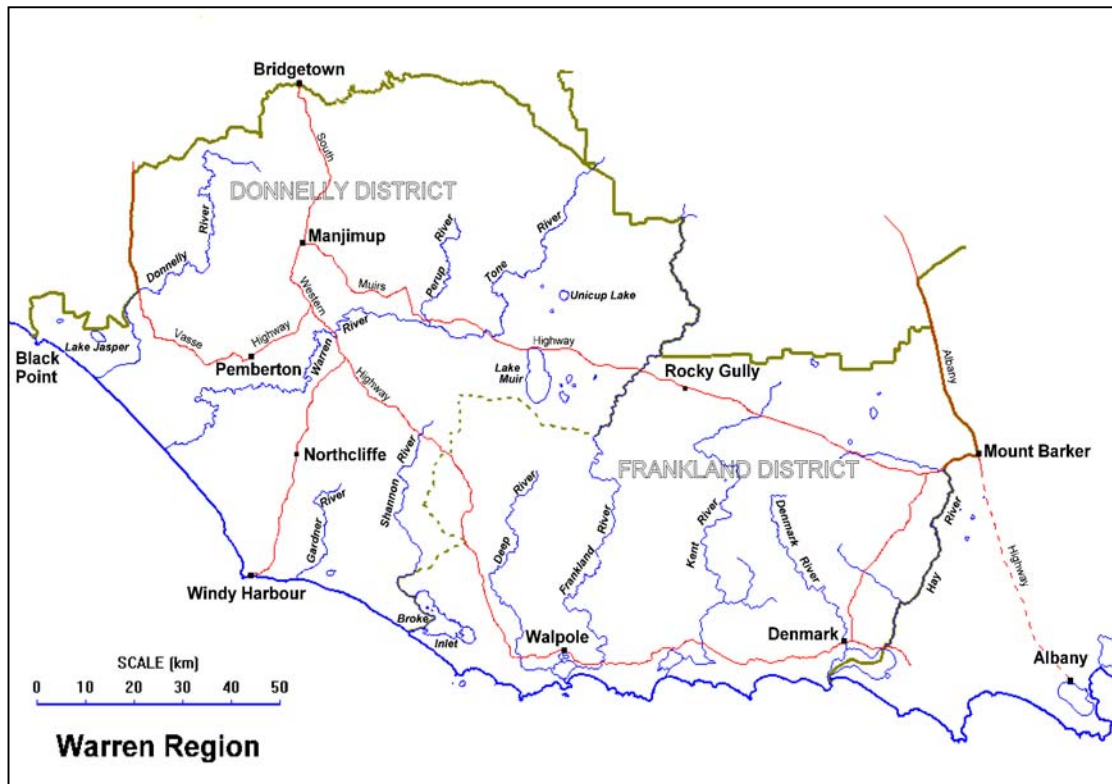
Over the years, the research group of the Forests Department and CALM, based in Manjimup, made significant contributions through collections by Hart, Loneragan, Christensen, Skinner, Annels, McCutcheon, Wardell-Johnson, Macfarlane, Cranfield and many others, mostly related to floristic and fauna studies and more recently to threatened flora.

The most recent additions to botanical knowledge were made during surveys of the Region for the Regional Forest Agreement process. In addition, comprehensive surveys of the vascular flora have been undertaken by Gibson, Keighery and Lyons of the coastal and near coastal communities of the Warren bioregion and the Lake Muir – Unicup –Byenup area. The Byenup-Muir is a complex wetland system, and surveys found the only records for *Euphrasia* (aff.) *scabra* and *Lilaeopsis polyantha*, both priority species.

Despite the substantial progress made to date, much work needs to be done. Large tracts of the Region remain virtually unrepresented in herbarium collections, and the regularity of first collections of new taxa in the Region during the last 10 years indicates much work is still required.

Taxonomic problems still exist in major groups, notably in areas addressed during work for this report, including *Hemigenia* and *Hemiandra* spp. in the Lamiaceae; *Leucopogon* spp. and *Astroloma* spp. in the Epacridaceae; *Astartea* spp. and *Agonis* spp. in the Myrtaceae; *Lambertia* and *Synaphea* in the Proteaceae and a number of taxa in the Cyperaceae. It is expected that the current review will not be the last word on rare species in the Region.

**Figure 2.** The Warren Region contains two districts, Frankland and Donnelly. The major towns, roads and rivers are also shown.







## PART TWO - DECLARED RARE FLORA IN THE WARREN REGION

As at December 2005, 18 taxa of Declared Rare Flora (DRF) were known to be extant within the boundaries of the Warren Region. A recent inclusion is *Meziella trifida* which was previously listed as presumed extinct on the DRF schedule for the Region, but has recently been relocated, and is now included as Rare Flora. The species is ranked as Critically Endangered.

*Lambertia orbifolia* and *Banksia goodii* were previously listed for the Warren Region but are now, as a result of CALM regional boundary rationalisation, included in the South Coast Region and are not included in this Management Program. *Astartea arbuscula* and *Pleurophascum occidentale* were previously listed as DRF but, on review of herbarium material and an assessment of populations and threats, have been removed from the schedule and are no longer included.

A brief description of the morphology, distribution, habitat, and conservation status is provided for each taxon dealt with herein. Where appropriate, the impacts of threatening processes such as fire, mechanical disturbance, weed invasion and *Phytophthora* dieback disease are noted from observations made in the field during routine monitoring visits for this review, and from discussion with volunteers and CALM staff. Recommendations are made for management and protection action to ensure the continued survival of populations of each taxon.

Descriptions of taxa were compiled by consulting relevant references, from direct discussion with botanists and through measurements and observations made from herbarium and fresh collections.

Distributions and habitats of each taxon were recorded from CALM Rare Flora files, herbarium labels and field observation. Emphasis was placed on the particular habitat characteristics of locations in the Warren Region.

Recommended changes (or otherwise) to the conservation status of taxa are determined from field observations, population and location data on CALM files and recent herbarium specimen information, taking into account known or surmised threats and breeding system requirements.

Included in the program is a brief summary of the number and condition of populations for each taxon in the region and threats to population survival. A table for each taxon lists the location, land status, date of last survey, number of plants and, where appropriate, condition of each population. The list of known populations generally refers to those in the Warren Region only. Only populations that have been surveyed or have reliable recent records are included with any detail. Old records for a few taxa are included and noted as such when no further detail is available.

Precise locality details are not provided here but are contained on CALM files and computer databases. In line with this, maps provide generalised locations only and in reality only reflect each taxon's distribution within the Region. The Warren Region filing system number for each species is shown beneath the family name (eg WAR F4/1).

Population numbers for each plant taxon are shown as CALM Departmental numbers (CLM #) where assigned, or otherwise as Regional numbers (WAR #). WA Herbarium records may indicate a wider range and larger number of populations but many of these historical populations have not been relocated and may have been destroyed since the time of collection.

In this Management Program, several species are considered to be of highest priority for further survey and consideration for gazettal as DRF (see Table 5). These taxa are included in the Priority Flora section relevant to their current classification.



Photograph of DRF species *Verticordia apecta* by Roger Hearn

*Asplenium obtusatum* G. Forster subsp. *northlandicum* Brownsey

ASPLENIACEAE

Shore Spleenwort

WAR F4/1

This fern, which was named in the New Zealand Journal of Botany as a subspecies of *Asplenium obtusatum* by Brownsey in 1977, has a scattered, wide distribution along temperate and sub-Antarctic coastlines of the Southern Hemisphere. While widespread in New South Wales, Victoria and Tasmania, there are currently only four known populations in Western Australia. Limited survey of its often inaccessible coastal and island granite habitat has possibly resulted in other populations remaining undetected.

**Description**

Shore Spleenwort has a shortly creeping thick rhizome, covered with purplish brown scales. Leaves are pinnate, stout, erect, rigid to 40 cm with green stems. Leaflets are stalked, shiny, dark green with notched margins, up to 4.5 cm long. Sori are oblong, parallel to each other and adjacent to veins on each side of the midrib of each leaflet.

**Distribution and Habitat**

The subspecies is known from just four Western Australian populations between Walpole and Albany, growing in shallow peaty soil pockets on granitic-gneiss rock up to 200 m above the sea. In these areas plants are fully exposed to salt laden winds.

**Conservation Status**

Current: DRF- Vulnerable

**Known Populations in the Warren Region**

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM2	Chatham Island	Frankland	NR	78	26/03/1997	Healthy in accessible areas
Na	D'Entrecasteaux NP	Frankland	NP	2	9/10/2001	Relocate & survey

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**Response to Disturbance**

Responses to fire, soil or other mechanical disturbance, change in soil moisture and weed invasion are unknown.

**Susceptibility to Phytophthora Dieback**

Unknown, probably not a threat.

**Management Requirements**

Monitor populations opportunistically and at least five year intervals.

Conduct surveys at other suitable sites in the Region, if or when opportunities arise.

Decline requests by rock climbers to pursue their sport on the Chatham Island's rock faces. The ledges and cracks used as hand and foot holds and for securing pitons are the same as those used by the ferns.

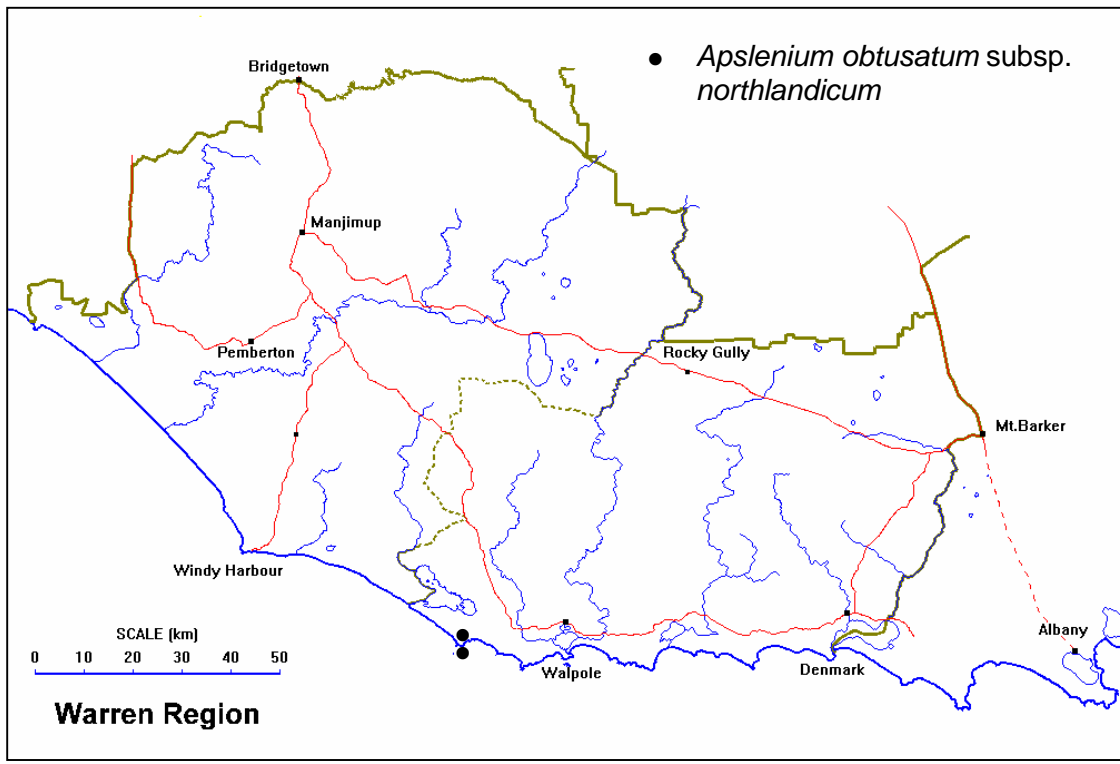
Relocate D'Entrecasteaux population and confirm identification (habitat description does not match other records.)

**Research Requirements**

None.

**References**

Brown *et al* (1998); Brownsey (1977, 1998); Jones and Clemesha (1976); Robinson and Coates (1995); Rye and Hopper (1981)



## *Banksia verticillata* R. Br.

## PROTEACEAE

Granite Banksia

WAR F4/3

*Banksia verticillata* was first collected from King George Sound in December 1801 by Robert Brown who described the species in *Transactions of the Linnaean Society* of London in 1810. It is a non-resprouting, seed obligate, fire killed *Banksia* that has a long reproductive cycle and is severely impacted by *Phytophthora*.

### Description

Granite Banksia is a large shrub (rarely a tree) to 5 m with a thick trunk that is much branched above. Bark is hard, roughly fissured and grey. Leaves are whorled (internodes 1-2 cm), narrow elliptic to oblong, obtuse, recurved with entire margins, the upper surface glabrous, the lower surface with matted, crisped, white hairs and petiolate. The inflorescence is terminal with a whorl of several lateral branches immediately below. Flowers are golden yellow.

**Flowering period:** January-April

### Distribution and Habitat

Occurs from west of Walpole to Manypeaks in two disjunct population clusters, one in the Albany area and the other in the Walpole area. Plants grow on and around granite outcrops, usually in shallow rocky sands and loams.

Old records for Thompson and Aldridge Coves have not been substantiated with only the closely related, similar species, *Banksia seminuda* being located there. \*

### Conservation Status

Current: DRF-Vulnerable

### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 6	Mt. Hopkins	Frankland	NP	200	17/07/2002	Burnt in March 2001
CLM 15	Woolbales	Frankland	NP	600	13/3/1997	Severely impacted by <i>P. cinnamomi</i>
CLM 20	Aldridge Cove	Frankland	NP	0	1994	Not found
CLM 21	Thompson Cove	Frankland	NP	0	1994	Not found
CLM 26	Poison Hill	Frankland	NP	2 000	5/10/2000	
CLM 34	Woolbales	Frankland	NP	1	03/09/1997	
CLM 35	Point Nuyts	Frankland	NP	1200	30/10/1997	

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### Response to Disturbance

Plants are killed by fire with regeneration from canopy stored seed post fire. The species is not dependent on fire to trigger germination and the population structure indicates continuous recruitment. The species has a long juvenile period (period without seed production) and requires population protection from fire for a period of at least 20 years.

Response to soil disturbance is unknown.

### Susceptibility to *Phytophthora* Dieback

Highly susceptible.

### Management Requirements

Ongoing periodic Phosphite treatment (every 3-4 years), of Woolbales and Poison Hill populations (including adjacent proteaceous communities).

Adjust fire management strategies adjacent to all populations to achieve fire exclusion.

Monitor populations on a two year cycle, particularly for disease impacts of *Phytophthora* and *Zithiostroma*.

Achieve adequate seed collection (at a population genetic level) prior to burning of populations.

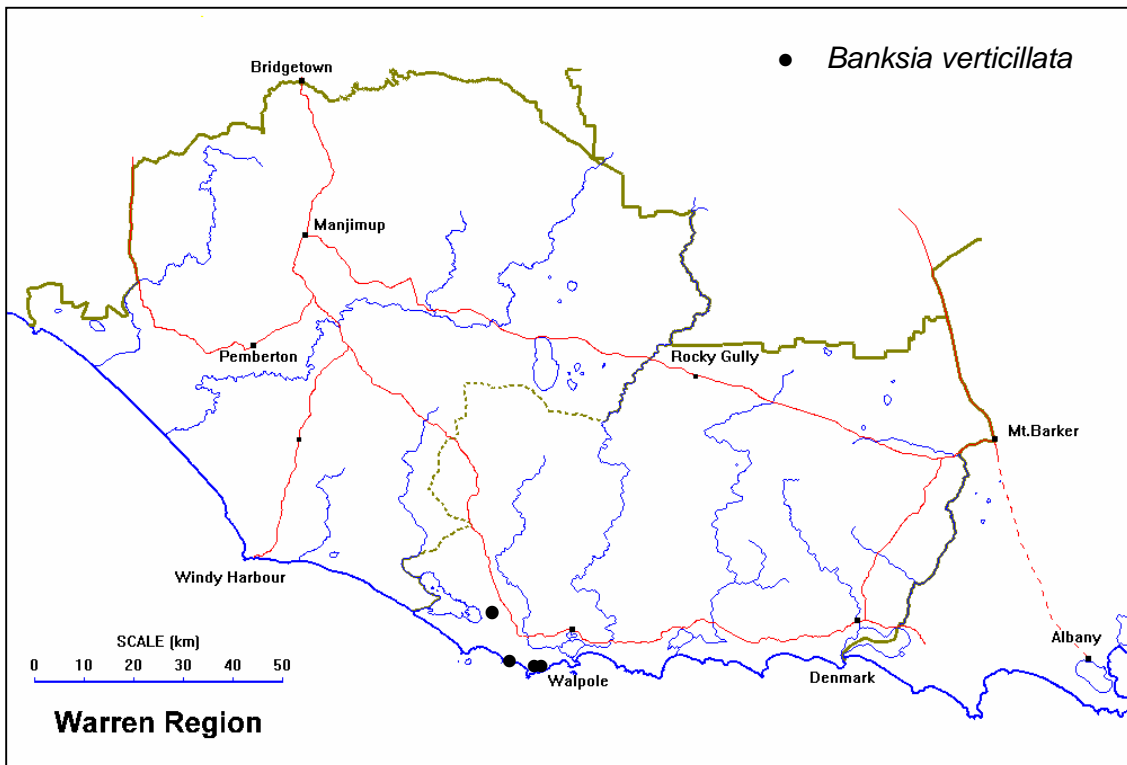
### Research Requirements

Complete studies into fire and population ecology.

Conduct molecular studies to determine minimum numbers of individuals in each population for seed collection

### References.

Brown *et al* (1998); Kelly and Coates (1995); George (1981, 1985); Monks *et al.* (1994); Robinson and Coates (1995); Taylor and Hopper (1988)



## *Caladenia christineae* Hopper & A.P. Br.

### ORCHIDACEAE

#### Christine's Spider Orchid

WAR F4/5

*Caladenia christineae* was first collected in 1977 by Alex George who again collected it in 1983. Subsequent collections were made by researchers including Stephen Hopper, Andrew Brown and Robert Bates. The taxon has variously been considered as a variant of *Caladenia longicauda*, *C. harringtoniae*, *C. serotina* and *C. uliginosa* and at one stage was treated as a subspecies of *C. harringtoniae*. Several large new populations were located during the preparation of this report.

#### Description

Christine's Spider Orchid is most closely related to *Caladenia harringtoniae* from which it can be distinguished by its creamy-white to pale creamy yellow, rather than deep to pale pink flowers, which are odourless, and its slightly earlier flowering season, peaking in mid to late October. Marginal fringes to the labellum are short. The species has up to four flowers and reaches a height of about 40 cm.

Although there is a slight overlap, *Caladenia christineae* appears to replace *C. harringtoniae* in the landscape as total rainfall and length of wet season decrease in the north-eastern part of the Region. It also occupies sites with poorer drainage, more often on the old plateau in broad wet basins and drainage areas, whereas *C. harringtoniae* is more often being found on edges of wet areas of more dissected landscapes, particularly the rejuvenated drainage lines of the Ravensthorpe Ramp.

The species has been known to hybridise with *Caladenia harringtoniae*, *C. latifolia* and *C. longicauda* (mainly around the Lake Muir area).

**Flowering period:** September-early November

#### Distribution and Habitat

Recorded from Yornup to Mt. Barker, growing around the margins of and in winter wet flats (often in standing water) in heath and sedge communities, often under mixed jarrah/marri forest and paperbarks.

#### Conservation Status

Current: DRF-Endangered

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Stoate/Talling	DON	SF	0	Spring 2002	Burnt Autumn 2004
CLM 5	Denbarker	FRA	MRWA	0	29/10/1996	Not relocated
CLM 15	Pardelup	FRA	RR	1	01/01/2001	
CLM 3	Muir Hwy	FRA	RR	100	11/10/1990	
CLM 4, 11 & 12	Lake Muir	DON	NR	400	22/9/1998	Borders the northern edge of Lake Muir
CLM 6	Seaton Ross Rd 1	DON	SF	0	13/10/1993	Misidentification – not <i>C. christineae</i>
CLM 7	Seaton Ross Rd 2	DON	PP	30	Spring 2002	
CLM 9	Kingston FB	DON	SF	30+	Spring 2001	
CLM 10	Corbalup Rd	DON	SF	20+	Spring 2002	
CLM 13	Tone SF 1	DON	SF	0	31/10/1996	
CLM 14	Tone SF 2	DON	SF	15	Spring 2002	
CLM 16	Donnelly Mill Rd	DON	SF	5	Spring 2002	Adjacent area burnt in Spring 2003
CLM 17	Conto Rd 1	DON	SF	20	Spring 2002	
CLM 18	Conto Rd 2	DON	SF	0	Spring 2002	
CLM 19	Aerial Rd	DON		60	Spring 2003	Not burnt for many years
CLM 20	Quenda Rd	DON	SF	100	Spring 2002	Part burnt in 1998
CLM 21	Southfield Rd	DON	SF	0	7/10/1995	Plants not seen since 1995
CLM 22	Muir Hwy	DON	SHR	94	21/10/2003	
CLM 23	Scrubup Rd	FRA	PRI	123	15/10/2003	



## Response to Disturbance

Plants may be killed by fire when above ground parts are present (May-November). However, flowering is known to be stimulated by summer fire during which time plants are dormant, with many populations having only been seen in significant numbers the spring following summer fire.

Response to soil disturbance is unknown.

As the occurrence of the species is linked to wet sites, changes to water tables following changes in hydrology and climate change over time may have a negative impact. Increasing salinisation may also be a threat to several of populations.

Response to weed invasion is unknown, but the long-term viability of populations may be vulnerable to annuals and perennial agricultural grasses that are able to occupy sites following fire or other disturbance.

## Susceptibility to *Phytophthora Dieback*

Unknown.

## Management Requirements

Monitor populations annually over next ten years with particular regard to impacts of salinisation and weed species on populations east of the main forest belt.

Search for additional populations in areas of suitable habitat across the Region.

Avoid late autumn, winter and early spring fuel reduction burning of areas known to contain populations of the species.

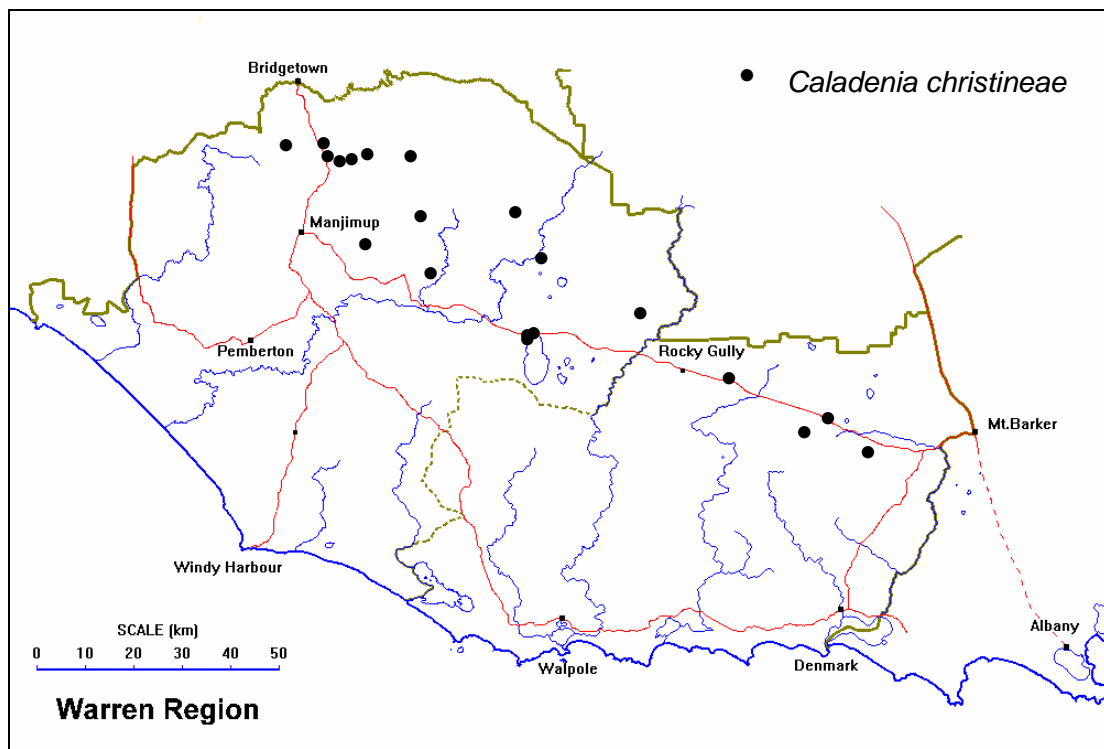
## Research Requirements

Liaise with Botanic Gardens and Parks Authority staff over seed and mycelium collection and storage.

Determine susceptibility to *Phytophthora* spp.

## References

Brown *et al* (1998); Hoffman and Brown (1992, 1998); Hopper and Brown (2001); Ian Wilson (personal communication, population data)



## *Caladenia dorrienii* Domin

### ORCHIDACEAE

#### Cossack Spider Orchid

WAR F4/4

Although it was first collected by James Drummond in the late 1830's, possibly from Wandoo flats west of Toodyay, this species was subsequently overlooked by taxonomists and was not named until Domin described it in 1912, from a 1909 collection made by Dorrien-Smith between Bridgetown and Kojunup. It is one of many spider orchids with a complicated taxonomic history and was for many years regarded as a variety of *Caladenia filamentosa* until being restored to full species status in 1989 by Mark Clements. The species is currently known from seven populations in the Frankland, Kojunup, Boyup Brook area, with three of these in the proposed Perup Nature Reserve in the Warren Region.

#### Description

Cossack Spider Orchid is a distinctive species that is distinguished by its down curved petals and lateral sepals, the latter crossing over in front of the ovary. Plants are generally short, rarely reaching 20 cm high. The flower stem is slender and hairy with a narrow linear leaf clasping the base. Each flower has narrow linear greenish white sepals and petals with longitudinal red veins and dark glandular hairy tips. The dorsal sepal is 25-30 mm long and held erect. The labellum, which is white splashed with red dots, has two rows of closely set calli along its middle and lacks a marginal fringe, instead having a few irregular teeth. Plants often grow in clumps or clusters.

**Flowering period:** September-November

#### Distribution and Habitat

The species is currently known from the Frankland, Kojunup, Boyup Brook area with an outlier at West Dale, growing in open Wandoo/Jarraah woodland over low heath on Wandoo sandy clays, usually in moist valley sites.

#### Conservation Status

Current: DRF-Endangered

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 6	Keninup SF	DON	SF	19	Spring 2003	Burnt Autumn 1996
CLM 7	Keninup SF	DON	SF	many	Spring 2003	Burnt Autumn 1996
CLM 8	Keninup SF	DON	SF	0	Spring 2003	
CLM 9	Keninup SF	DON	SF	48	20/10/1998	
CLM 10	Keninup SF	DON	SF	38	21/10/1998	
CLM 11	Keninup SF	DON	SF	99	21/10/1998	

#### Response to Disturbance

Although plants are likely to be killed by fire when above ground parts are present (July-December), the species appears to be stimulated to flower by summer fire. Mal Graham (personal communication) has noted that a population which responded to one fire event with mass flowering, failed to respond to a second summer fire event four years later, with population numbers declining.

Response to soil disturbance is unknown but comments below probably apply. Several populations have been disturbed by animal digging.

Response to change in soil moisture may be significant as occurrence is linked to wet sites and changes to water tables over time may impact. Salt may also be a significant threat outside main forest belt.

Response to weed invasion is unknown but the species is possibly vulnerable to annual and perennial grasses and weeds that are able to rapidly occupy a site after fire or other soil disturbance. CALM population 7 is under threat from weed invasion.

#### Susceptibility to *Phytophthora Dieback*

Unknown.

### Management Requirements

Survey suitable sites in the eastern parts of the Region for further populations.

Exclude late autumn, winter and early spring fuel reduction burns from known populations.

Monitor populations for numbers flowering in years subsequent to last burn.

Monitor populations for impact of exotic grasses, taking control measures as required.

### Research Requirements

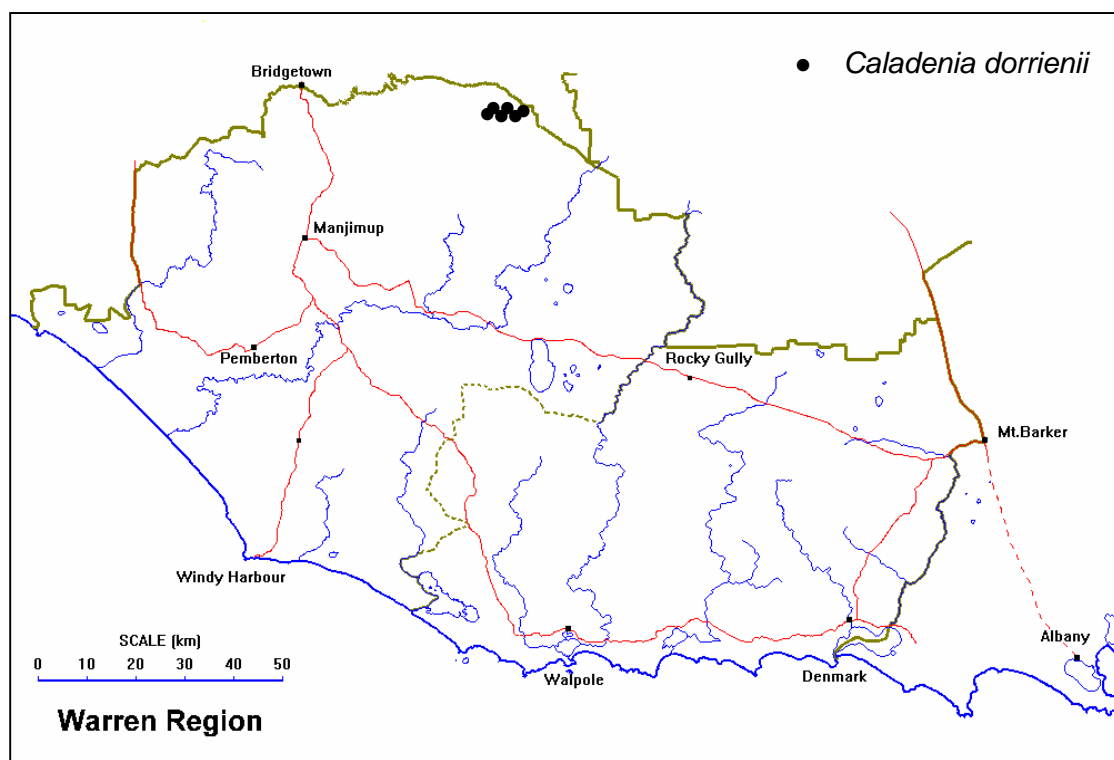
Liaise with Botanic Garden and Parks Authority staff over seed and mycelium collection and storage.

Determine susceptibility to *Phytophthora* spp.

Investigate the species' reproductive biology with specific reference to the effect of fire frequency.

### References

Brown *et al* (1998); Hoffman and Brown (1992, 1998); Hopper and Brown (2001)



## *Caladenia harringtoniae* Hopper & A.P. Br.

### ORCHIDACEAE

#### Pink Spider Orchid

WAR F4/6

*Caladenia harringtoniae* was first collected by Ron Heberle in 1983 from Mt. Clarence (Albany) in the CALM' South Coast Region but has since been collected from a number of locations across the Warren Region. In many areas it flowers only following fire and, as a consequence, a number of populations have not been seen since their original discovery.

The species has been collected from about twenty eight locations in the Region, with twenty four populations known to still contain flowering plants. Four populations have not been relocated or are extinct. The species appears to be relatively well conserved but is in need of ongoing monitoring in relation to habitat change.

#### Description

Pink Spider Orchid has small flowers with relatively narrow, stiffly held deep pink petals and sepals with white margins. Marginal fringes to the labellum are short. The species has up to 3 flowers and reaches heights of about 40 cm. A member of the *Caladenia longicauda* complex, it has affinities with *C. christineae* and *C. winfieldii* but can be distinguished from *C. winfieldii* in its shorter labellum fringes and tapering rather than slightly clubbed sepals and petals. From *C. christineae* it is distinguished by its deep pink rather than cramy white flowers. It has been found growing sympatrically with both and regularly hybridises with *C. christineae*.

*Caladenia harringtoniae* appears to replace *C. christineae* as the total rainfall and length of wet season increase in the south-west of the Region. *Caladenia christineae* occupies sites with poorer drainage, more often on the old plateau in broad wet basins and drainage areas, whereas *C. harringtoniae* is more often found on edges of wet areas in more dissected landscapes, particularly the rejuvenated drainage lines of the Ravensthorpe Ramp.

**Flowering period:** October-November

#### Distribution and Habitat

The species is found between Nannup and Albany where it occurs in a number of habitats but is most common in wet sites where soils are saturated for several months of the year. *Melaleuca*-Flooded gum swamps and flats, and creeklines in Jarrah and Karri forest types are all represented.

#### Conservation Status

Current: DRF-Vulnerable

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Thompson Rd 1	DON	RR	0	Spring 2003	Burnt Autumn 2004
CLM 2	Thompson Rd 2	FRA	SF	67	14/10/1998	
CLM 3 & 26	Lake Muir	FRA	NR	43	24/9/1998	Single population
CLM 4	Stachan	DON	SF	1	1/11/1994	
CLM 6	Palgarup Rd	DON	SF	3	Spring 2003	
CLM 8	Karri Valley	DON	SF	0	17/10/1990	Not seen recently
CLM 9	Iffley FB	DON	SF	0	Spring 2003	Possibly extinct
CLM 11	SW Hwy	FRA	RR	5	29/10/1990	Not relocated
CLM 12	Hill Rd. West	DON	SF	0	Spring 2002	
CLM 14	Mattaband Rd	FRA	SF	12	12/10/1998	
CLM 16	Pooginup Rd	FRA	SF	20+	Spring 2002	
CLM 17	Long 2 Rd	FRA	SF	7	14/10/1997	
CLM 18	Bevan Rd. 2	FRA	SF	68	17/10/1997	
CLM 19	Brumby Rd	FRA	SF	390	20/10/1997	
CLM 20	Bevan Rd. 2	FRA	SF	41	17/10/1997	
CLM 21	Conto Rd	DON	SF	0	Spring 2003	
CLM 22	Moriarty Rd	DON	SF	0	Spring 2002	
CLM 23	Sears Rd	DON	SF	13	Spring 2002	
CLM 24	Beedelup Falls	DON	NP	3	Spring 2004	
CLM 27	Carter Rd	DON	SF	5	Spring 2002	

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 28	Tine Mines Rd	DON	SF	20+	Spring 2002	
CLM 29	Swamp Rd	DON	SF	0	Spring 2002	
CLM 30	SW Hwy/Seaton Ross Rd	DON	RR	0	Spring 2002	
CLM 31	Thomson Rd 3	DON	SF	30+	Spring 2003	Burnt Autumn 2004
CLM 32	Hiker Rd	FRA	UCL	38	16/10/1997	
CLM 33	Spring Block	FRA	SF	47	22/10/1997	
CLM 34	Graphite Block	DON	SF	1	3/10/1997	
CLM 36	Pooginup Rd.	DON	SF	20+	Spring 2002	

### Response to Disturbance

Plants are killed by fire during their active growing period (May-November). However, flowering is known to be stimulated by summer fire (December-April), with most populations having only been seen in any numbers in the spring following a summer fire.

Response to soil disturbance is unknown but comments below probably apply.

As the species is linked to wet sites, significant changes to water tables over time may impact on the long-term viability of populations.

Response to weed invasion is unknown but the species is probably vulnerable to annuals that are able to rapidly occupy a site following fire or other soil disturbance.

### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Monitor populations every 4 to 5 years, preferably after a wet winter.

Avoid late autumn, winter and early spring fuel reduction burns of swamps known to contain populations of this taxon.

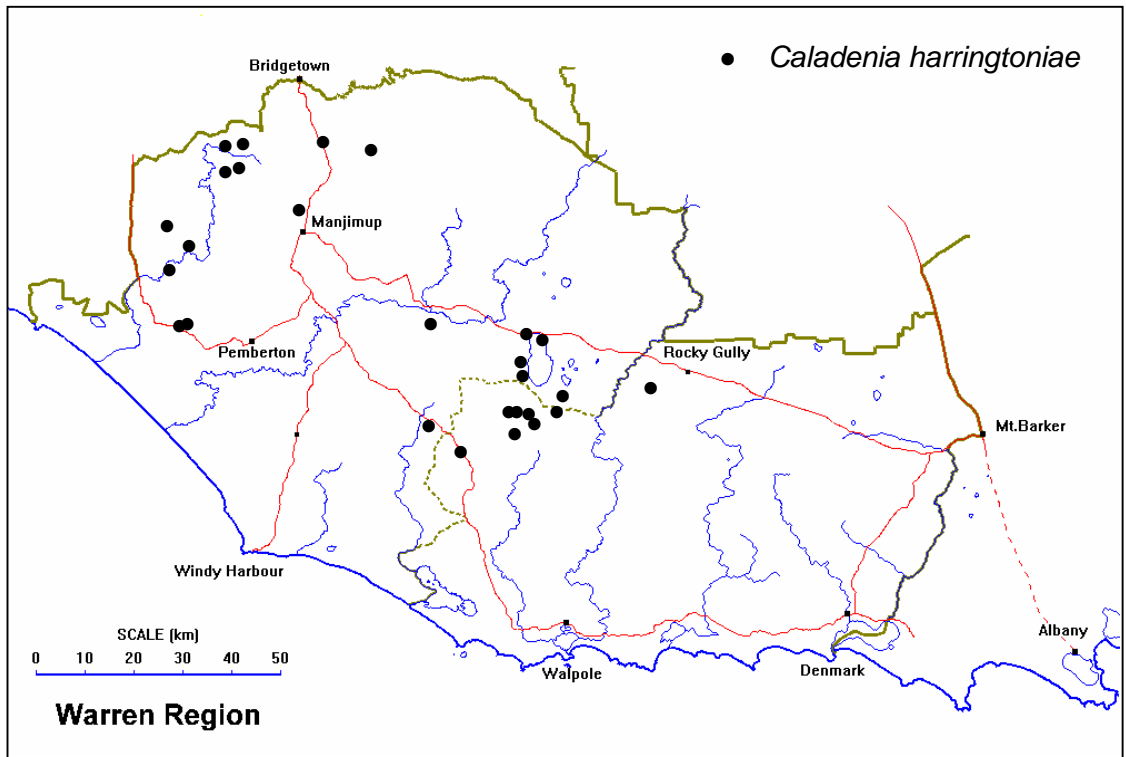
### Research Requirements

Liaise with Botanic Garden and Parks Authority staff over seed and mycelium collection and storage.

Determine susceptibility to *Phytophthora* spp.

### References

Brown *et al* (1998); Hoffman and Brown (1992, 1998); Robinson and Coates (1995); Hopper and Brown (2001)



## *Caladenia winfieldii* Hopper & A.P. Br.

### ORCHIDACEAE

#### Majestic Spider Orchid

WAR F4/23

*Caladenia winfieldii* was first discovered by the late Harry Winfield (after whom it is named) in the 1960's and was relocated and collected by Stephen Hopper and Andrew Brown in 1987. The species is confined to a single known population, consisting of two subpopulations, in State forest south-east of Manjimup. Originally, Harry Winfield had also seen the species at a site about two kilometres to the southwest of the current population and a collection was made by Tony Annels in 1969 from an area some 15 km south of the current area. However, searches over several years have failed to locate the species at either site.

The species is the subject to recovery actions contained in a separate Interim Recovery Plan. The larger part of the population is contained inside exclusion fencing. Hand pollination has been carried out to produce seed for long term storage and development of propagation techniques. Feral pigs, that in the past did a great deal of damage to the site, have been removed.

#### Description

An erect herb 30-60 cm tall with, pale to deep pink flowers, the colour darkening towards apex of labellum. Fringe segments are slender to 6 mm long.

*Caladenia winfieldii* differs from *C. harringtoniae*, with which it occasionally grows, in having somewhat broader petals, clubbed sepals, a longer labellum, taller, broader column and uniformly pink colouration.

**Flowering period:** October-November

#### Distribution and Habitat

The species is currently known from a single area. Old Herbarium collections indicate that there may have been another population 15 km south west of the Strachan population but this has not been relocated.

*Caladenia winfieldii* occurs in a broad swampy depression adjacent to a drainage line, growing in grey sandy loam, rich in humus under *Eucalyptus rudis*, *Melaleuca preissiana* and *Banksia littoralis* low woodland over tall scrub of *Xanthorrhoea preissii*, *Acacia saligna* and *Hakea varia* with a low scrub and herb layer. Plants apparently favour the protection of shrubs and are most often found at the base of and in the skirts of *Xanthorrhoea preissii*.

#### Conservation Status

Current: DRF-Endangered

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Strachan	DON	SF	133	1/1/1998	

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#### Response to Disturbance

Plants are likely to be killed by fire during their active growing period (May – November). However, flowering is thought to be stimulated by summer fire (December – April) when plants are dormant.

Response to mechanical disturbance is unknown but is probably as the same as its response to fire. If vegetative parts are removed before the tuber is fully replaced in early summer plants are likely to be damaged or killed.

Susceptibility to weed invasion is unknown but weeds probably suppress growth.

Prior to fencing, some grazing was impacting on the species.

The species is apparently dependent upon shelter provided by other plants that possibly protect it from grazing.

The species is dependent on winter soil saturation for flowering to occur.

### Susceptibility to Phytophthora Dieback

Presumed not susceptible, though dieback-caused changes to the site have been identified as a threat through loss of canopy protection and changes to site hydrology.

### Management Requirements

For detail see Interim Recovery Plan 15.

Exclude fire during the active growing period of the species between May and late November.

No planned burn for period of IRP.

Collect seed and liaise with Botanic Garden and Parks Authority staff regarding cryogenic storage.

Inspect community health and orchid population numbers annually.

Protect from disturbance during operations.

Monitor for pig activity.

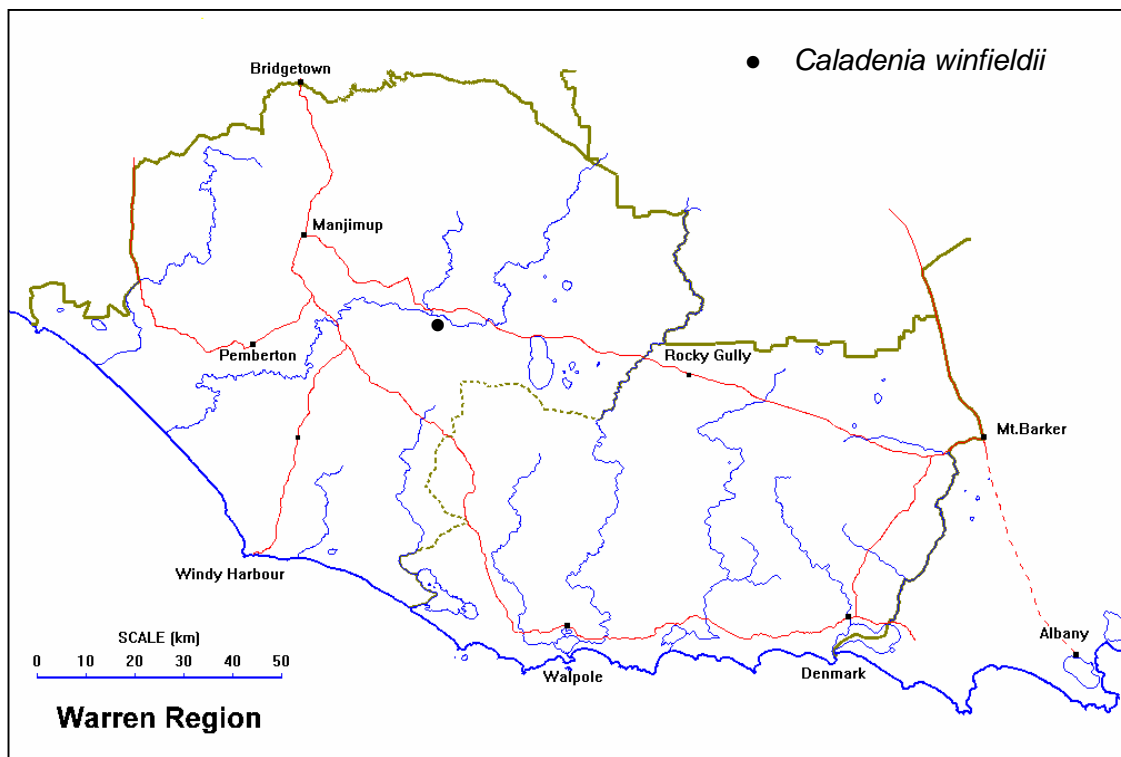
### Research Requirements

Survey for additional populations in areas of suitable habitat.

Monitor the effects of grazing control on that part of the population that has been fenced.

### References

Brown *et al* (1998); Hoffman and Brown (1992); Holland *et al.* (1996); Hopper and Brown (2001)





## *Conostylis misera* Endl.

## HAEMODORACEAE

Grass Conostylis

WAR F4/133

*Conostylis misera* was first collected from the Porongurup Range in 1840 and described by Endlicher in 1846. It is mainly known from CALM's South Coast Region but in 1986 was collected from Lake Kwoornicup, in the northwest part of the Warren Region.

### Description

Grass Conostylis is a small tufted prostrate perennial herb which generally grows in colonial groups, forming mats up to 400 mm across. The soft green flat leaves (5-18 cm long, 2-6 mm wide) are falcate and striate, with thin glabrous margins. The old leaves often remain attached to the plant and appear blackened and twisted. The relatively large flowers are conspicuous, solitary with a 3 cm scape and two to three acuminate, spreading sheathing bracts. The bright yellow flowers have a perianth tube 12-19 mm long with lobes to 18 mm. Flowers and fruits are covered with an indumentum of short branched hairs mixed with longer hairs.

The species is distinguished from other members of the genus by its short,  $\pm$  glabrous soft leaves and large, usually solitary flowers. The perianth enlarges to 20 mm long when in fruit.

**Flowering period:** October-November

### Distribution and Habitat

Plants occur in seasonally waterlogged, but not inundated, brown sandy clay loam flats from north of the Stirling Range to Narrikup and across to South Stirling. In CALM's South Coast Region where the species is more common it has disappeared from several sites and is under threat by weed invasion and "black spot" disease. Only one record is known for the Warren region at Kwoornicup Lake.

### Conservation Status

Current: DRF-Vulnerable

### Known populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 18	Kwoornicup Lake	FRA	NR	na	9/10/1986	Relocate

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### Response to Disturbance

The species is thought to re-establish successfully from seed after fire.

Plants may be out-competed by weeds.

As the species occurs on seasonally inundated wetlands it is likely to be susceptible to changes in hydrology and climate.

### Susceptibility to Phytophthora Dieback

Unknown

### Management Requirements

Relocate the Warren population which has not been seen since 1986.

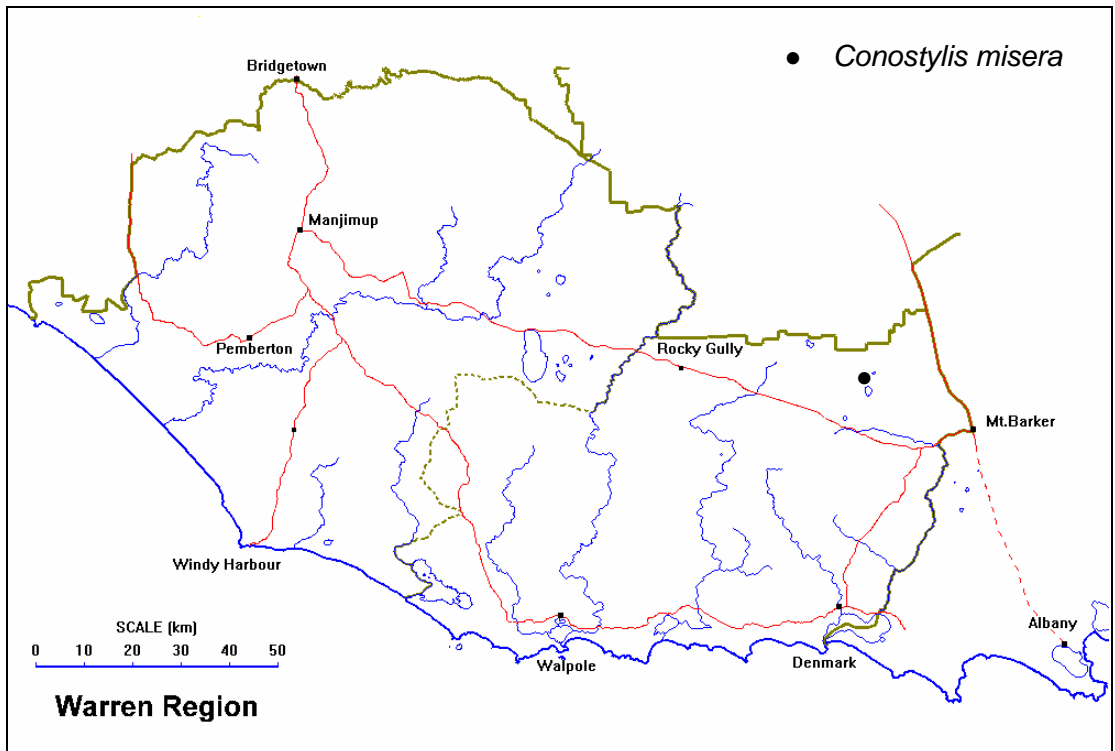
Search areas of suitable habitat for further populations.

### Research Requirements

None

### References

Brown *et al* (1998); Hopper *et al.* (1987); Robinson and Coates (1995)



## *Diuris drummondii* Lindley

## ORCHIDACEAE

Tall Donkey Orchid

WAR F4/8

Described by Lindley in 1840, this species has a confused taxonomic history and has at various times been placed with *Diuris laxiflora* and *D. emarginata*. It was reinstated by Mark Clements in 1989.

### Description

*Diuris drummondii* is the last flowering and tallest of the Western Australian donkey orchids, ranging from 50-105 cm high. Plants have three to seven or more widely spaced pale yellow flowers and sometimes form dense colonies of hundreds of individuals. Flowering predominantly occurs following Summer fire and in the absence of fire is often sporadic. Some populations, however, flower every year e.g. Lake Muir.

Tall Donkey Orchid differs from the related *Diuris emarginata* in its more robust habit, generally later flowering period and larger flowers.

**Flowering period:** Late November-January

### Distribution and Habitat

The species is recorded from a wide geographical range between Northampton and Walpole, growing in low lying depressions and swamps that contain water well into summer. In the Warren Region it has been found in peat swamps on the South Coast with *Banksia littoralis*, *Lepidosperma effusum*, *Baumea articulata* and *Haloragis brownii* and in similar habitat in the Lake Muir area with the addition of a *Eucalyptus rudis*, a range of *Melaleuca* species and sedges. It has also been recorded from swamps with sandy clay bases. One exception to this (CLM 5) was when a single plant was found growing on a track well clear of water; however the track passes through swamps both north and south of the recorded plant and it is possibly the result of transported seed.

Closely occurring populations within in the Lake Muir system may represent a single population of widely dispersed individuals.

### Conservation Status

Current: DRF-Vulnerable

### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Muir Hwy 1	DON	NR/RR	40+	25/11/1997	
CLM 2	Buranganup Rd	DON	SF	0	13/12/1994	
CLM 3	Lake Muir Rd	DON	SF	2	6/1/1994	
CLM 4	Bangalup Rd	FRA	SHRes/PP	100	5/12/1994	Three sub-populations
CLM 5	Yornup	DON	Rail Res	1	14/12/1994	
CLM 7	Lake Muir 1	DON	NR	1	23/12/1991	
CLM 8	Kodjinup NR 1	DON	NR	166	23/12/1993	
CLM 9	Lake Muir 2	DON	NR/RR	40	20/12/1993	
CLM 10	Frankland River Bridge	FRA	SHI	15	8/11/1992	
CLM 11	Walpole-Nornalup NP	FRA	NP	0	4/9/1997	Based upon a single visit. No collection was made and not seen since
CLM 12	Lake Muir 3	DON	NR	20+	5/12/1997	
CLM 14	Owingup NR 1	FRA	NR	6	22/12/1995	
CLM 15	Owingup NR 2	FRA	NR	300	22/12/1995	
CLM 17	Kodjinup NR 2	DON	NR	8	15/12/1997	
CLM 18	Muir Hwy 2	DON	RR	20	25/11/1997	
CLM 19	Muir Hwy 3	DON	RR	2	25/11/1997	
CLM 22	Lake Muir 4	DON	NR	20	8/12/1997	
CLM 23	Geordinup Rd	DON	NR	200	8/12/1997	Part Lake Muir-Byenup wetland system
CLM 24	Neeranup Rd 1	DON	NR	20	8/12/1997	As above
CLM 25	Neeranup Rd 2	DON	NR	150	8/12/1997	As above

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 26	Byenup Lagoon	DON	NR	200	17/12/1997	As above
CLM 27	Yarnup NR	DON	NR	50	28/11/1997	

### Response to Disturbance

Plants are likely to be killed by fire when in active growth (May-November). However, they are not affected by fire once their new tubers are fully formed and flowering appears to be stimulated by summer wildfires, with most populations “disappearing” between fire events.

Response to soil disturbance is unknown.

As the occurrence of the species is linked to wet sites, with plants often found with their base in standing water, changes to water tables over time may impact on their long-term viability.

Response to weed invasion is unknown but the species is probably vulnerable to weedy annuals that are able to occupy sites following fire or soil disturbance.

### Susceptibility to Phytophthora Dieback

Unknown.

### Management Requirements

Monitor populations prior to proposed burns and for two years following, or every second year in intervening periods.

Exclude late autumn, winter and spring fuel reduction burns from all populations and if possible all fire from populations growing in peat that has the potential to ignite and kill tubers.

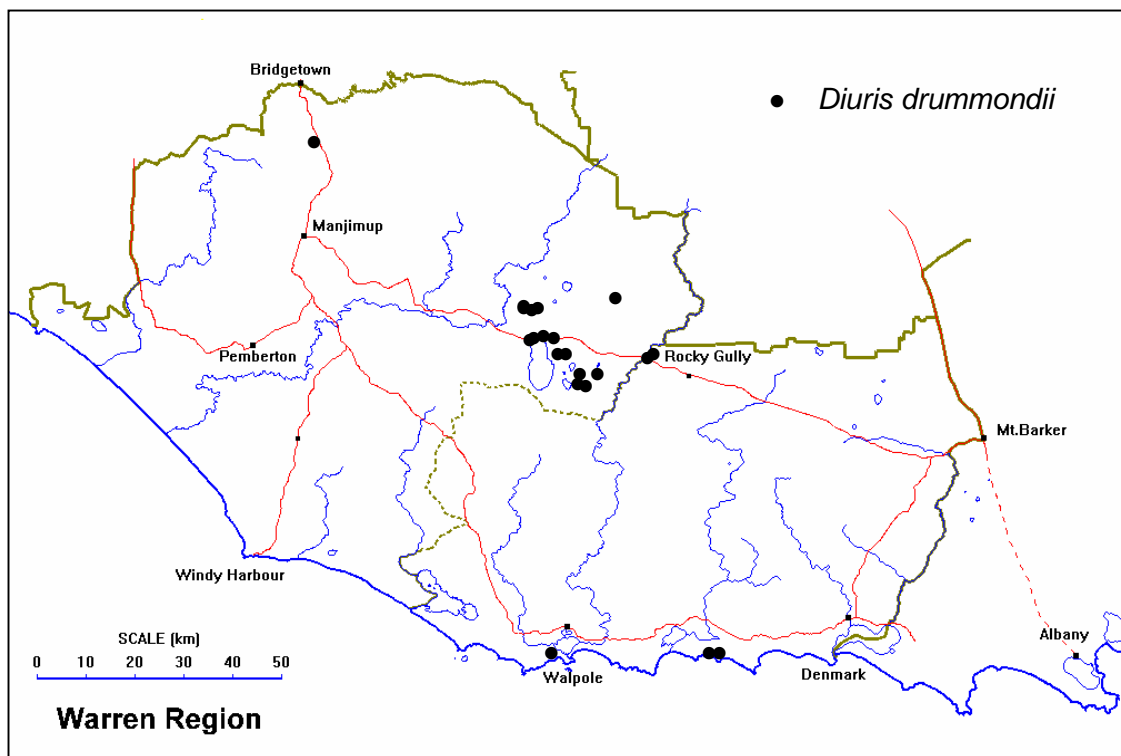
Search areas of suitable habitat for further populations.

### Research Requirements

Determine susceptibility to *Phytophthora* spp.

### References

Brown *et al* (1998); Hoffman and Brown (1992, 1998)



## *Drakaea micrantha* Hopper & A.P. Br. ms

## ORCHIDACEAE

### Dwarf Hammer Orchid

WAR F4/9

*Drakaea micrantha* was first collected from the Porongurups area by Goadby in 1930 and, although noted as being unusual by the taxonomist Richard Rogers, was placed in *Drakaea elastica*. It was not collected again until the 1970s, when Alex George found it in the southern suburbs of Perth and Andrew Brown collected it at Yarloop, both these collections being placed in *D. thynniphila*. In the 1980's, further collections and work on specificity of pollinators by Stephen Hopper and Andrew Brown resulted in the recognition of *D. micrantha* as a distinct species.

### Description

Growing to 30 cm tall, Dwarf Hammer Orchid has a diminutive flower 12-25 mm long and a small heart shaped, ground hugging leaf to 15 mm wide. The leaf is distinctive in that it has prominent white and pale green veins.

The species often grows with, and can be mistaken for, other hammer orchids, in particular the similar *D. glyptodon* which has a more robust labellum and lacks a prominent erect terminal spike-like appendage on the column and *D. thynniphila* which has a less tapered labellum and a larger, less prominently veined, often hairy leaf.

**Flowering period:** September-October

### Distribution and Habitat

The species has a wide distribution from Perth to the Porongurups, in the south being recorded in areas near Nannup, Mount Barker, Denmark, Walpole and Granite Peak. Plants occur on depauperate grey leached sands in stunted *Allocasuarina fraseriana*, *Eucalyptus marginata* woodland and forest, usually on old firebreaks and open disturbed areas where competition has been removed.

### Conservation Status

Current: DRF-Endangered

### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 3	Thompson Rd. 1	FRA	SF	3	13/10/1998	
CLM 6	Thompson Rd 2	FRA	SF	4	27/10/2001	
CLM 9	Mount Lindsey	FRA	NP	100	15/11/1998	
CLM 10	Dingo Flat Rd	FRA	PP	117	26/10/1999	
CLM 12	Granite Rd	FRA	SF	14	27/8/1997	
CLM 13	Stan Road	FRA	NP	8	8/10/2002	Two sub-populations
CLM 19	Weld Rd	FRA	NP	7	29/9/2001	
CLM 23	Vermullen Rd	FRA	SHRes?	?	3/10/1997	

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### Response to Disturbance

Plants are killed by fire when in active growth (May-October). However, they are not affected by fire once their new tubers are fully formed and dormant (November-April).

Response to mechanical disturbance is unknown but is probably the same as the response to fire if the above ground parts are removed before the new tuber is fully formed in early summer. Observation of known populations indicates that plants are able to quickly recolonise areas that have been disturbed.

Susceptibility to weeds is unknown, but plants are probably vulnerable to displacement by weed species.

Response to changes in soil moisture is unknown.

### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Monitor populations annually.

All populations need to be reassessed to review their conservation status.

Conduct further surveys for new population in the region.

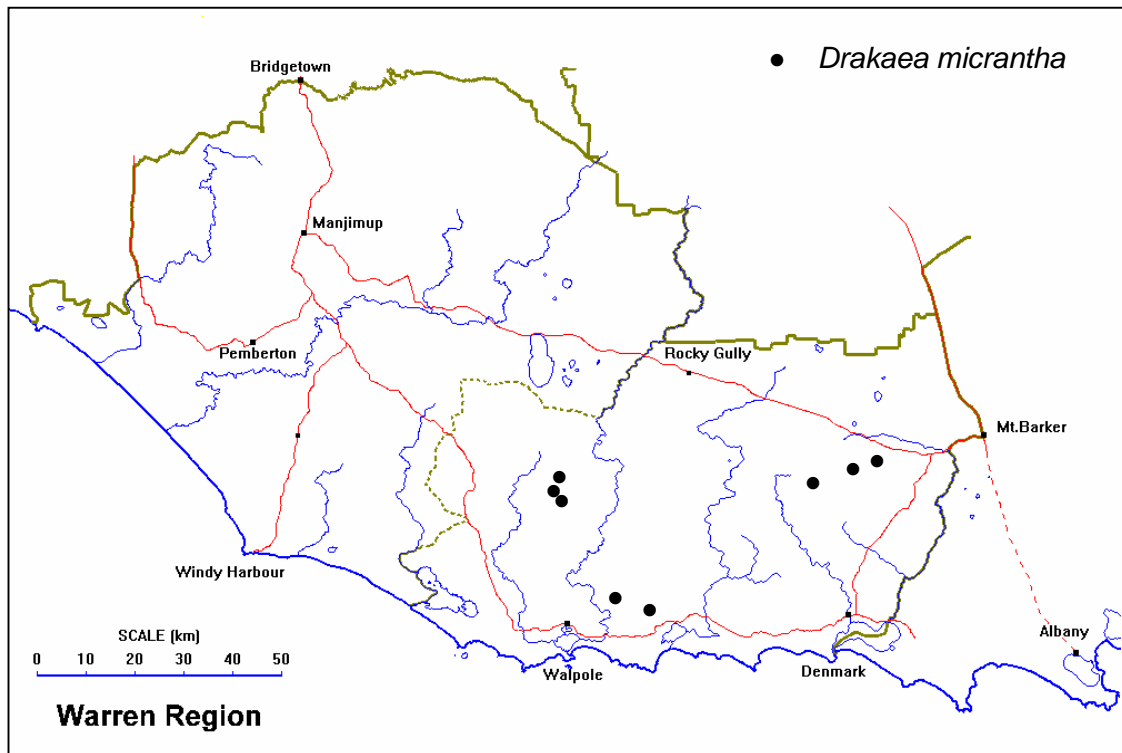
Install rare flora markers on all populations found along road reserves.

### Research Requirements

Determine susceptibility to *Phytophthora* spp.

### References

Brown *et al* (1998); Hoffman and Brown (1992, 1998); Robinson and Coates (1995); Hopper, *et al.* (1990)



## *Kennedia glabrata* Lindley

## PAPILIONACEAE

Northcliffe *Kennedia*

WAR F4/12

*Kennedia glabrata* is a rarely seen species that was described by Lindley in 1836 as *Kennedyya glabrata* from material grown in a greenhouse, the material's origins described as '...a New Holland plant, probably from the South coast....', this species was shuffled taxonomically out of and back into *Kennedia* by Bentham, and later into *Caulinia* by Mueller. Until recently, it was known only from populations near Northcliffe, hence its common name. However, it has now been collected from the Albany area (housed at the Albany Herbarium) with one collection made from the Youngs Siding area between Denmark and Albany and the other from about 30 km North of Albany immediately east of the Porongurups. This extension of the known distribution would be consistent with material being grown in horticulture in England in 1835, material probably originating from King George Sound. More recently it has also been found in the Esperance area.

Recruitment and persistence of individuals in populations is not known, complicating ranking assessment of the taxon's conservation status. Observations by Brenda Hammersley on William Bay populations indicate seedling mortality is high where plants have not reached sufficient maturity to survive short dry periods in spring. Plants in one of the Weld populations lost above ground parts when drought conditions were experienced, followed by signs of resprouting following more favourable conditions.

### Description

*Kennedia glabrata* is a prostrate perennial creeper to 3 m diameter with hairy stems and divided, trifoliolate, leaves with each leaflet obovate to very broadly obovate, cuneate or emarginate, 10-25 mm long, 7-27 mm wide, the margins undulate, sparsely hairy. Flowers are in simple umbel like racemes of 3-7 on erect peduncles to 15 cm. The bracts shed early. The calyx is 4-6 mm long, with white hairs, lobes 1.5-2.5 mm long. The standard is scarlet red and the eye yellow. The pod is 15-25 mm long and narrowly cylindrical.

*Kennedia glabrata* is identifiably different from *Kennedia prostrata* with *K. prostrata* having an inflorescence consisting of a solitary flower or pair of flowers and usually larger leaflets. *K. coccinea* differs from *K. glabrata* in having smaller stipules 1-4 mm long and usually larger leaves, an inflorescence of 5-20 flowers, a calyx 5-8 mm long with lobes 2-4 mm long with brown silky hairs and a compressed pod 40-60 mm long.

**Flowering period:** September-November

### Distribution and Habitat

The species is recorded from thirteen populations between Northcliffe and Albany with an outlier east of Esperance. It is known from granite outcrops (including islands) where it grows in shallow skeletal soils in swales and cracks on the rock surface with a suite of other species similarly adapted to these extreme sites, and one atypical occurrence in a peaty swamp area on an old fence line / firebreak.

### Conservation Status

Current: DRF-Vulnerable

### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments /condition
CLM 1	Chudalup	DON	NP	10	14/9/1994	
CLM 2	Muirillup	DON	SF	250	12/10/1998	
CLM 3	Weld 1	FRA	SF	0	29/8/1997	
CLM 4a	Woolbale Hills 1	FRA	NP	150+	14/3/1989	Area not usually accessible in spring.
CLM 4b	Woolbales Hills 2	FRA	NP	5	26/8/1997	
CLM 5	Broke Inlet 1	FRA	VCL	12	29/11/1991	
CLM 6	Broke Inlet 2	FRA	VCL	2	29/11/1991	
CLM 7a	William Bay	FRA	NP	10	11/11/2000	
CLM 7b	William Bay	FRA	NP	1	13/11/1997	
CLM 8	Maringup	DON	NP	30	29/8/1997	
CLM 9	Burnett SF	FRA	SF	12	21/9/1997	

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments /condition
CLM 10	Pingerup Rd	FRA	NP	1	12/12/1997	
CLM 11	Moores Track	DON	NP	4	21/9/1997	
CLM 12	Break Rd	FRA	SF	7	22/10/1998	
CLM 13	Railway Parade	FRA	SF	7	10/10/1998	

### Response to Disturbance

Although some resprouting has been observed, most plants are presumed to be killed by fire. However, recruitment from seed is likely to be stimulated by fire.

The long-term response to change in soil moisture is unknown, but seedling mortality is high during dry periods and some plants appear able to resprout when conditions are more favourable.

Response to soil disturbance is unknown for most populations, but an atypical population in William Bay is probably sustained by disturbance and fire.

### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Monitor populations annually if possible.

Search areas of suitable habitat for additional populations.

Collect seed from a range of populations.

### Research Requirements

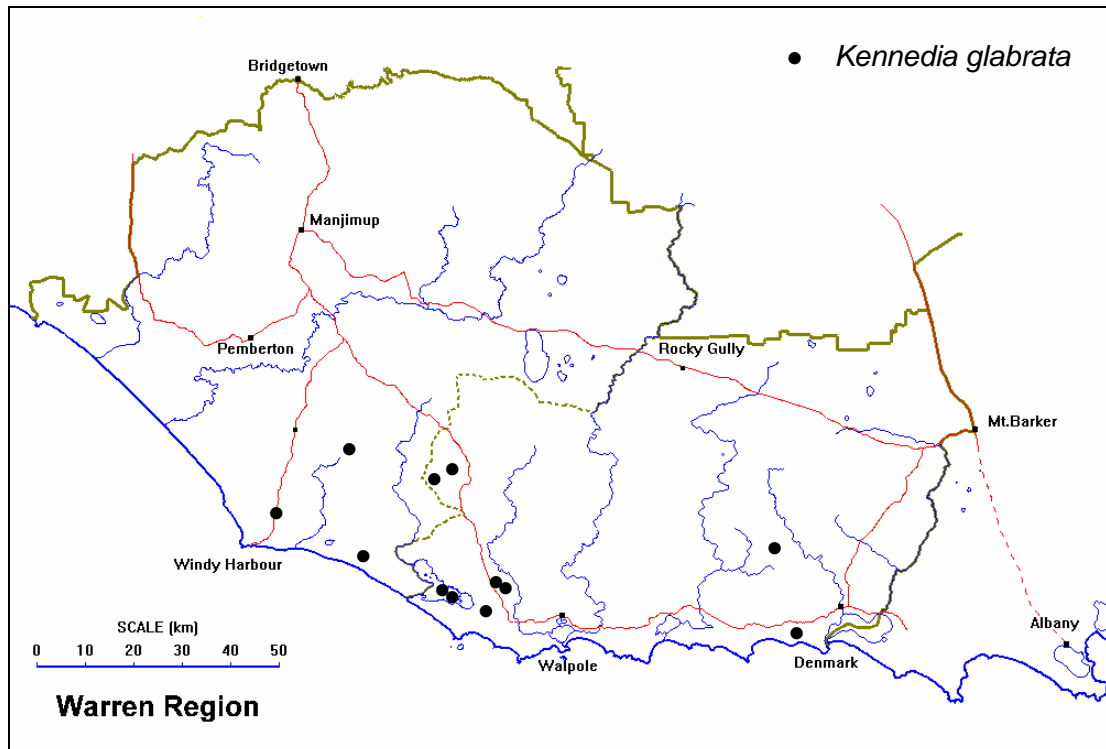
For selected populations, monitor individual plants over multiple years in order to gather data on the species regenerative, reproductive and conservation biology.

Determine susceptibility to *Phytophthora* spp.

### References

Bentham (1864); Brown *et al* (1998); Hopper *et al.* (1990); Robinson and Coates (1995); Rye and Hopper(1981); Wheeler *et al.* (2001)





## *Laxmannia jamesii* Keighery

## ANTHERICACEAE

James's Paper-lily

WAR F4/14

*Laxmannia jamesii* was first collected near Albany in 1972 by Greg Keighery who, following cytological studies and revision of the genus in 1987, described the species in honour of the late Dr. Sid James. The species was considered for deletion from the declared rare flora list in 1996, but was not removed due to some doubts over the accuracy of identification of plants in some populations and lack of recent data on others, particularly responses to recent disturbance such as fires.

### Description

James's Paper-lily is a tufted, stilted, rambling herb with slender wiry stems to 20 cm long. Leaves are narrow linear, 9-20 mm long and scattered singly along the stem with leaves clustered at the end. The sheath is translucent 4-7 mm and coarsely fimbriate. Flowering inflorescences are both sessile and axillary, 3-4 flowered along the stems and 4-8 flowered terminally. Terminal flowers are on a peduncle 12-30 mm long. The five red-brown outer inflorescence bracts are 3-4 mm long. The translucent, fimbriate inner bracts are one per flower and 2-3 mm long. Sepals are red-brown and petals are white, both about 4 mm long.

*Laxmannia jamesii* is distinct from *L. minor* which has short crowded stems and only terminal pedunculate inflorescences and *L. sessiflora* subsp. *australis* which has sessile inflorescences.

**Flowering period:** May-July

### Distribution and Habitat

The species is known from Two Peoples Bay to Busselton, growing in seasonally damp grey sandy soils in low closed heath over sedges or seasonally moist grey sandy laterite in jarrah woodland.

### Conservation Status

Current: DRF -Vulnerable

### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 4	South Coast Hwy	FRA	RR	50+	26/5/2004	Consists of several sub-populations that require reassessment as they appear to have diminished in size
CLM 8	Sheepwash SF 1	FRA	SF	1000	25/4/1998	Many sub-populations that require reassessment
CLM 12	Sheepwash SF 2	FRA	SF	50	2/7/1994	
CLM 13	Gumlink Rd	FRA	NR	0	21/10/1998	Possible misidentification. Not relocated
CLM 19	Pratt Road	FRA	UCL	100	26/5/2004	
CLM 20	Mitchell River Rd 1	FRA	SF	1000	27/5/1998	
CLM 21	Mitchell River Rd 2	FRA	SF	1000	29/4/1998	Two sub-populations
CLM 22	Sand Track 1	FRA	SF	200	15/8/1999	
CLM 24	Sheepwash SF 3	FRA	SF	1000	27/4/1999	
WAR 100	Sand Track 2	FRA	SF	na	27/7/1995	

### Response to Disturbance

Fire appears to kill adult plants, with, populations re-establishing from seed. Flowering has been recorded within two years of Autumn and Spring burning.

The occurrence of the species in disturbed areas in 'Sheepwash', on Gum Link Road and the South Coast Highway indicates it is able to re-establish following soil disturbance. However, the ideal frequency of disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

## Susceptibility to *Phytophthora Dieback*

Unknown.

## Management Requirements

Monitor populations annually.

Search for additional populations in areas of suitable habitat.

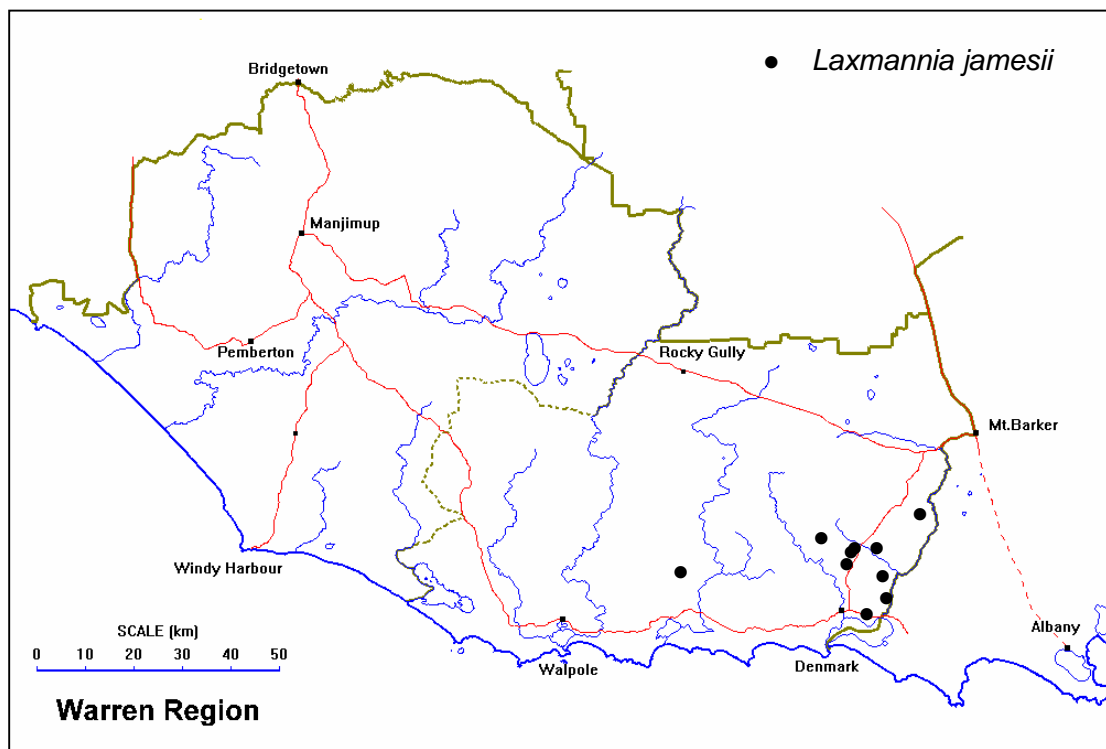
With South Coast Region staff, arrange for all populations to be visited over a one year period to confirm identifications and status with a view of nominating the species for removal from the Declared Rare Flora list.

## Research Requirements

Determine susceptibility to *Phytophthora* spp.

## References

Brown *et al* (1998); Keighery (1987); Robinson and Coates (1995)



## *Meziella trifida* (Nees) Schindl.

## HALORAGACEAE

WAR F4/204

*Meziella trifida* was collected by Preiss in 1840 and described by Nees in 1844 under the name *Gonocarpus trifidus* (as '*Goniocarpus*'). It was moved to *Haloragis trifida* by Walpers in 1846 and then to *Meziella trifida* by Schindler in 1905. The species was then not seen again and was presumed to be extinct until a population was located by Greg Keighery on the edge of the Scott Plains east of Augusta in 1992. This population consisted of mature plants, enabling confirmation of its generic status. The species is currently known from three populations, one of which was found in the Warren Region by Ray Cranfield during the summer of 1997.

### Description

*Meziella trifida* is a decumbent, glabrous, annual or perennial semi-aquatic herb with mainly reddish stems and leaves. The main stems are prostrate, freely branching, rooting at nodes. The lateral stems ascending, fertile. Leaves are alternate, entire, linear after water recedes and 3.5-5 mm long, sessile, acute, or, when immersed or submerged, trifid with two linear lobes at or above the middle and no longer than it. The inflorescence is an indeterminate spike of single flowers, each subtended by a leaf like bract and two short red bracteoles. Individual flowers are four-merous, bisexual, sessile with four red, subulate sepals 1.7 mm long, which are entire, smooth, erect, persistent and increasing in size as a corona on the fruit. The four petals are red, narrowly hooded, 1.7 mm long and shed immediately after anthesis. Each flower has four stamens and four styles. The ovary is small, four-locular, expanding rapidly in fruit. Fruit is about 2.7 mm long, 2.7 mm wide, red, indehiscent with one seeded pyrenes contained within a dry exocarp, (not splitting into separate mericarps at maturity as in *Myriophyllum*), and with clusters of 6-7 soft spreading spines to 1.3 mm long on the lower half of the torus below each sepal.

**Flowering period:** November-February

### Distribution and Habitat

The species is found between Albany and Scott River, growing in winter wet depressions and watercourses.

### Conservation Status

Current: DRF -Vulnerable

### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 2	South West Hwy	FRA	NP	na	25/2/1998	Three sub-populations
CLM 4	South West Hwy – Beardmore Rd	FRA	NP/SF /RR	na	5/5/2000	
CLM 5	Woolbale Rd	FRA	NP	100	15/4/1998	
CLM 6	Dixie Rd	FRA/ DON	SF	na	15/4/1998	
CLM 7	South Western Hwy – Inlet River Bridge	FRA	RR	100	22/1/1999	
CLM 8	Bandicoot Rd	FRA	SF	100+	18/1/2004	
CLM 9	Chesapeake Rd 1	DON	NP	1000	18/1/2001	
CLM 10	Circus Beach Walk Trail	FRA	NP	1000	17/3/2001	
CLM 11	Boggy Lake	FRA	NP	100	26/2/2001	
WAR 100	Chesapeake Rd 2	DON	NP	na	18/2/2004	
WAR 101	Gardner Rd	DON	NP	na	3/3/2004	
WAR 102	Chesapeake Rd 3	DON	NP	na	3/3/2004	
WAR 103	Gardner Rd 2	DON	NP	na	3/3/2004	
WAR 104	Gardner Rd 3	DON	NP	na	3/3/2004	
WAR 105	Windy Harbour	DON	NP	na	12/220/04	

### Response to Disturbance

As *Meziella trifida* is an aquatic plant, fire is presumed to have little impact unless the areas in which it grows dry out. It is possible that seeds may then be killed. This may affect recruitment as the species is an annual seed obligate.

Response to soil disturbance is unknown.

Being an aquatic, the species will be affected by any changes to in soil moisture through drainage and climate change.

Response to weed invasion is unknown.

### **Susceptibility to Phytophthora Dieback**

Unknown.

### **Management Requirements**

Locate populations in the Frankland district and assess their conservation status.

Search areas of suitable habitat for further populations.

Monitor populations to determine the impact of disturbance.

Liaise with Main Roads WA to protect a population on their land.

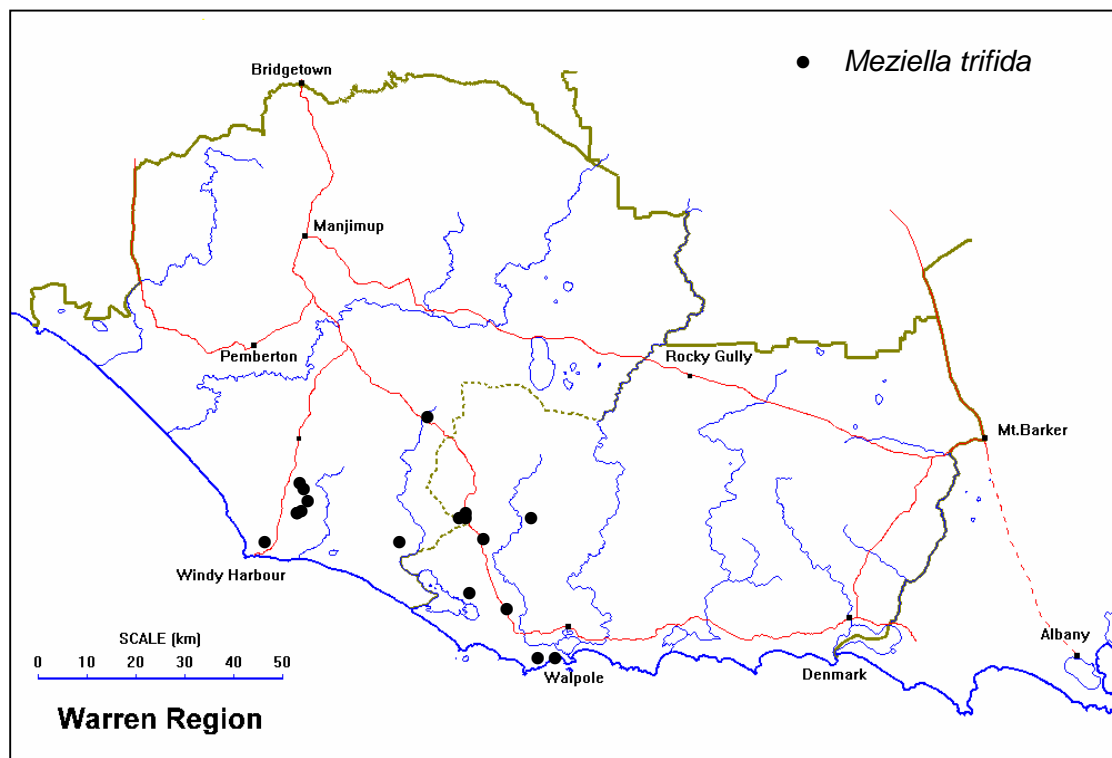
### **Research Requirements**

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### **References**

Brown *et al* (1998); Orchard (1990); Orchard and Keighery (1993); Robinson and Coates (1995)



## *Microtis globula* R. Bates

## ORCHIDACEAE

### Globular Mignonette Orchid

WAR F4/15

This elusive orchid was described in 1984 by Robert Bates from material he collected near Walpole. It flowers following summer fire. Three known locations have been burnt in the Warren Region in recent years but the species has not been relocated.

Field observation indicates that the species is restricted to organic soil communities and may be vulnerable to regimes that impact on the substrate. The failure of each of the known populations to respond to recent fire may be related to the nature of fire events to which they have been subject. One population that was burnt in very early summer may have been burnt too early and the fire may have been too cool. Two other populations were burnt in a hot fire in late autumn. This fire may have been too late in the season or, alternatively, being such a hot fire, underground tubers may have been destroyed as the peat substrate burnt. Urgent work is required to locate populations of this taxon and resolve issues related to the species conservation biology.

#### Description

An herbaceous perennial with a single terete leaf, 2-4 mm wide by 8-25 cm long and flowering stems up to 35 cm with up to forty pale yellow-green flowers to 2 mm wide and long that are crowded along its upper part. The lateral sepals are prominently incurved.

Although superficially similar to other *Microtis* spp., *M. globula* is readily distinguished by its prominently incurved lateral sepals, a feature that gives the flowers their globular appearance and leads to both the scientific and common names. It is one of the last *Microtis* spp. to flower each year.

**Flowering period:** December-January

#### Distribution and Habitat

The species has been recorded from Albany to west of Walpole, growing in seasonally wet peat swamps some nine to twelve months following summer fire.

#### Conservation Status

Current: DRF-Vulnerable

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments / condition
CLM 1	Railway Parade	FRA	NP	0	Spring 2003	
CLM 2	Keystone 2 Rd	FRA	NP	0	Spring 2003	
CLM 3	Cemetery Rd	FRA	SHRes	0	Spring 2003	Burnt 2002 (Golf Course)
CLM 5	William Bay	FRA	NP	200	1/1/1975	Need to relocate

#### Response to Disturbance

The occurrence of this species in peat makes it vulnerable to fires that burn into and remove the substrate. However, as it has only been recorded following hot summer fires this is likely to be a minor threat. In order to promote flowering, a fire regime is required that is restricted to periods when actively growing above ground parts are not present but the organic soil substrate is sufficiently wet to remain unburnt.

Response to soil disturbance is unknown.

Response to changes in soil moisture through drainage and changing climate is unknown.

Response to weed invasion is unknown.

#### Susceptibility to Phytophthora Dieback

Unknown.

#### Management Requirements

Monitor known populations annually.

Search areas of suitable habitat for further populations.

Amend fire management practices in the area of previously known populations to favour a summer regime.

### Research Requirements

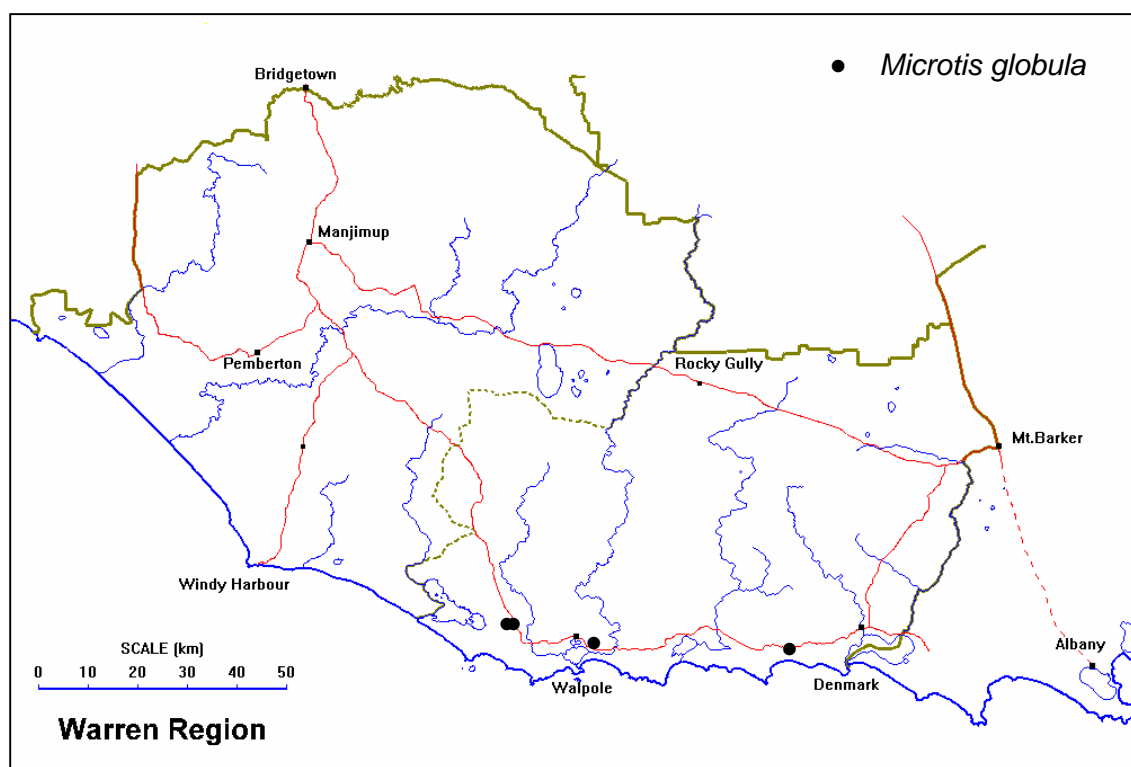
If populations are found, urgent studies into the species' biology are needed.

If populations are located, liaise with Botanic Garden and Parks Authority staff to initiate seed and mycelium collection for storage and possible propagation of plants for future translocations.

Determine susceptibility to *Phytophthora* spp.

### References

Bates (1984); Brown *et al* (1998); Robinson and Coates (1995); Hoffman and Brown (1992, 1998); Hopper *et al.* (1990)



***Rhacocarpus rehmannianus* (Muell. Hall.) Wijk & Margad. var. *webbianus* (Muell. Hall.) J.-P. Frahm**

HEDWIGIACEAE

WAR F4/99

*Rhacocarpus rehmannianus* var. *webbianus* is one of only four Western Australian mosses presumed to be endemic. The taxon was described in 1897 under the name *Harrisonia webbiana* and moved into *Rhacocarpus* in 1900. More recently, Frahm (1996) reduced it to a variety of *rehmannianus*. For many years the taxon was known from one population near Northcliffe (type locality Mount Lindesay). However, following extensive searches a second small population was located by B. Jackson and T. Middleton in a namma hole on a granite outcrop North of Walpole.

**Description**

*Rhacocarpus rehmannianus* var. *webbianus* has a fine textured appearance and irregularly branched, decumbent red stems, which are matted into strands to 10 cm long. Older parts of stems (lower parts) are bare of leaves. Leaves are deep green, glossy, spirally arranged, scattered along the stems, procumbent, overlapping but not stem clasping, obovate, 1-1.5 mm long by 0.5 mm wide. Margins are concave, entire and inrolled below the apex which is narrowly acute with a short (0.25 mm) hairpoint. Costa are absent. The alar cells are bronzed orange.

**Distribution and Habitat**

The variety is currently known from two populations, growing in flowing water and a waterhole, on granite outcrops. No other populations have been found, despite extensive searches in similar habitat across the Region.

**Conservation Status**

Current: DRF – Critically Endangered

A major threat to this taxon is the use of its habitat by tourists and recreationists as a footpath. A population near Northcliffe is under immediate threat as it is growing in a gully that tourists and recreationists use as a shortcut to the base of the granite dome. Urgent work is required to modify pathways and barriers in the area to provide protection to the taxon.

**Known Populations in the Warren Region**

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM1	Mt. Chudalup	Donnelly	NP	*	23/3/2004	* Area of 20 square metres recovering after fencing
CLM 2	Mitchell Road	Frankland	SF	na	7/11/1998	Assess recreational impact

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**Response to Disturbance**

Response to fire is unknown.

The taxon may be susceptible to walkers who could damage the sods that fix it to the substrate.

It is unlikely to be affected by small short-term changes in soil moisture as it grows in seasonally wet/dry areas and can withstand limited summer drought. However, there is a potential threat of it being replaced with other mosses if sites dry out for long periods.

Response to weed invasion is unknown. Mechanical removal of weeds may cause physical damage to the substrate and should be avoided.

**Susceptibility to *Phytophthora* Dieback**

Unknown, possibly irrelevant.

**Management Requirements**

Protect known population from disturbance by using barriers and redesigned boardwalks. Additional fencing is required.

Continue searches in areas of suitable habitat for additional populations.

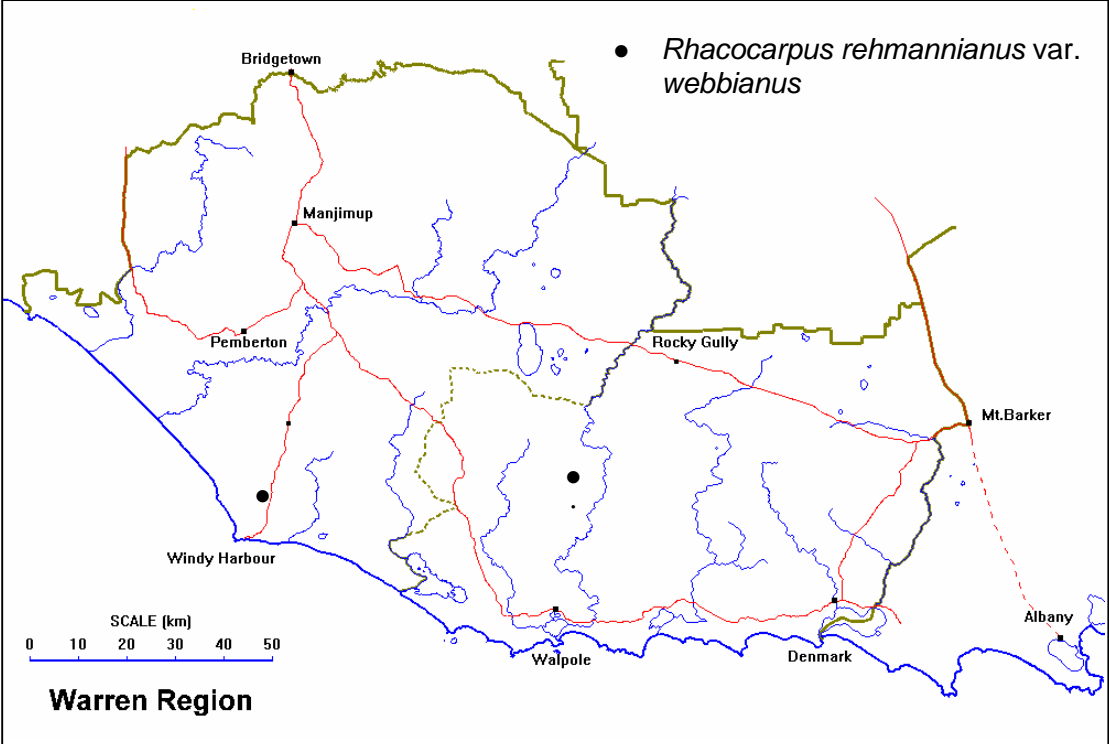


**Research Requirements**

None

**References**

Brian Best (personal communication); Frahm (1996); Stoneburner and Wyatt (1996)



## *Sphenotoma drummondii* (Benth.) F. Muell.

### EPACRIDACEAE

Mountain Paper Heath

WAR F4/134

This taxon was gazetted as DRF in 1996 as a result of work being done by Sarah Barrett of CALM's South Coast Region who found that it was under immediate threat in the Stirling Ranges from *Phytophthora*. Despite searches over three years, a population on Mt. Frankland had not been relocated. More recently, verbal advice from botanist Arthur Weston indicated the taxon was in fact still present in the latter area and a recent survey confirmed the presence of at least eight living plants and two dead plants.

#### **Description**

*Sphenotoma drummondii* is an erect robust shrub to 0.5 m high with densely crowded, erect to spreading, long-acute, pungent leaves 40-80 mm long by 8-10 mm wide. Leaves are ciliate in the lower half and appressed to the stem below the inflorescence which is a compact, cylindrical to ovoid spike of up to 40 flowers. Flowers are white, each subtended by a broadly acuminate, pungent brown leaf-like bract 8-15 mm long with ciliate margins. Sepals are elliptic, acute, about 10 mm long. The corolla, which is 14-17 mm long, has a constricted throat and lobes 5-7 mm long.

**Flowering period:** October-December

#### **Distribution and Habitat**

The species grows in rock crevices on high granite peaks, principally in the Stirling Range (five populations) in the South Coast Region. A single population is recorded at Mt. Frankland within the Warren Region with another possible population on a granite outcrop in the Denbarker area (not relocated despite searches in 1997).

#### **Conservation Status**

Current: DRF-Endangered

The Mt. Frankland population that was recently relocated may be at risk if a proposal to put the area on the Rock Climbers atlas of places to climb succeeds.

#### **Known Populations in the Warren Region**

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<b>Pop. No.</b>	<b>Location</b>	<b>District</b>	<b>Land status</b>	<b>No. of plants</b>	<b>Last survey</b>	<b>Comments/condition</b>
CLM 12	Mt. Frankland	Frankland	NP	5	5/3/1998	

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#### **Response to Disturbance**

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to weed invasion is unknown.

The location of plants in fissures, cracks and on ledges would indicate plants are vulnerable to damage from rock climbers.

#### **Susceptibility to *Phytophthora* Dieback**

Research conducted on Stirling Range populations indicates that the species is highly susceptible.

#### **Management Requirements**

Search for new populations in areas of suitable habitat.

Resurvey Mt. Frankland and possibly also the Denbarker area when the species is in flower.

Monitor the known population annually, specifically for possible impacts of *Phytophthora* spp. and treat with phosphite if required.

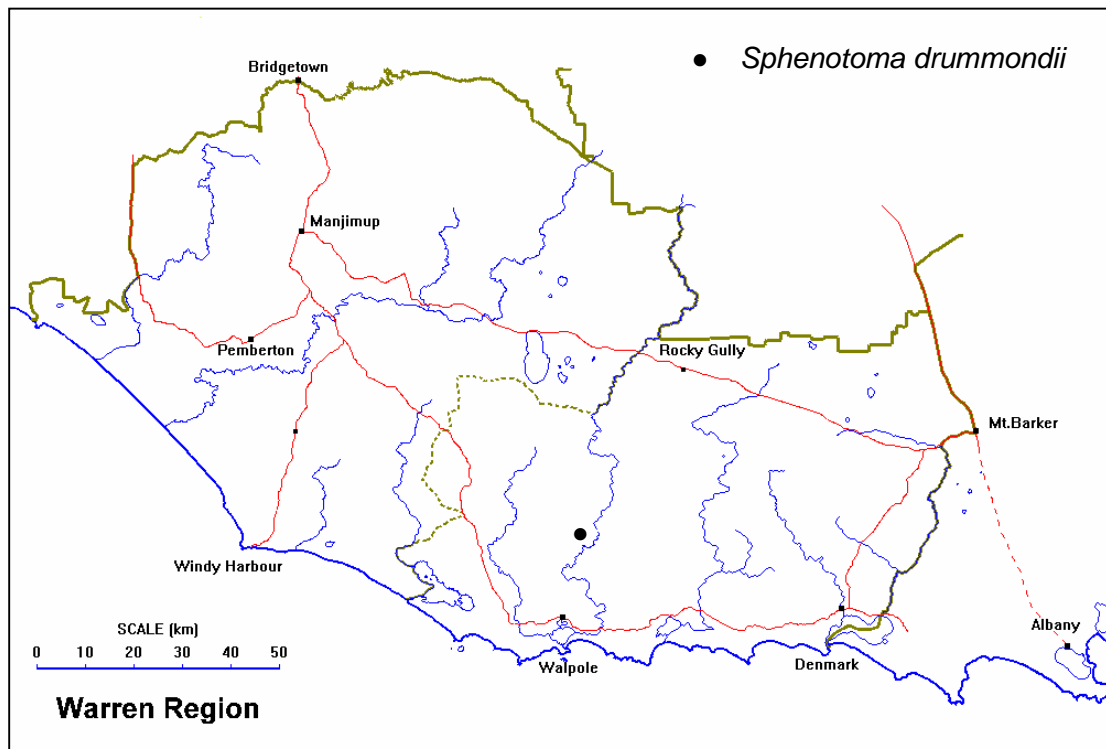
If suitable material is available, liaise with the Threatened Flora Seed Centre regarding seed collection and storage.

## Research Requirements

None.

## References

Brown *et al* (1998); Bentham (1869); Robinson and Coates (1995); Sarah Barrett (personal communication)



## *Verticordia apecta* E.A. George & A.S. George

MYRTACEAE

WAR F4/127

*Verticordia apecta* was first collected by Elizabeth George and Tony Annels while visiting a *V. endlicheriana* var. *angustifolia* population in 1993 and was described by Elizabeth and Alex George the following year. Despite searches of the known location and other similar sites in and adjacent to the area, the species was not seen again until 1999. After not being seen for six years fourteen flowering plants and a possible twenty non flowering plants were located at the type locality in 1999. All were growing within a small area of about 10 square meters. A fire in 2004 completely burnt this site and no extant plants are currently known.

### Description

A lignotuberous slender shrub to 45 cm tall with linear lower stem leaves 3-9 mm long and upper narrow elliptic stem leaves about 7 mm long. Floral leaves are elliptic to obovate. Flowers are scarce in the upper axils and have peduncles 9-19 mm long. Sepals and petals are deep pink with white fine fringe segments.

Its general appearance the species is superficially like that of *Verticordia habrantha* which occurs at the same location, however it is readily distinguished from that species by its generally scruffy flower, its fimbriate pink petals and its shortly bearded style.

**Flowering period:** November

### Distribution and Habitat

The species is known only from the type locality on the Hay River where it grows on shallow sandy clay/loam soils surrounding a granite outcrop. Surrounding habitat is low open Wandoo woodland/scrubland.

### Conservation Status

Current: DRF – Critically Endangered

Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 1	The Pass	FRA	SF	14	17/11/1999	Fire mid May 2004, completely burnt the site

---

### Response to Disturbance

The type collection was made two years after a fire indicating that it has the ability to resprout.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to changes in canopy cover is unknown.

### Susceptibility to *Phytophthora* Dieback

Unknown, but, given susceptibility of other species in the genus, it should be assumed to be susceptible until shown otherwise.

### Management Requirements

The population urgently needs post-fire assessment for regeneration, either from rootstock or seed.

Continue to monitor the population annually.

Search areas of suitable habitat for further populations.

Protect the known site from the introduction of *Phytophthora* spp.

If plants regenerate from fire, conduct seed collection or germ plasm collection for storage and possible future translocation.

### Research Requirements

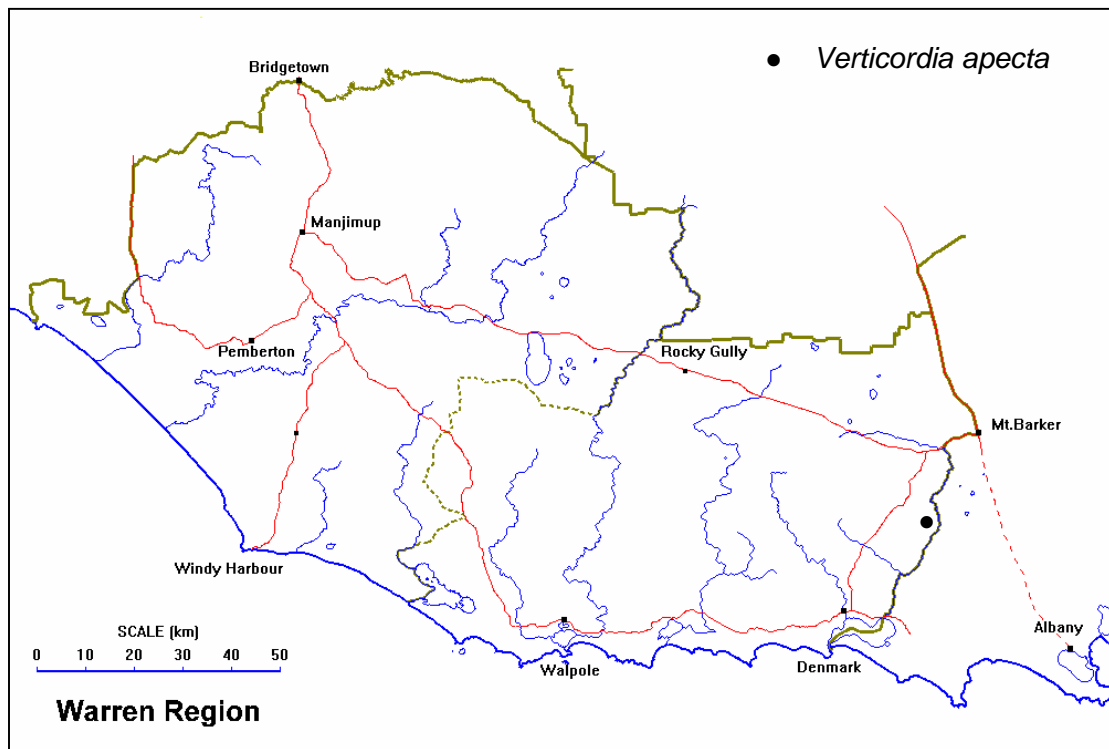
If the population does not recover within 3 years, investigate use of disturbance or smoked water to stimulate germination.

Determine response to disturbance.

Liaise with Botanic Garden and Parks Authority staff with respect to clonal propagation.

### References

George and George (1994)



*Verticordia densiflora* Lindl. var. *pedunculata* A.S. George

MYRTACEAE

SFR F4/159

*Verticordia densiflora* was described by Lindley in 1839 with the variety *pedunculata* described by Alex George in 1991. Its distribution is centred on Ruabon and Tutunup (south and east of Busselton) with an outlier at Perup that, although morphologically distinct, has been tentatively included. While this population has not been relocated, a collection from the Muir Highway, west of Lake Muir matches it in morphology. Other populations have been located in the Lake Muir area that match the Perup collection and all appear to represent a new taxon distinct from var. *pedunculata* and var. *caespitosa*.

**Description**

A shrub to 60 cm tall (Perup). Leaves are often crowded, opposite and decussate, linear to semi-terete, 3-10 mm long by 1.0-2.5 mm wide. Flowers are pink or white in dense corymbs at ends of branchlets. Floral leaves are lanceolate, 3-4 mm long by (0.8) 1.0-1.5 mm wide. Peduncles are 5-9 mm long. The calyx is hemispherical, not ribbed, with a ring of long hairs at base, free above the floral tube and 2-4 mm long, divided below the middle into 2-5 ciliate, digitate lobes. Petals are free above the floral tube, 0.8-2 mm long, orbicular, fringed with numerous cilia. Each flower has ten stamens alternating with ten staminodes, joined towards base. Staminodes are linear and glandular. The style is curved, exserted, 5-6 mm long and bearded towards the end.

Perup/Lake Muir populations tend to be at the shortest end of all dimensions noted above, or just outside. These populations are disjunct from other *Verticordia densiflora* populations and are sufficiently different (though consistent within themselves) to possibly represent a new taxon at the varietal level.

**Flowering period:** December-January (for Perup)

**Distribution and Habitat**

Known mainly from Busselton area with a outlier in the Perup-Lake Muir area, growing on shallow sandy soils over exposed outcrops of gneissic rock or in winter wet swamps.

**Conservation Status**

Current: DRF – Endangered

**Known Populations in the Warren Region**

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments / condition
CLM 6	Lake View Road	DON	NR	na	6/11/1995	Unable to relocate
WAR 100	Swamp Road	DON	NR	na		Location to be checked

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**Response to Disturbance**

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

**Susceptibility to Phytophthora Dieback**

Unknown, but given susceptibility of other members of the genus, should be presumed susceptible.

**Management Requirements**

Relocate historically known populations and asses their conservation status.

Monitor populations and asses their response to disturbance.

Survey areas of suitable habitat for further populations.

**Research Requirements**

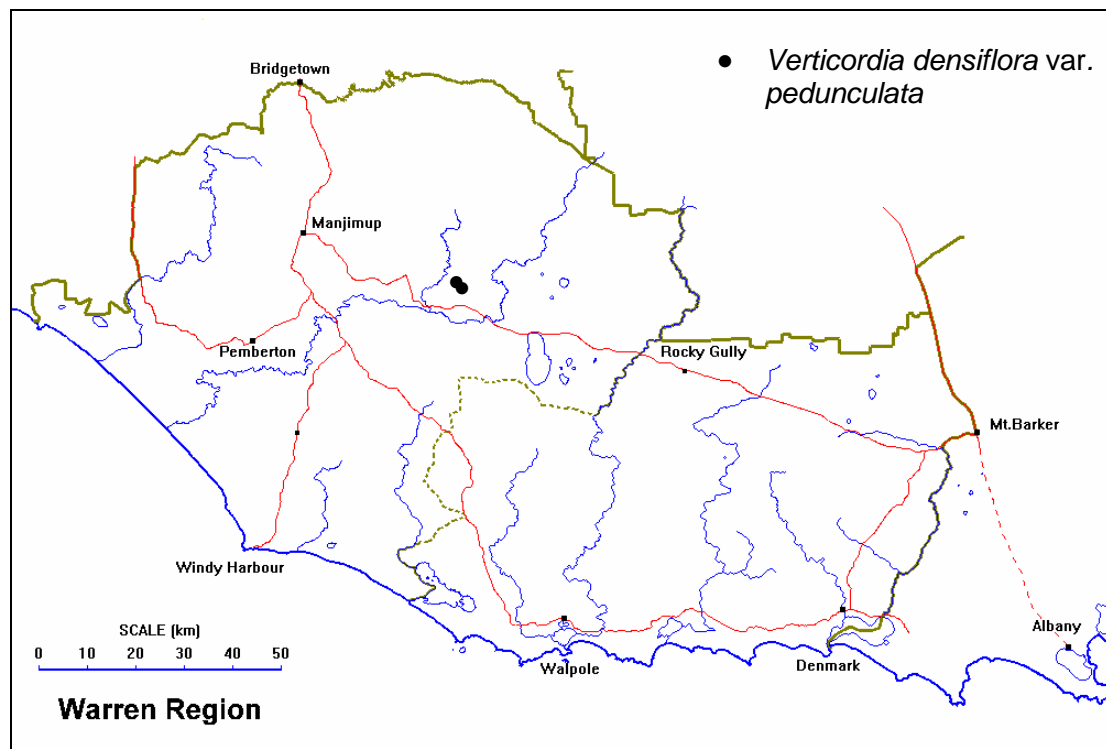
Determine taxonomic and conservation status.

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Bentham (1866); Brown *et al* (1998); George (1991)



*Verticordia fimbrilepis* Turcz. subsp. *australis* A.S. George

MYRTACEAE

Shy Feather flower

WAR F4/18

*Verticordia fimbrilepis* subsp. *australis* is a poorly known taxon that was described by Turczaninow in 1847 from a Drummond collection made in 1840. No further collections were made until it was rediscovered in 1983 near Woodanilling. It was also collected from the Kent River by Tony Annels in 1983 but at that time was thought to be an undescribed taxon. A second population was located on Willyung Hill but only a single plant was found. The subspecies is not known from reserved land or proposed reserved land. The Willyung population (single plant) is in a quarry and has not been relocated, the Kent River population is on land targeted for damming.

**Description**

Shy Feather flower is a small erect shrub to 40 cm with slender branches, the upper stems red. Leaves are linear terete to 18 mm long, mucronulate, mostly opposite or in small clusters, though generally sparse on the stem. Flowers are bright pink. Peduncles are 5-15 mm long. The calyx tube is almost hemispherical, ten ribbed, glabrous, with five spreading primary lobes to about 5 mm, each digitally divided into 5-7 linear lobes. Petals are 0.9-1.0 mm wide, ovate, deeply fringed, nearly as long as the calyx lobes. Stamens are free, incurved, filaments pink, anthers deep red.

Near the Kent River the taxon is growing in association with *Verticordia plumosa* which has purple-pink flowers and denser foliage that extends up to the flowers.

**Flowering period:** October-November

**Distribution and Habitat**

This subspecies is known from two populations, one near Woodanilling, the other on the Kent River where it grows in low heath in brown sandy loam around outcropping granite. The typical subspecies (subsp. *fimbrilepis*) occurs near Pingelly.

Despite extensive survey of suitable habitat no further populations have been located in the Warren Region.

**Conservation Status**

Current: DRF-Endangered

**Known Populations in the Warren Region**

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
	Kent River	Frankland	VCL*	2 000+	31/10/1998	* In 1987 and 1992 the area was recommended for inclusion as a reserve. In 1994 the proposed reservation was dropped at request of the then WA Water Authority and the area recommended for a future dam site. There is ongoing discussion with Walpole Wilderness Advisory Committee

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**Response to Disturbance**

Regenerates from lignotuber and seed after fire.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

**Susceptibility to Phytophthora Dieback**

Presumed susceptible (low to moderate).

**Management Requirements**



Conduct detailed searches for additional populations upstream and downstream from the known population.

Conduct further searches for the species in areas of suitable habitat.

With Threatened Flora Seed Centre staff, arrange to collect and store seed against possible loss of this taxon from the wild.

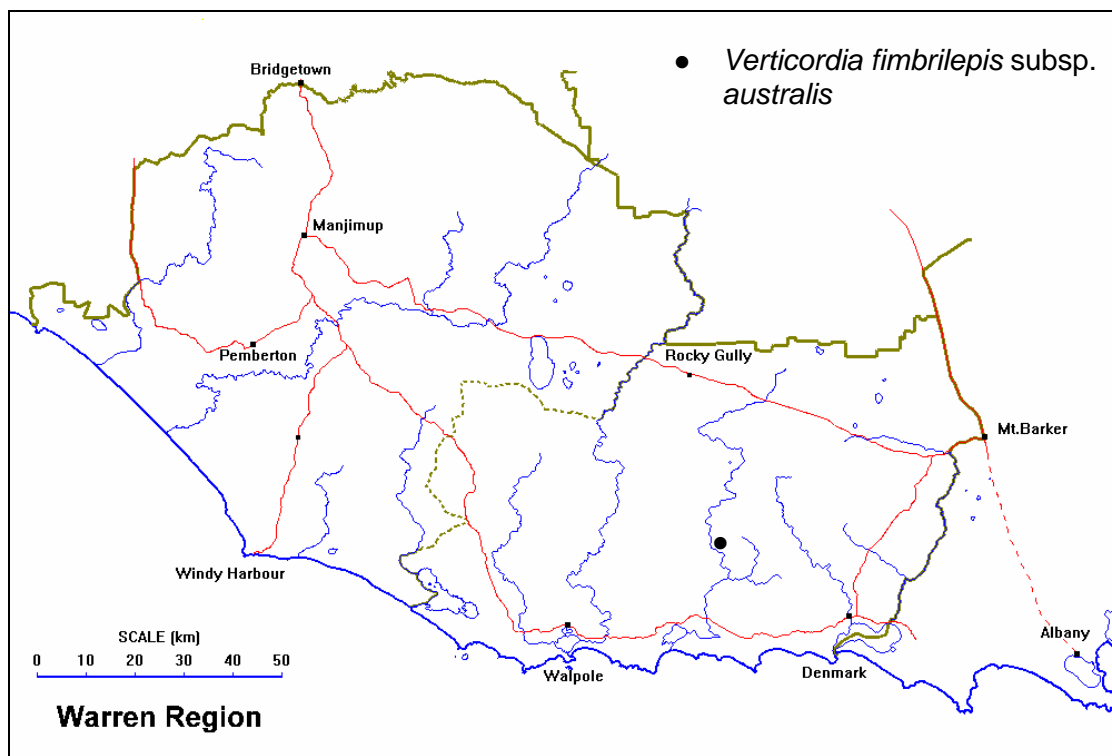
Liaise with the WA Water Authority in developing long term protective measures for this taxon.

### Research Requirements

Determine susceptibility to *Phytophthora* spp.

### References

Bentham (1866); Brown *et al* (1998); George (1991)



## PART THREE - PRIORITY FLORA IN THE WARREN REGION

### PRIORITY FLORA LISTS

Possibly threatened flora species that do not meet survey criteria are added to the Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora. Species that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation Dependent species are placed in Priority 5.

#### 1. PRIORITY ONE SPECIES

Species which are known from one or a few (generally less than five) populations or collections 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



Photograph of Priority one species, *Synaphea decumbens* by Erica Shedley

## *Andersonia redolens* K. Lemson ms

### EPACRIDACEAE

WAR F4/173

*Andersonia redolens*, previously known by the phrase name *Andersonia* sp. Collis, was first collected during a floristic study of the Tingle mosaic conducted by Grant Wardell-Johnson in the 1990s but, at that time, was thought to be a form of *Andersonia lehmanniana*. It is currently known from four populations, though a possible fifth population may be present in Crossing Block. Dr Christina Lemson (ECU Joondalup) will formally name the species in a forthcoming revision of the Genus.

#### Description

*Andersonia redolens* is a clump forming shrub to 20 cm high by 50 cm in diameter with leaves 6-15 mm long by 1-3 mm wide, that are spirally arranged, imbricate, sessile with an adnate sheathing base and often twisted, ciliate margins and fine layer of hairs on their surfaces. Flowers are white or sometimes tinged pink, in terminal heads or clusters subtended by a bract and pair of leaf-like, ciliate bracteoles. Sepals are five in number, free, ciliate, 8-10 mm long. The corolla is tubular, densely tomentose inside, 6-8 mm long and five-lobed with lobes to half length of corolla. Stamens are five in number, free, hairy below anthers, not exerted from corolla. The style is glabrous. Fruit consist of a five-celled capsule.

**Flowering Period:** September-December

#### Distribution and Habitat

This species is known from five populations north of Walpole, growing under *Eucalyptus marginata*-*Corymbia calophylla* forest with *Bossiaea linophylla*, *Lomandra* spp. and *Agonis* spp. in lateritic gravel on upper slopes and rises.

#### Conservation Status

Current: Priority 1

Recommended: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Collis Forest Block 1	FRA	SF	2000	14/9/1994	
WAR 100	Collis Forest Block 2.	FRA	SF	10	6/2/2004	Collect specimen for identification
WAR 101	Northumberland Forest Block	FRA	NP	200	3/3/2003	Recollect to confirm identification
WAR 102	Deep River	FRA	SF	1000+	28/8/1999	Found over an area of about 25 ha

#### Response to Disturbance

Plants are killed outright by fire and regenerate from seed. Time to first flowering is not known though part of one population was burnt in autumn 1994 and will be monitored.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Susceptible-Deep River populations that were treated with Phosphite were able to tolerate it at normal concentrations and appear healthy.

#### Management Requirements

Search suitable habitat in Crossing Block for a population that is recorded from there.

Monitor known populations annually, specifically for possible introduction of *Phytophthora* and time to first flowering following germination.

Treat the *Phytophthora* affected population with Phosphite to ensure that plants reach seed producing age (2-3 years).

Search suitable habitat in areas between and adjacent to known and reputed populations.

### Research Requirements

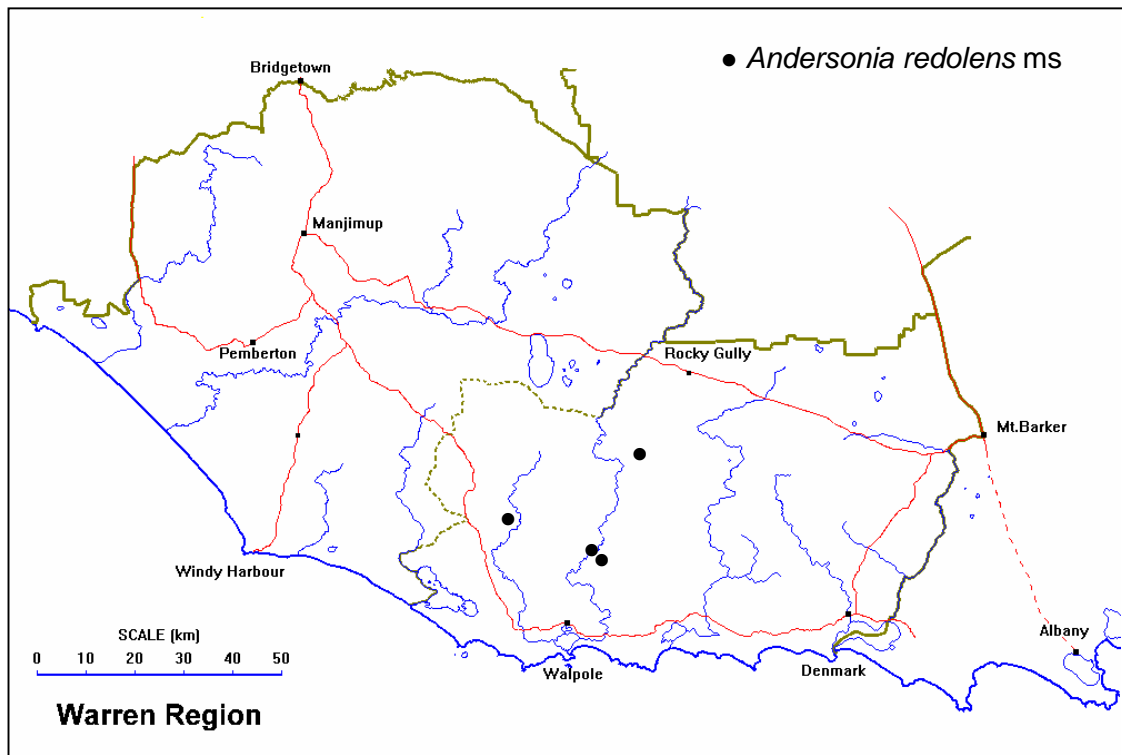
Determine susceptibility to *Phytophthora* spp.

Seed bank longevity needs to be investigated, due to reliance on seed bank for regeneration post fire.

Liaise with Kristina Lemson in relation to her revision of *Andersonia*.

### References

Kristina Lemson (personal communication)



## ***Andersonia* sp. Mitchell River (BGH 925)**

### EPACRIDACEAE

WAR F4/174

First collected by Brenda Hammersley in 1993, this taxon is known from a very limited area to the North and East of Mt. Lindesay and South of Narrikup in the Hay River catchment. Dr Christina Lemson (ECU Joondalup) will formally name it in a forthcoming revision of the Genus.

#### **Description**

*Andersonia* sp. Mitchell River is a small spreading shrub to 40 cm tall by 40 cm wide with soft, glabrous, erect to spreading, flat to spirally twisted leaves 6-12 mm long by 0.5-1.5 mm wide that taper to a fine apical point. Recently dead leaves are retained on the stem. Flowers are solitary, terminal on short branches, subtended by a series of leaf-like bracteoles. Sepals are pale greenish white to pale pink, 8-15 mm long, glabrous with smooth surfaces and ciliate margins. The corolla is blue, 7-15 mm long with dark coloured, spreading lobes that are shorter than the tube and densely bearded inside. Staminal filaments are hairy towards the anthers, slightly flattened but never auriculate. The style and ovary are sparsely hairy.

*Andersonia* sp. Mitchell River differs from *Andersonia hammersleyana* in its less hairy character. Both species differ from members of the *A. auriculata* complex in having corolla lobes that are shorter than the tubes.

**Flowering period:** June-September

#### **Distribution and Habitat**

The species is known from a narrow geographic range from North of Denmark to South of Narrikup in the Hay River catchment, growing on the edges of watercourses and scattered along the edge of a firebreak. Habitat is generally sand over laterite or granite in open heath in Jarrah woodland and low forest.

#### **Conservation Status**

Current: Priority 1

Recommended: Priority 2

#### **Known Populations in the Warren Region**

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Hell River Rd	FRA	SF	100	7/8/1997	
CLM 2	Mitchell River	FRA	SF	20	7/8/1997	Two sub-populations
CLM 3	Mitchell River Rd.	FRA	SF	300	15/10/1998	
CLM 4	Mt. Lindesay 1	FRA	SF (NP)	2	19/8/2001	
CLM 6	Sunny Glenn Rd	FRA	SF	30	29/8/1996	
CLM 7	Sheepwash SF	FRA	SF	200	31/7/1998	
CLM 8	Centre Break Rd	FRA	SF	500	25/4/1998	
CLM 9	Romance R	FRA	SF	1000+	23/10/2000	Possibly misidentified = <i>Andersonia</i> sp. Frankland
WAR 100	Sheepwash 1	FRA	SF	300	22/8/2002	
WAR 101	Sheepwash 2	FRA	SF	1000	22/8/2002	
WAR 102	Mt. Lindesay 2	FRA	SF (NP)	500	23/8/2002	

#### **Response to Disturbance**

Plants are killed by fire and regenerate from seed.

Response to soil disturbance is unknown but, as plants have been located on fire break, it is thought that the species is able to colonise disturbed areas.

Response to change in soil moisture is unknown but, given the plants proximity to water on lower slopes and in broad wet areas, it is possibly dependent on seasonal periods of high soil moisture.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora* Dieback

Unknown, but given susceptibility of other species in the genus should be managed as if highly susceptible. Some plants in the Sheepwash Forest Block have shown symptoms of dieback death.

### Management Requirements

Monitor known populations annually, specifically for the possible introduction of *Phytophthora*.

Search for new populations in areas of suitable habitat between and adjacent to known populations.

Liaise with Rivers and Waters over protection of gauging weir population.

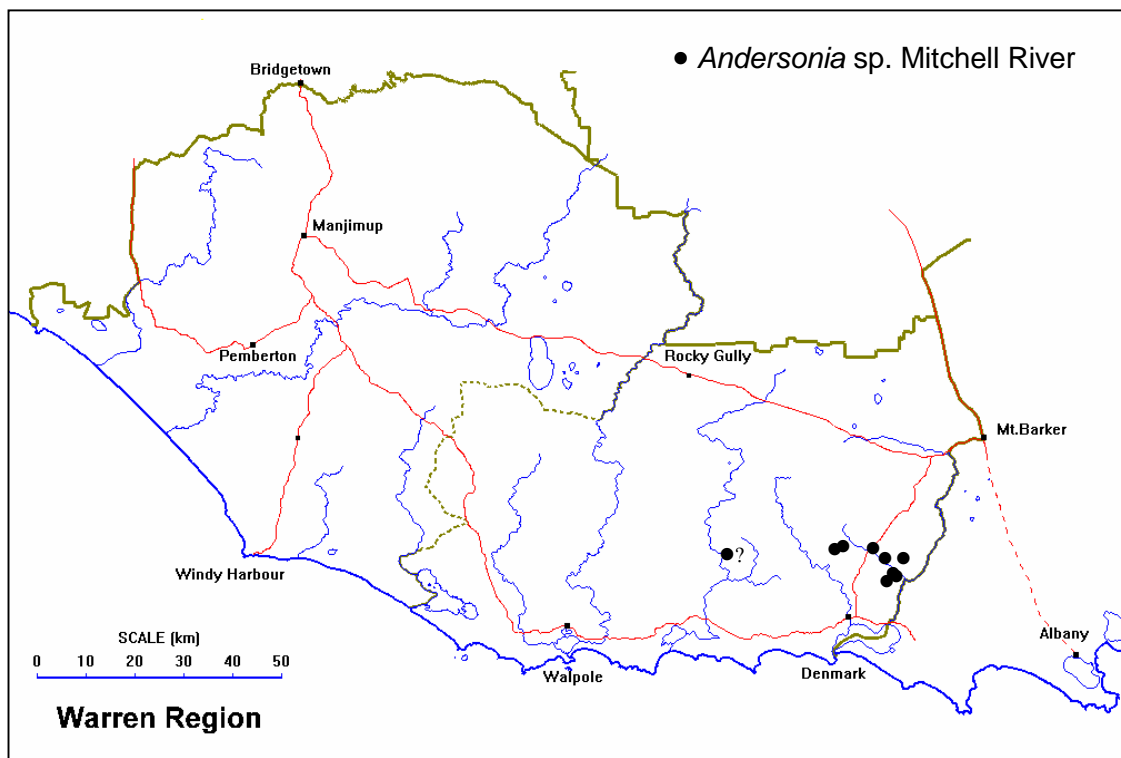
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Liaise with Kristina Lemson in relation to her revision of *Andersonia*.

### References

Kristina Lemson (personal communication)



## *Austrofestuca littoralis* (Labill.) E.B. Alexeev

### POACEAE

WAR F4/181

Joyce Vickery, in her 1952 revision of Australian *Festuca* spp., sank *Schedonorus* into *Festuca* and raised the Western Australian subspecies of *F. littoralis* to full species status, naming it *F. pubinervis*. At that time she also alluded to the possible separation of Australian *Festuca* spp. from their northern counterparts. Tzvelev separated them at a subgeneric level in 1971 and Alexeev raised the subgenus *Austrofestuca* to full generic status in 1976 and

nk A.

*pubinervis* back into *A. littoralis*.

Until quite recently, only three collections of this species had been made in the last 30 years, the most recent from Middleton Beach, Albany in 1988. Prior to this, most collections were made in the early 1900's with an earlier collection made by Drummond from King George Sound in the 1800s. Les Watson has recently reported that it occurs at Middleton Beach and a beach near Frenchmans Bay where he observes it '...looks at hazard of being pushed off by *Ammophila*' (the introduced Marram Grass, *Ammophila arenaria*). Searches at the Warren failed to locate it in 1996. Greg Keighery reports a similar situation for the populations he has seen.

#### Description

A perennial tufted grass to 0.7 m high with a long vertical branching rhizome. Leaves are up to 500 mm long and 1.5-2 mm wide, with the blade inrolled. The outer surface is glabrous, inner surface hairy, apex pungent, often exceeding the panicle. The ligule is membranous, firm, 1-2 mm long. The inflorescence is a dense yellowish, straw coloured, flattened spike-like panicle to 150 mm long, usually exerted, occasionally half enclosed in uppermost leaf sheath. Spikelets are compressed, 12-16 mm long, with 3 or 4 bisexual florets. Glumes are in pairs, slightly unequal, broad, 10-15 mm long, acute, 5-7 ribbed with very scabrous keels. Lemmas are 12-15 mm long, obtuse, 7-9 ribbed, with long white hairs on the lower part of the ribs and one margin. The callus has long hairs. The paleas are almost as long as the lemma and hairy on the keel and sides.

*Austrofestuca littoralis* has been confused in the field with *Poa poiformis* which occurs in adjacent near coastal heaths. However, the latter, taxon is readily differentiated by its ligule which is firm with a short ciliolate rim 0.2-1.3 mm long, its spikelets compressed, 6-10 mm long, glumes three ribbed and usually with a small tuber. Marram grass, *Ammophila arenaria*, occupying the same habitat as the *Austrofestuca*, has lateral rhizomes, ligules firm, narrow, 10-30 mm long, and glumes with one to three ribs.

**Flowering Period:** September-January

#### Distribution and Habitat

The species is found only on coastal sand dunes with a recorded distribution from Esperance (Rossiter Bay) to the mouth of the Warren River. Collections have recently been made from Albany (Middleton and Cheynes Beaches and near Frenchmans Bay), and the mouth of Fitzgerald River. Greg Keighery reports he has seen the species at Denmark (Ocean Beach) and West Cape Howe.

#### Conservation Status

Current: Priority 1

Recommended: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 3	Warren Beach	Donnelly	NP	0	28/1/1996	Unable to relocate original population
WAR 100	Quarram NR	Frankland	NR	<50	29/11/2003	Scattered over 50ha
WAR 101	Denmark	Frankland	Other	na	na	Unable to relocate original population

### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown, but the species appears to be an ocean edge sand binder.

Response to change in soil moisture is unknown.

Response to weed invasion is largely unknown but sites at Warren are now occupied by the aggressive exotic Marrum grass (*Ammophila arenaria*) which is probably responsible for displacing *Austrofestuca*. See above for observations by Les Watson and Greg Keighery.

### Susceptibility to Phytophthora Dieback

Unknown, but probably not at issue.

### Management Requirements

Search the Warren and Ocean Beach areas in Spring to relocate populations of *Austrofestuca littoralis*.

Prior to establishing new populations of *Ammophila arenaria* to stabilise sand dune blowouts, search for possible populations of *Austrofestuca*. Populations should be monitored if found and protected if necessary during restoration work.

Establish seed bank from known population near Albany.

Search suitable habitat between Black Point and Albany for new populations of *Austrofestuca littoralis*.

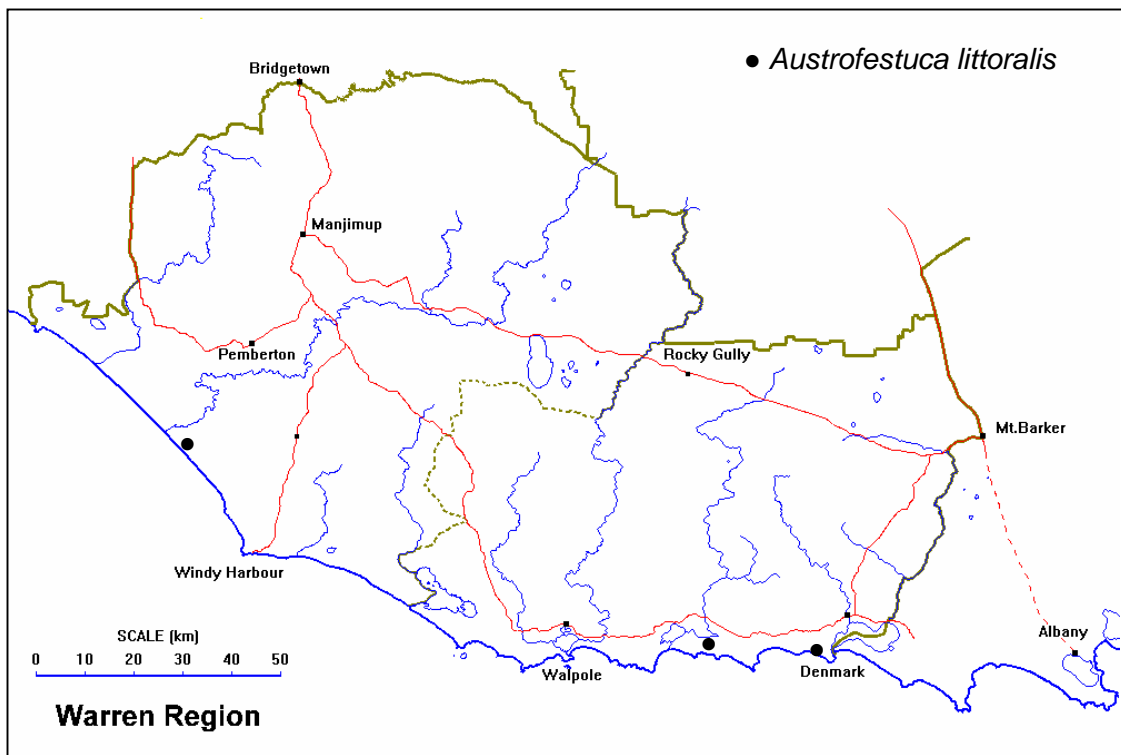
### Research Requirements

Confirm or otherwise the susceptibility to *Phytophthora* spp.

Investigate use of *Austrofestuca* as an alternative to *Ammophila* for dune stabilisation work.

### References

Gardner (1952); Vickery (1939); Wheeler *et al.* (2002); Les Watson (personal communication)





## *Caladenia evanescens* Hopper & A.P. Br.

### ORCHIDACEAE

#### Semaphore Spider Orchid

WAR F4/103

The first collection of this species was made by Rob Oliver in 1962 from somewhere in the vicinity of Albany and some years later (1984) it was collected by Robert Bates following a summer fire near Peaceful Bay. It was also photographed near William Bay but, as specimens were not taken, this population needs to be verified. Despite extensive searches by a number of people over many seasons, including the Peaceful Bay site following summer fire in 1989, it has not been seen in any of these areas since.

#### Description

A member of the *Caladenia filamentosa* species complex. *C. evanescens* is a relatively small plant 15-20 cm in height with a leaf to 13 cm long and 5 mm wide. The leaf is often withered when flowering at which time the plant produces a single pale green/creamy yellow flower about 5 cm long and 4 cm wide. The petals and sepals are pale yellow to white near the base, the lateral sepals to 4 cm long and 4 mm wide and petals erect, to 3.5 cm long by 3 mm wide. The distinctive labellum, which is white with red/maroon markings is 14 mm long by 7 mm wide and, unlike those of most species, projects forwards rather than curving downwards. Its calli are white, in two pairs extending at least half the length of the labellum.

The species is closely related to *Caladenia abbreviata* and has an overlapping range. However, the latter species is readily distinguished by its down curved labellum, multiple flowers, darker colouration and longer petals and sepals (to 5 cm).

**Flowering period:** October-November

#### Distribution and Habitat

Semaphore Spider Orchid is known from a single population near Peaceful Bay where it grows amongst coastal heath at the base of consolidated dunes. Possibly extends to William Bay and into the Albany area.

#### Conservation Status

Current: Priority 1

Recommended: Priority 2

A poorly known, apparently rare species considered to be in urgent need of further survey to establish its conservation status.

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Peaceful Bay	Frankland	NP	0	10/1995	Relocate population

#### Response to Disturbance

Plants are killed by fire when above ground parts are present (May-November). However, as the Peaceful Bay population was located following a summer fire, flowering is thought to be stimulated fire that occurs when plants are dormant.

Response to soil disturbance is unknown, but comments below probably apply.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown, but the species is probably vulnerable to annuals that are able to rapidly occupy a site following fire or other soil disturbance.

#### Susceptibility to Phytophthora Dieback

Unknown.

#### Management Requirements

Relocate the Peaceful Bay population.

Search suitable habitat for new populations.

If a population is located, secure seed and mycelium for conservation work at the Botanic Gardens and Parks Authority.

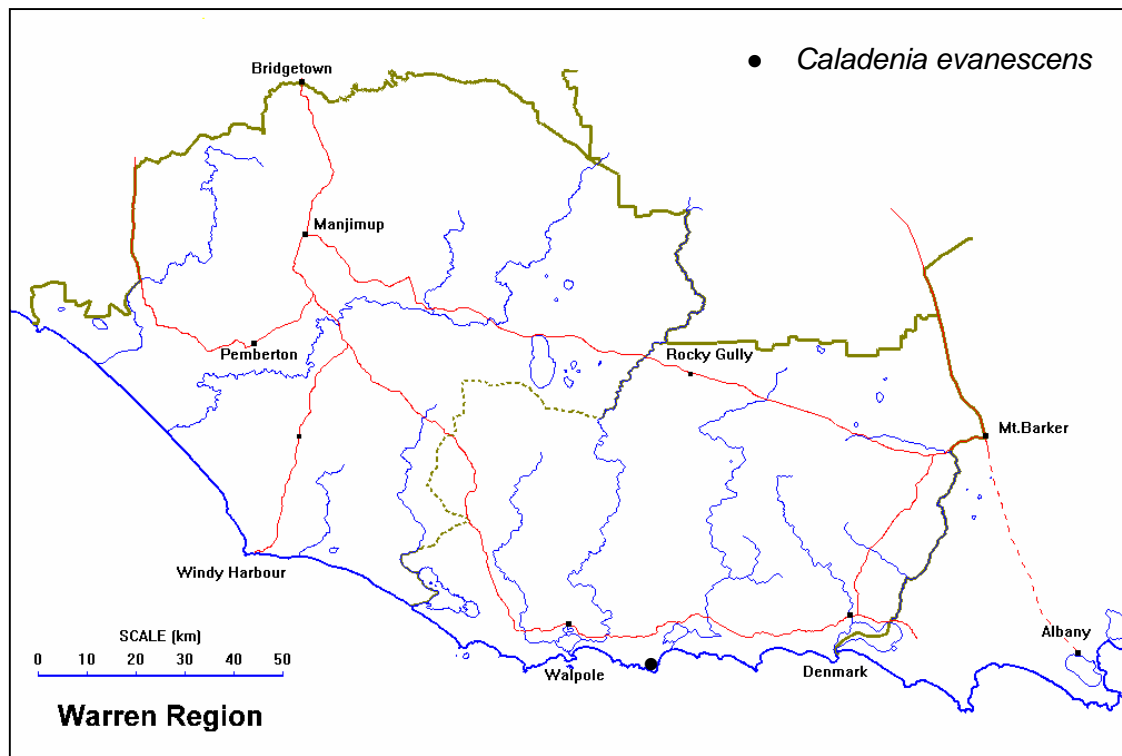
### Research Requirements

Determine susceptibility to *Phytophthora* infection.

Liaise with Botanic Garden and Parks Authority staff as required above.

### References

Hoffman and Brown (1992, 1998); Hopper and Brown (2001)



*Carex tereticaulis* F. Muell.

CYPERACEAE

WAR F4/182

*Carex tereticaulis* is a widespread species that is found in all southern Australian States of Australia. In Western Australia it is only known from four collections. However, three of these are recent - one by Greg Keighery from Dardanup and the other two by Jenny Dewing from Bridgetown.

**Description**

*Carex tereticaulis* is a perennial rhizomatous sedge to about 1 m tall that often forms large dense clumps. Culms are 2-4 mm in diameter, terete or slightly compressed and glabrous in the lower parts, obtusely 3 angled and scabrous just below the inflorescence. The leaves, which grow to 20 cm long by 2-5 mm wide, are striate and have fairly smooth margins. The basal bract has a long fine awn that is much shorter than the inflorescence. The often dense inflorescence, 15-100 mm long, is a narrow erect spike like panicle of numerous spikelets. Spikelets are sessile, about 5 mm long and contain both male and female flowers. The glumes are brown on each side of the midrib which is produced into a serrulate awn with broad translucent margins and is lacerate towards the apex. Anthers are about 2 mm long with a hairy apex. The utricle is ellipsoid and 2-4 mm long by 1-2 mm diameter. The style has two branches.

**Flowering period:** September-January

**Distribution and Habitat**

There are early records of this species from Guildford and Harvey, the latter not being relocated. There have been two more recent collections at Dardanup and Bridgetown, both populations growing in seasonally inundated areas.

**Conservation Status**

Current: Priority 1

**Known Populations in the Warren Region**

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM2	Bridgetown	Donnelly	PP	na	20/2/1996	Relocate population
CLM3	Winnejup Reserve	Donnelly	SHRes	na	25/11/1996	

---

**Response to Disturbance**

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

**Susceptibility to Phytophthora Dieback**

Unknown.

**Management Requirements**

Relocate the Bridgetown population and survey.

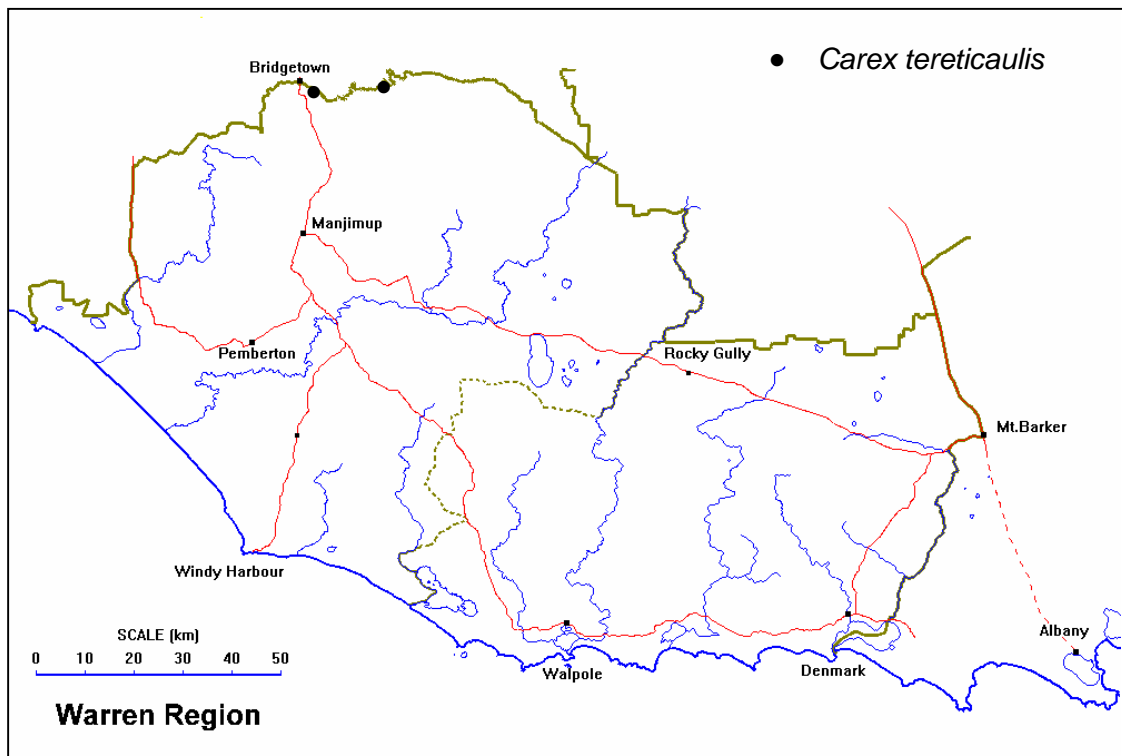
Survey suitable sites in the Region for possible new populations.

**Research Requirements**

Determine susceptibility to *Phytophthora* spp.

**References**

Bentham (1878); Rye (1987a); Wilson (1993)



## *Cryptandra arbutiflora* Fenzl var. *pygmaea* Rye

### RHAMNACEAE

WAR F4/60

*Cryptandra arbutiflora* was first collected by Ernie Wittwer in 1975 from a locality stated as being '...Muir Highway, 20 km E of Manjimup' and was subsequently recollected by Tony Annels in Talling near Lake Muir in 1990. Searches in the Nyamup area (20 km E of Manjimup) have failed to relocate the original collecting site, and no habitat resembling sites where it has been found, has been located in that area. It is possible that the distance was estimated in miles (noting the timing of the collection was during the period of metrication of Australia), and then converted to kilometres, but the reverse conversion used accidentally. Converting twice in reverse would put the Wittwer population very close to the Talling population. The differences could be explained by whether the distance was read off a map or off an odometer, and whether the chosen point of reference for Manjimup was, for example, the Post Office, the intersection of Muir Highway and South West Highway, or the edge of town. It may well be that both collections were from the same place.

#### Description

*Cryptandra arbutiflora* is a low spreading shrub to 20+ cm high with shortly petiolate (0.6-0.8 mm), linear to narrow oblong, glabrous leaves 3-6 mm long, 0.6-2 mm wide. Flowers are white and crowded in leafy spikelets. Each flower is sessile to shortly petiolate with a floral tube about 1 mm long enlarging to 2 mm when in fruit.

The var. *pygmaea* differs from other varieties of *Cryptandra arbutiflora* in the Region in having a very short flower tube (var. *tubulosa* about 2-3 mm; var. *arbutiflora* about 3-4 mm) and a very small stature.

**Flowering period:** August-November

#### Distribution and Habitat

The species is known from five populations between Lake Muir, Rocky Gully and Tonebridge, growing on shallow clay around granite outcrops in heath vegetation surrounded by Jarrah forest and on the margins of a wetland under *Eucalyptus decipiens* woodland. The area surrounding Lake Muir is intended to become part of the Perup-Lake Muir Nature Reserve Complex and populations within this area are not considered to be under threat.

#### Conservation Status

Current: Priority 1

Recommended: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1a	Talling (swamp)	DON	SF (NP)	220	4/12/1995	
CLM 1b	Talling (Granite)	DON	SF (NP)	50	4/12/1995	
WAR 101	Rocky Gully	DON	-	na	9/9/1995	Relocate
WAR 102	Galamup NR	DON	NR	na	23/10/1997	
WAR 103	Tonebridge	DON	-	na	5/9/1995	Relocate

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Monitor periodically with specific emphasis on assessing response to disturbance.

Search for further populations in areas of suitable habitat.

### Research Requirements

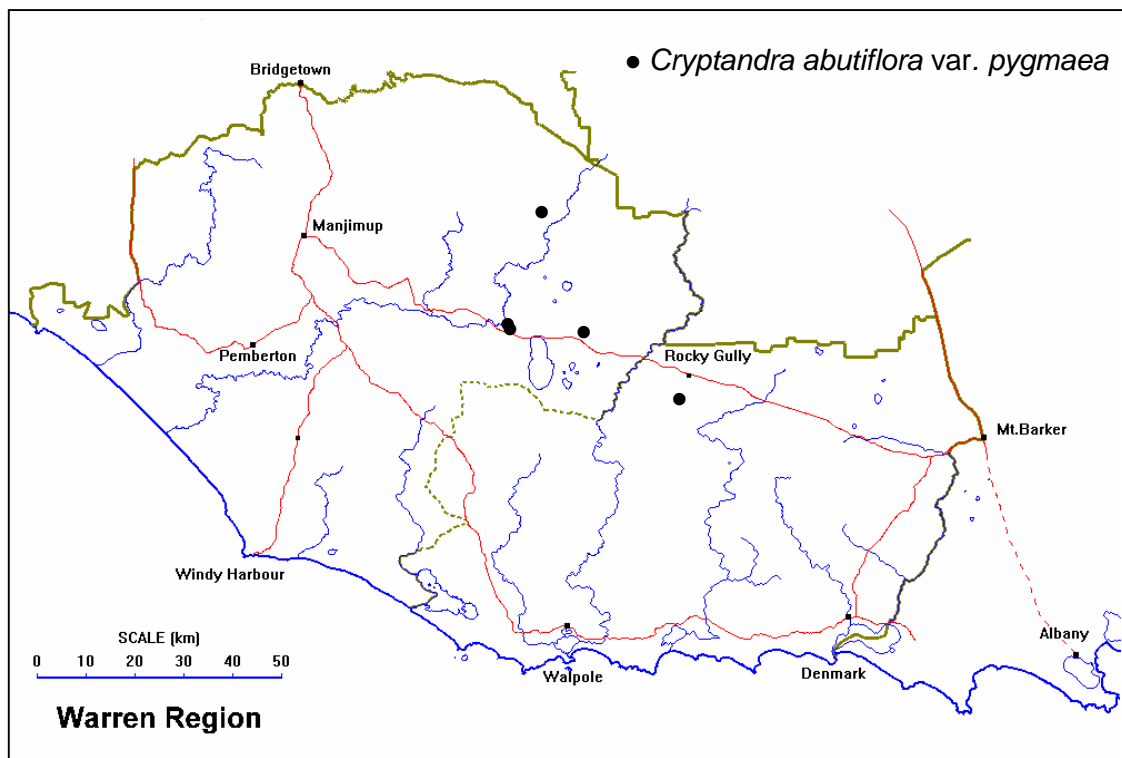
Determine susceptibility to *Phytophthora* spp.

Study the variety's response to fire to determine if it is a resprouter or seed obligate and, following germination, determine the length of time before flowering and first seed set.

Determine the variety's response to other disturbance.

### References

Rye (1995a)



## *Deyeuxia inaequalis* Vickery

POACEAE

WAR F4/197

*Deyeuxia inaequalis* was described in 1940 by Joyce Vickery, from a specimen collected near the Warren River (Arnott's near Manjimp) by W.M. Carne in 1923. The species was relocated near Manjimup by Tony Annels in 1988.

### Description

*Deyeuxia inaequalis* is an annual or perennial grass to 70 cm with linear leaves 50-150 mm long by 1-5 mm wide. The ligule is membranous, 3-5 mm long, torn at tip, tufted, hairless. The inflorescence is dense, cylindric and spike-like. Spikelets are 5-6 mm long, green, stalked, compressed, each with a single bisexual floret. Glumes are in pairs, 5-6 mm long, spreading, narrowly ovate, unequal, the lower glume a little longer, pointed, 1-ribbed with a rough keel. The lemma body is approx 2.5 cm long, firm and hardening at maturity, narrowly ovate to ovate, rough, 3-5-ribbed, the tip minutely 4-toothed, with a bent and twisted dorsal awn arising from near the base. The awn is 3.5-4.5 mm long. The floret base has silky hairs. The palea is approximately 2.5 mm long, almost equal to the lemma, 2-ribbed, 2-keeled and two-toothed.

The species differs from *Deyeuxia quadriseta* in its slightly longer glumes with the lemma more or less half the length of the lower glume.

**Flowering period:** December

### Distribution and Habitat

The species is currently known from two collections near Manjimup. There are old records from the Warren and Donnelly rivers, but these have not been relocated. Plants are found in sandy loams on slopes.

### Conservation Status

The Manjimup population is under threat from major weed invasion.

Current: Priority 1

### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Manjimup (Warren River)	DON	Other Res	na	8/12/1994	
WAR 101	Lindsay FB	DON	SF	na	2/12/1988	

### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change canopy is unknown.

### Susceptibility to *Phytophthora* Dieback

Unknown, but probably not susceptible given that the related *Deyeuxia drummondii* is resistant to *Phytophthora*.

### Management Requirements

Resurvey known populations.

Monitor populations periodically, with specific regard to assessing response to disturbance.

Search for further populations in suitable habitat.

### Research Requirements

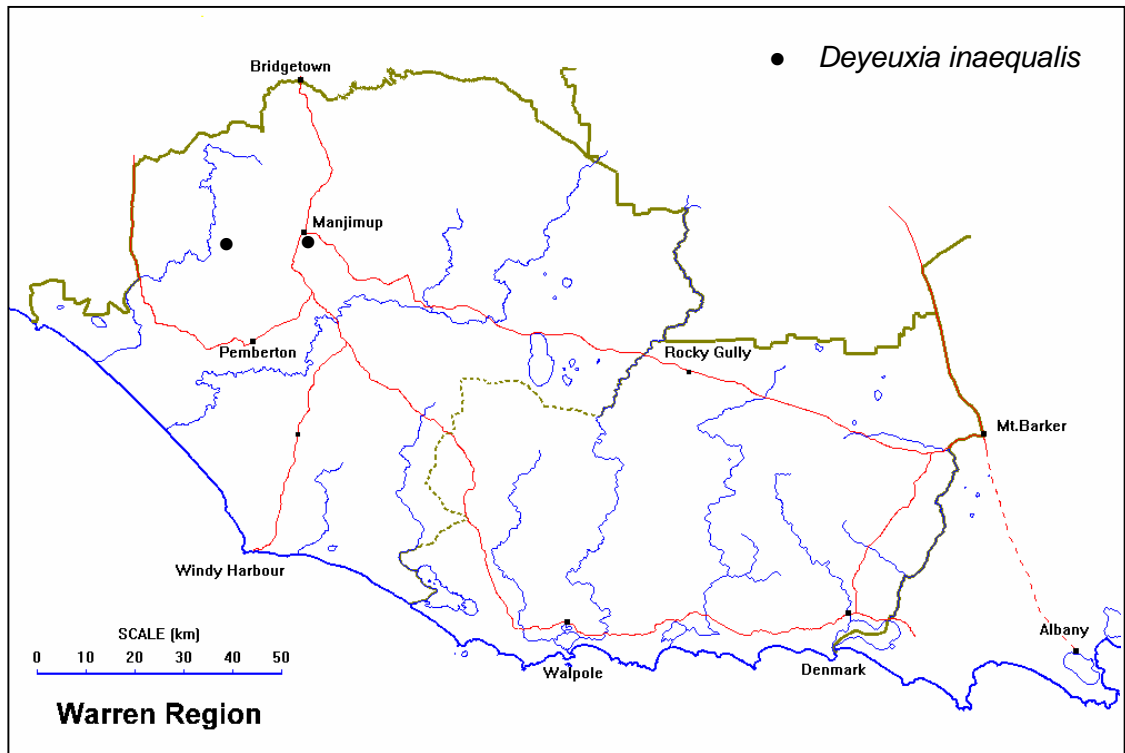
Investigate susceptibility to *Phytophthora* spp.

Determine response to disturbance.

Determine life history i.e. Annual or perennial, how does it regenerate etc.

### References

Wheeler (2001); Vickery (1940)





*Eriochilus scaber* Lindley subsp. *orbifolia* Hopper & A.P. Br. ms

ORCHIDACEAE

Round-leafed Bunny Orchid

WAR F4/104

*Eriochilus scaber* subsp. *orbifolia* was first collected by Stephen Hopper and Andrew Brown in the Winter of 1989 following a Summer fire near Walpole. It was then not seen again until 1994 when Bill Jackson relocated it in the same area, again following a fire. It will be formally described by S. Hopper and A. Brown in a forthcoming edition of *Nuytsia*.

**Description**

Round-leafed Bunny Orchid is a small herb to 10 cm tall with a single orbicular basal leaf, 3-20 mm long and one to three pale pink and white flowers. The leaf on non-flowering plants is evenly hirsute, discolorous, the upper surface dark green with five white longitudinal stripes. The margins and lower surface are red/dark maroon. The leaf of flowering plants is concolourous, yellowish green and glabrous with the lamina cupped around scape and similar in size to those on non-flowering plants, 8-20 mm long by 10-15 mm wide. The scape is wiry uniformly green, sparsely hirsute.

The leaves of non-flowering plants are darker green, hirsute and more prominently veined than those on flowering plants. This dimorphism in leaves of non-flowering and flowering plants is the most striking of any south-western orchid.

*Eriochilus scaber* subsp. *orbifolia* differs from the subsp. *scaber* in its orbicular leaf, held flat on the ground, with a creamy green petiole, 1-3 mm above ground, rather than a narrowly ovate to ovate leaf, with a dark maroon or creamy green petiole, 2-12 mm above ground.

*Eriochilus scaber* differs from *E. tenuis* in its shorter hirsute scapes usually less than 10 cm tall, its leaf on non-flowering plants striped above and red beneath, and its earlier flowering from July-August.

Flowering period: July-August

**Distribution and Habitat**

Known from two populations south-west of Crystal Springs, growing in moist, sandy soil in swales between consolidated sand dunes.

**Conservation Status**

Current: Priority 1

Recommended: Priority 2

**Known Populations in the Warren Region**

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Long Point Road	FRA	NP	na	3/8/1998	
CLM 2a	Crystal Springs 1	FRA	NP	200	6/8/1994	
CLM 2b	Crystal Springs 2	FRA	NP	50	12/8/1994	

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**Response to Disturbance**

Plants are killed by fire when above ground parts are in active growth (April to October). Plants flower in the winter following a hot summer fire.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown. However, as the subspecies occurs in winter moist flats, the drying out of these areas is likely to have a negative affect.

Response to weed invasion is unknown.

**Susceptibility to Phytophthora Dieback**

Unknown.

**Management Requirements**

Resurvey and monitor populations periodically, particularly following summer fire.

Search for further populations in areas of suitable habitat

Avoid late autumn, winter and early spring burning of populations.

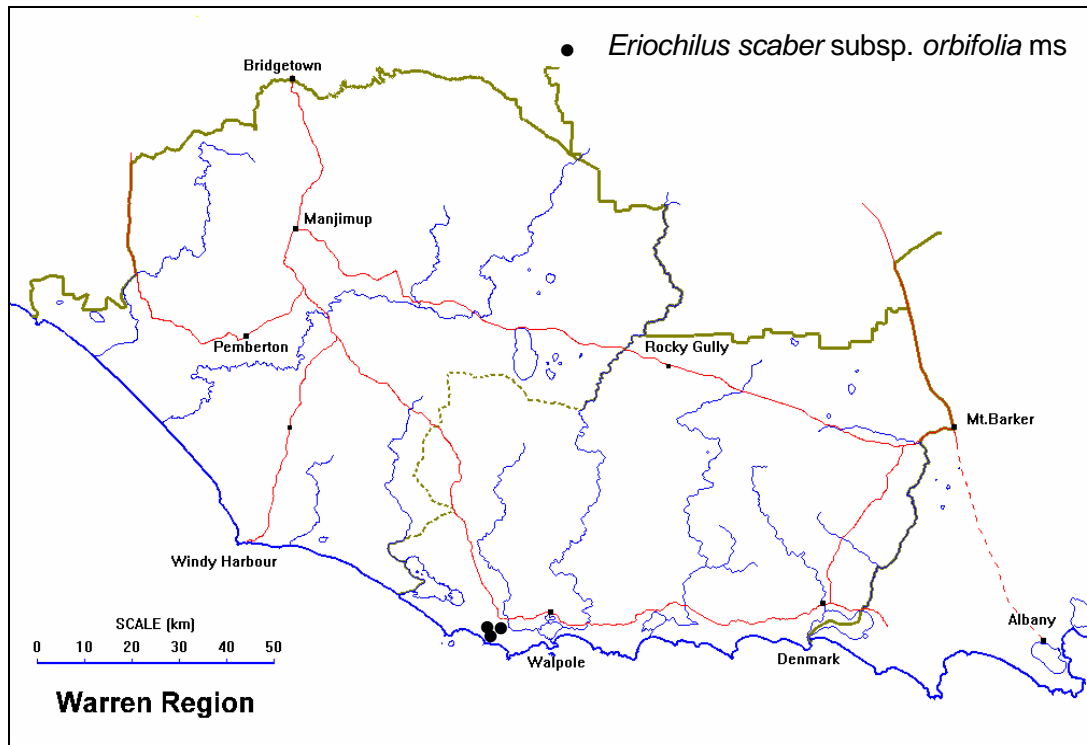
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Liaise with Botanic Gardens and Parks Authority staff over seed and mycelium collection and storage.

### References

Hoffman and Brown (1992, 1998); Hopper and Brown (in press)



## *Eryngium* sp. Lake Muir (E. Wittwer 2293)

APIACEAE

WAR F4/166

Although originally placed with the eastern *Eryngium vesiculosum* this species has now been confirmed as a uniquely Western Australian taxon. It was, until relocated by Greg Keighery and Neil Gibson in 1997, known from a single collection made by Wittwer in 1980. Subsequently, two additional populations have been located.

### Description

*Eryngium* sp. Lake Muir is a perennial near-prostrate herb to 150 mm with small leaves 100-150 mm long by 3-4 mm wide, each pinnatisect (three lobed), with lobes entire, terminating in sharp spines. The inflorescence is an ovoid to globular head-like umbel, 5-12 mm long by 5-8 mm wide, excluding the inner and outer bracts. Flowers are sessile, bisexual, pale green. The six to ten outer bracts are pale green, narrowly ovate, 3-18 mm long by 1-1.5 mm wide. The pungent inner bracts are similar but smaller.

The species resembles a small thistle, with spiny bracts and flowers in globular heads.

*Eryngium* sp. Lake Muir differs from *Eryngium pinnatifidum* in its narrower three lobed, rather than many lobed (pinnatifid) leaf, shorter and narrower floral bracts, green flowers and smaller stature.

**Flowering period:** December-January

### Distribution and Habitat

The species is known from the Lake Muir area, growing in winter wet saline grey clay flats, typically with *Melaleuca cuticularis* and often with another priority taxon, *Apodasima ceramophila* ms.

### Conservation Status

Current: Priority 1

Recommended: Priority 2

### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Neeranup Rd.	DON	NP	1000	15/12/2003	
WAR 101	Swamp Rd. 1	DON	NP	50	15/12/2003	
WAR 102	Swamp Rd. 2	DON	NP	1000	15/12/2003	

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### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change canopy is unknown.

### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Conduct surveys in the Lake Muir/Unicup/Frankland area to determine the conservation status of the species.

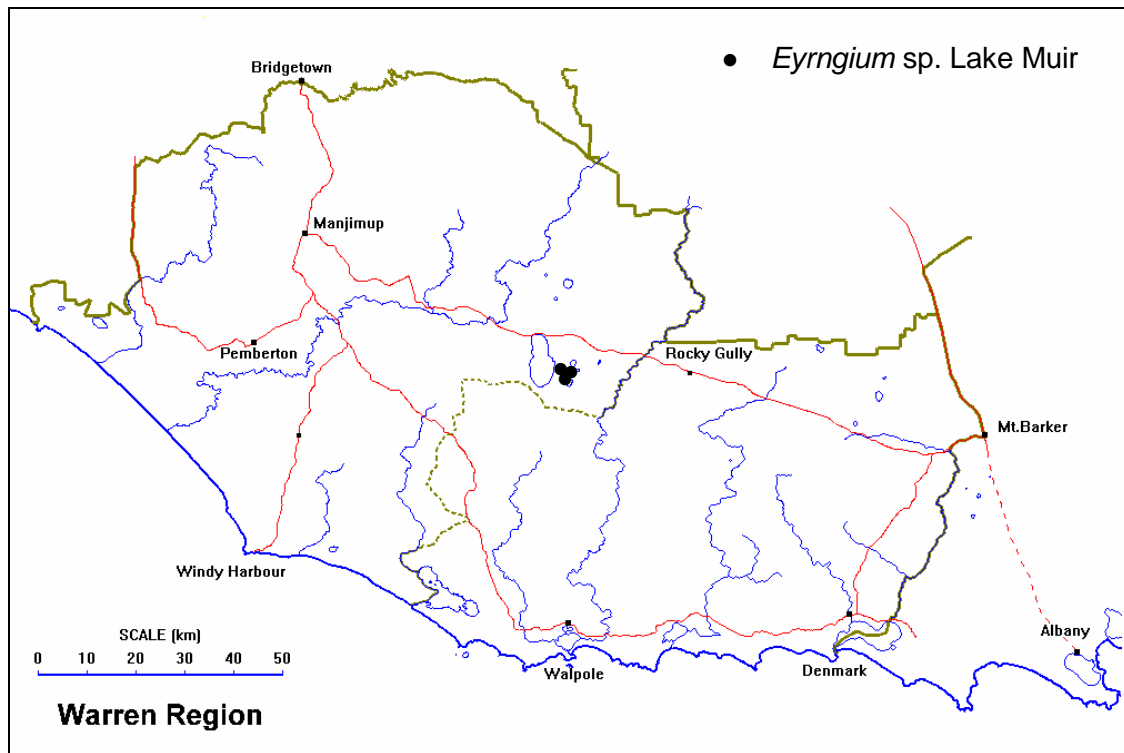
Obtain seed collections for storage at CALM's Threatened Flora Seed Centre.

### Research Requirements

Investigate the species' response to disturbances and susceptibility to *Phytophthora* spp.

## References

None



## *Hydatella australis* Diels

### HYDATELLACEAE

WAR F4/142

*Hydatella australis* was first collected in the Warren region in 1994 during fieldwork for this program. At that time it was placed with *H. sessilis* ms before returning to *H. australis*. Although searched for widely across the Region it has only been found in three locations.

#### Description

*Hydatella australis* is a tufted, annual, monoecious, emergent semiaquatic moss-like herb that grows in a reddish sward to 10 mm tall. Older plants have up to forty leaves, each filiform, terete to 13 mm long. Flowers develop in a sessile/sub-sessile or very short (to 1 mm) capitula that contains either male or female flowers. Fruit is smooth, hyaline.

Some *Trithuria* species that are common in swamps in the area are also of a similar height and grow as reddish moss like swards, but differ in having male and female flowers on the same inflorescence and three ribbed fruit.

**Flowering period:** September-November

#### Distribution and Habitat

The species is known from one extant population in the Warren Region, growing in a winter wet swamp in black clay, germinating and developing as the surface water recedes.

#### Conservation Status

Current: Priority 1

Recommended: Priority 2

Despite searching similar sites close to the known population and other suitable habitat widely across the region over two years, no further populations have been located.

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Perup NR	DON	NR	10,000+	11/10/1994	
WAR 101	Yarnup NR	DON	NR	<100	10/1999	
WAR 102	Kodjinup NR	DON	NR	<500	10/1999	

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#### Response to Disturbance

The species is unlikely to be affected by fire in its known habitat.

Response to soil disturbance is unknown, but the fragile nature of the habitat and the plants life cycle would indicate that any mechanical or other disturbance that changes the floor of the lake could be deleterious to the species. Field observation indicates the species germinates and completes its life cycle in the period between the presence of shallow water over its habitat and drying out in early summer. Changes to this regime could be deleterious to the species. Further clearing in the catchment may result in the creation of a permanent water body (a situation common in the area) and loss of the species. Drainage for salinity management could also be deleterious to the species.

Response to weed invasion is unknown, but is probably deleterious to the species.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements

Monitor disturbance in the area of populations, particularly for impacts of works on road shoulders above lake and, possible impacts of table drain overflow and erosion into the lake. Liaise with the Local Authority as required to protect the population from siltation.

Search for further populations in areas of suitable habitat across the Region.

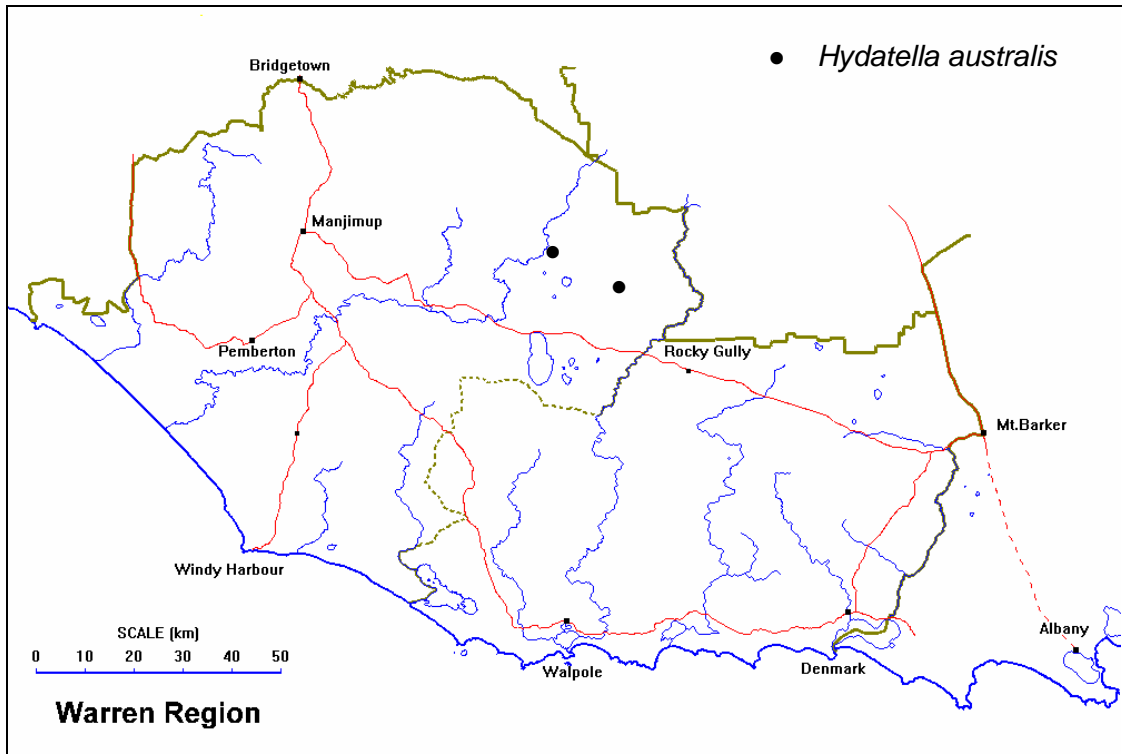
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Investigate response to disturbance.

### References

Gibson and Keighery (2000)



## *Pentapogon quadrifidus* (Labill.) Baill. var. *quadrifidus*

POACEAE

WAR F4/205

*Pentapogon quadrifidus* is a monotypic species that is endemic to Australia. It was originally placed in the genus *Agrostis* and named *A. quadrifida* by Labillardiere in 1805 from his collection "in capite Van-Diemen". It was then moved into the genus *Pentapogon* and submerged into *P. billardieri* by Robert Brown in 1810 and was split into two varieties (*billardieri* and *parviflorus*) by Bentham in 1878. It was moved into *Stipa* by Mueller in 1873 under several named forms and was finally reinstated as a species of *Pentapogon* by Baillon in 1893. Bentham's var. *parviflorus* was reinstated by Morris in 1990. *Pentapogon quadrifidus*, which is known from several other Australian states, was discovered in WA by Terry Macfarlane, Rod Annels and Roger Hearn when investigating a site for other species in this program.

### Description

*Pentapogon quadrifidus* is a loosely tufted annual or short-lived perennial to 0.7 m high. The leaf sheath encloses the culm and is striate, glabrous or pubescent with hairs about 0.5 mm long. The ligule is membranous, 1-2 mm long and subulate while the blade is tightly rolled, pilose with hairs to 1 mm long with the flag usually glabrous. The inflorescence is a compact dense much branched panicle 3-15 cm long by up to 2.5 cm wide, exerted or enclosed in uppermost sheath with branches scabrous. Spikelets are narrow, gaping when mature, of 1 bisexual floret, disarticulating above the glumes. The rachis is scabrous. Glumes are unequal, lower 5-9 mm long, upper 6-10 mm long, keeled, aristate, with 2-4 short lateral nerves, margins membranous, glabrous, keel scabrous. The lemma is narrow, shorter than lower glume, 4-7 mm long, glabrous, 2-lobed, each lobe with 2 short slender curved slightly flattened, single nerved awns 3-4 mm long. The awn from the sinus is stout, twisted, geniculate, curved, 1.5-2.5 cm long, callus bearded with hairs about 1 mm long. The palea are awnless, glabrous.

The var. *parviflorus* is not recorded in Western Australia and differs in the outer glumes being less than 4 mm long.

It is possible that the Western Australian collections are a new variety or species. Key characters of this taxon, and those of Eastern States collections and descriptions that were not available at the time of preparing this report, need to be compared.

**Flowering period:** Spring to summer

### Distribution and Habitat

The species is known from South Australia, New South Wales, Victoria and Tasmania with one population in Western Australia near Rocky Gully. Plants grow in winter wet low open woodlands.

### Conservation Status

Current: Priority 1

### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments / condition
CLM1	Rocky Gully	FRA	WR	1000	23/11/1995	

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### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to changes in canopy cover is unknown.

## Susceptibility to *Phytophthora Dieback*

Unknown

### Management Requirements

Relocate & resurvey population last seen in 1995.

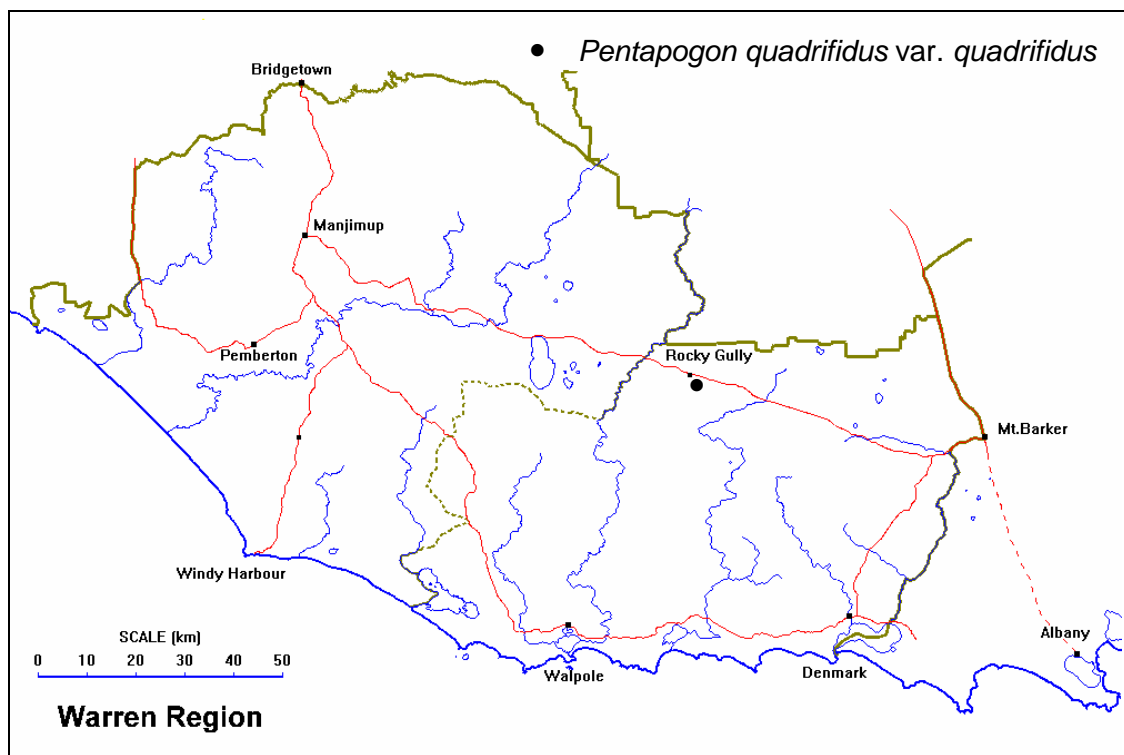
Search areas of suitable habitat for further populations.

### Research Requirements

None.

### References

Bentham (1878); Jacobs and McClay (1993); Morris (1990)





## *Sphaerolobium benetectum* R. Butcher

### PAPILIONACEAE

WAR F4/253

#### Description

*Sphaerolobium benetectum* is a shrub to 0.3-1m tall with slender, terete stems and alternate leaves that are more or less whorled, sessile, linear to lanceolate, 3-3.5 mm long, 0.3-0.5 mm wide. Leaves are shed before flowering. The inflorescence is on an elongated, terminal raceme, with 10-100 paired axillary flowers. Flowers are pea-shaped, standard yellow-orange and red, 5.1-6.3 mm long by 4.7-5.1 mm wide with the red eye more or less oblong with a flared apex and irregular margin. Wings are pink-red, oblong, 5-5.5 mm long by 1.8-1.9 mm wide. The keel is yellow and red, longer than wings, 5.6-6.2 mm long by 2.3-2.6 mm wide. The fruit is an inflated long-stalked pod, usually somewhat asymmetric and is broad or broader than long.

The species differs from *S. validum* in its standard eye which has irregular rather than stellate edges and its elongated rather than triangular wings. It is also more or less herbaceous with slender long branches, rather than short woody branches.

The species is easily distinguished from *S. drummondii* as the latter has flowers that are orange-red, pink-purple or cream, the standard eye is domed to cordate, the sub-apical stylar wing lack a fringed margin and the anther appendages are usually pale orange and hastate to rhombic.

**Flowering period:** late October to November

#### Distribution and Habitat

*Sphaerolobium benetectum* is found in disjunct populations south of Collie, north-east of Augusta and at Mount Lindsey. A population north of Walpole (Soho forest block) has not been relocated and the population at Mount Lindsey may have been killed by fire. The species is restricted to low-lying, seasonally wet areas fringing swamps, growing in grey sandy loam to sandy clay soils.

#### Conservation Status

Current: Priority 1

Recommended: Priority 2

#### Known populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Gumlink Rd	FRA	RR	na	20/11/1999	
WAR 101	Mount Lindsey	FRA	NP	1	11/2003	Not relocated
WAR 102	Soho	FRA	SF	na	5/11/1995	Relocate

#### Response to Disturbance

May have low tolerance to fire as, in the Mount Lindsey population, only one adult plant and no young seedlings were found by Brenda Hammersley and Roger Hearn in 2003 following a November burn in 1998.

#### Response to Phytophthora

Unknown.

#### Management Requirements

Relocate a population at Soho Block.

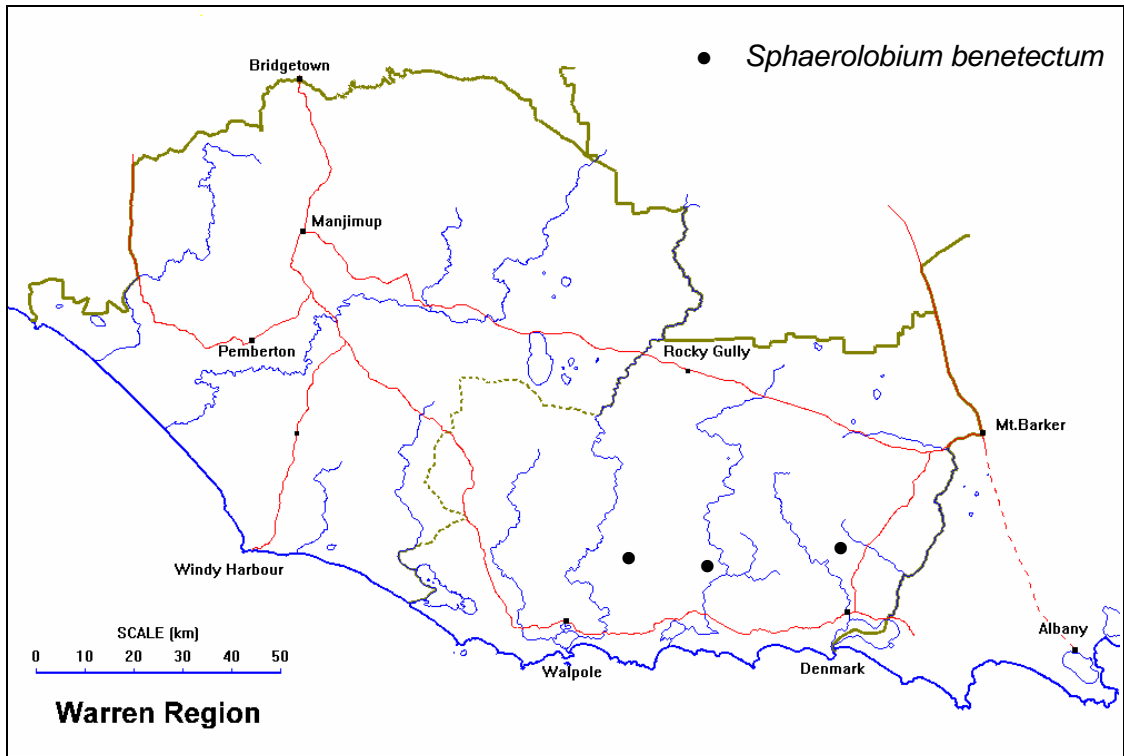
Search for further populations in areas of suitable habitat

#### Research Requirements

Determine response to fire.

Determine susceptibility to *Phytophthora* spp.

#### References



## *Synaphea decumbens* A.S. George

### PROTEACEAE

WAR F4/198

Alex George described this species in 1996 from a collection he made near Moorinup Lake, north of Lake Muir in 1971. Material collected in 1996, two kilometres south of the type locality, was used to supplement the species description given here with plants being generally larger (with larger leaves and longer spikes) than described in Alex George's Flora of Australia treatment. A possible new population may be present in Unicup Nature Reserve but to date only vegetative material has been seen.

#### Description

*Synaphea decumbens* is a small shrub with simple, pubescent, decumbent stems to 20 cm long. Leaves are cuneate to flabelliform, gently undulate, irregularly dentate lobed, the lamina 4-15 cm long by 2.5-6 cm wide, tapering into a 1-16 cm petiole. The ultimate lobes are approximately triangular, obtuse and mucronate. Spikes are 4-34 cm long. The peduncle is simple, 5-15 cm long, pilose the rachis pubescent. Bracts are acute, 2.5-3 mm long. The perianth is widely opening and sparsely puberulous, the adaxial tepal 6-6.5 mm long and about 3 mm wide, very convex with a thick dorsal ridge on lower half. The abaxial tepal is 5-5.5 mm long. The stigma is oblong but expanded at base, shallowly emarginate, 1.5 mm long by 1 mm wide.

The species resembles *Synaphea hians* but the latter is not known from the Warren Region or adjacent areas. *Synaphea hians* is readily distinguished by its stigma which is deeply divided with erect to incurved horns to about 2 mm long. A collection made by Ian Wilson in 1996 from near Lake Muir is similar in many ways to *S. decumbens* but keys out more closely to *S. otio stigma*, having a large broadly lunate stigma. (This collection differs from *S. otio stigma* in having an even larger stigma).

**Flowering period:** September-October

#### Distribution and Habitat

Known from Jarrah forest near Lake Moorinup in the Lake Muir area, growing in sand over laterite.

#### Conservation Status

Current: Priority 1

Recommended: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Panhandle Swamp	DON	NR/RR	<50	2003	Healthy
WAR 100	Wingebellup Rd 1	DON	RR	20+	2003	
WAR 101	Wingebellup Rd 2	DON	NR		2003	Few plants seen
WAR 102	Tuckett Rd.	DON	NR/River R	500+	2003	
WAR 103	De Landgrafft Rd	DON	NR	1000+	2003	Scattered along road over several km's and in adjacent bush
WAR 104	Southfield Rd	DON	NR/RR	<100	1996	Needs collections

#### Response to Disturbance

Response to fire is unknown.

The population at De Landgrafft Rd (WAR 103) indicates that this species responds to disturbance as it has been spread by road graders for several kilometres along the road.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change canopy is unknown.

#### Susceptibility to *Phytophthora Dieback*

Unknown, but given the susceptibility of the Proteaceae in general, should be assumed to be highly susceptible.

### Management Requirements

Search areas of suitable habitat for further populations.

With Threatened Flora Seed Centre staff, collect seed for long term conservation storage.

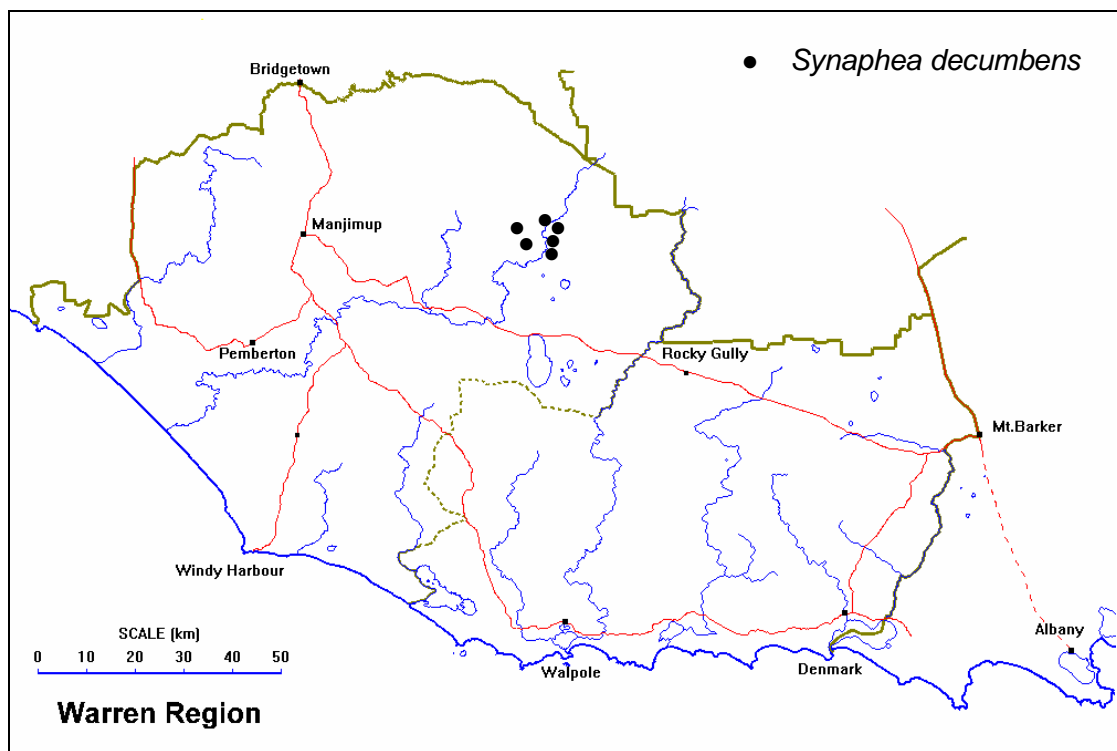
### Research Requirements

Determine the susceptibility to *Phytophthora* spp.

Determine the question of response to fire.

### References

George (1995b)



## ***Tetratheca* sp. Kent River (B.G. Hammersley 1791)**

### TREMANDRACEAE

WAR F4/217

*Tetratheca* sp. Kent River is a rare taxon that was first collected by Brenda Hammersley in 1996 while working on the taxonomic dilemma of *Tetratheca setigera* / *T. elliptica*. Examination of the material by Terry Macfarlane shows that it is closely related to *T. prolifera* from the Swan Region but is never the less a distinctive taxon.

#### **Description**

*Tetratheca* sp. Kent River is a small shrub 0.1-0.3 m high with multiple stems from the base. Stems are terete, 0.8-1.3 mm broad, branching. Leaves are alternate, occasionally sub-opposite, never in whorls, lower ones broadly elliptic to narrow elliptic or oblong, 10-12 mm long by 4-5 mm wide, the upper ones narrower, upper surface scabrous with stiff short white hairs and longer red glandular setae, lower surface glabrous or with scattered hairs on midrib, margins with reddish hairs making leaf appear dentate. Flowers are deep pink, solitary on peduncles 6-9 mm long. The five sepals are ellipsoid to oblong and 2.5 mm long. The five petals are narrow, 8 mm long by 3.5 mm wide at the apex. The stamens are 2.5 mm long. The tube is very short (to 0.3 mm long), white, scabrous on the inner surface.

The species is similar to *Tetratheca setigera* but is readily distinguished by its very short scabrous tube and generally more slender, delicate appearance.

**Flowering period:** August-September.

#### **Distribution and Habitat**

The species is known from two populations on the Kent River north-east of Walpole where it is found in Jarrah woodland adjacent to watercourses, growing in sand, on or near granite. The two populations occur close together along the same river and, as the area between them has yet to be surveyed, it is possible more plants will be found.

#### **Conservation Status**

Current: Priority 1

#### **Known Populations in the Warren Region**

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<b>Pop. No.</b>	<b>Location</b>	<b>District</b>	<b>Land status</b>	<b>No. of plants</b>	<b>Last survey</b>	<b>Comments/condition</b>
CLM1	Break Rd 1	Frankland	PP	5	9/10/2002	
CLM2	Break Rd 2	Frankland	PP	35	9/10/2002	

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#### **Response to Disturbance**

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### **Susceptibility to Phytophthora Dieback**

Unknown.

#### **Management Requirements**

Survey other areas of suitable habitat for further populations.

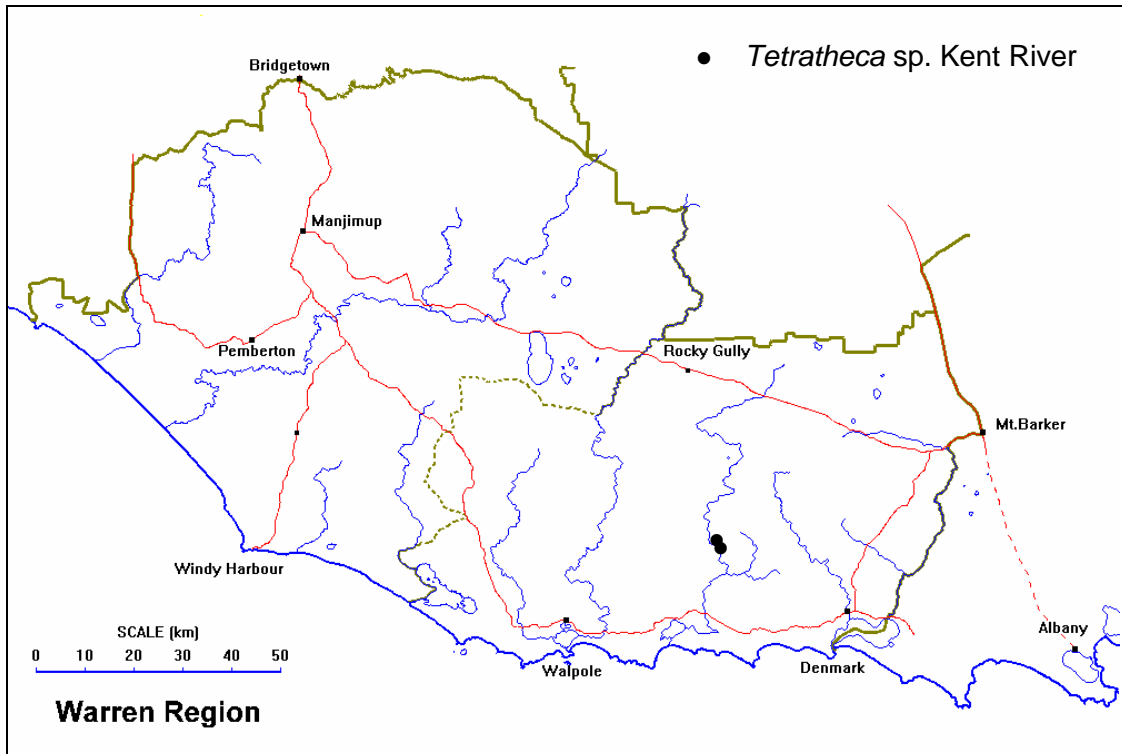
Survey area between the two populations.

### Research Requirements

Determine susceptibility to *Phytophthora* spp.

### References

Macfarlane (in prep.)



## 2. PRIORITY TWO SPECIES

Species which are known from one or a few (generally less than five) populations or collections, 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



Photograph of Priority two species, *Andersonia annelsii* ms by Roger Hearn

## *Andersonia annelsii* K. Lemson ms

### EPACRIDACEAE

WAR F4/129

*Andersonia annelsii* ms was collected by Tony Annels in 1982 and was recognised as distinct by Greg Keighery in 1990. It is still only known only from the original location. In February 2004, only small seedlings were observed (1-2 years old) and, as the seed bank has been severely depleted, the species may become extinct if fire occurs before they have reached maturity and set seed.

#### Description

*Andersonia annelsii* ms is a wiry, woody shrub to 25 cm with glabrous rhomboidal to ovate leaves 1-3 mm long by 1-2 mm wide and white flowers arranged in ovoid to globular terminal spikes, each subtended by a bract about twice the dimension of the leaves. The sepals are free and 7-12 mm long. The corolla is pubescent inside, tubular, five lobed, 7-12 mm long and equal in length to the sepals. The lobes are 1.5-3 mm long (about 25% of length of corolla). The stamens are free, not exerted, the staminal filaments glabrous. The style is glabrous and exerted. The fruit is a five-celled capsule.

**Flowering period:** October

#### Distribution and Habitat

The species is known only from a single population in a low open heath of *Pericalymma ellipticum* and *Baeckea camphorosmae* in Palgarup State Forest east-northeast of Manjimup, growing in white sandy loam over an exposed quartzite/granite ridge. This area is in the proposed Perup Nature Reserve.

#### Conservation Status

Current: Priority 2\*

\*Species is of the highest priority for further survey and consideration for gazettal as DRF.

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Perup NR	DON	NR	1000+	2/2004	The population has been reduced severely in size and area due to <i>Phytophthora</i> .

---

#### Response to Disturbance

The species is killed by fire and regenerates from seed. Seedlings that appeared following a fire in 1995 have not yet flowered.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

The population has reduced dramatically in size through *Phytophthora* infection.

#### Management Requirements

Monitor the population for *Phytophthora* damage.

Search areas of suitable habitat adjacent to the known population.

Determine the length of time to first flowering after germination.

Mark and protect the known population from vehicular traffic and machine operations.

#### Research Requirements

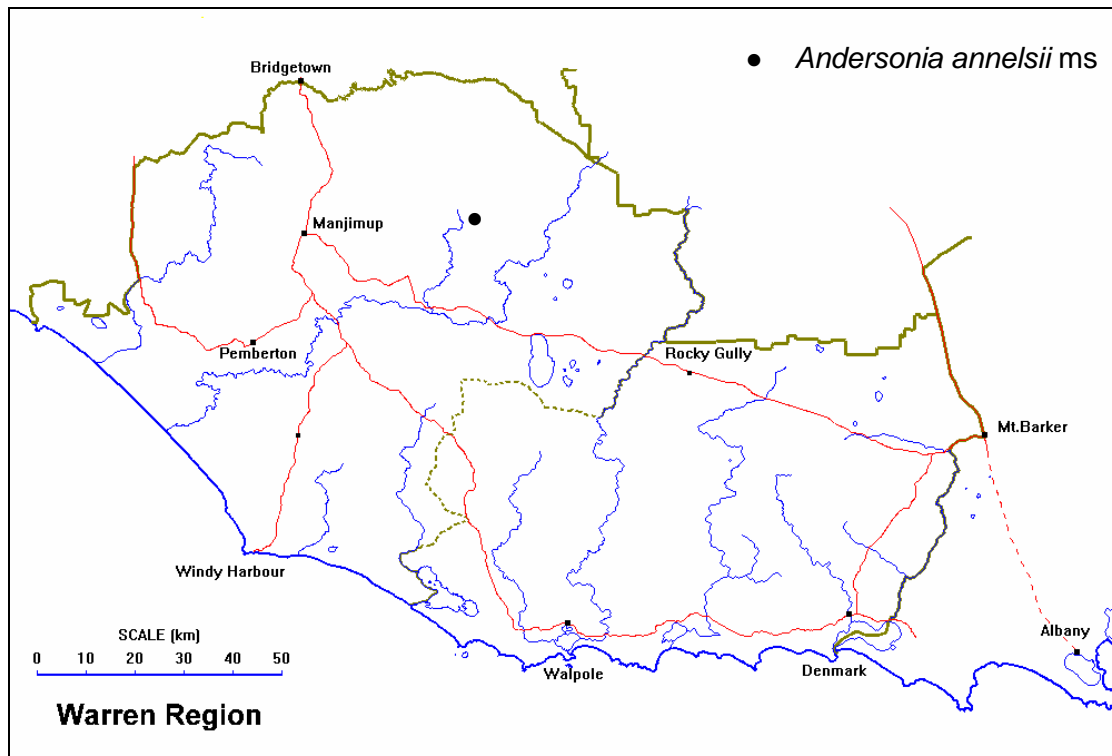


Determine responses to disturbance.

Determine the longevity of the soil seed bank, especially as the species is killed by fire and regenerates solely by seed.

### References

None.



## *Andersonia auriculata* L. Watson

### EPACRIDACEAE

WAR F4/36

There are at least two other recognisable *Andersonia* taxa that are very close to *A. auriculata* but have separate and distinct geographic distributions in the Warren Region. These have not been included here and only populations containing plants that fit the type circumscription of the species are listed below.

*Andersonia auriculata* is currently known from twenty documented populations. Several additional populations that have been recently found have not been included in this program. Refer to regional files for these.

The Gumlink road populations west of the Saw Rd intersection consist of scattered plants along the edge of the road and are probably an artefact of road grading rather than a natural population.

#### Description

*Andersonia auriculata* is a small ascending shrub 7-30 cm tall with bright green, spreading, spirally twisted leaves 5-25 mm long by 1-5 mm wide that are tapered to a thickened pungent apex. Most dead leaves are retained on the stem. Flowers are subtended by a series of pale green leaf-like bracteoles. The flower buds are light green-yellow, sepals white to very pale green, corolla tube blue, lobes darker and about twice as long as the tube, erect, densely bearded, white, almost to the tip. Staminal filaments are hairy and often auriculate but the extent of lobbing is variable both within populations and in different flowers on individual plants. The style is sparsely hairy.

The allied taxon *Andersonia* sp. Frankland and the white flowered form of *Andersonia auriculata* also occur in the Warren Region but are readily separated from *A. auriculata* as they have discrete distributions. Plants found west of the Frankland River (*Andersonia* sp. Frankland) differ in the absence of auricles on filaments and having finer foliage and a generally shorter corolla, while the group east of the Frankland River but west of the Bow River and north of private property differ in the absence of auricles on filaments and having a white (or extremely pale blue) corolla with lobes shorter or about equal to tube length. *Andersonia hammersleyana* ms differs in its lack of auricles and its general hairy character.

**Flowering period:** May-September

#### Distribution and Habitat

The species occurs in Jarrah/Sheoak/Marri woodlands and open heaths abutting areas that are subject to winter inundation between Kordabup, Nornalup, Peaceful Bay and Thames Block, growing on white to grey sandy soils.

#### Conservation Status

Current: Priority 2

Recommended: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Quarram Town Site	FRA	VCL	500	27/7/2001	
CLM 2a	Gum Link NR	FRA	NR	na	28/8/1994	
CLM 2b	Gum Link Rd/Saw Rd	FRA	TR	na	28/8/1994	
CLM 3	Thames Block 1	FRA	SF	na	1/5/1994	
CLM 4	Nut Road 1	FRA	NP	18	31/7/1998	
CLM 5	Nut Road 2	FRA	NP	100	21/7/1993	
CLM 6	Kordabup Rd 1	FRA	SHR	100	28/7/1993	
CLM 7	Kordabup Rd 2	FRA	SF/ VCL	5	2/8/2001	
CLM 8	Ficifolia Rd/Nut Rd	FRA	NP	na	6/6/1989	
CLM 9	Peaceful Bay/ The Gap	FRA	NP	na	1/9/1991	
CLM 10	Quarram NR	FRA	NR	na	23/4/1989	
CLM 12	Middle Rd	FRA	SF	100	9/11/1998	
CLM 13	Kordabup Rd 3	FRA	TR	1000	18/8/2000	

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 14	Tindale Rd	FRA	SF	30	28/8/2002	
CLM 15	Gum Link Rd	FRA	SF	8	27/6/2001	
CLM 16	Thames Block 2	FRA	SF	na	6/12/2001	Misidentification
CLM 17	Gum Link Rd 2	FRA				
CLM 18	Ficifolia Rd 2	FRA	NP	na	12/10/1995	Herbarium record only
CLM 19	Ficifolia Rd 3	FRA	NP	na	11/02/1997	As above
CLM 20	Turpin Rd					Relocate to confirm ID (sterile specimen)
WAR 100	Soho FB	FRA	NP	1000+	15/6/2004	Relocate population. Many deaths due to <i>Phytophthora</i>

### Response to Disturbance

The species is killed by fire and regenerates from seed. The first significant flowering is in the third spring after fire.

Plants are killed following soil disturbance but regenerate from seed. Populations along Gum Link Road are likely to have originated following movement of seed during road grading.

Natural populations are usually found in ecotones just above zones subject to winter inundation. Significant changes in water tables could impact on the taxon's conservation status, particularly where *Phytophthora* species are present.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora* Dieback

Highly susceptible with all known populations apparently affected by the pathogen.

### Management Requirements

Dieback management to be practised during operations that are likely to affect populations.

Monitor the health / plant numbers in populations every second year.

Consider treating populations with Phosphonate in *Phytophthora* affected sites.

Liaise with Shire / MRWA to protect populations.

Survey populations in the Gum Link Rd and Thames block area and determine if they are one continuous population or separate populations

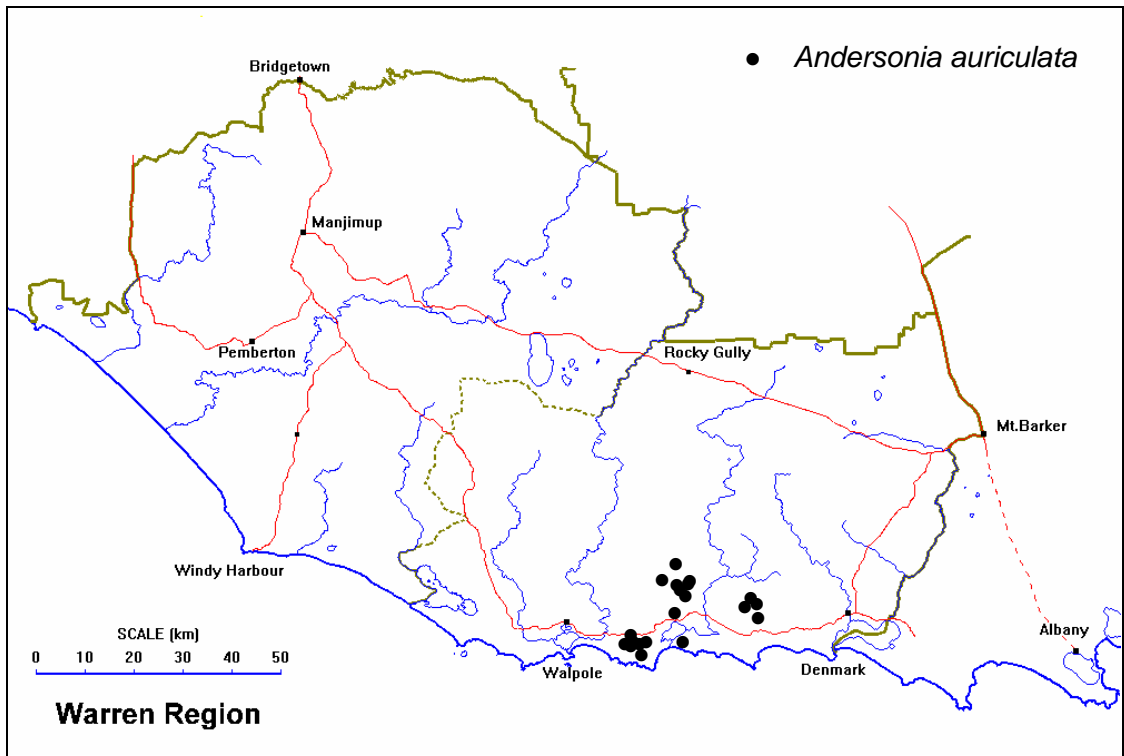
Collect and store seed from all populations to protect against possible population (and taxon) extinction.

### Research Requirements

Liaise with Kristina Lemson on matter of taxonomy of the complex, reviewing conservation status of the taxon/taxa when her revision of the genus is complete.

### References

Watson (1962); Kristina Lemson (personal communication); Wheeler *et al.* (2002)



## *Andersonia hammersleyana* K. Lemson ms

### EPACRIDACEAE

WAR F4/108

*Andersonia hammersleyana* ms is a recently discovered species that was first collected by Brenda Hammersley in 1990. For several years it was known from a single, small, apparently dieback affected population until a second larger population was found by Laurie Anderson in 1996. Both populations are located in an area that is a proposed dam site. A possible third population has been located about 10 km northwest of these two populations but needs collecting when in flower to confirm its identity. The species is most closely related to *Andersonia pinaster* ms and will be formally described by Kristina Lemson during a revision of the genus. Both known populations occur in State Forest in areas that were originally proposed for inclusion in a National Park (1987) but are now likely to be excised to create a water reserve for future damming of the Denmark River (1994).

#### Description

*Andersonia hammersleyana* ms is a small straggly shrub to 80 cm with narrowly ovate-triangular, ciliate, erect to slightly spreading, flat to spirally twisted leaves 10-18 mm long by 1.5-2.5 mm wide, tapering to a thickened pungent apex. Dead leaves are retained on the lower stem. Flowers are blue and white, 10-15 mm long, solitary, terminal on short branches, subtended by numerous leafy bracteoles, these densely hairy. The sepals are white, tinged pink to 15 mm long and glabrous. The corolla is about 15 mm long, the tube pale blue/white to 9 mm long with deep blue, densely hairy lobes to 6 mm long, tips spreading. The style is sparsely hairy. Stamens are not exerted. Staminal filaments are hairy.

*Andersonia hammersleyana* ms is distinguished from *A. auriculata* and *A. aff. auriculata* by its hairy leaves and large flowers.

**Flowering period:** April-October

#### Distribution and Habitat

The species is known from two populations near Mt. Lindesay, growing in sandy-gravel soils in jarrah forest with a heath understorey.

#### Conservation Status

Current: Priority 2\*

\*Species is of the highest priority for further survey and consideration for gazettal as DRF.

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 101	Mt. Lindesay	FRA	SF (WR)	<100	16/9/1994	
WAR 102	Granite Rd.	FRA	SF (WR)	500	19/8/1996	

#### Response to Disturbance

Plants are killed by fire and regenerate from soil-stored seed. Plants have been observed to germinate sporadically over three successive years with significant drought losses of new seedlings each year. Flowering and first seed set occurred in the third season after germination.

Plants on a firebreak were noted to respond to mechanical disturbance in the same way as to fire.

The species is apparently vulnerable to summer drought in the first year after germination. Both populations occur in moisture gaining situations in the landscape.

Response to weed invasion is unknown.

#### Susceptibility to Phytophthora Dieback

As with other species in the genus, *Andersonia hammersleyana* ms is presumed to be highly susceptible. However, sampling of dead plants has failed to return a positive result for *Phytophthora*

and further testing will be conducted. The moist habitat of the species makes populations vulnerable to rapid disease development if infection occurs.

### Management Requirements

Monitor populations annually.

Collect seed from the second population.

Survey areas of suitable habitat for further populations.

Given the location of both populations in relation to roads and the likely introduction of *Phytophthora*, periodic treatment of the sites with phosphonate should be conducted.

Planned fire events in the area of populations should be separated by at least six and preferably eight years.

The third possible population on Watershed Road needs to be relocated and collected when in flower to confirm its identity.

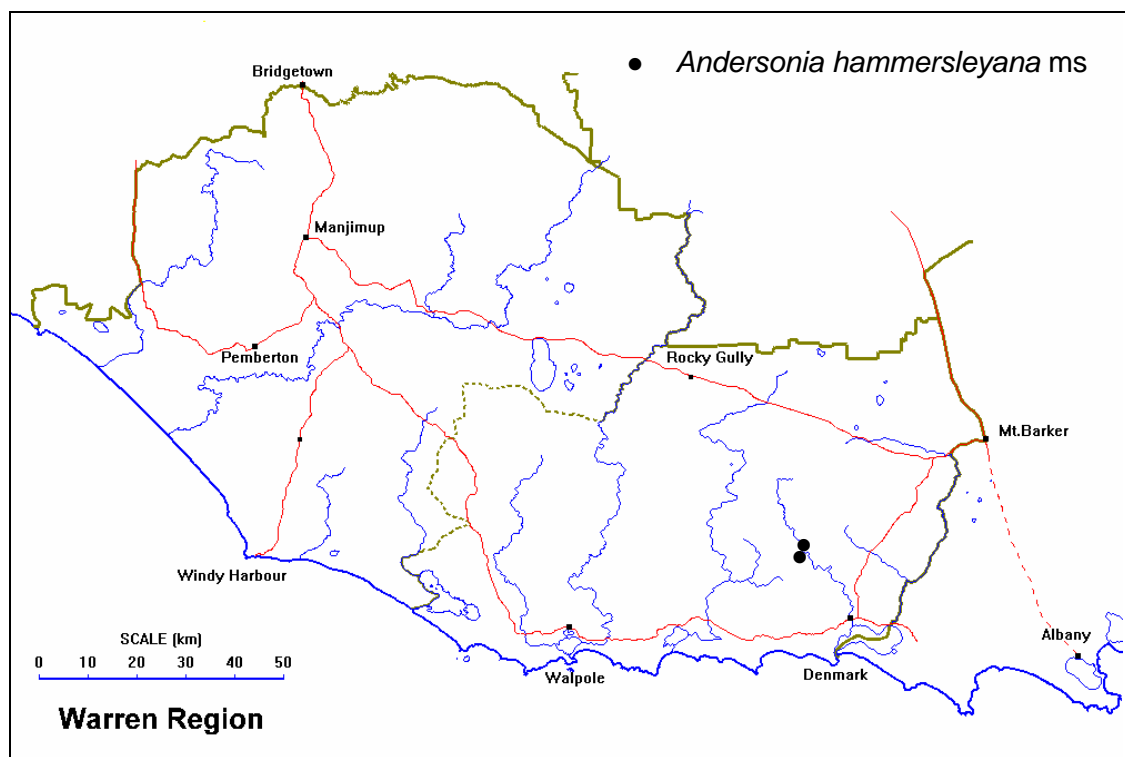
### Research Requirements

Confirm susceptibility to *Phytophthora* spp.

Liase with Kristina Lemson regarding taxonomy and conservation.

### References

Kristina Lemson (personal communication); Wheeler *et al.* (2002)



## *Andersonia virolens* K. Lemson ms

### EPACRIDACEAE

WAR F4/132

This species was illegitimately named *Sprengelia macronema* by Mueller from material he collected from Mt. Roe (Burrobnup) on his 1877 trip through the Region and was later (1962) included in *Andersonia setifolia* by L. Watson. Type material borrowed by Kristina Lemson for her revision of *Andersonia* revealed two specimens on a composite sheet with *A. sprengelioides*. As the species had been illegitimately named she assigned the manuscript name *A. virolens* to it. Several visits to Mt. Roe made prior to seeing the 'Type' collection, failed to relocate the original population and plants are currently known only from Mt. Lindesay and the Nicol Road areas.

#### Description

*Andersonia virolens* is a cushion-like shrub to 20 cm with narrowly ovate, spiral, spreading, ciliate, imbricate, sessile leaves, 5-8 mm long by 1-2 mm wide, gradually tapered to a thickened pungent apex and with an adnate sheathing base. Flowers are white and arranged in ovoid to globular terminal spikes, each subtended by a bract and two bracteoles. The five sepals are about 4 mm long. The corolla is tubular, five lobed, 5.5-6.5 mm long with lobes that are glabrous or sparsely hairy towards base. The throat is bearded. Stamens are red in colour, exserted and spreading. The staminal filaments and style are glabrous. Flowers emit an odour of rotting flesh (similar to that of *Cryptandra congesta* which grows in close proximity to it). The fruit is a five-celled capsule.

The population on Mt. Lindsey and Nicol road are morphologically different, with the Mt. Lindsey form upright and the Nicol road population compact and pincushion like.

**Flowering period:** October-November

#### Distribution and Habitat

The species is known from granite heath and shrubland at Mt. Lindesay, Sharpe Block and Mt. Roe (Burrobnup), growing in sandy soil.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments / condition
WAR 1	Burrobnup (Mt. Roe)	FRA	SF (5g)	0	6/10/1994	Not relocated
CLM 1, 2 & 3	Mt. Lindesay	FRA	SF (NP)	1000+	17/8/1997	CLM1, 2 & 3 are the same population
WAR 100	Nicol Rd	FRA	SF	na	20/1/2004	Burnt in 2003, Assessed too soon after burn to identify seedlings
WAR 101	Preston Rd.	FRA	SF	50+	10/2002	Similar morphology to Nicol Rd population.
WAR 102	Mt. Pingerup	FRA	NP	30	11/12/1997	As above

#### Response to Disturbance

Plants are killed by fire and regenerate from seed. The first flowers appeared in the third year following germination.

Observation of the Mt. Lindesay population suggests that the species re-colonises disturbed areas.

Responses to changes in soil moisture are unknown.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora Dieback*

Unknown, but given the susceptibility of other members of the genus populations should be managed as if highly susceptible.

### Management Requirements

Search suitable habitat on Mt. Roe for the Type population.

Monitor populations annually, particularly for the possible introduction of *Phytophthora*.

Search areas of suitable habitat between and adjacent to the two known populations.

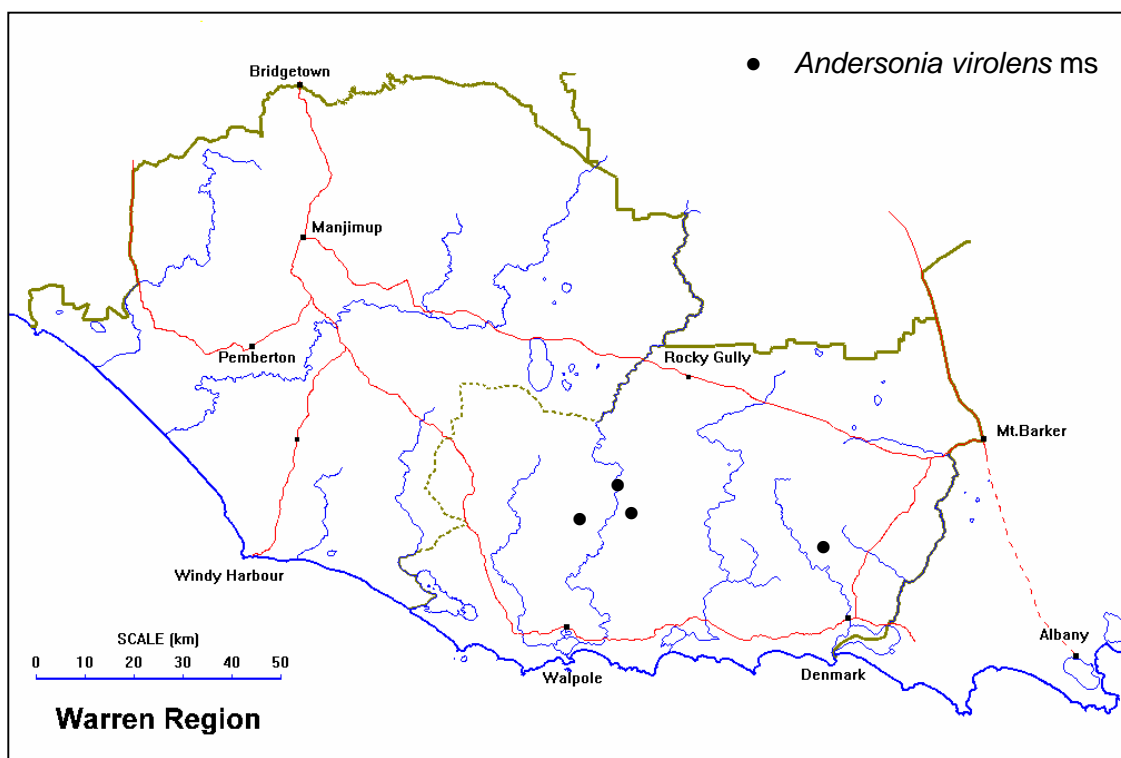
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Liaise with Kristina Lemson in relation to her revision of *Andersonia*.

### References

Watson (1962); Kristina Lemson (personal communication); Wheeler *et al.* (2002)





## *Anthocercis sylvicola* T. Macfarlane & Wardell-Johnson

### SOLANACEAE

WAR F4/128

*Anthocercis sylvicola* was first collected by R.D. Royce in 1965 and two years later (1967) a second collection was made by Paul Wilson. Following these collections it was not seen for over 20 years until a population was found during floristic studies that were being undertaken in the Walpole Nornalup National Park in 1989. More recently, during field work for this plan, a small population was found near Granite Peak, the population found by Paul Wilson was relocated and a new population was located in the Woolbales by Ted Middleton. The species was formally described by Terry Macfarlane and Grant Wardell-Johnson in 1996.

Along with a number of other Warren taxa included in this plan, *Anthocercis sylvicola* is considered to be a primitive Gondwanan relic of a more mesic environment.

#### Description

*Anthocercis sylvicola* is a spinescent, often sprawling, partly pubescent shrub with glandular and non-glandular hairs. Stems are up to 2.5 m tall by 1.5 cm thick, either erect or in an inclined or horizontal position with erect branches, these often giving the appearance of being separate plants. Spines are one to two per leaf axil. Leaves are obovate, entire, acute, 7-11 mm long by 2-4.5 mm wide, sparsely hairy, the petiole 1-1.5 mm long. The inflorescences are terminal or subterminal comprising of cymes of up to five flowers or flowers axillary and solitary. Pedicels are about 3 mm long. The calyx is green and about 3 mm long, externally glabrous with five lobes. The corolla is 7-8.5 mm long, purple and green with lobes 3-4 mm long.

What constitutes a single plant is a problem in the field due to the sprawling character of the species and its tendency to set vertical shoots, each looking like a new plant. Overestimates of population size are likely. (\* See table below.)

**Flowering period:** September-February

#### Distribution and Habitat

The species is known from a few areas of tall open forest between Walpole and Denmark, growing on brown gravelly, free draining clay loams. In each site soil moisture is high due to the habitat being downslope of water shedding granite outcrops.

#### Conservation Status

Despite extensive survey work, the species is known from just five extant populations. A sixth (Royce's) that is possibly east of Walpole has not been relocated and may be extinct. The failure of plants to set seed or reproduce vegetatively (though resprouting has been observed) suggests the species is at risk.

Current: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments / condition
CLM1	Deep River	FRA	NP/RR	12	1/1997	
CLM2	Mt. Clare	FRA	NP	500+ *	1/1997	* May be an overestimate.
CLM3	Granite Peak	FRA	NP	200+	22/9/1994	
CLM4	Woolbales	FRA	NP	na	1/1997	
WAR 100	Mt. Hallowell	FRA	SHR	1	30/8/1998	Relocate plant
WAR 101	Brainy cutoff	FRA		na	5/3/1998	

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

### **Susceptibility to *Phytophthora Dieback***

Unknown.

### **Management Requirements**

Monitor populations periodically.

Monitor specifically before disturbance and in years following disturbance.

### **Research Requirements**

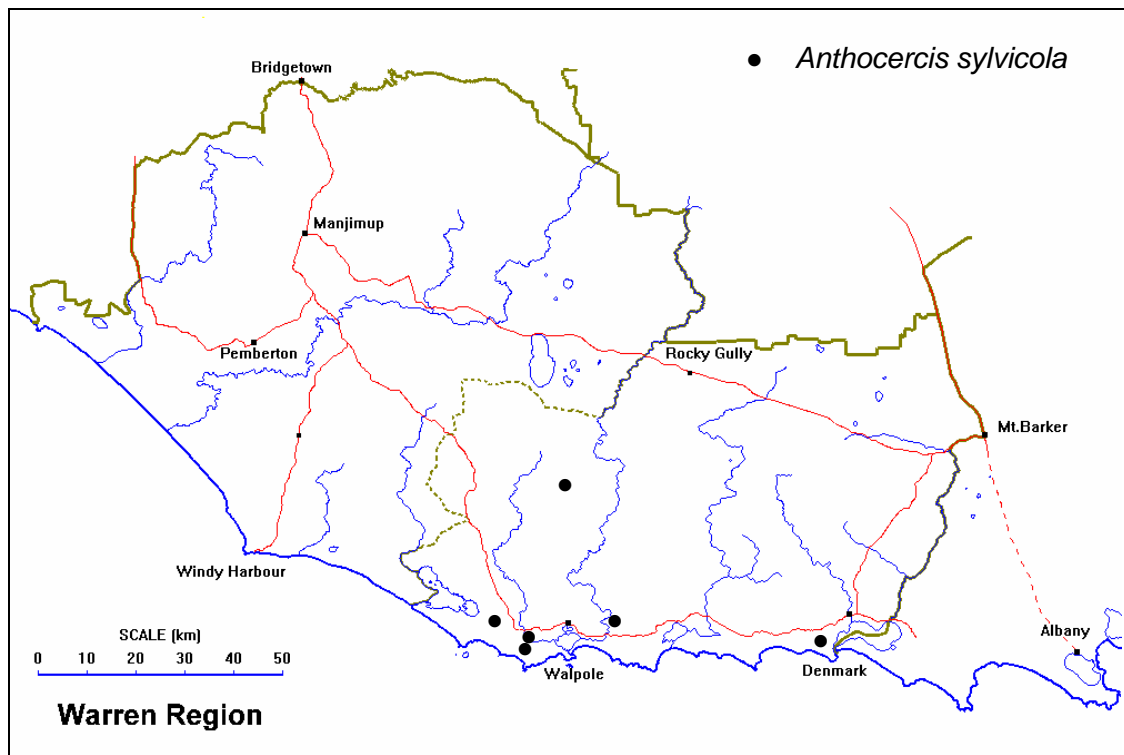
Research reproduction and regeneration.

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### **References**

Macfarlane and Wardell-Johnson (1996)



## *Apodasmia ceramophila* L.A.S. Johnson & B.G. Briggs ms

### RESTIONACEAE

WAR F4/47

*Apodasmia ceramophila* ms was first collected near Yarloop by R.D. Royce in 1947 and has since been collected intermittently in southern areas of Western Australia. It is now known from twelve populations, the majority of which are not secure. As it is a wetland species, it may be subject to climate change and altering water tables.

While survey indicates the species is more common than previously thought, field observation of southern populations indicates ongoing monitoring is essential. It is difficult to determine the actual number of plants as this species is clonal, e.g. a population may represent a single genotype. Populations on the Swam Coastal Plain have not been relocated. All known populations are subject to habitat modifying pressures such as land degradation due to impacts of adjacent land use. While salt tolerance is evident in southern populations, a feature of the genus (B. Briggs, personal communication), increasing salt levels may exceed the species tolerances. Siltation, erosion, drainage and weeds show evidence of becoming major problems for all populations.

#### Description

*Apodasmia ceramophila* ms is an erect, perennial, dioecious rush to 45 cm with a creeping rhizome. Stems are about 1 mm broad and greyish in colour. Leaves are about 12 mm long, acuminate with narrow translucent margins. The male spikelets are few, spreading, 5-9 mm long, the bracts reddish brown 3.5-5.5 mm long and acuminate. The female flowers are in a terminal head like cluster about 8 mm long. Involucral bracts are 5-6 mm long. Floral bracts are broadly ovate and shortly acuminate.

**Flowering period:** July-December

#### Distribution and Habitat

The species is known from three disjunct areas in Harvey-Yarloop, Lake Muir-Rocky Gully-Mt. Barker, and Forrestdale (K. Meney personal communication), growing in dense clays on the margins of lakes, rivers and swamps. All areas are subject to inundation. Southern populations are usually found in *Melaleuca* shrubland.

#### Conservation Status

Current: Priority 2

Recommended: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants*	Last survey	Comments/condition
CLM 1	Lake Muir 1	DON	NR	1ha	9/12/1994	Drainage problem
CLM 2	Wamballup	FRA	NR	0.5 ha	11/10/1994	As above
CLM 3	Rocky Gully 2	FRA	PP	0.25 ha	3/11/1994	As above
CLM4	Lake Muir 2	DON	NR	1 ha	9/12/1994	As above
CLM5	Lake Muir 3	DON	NR	1 ha	9/12/1994	As above
CLM6	Kent River	FRA	RR	< 0.25 ha	23/11/1995	As above
WAR 101	Pinticup NR	DON	NR	na	27/3/1997	As above
WAR 102	Cobertup NR	DON	NR	na	10/12/1997	As above
WAR 103	Kululinup NR 1	DON	NR	1 ha	22/10/1997	As above
WAR 104	Kodjinup NR	DON	NR	1ha	15/12/1999	As above
WAR 105	Kululinup NR 2	DON	NR	0.5 ha	15/12/1999	As above
WAR 100	Frankland River	FRA				Not relocated

\*or area occupied

#### Response to Disturbance

Known to resprout after fire.

Has recolonised damaged areas adjacent to the Kent River.

*Apodasmia ceramophila* ms is a species that occupies seasonally winter inundated and summer parched sites and is possibly vulnerable to changes in water tables. See comments above regarding salt.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Resurvey then monitor populations every three years, or more frequently if disturbance levels on adjacent lands are known to be high.

Search for further populations, particularly for adequately conserved populations in the Denbarker area.

### Research Requirements

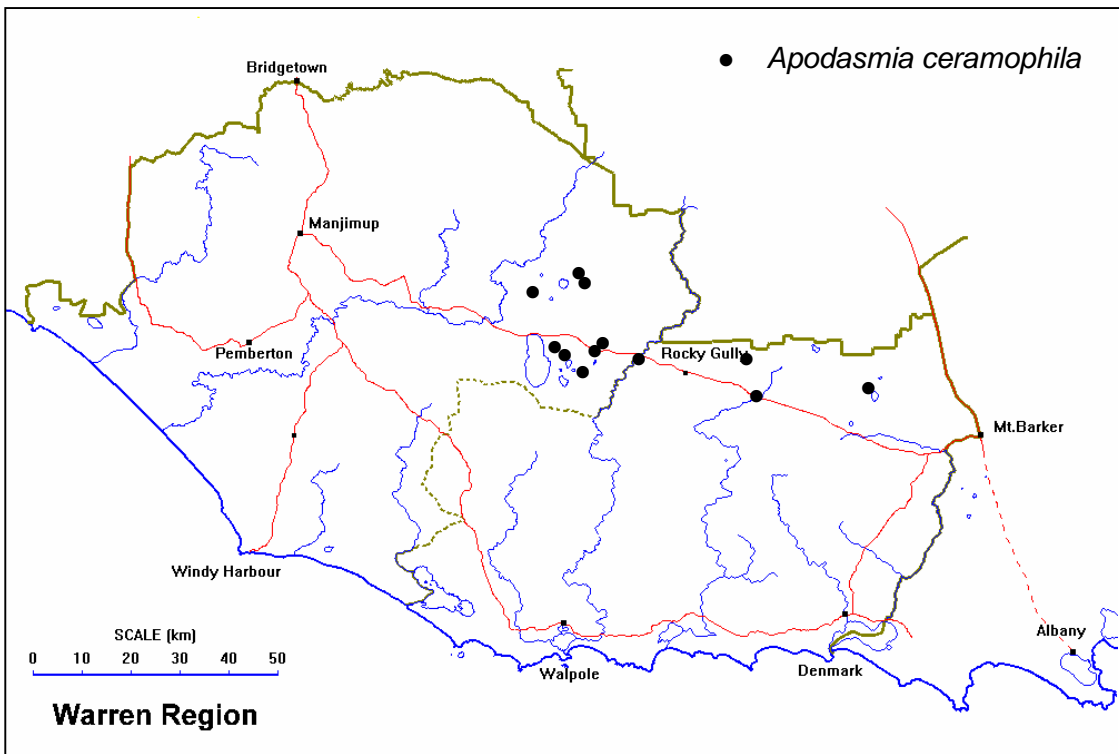
Determine response to disturbance.

Determine questions of susceptibility to salt levels and *Phytophthora* spp.

Conduct molecular genetic studies intra- and inter-population due to clonal and long-lived nature of taxon.

### References

Rye (1987b); Meney and Pate (1999)



## *Borya longiscapa* Churchill

### ANTHERICACEAE

WAR F4/39

*Borya longiscapa* was collected by Eileen Croxford in 1982 and described by D. Churchill in 1987. It has a very restricted distribution over a range of less than 20 km with pig digging and the spread of *Phytophthora* posing immediate threats to several populations. The species has been well searched for and it is believed unlikely that further populations will be found.

#### Description

*Borya longiscapa* is a domed, erect or reclining perennial to 60 cm high, making it the largest of the *Borya* species. It is characterised by its long scapes, 14-42 cm long and the large number of outer involucre bracts (10-12 per flowering head). *Borya sphaerocephala* differs in only reaching 20 cm in height, with scapes 5-20 cm long and 3-8 outer involucre bracts.

**Flowering period:** September-December

#### Distribution and Habitat

The species is known from a small area to the north of Denmark, growing in shallow soil on granite outcrops.

#### Conservation Status

Current: Priority 2

Recommended: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Mt. Lindesay 1	FRA	SF	2000	15/10/1994	
CLM 2	Mt. Lindesay 2	FRA	SF		15/10/1994	
CLM 3	Break Rd	FRA	SF		6/12/1994	Pig activity noted
CLM 4	Granite Rd 1	FRA	SF	200	27/11/1992	
CLM 5	Stan Rd 1	FRA	PP	2000	25/9/1992	
CLM 6	Stan Rd 2	FRA	SF	2000	25/9/1992	
CLM 7	Nutcracker Rd	FRA	PP	200	28/9/1992	
CLM 8	Stan Rd 3	FRA	SF	200	30/9/1993	
CLM 9	Little Lindesay	FRA	SF	2000	26/10/1994	
CLM 10	Granite Rd 2	FRA	SF	200	22/9/1995	
CLM 11	Granite Rd 3	FRA	SF	1000	19/8/1996	
CLM 12	Granite Rd 4	FRA	SF	1000	19/8/1996	

#### Response to Disturbance

Response to fire: unknown.

Response to soil disturbance is unknown.

Plants are drought tolerant and are able to resprout following rain.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown, but probably susceptible (as are other *Borya* spp.)

#### Management Requirements

Continue pig control.

Resurvey populations and monitor every two years or following disturbance.

Search for additional populations.

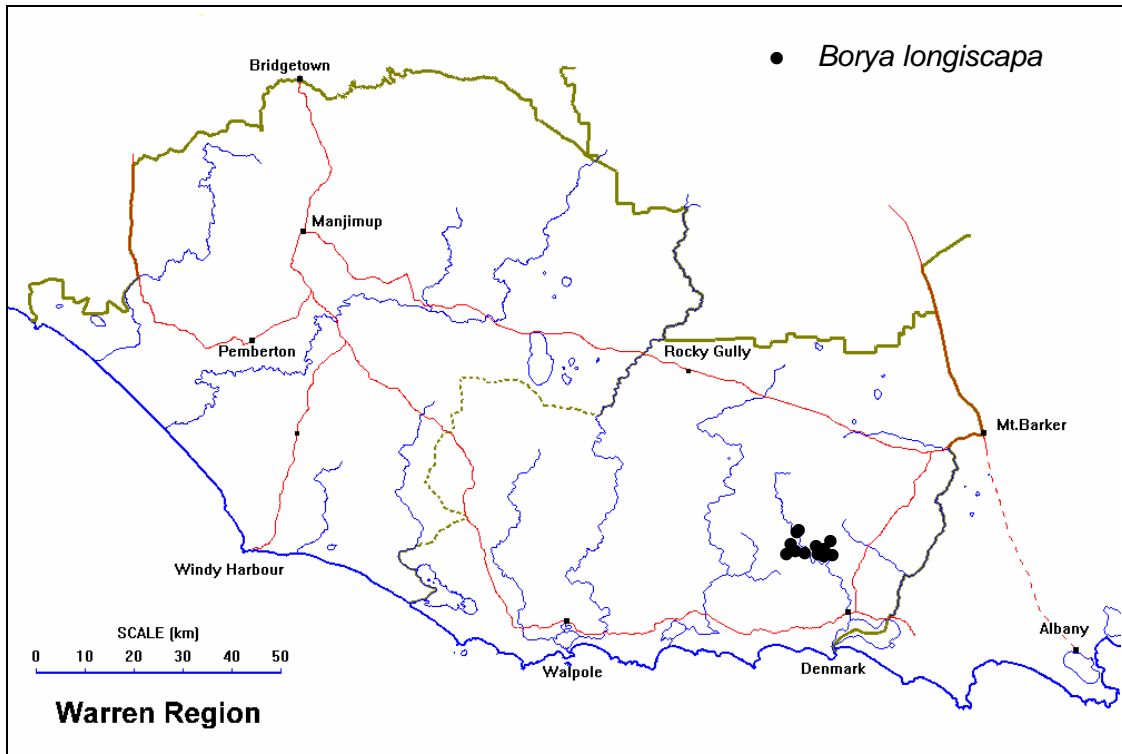
#### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Churchill D.M. (1987)



## *Caladenia abbreviata* Hopper & A.P. Br.

## ORCHIDACEAE

### Coastal Spider Orchid

WAR F4/40

*Caladenia abbreviata* is a poorly known species that was first collected south of northwest of Augusta by Andrew Brown in 1986 and subsequently near Walpole by Bill Jackson in 1989. Due to its coastal habitat in often inaccessible areas of the south coast it has remained poorly collected.

### Description

Coastal Spider Orchid is a attractive late flowering orchid which grows between 25-30 cm high and has a leaf 10-20 cm long by 4-5 mm wide that is often withered when flowering. The inflorescence consists of one to three green/yellow or rarely reddish flowers about 6-8 cm long by 5-7 cm wide with petals 2.5-5 cm long by 2-3 mm wide, horizontal to down curved or occasionally held high. The labellum is down curved, 10-13 mm long and 7-9 mm wide with a narrow fringe and thick dark red radiating basal lines becoming large irregular spots and blotches towards the recurved apex. Calli are in 8-13 pairs extending at least half the length of the labellum.

*Caladenia abbreviata* is closely related to, and overlaps in range with, *C. evanescens*, however, the latter species is readily distinguished by its shorter petals and sepals, its projecting labellum and single flower.

**Flowering period:** November-December

### Distribution and Habitat

The species is known from areas of coastal Peppermint woodland in scattered populations between Yallingup and William Bay, growing in deep sand on consolidated dunes. It has been reported from the Lake Jasper area but has not been relocated there since first sighted. It has also been reported from Black Point and the Black Point - Scott National Park Road but requires confirmation.

### Conservation Status

Current: Priority 2

### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 101	Crystal Springs 1	FRA	NP	50	28/11/1989	
WAR 102	Crystal Springs 2	FRA	NP	50	16/11/1995	

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### Response to Disturbance

Plants are killed by fire during their active growing period (May – October).

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown, but the species is probably vulnerable to annuals that are able to rapidly occupy a site after fire or other soil disturbance.

### Susceptibility to *Phytophthora Dieback*

Unknown.

### Management Requirements

Resurvey and monitor populations annually.

Manage fire in the area of the known population to ensure conservation of the species.

Search Lake Jasper/Black Point area for reported populations.

Survey other areas of suitable for possible additional populations.

Collect seed and mycorrhiza for conservation work being conducted at the Botanic Gardens and Parks Authority.

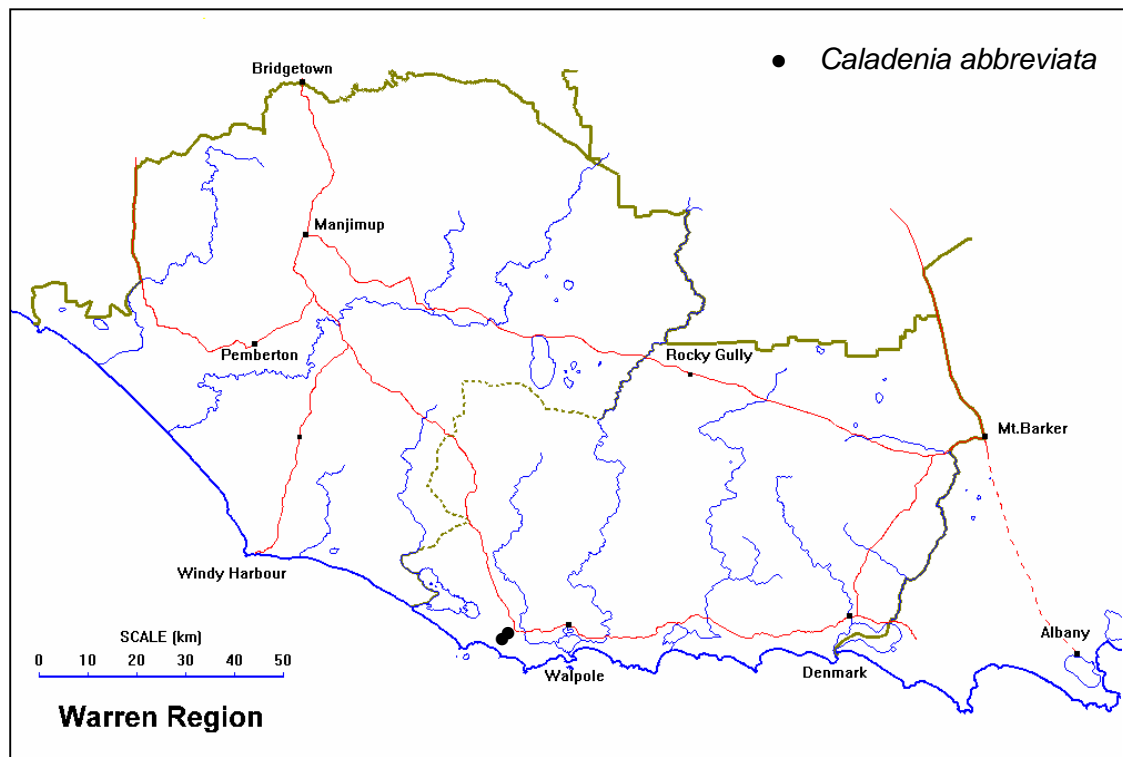
### Research Requirements

Liase with the Botanic Gardens and Parks Authority as required.

Determine issue of susceptibility to *Phytophthora* spp.

### References

Hoffman and Brown (1992, 1998); Hopper and Brown (2001)





## *Caladenia erythrochila* Hopper & A.P. Br.

### ORCHIDACEAE

WAR F4/169

*Caladenia erythrochila* is a rare species that was first located and photographed by Harry Winfield in the 1970's. It was then not seen again until 1995 when it was collected by Bill and Gloria Jackson as part of the field work component of this program. At the single known site it was found to occur in close proximity to the rare *C. sp.* Boyup Brook, this population previously unknown.

#### Description

*Caladenia erythrochila* is a small spider orchid 20-28 cm high with a leaf 8-10 cm long by 1-2 mm wide. Each plant has one to two deep maroon or burgundy flowers 8-10 cm long by 4-8 cm wide. Sepals and petals are very narrowly filamentose and densely ciliate with cilia to 1 mm long. The taxon is related to *C. pulchra* but differs in its consistently deeper maroon flower colour, smaller flower size and shorter stature.

**Flowering period:** late September-early October

#### Distribution and Habitat

The species is known from two populations in open Jarrah/Marri/Wandoo forest near Tone Bridge, growing on laterite with grey sandy lateritic gravel, mid slope on a gentle sloping tending to flat terrain.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Southfield Rd	DON	NR	3	7/10/2004	
WAR 101	Scotts Brook Rd	DON	TR	na	na	Relocate population

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#### Response to Disturbance

Plants are killed by fire during their active growing period between May and early November.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements

Manage fire regimes in the area of known populations to ensure their long-term conservation.

Monitor populations annually.

Survey areas of suitable habitat for further populations.

Collect seed and *Mycorrhiza* for conservation work at the Botanic Gardens and Parks Authority.

#### Research Requirements

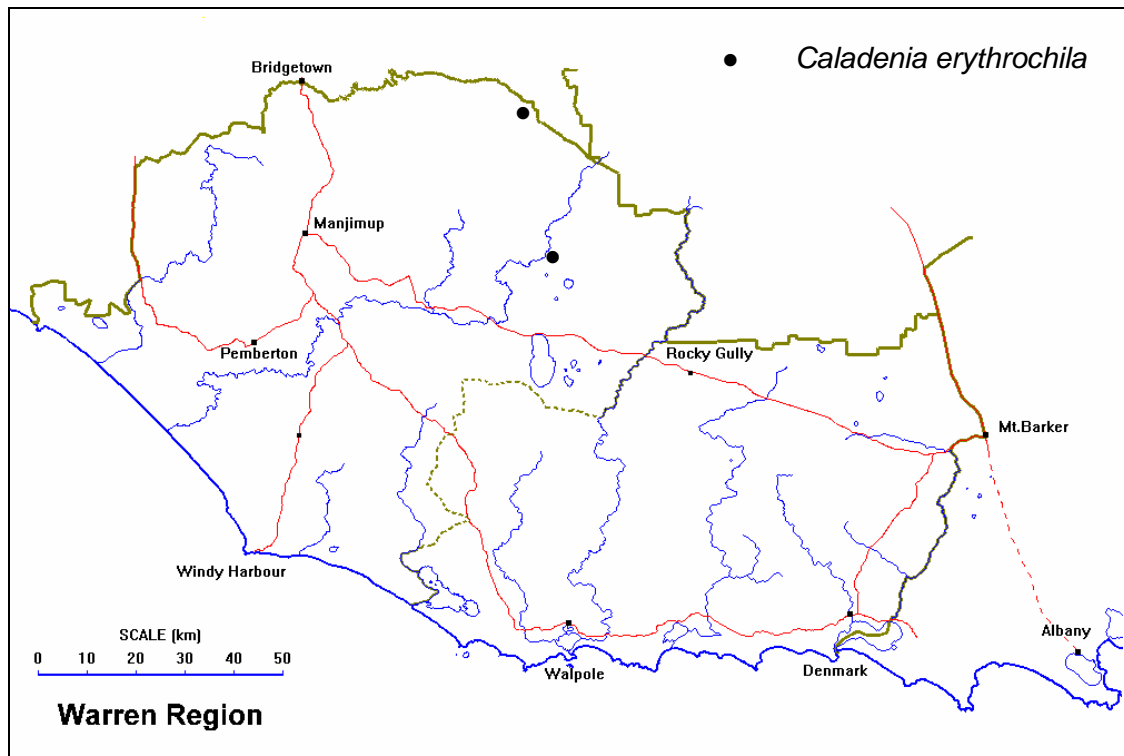
Liaise with Botanic Gardens and Parks Authority as required.

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

## References

Hoffman and Brown (1992, 1998); Hopper and Brown (2001)



## *Caladenia luteola* Hopper & A.P.Br.

### ORCHIDACEAE

#### Lemon Spider Orchid

WAR F4/195

*Caladenia luteola* is a poorly known but apparently rare species collected by Stephen Hopper in 1986 near Woodanilling and by Mal Graham in 1992 near Katanning. It was thought to be restricted to the Woodanilling/Katanning area until 1995 when collected by Bill Jackson near Tonebridge, a range extension of about 100 km. However, recent taxonomic studies indicate that this population is morphologically different to the type and may represent a new taxon.

#### Description

*Caladenia luteola* is a relatively small orchid 15-25 cm high with a long, narrow, hairy leaf 8-12 cm long by 3-5 mm wide and one to three pale yellow spider-like flowers. The lateral sepals are 5.5-7.5 cm long by 2.5-4 mm wide and petals 4.5-6.5 cm long by 2.5-3 mm wide. The labellum is 15-19 mm long by 9-12 mm wide, pale yellow with pale inconspicuous brown veins. The apex is evenly recurved and the rear margins curved upwards.

*Caladenia caesarea* occurs within the range of *C. luteola* and is similar in morphology. However, *C. luteola* differs in its paler yellow flowers, its rear labellum margins curved upwards, and its recurved labellum apex. *Caladenia* sp. Boyup Brook differs in its much smaller flowers and darker veined labellum.

The population at Tonebridge appears to be slightly different in morphology to populations outside the region and may represent a new taxon. However, until further taxonomic studies are conducted it will remain placed with *C. luteola*.

**Flowering period:** September-October

#### Distribution and Habitat

The species is known from a few populations between Woodanilling and Tonebridge, growing on clay or gravely loams in open Jarrah forest with occasional scattered Wandoo. In the Warren Region it occupies a single site near Tonebridge.

Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 1	Tonebridge	DON	NR	50	10/10/1995	

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#### Response to Disturbance

Plants are killed by fire during their active growing period between May and early November.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements

Manage fire regimes in the area of the known population to ensure its long-term conservation.

Monitor population annually.

Survey areas of suitable habitat for further populations.

Collect seed and mycorrhiza for conservation work at the Botanic Gardens and Parks Authority.

### Research Requirements

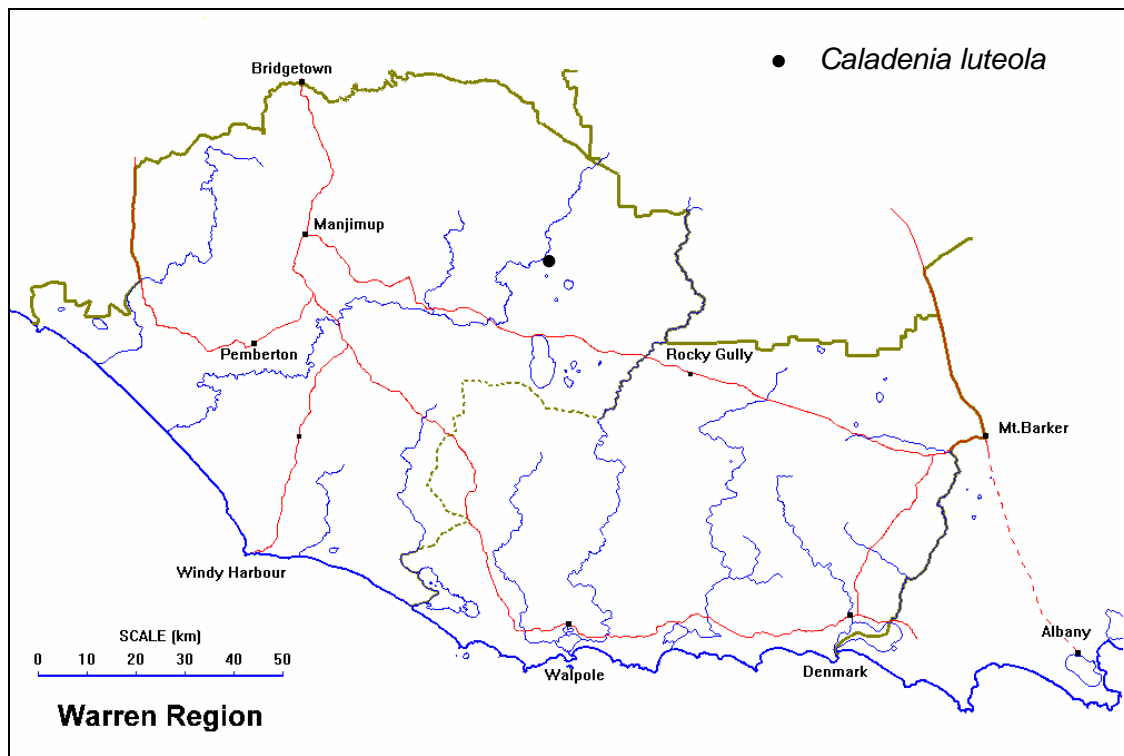
Liaise with the Botanic Gardens and Parks Authority as required.

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Hoffman and Brown (1992) as *C. caesarea* subsp. *subdita* and (1998) as *C. luteola*; Hopper and Brown (2001); A. Brown (personal communication)



## *Caladenia starteorum* Hopper & A.P. Br.

### ORCHIDACEAE

WAR F4/218

*Caladenia starteorum* is a rare species named after the Start family who were the first to recognise it as distinct. It was collected by them west of Mount Barker in 1991, with a single subsequent collection made west of the Porongurups in 1993.

#### Description

*Caladenia starteorum* is a tall species 20-60 cm high with a single, hairy, erect, linear leaf 10-20 cm long by 7-10 mm wide, the basal third irregularly blotched with red-purple. Plants have one or two flowers that are predominantly pink with white marks and 6-9 cm across. The petals and sepals appear stiffly held, spreading more or less horizontally at first and then curving downward, relatively broad in the basal 1/3 -1/2 then narrowing abruptly to a long acuminate apical portion. The osmophores are 10-20 mm long, present on the sepals only. The labellum is markedly two-coloured, the basal half being white with pale pink radiating stripes, the apical half uniformly dark pink, recurved. The marginal calli are up to 5 mm long, the central labellum calli are in four rows, the longest 2 mm long.

*Caladenia starteorum* is most similar to *C. winfieldii* but differs in its larger column, white (rather than pink) base to the labellum lamina, its shorter petals and its smaller lateral sepals with a shorter osmophore. *Caladenia starteorum* also flowers earlier (September to October) than *C. winfieldii* (late October to November). *Caladenia starteorum* may also be confused with *C. harringtoniae* but differs in its shorter sepals with an osmophore, its larger labellum with longer marginal calli and its larger column.

**Flowering period:** Late September-October.

#### Distribution and Habitat

The species is confined to two populations east and west of Mt Barker. The single known population in the Warren region is found on a winter-wet flat, growing in sandy clay soil amongst low scrub and herbs.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 101	Sheepwash SF	FRA	SF	208	7/10/2004	

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#### Response to Disturbance

The species flowers in greater profusion in the spring following summer fire (November-April) when plants are dormant. However, plants are killed by fire during their active growing period between May and October.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora Dieback*

Unknown

#### Management Requirements

Monitor populations annually.

Survey areas of suitable habitat for further populations.

Collect seed and mycorrhiza for conservation work being conducted at the Botanic Gardens and Parks Authority.

### Research Requirements

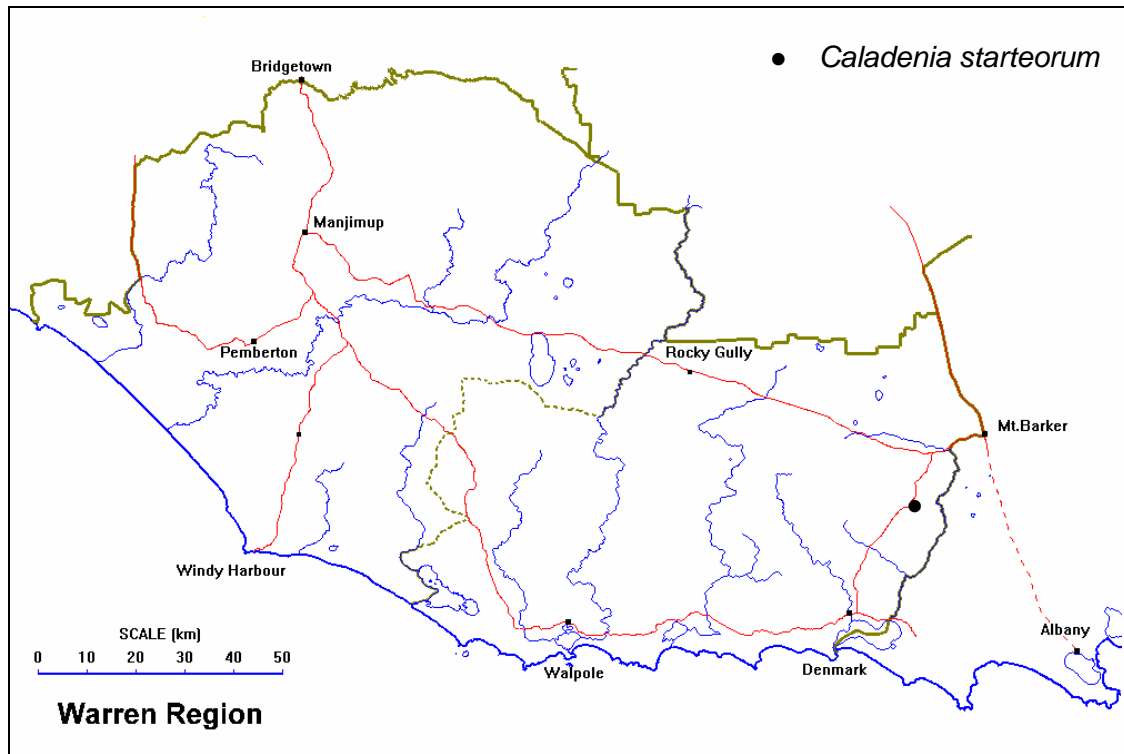
Liase with the Botanic Gardens and Parks Authority as required.

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Hopper and Brown (2001)



## ***Calothamnus* sp. Mt. Lindesay (BGH 439)**

### MYRTACEAE

WAR F4/155

*Calothamnus* sp. Mt Lindesay was first collected by Brenda Hammersley from Mt. Lindesay and was subsequently collected by the authors from Mt. Roe (Burrabunnup). The species was initially placed with *Calothamnus crassus*, a taxon that is now considered to be three separate taxa found between the Stirling Ranges west and the Scott River area.

#### **Description**

*Calothamnus* sp. Mt Lindesay is an erect open shrub to 2 m tall with terete, curved, needle-like leaves 20-60 mm long by 0.7-1.0 mm wide. The flower spike is roughly cylindrical, 30-80 mm long, with occasional three year old leaves still persistent. Flowers are red and half embedded in the swollen stem, the stamens, 20-25 mm long, fused in four bundles of about equal length with five to eight fertile anthers per bundle, each bundle with about equal numbers of stamens. The fruit is globular and 3-4 mm long.

The species is readily distinguished from the related *Calothamnus lateralis* which has (usually) a one sided spike and substantially larger more robust leaves, and *C. schaueri* which has staminal bundles to only about 10 mm and fruit not embedded in the stem.

**Flowering period:** September-December

#### **Distribution and Habitat**

The species is known from mallee-eucalypt shrubland and heath communities between Denmark and Walpole, growing in shallow coarse sand over granite. Associated taxa include *Platytheca galioides*, *Grevillea fuscolutea*, *Dodonaea ceratocarpa*, *Chamelaucium forrestii*, *Dryandra formosa*, *Verticordia plumosa* and occasional *Acacia sulcata*.

#### **Conservation Status**

Current: Priority 2

#### **Known Populations in the Warren Region**

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<b>Pop. No.</b>	<b>Location</b>	<b>District</b>	<b>Land status</b>	<b>No. of plants</b>	<b>Last survey</b>	<b>Comments/condition</b>
CLM 1	Mt. Lindesay	FRA	SF (NP)	500+	23/01/2001	
CLM 2	Mt. Roe 1	FRA	SF (5g)	2000	7/11/1995	
CLM 3	Mt. Roe 2	FRA	SF	150	16/7/2002	120 juvenile plants

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#### **Response to Disturbance**

Sometimes killed by fire and regenerating from soil-stored seed. Time to first substantial flowering is approximately four years, therefore fire management needs to allow for sufficient seed production and build up of the seed bank.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### **Susceptibility to Phytophthora Dieback**

Unknown.

#### **Management Requirements**

Monitor populations every two or three years.

Search for further populations in areas of suitable habitat.

### Research Requirements

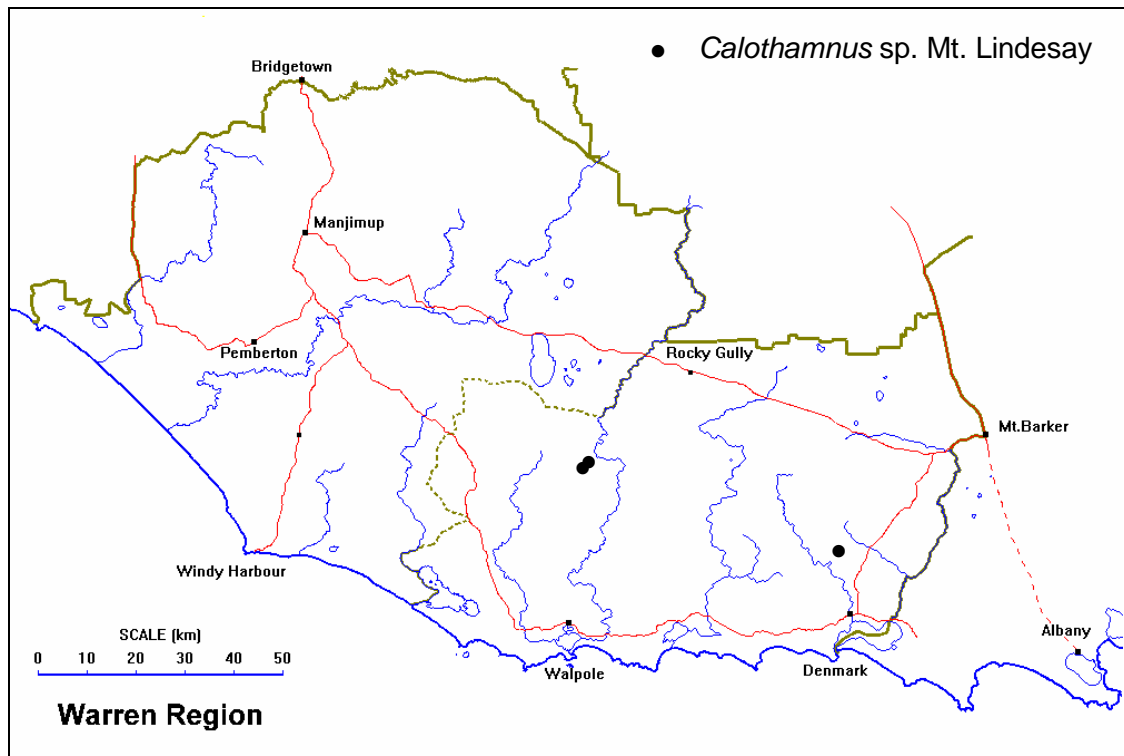
Finalise taxonomy of the *C. lateralis/crassus* complex.

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Hawkeswood (1987); Robinson and Coates (1995)





## *Calymperastrum latifolium* (Hampe) Stone

### POTTIACEAE

SFR F4/213

This moss was first collected by Preisse in 1840 in what is now suburban Perth. It was described in Lehmann's *Plantae Preissianae* (1846) by German Bryologist Georg Ernst Ludwig Hampe and placed in *Calymperes* (Calymperaceae) as *C. latifolium*. It was then not recorded again until 1971 when Ilma Stone collected a sample near Windy Harbour and was able to match it to type material held at the British Museum. Its taxonomy was reviewed by Stone in 1985, and the species transferred from *Calymperes* to *Calymperastrum* and placed in the Pottiaceae. Fruiting material is still required to confirm this placement. This is one of only half a dozen mosses endemic to WA.

#### Description

Stem short, simple with leaves oblong – spatulate, involute, entire, when dried convolute, uncinata – incurved. Nerve continuing equally (i.e. extending to the leaf apex but not beyond) inconspicuous.

From Stone:

*Calymperastrum latifolium* is a small corticolous plant to about 1.5 cm tall with a reddish gold, usually simple stem covered in a reddish gold woolly tomentum. Leaves are spirally arranged, more or less even but slightly longer and more crowded towards the top, when moist erecto-patent, when dry crisped with strongly incurled margins and a conspicuous highly refractive white to yellowish costa. Leaves are narrowly ligulate, concave to flat, more or less sheathing base, 2.0-3.3 mm long including sheath and 4-5 times as long as wide. The sheath is about quarter of the length of the leaves, its apex rounded to obtuse, margins entire; costa strong finishing three to five cells below the apex.

**Flowering Period:** Unknown.

#### Distribution and Habitat

The original collection was made in what is now suburban Perth with the only other collection being near Windy Harbour. Both records indicate that it grows on the base of *Macrozamia*.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Chudalup	DON	NP	0	2/9/2004	Last survey 1999. Six <i>Zamia</i> observed to host <i>C. latifolium</i> . Appears that a <i>Bryum</i> has taken over site.

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#### Response to Disturbance

Response to fire is unknown, but fire which burns into the base of hosts likely to kill colonies.

Response to soil disturbance is not applicable as the species occurs on the basis of *Macrozamia*

Response to change in soil moisture. See above.

Response to weed invasion. See above.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora*

Host is known to be susceptible to *Phytophthora*.

#### Management Requirements

Survey for further populations in areas of suitable habitat.

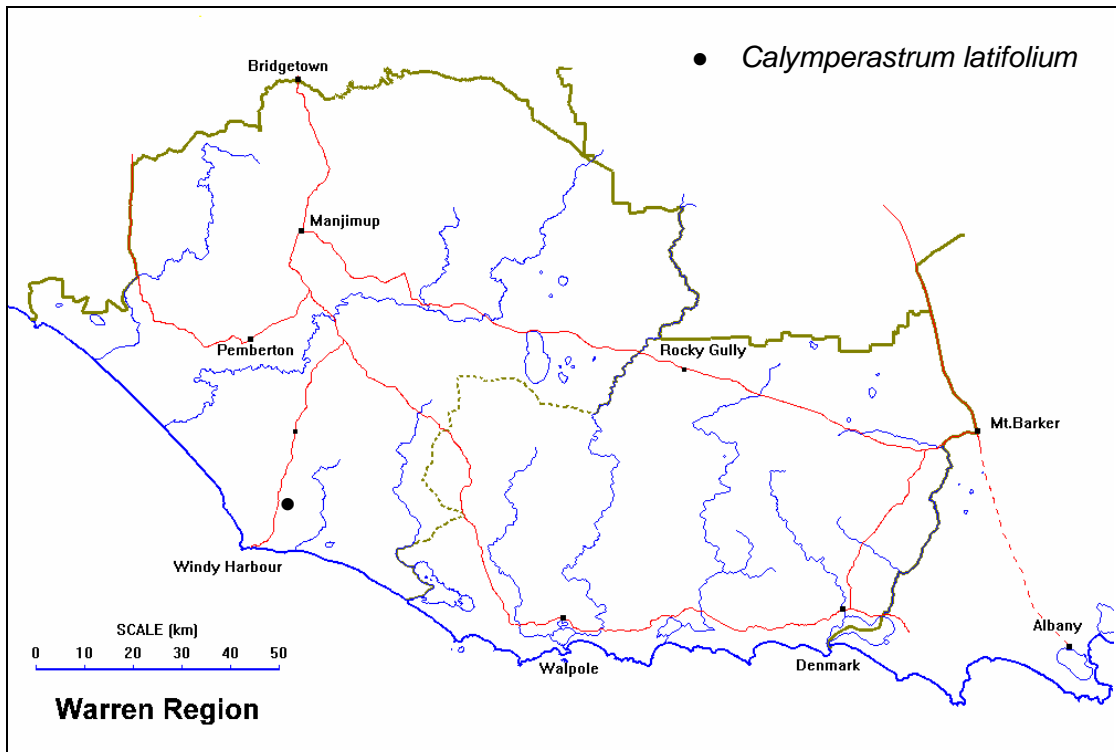
#### Research Requirements

Determine life history.

Locate fruiting material.

**References**

Lehmann (1846a); Stone (1985)



## *Chamaexeros longicaulis* T. Macfarlane

### DASYPOGONACEAE

WAR F4/72

*Chamaexeros longicaulis* was described by Terry Macfarlane in 1994 from plants collected north of Boggy Lake by David Churchill in 1950. The single specimen was initially placed in *Tricoryne* and later moved to *Chamaexeros* by Greg Keighery.

#### Description

*Chamaexeros longicaulis* is a low clumping, clonal, rhizomatous, perennial herb 20-50 cm high by 1-2 m wide that is often found growing in dense mats/swards. Leaf blades are 6-16 cm long by 2-5 mm wide, margins fringed. Inflorescences are one to three per shoot, 2-20 cm long in a compact cyme. Flowers are bright yellow.

Although *Chamaexeros longicaulis* is similar in appearance to juvenile *Lomandra integra* when regenerating after fire, the latter species is readily distinguished as it lacks a fringe on its leaf margins.

**Flowering period:** October-November

#### Distribution and Habitat

The species is known from a very restricted range (<10 km) to the west of Walpole, growing in sandy soils in tall forest, often dominating openings in the forest.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Forest of Arms	FRA	NP	na	28/9/1989	
CLM 2	Rest Point Rd 1	FRA	NP/RR	1000+	8/9/1995	Also on adjacent private property and golf course.
CLM 3	Sandy Beach	FRA	NP/RR	1000+	8/9/1995	
WAR 100	Nuyts Wilderness	FRA	NP	1000+	24/3/1998	
WAR 101	Brainy cutoff	FRA	NP	200+	5/3/1998	
WAR 102	Rest Point Rd 2	FRA	NP	na	10/10/2000	

#### Response to Disturbance

The species regenerates after fire through vegetative sprouting of stout rhizomes up to 5 cm below ground level.

Its response to soil disturbance is unknown but the extent and depth of disturbance is probably critical in relation to the rhizomes. Road verge populations appear able to withstand the low levels of disturbance associated with road maintenance.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora Dieback*

Unknown, but some closely related taxa are susceptible.

#### Management Requirements

Determine the number of plants in all populations.

Liaise with the Local Authority and neighbours to protect the Rest Point population.

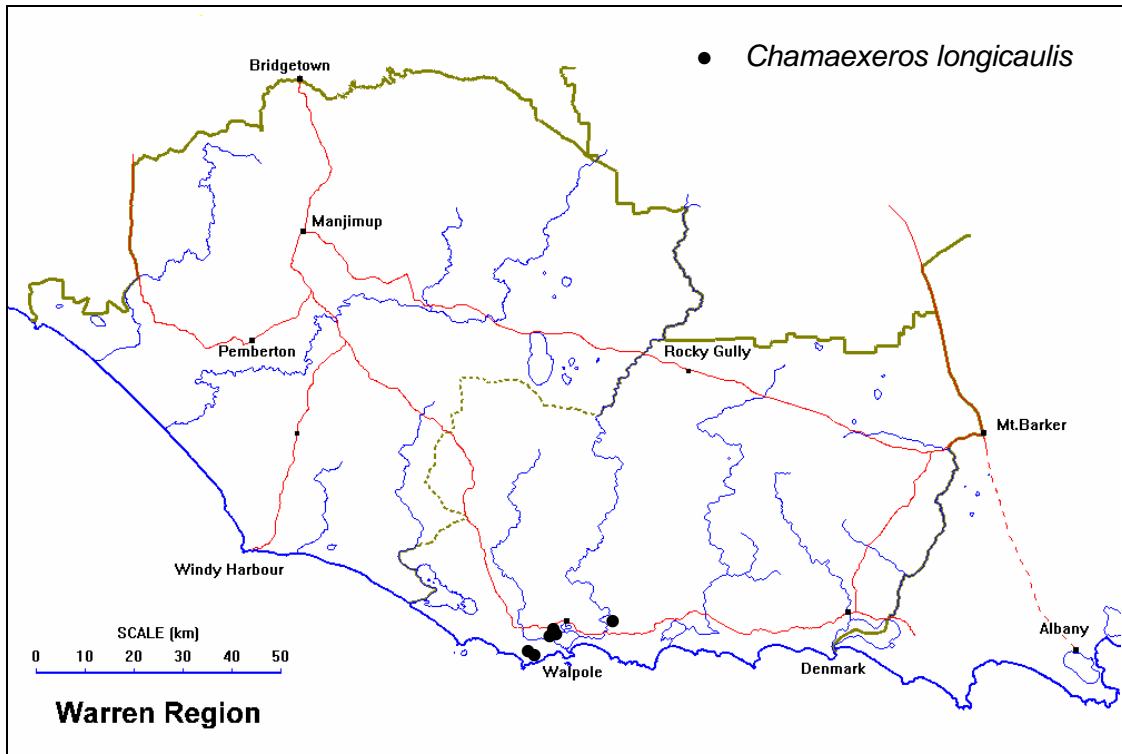
Search for additional populations in areas of suitable habitat.

### Research Requirements

Confirm susceptibility to *Phytophthora* spp.

### References

Macfarlane (1994)



*Chamelaucium floriferum* N.G. Marchant & Keighery subsp. *diffusum* N.G. Marchant & Keighery ms

MYRTACEAE

Walpole Wax

WAR F4/143

Walpole Wax is an endemic, relictual species comprising two subspecies both of which are listed as priority taxa. *Chamelaucium floriferum* subsp. *diffusum* ms is an attractive plant that has significant scope for horticultural development. The population recorded near Northcliffe does not fit comfortably into this taxon and studies into population genetics are required to determine its status.

**Description**

*Chamelaucium floriferum* subsp. *diffusum* ms is a diffuse shrub to 3 m with crowded, opposite, decussate, shortly petiolate, linear-acute leaves 7-20 mm long by 0.5-1 mm wide. Flowers are axillary, usually solitary, exceeding leaves and forming a leafy raceme. Pedicels are 5-10 mm long, subtended by a pair of hooded scarious bracteoles 2-3.5 mm long. The floral tube is 2.5-5 mm long, shallowly or obscurely 10-ribbed. The five sepals and petals are free, 0.3-0.8 mm long and 2.5-3.5 mm long respectively. The petals are entire to shallowly crenate, white or pink. The ten stamens alternate with the ten staminodes and are fused together basally in a ring, the staminodes narrowly triangular to linear. The style is glabrous. The ovary is one celled with about 8 ovules. The fruit consists of an indehiscent nut with persistent sepals and petals.

The subspecies differs from *Chamelaucium floriferum* subsp. *floriferum* ms (Priority 3) in the latter being a compact shrub with flowers on shorter pedicels and rarely exceeding the leaves.

**Flowering period:** October-December

**Distribution and Habitat**

The species is found between Northcliffe and Quarrum, growing in heath on or associated with granite outcrops.

**Conservation Status**

Current: Priority 2

**Known Populations in the Warren Region**

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1a	Mehniup NR	FRA	NR	na	20/8/1993	
CLM 1b	Mehniup NR	FRA	NR	500	15/8/2002	
CLM 2	Woolbale Hills	FRA	NP	400	28/8/2002	
CLM 3	Mehniup TR	FRA	TR	5	17/9/1998	
CLM 4	Burnett Block	FRA	SF	500	28/11/2000	
CLM 5	Mt. Hopkins	FRA	NP	1500	31/8/1997	

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**Response to Disturbance**

The subspecies is killed by fire with no evidence of resprouting noted. It appears to be an obligate seed regenerator with a significant annual investment in seed production. Its habitat is restricted to sites where plants would escape effects of frequent fire.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

**Susceptibility to Phytophthora Dieback**

Unknown, but, given susceptibility of several other members of the genus, it should be managed as if highly susceptible.

**Management Requirements**

Monitor populations periodically, specifically before and three years following burns.

Search for further populations in areas of suitable habitat.

### Research Requirements

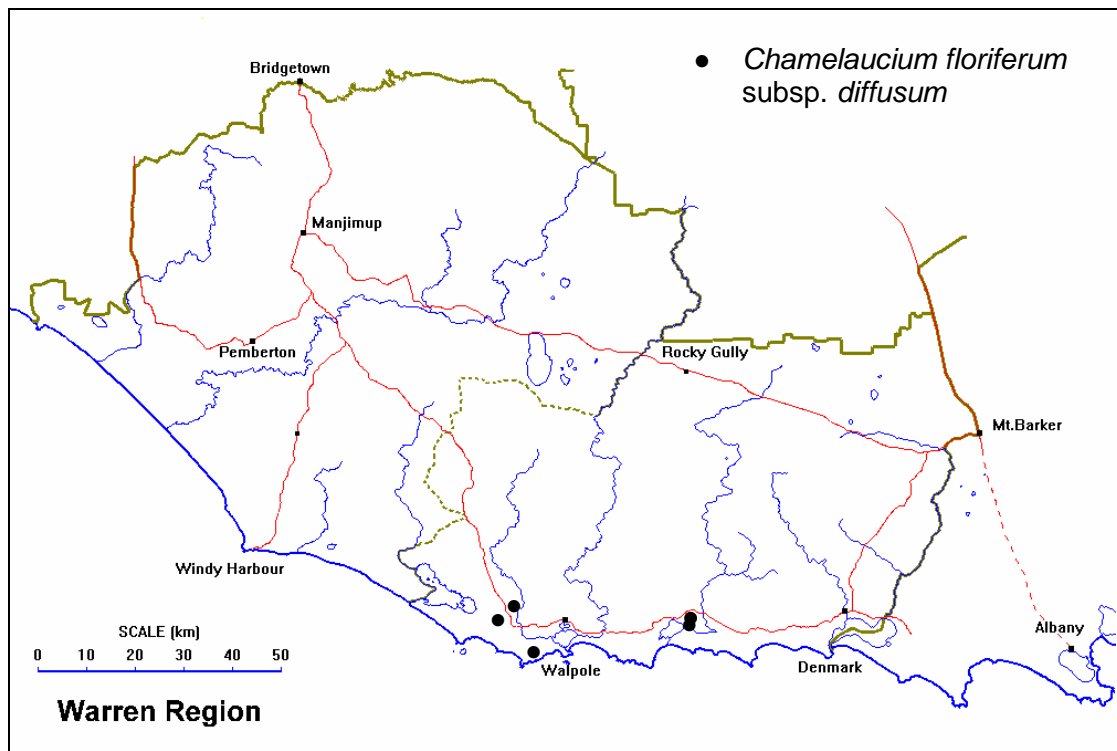
Determine susceptibility to *Phytophthora* spp.

Determine the reproductive biology of the taxon, particularly in relation to fire effects.

Investigate the possible introduction of this taxon into horticulture.

### References

Wheeler *et al.* (2002); Neville Marchant (personal communication)



*Chamelaucium forrestii* (F.Muell.) N.G. Marchant & Keighery subsp.  
*forrestii* ms

MYRTACEAE

WAR F4/59

*Chamelaucium forrestii* subsp. *forrestii* ms is a restricted plant that was described by Mueller in 1878 as a species of *Darwinia* from material he collected from Mt. Roe (Burrobunup) on his 1877 trip through the Region. It has since been placed in *Chamelaucium* and has been split into two subspecies, subsp. *forrestii* ms, found North of Walpole and subsp. *orarium* ms found east of Albany.

**Description**

*Chamelaucium forrestii* subsp. *forrestii* ms is an erect, glabrous shrub to 2 m high with opposite, decussate, narrow linear to semi-terete leaves to 20 mm long. Leaves are slightly channelled above and obtuse. Flowers are solitary in the upper axils, nodding on reflexed pedicels to 5 mm long. Bracteoles are deciduous, red and 3-4 mm long. The calyx tube is 3-4 mm long with obovate lobes about 1 mm long. Petals are white, ovate, 3-4 mm long and held erect. There are ten stamens and staminodes, the stamens about 1 mm long and the staminodes about 0.5-1 mm long. The style is 4-5 mm long and glabrous except for a ring of hairs subtending the stigma.

In appearance *Chamelaucium forrestii* subsp. *forrestii* ms is very similar in morphology to members of the *C. floriferum* group, but is readily distinguished by its erect petals which resemble the bell-like flowers of some *Darwinia* species. Members of the *C. floriferum* group have petals that spread in the more typical "wax" configuration.

**Flowering period:** September to November

**Distribution and Habitat**

Known from a restricted area north of Walpole, growing on and immediately adjacent to, granite outcrops.

**Conservation Status**

Current: Priority 2

Recommended: Priority 3

**Known Populations in the Warren Region**

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Granite Peak	FRA	NP	500+	29/9/1994	
CLM 2	Crossing Block	FRA	NP	na		Not recently assessed
CLM 3	Mitchell Rd	FRA	NP	<40	20/9/1994	
CLM 4	Peak Block	FRA	SF	200+	10/10/1994	
CLM 5	Mt. Roe (Burraunnup)	FRA	SF (5g)	200+	6/10/1994	Many sub-populations in the immediate area of Roe Block

**Response to Disturbance**

The subspecies is killed by fire with no evidence of resprouting noted. It appears to be an obligate seed regenerator with a significant annual investment in seed production. Its habitat is restricted to sites where plants would escape the effects of frequent fire.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

**Susceptibility to Phytophthora Dieback**

Unknown, but given susceptibility of several members of the genus, should be managed as if highly susceptible.

**Management Requirements**

Monitor populations periodically, and specifically before and three years following fire.

Search for further populations in areas of suitable habitat.

Determine size and extent of sub-populations in the Roe Forest block..

### Research Requirements

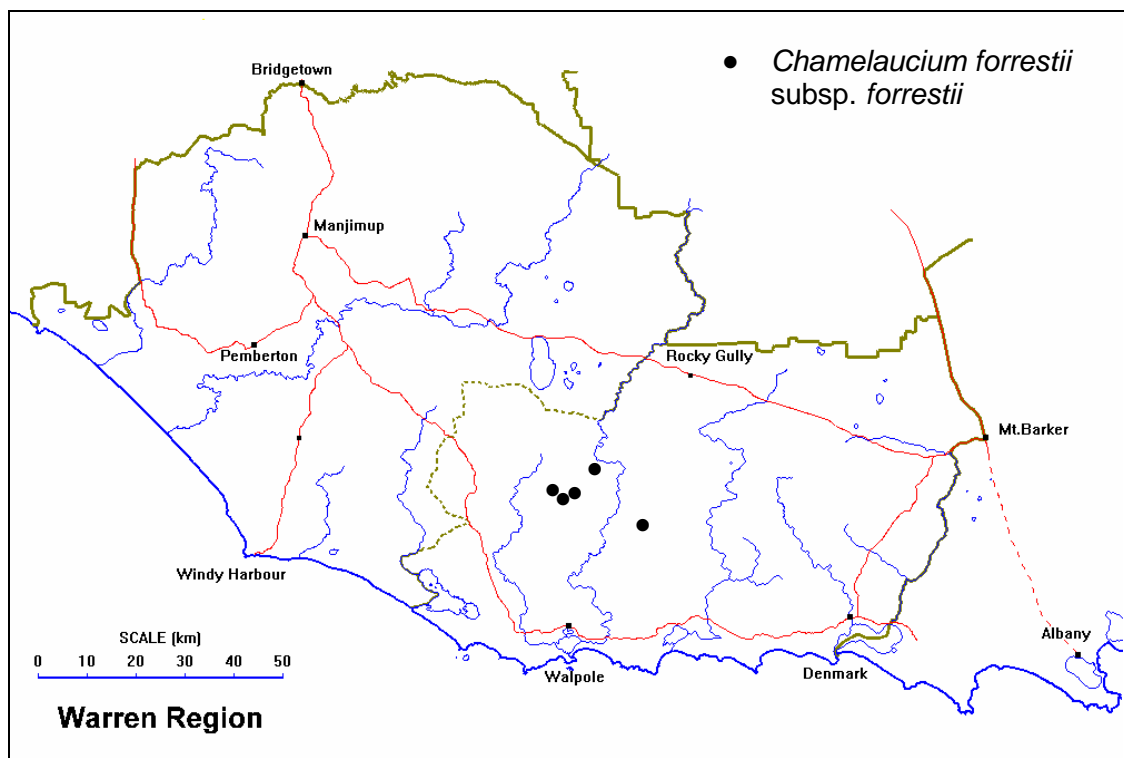
Determine susceptibility to *Phytophthora* spp.

Determine the reproductive biology of the taxon, particularly in relation to fire effects.

Investigate the possibility of introducing this taxon into horticulture.

### References

Robinson and Coates (1995); Wheeler *et al.* (2002); Neville Marchant (personal communication)





## *Chordifex jacksonii* L.A.S. Johnson & B.G. Briggs ms

### RESTIONACEAE

WAR F4/29

*Chordifex jacksonii* ms was first collected near Walpole by S.W. Jackson and then presumed extinct until relocated by Neil Gibson and Mike Lyons while conducting floristic surveys of the wetland communities of the South Coast in 1990.

#### Description

*Chordifex jacksonii* ms is a perennial rush to 75 cm with terete culms. The spikelets are 2-5 mm long, globose to ovoid and borne on long filiform, sometimes branching pedicels originating from sheathing leaves along the culm. The glume mucro is about 2 mm long.

The species differs from *Tremulina cracens* in having a mucro and from *Tremulina tremula* and *Platychorda appanata* in having terete rather than flattened culms. *Chordifex amblycoleus*, which has a mucro, differs in having mostly narrow oblong-cylindrical spikes (occasionally globular) and more robust culms.

There are two outlying populations that occur at the western border of D'Entrecasteaux National Park (Black Point Road). The shape of the flowering spike in these two populations is slightly more elongated than the others.

**Flowering period:** December-May (with many old spikes persistent outside this period).

#### Distribution and Habitat

The species is found in sedgelands and swamps from Broke Inlet to south of Rocky Gully, growing in dense mixed species communities. *Chordifex Amblycoleus* differs from *C. jacksonii* ms in growing in almost pure single species communities.

#### Conservation Status

Current: Priority 1

Recommended: Priority 4

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Broke Inlet	FRA	NP	na	27/1/1997	
CLM 2	Pingerup Rd 1	FRA/DON	NP	50	5/5/1991	
CLM 3	SW Highway	FRA	NP	2500	14/01/2004	
CLM 4	Boronia Rd	FRA	SF	800+	27/9/2002	May be <i>Chordifex gracilior</i>
CLM 5	Nornalup Rd	FRA	NP	1.5 ha	27/9/2002	
CLM 6	Pingerup Rd 2	FRA/DON	NP	1000+	12/2/1995	
CLM 7	Beardmore Rd	FRA	SF	1000+	23/3/1995	
CLM 8	Black Point Rd 1	DON	NP	1000+	10/8/1995	
CLM 9	Black Point Rd 2	DON	RR?	<100	10/8/1995	
CLM 10	Mountain Rd	FRA	SF	1ha	27/9/2002	
CLM 11	Bearmore Rd 2	FRA	SF	na	30/9/1996	
WAR 100	Pingerup Plains	FRA	NP	100	24/4/1997	

#### Response to Disturbance

*Chordifex jacksonii* ms is a short-lived species that is killed by fire and dependent on soil-stored seed for regeneration.

Response to soil disturbance is unknown.

Occurs in a wetland habitat and may be therefore susceptible to changes in hydrology or climate change.

Response to weed invasion is unknown.

## Susceptibility to *Phytophthora Dieback*

Unknown.

### Management Requirements

Monitor health and condition of populations on a periodic basis, usually two years after most recent burn.

Survey areas of similar habitat for further populations.

Check identification of the Boronia Rd. population and confirm.

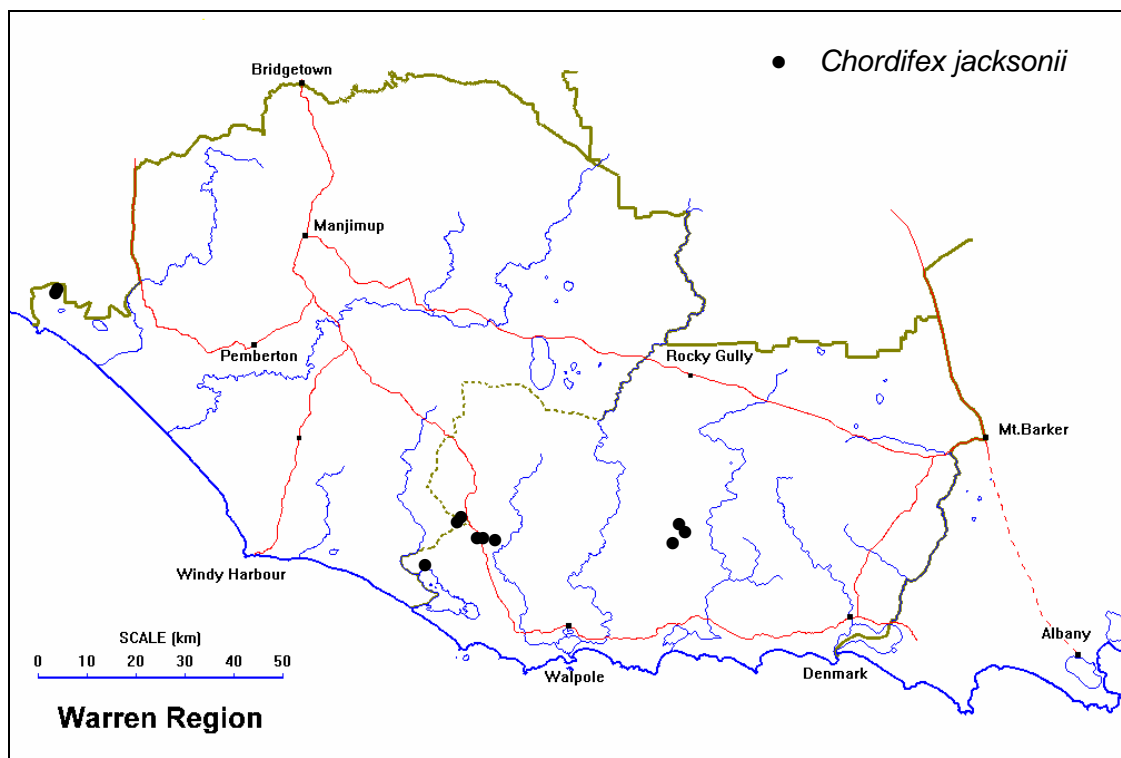
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Meny and Pate (1999); Wheeler *et al.* (2002); Briggs and Johnson (2004)



## *Cryptandra congesta* Rye

### RHAMNACEAE

WAR F4/125

*Cryptandra congesta* is a rare species that was first collected from Mt. Lindesay by Greg Keighery in 1990 and then by Brenda Hammersley in 1992. The species was placed with *Cryptandra glabriflora* and *C. leucopogon* before being described as new by Barbara Rye in 1995.

#### Description

*Cryptandra congesta* is a low spreading rounded shrub, to 30 cm high by 20-40 cm wide. Unlike many *Cryptandra* spp. the branchlets are not spinescent. Leaves are narrow ovate to narrowly oblong, 2-3.3 mm long by 0.7 mm wide. Flowers are usually arranged in a 'congested' head like cluster 5-8.5 mm wide with about five to twelve flowers per branchlet. Floral bracts are about 2 mm long, prominently ciliate and four to six per flower. The floral tube is about 1.5 mm long. The style is not lobed. Flowers have the odour of rotting flesh (as does that of *Andersonia macronema* which grows close to it).

*Cryptandra myriantha* is similar in appearance and may occur in the northeast parts of the Warren Region. However, it differs in having less prominently ciliate floral bracts, a shorter floral tube and a three lobed style.

**Flowering period:** April-May

#### Distribution and Habitat

The species is known from a small area north of Denmark, growing in shallow sands on and around granite outcrops.

#### Conservation Status

Current: Priority 2\*

\*Species is of the highest priority for further survey and consideration for gazettal as DRF.

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Mt. Lindesay	FRA	SF (NP)	1 000+	17/8/1997	
CLM 2	Little Lindesay	FRA	SF (NP)	>500	1/5/2003	CLM 3 is the same population)

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#### Response to Disturbance

Regenerates from seed following fire with subsequent seedlings flowering in their fourth year.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements

Exclude fire for a minimum of eight years following burning.

Monitor populations every two years.

Search for further populations in suitable habitat in the Region.

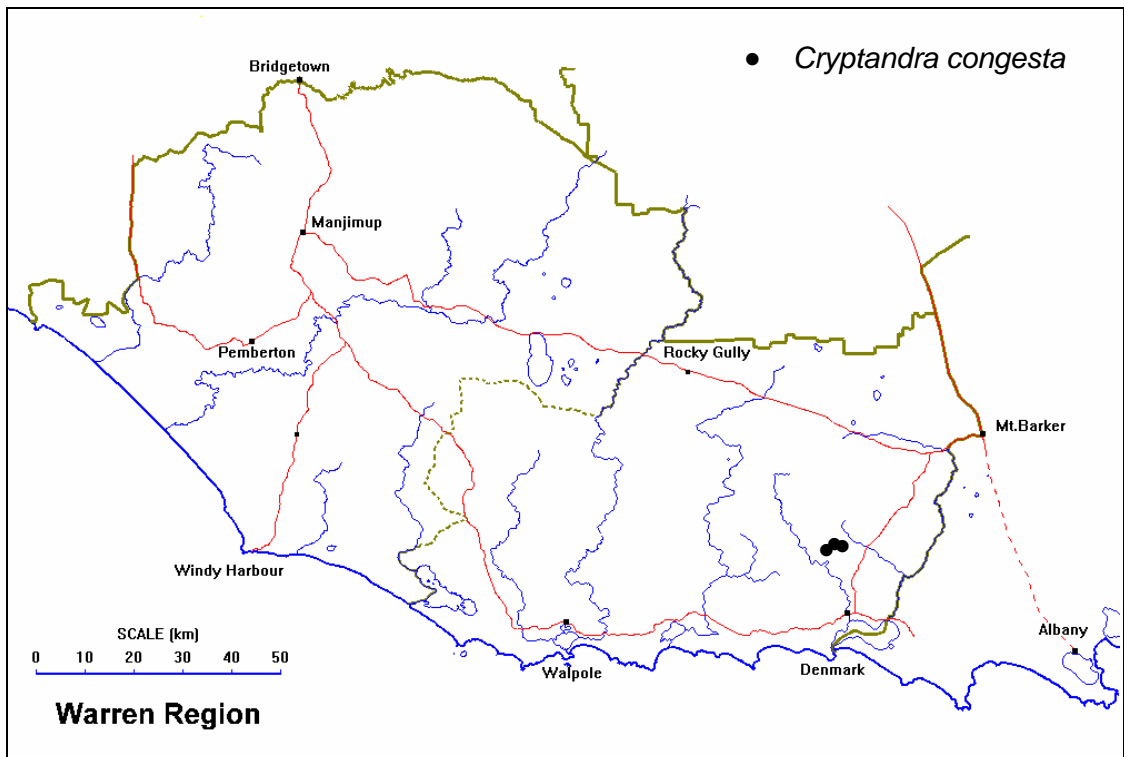
#### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

**References**

Rye (1995a)



## *Dampiera orchardii* Rajput & Carolin

### GOODENIACEAE

WAR F4/41

*Dampiera orchardii* was first collected by Muir in 1880 in an area described as 'towards the Tone River'. It then appears to have not been seen again until B. Benn collected it near Lake King in 1963 and Alex George collected it near Newdegate in 1965. Plants were thought to be *D. tenuicaulis* and *D. rogeriana* respectively prior to the species being formally described in 1988.

The species has not been relocated in the Warren Region despite surveys done in the Tone River area. However the habitat described in collections of the species exists in the area and it is possible it will be found during catchment recovery work being done on the Lake Muir and Lake Unicup complexes.

#### Description

*Dampiera orchardii* is an erect perennial to 40 cm with few, sessile, oblong to elliptic, entire, very small leaves 0.5-1.5 mm long by 0.5-0.7 mm wide. The inflorescence consists of a one to three flowered cyme on pedicles 0.5-1 mm long. Bracteoles are 1-1.2 mm long. Sepals are 0.5 mm long, tomentose with golden yellow hairs. The corolla is 10 mm long with adpressed yellow hairs on outer surface. The wings are 1.5-2 mm wide. There are five to nine calli in the throat.

**Flowering period:** October-November

#### Distribution and Habitat

The species is currently known from several locations in the Oldfield River-Newdegate area and is historically known from 'towards Tone River'. Habitat is sand or sandy-loam under tall mallees with one reference to being near a salt lake.

To date, the 'Tone River' population has not been relocated. The species is not known elsewhere in the Warren Region.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
	Towards the Tone River	Unknown	Unknown	Unknown		Further surveys needed

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### Susceptibility to Phytophthora Dieback

Unknown.

#### Management Requirements

Conduct surveys in the Tone River, Lake Muir and Lake Unicup areas.

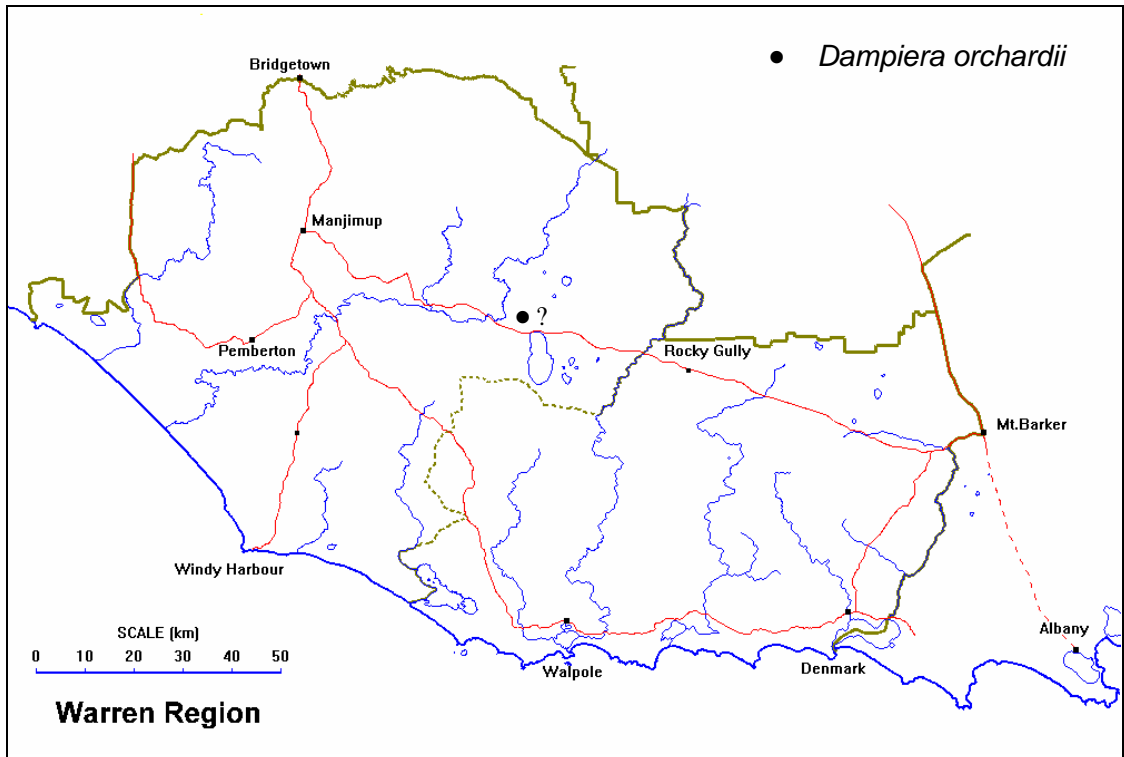
Survey other areas of suitable habitat in the Warren Region.

#### Research Requirements

Unknown.

**References**

Rajput and Carolin (1988); Rajput and Carolin (1992)



## *Diuris heberlei* D. L. Jones

## ORCHIDACEAE

Heberle's Donkey Orchid

WAR F4/153

*Diuris heberlei* is a poorly known species that was first found by Ron Heberle in coastal swamps east of Albany and described by David Jones in 1991. Recent surveys have shown it to be scattered along the south coast between Two Peoples Bay and the Scott River.

### Description

*Diuris heberlei* is a tall donkey orchid, 20-50 cm high with leaves 10-15 cm long by 2-3 mm wide and with one to four yellow flowers 35-40 mm long by about 35 mm wide.

The species is closely related to *Diuris drummondii* but grows less than 50 cm tall, has a broad mid lobe to the labellum and is confined to coastal swamps.

**Flowering period:** Late December-February

### Distribution and Habitat

The species is found in scattered coastal restionaceous/cyperaceous peat swamps in swales between stabilised sand dunes between the Scott River and Two Peoples Bay.

### Conservation Status

Current: Priority 2

### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	"Fish Creek"	DON	NP	500+	5/1/1996	
WAR 100	Fisherman's track	DON	NP	500+	5/12/2003	Confirm identification

### Response to Disturbance

Plants flower in the absence of fire. Hot fires that remove the organic, peaty soils in which the species grows may kill tubers.

Response to soil disturbance is unknown, though loss of the organic substrate could be expected to threaten the taxon.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Avoid burning when organic soils could be expected to ignite. Develop strategies to suppress wildfire fire with the minimum physical impact.

Resurvey "Fish Creek" population and monitor every two years and also before and after burning.

Search areas of similar habitat for further populations.

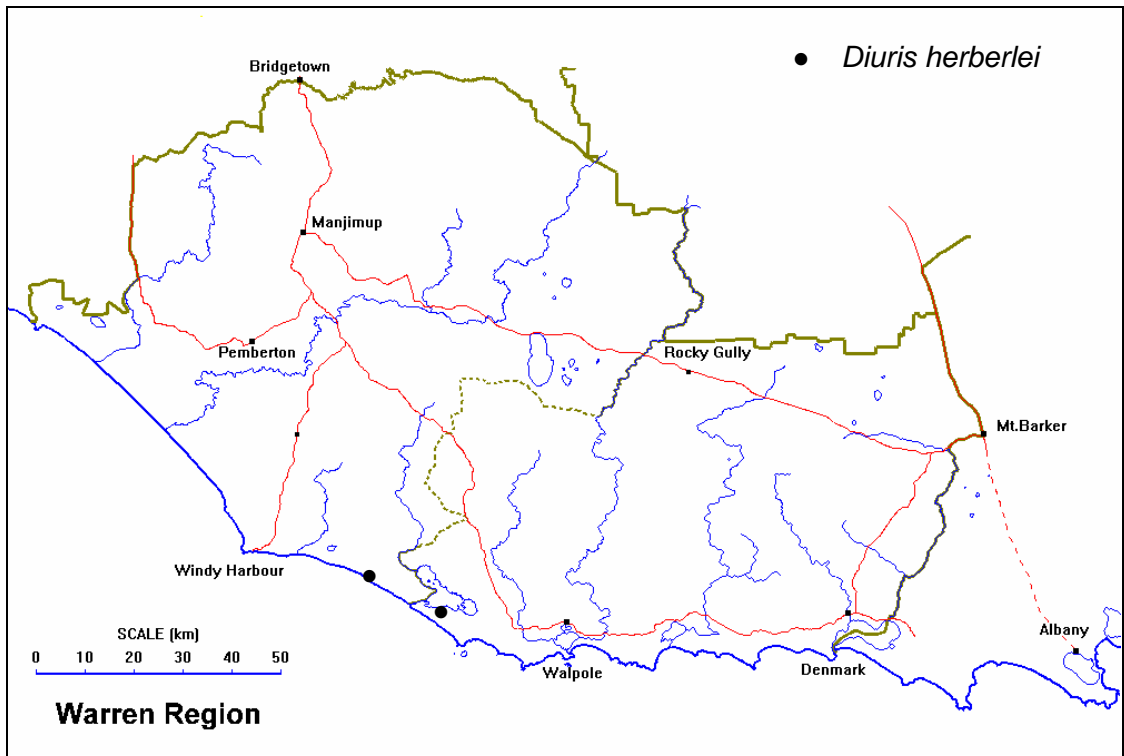
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Hoffman and Brown (1992, 1998); Jones (1991)





## *Drepanocladus aduncus* (Hedw.) Warnst.

### AMBLYSTEGIACEAE

WAR F4/184

*Drepanocladus aduncus* is a widespread aquatic moss in the Northern hemisphere and south-eastern Australia with relictual populations in Western Australia where it is confined to aquatic environments in the high rainfall, low evapo-transpiration zone of the south west coast of the State. Collections from Western Australia have been variously placed in *Leptodictum serpens*, *Drepanocladus sentneri* and *D. aduncus*, the latter name adopted here based on a determination by Robert Wyatt.

#### Description

*Drepanocladus aduncus* is a dioecious soft textured, dull green to yellowish green aquatic moss to 10 cm or more. Stems are irregularly to pinnately branched. Leaves are patent, 2-5 mm long, straight to falcate (occasionally falcate secund), not plicate, ovate to ovate lanceolate, tapering to a long acuminate apex, the base cordate and slightly decurrent. Margins are entire. The costa extends half to three quarters of the way up the leaf and is about 0.05 mm wide near the base. Upper cells are linear to linear rhomboidal. Alar cells are angular, inflated, the hyaline pale yellow, forming auricles not quite reaching the costa.

**Sporulating period:** Unknown in WA.

#### Distribution and Habitat

The species is currently known from two populations near Northcliffe where it is confined to permanently wet habitats.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Malimup	FRA	PP	*na	1993	* area of about five square metres. May be clonal
WAR 101	William Bay NP	DON	NP	na	25/10/1998	

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#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown but, as populations are growing in a modified habitat, extent of disturbance probably critical.

Response to change in soil moisture is unknown, but given the species has a very specific habitat, it likely to be vulnerable to long-term drying out.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

Probably not relevant.

#### Management Requirements

Liaise with property owner to protect habitat of the private property population.

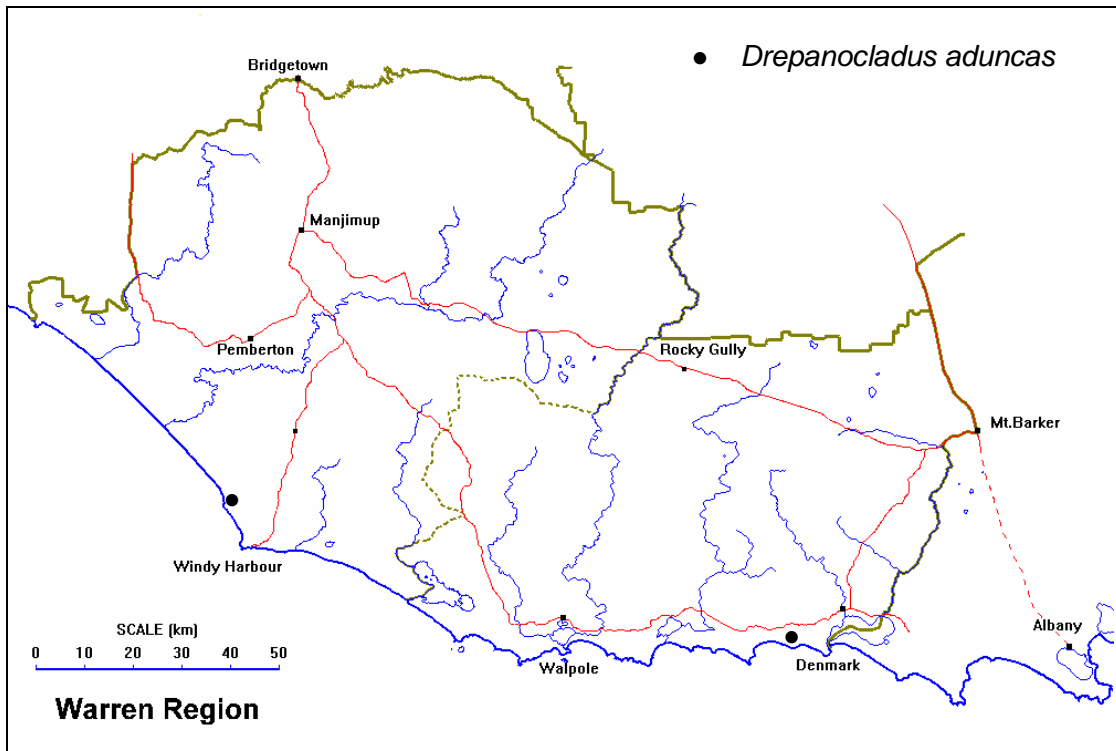
Search areas of suitable habitat for further populations.

#### Research Requirements

Unknown.

#### References

Catchside (1980); Scott and Stone (1976)



## *Drosera binata* Labill.

## DROSERACEAE

WAR F4/97

*Drosera binata* was described by Labillardiere in 1805 from material collected in Tasmania. Since then it has been found in all southern Australian States with the first Western Australian collection made by Neil Gibson and Mike Lyons in 1991. Western Australian material is considered to be closest in form to plants found in Tasmania.

### Description

*Drosera binata* is a small, sometimes stoloniferous herb with a short stem, fibrous roots and erect leaves that arise from ground level. Leaves have a slender petiole 2-15 cm long and end in two linear lobes to 10 cm long (never four as is often seen in eastern Australia). Plants have one or two glabrous, branched scapes to 30 cm long, each with up to six white petalled flowers.

**Flowering period:** November-December (WA)

### Distribution and Habitat

Although common in other southern States, this species is rare in Western Australia where it is known from just four populations (Shannon National Park, adjacent to the Walpole Nornalup National Park, near the Woolbales and the Walpole townsite) in all areas growing in organic soils associated with *Homalospermum firmum*, *Cephalotus follicularis*, and Cyperaceae species.

### Conservation Status

Current: Priority 2

### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Pingerup	FRA	NP	1 000+	15/12/1994	
CLM 2	Conspicuous	FRA	RR	500+	13/12/1995	
WAR 100	Woolbales	FRA	NP	na	na	Relocate population
WAR 101	Walpole townsite and Water treatment plant	FRA	NR/NP?	na	na	Relocate population

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### Response to Disturbance

The Pingerup population was observed to regenerate rapidly after a fire in December 1994. However, fires that remove the organic soil substrate could place the species at risk.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Resurvey populations and monitor every two years..

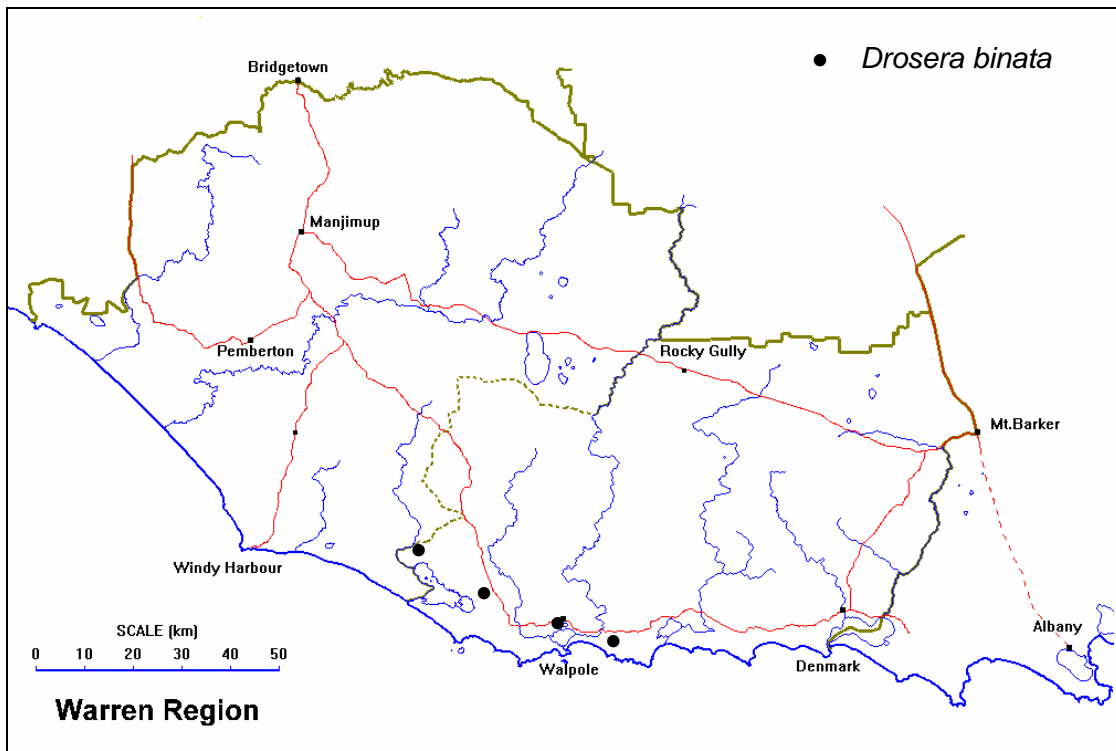
Search areas of similar habitat for further populations.

### Research Requirements

Unknown.

## References

Erickson (1968); Marchant *et al.* (1982)



*Dryandra sessilis* (Knight) Domin var. *cordata* (Meisn.) A.S. George

PROTEACEAE

WAR F4/202

*Dryandra sessilis* var. *cordata* is a taxon with a confusing taxonomic history, originally being named a variety of *Dryandra floribunda* by Meissner in 1848, then named *Josephia sessilis* by Knight in 1809 and *Dryandra floribunda* by Robert Brown in 1810, with variety *cordata* named by Meissner in 1848. It was also described by Bentham as var. *major* in 1870. In 1923 Domin reinstated *sessilis* as the specific name, a name not taken up in Western Australia until the 1970's. Finally, in 1996 Alex George reinstated the variety *cordata*.

The var. *cordata* has the largest leaves and flowers in the species. Distribution is restricted to coastal areas in the high rainfall zone.

**Description**

*Dryandra sessilis* var. *cordata* is an upright bushy shrub to 2.5 m tall that lacks a lignotuber. Its stems are hirsute becoming glabrescent with age. Leaves are cuneate to oblong, often cordate, to 60 mm long by 40 mm wide, dark green, sessile or nearly so, undulate, serrate, pungent and toothed. The inflorescence is terminal and conspicuous. Involucral bracts are pubescent, shorter than flowers. Floral bracts are absent. The perianth is straight, slender, pale yellow, about 35 mm long. The pistil is straight, 30-34 mm long, slightly shorter than perianth with the pollen presenter cylindrical to ellipsoid above the neck. Follicles are ovoid, firmly attached and opening on maturity.

**Flowering period:** July-December

**Distribution and Habitat**

The species is found between Peaceful Bay and Cape Naturaliste, growing in coastal heath, shrubland and low woodland, in grey sand over limestone and deep sand on coastal dunes.

**Conservation Status**

Current: Priority 2

Recommended: Priority 4

**Known Populations in the Warren Region.**

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 2	Mandalay Beach Road	FRA	NP	na	na	
CLM 6	William Bay NP	FRA	NP		9/9/2000	
CLM 8	Long Point Track	FRA	NP	100	10/11/1999	
WAR 100	Gardner River Track 1	DON	NP	3	13/02/2004	
WAR 101	Gardner River Track 2	DON	NP	100-200	13/02/2004	
WAR 103	Gardner River Track 3	DON	NP	1500	12/02/2004	
WAR 104	Cathedral Rock carpark	DON	NP	200+	19/03/2004	
WAR 105	Conspicuous Rd	DON	NP	50+	11/05/2004	
WAR 106	Fisherman's Track 1	DON	NP	na	15/12/2003	
WAR 107	Rame Head track	FRA	NP	7	7/01/2004	
WAR 108	Fisherman's Track 2	FRA	NP	12	10/02/2003	
WAR 109	Hush Hush Beach Rd	FRA	NP	200	9/11/1999	
WAR 110	Banksia Camp Rd	FRA	NP	100+	9/11/1999	
WAR 111	William Bay NP 1	FRA	NP	numerous	16/02/1999	
WAR 112	William Bay NP 2	FRA	NP	numerous	16/02/1999	
WAR 113	William Bay NP 3	FRA	NP	100+	5/03/1999	
WAR 114	Callcup Dunes	FRA			21/6/1972	Relocate and reassess

**Response to Disturbance**

The taxon is killed by fire and Winter burning that kills the parent population after the onset of winter rain and associated germination of the ephemeral seed bank has a high probability of causing local extinction.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora Dieback*

Susceptible to *Phytophthora*.

### Management Requirements

Protect populations from frequent fires to give seedlings a chance to re-establish, mature and produce seed.

Relocate populations.

Manage populations (when located) to protect from impacts of *Phytophthora* spp.

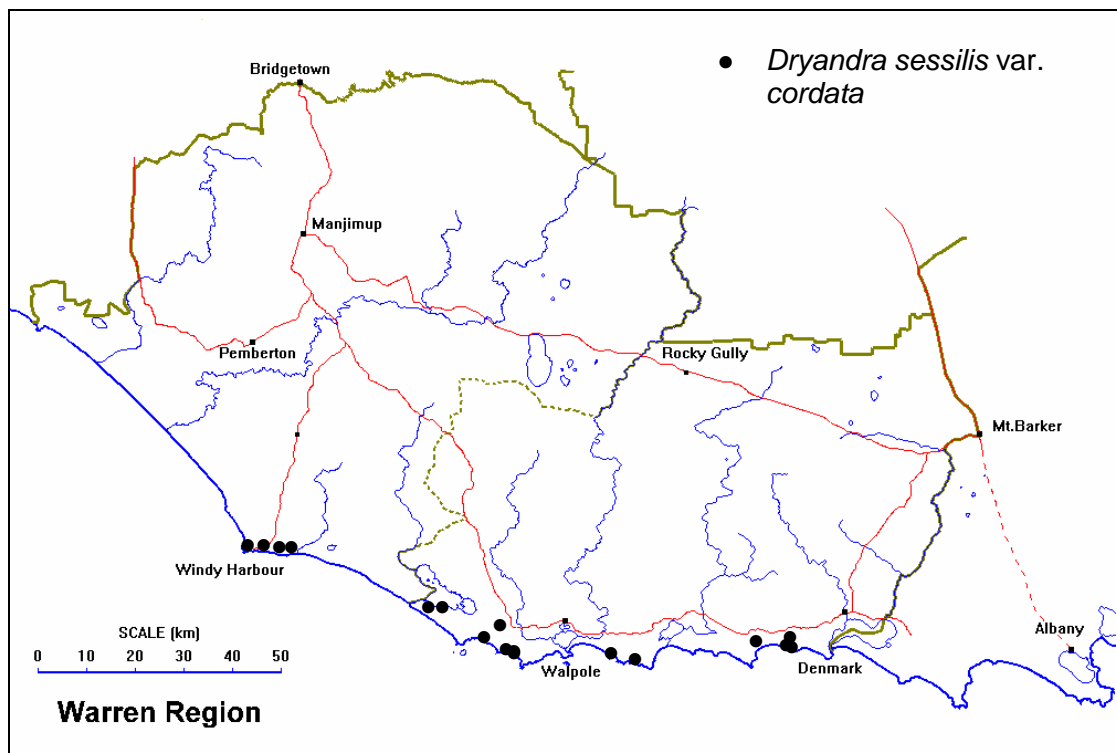
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine responses to disturbance.

### References

Bentham (1870); George (1996)



## *Eucalyptus virginea* Hopper & Wardell-Johnson

### MYRTACEAE

WAR F4/109

Although discovered by Barney White in the 1960's, *Eucalyptus virginea* was not seen again until relocated during a floristic study of the area in 1993. The species has some similarities with, and is possibly related to *Eucalyptus lane-poolei*. Total known numbers of plants are less than 2000 with one of the three populations consisting of less than ten plants that are all mature and showing no signs of regeneration. Extensive survey work to date indicates that further populations are unlikely to be located.

#### Description

*Eucalyptus virginea* is a long lived, occasionally multi-stemmed lignotuberous tree to 20 m high with a white powdery bark. Adult leaves are petiolate, narrowly ovate to falcate, 45-120 mm long by 10-26 mm wide. Umbels are three to nine flowered with flowers on pedicels 5-12 mm long. Buds are ovoid to globular, 7-9 mm long, the bud cap hemispheric to slightly conic and 3 mm long. Flowers are cream. Fruits are shallowly hemispheric, 8-14 by 10-15 mm. The disc is broad, level to ascending. The four valves are strongly exerted.

*Eucalyptus virginea* is a distinctive species that is characterised by its powdery bark, more or less globular buds and shallowly hemispheric fruits with exerted valves.

**Flowering period:** January-February

#### Distribution and Habitat

The species is known from three populations, two adjacent to the Denmark River, the other west of Denmark. In both areas it is found growing on shallow soils associated with granite and adjacent to other *Eucalyptus* species.

#### Conservation Status

Current: Priority 2\*

\*Species is of the highest priority for further survey and consideration for gazettal as DRF.

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Mt. Lindesay	FRA	SF	<1 000	1/1993	Part of the area is proposed NP and part is in the proposed dam area
CLM 2	Denmark River	FRA	SF	<1 000	1/1993	Proposed dam area
CLM 3	Mt. Shadforth	FRA	PP	6	1/1993	Old mature trees

#### Response to Disturbance

Plants have shown lignotuber growth and resprouting following fire. Seedlings were not observed following the 1991 Mt. Lindesay fire.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown, but should be treated as if susceptible.

#### Management Requirements

Resurvey and monitor populations five yearly noting any signs of recruitment, senescence, disease and pests and record responses to disturbance.

Liaise with the private property owner, the Botanic Gardens and Parks Authority and CALM's Threatened Flora Seed Centre in relation to collecting seed for long term storage and protecting plants on private land.

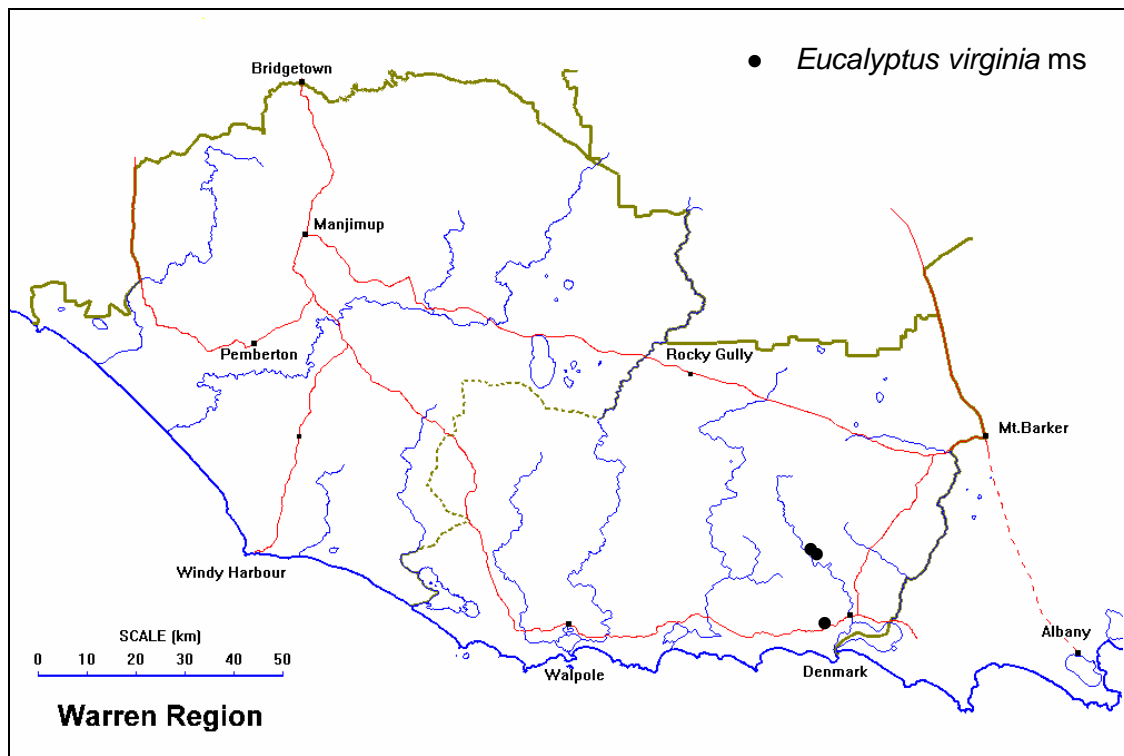
### Research Requirements

Confirm susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Grant Wardell-Johnson (personal communication)





## *Euphrasia scabra* R. Br.

### SCROPHULARIACEAE

Yellow Eye-bright

WAR F4/120

*Euphrasia scabra* was once a widely distributed Australian species that was described by Robert Brown in 1810 from material he collected at Port Dalrymple in 1804. In 1982 Bill Barker noted the disappearance of the taxon from the Australian landscape and, despite extensive searches over the last few years only *Parentucellia viscosa*, an exotic taxon, has been found across most of the Region. Just two populations are currently known from the Lake Muir area. Populations in the Salt River Rd. (North Stirling Ranges) have disappeared and an old reference to Denmark/Mt. Barker area has not collaborated.

#### Description

*Euphrasia scabra* is an erect scabrous/pubescent annual herb 8-50 cm tall with glandular and non glandular hairs. Leaves are opposite, to 20 mm long, elliptic to ovate, pinnatifid to serrate. Floral leaves are longer than stem leaves. Flowers are in a terminal spike, dense at first but, after extension, often long and interrupted on a pedicel to 1 mm. The calyx, to 9 mm long, is narrow, tubular, glandular pubescent and four lobed. The corolla tube, to 14 mm long, is yellow and two lipped, with the upper lip hood-shaped with two broad spreading reflexed lobes. The lower lip is three lobed. Stamens are in pairs, connivent under upper lip, filaments glabrous and the anthers glabrous to hairy.

*Parentucellia viscosa* differs in its longer corolla (16-20 mm long), its longer calyx (9-13 mm) and sub-sessile flowers.

*Euphrasia scabra* is a seed obligate annual and is hemi-parasitic. Western Australian populations differ from those in the eastern states in having glandular hairs rather than entirely non-glandular hairs.

**Flowering period:** October-November

#### Distribution and Habitat

The species has been recorded across southern Australia, but with very few recent collections. In Western Australia early records showed a distribution from Perth to Esperance but the only currently known location is in the Lake Muir area (1971 and 1997) and in the Narrikup area (1973) with the latter populations having since disappeared. Early collections also include references to Mt. Barker (1867) and Mt. Lindesay (1879). The species is found in low open heath community types on sandy soils over ironstone that are wet (saturated) for part of the year.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last Survey	Comments/condition
CLM 1	Lake Muir NR 1	DON	NR	1000+	11/2001	Over area of three ha
WAR 100	Lake Muir NR 2	DON	NR	100	11/2001	20 sq m

#### Response to Disturbance

Susceptible to local extinction from frequent fire as it a late flowering seed obligate annual.

Response to soil disturbance is unknown.

*Euphrasia scabra* is a wetland species and is therefore susceptible to changes in hydrology and climate.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora Dieback*

Unknown.

### Management Requirements

Conduct further intensive searches in areas where it has previously been collected.

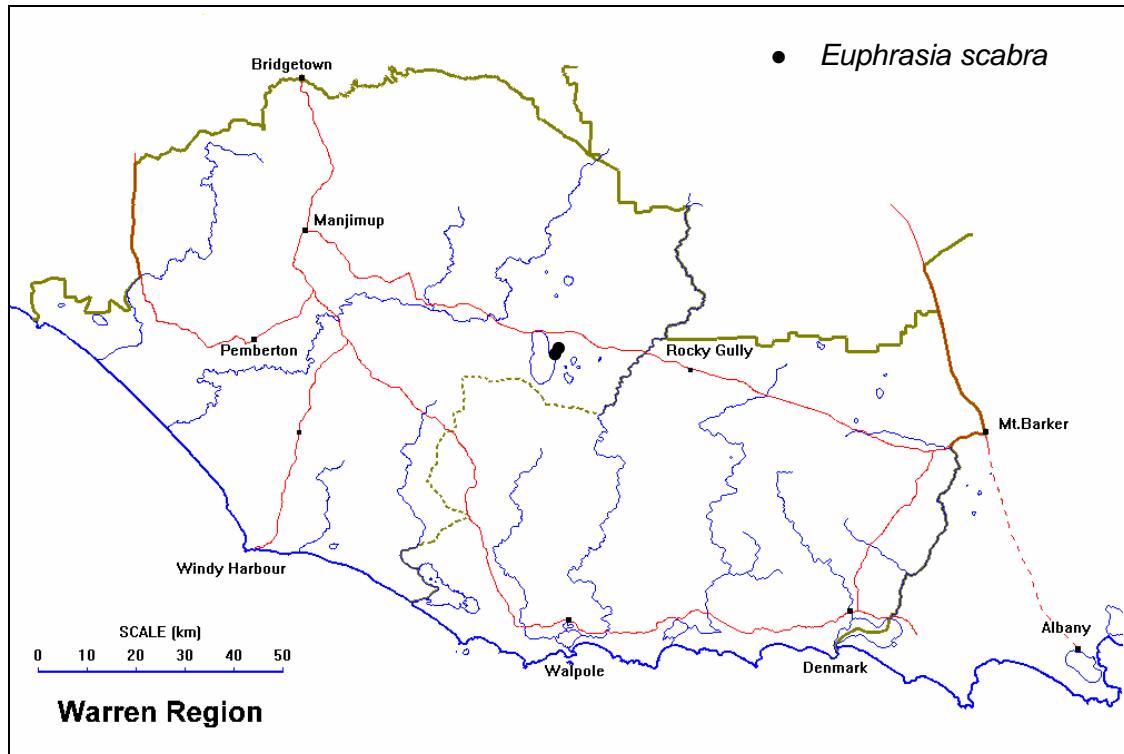
### Research Requirements

Determine if sufficiently different from eastern populations to consider a distinct taxon.

Determine response to disturbance.

### References

Barker (1982); Bentham (1869); Grieve and Blackall (1982); Wheeler (1987b)



## *Fabronia hampeana* Sond.

### FABRONIACEAE

WAR F4/250

*Fabronia hampeana* is a possibly widespread, endemic moss that was originally collected by Preisse in 1840 in what is now suburban Perth and later (1844) described by German Bryologist Otto Wilhelm Sonder in Hampe's *Icones Muscorum Novorum vel minus Cognitorum* and documented in Lehmann's *Plantae Preissianae* (1846). Records of its occurrence are scarce, with recent collections from Perth, Windy Harbour and possibly Sullivans Rock. Perth collections are mostly from sites that have since been cleared for housing. However, it is possible that the Bold Park population still exists. The Windy Harbour population has not been relocated.

#### Description

*Fabronia hampeana* is a cushion forming moss with horizontal stems sitting on a layer of woolly, tomentose rhizomes, bearing numerous short erect branches about 7-9 mm long. The shoots are soft, silky and very narrow with long appressed hairs. Leaves are as wide as stems and narrow lanceolate with a long hair point. Margins are covered in long cilia, these longer than the width of the leaf and dense enough to generally obscure the leaves. Leaves are usually secund, all pointing to the upper side of the stems. The nerve is weak reaching only mid leaf. Seta rise above the cushion to a height about double the length of the leaves. The capsule is short, ovate with a rounded conical operculum.

The species differs from *Fabronia australis* in having cilia on the margins of the leaves.

**Flowering period:** Unknown

#### Distribution and Habitat

The type collection of *Fabronia hampeana* was made in what is now suburban Perth, as were three more recent collections. The only other documented collection was made near Windy Harbour by Ima Scott in 1971. A collection made by Brenda Hammersley at Sullivans Rock on the Albany Highway appears to be *F. hampeana*, as does a collection from the Stirling Range. Most records indicate that it grows on the base of *Macrozamia*s, though the Stirling Range collection is recorded as growing on *Xanthorrhoea* stems.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
	Chudalup – Windy Harbour	DON	NP	0	2/9/2004	Not relocated

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#### Response to Disturbance

A fire that burns into the base of hosts is likely to damage or kill colonies.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Host is known to be susceptible to *Phytophthora* spp.

#### Management Requirements

Survey areas of suitable habitat for the species.

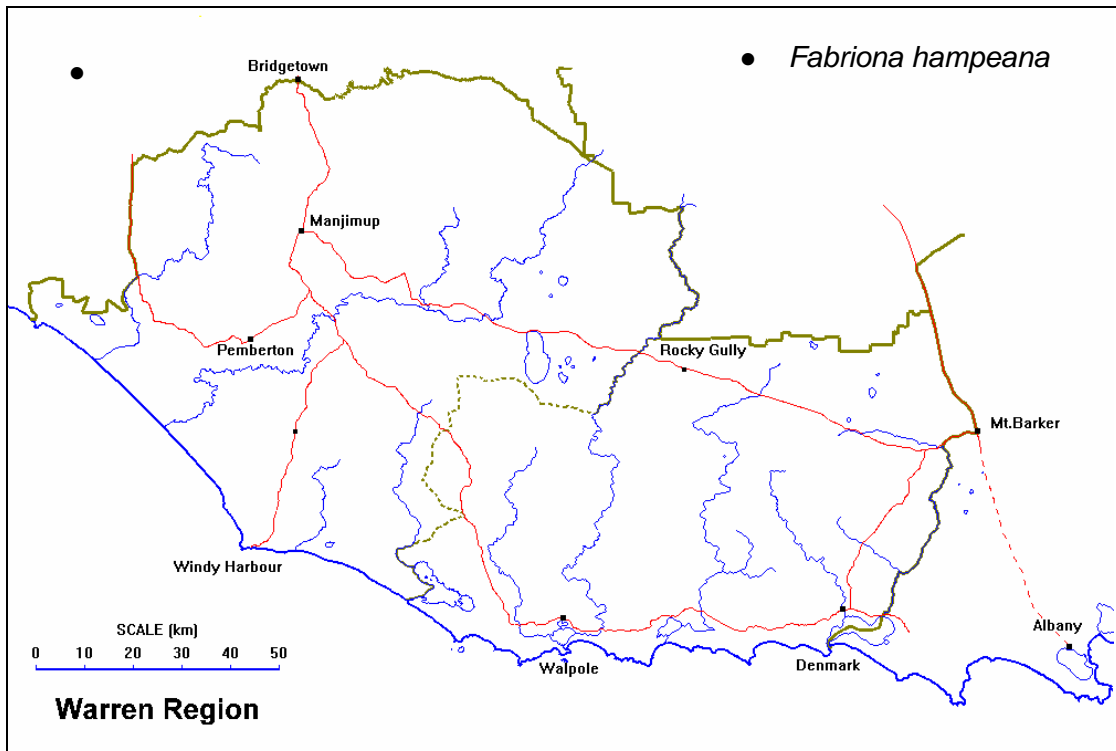
#### Research Requirements

Research the species' life history and impacts of disturbance.

Locate fruiting material.

## References

Lehmann (1846b); Scott and Stone (1976)



## *Grevillea acropogon* Makinson

## PROTEACEAE

WAR F4/251

A member of the *Grevillea thelemanniana* group, *Grevillea acropogon* was first collected from north of Lake Unicup by Ted Middleton in 1993 and is still known only from that area. The species was formally described by Makinson in 2000.

### Description

*Grevillea acropogon* is a prostrate to erect shrub to 1.8 m high with branchlets softly angular to subterete, loosely to sparsely sub-tomentose with straight hairs, becoming nearly glabrous. Leaves are linear, rigid, 1.5-2.5 cm long, divaricately pinnatisect with five to seven primary lobes 10-15 mm long by 0.8-1.1 mm wide, the upper surface loosely subtomentose or subsericeous, soon glabrous, not pitted. Margins are angularly revolute and the lower surface mostly or wholly enclosed except for mid-veins. The conflorescence is decurved, shortly and broadly secund, 18-24 flowered, acropetal. The rachis is 12-17 mm long (only c. 8-9 mm active), openly pubescent becoming almost glabrous. The perianth and style are both red, the perianth glabrous outside except for a few inconspicuous appressed hairs near tip of limb segments, densely bearded inside. The pistil is 20-22 mm long. Follicles and seeds not seen.

*Grevillea ripicola* is closely related to *G. acropogon* but differs in its glabrous leaf lower surface, longer leaves i.e. 2.5-6 cm long, longer and wider ultimate lobe 10-30 mm long and 1.5-5 mm wide, and a longer pistil 29-35 mm.

**Flowering Period:** June-September

### Distribution and Habitat

*Grevillea acropogon* is known from one population north of Lake Unicup Nature Reserve, growing in shallow soils over ironstone on the margin of seasonally inundated areas.

### Conservation Status

Current: Priority 2

Recommended: Priority 1

### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Lake Unicup area	DON	PP	51	1/9/2004	

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### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Survey areas of suitable habitat for further populations

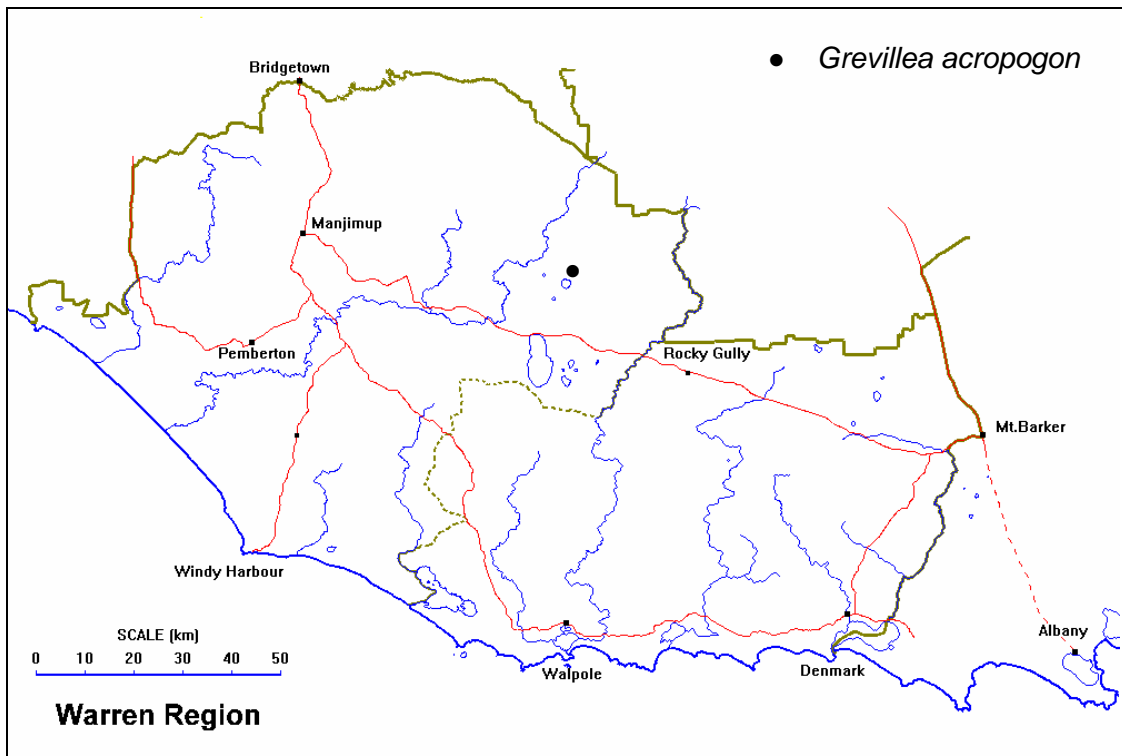
Collect seed for *Phytophthora* testing.

### Research Requirements

Determine response to disturbance.

## References

Makinson (2000)



## *Grevillea fuscolutea* Keighery

### PROTEACEAE

WAR F4/44

*Grevillea fuscolutea* was first collected in 1879 by William Webb and later (1980) by a Forests Department survey team. It was then recollected from the same general area over subsequent years. Recognised as being part of the *Grevillea drummondii* complex, it was named in 1992 by Greg Keighery. Despite extensive surveys, it has only been recorded from a few populations north of Denmark.

#### Description

*Grevillea fuscolutea* is an erect open, much-branched shrub to 2.5 m tall with densely tomentose branchlets when young, becoming glabrous with age. New growth is ferruginous in colour. Leaves are grey-green, oblanceolate to linear, 41-78 mm long by 7-12 mm wide with margins recurved, midrib prominent and a short black mucro. The petiole is 3-5 mm long. Flowers are in axillary racemes, usually five on short peduncles, the rachis densely pubescent. Bracts are 3-4 mm long. Pedicels are 4-6 mm long, orange-ferruginous and hirsute. The perianth is 6-8 mm long, golden yellow with orange hairs, inside and glabrous except for a ring of hairs in the throat. The style is 6-7 mm long and yellow with orange-red hairs.

*Grevillea fuscolutea* is closely related to *G. fistulosa* but differs in having a ring of hair in the perianth, and yellow instead of red flowers.

**Flowering period:** April-October

#### Distribution and Habitat

The species is restricted to granite outcrops north of Denmark, growing in coarse grey sand and shallow loam in open low woodland of *Eucalyptus marginata* over low open heaths.

#### Conservation Status

Current: Priority 2\*

\*Species is of the highest priority for further survey and consideration for gazettal as DRF.

#### Known Populations in the Warren Region

Pop. No.	Location	District	and status	No. of plants	Last survey	Comments/condition
CLM 3	Mt. Lindesay 1	FRA	SF	2000+	28/2/1992	
CLM 1	Mt. Lindesay 2	FRA	PP	80+	28/9/1992	
CLM 2	Little Lindesay 1	FRA	SF	200+	8/10/1994	

#### Response to Disturbance

Plants are killed by fire and regenerate from seed. Seedlings reach reproductive maturity in the fourth year after fire. It has been noted that, as with a number of other granite species on Mt. Lindesay, germination is spread over about three years post fire.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora Dieback*

Unknown, but presumed susceptible.

#### Management Requirements

Monitor populations every two years, and also pre and post disturbance events.

Search for further populations in areas of suitable habitat.

Exclude vehicle/motor cycle access from Little Lindesay for *Phytophthora* spp. management.

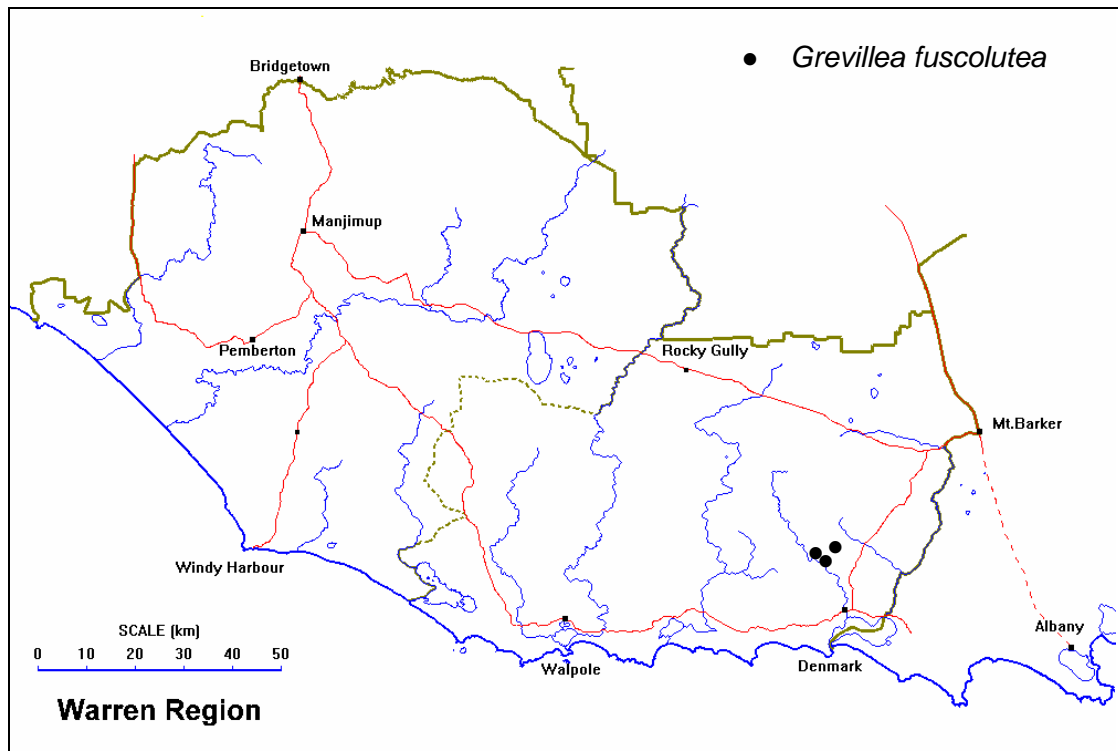
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Keighery (1992)





## *Hemiandra australis* B. Conn ms

### LAMIACEAE

WAR F4/180

*Hemiandra australis* was first collected by Bob Voutier in 1974 but at that time was thought to be *Hemiandra pungens*. It was subsequently collected by Barry Conn who recognised it as a distinct taxon. A collection of a *Hemiandra* made at Broke Inlet during work for this report appears to be this species as does a population on Meerup dunes.

#### Description

*Hemiandra australis* is an upright shrub to about 1 m tall and 1 m wide with hairy stems when young, becoming glabrous with age. Leaves are ovate, 8-16 mm long, 3-4 mm wide with scattered hairs of variable length on the margins and mid-vein (abaxial) and bases not overlapping. Inflorescences are pedicellate with pedicles 1-1.5 mm long and densely hairy. Bracteoles are leaf-like, 8-10 mm long, 1 mm wide, also with hairs on margins and mid-vein. Calyx (tube plus lobes) is 6-9 mm long and two lipped, the upper lip entire, 3-4 mm long, lower lip divided into two acute lobes 2-3 mm long, with scattered hairs on margins, retained as part of the seed capsule. The corolla is about 13 mm long, pale pink to mauve with short hairs on outer surface and long tangled hairs on the inner surface, two lipped, the lower lip three lobed, deeply divided, the upper lip two lobed, not as deeply divided. Stamens are of unequal length, upper pair about 3.5 mm long and the lower pair about 5 mm long.

**Flowering period:** November-January

#### Distribution and Habitat

The species is known from thirteen populations on coastal dunes between the mouth of the Warren River and Broke Inlet, growing in deep sandy soil in heath communities.

#### Conservation Status

Current: Priority 2

Recommended: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1, 7 & 8	Pemberton/Callcup Hill	DON	NP	na		Herbarium record. Exact location not known
CLM 2	Inlet River/ Broke Inlet	FRA	NP	20	19/12/1994	
CLM 3	Meerup Dunes	DON	NP	1000+	27/2/1997	
CLM 5	Pt. D'Entrecasteaux	DON	NP	20+	12/2/2004	
CLM 6	Windy Harbour Rd.	DON	NP	na	12/1/1995	Herbarium record only
WAR 101	Summertime Track	DON	NP		1/12/2003	
WAR 102	Southern shore, Broke Inlet	FRA	NP		7/1/2003	Herbarium record. Requires resurvey.
WAR 103	Clarke Island	FRA	NP	30	6/1/2003	1000+ seedlings
WAR 104	Broke Inlet	FRA	NP		8/11/2000	As above
WAR 105	Fisherman's track	FRA	NP	10	4/12/2003	

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to Phytophthora Dieback

Unknown.

### Management Requirements

Locate all known populations and make additional plant collections in each.

Search coastal areas for further populations and, if found, collect material for taxonomic work.

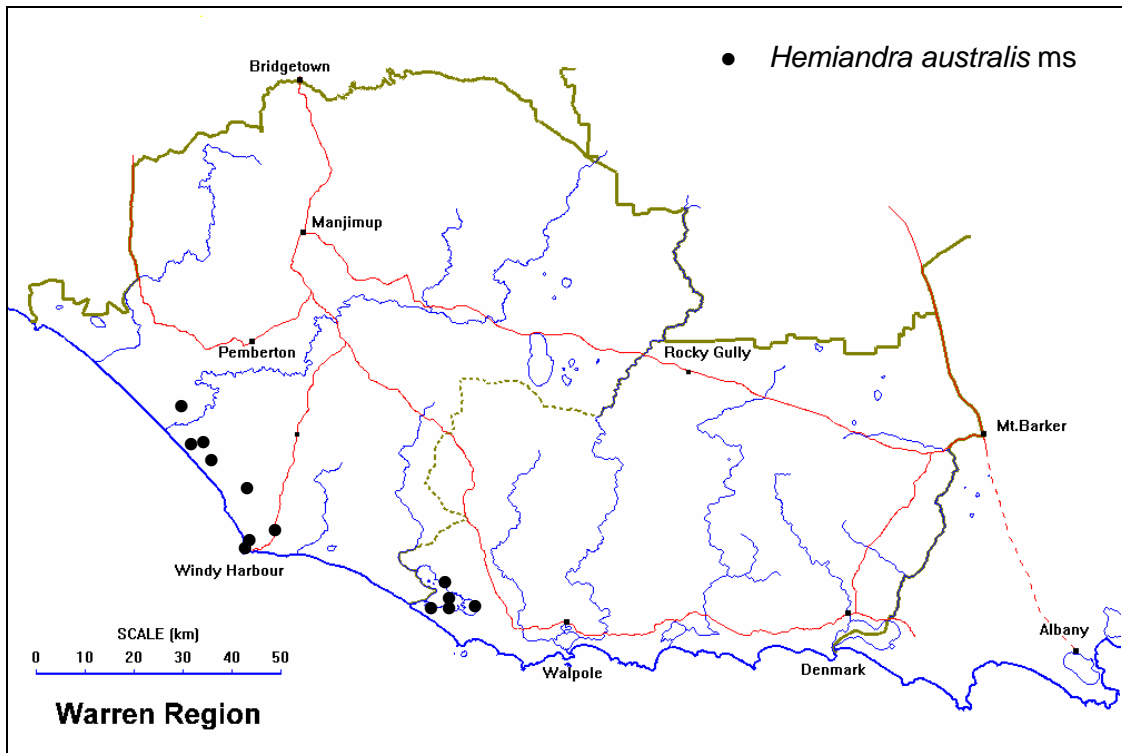
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Barry Conn (personal communication)



## *Hybanthus volubilis* E.M. Bennett

### VIOLACEAE

WAR F4/168

*Hybanthus volubilis* was collected by Royce in 1947 and described by Eleanor Bennett in 1972. Until recently, it was known from just a few populations in the Margaret River area but has since been located in the Warren Region by Tony Annels in 1995.

#### Description

*Hybanthus volubilis* is a twining perennial herb to 1 m high with linear to narrowly elliptic, acute leaves 10-20 mm long by 2-6 mm wide. Flowers are axillary, solitary the flower scapes recurved and about 4 mm long. Sepals are 2-2.5 mm long, green to purple. The lower petal is 6-8 mm long, white with mauve veins and the lateral petals 1.5-2.5 mm long and blue to purple. The capsule is 5 mm long.

The species is identified by its twining habit and solitary flowers.

**Flowering period:** September-October

#### Distribution and Habitat

The main distribution is in Jarrah/Karri forest along riverbanks, between Margaret River and Scott River National Park, with an outlier recorded on the margins of the Deep River.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Deep River	FRA	SF	100+	11/10/1995	Full survey required

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to changes in soil moisture is unknown but, as the species is only recorded along riverbanks, climate change may be a major threat.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements

Conduct a full survey of the Warren population.

Search for further populations in the Warren Region.

#### Research Requirements

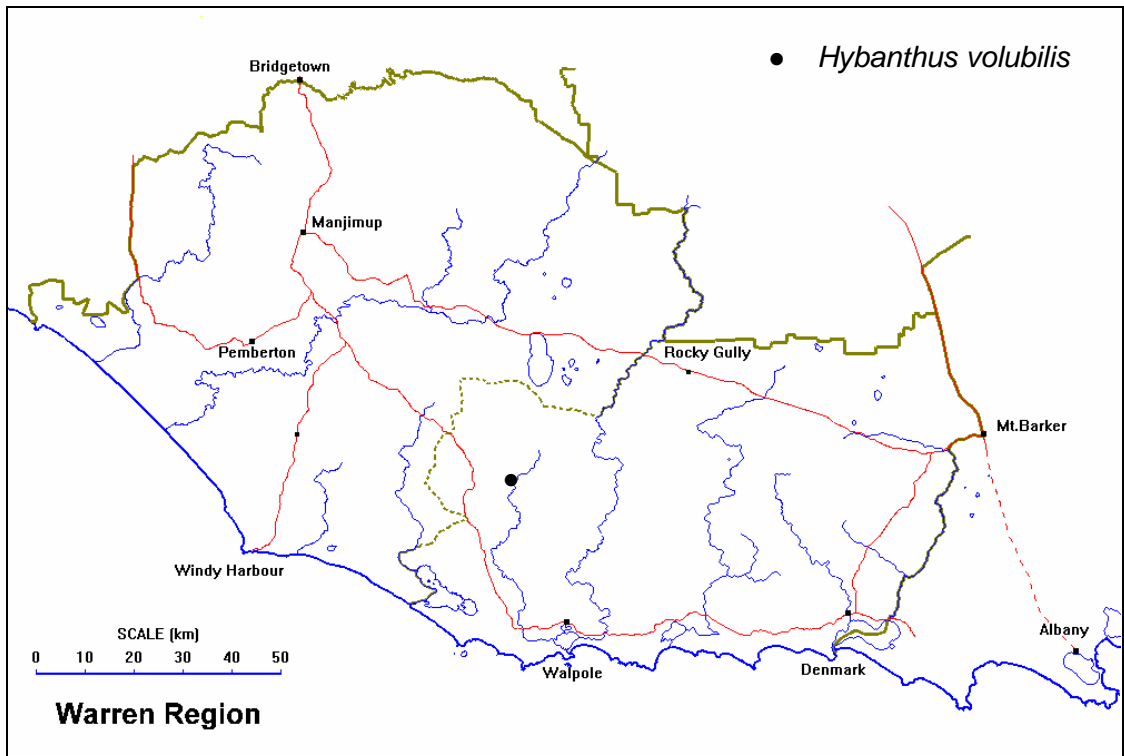
Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

Conduct molecular research to ascertain if there any differences between the Warren and Margaret River populations.

#### References

Bennett (1972) ; George (1982)



## *Juncus meianthus* K. L. Wilson

## JUNCACEAE

WAR F4/147

*Juncus meianthus* was first collected from the Nornalup area by Blackall in 1929 and, at that time, was placed with *Scirpus antarctica*. It was then not collected again until 1979 when Mary McCallum-Webster found it near Albany. Prior to recognition as a new species, both Western Australian collections were considered to be forms of the Eastern Australian *Juncus gracilis*.

### Description

*Juncus meianthus* is a perennial herb 50 to 300 mm high with filiform densely tufted, leafy stems to 0.5 mm wide, each containing persistent old leaf sheaths. Leaves are flat to channelled or terete, appearing filiform, 40-150 mm long by 0.5-1 mm wide. Flowers are bisexual and arranged in a single cluster or sometimes an irregular cyme of small flower clusters. The basal bract usually exceeds the inflorescence in length. Bracteoles are minute. The six tepals are brown, narrowly ovate to ovate and 1.5 mm long. There are three or six stamens and the style is three branched. The ovary is superior and up to three celled. The capsule is as long as or longer than the tepals.

**Flowering period:** November-January

### Distribution and Habitat

*Juncus meianthus* is a poorly known species that is recorded sporadically between Karridale and Albany. Habitat is coastal rocks and along creeks, probably associated with granite. A search was conducted in suitable habitat in the Walpole (coastal) area but plants were not located. The species is currently known from just one population in the Warren region.

### Conservation Status

Current: Priority 2

### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Nornalup	FRA	NP	0		Not relocated
WAR 101	Granite Peak	FRA	NP	Isolated plants	19/3/2004	Confirm identification of specimen

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### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora Dieback*

Unknown.

### Management Requirements

Search the Nornalup area for the recorded population.

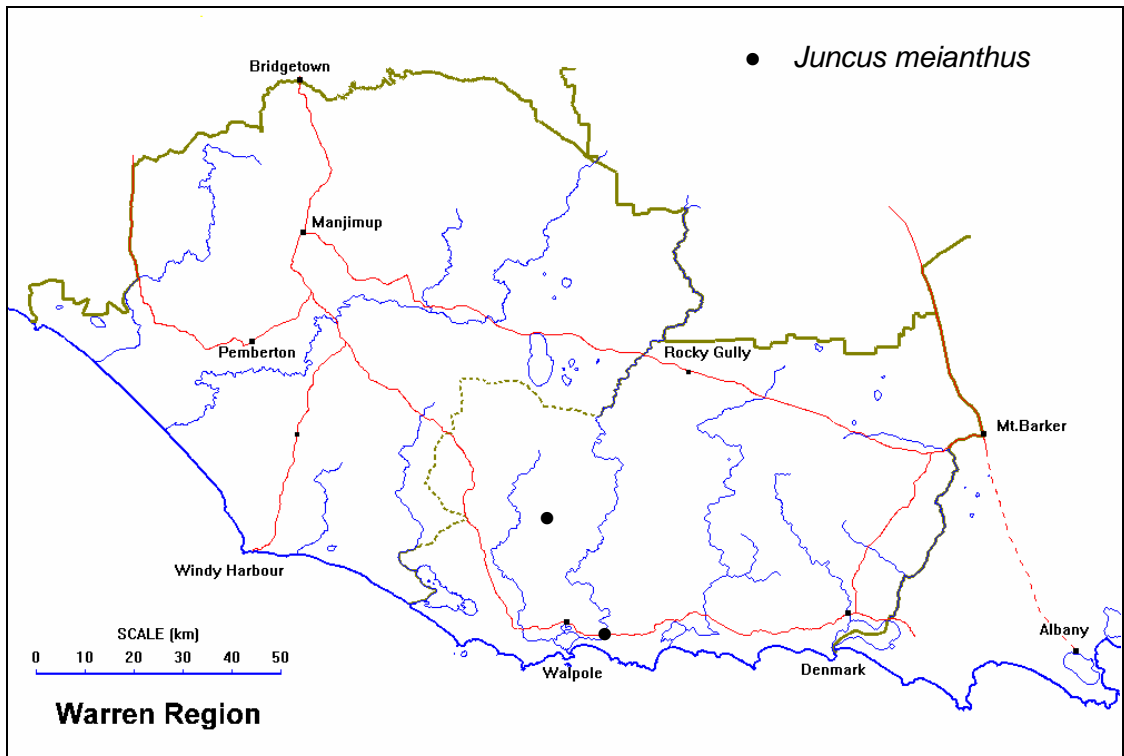
Search other areas of suitable habitat in the Warren Region.

### Research Requirements

Unknown.

### References

Wheeler *et al.* (2002)



## *Laxmannia grandiflora* subsp. *brendae* Keighery

### ANTHERICACEAE

WAR F4/177

*Laxmannia grandiflora* subsp. *brendae* was independently collected by Brenda Hammersley and Sarah Barrett in 1995 from different parts of Mt. Lindesay.

#### Description

*Laxmannia grandiflora* subsp. *brendae* is an erect, compact stilted plant 20-60 mm tall, including stilt roots which are 10-15 mm long. Stems are 1.5-2.5 mm wide. Leaves are linear terete, pungent, usually curved, 10-15 mm long. The inflorescence is four to twelve flowered, generally not exceeding the leaves in length. Peduncles are erect, 10-30 mm long. The outer bracts are translucent to fawn, scarious, keeled at base, oblong-ovate and 4-5 mm long. Sepals are 4-5 mm long, transparent to white. Petals are cupular and c. 3 mm long with a brown median strip and transparent to white margins.

*Laxmannia grandiflora* subsp. *brendae* differs from other subspecies in its small size, fewer flowers, short peduncle, petals with a brown median strip and early flowering period. *Laxmannia minor*, (also on Mt. Lindesay) differs from *Laxmannia grandiflora* subsp. *brendae* in having a more robust stem, longer peduncles (50-200 mm) and more numerous flowers (18-28), equal length petals and sepals (4-6 mm), and later flowering period (September-November).

**Flowering period:** August-September

#### Distribution and Habitat

The species is known from three small populations on Mount Lindesay, growing in shallow siliceous sand near surface granite in open heath communities.

#### Conservation Status

Current: Priority 2\*

\*Species is of the highest priority for further survey and consideration for gazettal as DRF.

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land Status	No. of Plants	Last Survey	Comments/condition
CLM 1	Mt. Lindesay	FRA	NP	-	8/1995	Plants have not been relocated since a fire in 1998
CLM 2 a	Little Lindesay 1	FRA	NP	50	Oct/2003	
CLM 2 b	Little Lindesay 2	FRA	NP	30	Oct/2003	

#### Response to Disturbance

The subspecies is killed by fire and regenerates from seed. The first few flowers were seen on seedlings in fourth spring after fire

Response to changes in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora Dieback*

Unknown.

#### Management Requirements

As the subspecies is a seed obligate with first significant flowering five years after germination, exclude its habitat from fire for at least ten years.

Search for further populations on Mt. Lindesay.

Search for further populations in areas of similar habitat away from the Mt. Lindesay.

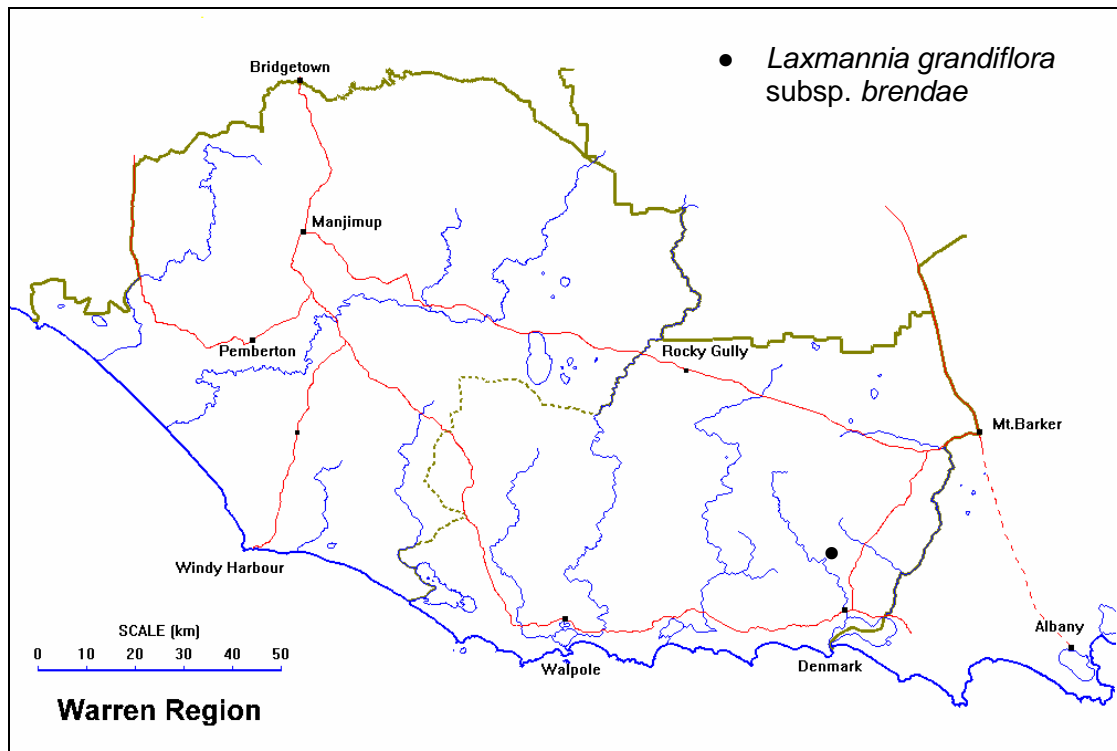
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Keighery (1987); Keighery (2002)





## *Leptinella drummondii* (Benth.) D.G. Lloyd & C.J. Webb

### ASTERACEAE

WAR F4/171

One of the earliest collections of *Leptinella drummondii* was by Oldfield in the 1850's from the 'Don' River, presumably the Gordon River, which was a source of a number of his collections. Bentham described the species in 1867 and it was then not recorded again until 1965 when collected by Royce on the banks of the Blackwood River. Recent collections on the Frankland and Tone Rivers would support the interpretation of 'Don' as being the Gordon, one of the upper branches of the Frankland. The species may be at risk from increasing salinity in the rivers.

#### Description

*Leptinella drummondii* is a perennial, prostrate herb to 15 cm high with stems covered in very dense long woolly hairs. Leaves are 20-60 mm long by 10-15 mm wide petiolate, deeply bipinnatisect, sparsely hairy, alternate or in alternate pairs or clusters, the base stem-clasping. Flower heads are cream to yellow, disc-like, solitary, about 5 mm across and pedunculate. The involucre bracts are broadly ovate to broadly elliptic, about 2 mm long, herbaceous with membranous margins. The outer florets are female, tubular, very short, inflated, four-lobed and arranged in two or three rows. The inner florets are male, tubular and four-lobed. The achenes are sessile and the pappus is absent.

*Leptinella drummondii* differs from *Cotula* species growing in the same area in having outer female florets with a distinct short, inflated corolla and dense brown-hairy creeping stems.

**Flowering period:** November-February

#### Distribution and Habitat

Outside of the Warren region the species has been recorded at Blackwood River near Nillup and Darradup. Within the region it is known from five locations between the Frankland River near Mt. Roe and the Tone River near Lake Muir. It has always been found on river banks.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 3	Roe Rd-Frankland River	FRA	SF (5g)	na	14/12/1990	1990 collection
CLM 4	Muir Hwy-Tone River	DON	SF / NR	50+	24/11/1994	Recorded as two subpopulations
CLM 5	Tick Rd-Wilgarup River	DON	SF	na	13/3/1997	
WAR 100	Mordalup Rd-Tone River	DON	NR/WR	500+	12/1996	Collect in flower for WA Herbarium
WAR 101	Randall Rd-Wilgarup River	DON	SF	100+	12/1996	Collect in flower for WA Herbarium

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Susceptible to changes in climate and hydrology.

Due to its river bank habitat, potentially susceptible to salinity.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements

Relocate all populations.

Search for further populations in areas of suitable habitat.

Monitor every three to four years.

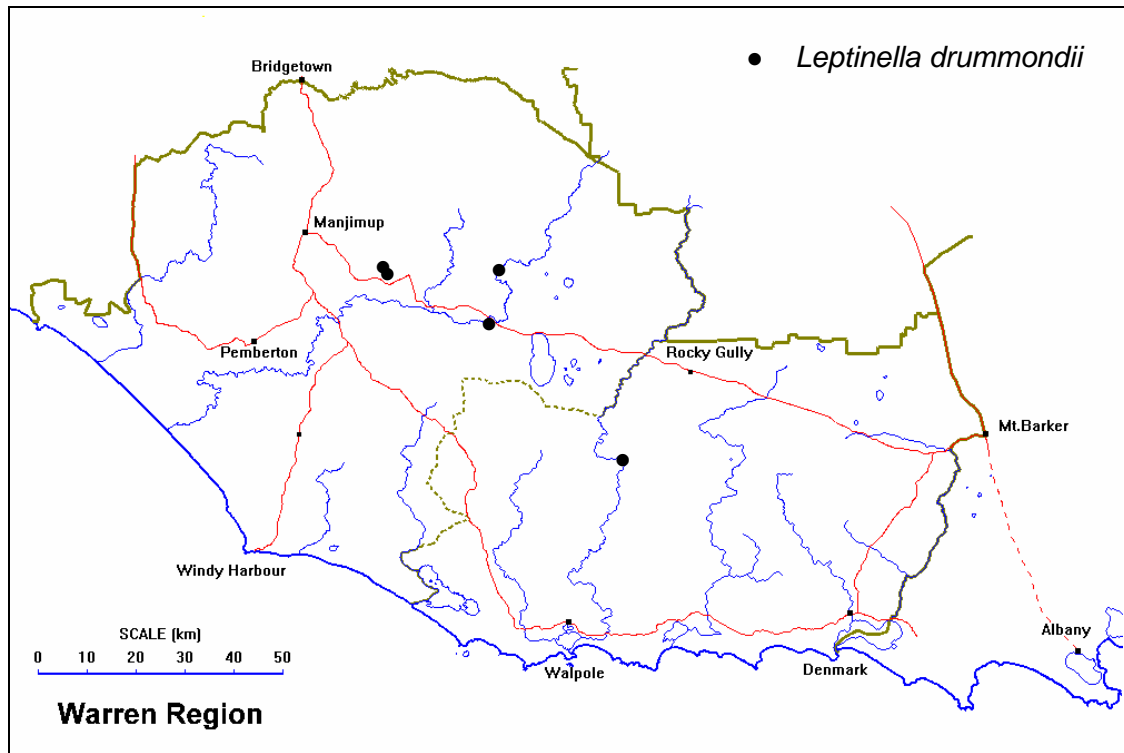
### Research Requirements

Determine susceptibility to *Phytophthora* spp. and rising salt levels.

Determine response to disturbance.

### References

Bentham (1866); Wheeler (2002)



## *Lilaeopsis polyantha* (Gand.) H. Eichler

APIACEAE

WAR F4/214

*Lilaeopsis polyantha* is a predominantly eastern Australian species that was first collected from Lake Muir in Western Australia by Jacobs in 1993. Since then two more collections have been made from the same area by Greg Keighery and Neil Gibson.

### Description

*Lilaeopsis polyantha* is an aquatic herb with creeping rhizomes and terete, septate, glabrous phyllodes 1-35 cm long by 0.5-5 mm wide at base arising from rhizome nodes. Peduncles are 1-3 cm long and much shorter than the phyllodes. Flowers are rare on pedicels up to 1 cm long. The fruit is ribbed, 2-3 mm long and about half as broad. Mericarps are ribbed with the ribs at the junction thick and corky.

**Flowering period:** November

### Distribution and Habitat

The species is known from two populations on the northern and southern margins of Lake Muir, growing on black sandy mud. It appears to show some level of salt tolerance.

### Conservation Status

Current: Priority 2

### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Lake Muir north	DON	NR	na	11/12/1997	
WAR 101	Lake Muir south	DON	NR	na	27/10/1997	

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### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown, but the species may possibly be susceptible to changes in water level due to climate change.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

### Susceptibility to *Phytophthora Dieback*

Unknown

### Management Requirements

Relocate and survey populations

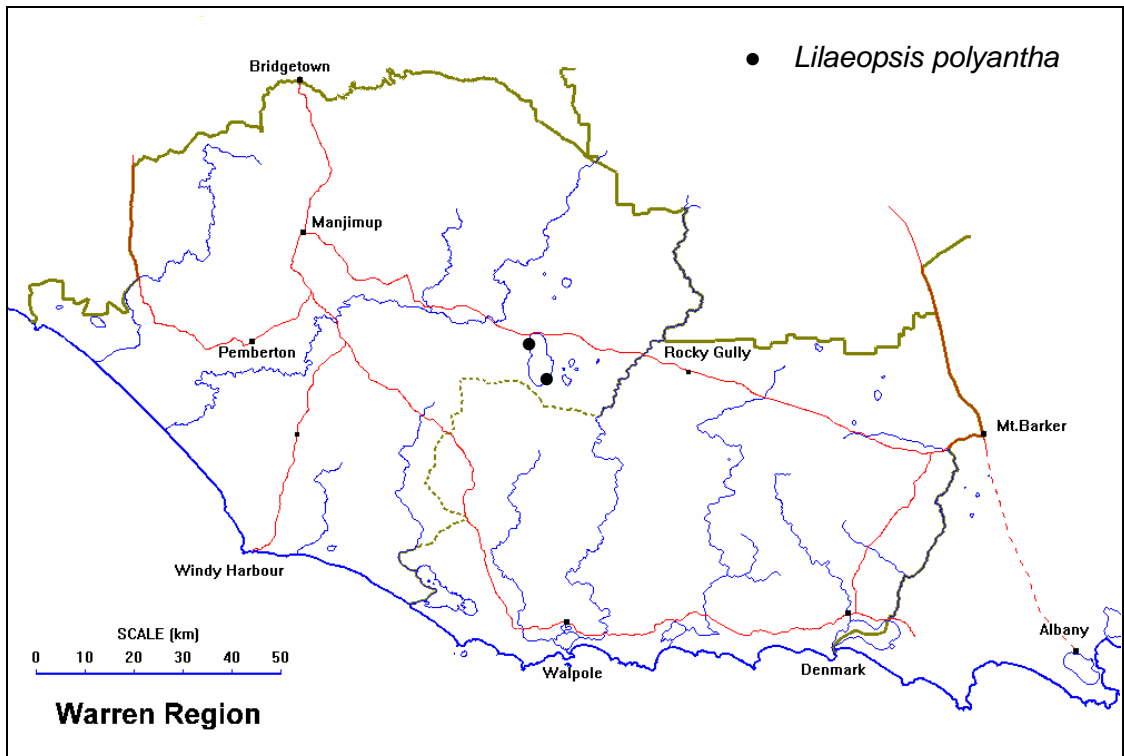
Survey areas of suitable habitat for further populations

### Research Requirements

Determine response to disturbance.

### References

Burbidge and Gray (1976); Walsh and Entwistle (1999)



## *Melaleuca pritzelii* Domin (Barlow)

### MYRTACEAE

WAR F4/224

*Melaleuca pritzelii* was described by Domin as a variety of *Melaleuca densa* in 1923 based upon a 1901 Pritzel collection from "...NW Plantagenet...." It was raised to species status by Barlow in 1992.

#### Description

*Melaleuca pritzelii* is a shrub to 1.2 m tall, with a tomentose inflorescence axis and hypanthium and young shoots that are initially tomentose, becoming glabrous. Leaves are sessile, 1.2-2.5 (4.1) mm long by 1.2-2.0 (3.5) mm wide, acute at the apex, arranged in alternate pairs (sometimes in threes) at right angles and strongly spreading. The lamina is broadly ovate or sometimes obovate and flat but keeled. The inflorescence is terminal or lateral on old wood and contains 10-15 flowers. Bracts are broadly ovate, 1.6-2.0 mm long by 0.8-1.3 mm wide and early deciduous. Hypanthium is 1.4-1.9 mm long and funnel-shaped. Sepals are 0.8-1.0 mm long, transversely ovate, scarious and glandular. Stamens are two to four per bundle, light cream, 3.6-6.5 mm long including a claw (1.2) 1.5-2.5 mm long. The style is 5.5-8.2 mm long. The fruit is 2.0-2.4 mm long, 3.6-4.0 mm diameter, cup shaped, papery in texture, the valves deeply recessed below the aperture.

It has been suggested that the population in the Warren Region could be a morphological extreme of *Melaleuca densa*.

**Flowering period:** August-September

#### Distribution and Habitat

The species occurs mainly outside the Warren region between Ongerup and Pootenup with just one record in the region at Lake Muir. Habitat is mallee heath or tall shrubland on poorly drained sands over clay.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 13	Lake Muir	FRA	NR	na	24/3/1997	

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#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Changes in hydrology and climate may affect the long-term conservation of the species.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to Phytophthora Dieback

Moderately resistant

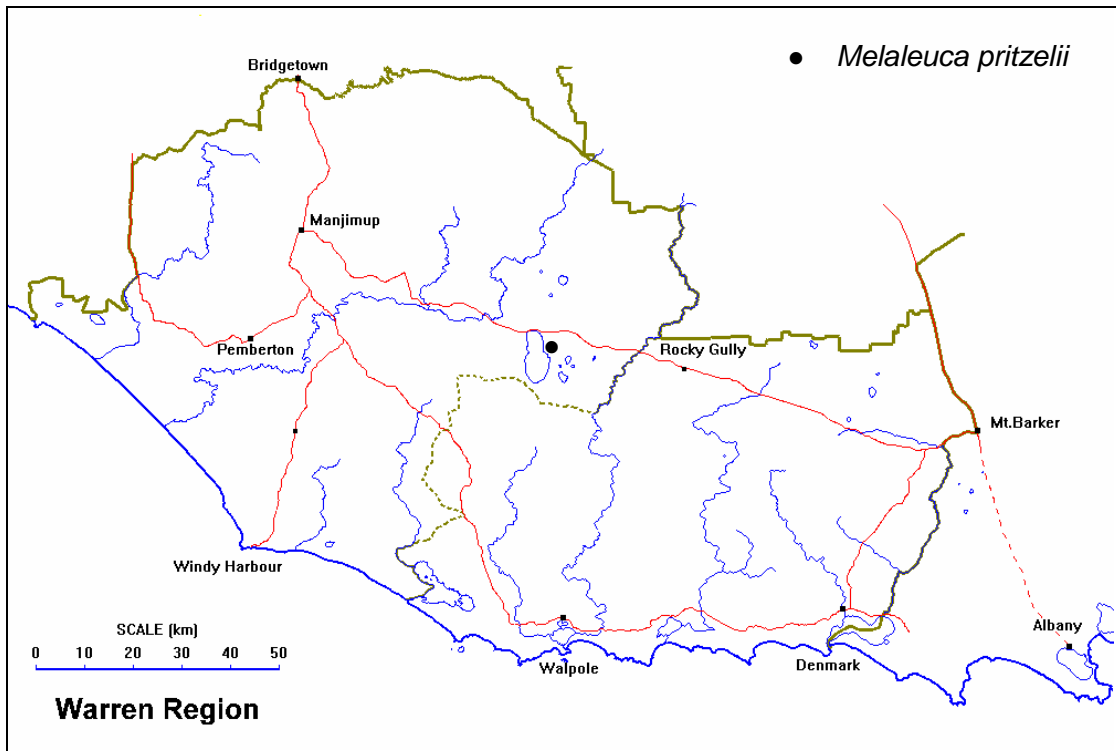
#### Management Requirements

Additional collections are required from the Warren population.

#### Research Requirements

Determine if the Warren population is *Melaleuca pritzelii*, *M. densa* or a hybrid.

#### References



## *Mitreola minima* B. Conn

## LOGANIACEAE

WAR F4/51

This monocarpic fire ephemeral was first collected near Capel by Greg Keighery in 1975. It was later collected in the Fitzgerald NP by Ken Newbey in 1985 and near Walpole by Tony Annels in 1988. Its taxonomy was not resolved until 1995 when material being examined by Clyde Dunlop was sent to Barry Conn who was at that time working at Kew. Barry was able to confirm its place in *Mitreola*, a widespread genus of about six species in the tropics and subtropics of America, Africa and Asia. Two species occur in Australia, with *Mitreola minima* endemic to the south-west.

### Description

*Mitreola minima* is a small, branching, short lived annual herb, appearing in large numbers the year after a fire. Plants are 20-60 mm high with opposite linear to linear-lanceolate leaves about 3-6 mm long by 0.5-1 mm wide. Flowers are shortly pedicellate, subtended by the leaves and densely clustered towards the end of the branches. Calyx lobes are about 2 mm long. The corolla tube is white, about 1.5 mm long, five lobed and contains five stamens. The style is divided at the base into two widely separated parts that fuse together at the stigma. The ovary is two celled.

**Flowering period:** October-December

### Distribution and Habitat

*Mitreola minima* is recorded from eight populations between Capel and the Fitzgerald River. Its disappearance from several of these areas in the absence of fire may reflect in its apparent rareness. The species appears to prefer well drained sandy soils in areas of open woodland over dense shrub understorey. The type habitat is on the margins of swamp communities.

### Conservation Status

Current: Priority 2

### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Mountain Rd /Boronia Rd	FRA	SF (5g)	200+	5/12/1995	
CLM 2 & 3	Middle Rd 2	FRA	NP	<50	20/11/1995	1000+ plants on 1994
CLM 4	Middle Rd 1	FRA	SF (5g)	0	20/11/1995	Common in November 1990
CLM 6	Kangaroo Rd	FRA	SF	na	30/11/1994	
WAR 100	Valley of the Giants	FRA	NP	0	9/11/1994	Common in November 1988. Requires resurvey
WAR 101	Cemetery Rd	FRA	NP	na	?	Recollect and confirm location
WAR 102	Mountain Rd 1	FRA	SF (5g)	500+	5/12/1995	

### Response to Disturbance

Germination is triggered by fire and the subsequent removal of competition. The species has only been seen in any abundance after fire, and then disappears within a few years.

Response to soil disturbance is unknown.

The species is susceptible to changes in hydrology, climate and especially drought. If germination occurs and is followed by a drought, localised extinction may occur.

Response to weed invasion is unknown.

### Susceptibility to Phytophthora Dieback

Unknown.

### Management Requirements

Monitor populations following fire.

Search areas of suitable habitat following fire.

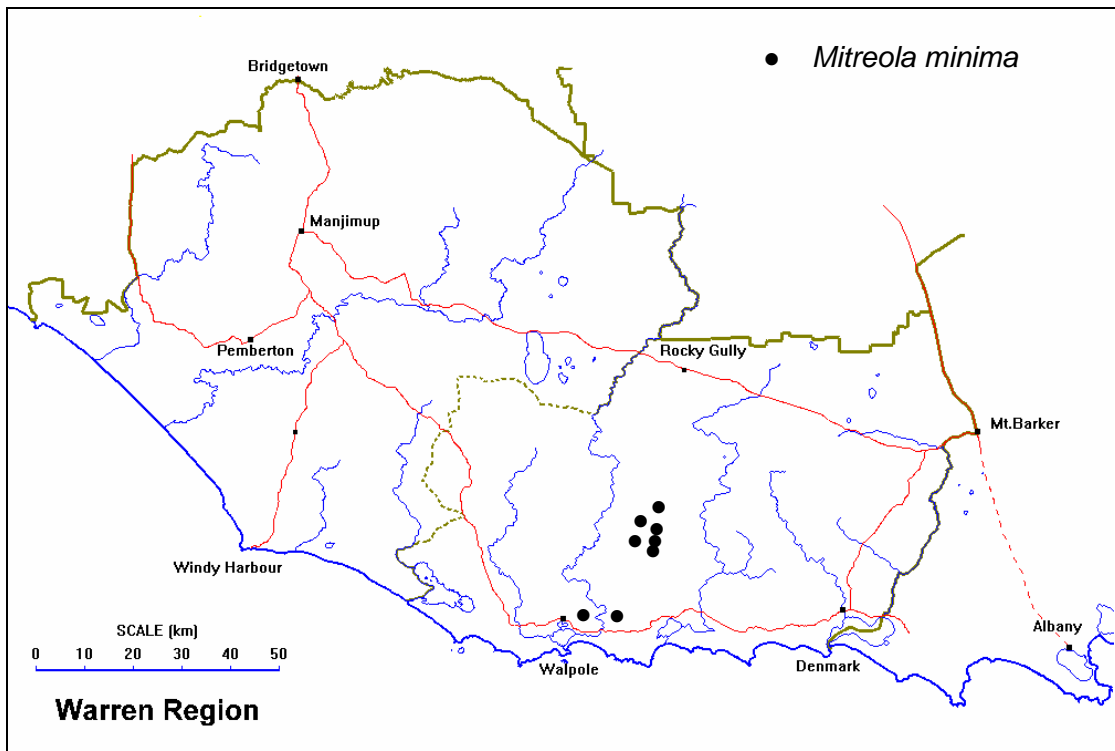
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Research response to disturbance.

### References

Conn (1996); Conn and Brown (1996)





## *Rorippa dictyosperma* (Hook.) L. Johnson

### BRASSICACEAE

Forest Bitter Cress

WAR F4/178

*Rorippa dictyosperma* is a poorly known species that was described by Hooker in 1834 as *Cardamine dictyosperma* and was later (1962) moved to *Rorippa* by Les Johnson. Previously known only from the Porongurups, it has recently been collected twice near Walpole. Johnson noted that the Western Australian material he saw was slightly different to eastern material and may represent a new taxon.

#### Description

*Rorippa dictyosperma* is a perennial herb to 90 cm high that is decumbent at the base, branched and erect above. Leaves are petiolate, the basal ones pinnate to 20 cm long with a large terminal lobe and entire or dentate margins. Leaves further up the stem are progressively more lanceolate and entire. Sepals are dimorphic, 2.5-5 mm long, the inner pair saccate. Petals are clawed, 5-10 mm long and white in colour. There are six stamens. The style is 2-4 mm long. The siliqua is linear, 25-60 mm long by 1-2 mm wide, straight or slightly curved, ascending, dehiscent, beakless. Pedicels are 8-20 mm long and spreading to reflexed. Seed is 1-2 mm long, reticulate and ovoid to oblong in one row per locule.

**Flowering period:** November-January

#### Distribution and Habitat

The species is found in shallow soils on outcropping granite between the Porongurups and Walpole.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 3	The Knoll	FRA	?NP	<20	30/11/1994	Unable to relocate
CLM 6	Soho	FRA	NP	<20	14/01/1989	

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#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements

Relocate and survey Soho population.

Monitor populations annually.

Search areas of suitable habitat for further populations.

#### Research Requirements

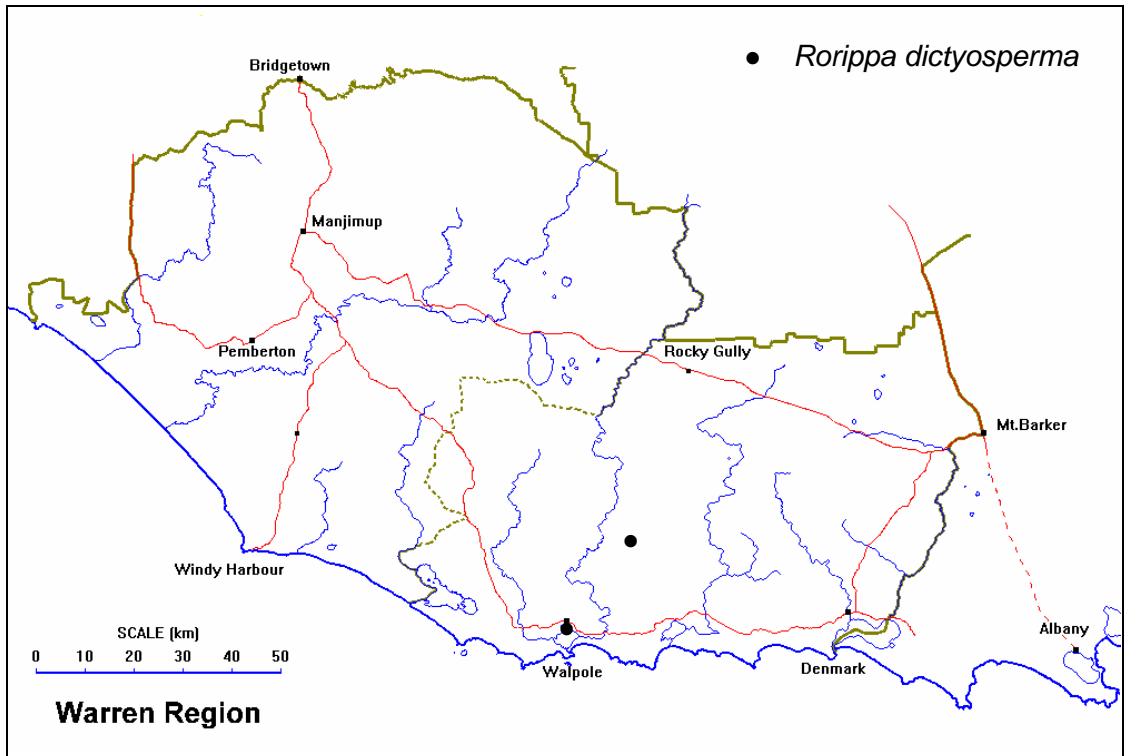
Research the taxonomy of Western Australian populations.

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

#### References

Hewson (1982)



## *Schizaea rupestris* R.Br.

### SCHIZAEACEAE

WAR F4/144

*Schizaea rupestris* was described by Robert Brown in 1810 from material that was presumably collected by him in eastern Australia. The first Western Australian collections were made from near Lake William by Halliday in 1974, and subsequently near Walpole by McComb in 1979. These were tentatively presumed to be a new species and were given the name *Schizaea* sp. Lake Williams in the Albany Flora Wildlife Management Program. These collections have subsequently redetermined as *S. rupestris*. While not uncommon in eastern Australia, the species appears to be rare in Western Australia and is possibly another Gondwanan relict that is hanging on in a few sites in the high rainfall, low evapo-transpiration zone of the south coast.

#### Description

*Schizaea rupestris* is a rhizomatous clump forming comb fern with distinctly flattened strap-like glossy leaves 0.5-1.5 mm wide, each with two rows of stomata either side of the midrib on the 'dorsal' surface. The fertile lamina is about 50-150 mm long and is usually longer and narrower than the sterile lamina at 30-100 mm. Six to ten pairs of sporangia form a comb like sporophore 6-10 mm long by 2-4 mm wide.

#### Distribution and Habitat

The species is recorded from Lake William, Romance block and Walpole, growing in damp/wet peaty sand beneath sedges and low heath. The Walpole population consists of two small sub-populations in wet seepage areas a few hundred meters apart.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 3	Romance block	FRA	WR	na	30/1/1992	Unable to relocate
CLM 2	Walpole	FRA	NP	<100	19/12/1994	

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#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora Dieback*

Unknown, but impacts in upstream communities may affect hydrology and indirectly the species.

#### Management Requirements

Monitor populations every two to three years, particularly for signs of human impact.

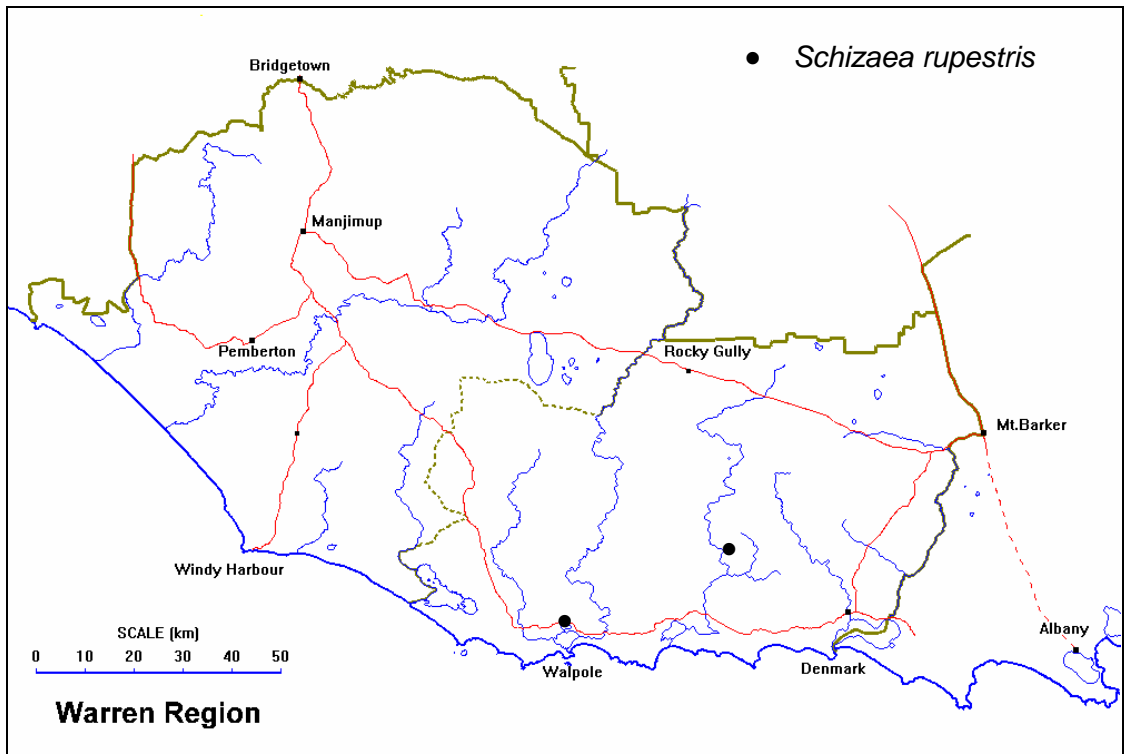
Search areas of suitable habitat for further populations.

#### Research Requirements

Unknown.

#### References

Robinson and Coates (1995)



## *Schoenus fluitans* Hook. F.

## CYPERACEAE

### Floating Bog Rush

WAR F4/194

Although described in "Flora Tasmaniae" by Hooker in 1858 and well known in the south eastern states, *Schoenus fluitans* remained unknown in Western Australia until collected by Grant Wardell-Johnson around 1989 and later identified in 1993. Identification of this population was based upon a single specimen and, as the population has not been relocated, requires verification. *Schoenus fluitans* is very closely related to *S. loliaceus*, another Priority 2 species.

### Description

*Schoenus fluitans* is a floating rush with weak, slender, branched and tufted stems 10-25 cm long that are usually submerged. Leaves are filiform to 10 cm long. Spikelets are about 10 mm long, 2-4 flowered, usually solitary and terminal on the stems or branchlets with rarely one or two sessile spikelets lower down the stems. The bract is glume-like. Glumes are glabrous, membranous, subobtusate, the lowest one occasionally empty. There are no hypogynous bristles. The nut is about 1.3 mm long by 1 mm in diameter and trigonous with more or less prominent angles.

Being equivalent in form and habitat, *Schoenus loliaceus* is most similar to *S. fluitans* but has a more robust aquatic habit, the basal bract is long and leaf-like, and it has a spike of three to seven single brown spikelets rather than two to four with a reddish tinge.

**Flowering period:** Spring-Summer

### Distribution and Habitat

In Western Australia, *Schoenus fluitans* is known from a single swamp in coastal dunes west of Northcliffe, growing in water at least 200 mm deep.

### Conservation Status

Current: Priority 2

### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Warren	DON	NP	na	9/1996	Unable to relocate

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### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown, but given its habitat, the species is probably susceptible to any significant change in hydrology.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora Dieback*

Unknown.

### Management Requirements

Relocate population and assess threats.

Make representative herbarium collections.

Search for further populations in areas of suitable habitat.

### Research Requirements

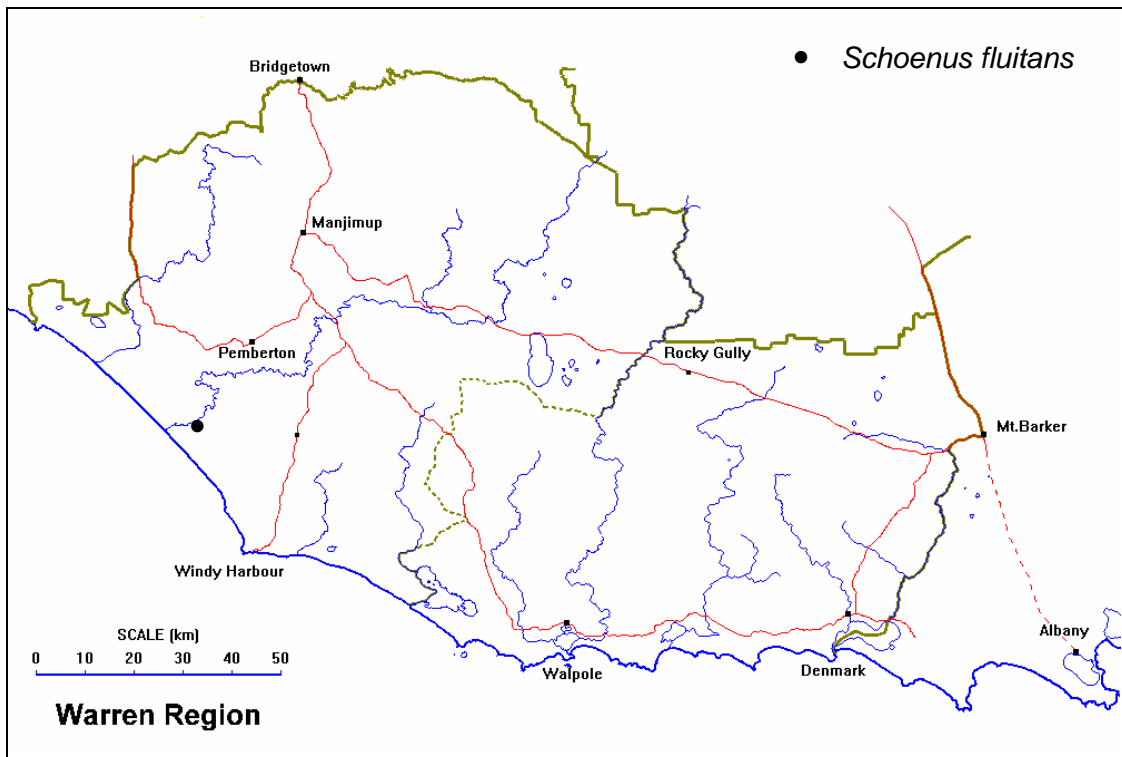
Determine if the species is *Schoenus fluitans* or *S. loliaceus*.

When located, determine response to disturbance.

Determine susceptibility to *Phytophthora* spp.

**References**

Bentham (1878); Wheeler *et al.* (2002); Wilson (1993)



## *Selliera radicans* Cav.

## GOODENIACEAE

WAR F4/193

*Selliera radicans* is a monotypic species that occur in all the southern states of Australia, New Zealand and Chile. Carolin (1992) raised the question of whether it should be included in *Goodenia* and the possibility of it containing more than one taxon. The species was first collected in Western Australia by Neville Marchant in 1977.

### **Description** (Western Australian specimens only)

*Selliera radicans* is a prostrate, perennial, glabrous herb with stems to 50 cm that are often matted and rooting at nodes. Leaves are glossy, spatulate, entire, 1-7 cm long by 1-7 mm wide. The inflorescence consists of a solitary axillary flower or a condensed axillary raceme. Bracteoles are linear to 2 mm long. The peduncle is up to 15 mm long. Sepals are 4-5 mm long, ovate to oblong, adnate to ovary almost to top. The corolla is 5-12 mm long, tubular but completely split adaxially without a pouch, the lobes about equal, reddish brown inside, whitish outside. The stamens are free. The ovary is inferior and two locular. The indusium is subglobular, with silky hairs at base, glabrous or nearly so on lips. The fruit is fleshy.

**Flowering period:** February-March

### **Distribution and Habitat**

In Western Australia, *Selliera radicans* is known only from collections in the Denmark area where it grows in saline mud under *Melaleuca cuticularis* and is inundated by estuarine water at high tide. All populations in the estuary probably constitute one biological population. Suitable habitat is common along the south coast and requires survey.

### **Conservation Status**

Current: Priority 2

Recommended: Priority 1

### **Known Populations in the Warren Region**

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1a	Crusoe Beach 1	FRA	UCL	500	6/5/2001	
CLM 1 b	Crusoe Beach 2	FRA	UCL	na	1/2/1997	
CLM 2	Hay River mouth	FRA	SHRes	1000	6/5/2002	
CLM 3	Honeymoon Island	FRA	SHRes	na	21/1/1991	Herbarium record
CLM 4	Opposite Honeymoon Island	FRA	SHRes	na	27/3/1997	As above

### **Response to Disturbance**

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

### **Susceptibility to Phytophthora Dieback**

Unknown, possibly not an issue.

### **Management Requirements**

Relocate and survey the Denmark population.

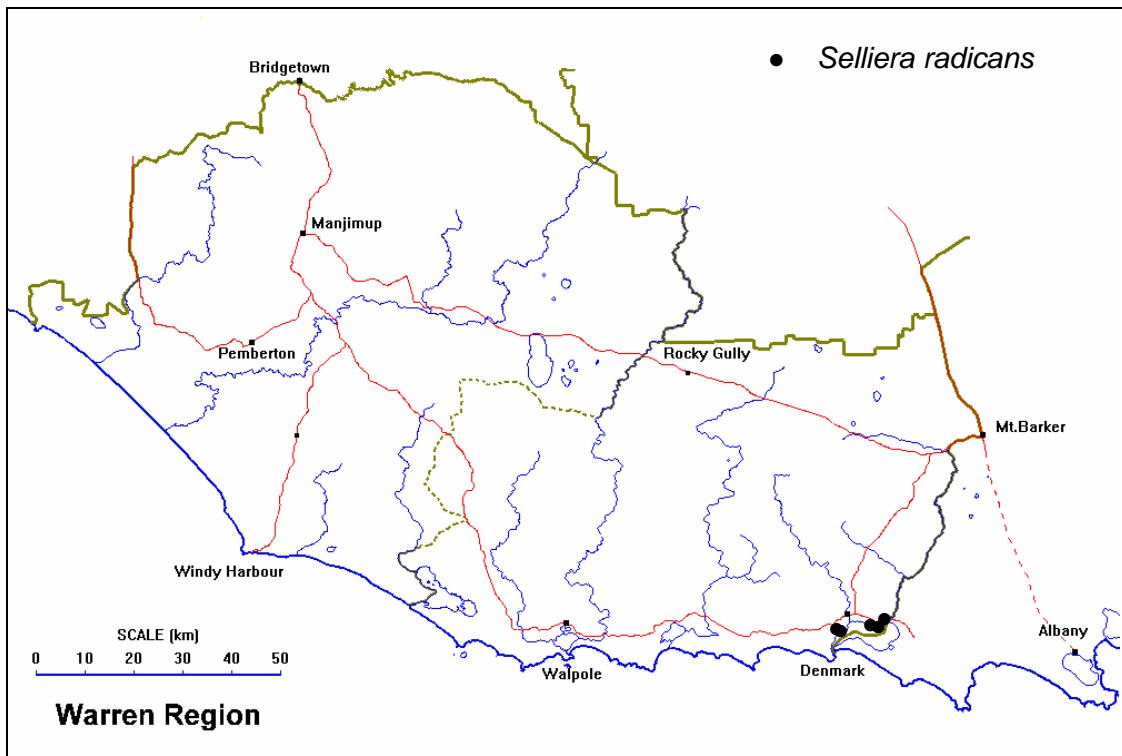
Survey other areas of suitable habitat for additional populations.

### **Research Requirements**

Determine response to disturbance.

## References

Carolin (1992)





## *Sphagnum nova-zelandicum* Mitt.

### SPHAGNACEAE

WAR F4/186

*Sphagnum nova-zelandicum* was reported from the Warren and Menzies botanical sub-districts of south-west Western Australia by Gardner but, until recently, no material had been lodged with the Western Australian Herbarium and no exact records of populations existed. Neville Marchant located a population on the Weld River in the 1970's but attempts to relocate it have failed. A collection by Grant Wardell-Johnson from State Forest north of Walpole and two other reported sightings by him in the Walpole Nornalup National Park have now confirmed the presence of this relic taxon in the high rainfall zone of Western Australia. The species was originally thought to be *Sphagnum subsecundum* and later considered to be *S. molliculum*. However, material recently sent to an eastern states taxonomist was identified as *S. nova zelandicum*.

#### Description

*Sphagnum nova-zelandicum* is a green to reddish brown or orange aquatic moss 10-25 cm high. Stems are dark brown or pale green with stem leaves fairly large, oblong, ligulate, rounded at the apex, margins finely toothed or fringed, no costa. Branches are usually in threes in a fascicle. Branch leaves are subsecund, cymbiform, very concave, narrowly ovate to oblong lanceolate, acuminate to obtuse with six to seven teeth, without any costa. Large cell (leucocysts) are hyaline, the small cell with chloroplasts (chlorocysts).

**Sporulating period:** Unknown for Western Australian plants.

#### Distribution and Habitat

*Sphagnum nova-zelandicum* is a Gondwana relic that is known from the east coast of Australia and New Zealand and reported for the Warren and Menzies botanical sub-districts in Western Australia. It is currently known from two populations within twenty km of Walpole, with two others to be assessed and/or relocated. It occurs on acid wet sites in pools and swamps.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 1	Quinn Rd 1	FRA	SF	1sq m	8/2001	Relocated
WAR 2	Angrove Rd	FRA	SF	na	9/1996	Not relocated
WAR 3	Isle Rd/Delta Rd	FRA	NP	na	9/1996	Not relocated
WAR 4	Weld River	FRA			2001	Not relocated
WAR 5	Quinn Rd 2	FRA	SF	10 sq m	11/2003	New population

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Potentially vulnerable to any change in climate and hydrology.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora Dieback*

While probably not directly relevant to the taxon, impacts on the community and adjacent communities may need assessing.

#### Management Requirements

Search for and document the three reported populations.

Search areas of suitable habitat across the Warren and Menzies botanical sub-districts.  
Monitor populations annually, specifically on response to disturbance.

### Research Requirements

Unknown.

### References

Catchside (1980); Seppelt (2000); Smith (1969); Stoneburner *et al.* (1993)



## *Spyridium riparium* Rye

### RHAMNACEAE

WAR F4/112

*Spyridium riparium* was originally collected from Northumberland Road by Eileen Croxford in 1980 and again on the Mitchell River in 1984. These collections were considered to be closest to *S. villosum* and populations were included in the Albany Flora Management Plan under that name with reference to the then manuscript name *S. riparium*. Additional material was collected by Brenda Hammersley in 1983 for Barbara Rye to finalise the taxonomy of the new species.

#### Description

With the exception of the inflorescence, this species looks superficially like *Trymalium ledifolium*. A shrub to 1.5 m, young stems densely hairy with minute stellate and scattered simple hairs to 1.5 mm. Leaves are usually narrow ovate 8-17 mm long by 1.5-3.5 mm wide, margins recurved, lower surface white to pale green with dense minute stellate hairs and scattered simple hairs, upper surface glabrous. Numerous densely hairy sessile or subsessile flowers are found in a terminal cymose inflorescence 10-18 mm across, and in smaller groupings in the upper axils.

*Tryfolium ledifolium* can readily be distinguished from *Spyridium riparium* by its slender raceme-like panicles and individual flowers on pedicles 1-3 mm long.

**Flowering period:** July-October

#### Distribution and Habitat

The species is known from four populations between the Kent and Mitchell Rivers. In these areas it grows on, and immediately adjacent to, the banks of water courses and swamps in sandy and sandy gravel soils under jarrah/jarrah-sheoak/jarrah-karri woodland with *T. ledifolium*.

#### Conservation Status

Current: Priority 2

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1, 2 & 6	Mitchell River 1	FRA	SF/RR	200+	19/2/1999	Single population
CLM 3 & 4	Kent River /Styx River.	FRA	SF	900+	22/10/1994	Healthy, however <i>Watsonia</i> present
CLM 5	Nornalup Rd	FRA	RR/SF	500+	8/10/1996	
CLM 7	Tindale Rd	FRA	PP	na	29/2/1999	Herbarium record only. Needs to be relocated

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#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

The Styx River population is vulnerable to invasion by *Watsonia*.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements

Monitor known populations every two years.

Monitor response to disturbance.

Search for further populations in areas of suitable habitat.

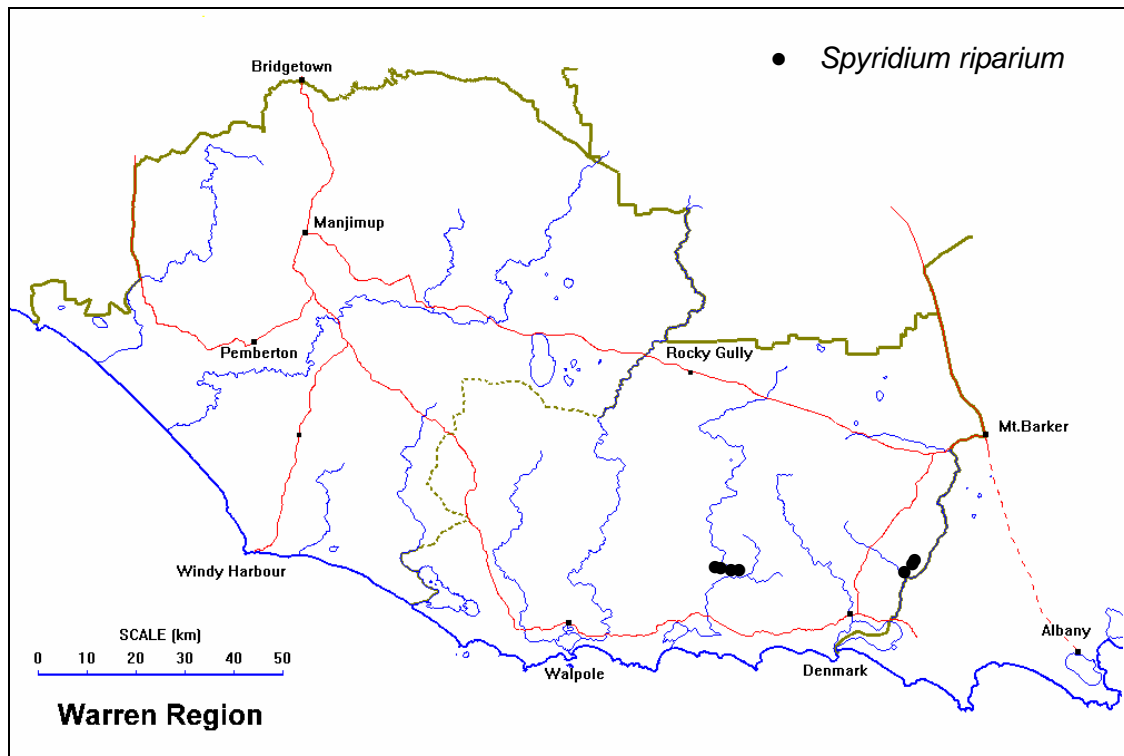
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Rye (1995b)



## *Thomasia quercifolia* (Andrews) Gay

### STERCULIACEAE

WAR F4/101

The complex of *Thomasia quercifolia*, *T. triloba* and *T. heterophylla* ms has only recently been resolved by work done by Kelly Shepherd. *Thomasia quercifolia* was originally described as *Lasiopetalum quercifolium* by Andrews in 1807 from nursery material originating in Sydney that was of unknown origin but was probably from King George Sound. The species was moved to *Thomasia* by Gay in 1821 and it was then not collected again until 1966 when found south of Albany by Pfeiffer. Subsequently, many collections of an undescribed taxon that is now recognised as *T. heterophylla* ms, were placed in *T. quercifolia*, (the remainder in *T. triloba*, a taxon which may well be extinct).

#### Description

*Thomasia quercifolia* is a shrub to about 1 m with numerous rigidly hirsute-tomentose, densely foliose branches. Leaves are to 25 mm long and have three primary lobes, with multiple lobes on each, the upper surface with stellate hairs, the underside tomentose and densely hirsute with both fine simple hairs and larger stellate hairs on the underside. Stipules are large (to 12 mm) and multi-lobed, tomentose and densely hirsute with stellate hairs on the underside. Racemes are simple (monochasium) with small purple flowers (to 12 mm diameter).

*Thomasia quercifolia* is distinguished from other *Thomasia* species in the complex by the tomentose hairs on the underside of its leaves.

**Flowering period:** October

#### Distribution and Habitat

The species is known from Albany and Walpole (?D'Entrecasteaux) in shallow soils over limestone in coastal communities. The species is restricted to a specific niche in this habitat.

#### Conservation Status

Current: Priority 2

Recommended: Priority 3

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 2 b	Denmark	FRA	SHRes	100	28/10/1999	Subpopulation
CLM 2 a	Denmark	FRA	SHRes	500	5/5/1999	As above
CLM 3	Conspicuous	FRA	NP	na	29/12/1994	
CLM 6	William Bay	FRA	NP	na	2/11/1993	
WAR 100	Pt. D'Entrecasteaux	DON	NP	na		Not relocated

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#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora Dieback*

Unknown.

#### Management Requirements

Relocate the Conspicuous population.

Relocate the reputed population in D'Entrecasteaux and make collections.

Collect seed for *Phytophthora* testing.

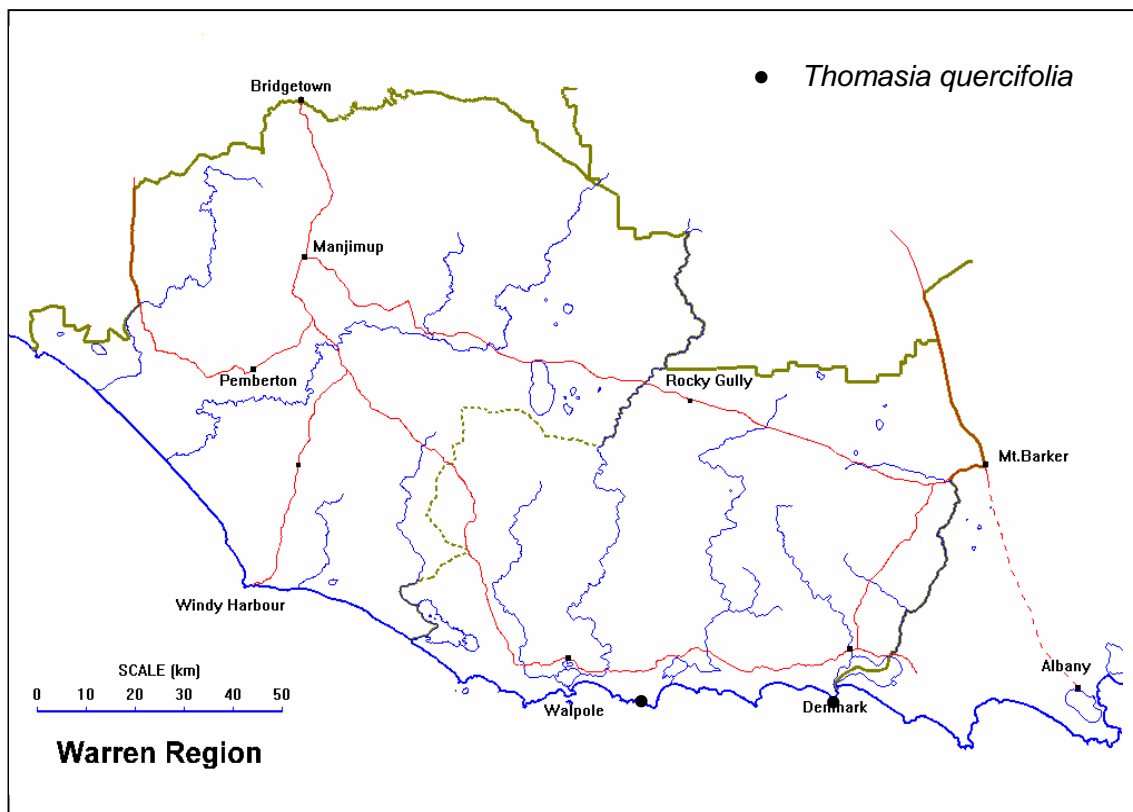
### Research Requirements

Determine response to disturbance.

Determine susceptibility to *Phytophthora* spp.

### References

Andrews (1807); Bentham (1863); Kelly Shepherd (personal communication)



*Verticordia endlicheriana* Schauer var. *angustifolia* A.S. George

MYRTACEAE

WAR F4/34

The type of *Verticordia endlicheriana* was collected from near Cape Riche by Preiss, probably in November 1840, and described by Schauer in 1844. Five varieties were described by Alex George in 1991, the variety *angustifolia* from material collected by him in 1964 from Mt. Barker. The earliest collection of this taxon was made in 1822 from King George Sound by Baxter. This indicates a population exists or existed on (or at least very close to) the coast in the Albany area. The Mount Barker population was first collected by Goadby in 1900. By the commencement of fieldwork for this Program, the taxon was known from a second small population (growing with *V. apecta*) and is now known from an additional three populations.

**Description**

*Verticordia endlicheriana* is a shrub to 1 m with one or more stems. The linear stem and floral leaves are 4-10 mm and 4-8 mm long respectively. Flowers are erect in rounded groups on pedicels 5-12 mm long. The hypanthium is 0.6-1.5 mm long, ten ribbed and glabrous. The sepals are yellow, 3-4 mm long and widely spreading with six to eight lobes. Petals are yellow and 2.5-4.5 mm long. The stamens and staminodes are free, alternately long (1.5-3.2 mm) and short (1-2 mm), erect then incurved. The style is 1.5-2.5 mm long and straight. The species lacks a lignotuber.

**Flowering period:** November-December

**Distribution and Habitat**

The variety occurs in the Mount Barker/Denmark/Denbarker area, growing on granitic loam in granite heath communities. Extensive searches of suitable habitat in the Warren Region have failed to locate further populations.

**Conservation Status**

Current: Priority 2

**Known Populations in the Warren Region**

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 2	Little Lindesay	FRA	SF (NP)	1500+	21/11/1998	Two subpopulations
CLM 3	The Pass	FRA	SF (NP)	1100	22/10/1997	
CLM 4	Granite Rd	FRA	SF	1000+	17/10/1996	Planned for excision as a dam site
CLM 5	Mt. Roe	FRA	5g	10000+	7/11/1995	
WAR 101	Roe FB	FRA	SF	500	13/11/1999	

**Response to Disturbance**

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

**Susceptibility to Phytophthora Dieback**

Presumed susceptible.

**Management Requirements**

Resurvey and monitor populations.

Monitor for response to disturbance.

Search areas of suitable habitat for further populations.

Protect known populations from exposure to *Phytophthora* spp.

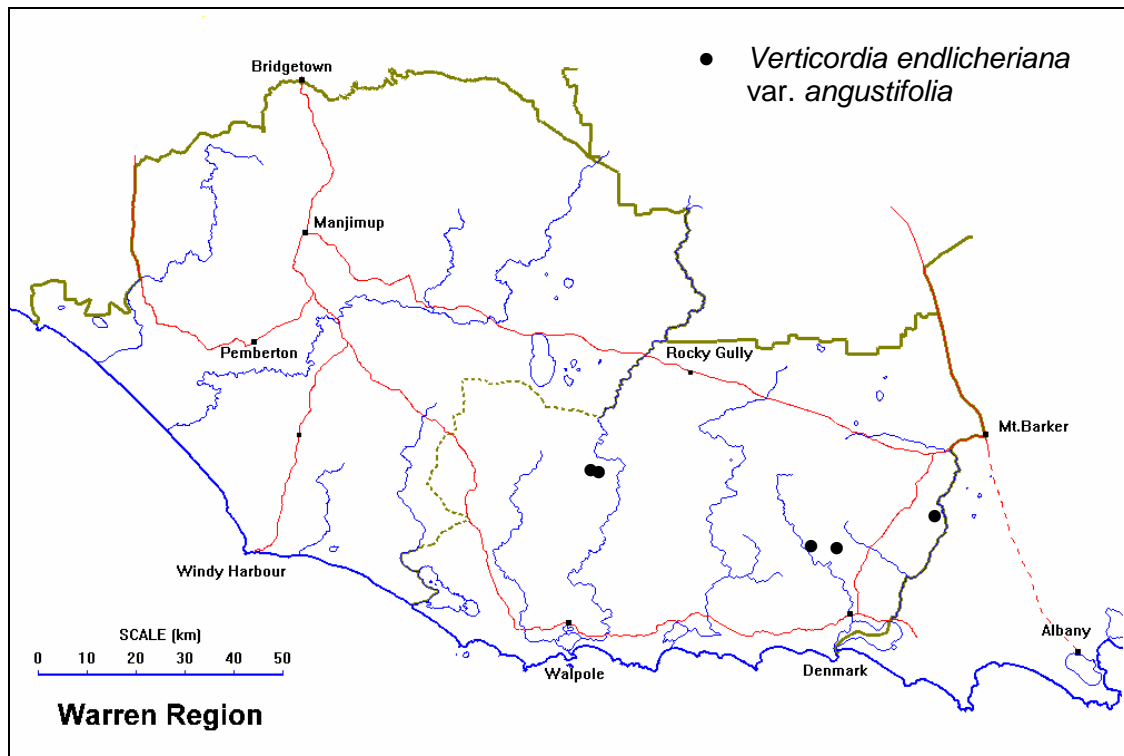
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

George (1991)





## ***Wurmbea* sp. Cranbrook (A.R. Annels 3819)**

### COLCHICACEAE

WAR F4/157

*Wurmbea* sp. Cranbrook was first collected by Tony Annels in 1993 but has yet to be formally described. Recorded populations occur in naturally fresh to brackish habitats but these areas are becoming more saline as a result of land clearing. The Wamballup and Kululinup populations occurs with two other priority taxa, *Apodasmia ceramophila* ms (P2) and *Villarsia submersa* (P4).

#### **Description**

*Wurmbea* sp. Cranbrook is a glabrous herb to 30 cm tall with an unbranched stem and three leaves, the lowest basal (to 16 cm long), the second on the stem, and the third subtending an inflorescence of two to four flowers. Flowers are bisexual or the uppermost flower male. There are six to eight tepals to 11 mm long with one nectary per tepal. Each tepal has a white to yellowish band across its lower third. There are six stamens, three styles and three ovary cells.

The species differs from *Wurmbea dioica* in its larger size, more cup shaped flowers with larger tepals and more thickened nectaries. It differs from *W. monantha* in its larger flowers and white rather than pink nectaries which differ in shape. Its swamp habitat is also different from both other taxa.

**Flowering period:** October-November

#### **Distribution and Habitat**

The species is known from winter inundated swamps west of Cranbrook, growing in heavy grey saline clay soils and flowering while its lower parts are still under water.

#### **Conservation Status**

Current: Priority 2

Recommended: Priority 3

#### **Known Populations in the Warren Region**

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 2	Wamballup NR	FRA	NR	500+	11/10/1994	
WAR 100	Perup NR	DON	NR	10000+	1999	
WAR 101	Byenup Lagoon	DON	NR	1000+	10/2004	
WAR 102	Kululinup NR North	DON	NR	10000+	11/2003	
WAR 103	Kululinup NR South	DON	NR	10000+	11/2003	
WAR 104	Muir Hwy	DON	NR	10000+	11/2003	

#### **Response to Disturbance**

Response to fire is unknown.

Response to soil disturbance is unknown.

The species fails to shoot from corms or flower in the absence of inundation and is therefore vulnerable to change in hydrology and climate.

Response to weed invasion is unknown.

#### **Susceptibility to *Phytophthora Dieback***

Unknown.

#### **Management Requirements**

Search areas of suitable habitat for further populations.

Monitor populations annually.

Limit future drainage in the area until impacts on the species can be assessed.

Include as an issue for the Lake Muir Recovery Plan.

### Research Requirements

Describe the species.

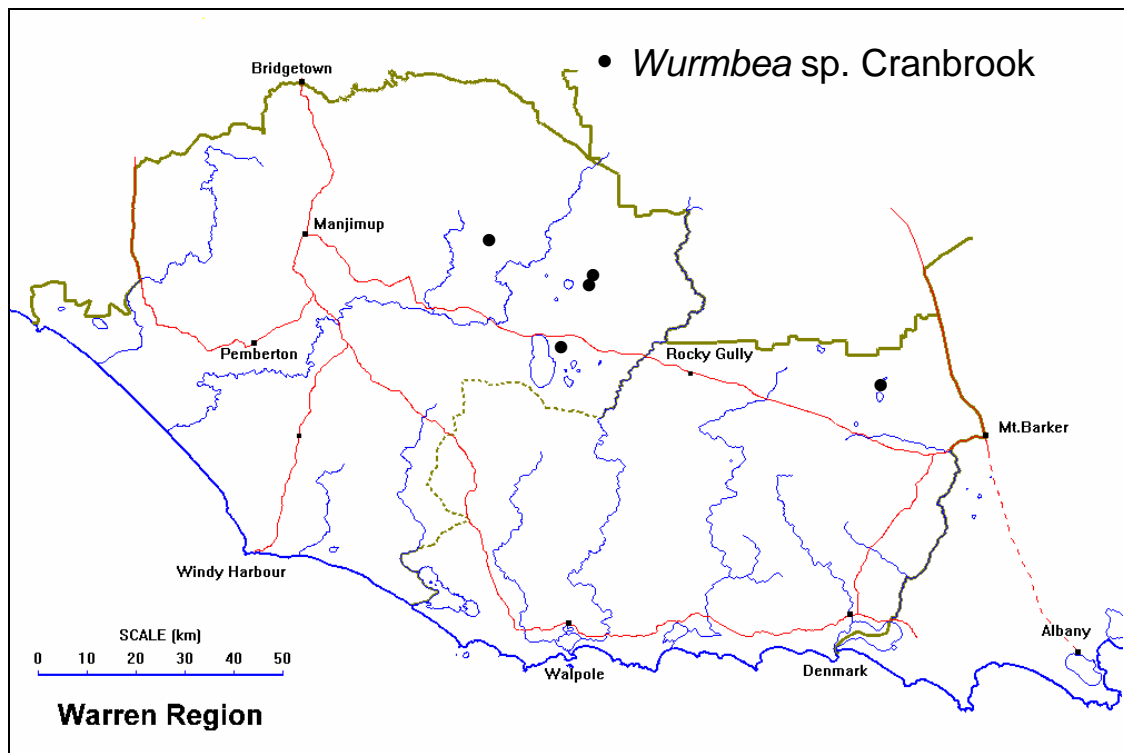
Investigate critical salt tolerance levels for the species.

Investigate response to disturbance.

Investigate mechanisms responsible for triggering flowering.

### References

None.



### 3. PRIORITY THREE SPECIES

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



Photograph of Priority three species, *Lomandra ordii* by Roger Hearn

## *Actinotus* sp. Walpole (J.R. Wheeler 3786)

APIACEAE

WAR F4/164

The first collection of *Actinotus* sp. Walpole was made from near Granite Peak by Alex George in 1971, with further collections made near Walpole by Judy Wheeler and Sue Patrick in 1993. Searches since have failed to relocate these populations.

### Description

*Actinotus* sp. Walpole is a softly hairy, prostrate perennial herb with lobed, alternate, broadly ovate, leaves 2-15 mm long by 2-12 mm wide, each with 5-13 marginal teeth and on petioles 2-12 mm long. The inflorescence is in a simple umbel surrounded by an involucre of woolly bracts. Flowers are white, about 4 mm across and on short pedicels. Floral bracts are glabrous and narrowly elliptic, about 2 mm long.

*Actinotus laxus* ms is similar in general appearance to *Actinotus* sp. Walpole but has a obovate to cuneate leaf blade 8-25 mm long by 3-12 mm wide and less marginal teeth.

**Flowering period:** December-March (occasionally October)

### Distribution and Habitat

*Actinotus* sp. Walpole has a restricted distribution between Walpole and Margaret River, occurring on low terrain on the edges of creeks and on swamp margins in forest.

### Conservation Status

Current: Priority 3

### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 6	Delta Rd 1	FRA	NP	Unknown	26/2/1997	Not relocated
CLM 7	Delta Rd 2	FRA	NP	Unknown	26/2/1997	Not relocated
CLM 8	Northcliffe	DON	SF	500+	12/3/1997	
CLM 2	South West Hwy	FRA	NP/RR	Unknown	26/2/1997	Not relocated
CLM 1	Granite Peak	FRA	NP	Unknown	27/2/1997	Not relocated
WAR 100	Cederman Rd	DON	SF	na	28/4/2004	
WAR 101	Dog Rd	FRA	NP	na	26/2/1997	

### Response to Disturbance

Field observations indicate that the species recruits in high numbers from seed post fire.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown but, given its habitat, the species may be adversely affected by drier regimes or rising water tables.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Relocate vouchered populations and assess them.

Search areas of suitable habitat for new populations.

### Research Requirements

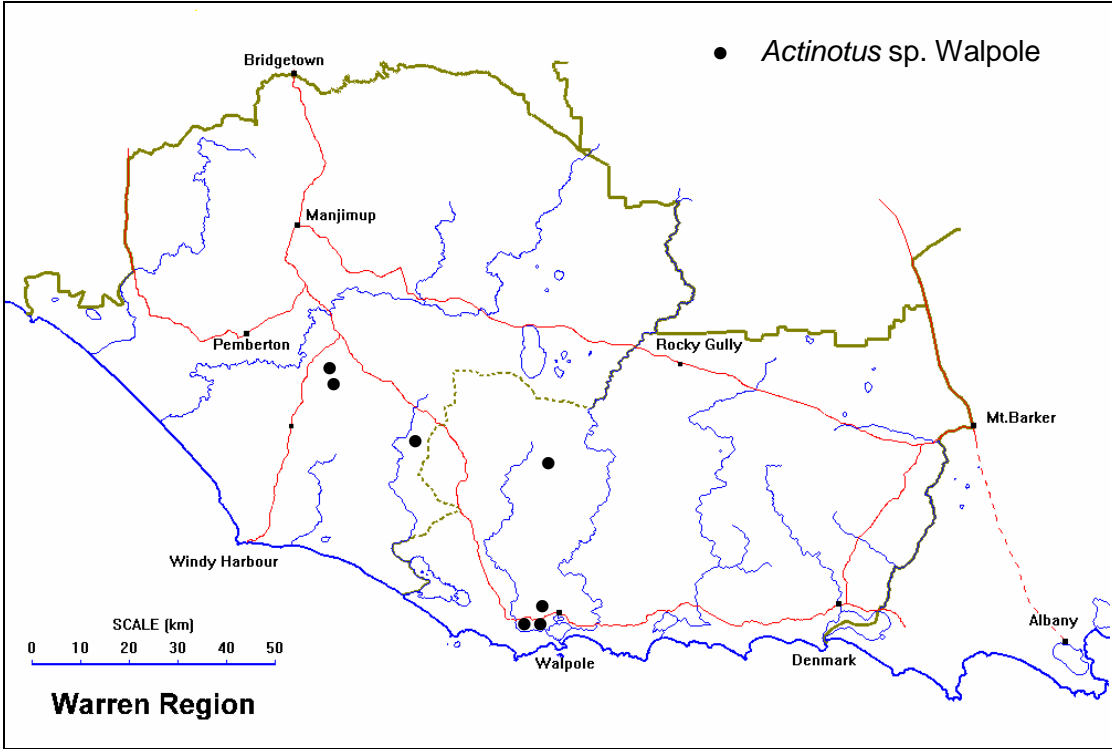
Determine susceptibility to *Phytophthora* spp.

Assess the affects of disturbance on the species.

Assist those conducting taxonomic studies at the University of Sydney.

**References**

Wheeler *et al.* (2002); Jenny Hart (personal communication)



## *Alexgeorgia ganopoda* B. Briggs & L. Johnson

### RESTIONACEAE

WAR F4/21

*Alexgeorgia ganopoda* is a recently described species that was first collected at Bow River by S.W. Jackson in 1913 but was then not seen again until found north of Mt. Frankland by Barbara Briggs in 1977 and near Bow Bridge by Greg Keighery in 1986.

#### Description

*Alexgeorgia ganopoda* is a clonal herb with interlaced rhizomes 10-15 cm below ground and aerially branched culms. Clones are normally dioecious with female flowers geophilous (10-20 cm below the surface), the styles emerging from the soil at the time of flowering. Seeds are borne on rhizomes, germinating *in situ*. Culms are 20-80 cm long with yellow green young growth and deeper green old growth, covered with brown, glossy, more or less glabrous scale leaves.

**Flowering period:** December-February

#### Distribution and Habitat

*Alexgeorgia ganopoda* is known from several locations between the Pingerup Plains west of Walpole and the Styx River west of Denmark, growing on sand plain heaths and extending into shallow sand over gravel on the fringes of adjacent open jarrah forest.

#### Conservation Status

**Currently:** Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Thomson Rd	FRA	NP/SF	10 000+	5/12/1997	
CLM 2	Bow Bridge	FRA	RR	100+	5/12/1994	Unlikely to persist due to weed invasion
CLM 3	Mountain Rd.	FRA	NP/(5g)	500+	30/11/1994	
CLM 4	Break Rd 1	FRA	SF (5g)	1 000+	28/11/1994	
CLM 5	Break Rd 2	FRA	SF/(5g)	1 000+	28/11/1994	
CLM 6	Break Rd 3	FRA	SF/(5g)	10 000+	28/11/1994	
CLM 7	Boronia Rd.	FRA	NP/SF	10 000+	30/11/1994	
CLM 8	Owingup	FRA	RR	na	14/7/1995	
CLM 9	Timberjack Rd	FRA	NP	na	12/2/1997	
WAR 101	Pingerup Plains	FRA	NP	5 000+	16/4/1997	

#### Response to Disturbance

Plants are killed by fire, with regeneration occurring through the germination of soil-stored seed. Male culms have been seen in the second season after regeneration with seed retrieved from rhizomes in the third season (observations on Boronia Road population).

Response to soil disturbance appears to be the same as fire.

The species is partially xeromorphic and is able to withstand inundation.

Based on observations at the Bow River population it appears that the species is able to persist in the presence of annual grasses, even following mowing (south side of road) but has been displaced by perennial grasses (north side of road).

Increased canopy cover results in reduced vegetative spread of rhizomes.

#### Susceptibility to Phytophthora Dieback

Unknown.

#### Management Requirements

Monitor each population periodically and also prior to and post burning.

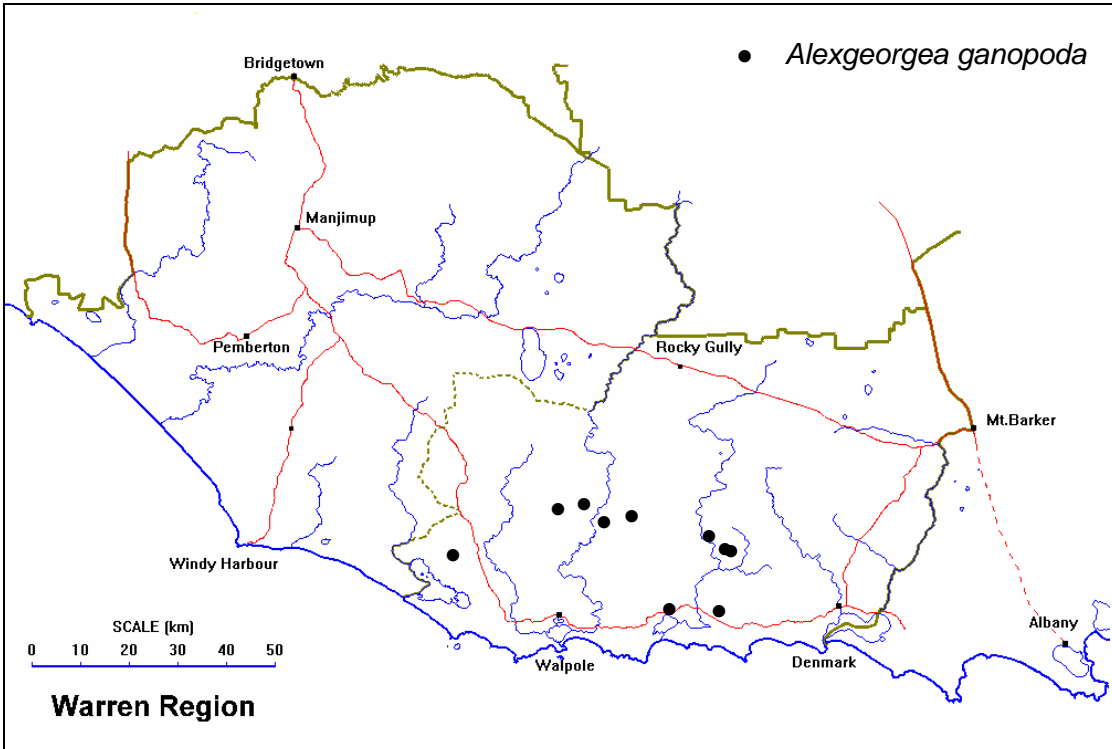
Search areas of suitable habitat for further populations.

**Research Requirements**

Determine susceptibility to *Phytophthora* spp.

**References**

Briggs *et al.* (1990); Meney (1990); Meney and Pate (1999)



## *Amperea protensa* Nees

### EUPHORBIACEAE

WAR F4/22

Although the type of *Amperea protensa* was reputedly collected at 'Mongers Lake' [Perth] by Preiss in 1840, the species appears to now be restricted to the south coastal plain. It is noted that Preiss spent time in late 1839 and again in 1840 in the Albany/Plantagenet and Augusta areas and it is possible, given the sometimes random numbering of his collections, that an error has occurred and the actual collection originated in the south. The species poorly collected. However, while not common, it would seem to be secure within the conservation estate with little threat to most populations. A number of subspecies have been named in the past but none are currently accepted.

Many localities of early collections were not surveyed during recent fieldwork and future assessment may justify the removal of this species from the list.

The species has been confused with *A. volubilis* in the past and has an overlapping but wider distribution to the east and north.

#### Description

*Amperea protensa* is a small glabrous, dioecious, bushy perennial about 20 cm high by 30 cm across with a woody rootstock. Stems are smooth, slender, decumbent with widely spaced, sessile or shortly petiolate leaves. The leaf blade is broadly obovate to linear, 1-3 cm long by 2-8 mm wide. Stipules are broadly deltoid to narrowly ovate, entire or with lobed margins and often fused with the adjacent stipule to form a cup behind the petiole. Flowers are clustered in the leaf axils, the male flowers three (-four) merous, in clusters of several flowers, each with 3-6 stamens. There are one or two female flowers per axil.

The closely related *Amperea volubilis* can be distinguished from *A. protensa*, by its tangling/climbing/twining habit and entire stipules.

**Flowering period:** October-January.

#### Distribution and Habitat

*Amperea protensa* has a south coastal plain distribution between Albany and Scott River, growing in swampy flats (grey sands) and drainage lines in tussock sedgeland and in dense tall scrub/low woodland with *Banksia littoralis*.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Peaceful Bay Rd	FRA	NP	na	20/1/1979	
CLM 3	Pingerup Rd 1	DON	NP	10	18/12/1990	
CLM 4	Inlet Rd	FRA	NP	na	19/12/1994	
CLM 6	Beardmore Rd	FRA	SF	3	14/1/2004	
CLM 7	Angrove Rd	FRA	SF	na	1/12/1988	
CLM 8	Conspicuous 1	FRA	NP	na	1/12/1988	
CLM 9	Conspicuous Beach Rd	FRA	NP	na	12/12/1988	
CLM 10	Ficifolia Rd	FRA	NP	na	2/12/1988	
CLM 11	Conspicuous 2	FRA	NP	na	20/2/1989	
CLM 12	Middle Rd	FRA	SF	na	20/9/1994	
CLM 13	Bow Bridge	FRA	RR	na	5/12/1994	
CLM 14	Pingerup Rd. 2	FRA	NP	na	15/12/1994	
CLM 15	Deeside Coast Rd	DON	NP	na	15/12/1994	
CLM 16	Mt. Hallowell	FRA	SHRes	na	4/6/1995	
CLM 17	William Bay	FRA	NP	na	25/10/1996	
WAR 101	Lower Gardner Rd	DON	NP	13	13/2/2004	
WAR 102	Hill Rd	FRA	SF	3	14/1/2004	
WAR 103	Sheepwash FB	FRA	SF	3	16/10/1998	



WAR 104	Nelson Rd	FRA	NP	4	19/12/1996
WAR 105	Ficifolia Rd 2	FRA	NP	5	2/10/1995
WAR 106	Mt. Burnside	FRA	SF	na	25/2/1998

### Response to Disturbance

Plants in the Pingerup Road population were observed to resprout from rootstock following fire.

Response to soil disturbance is unknown.

The species is persisting in a grass invaded road verge at Bow River but would appear to be readily displaced.

Response to changes in soil moisture is unknown, but given its habitat, the species is probably vulnerable to any significant changes in site moisture.

### Susceptibility to Phytophthora Dieback

Unknown.

### Management Requirements

Relocate and survey locations of early records.

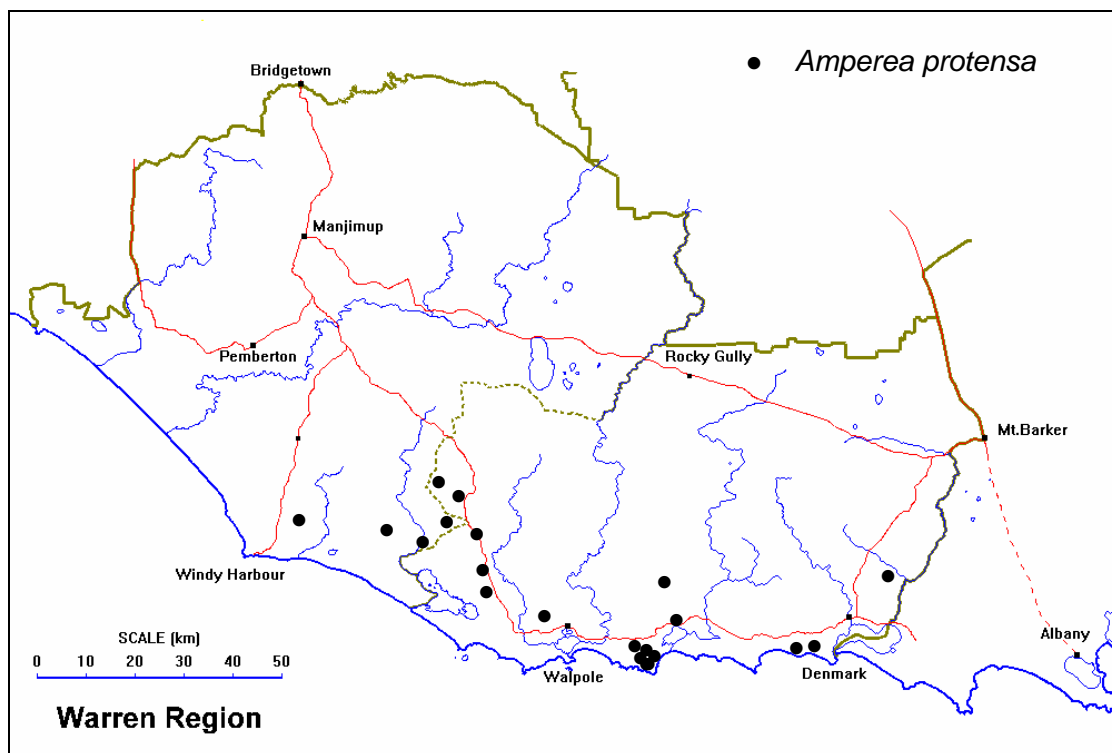
Search areas of suitable habitat for further populations.

### Research Requirements

Determine susceptibility to *Phytophthora* spp.

### References.

Henderson (1992)



## *Andersonia amabile* K. Lemson ms

### EPACRIDACEAE

WAR F4/175

*Andersonia amabile* ms is a recently recognised species that was first collected near Peaceful Bay, Walpole and Black Point by Neil Gibson in 1990 and is now known from about a dozen populations.

#### Description

*Andersonia amabile* ms is a shrub to 0.4 m, varying from small and compact to straggling. Leaves are spreading, ovate, 1.5-5 mm long, 0.5-3 mm wide, abruptly tapering into a pungent triquetrous upper part. Flowers are white or pale pink in very short ovoid to cylindrical terminal spikes, each flower subtended by a bract and two bracteoles. The five sepals are free and 2-4 mm long. The corolla is tubular, 2-3 mm long with five spreading lobes that strongly push back through the sepals. Flowers are glabrous and open widely. Stamens are usually free and usually five in number with the Pingerup Road population having six. Staminal filaments are usually filiform, glabrous, dilated at base. The Pingerup Road population varies with a mix of filiform, wide (petal like) and intermediate filaments. The style is glabrous, straight and not exerted beyond corolla.

*Andersonia amabile* ms is sometimes similar in appearance to small flowered, small leaved forms of *A. sprengelioides*.

**Flowering period:** October-December (January)

#### Distribution and Habitat

*Andersonia amabile* ms is recorded from near Warner Glen, Black Point, D'Entrecasteaux National Park, Lake Muir and Denmark. Found growing in heath communities in black and grey sand in seasonally wet swamps.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 3	Black Point	DON	NP	<100	18/1/1996	
CLM 4	Pingerup Rd	DON/FRA	NP	2000+	1/12/1995	
CLM 1	Peaceful Bay	FRA	NP	<100	13/10/1994	
CLM 6	Watershed Rd	FRA	SF (5g)	<20	16/12/1994	
CLM 7	Broke Inlet 1	FRA	NP	<50	19/12/1994	
CLM 8	Broke Inlet 2	FRA	NP	200+	19/12/1994	
CLM 2	Kangaroo Rd 1	FRA	SF	<20	30/11/1994	
CLM 5	Kangaroo Rd 2	FRA	SF	200+	30/11/1994	
CLM 9	Break Rd	FRA	SF(5g)	<20	2/11/1996	
WAR 100	Collis FB	FRA	SF	na	13/4/2000	
WAR 102	Parry Rd	FRA	SHRes	na	26/11/1990	

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#### Response to Disturbance

Plants are killed by fire and recruit from seed with the first flowering in the second spring following germination.

Plants have been observed to recruit from seed on a disturbed road verge.

As the species grows in periodically inundated wetlands it is likely to be vulnerable to significant long-term changes in water relations.

Response to weed invasion is unknown.

#### Susceptibility to Phytophthora Dieback

Unknown, but given the susceptibility of other members of the genus, should be presumed susceptible.

### Management Requirements

Monitor populations every three years and both before and after fire.

Collect seed for storage at CALM's Threatened Flora Seed Centre.

Search areas of suitable habitat for further populations.

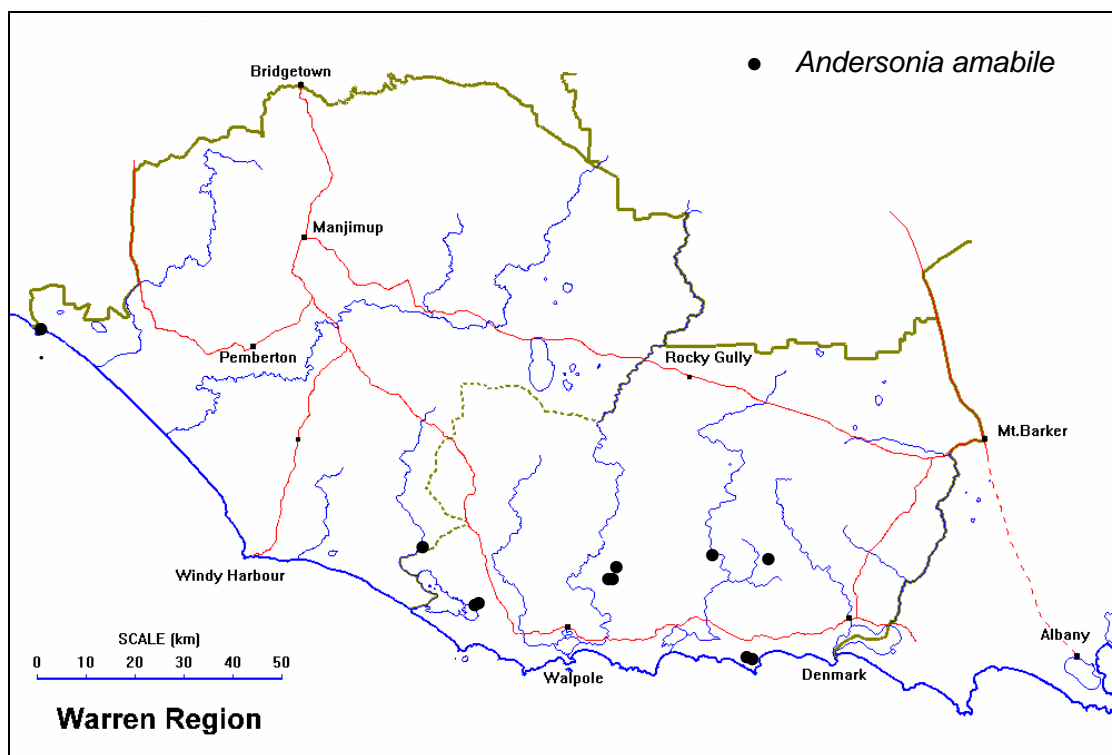
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Assist Kristina Lemson in her taxonomic review of *Andersonia*.

### References

Kristina Lemson (personal communication); Wheeler *et al.* (2002)



## *Astartea* sp. Mt. Johnston (ARA 4577)

### MYRTACEAE

WAR F4/176

*Astartea* sp. Mt. Johnston is a recently discovered member of the *Astartea fascicularis* complex that is closely related to *Astartea* sp. Pingerup Rock. It was first collected on Mt. Johnston while conducting survey work in 1994 and was recollected from the same site a year later. It has since been found at several other localities. Despite searching many granite outcrops across the Region, *Astartea* sp. Mt. Johnston has only been recorded on eleven occasions and would appear to be naturally rare rather than poorly collected. The majority of populations are affected by *Phytophthora*.

#### Description

*Astartea* sp. Mt. Johnston is an open spreading shrub to 3.5 m high with shortly petiolate, linear to channelled, glandular, terete leaves 6-14 mm long by 0.4-0.5 mm wide that are opposite or in opposite leaf bundles (condensed branchlets arising in the axils of leaves). These bundles are generally twisted upward and arranged as if along one side of a branch, each with numerous individual leaves (often 12-18) in opposite pairs. The leaf bundles are closely arranged on the stem giving a soft, densely foliose character to branchlets and the plant as a whole. Leaves are normally light green but turn red during summer. Flowers are axillary, solitary with peduncles 6-10 mm long. Each flower has two bracteoles that are about 1.5 mm below calyx and persistent into flowering. The calyx is 3-5 mm long and deeply pouched, fully enclosing the developing bud. Flowers are 8-12 mm wide with five white to pale pink petals 3-5 mm long by 2.5-4 mm wide. There are twenty to thirty stamens with each bundle containing four to six stamens. Capsules are 3-4 mm across with the sepal horns persistent as marginal appendages.

Other members of the *Astartea fascicularis* complex found in the Warren region have smaller (2-8 mm long) darker leaves giving them a more sparse appearance, shorter peduncles (2-6 mm long), and generally smaller flowers (to 8 mm wide). A similarly long peduncled species from between Walpole and Denmark lacks horns on the sepals and another long horned, wide membraned bracteolate species from the region has small flowers and shorter peduncles and leaves.

**Flowering period:** October-December

#### Distribution and Habitat

*Astartea* sp. Mt. Johnston is recorded from an area about 30 km north of Walpole, west of the Frankland River and east of the South West Highway, growing in pockets of sandy loam on large granite outcrops in a heath community of *Acacia triptycha*, *Verticordia plumosa*, *Agonis linearifolia* and *Andersonia sprengelioides*.

#### Conservation Status

Current: Priority 2\*

\*Species is of the highest priority for further survey and consideration for gazettal as DRF.

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Peak Block 1	FRA	SF	3000	27/2/1997	
CLM 2	Mount Johnston	FRA	NP	1000	10/1/1997	Was WAR 100
WAR 101	Wattle FB	FRA	SF	2000	7/11/1997	
WAR 102	Claude Rd	FRA	SF	1000	12/11/1999	
WAR 103	Roe Block 1	FRA	SF	1000	15/6/1997	
WAR 104	O'Donnell FB	FRA	NP	21	13/10/1999	
WAR 106	Ordnance FB	FRA	SF	300	15/4/1998	
WAR 107	Sharpe FB 2	FRA	SF	na	Na	
WAR 108	Sharpe FB 1	FRA	SF	1000	24/11/1997	
WAR 109	Roe Block 2	FRA	SF	1000	27/10/1997	

#### Response to Disturbance

Plants are killed by fire and regenerate from seed with the first substantial seed set occurring in the third year after germination. Germination rates are extremely low in the absence of fire.

The species is a shallow rooting plant that lacks a tap root and is vulnerable to removal of organic layers on the granites in which it grows.

*Astartea* sp. Mt. Johnston is a moisture loving plant that is apparently unable to compete with granite *Agonis* (*Agonis* sp. Last Bottle Rock) on sites where the two species occur together.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora* Dieback

Dead plants in two populations have returned positive results for *Phytophthora*, as have plants in the CALM grounds at Manjimup. Treatment with Phosphite has proved successful in treating infected plants.

### Management Requirements

Search areas of suitable habitat for further populations.

Monitor populations for the presence of *Phytophthora* species and treat accordingly.

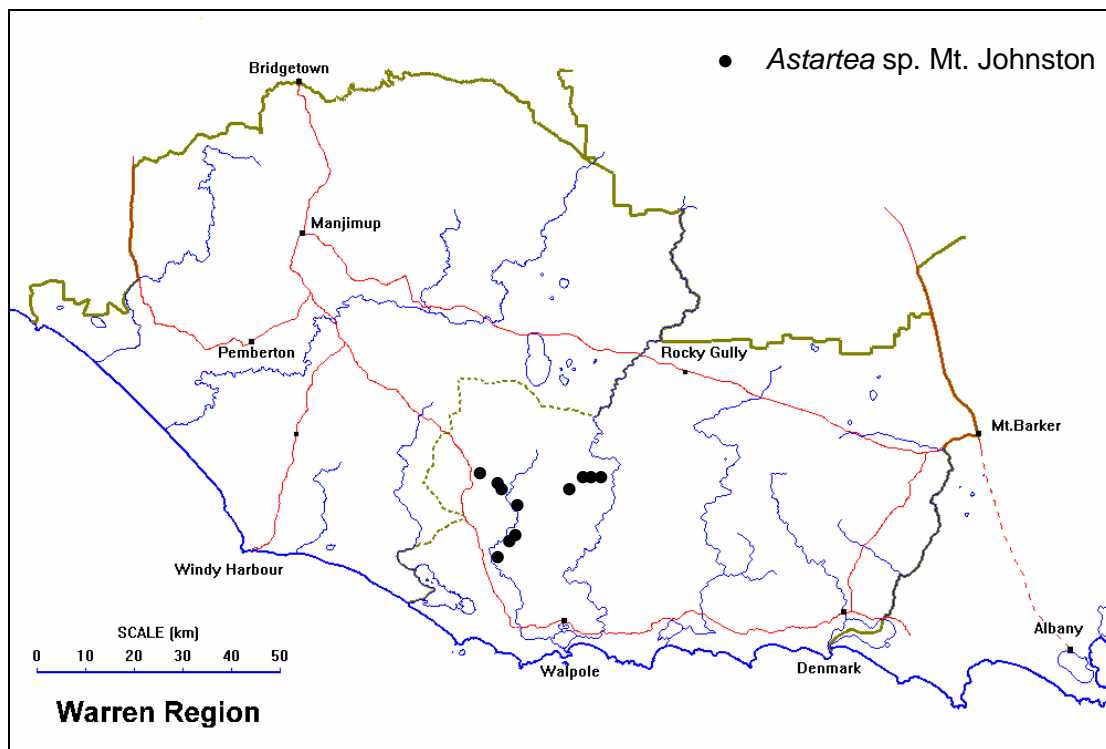
### Research Requirements

Monitor populations post fire and record germination rates, survival, rates and time to first flowering.

Determine response to disturbance.

### References

Hutchinson (1997); Barbara Rye (personal communication); Malcolm Trudgen (personal communication)



## *Boronia anceps* Paul G. Wilson

### RUTACEAE

WAR F4/221

Although not formally described by Paul Wilson until 1998, *Boronia anceps* was first collected from the Boggy Lake area in the Warren Region by Churchill in 1957. Elsewhere it is mainly recorded from the Scott River area. The species is closely related to *Boronia fastigiata* and *B. spathulata*.

#### Description

*Boronia anceps* is a perennial glabrous herb to 60 cm without a lignotuber. Stems are flattened when young becoming two-edged when mature. Leaves are opposite, simple, sessile, narrowly obovate to narrowly elliptic or oblong to obovate, flat, to 45 mm long by 13 mm wide, the tip rounded with small point. Flowers have four petals and four sepals and are pink or mauve, 15-18 mm across, in long-pedunculate terminal clusters or occasionally solitary. The peduncles are slender to 60 mm long. Pedicels are slender, smooth, to 10 mm long. Sepals are dark red purple, ovate, 2-4 mm long, glabrous or woolly ciliate. Petals are pink, ovate to elliptic, 7-10 mm long, acuminate and glabrous. Stamens are all fertile with filaments about 3 mm long, warty, with sparse hairs towards the base. The ovary is woolly. The style and stigma are 1 to 1.5 mm long, the tip small. Fruit consists of four fruitlets.

*Boronia anceps* is distinguished by its flattened, two edged stems.

**Flowering period:** September to January with a record for April.

#### Distribution and Habitat

*Boronia anceps* is found in sandy swamps and also on laterite in seasonally wet woodland areas between the Scott River and Cape Naturaliste with one collection made near Walpole in the Warren Region. Since its discovery, it has not been relocated in this latter area.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Boggy Lake	FRA	NP	na	na	Relocate

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#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy cover is unknown.

#### Susceptibility to Phytophthora Dieback

Unknown

#### Management Requirements

Relocate and survey the population at Boggy Lake.

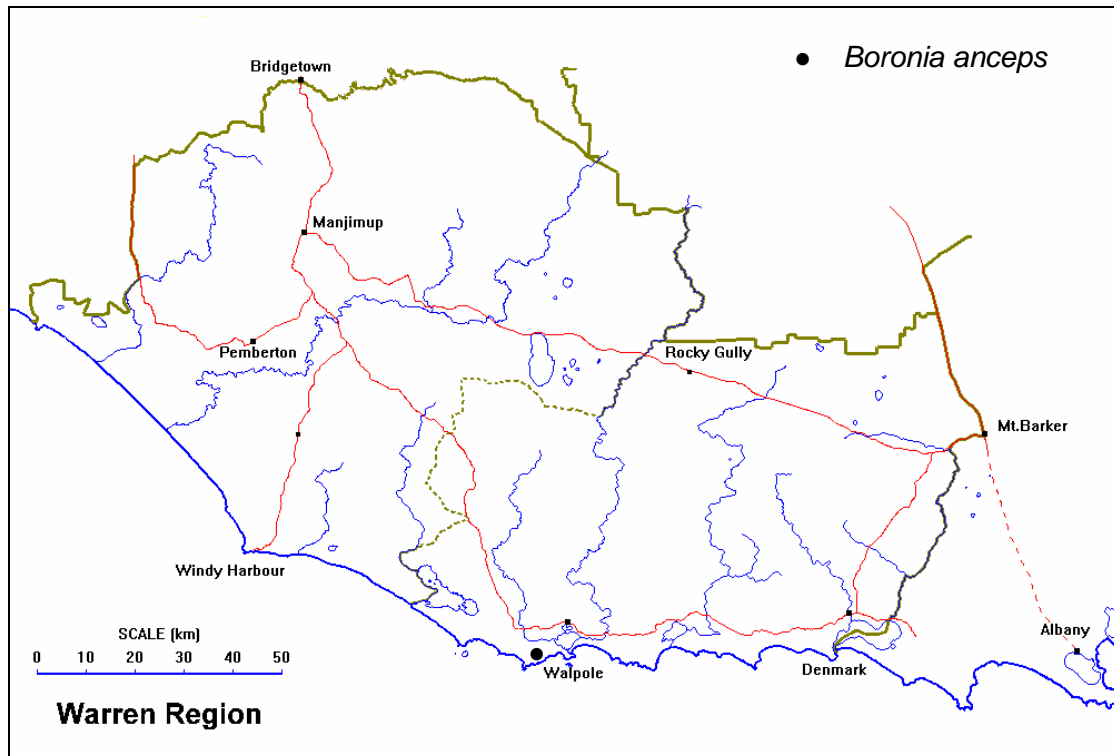
#### Research Requirements

Determine response to *Phytophthora*.

Determine response to disturbance.

#### References

Wilson (1998); Wheeler *et al.* (2002)



## *Boronia virgata* Paul G. Wilson

### RUTACEAE

WAR F4/57

This regional endemic was described by Paul Wilson in 1971. However, the first collections were made by Charles Gardner in 1921, 1922 and 1936 and variously placed in *Boronia viminea* and *B. lanuginosa*. Following this, no further collections were made until the 1960's, with the greatest number being made in the 1990's following its listing as a priority taxon.

#### Description

*Boronia virgata* is an erect shrub to 2 m high with long slender minutely pubescent to glabrous stems that are often supported by and emergent above associated vegetation. Leaves are glabrous, to 10 mm long and pinnate with three to seven linear acute leaflets. Flowers are solitary, axillary. Pedicels are slender, 4-16 mm long and glabrous with two minute bracts about halfway along their length. The four sepals are glabrous, 2-3 mm long, red and narrowly triangular. The four petals are ovate, acute to obtuse, often mucronate, puberulous within and towards the margins outside. Stamens are erect, sparsely hairy with semi-terete filaments to 3 mm long.

*Boronia virgata* is similar to and often occurs with *B. stricta*. However *B. stricta* differs in having pilose stems and hirsute leaves.

**Flowering period:** September-February

#### Distribution and Habitat

*Boronia virgata* has a restricted distribution between Denmark, Walpole and Granite Peak, growing in winter wet heathlands, swamps and drainage lines on peaty sands. Although locally uncommon it often occurs over large areas.

#### Conservation Status

Current: Priority 3

Recommended: Priority 4

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	South Coast Hwy 1	FRA	RR	na	20/9/1992	
CLM 2	South Coast Hwy 2	FRA	RR	na	7/10/1970	Not located
CLM 3	Cemetary Rd	FRA	NP	na	18/12/1985	
CLM 4	Boronia Rd 1	FRA	NP	na	18/10/2001	
CLM 5	Kordabup Rd 1	FRA	RR/SHRes	500+	26/9/1992	
CLM 6	Watershed Rd	FRA	NP	20	10/12/1997	
CLM 7	Nut Rd	FRA	NP	na	5/2/1992	
CLM 8	Proctor Rd	FRA	RR	100	16/10/1992	
CLM 9	Mehinup Hill	FRA	NR	2	3/11/1998	
CLM 10	William Bay	FRA	NP	na	11/11/2000	
CLM 11	Mitchell Rd 1	FRA	NP		9/10/2000	
CLM 12 a	Boronia Rd 2	FRA		12	17/12/1997	
CLM 12 b	Mitchell Rd 2	FRA	NP/SF	na	20/9/1994	
CLM 13	Bandit Rd	FRA		500	20/11/1995	
CLM 14	Nicol Rd	FRA	NP	100	29/11/1995	
CLM 15	Middle Rd	FRA	NP	3	9/11/1998	
CLM 16	Angove Rd	FRA	WRC	45	18/11/1998	
CLM 17	Mount Lindsey Rd	FRA	SF	100	17/10/2001	
CLM 18	Kordabup Rd 2	FRA	NR	50+	11/12/2000	
CLM 19	Beardmore Rd	FRA	SF	na	11/10/1999	Herbarium record only
WAR 100	Boronia Rd. 3	FRA	NP	na	12/10/2002	Herbarium record only
WAR 101	Rest Point Rd	FRA	SHR	na	1/11/2001	Herbarium record only

#### Response to Disturbance

The species appears to be killed by fire and is dependant on the soil seed bank for recruitment. However, the longevity of the soil seed bank is unknown.



Response to soil disturbance is unknown.

The species is a wetland or wetland ecotonal taxon and is vulnerable to long-term changes in soil moisture.

Response to weed invasion is unknown.

#### **Susceptibility to *Phytophthora Dieback***

Unknown.

#### **Management Requirements**

Monitor known populations very 4-5 years and immediately prior to and post disturbance.

Make opportunistic collections from any new populations found.

Locate populations known only from herbarium records.

Monitor populations affected by the construction of dams, drainage and climate change.

All populations need to be resurveyed and mapped correctly.

#### **Research Requirements**

Determine susceptibility to *Phytophthora* spp.

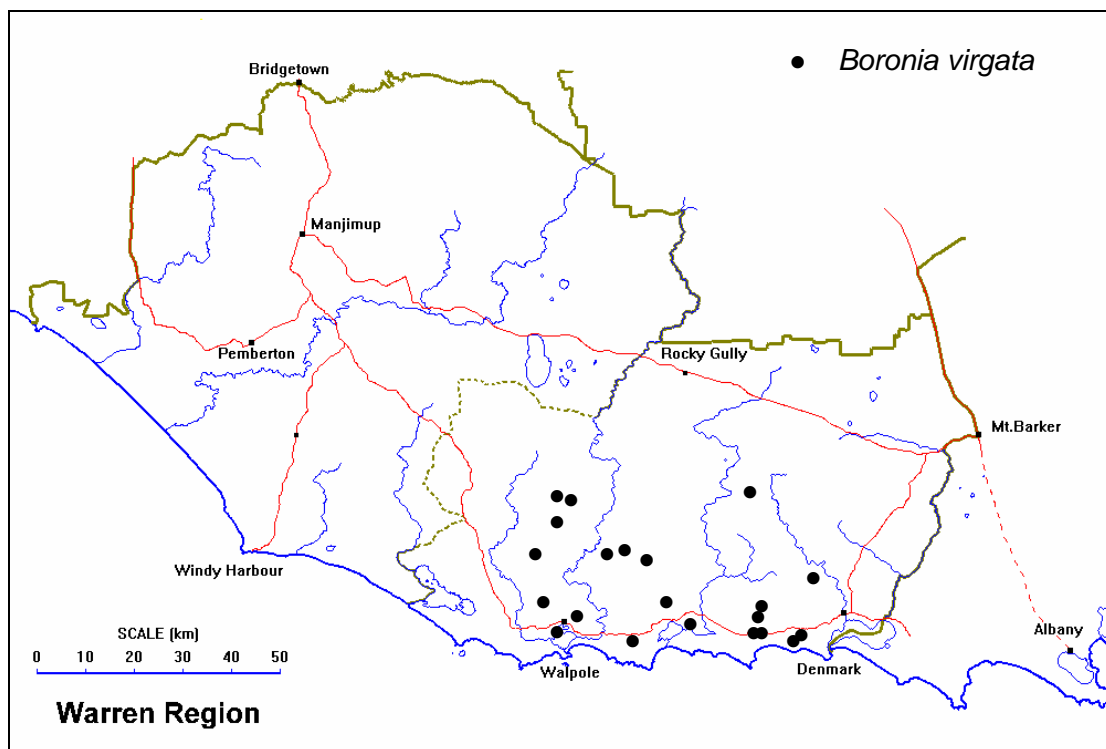
Research seed bank longevity.

Determine if the species is an annual or perennial.

Determine response to disturbance.

#### **References**

Robinson and Coates (1995); Wilson (1971)



## *Calytrix pulchella* (Turcz.) B.D. Jackson

### MYRTACEAE

WAR F4/118

*Calytrix pulchella* is a poorly known plant that was described as a species of *Calycotrix* by Turczaninow in 1852. The name *Calycotrix* was changed to *Calytrix* by Jackson in 1895. The species occurs in disjunct populations, and future molecular studies may show that it consists of more than one taxon. Despite extensive field work no further populations have been found in the Warren Region.

#### Description

*Calytrix pulchella* is a glabrous, perennial shrub to 60 cm with appressed to spreading-ascending, usually closely spaced leaves, the leaf blade linear to very narrow elliptic, 3-10 mm long by 0.6-1 mm wide, the margins entire, the base gradually tapering to the petiole and the apex acute to acuminate. Stipules are to 0.4 mm long. The petiole is 0.5-1.5 mm long. Flowers are few to many and scattered or sometimes clustered. The peduncle and bracteoles are partly united into a 7-10 mm long, narrowly funnel shaped cheiridium. The hypanthium is ten ribbed and 7-12 mm long. Calyx segments are connate at the base (to 0.4mm), orbicular to obovate, 1.5-2 mm long by 1.3-2 mm wide, the margins lobed to erose, apex truncate to acute and produced into an awn to 10 mm long. Petals are pink to deep pink, yellow at base, lanceolate to elliptic, 6-10 mm long by 3-4 mm wide, the apex acute. Stamens 25-40 with deep pink filaments 1.5-6 mm long. The style is deciduous and 4-4.5 mm long.

In the Warren Region the range of *Calytrix pulchella* abuts that of the closely related *C. tenuiramea* from which it is distinguished by its longer cheiridium (7-10 mm vs. 4-8 mm) and longer hypanthium (7-12 mm vs. 6-7.5 mm).

**Flowering period:** August-November (in the Warren Region it is recorded from mid October to the first week of November)

#### Distribution and Habitat

*Calytrix pulchella* is recorded from about eight or nine disjunct populations between Jerramungup, Mundaring and Manjimup. In the Warren Region it grows in grey sand over laterite in an open heath area of about three hectares that is surrounded by jarrah/marri forest.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 3	Walcott 1 (Kent Rd)	DON	SF	10 000+	10/11/1994	Some evidence of rabbit activity
WAR 100	Walcott 2 (Fred Rd)	DON	SF	na		
WAR 101	Walcott 3	DON	SF	na		

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

Response to rabbit activity is unknown.

#### Susceptibility to *Phytophthora Dieback*

Unknown, but given the susceptibility of other members of the family it should be managed as if vulnerable.

### Management Requirements

Monitor population annually.

Search for further populations, particularly in the Perup area.

### Research Requirements

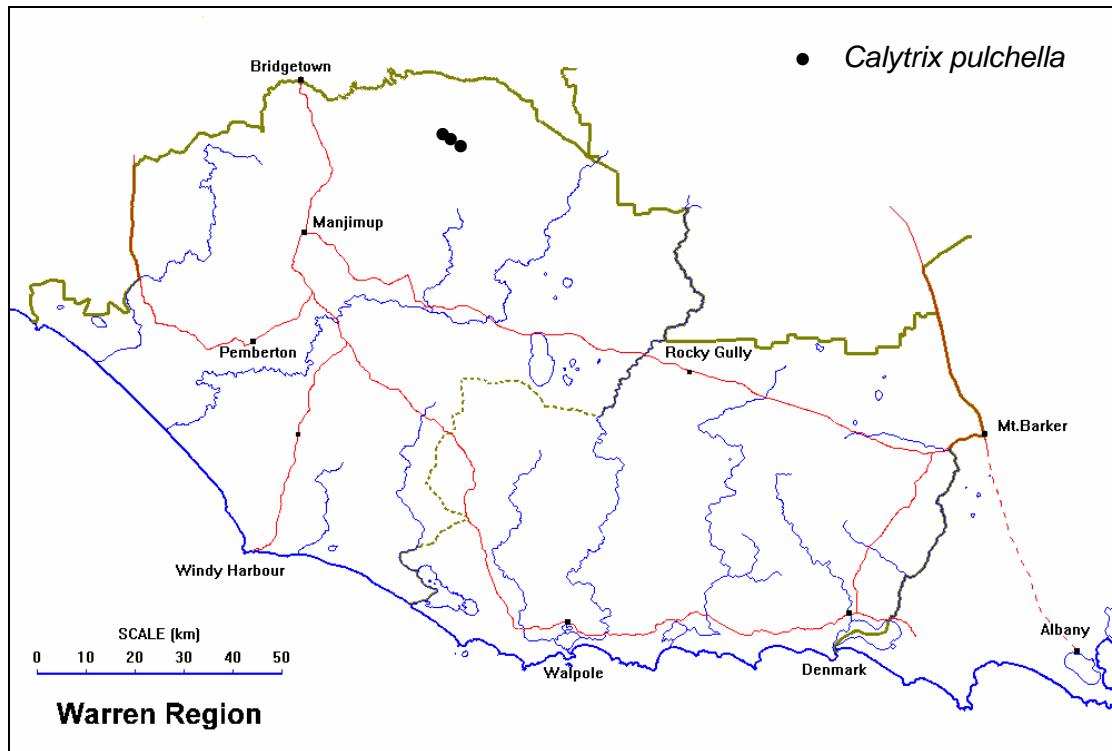
Determine response to disturbance.

Determine susceptibility to *Phytophthora* spp.

Research the relationship between Warren and Wheatbelt populations

### References

Craven (1987)



*Chamelaucium floriferum* N.G. Marchant & Keighery subsp. *floriferum* ms

MYRTACEAE

Walpole Wax

WAR F4/183

*Chamelaucium floriferum* ms is a relic species that is currently split into two subspecies, both of which are endemic to the Warren Region and listed as priority taxa. A population of *C. floriferum* is recorded near Northcliffe that does not fit comfortably into either subspecies and population genetic studies are required to resolve its taxonomy. *Chamelaucium floriferum* subsp. *floriferum* ms is a particularly attractive subspecies that has significant scope for horticultural development.

**Description**

*Chamelaucium floriferum* subsp. *floriferum* ms is a compact shrub to 3 m with opposite, decussate, shortly petiolate, crowded, linear, acute leaves 6-20 mm long by 0.5-1 mm wide. Flowers are axillary, usually solitary, exceeding the leaves and forming a leafy raceme. Pedicels are 2-5 mm long, subtended by a pair of hooded scarious bracteoles 2-3.5 mm long. The floral tube is 2.5-5 mm long and shallowly or obscurely ten ribbed. The five entire to shallowly crenate, white or pink sepals and petals are free, 0.3-0.8 mm and 2.5-3.5 mm long respectively. There are ten stamens alternating with ten staminodes which are together fused basally in a ring. Anthers open by longitudinal slits. Staminodes are narrowly triangular to linear, the style glabrous. The ovary is one celled with about eight ovules. The fruit is an indehiscent nut with persistent sepals and petals.

*Chamelaucium floriferum* subsp. *diffusum* ms differs from *C. floriferum* subsp. *floriferum* ms in being a diffuse shrub with flowers on longer pedicels and usually exceeding leaves.

**Flowering period:** October-December

**Distribution and Habitat**

*Chamelaucium floriferum* subsp. *floriferum* ms is found over a small area west of Walpole where it grows in heath, on or associated with granite outcrops.

**Conservation Status**

Current: Priority 3

**Known Populations in the Warren Region**

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Aldridge Cove Track	FRA	NP	na	22/1/1992	
CLM 2	Meredith Rd/Delta Rd?	FRA	NP	na	2/10/1967	Relocate population
CLM 3	Thompson Cove/Mt Hopkins Track	FRA	NP	na	22/9/1992	
CLM 4	Mt. Hopkins	FRA	NP	na	22/9/1992	
CLM 5	Little Chudalup	DON	NP	1000+	1/11/1994	
CLM 6	Poison Hill	FRA	NP	na	1/1/1991	
WAR 100	Woolbales 1	FRA	NP	500+		
WAR 101	Woolbales 2	FRA	NP	na		
WAR 102	Wilderness Track		NP		29/11/1997	Herbarium record only

---

**Response to Disturbance**

Plants are probably killed by fire with no evidence of resprouting noted.

The taxon appears to be a seed obligate with a significant annual investment in seed production.

Habitat is restricted to sites where plants would escape the effects of frequent fire.

Response to soil disturbance is unknown.

Response to a change in soil moisture is unknown.

Response to weed invasion is unknown.

**Susceptibility to Phytophthora Dieback**

Unknown, but given the susceptibility of several other members of the genus, *Chamelaucium floriferum* subsp. *floriferum* ms should be managed as if highly susceptible.

### Management Requirements

Monitor populations periodically.

Search for further populations in areas of suitable habitat.

### Research Requirements

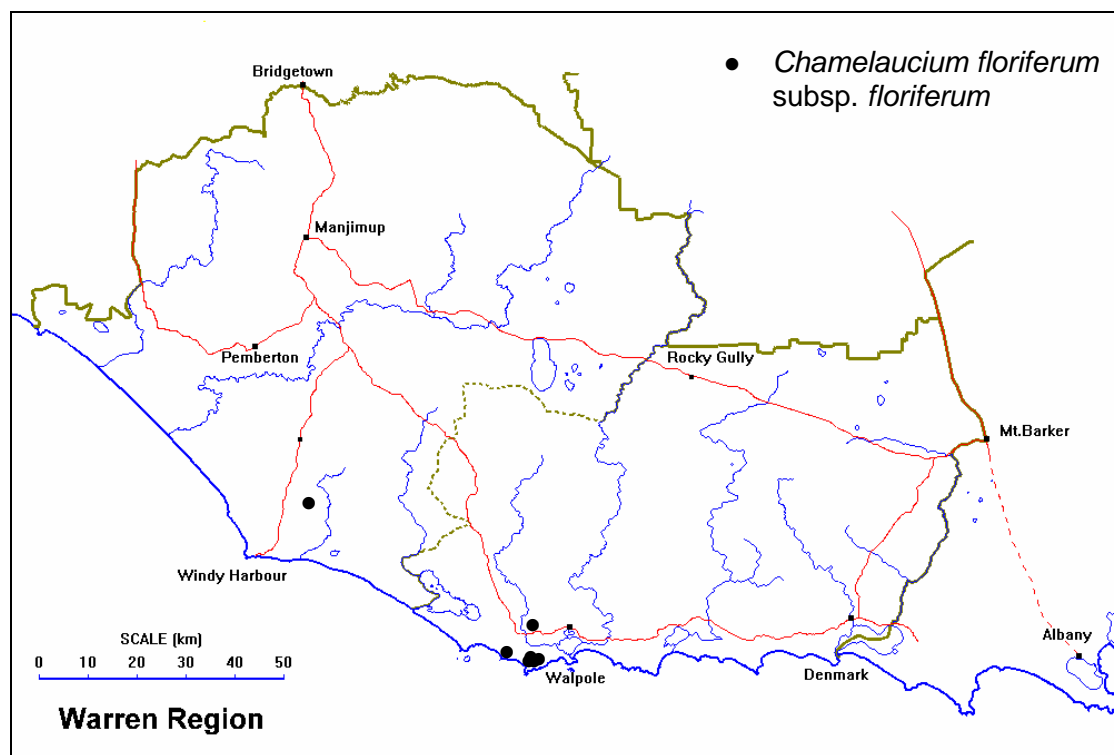
Determine susceptibility to *Phytophthora* spp.

Determine the reproductive biology of the taxon, particularly in relation to fire.

Consider the introduction of this taxon into horticulture.

### References

Wheeler *et al.* (2002); Neville Marchant (personal communication)



## *Chorizema reticulatum* Meissner

### PAPILIONACEAE

WAR F4/137

*Chorizema reticulatum* is an inconspicuous species that was described by Meissner in 1844 from a collection Preiss made in 1840. It has since been sporadically collected and appears to be subject to significant grazing effects, possibly by rabbits, with populations all but disappearing when in bud and early flower. It is possibly relatively common, but should be assessed across its geographic range to confirm its conservation status prior to being considered for de-listing. Some populations are being grazed by either kangaroos or rabbits. Special attention needs to be made of these impacts.

#### Description

*Chorizema reticulatum* is a small shrub to 40 cm high with erect stems and a few branches that are silky pubescent when young, tending to glabrescent later. Leaves are usually crowded on the lower part of the stem, 18 mm long by 3 mm wide, alternate, reticulate, conspicuous, ovate or elliptic, acute, mucronate, flat or with slightly recurved margins with scattered hairs, the petiole 1-2 mm long. The inflorescence is an erect terminal raceme 7-20 cm long with 8-20 flowers that are covered with dense, appressed, short grey hairs. Pedicels are 3-8 mm long. The bracts and bracteoles are ovate, acute, about 1-2.5 mm long. The calyx is 4-6.5 mm long and densely hairy, the upper two lobes united but with tips free and 1.5-2 mm long, the lower three lobes 2-3 mm long. The standard is broad-ovate, emarginate, 8-14 mm long by 7-12 mm wide and pink or orange in colour with yellow markings. The wings are broad-obovate to spatulate, about 8 mm long by 5 mm wide. The broadly-ovate keel is much shorter than the wings and about 5 mm long by 2-3 mm wide. The stamens with filaments are 3.5-5 mm long and the versatile anthers about 0.25 mm long.

The range of *Chorizema reticulatum* overlaps that of *C. glycinifolium* which has some superficial morphological similarities, but is readily distinguished by its erect, wiry, few branched stems as opposed to weakly erect to sprawling, and almost flat ovate to elliptic leaves crowded towards the base, as opposed to recurved to loosely revolute, ovate to almost linear leaves scattered along the stem.

**Flowering period:** August-October

#### Distribution and Habitat

*Chorizema reticulatum* is recorded from Mt Manypeaks, the Stirling Range and scattered locations westward to the Leeuwin/Naturalist Ridge with about thirteen populations in the Warren Region in the Denmark area. The species occurs in *Eucalyptus* forest in areas of grey sand over laterite and granite.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	South Coast Hwy 2	FRA	RR	<50	24/9/1994	
CLM 2	McIntosh Rd	FRA	RR	<50	24/9/1994	
CLM 3	Sandy Track-Denbarker 2	FRA	SF (NP)	100+	30/8/1996	
CLM 4	Nornalup Rd	FRA	RR	20	8/9/1996	
CLM 10	Scotsdale Rd	FRA	RR	na	12/9/1991	Relocate population
CLM 12	Mount Lindesay 1	FRA	NP	na	26/9/1995	
CLM 14	South Coast Hwy 1	FRA	RR	na	21/8/1989	
WAR 100	Mount Hallowell	FRA	SHRes	na	14/9/2001	Herbarium record only
WAR 101	Skippings Rd	FRA	?	na	4/9/2000	Herbarium record only
WAR 104	Watershed Rd	FRA	NP	na	21/2/1997	Herbarium record only
WAR 105	Middle Rd	FRA	NP	na	15/9/1995	Herbarium record only
WAR 106	Little Lindesay	FRA	SF (NP)	<20	15/9/1995	Herbarium record only
WAR 107	Mt. Lindesay 2	FRA	SF (NP)	<20	26/9/1995	Herbarium record only

### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora Dieback*

Unknown.

### Management Requirements

Monitor known populations annually.

Search areas of suitable habitat for further populations.

With staff from the South Coast Region and South West Region, assess all recorded populations to accurately determine the conservation status of the species.

### Research Requirements

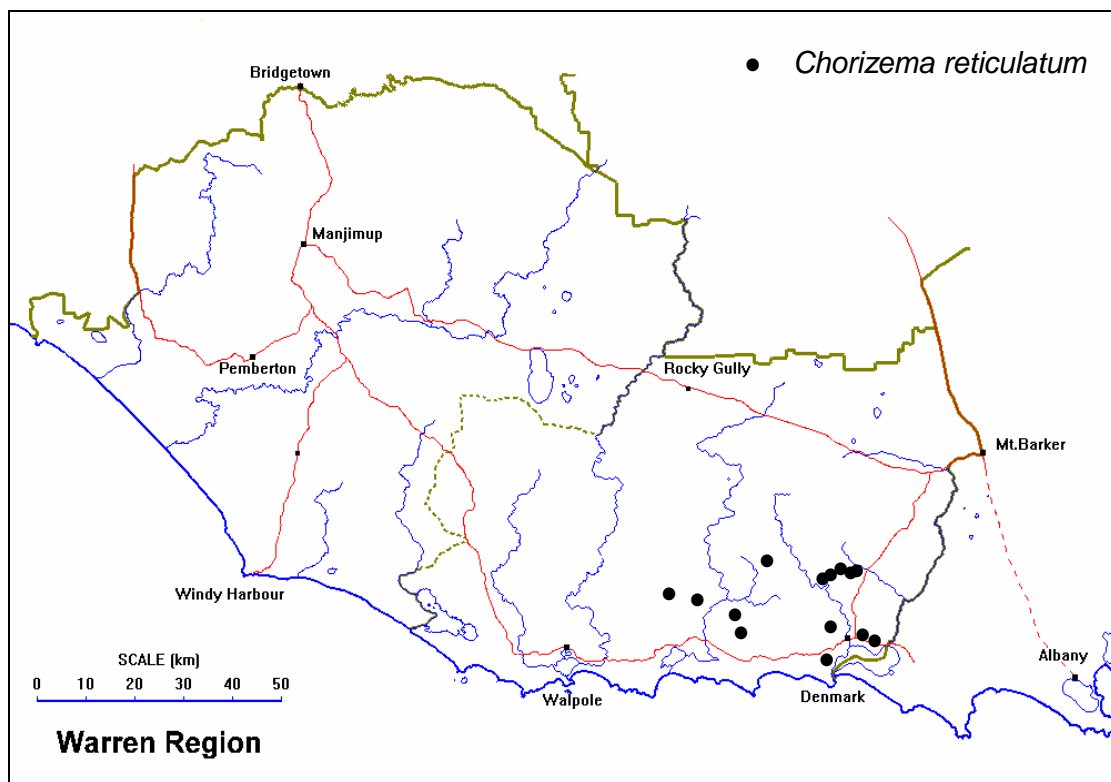
Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

Fence part of one population to assess vulnerability to grazing.

### References

Bentham (1864); Taylor and Crisp (1992)



## *Cyathochaeta stipoides* K.L. Wilson

### CYPERACEAE

WAR F4/206

*Cyathochaeta stipoides* was first collected from the Scott River Plains area by Royce in 1948 and was seen again in 1979 when Karen Wilson found it along the Bow River. At the time it was placed with *C. clandestina* and *C. teretifolia* but was considered a new species by Wilson in 1997. The epithet refers to the diaspores that superficially resemble those found in the grass genus *Stipa*.

#### Description

*Cyathochaeta stipoides* is a tall grass-like perennial to 1 m high with tussocks forming along a very short rhizome. The culms are erect, terete, smooth and 1 to 2 mm in diameter. Leaves are terete, basal and cauline to 200 mm long with an open sheath. Involucral bracts are leaf-like with a 'blade' to 5 mm long and sheath 4 to 5 mm long. The inflorescence is spike-like, to 30 cm long with two to seven or more solitary spikelets at the stem nodes, the spikelets almost completely hidden within the sheath of leaf-like bracts. Spikelets are dark brown to 50 mm long. Floral segments are 6 mm long. The style base above the nut is very long, twisted and awn-like. The nut is 7 mm long with the floral segments and the style is 50 mm long and base persistent.

**Flowering period:** October to May.

#### Distribution and Habitat

*Cyathochaeta stipoides* is found along the south coast between Scott River and Bow Bridge, growing in sandy heath on seasonally wet flats.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 2	Windy Harbour 1	DON	NP	na	3/5/1991	
CLM 3	Windy Harbour 2	DON	NP	na	3/5/1991	
CLM 4	Maringup Rd	DON	NP	na	18/1/1992	
CLM 5	Pneumonia Rd	DON	NP	na	18/12/1994	
CLM 6	South West Hwy	FRA	SF	na	19/12/1994	
CLM 9	Ficifolia Rd	FRA	NP	na	11/7/1997	
CLM 10	Jane Formation	DON	NP	na	19/3/1997	
WAR 100	Gardner Rd 1	DON	NP	na	18/2/2004	Covers 0.3 ha
WAR 101	Gardner Rd 2	DON	NP	na	18/2/2004	Covers approx 1 ha
WAR 102	Gardner Rd 3	DON	NP	100+	18/2/2004	

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to Phytophthora Dieback

Unknown

#### Management Requirements

Resurvey and monitor all CALM populations

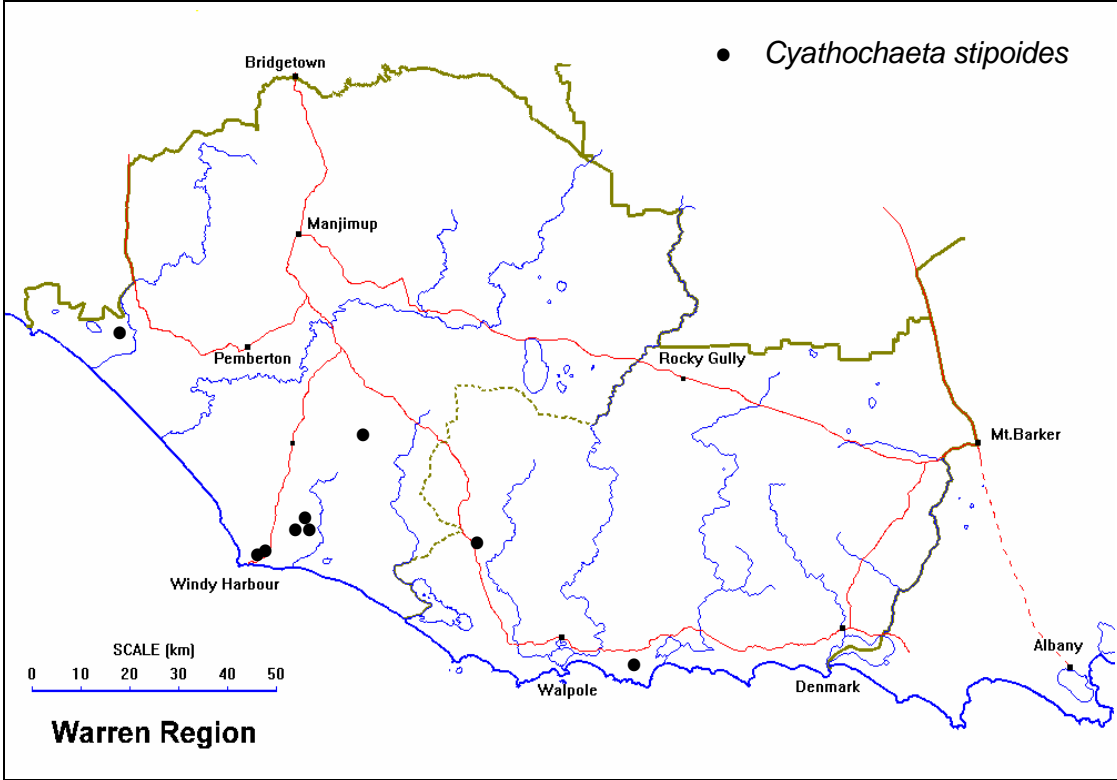
#### Research Requirements



Determine response to disturbance  
Determine response to *Phytophthora* species

**References**

Wilson (1997); Wheeler *et al.* (2002)



## *Cyathochaeta teretifolia* W. Fitzg.

### CYPERACEAE

WAR F4/191

*Cyathochaeta teretifolia* is a widespread species that was described by Fitzgerald in 1903 from a collection he made from a swamp in Bayswater. It has since been regarded a form of *Cyathochaeta avenacea* or treated as a variety. However, Karen Wilson reinstated it as a distinct taxon in 1995. A collection from north east of Walpole has since been placed in *C. teretifolia* but is much less robust. Field observations indicate that *C. avenacea* is generally found in open forest while the taxon currently placed with *Cyathochaeta teretifolia* is found in swamps. Further collections are required to confirm its placement in *C. teretifolia*.

#### Description

*Cyathochaeta teretifolia* is a tall tussock forming rhizomatous perennial sedge with erect culms to 2 m high. Culms are terete below the inflorescence and striate. Leaves are basal, not numerous, terete or slightly compressed, about as wide as the culms and generally erect and tapering to a slender point. The ligule is membranous and the sheath yellow to yellow-orange. Involucral bracts are leaf-like, partially open sheathing, 12-15 mm long by 1-2 mm wide, the margins hyaline. The inflorescence is narrow, spike like, 50-60 cm long with five plus spikelets per node, sessile or pedicellate and often exceeding the sheathing bract. The four glumes are aristate, the two lower ones and the upper one empty. The fertile glume has a hermaphrodite flower with long, ciliate hypogenous bristles. There are two stamens. The style is bifid and much longer than the glumes, the base awn-like, very elongated, persistent, slightly bent about half way along its length, twisted with age in its lower half, about 1.5 times the length of the nut and 1.5-2 cm long.

In the Warren Region the distribution of *Cyathochaeta teretifolia* overlaps with other *Cyathochaeta* species. However, *Cyathochaeta clandestina*, *C. equitans* and *C. stipoides* have involucral bracts in excess of 4 cm long and awns in excess of 5 cm. *Cyathochaeta avenacea* is similar in dimensions to *C. teretifolia* but has leaves with flattened blades, rather than terete. Field observations of *Cyathochaeta avenacea* in the Walpole-Denbarker area is that *C. avenacea* takes two forms, the forest form generally having flattened blades and the one in swamps having leaves approaching terete and therefore similar to *C. teretifolia*.

**Flowering period:** November-February (with fruit persistent well beyond this period)

#### Distribution and Habitat

*Cyathochaeta teretifolia* mainly occurs in swamps on the northern Swan Coastal Plain with early collections also from the Bayswater area. Two outliers are recorded, one at Yelverton, the other north-east of Walpole. The species is known from swamp and creekline situations.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Mountain Rd	FRA	(5g)	na		To be relocated and assessed

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Relocate and assess the conservation status of the Mountain Road population.

Make collections from the Mountain Road population.

Monitor the population every three years.

Search for further populations in other areas of suitable habitat in the Warren Region.

### Research Requirements

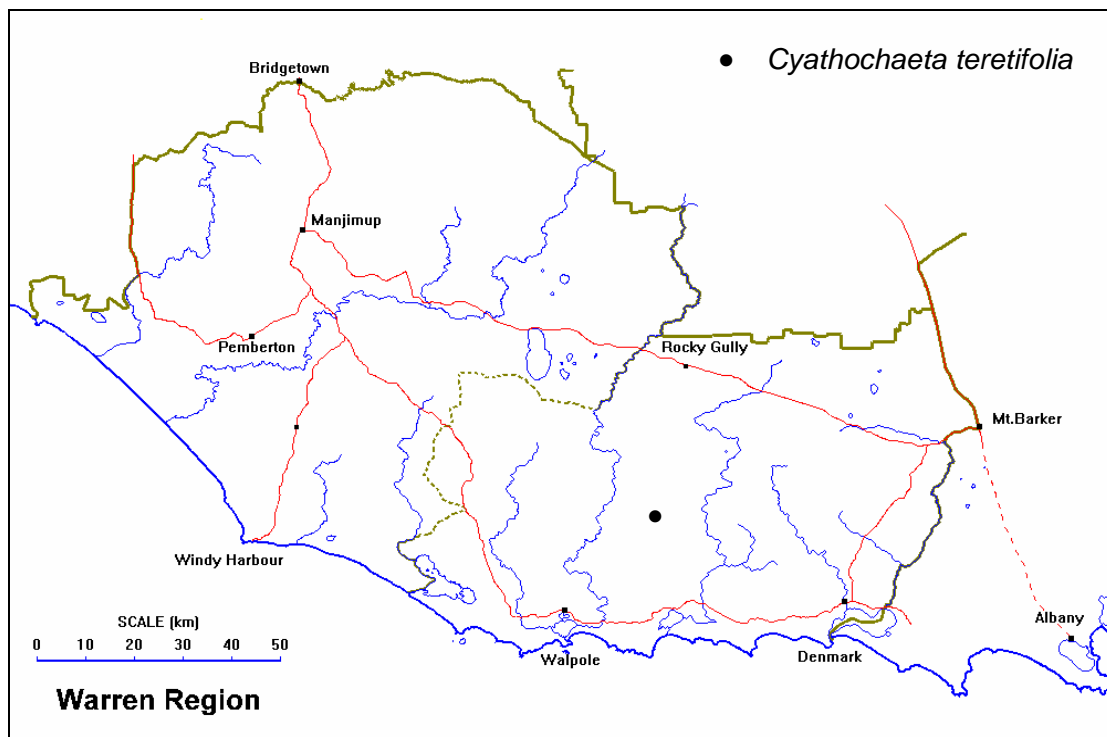
Determine the taxonomic status of the Mountain Road population.

Determine its response to disturbance.

Determine susceptibility to *Phytophthora* spp.

### References

Fitzgerald (1903); Wilson (1997)



## *Dicrastylis glauca* Munir

### LAMIACEAE

WAR F4/61

*Dicrastylis glauca* is a poorly known species that was described by Munir in 1978 from a Charles Gardner collection. It was previously included in *Dicrastylis corymbosa* and the reference to its existence (or former existence) in the Warren Region is based on a Muir collection which gives the location as 'towards the Tone River'. No current populations are known from the Warren Region but potential habitat exists in the Perup Nature Reserve and several other nature reserves in the north-eastern part of the Region.

#### Description

*Dicrastylis glauca* is an erect (also recorded as prostrate) shrub 11-30 cm tall with the general appearance of a *Gnaphalium* and branched, cylindrical, woody, glaucous stems. The leaves are sessile, decussate, oblong, obtuse, with revolute margins, the midrib distinct on the under-surface, 0.4-1.5 mm long by 1-3 mm wide and glaucous. The many flowered inflorescence consists of dense, terminal, white-woolly cymose heads 0.5-1 cm in diameter that are globose, sessile or on very short peduncles, each subtended by two leafy bracts. Bracts are opposite and sessile, 3-6 mm long by about 2 mm wide, densely white-woolly-tomentose below, almost glabrous or sparsely hairy above. Flowers are five merous (occasionally four), the calyx densely white woolly tomentose outside, glabrous inside, the corolla white, tubular, unequally five lobed, the anterior lobe larger than the others.

*Dicrastylis glauca* is close to *D. corymbosa* and has an overlapping range, but differs in its glaucous stems and leaves (*D. corymbosa* is densely white woolly tomentose) and its larger anterior corolla lobe (in *D. corymbosa* the lobes are equal).

**Flowering period:** October-January

#### Distribution and Habitat

*Dicrastylis glauca* is recorded from the Newdegate, Lake Grace and Hyden area with an early Muir collection from 'towards the Tone River'. Habitat is recorded as 'sandy places' and Mallee woodland.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
	Not located					

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#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

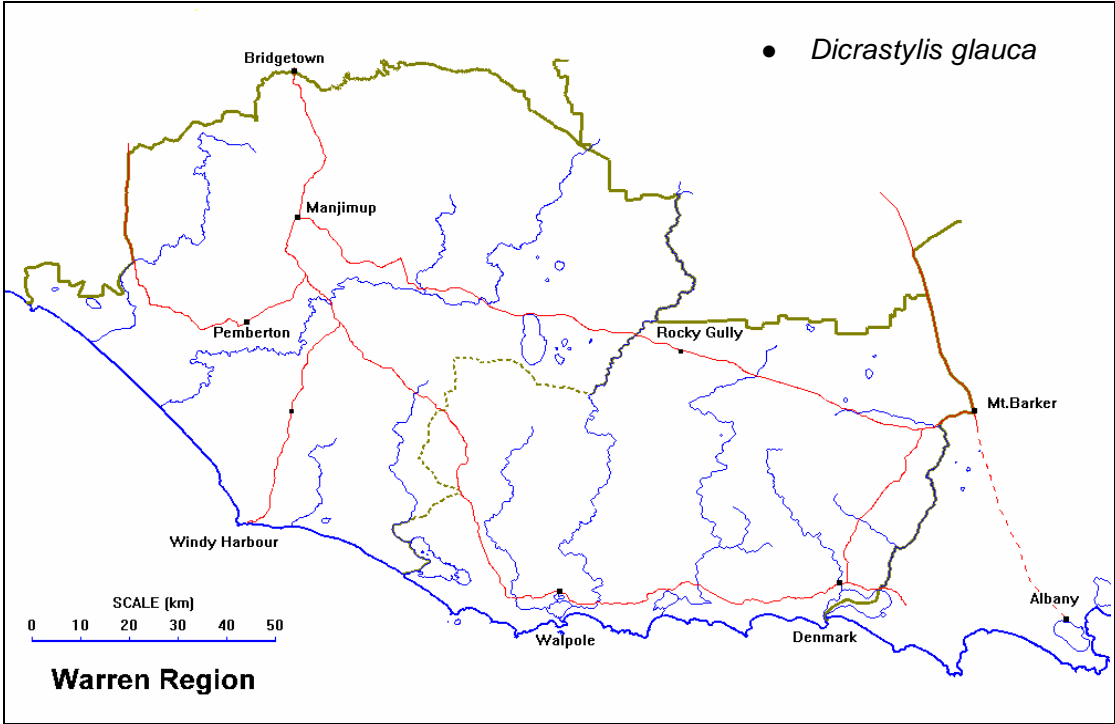
#### Management Requirements

Systematically search areas of suitable habitat in the Perup area for populations of this species.

#### Research Requirements

**References**

Munir (1978)



## *Eucalyptus brevistylis* Brooker

### MYRTACEAE

Rate's Tingle

WAR F4/62

*Eucalyptus brevistylis* is endemic to the Warren Region where it was first recognised as being distinct by Jack Rate and described by Ian Brooker in 1974. While not under any immediate threat, *E. brevistylis* is a well surveyed, highly endemic, large tree species known from few populations with no further populations likely to be found. It is in need of long-term monitoring and should any threat arise or recruitment fail, be considered for gazettal.

#### Description

*Eucalyptus brevistylis* is a medium to tall tree to 40 m with rough fibrous, longitudinally fissured, light grey-brown over reddish brown bark. Seedlings and adult branchlets are usually glaucous. Juvenile leaves are opposite to 9 cm long by 6 cm wide. Adult leaves are petiolate, alternate, lanceolate to broadly falcate, 6-11 cm long by 1-3 cm wide with a discoloured shiny dark green upper surface covered in numerous oil glands. Inflorescences are axillary, generally seven to thirteen in number (usually eleven), the buds pedicellate, clavate to ovoid to 3-4 mm long and lacking a scar. The operculum is hemispherical and 1-2 mm long. Flowers are white, the outer stamens without anthers and style very short.

*Eucalyptus brevistylis* differs from *E. jacksonii* in lacking buttressing and having more than seven flowers per umbel, and from *E. guilfoylei* in having pedunculate flowers and fruits.

**Flowering period:** April-November

#### Distribution and Habitat

*Eucalyptus brevistylis* is restricted to the east and north-east of Walpole, growing in association with granite outcrops, creeklines, and the ecotone between sandy plains/flats and granitic hills.

#### Conservation Status

Current: Priority 3

Recommended: Priority 4

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1a	Monestary Rd	FRA	NP	na	4/11/1992	
CLM 1b	South Coast Hwy	FRA	NP/RR	<1 000	1992	Wardell-Johnson study
CLM 1c	Zig Zag Rd	FRA	NP	na	12/8/1991	
CLM 2	Boronia Rd	FRA	NP (5g)	<10 000	3/11/1992	Wardell-Johnson study
CLM 3	Spikes Rd/Creek Rd	FRA	NP	na	4/1/1992	
CLM 4	Crossing FB	FRA	SF (5g)	<1 000	1992	
CLM 5	Mountain Rd	FRA	NP	na	15/6/1992	
CLM 6	Collis Rd	FRA	SF/NP	<1 000	15/6/1992	Wardell-Johnson study
CLM 7	Middle Rd	FRA	NP	<1 000	4/11/1992	Wardell-Johnson study

#### Response to Disturbance

The species is not killed by fire.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown, but given the susceptibility of other members of the genus, it should be managed as if vulnerable.

#### Management Requirements

Monitor the species health every five years.

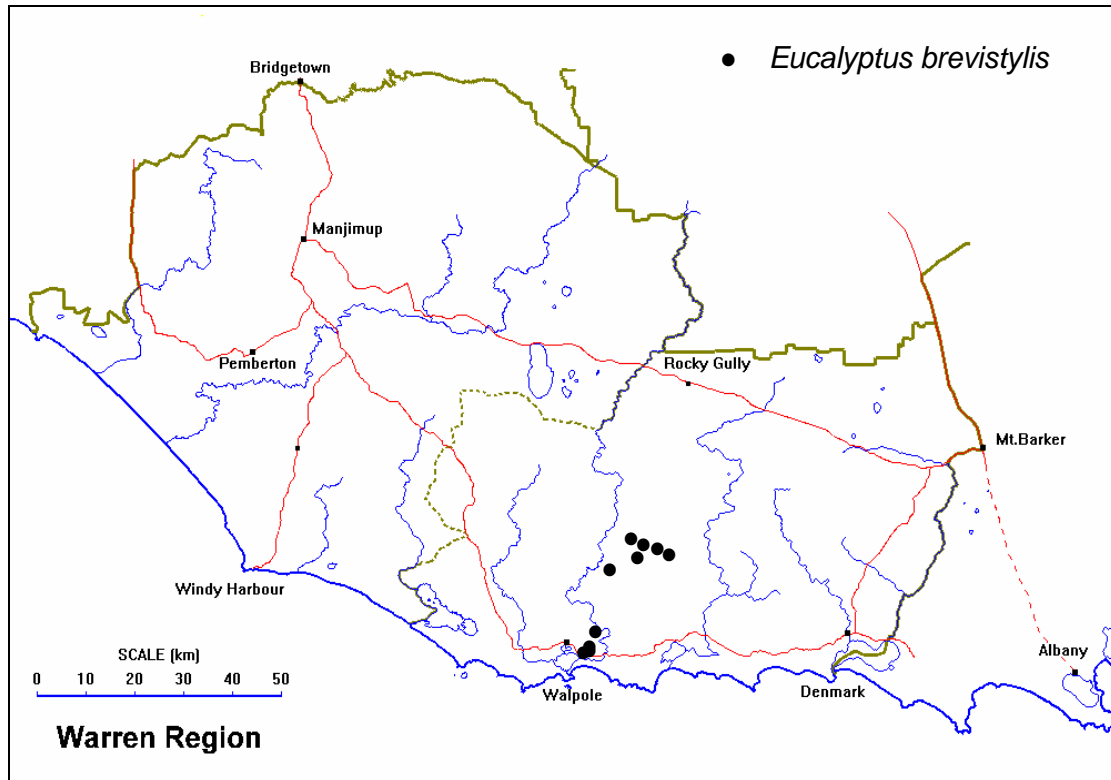
## Research Requirements

Determine response to disturbance.

Determine susceptibility to *Phytophthora* spp.

## References

Brooker (1974); Brooker and Kleinig (2001); Wardell-Johnson and Coates (1996)



## *Gastrolobium formosum* (Lindl.) G. Chandler & Crisp

### PAPILIONACEAE

WAR F4/46

*Gastrolobium formosum* was described by Kippist in 1847 as a species of *Jansonia* based on a Gilbert collection from Scott River. It was later (1848) described as a species of *Cryptosema* and named *pimeleoides* by Meissner who was presumably unaware that it has already been described. In 1930, Charles Gardner accepted the genus *Jansonia* but used the name *pimeleoides*. Following taxonomic work conducted by Chandler and Crisp in 2002, it was placed in *Gastrolobium* and the original name *formosum* used.

#### Description

*Gastrolobium formosum* is an open spreading shrub to 3 m with opposite, petiolate, narrowly ovate to ovate-elliptic, usually shortly mucronate leaves 15-75 mm long by 7-22 mm wide and a terminal or axillary inflorescence of often recurved heads, each containing four sessile flowers surrounded by broad, pubescent involucral bracts. Flowers are red, bisexual, the bracteoles absent. The calyx is two-lipped, five-lobed and densely hairy. The standard petal is reduced and just 3-5 mm long. The wings are 12-16 mm long and the keel 15-20 mm long. The ten stamens are free and alternately long and short.

**Flowering period:** October-January.

#### Distribution and Habitat

*Gastrolobium formosum* is found mainly in the Margaret River area with two populations found in the Warren Region at Black Point and Boggy Lake. It has not been relocated in the latter area. The species grows on the edges of rivers and streams and in winter wet swamps.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Boggy Lake	FRA	NP	na	27/12/1957	Unable to relocate
CLM 12	Black Point Rd	DON	NP/RR	<100	18/1/1996	

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to Phytophthora Dieback

Unknown.

#### Management Requirements

Relocate the Boggy Lake population.

Monitor populations every three years.

Search areas of suitable habitat for further populations.

Assess all populations to confirm their conservation status.

#### Research Requirements

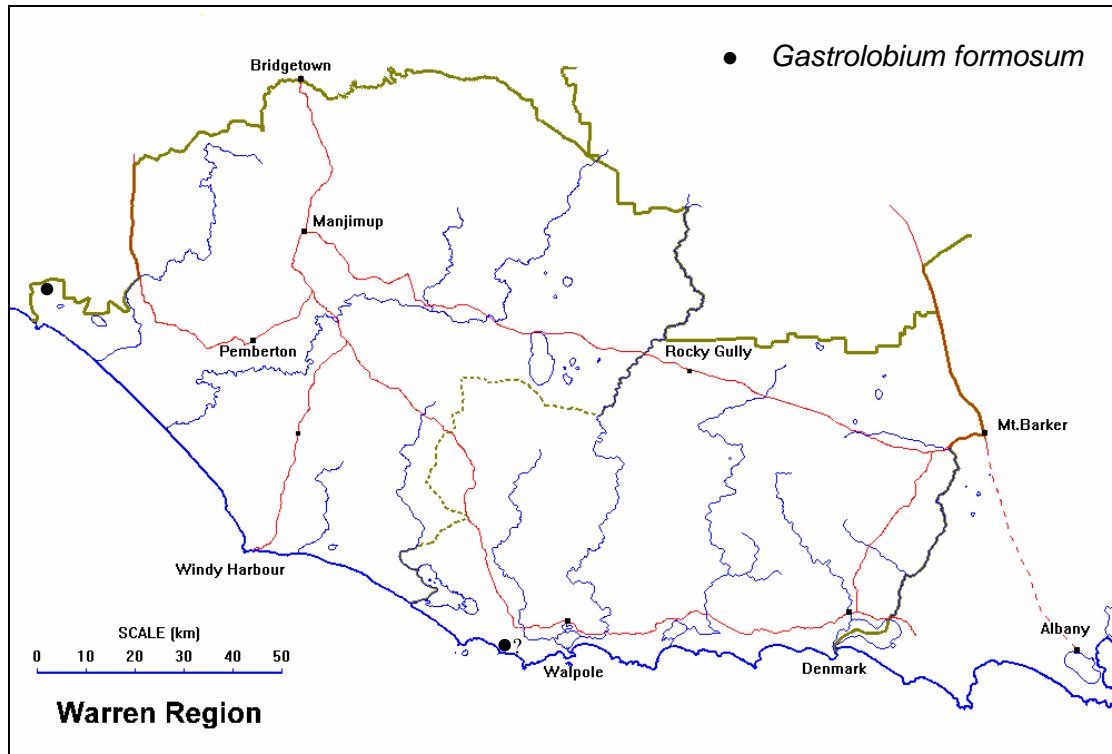


Determine response to disturbance.

Determine susceptibility to *Phytophthora* spp.

### References

Bentham (1864); Crisp (1996); Chandler *et al.* (2002)



## *Gonocarpus pusillus* (Benth.) Orch.

### HALORAGACEAE

WAR F4/165

*Gonocarpus pusillus* was named as a species of *Haloragis* by Bentham in 1864, from a Robert Brown collection made "to the E of King George Sound". Two varieties were described at that time - *pusilla* and *subaphylla* with the latter raised to species status and named *Haloragis simplex* by Britten in 1907. In 1975 Tony Orchard moved *pusilla* back into the genus *Gonocarpus*. *G. pusillus* is an inconspicuous species that has in the past been poorly collected with few populations known until the 1970's.

#### Description

*Gonocarpus pusillus* is a prostrate perennial herb with entire, linear to narrowly elliptic leaves 7-8 mm long by 1 mm wide that are opposite at the base, becoming alternate up the stems. Flowers are yellow to red, one per axil, four merous with sepals about 0.3 mm long and petals about 1 mm long. The stamens are eight in number with anthers 0.5-0.6 mm long. The fruit is silver grey, ovoid to globular, 0.8 by 0.8 mm, eight-ribbed, scabrous basally and on ribs.

The leaves often tend to be caducous giving the appearance of *Gonocarpus simplex* but *G. pusillus* is distinguished by its prostrate habit and branching nature. It differs from *G. paniculatus* (dune form) in its smaller size and *G. paniculatus* (swamp form) in its smaller size and prostrate habit.

**Flowering period:** November-December

#### Distribution and Habitat

*Gonocarpus pusillus* is found between Busselton and Albany, growing in heath and low woodland in seasonally wet swamps, being most noticeable in areas of recent disturbance.

#### Conservation Status

As it occurs in seasonal wetlands it may be susceptible to climate change.

Current: Priority 3

Recommended: Priority 4

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Styx River	FRA		na	?	
WAR 101	Romance Rd	FRA		na	28/11/1994	
WAR 102	Thompson Rd 1	FRA		na	?	
WAR 103	Chesapeake Rd	DON		na	23/02/1998	
WAR 104	Nuyts Wilderness	FRA		na	26/11/1997	
WAR 105	Suez Rd	FRA		na	?	
WAR 106	Thompson Rd 2	FRA		na	11/12/1974	Orchard collection
WAR 107	Scott Rd 1	DON		1000+	5/11/1995	
WAR 108	SheepWash	FRA		50	7/11/1998	
WAR 109	Watershed Rd	FRA		100	6/12/1994	
WAR 110	Scott Rd 2	DON		na	?	
WAR 111	Pt D'Entrecasteaux	DON		na	18/11/1999	
WAR 112	Roe Rd	FRA		na	30/11/1999	
WAR 113	Lake William	FRA	NP	na	24/11/1988	Keighery collection

#### Response to Disturbance

Following fire the species reshoots from rootstock and regenerates from seed.

*Gonocarpus pusillus* readily occupies disturbed sites where it grows into a relatively large tufted plant in the absence of other competition.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

### Management Requirements

Liaise with South West Region and South Coast Region to assess the threatened status of all recorded populations.

Search areas of suitable habitat for further populations.

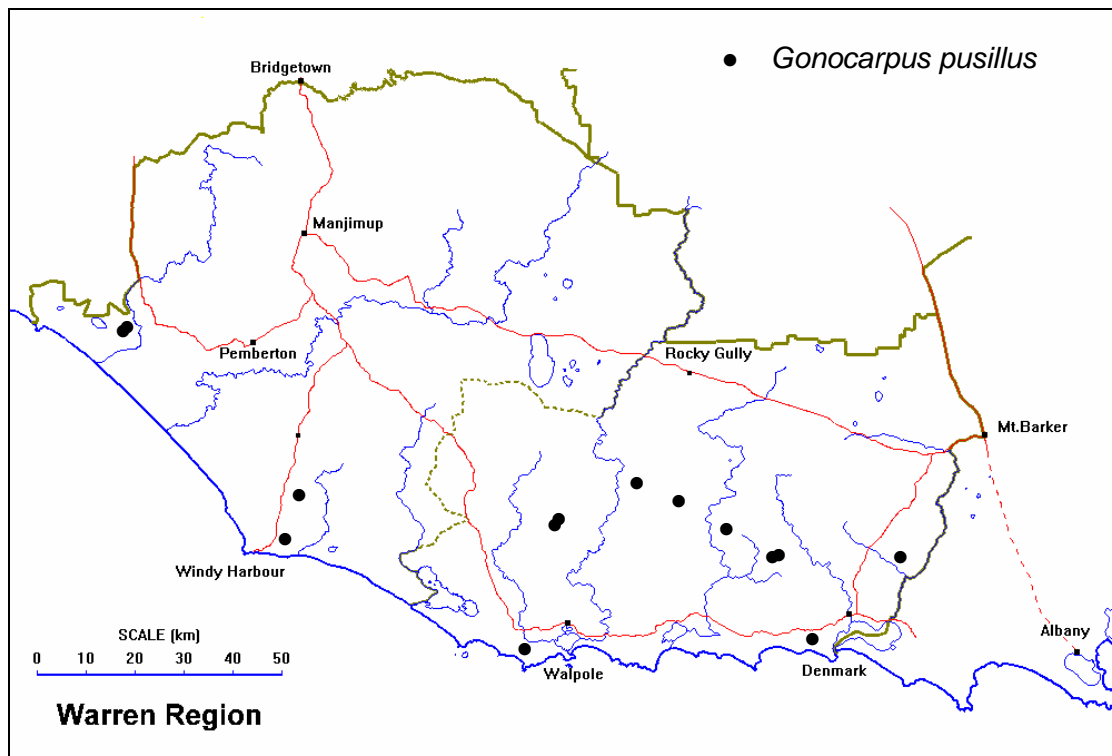
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine the long term viability of soil stored seed.

### References

Bentham (1864); Orchard (1990)



## *Gonocarpus simplex* (Britten) Orch.

### HALORAGACEAE

WAR F4/10

*Gonocarpus simplex* was named *Haloragis pusilla* var. *subaphylla* by Bentham in 1864, from a Robert Brown collection from the "S. Coast". It was later raised to species level by Britten and named *H. simplex*. In 1975 Tony Orchard placed the species back into *Gonocarpus*.

#### Description

*Gonocarpus simplex* is a multi-stemmed, filiform, tufted perennial herb 8-40 cm tall which, when not in flower, has a sedge-like appearance. In areas of dense understorey the species develops a tangling form. The deciduous leaves are few, alternate, linear, glabrous and 5-10 mm long. The red bracts are also deciduous, deltoid in shape and 1.7 mm long. Flowers are greenish red, male or bisexual and apparently on separate plants. The bisexual flowers are sessile, while male flowers are on pedicles to 2 mm long. The four sepals are about 0.4 mm long and the four petals about 1.7 mm long. There are eight stamens. The ovary is eight ribbed.

**Flowering period:** November-December

#### Distribution and Habitat

*Gonocarpus simplex* is known from Cape Le Grande NP and in the Warren Region it is recorded between Denmark and Lake Jasper, growing in grey peaty sands in mixed restionaceous/cyperaceous/myrtaceous flats that are subject to periodic inundation. It is often found in disturbed areas such as are found in table drains and culverts. It is a relatively common though inconspicuous species (even when in flower) and probably occurs in other areas of suitable habitat east and west of its known range in the region.

#### Conservation Status

Current: Priority 3

Recommended: Priority 4

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Northcliffe	DON	VCL	na	11/12/1987	
CLM 2	Collis Rd	FRA	SF	500+	30/11/1994	
CLM 3	Gum Link Rd	FRA	SF (5g)	500+	9/11/1994	
CLM 4	Break Rd	FRA	SF (5g)	10 000+	28/11/1994	
CLM 5	Watershed Rd	FRA	SF (5g)	100+	6/12/1994	
CLM 7	Deeside Coast Rd	DON	NP	500+	15/12/1994	
CLM 8	Pingerup Rd	FRA/DON	NP	1000+	15/12/1994	
CLM 9	Inlet Rd 1	FRA	NP	1000+	19/12/1994	
CLM 10	Beardmore Rd	FRA	NP	10 000+	19/12/1994	
CLM 11	Crystal Springs	FRA	NP	1000+	19/12/1994	
CLM 12	Inlet Rd 2	FRA	NP	1000+	19/12/1995	
CLM 13	Boronia Rd	FRA	SF (5g)	1000+	9/12/1995	
CLM 14	Nicol Rd	FRA	NP/SF	100+	9/12/1995	

#### Response to Disturbance

Following fire the species reshoots rapidly from rootstock.

*Gonocarpus simplex* occupies disturbed sites where it grows into a large tufted plant.

Grows in areas subject to extended periods of inundation and summer drying.

Response to weed invasion is unknown.

#### Susceptibility to Phytophthora Dieback

Unknown.

#### Management Requirements

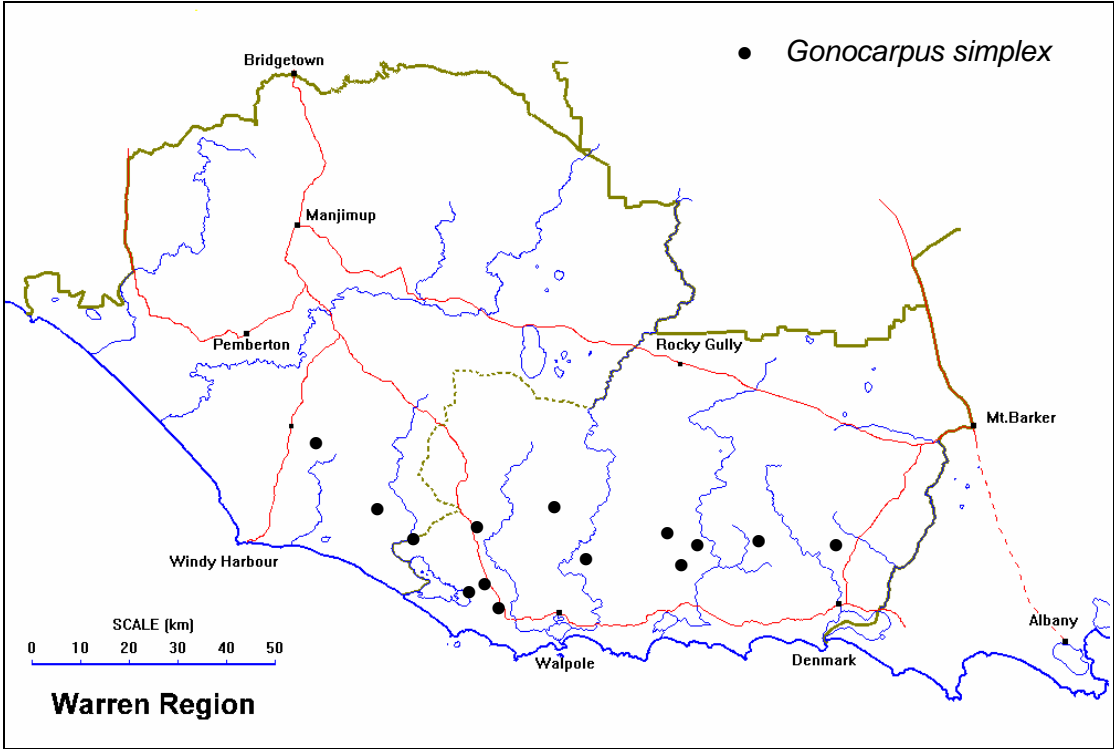
Resurvey and assess all populations.

**Research Requirements**

Determine susceptibility to *Phytophthora* spp.

**References**

Bentham (1864); Orchard (1990)



## *Gonocarpus trichostachyus* (Benth.) Orch.

### HALORAGACEAE

WAR F4/45

*Gonocarpus trichostachyus* was described by Bentham in 1864 as a species of *Haloragis* from material collected by Drummond and was placed in *Gonocarpus* by Tony Orchard in 1975. The Mt. Lindesay population appears to be at the western limit of the species' known distribution.

#### Description

*Gonocarpus trichostachyus* is an erect perennial herb to 17 cm high with smooth, strigose stems and decussate, sessile, oblanceolate, glabrous to sparsely strigose leaves to 10 mm long, the margins thickened, crenulate and hyaline. Bracts are alternate, 1-1.3 mm long, entire and reddish in colour. The red-purple to brown bracteoles are under 0.5 mm long and have a short mucro. Flowers are four-merous and pendulous on a pedicel 0.5 mm long. The sepals are about 0.5 mm long and reddish green, while the petals are about 1.0 mm long and reddish purple. There are eight stamens. The ovary is weakly eight ribbed, densely appressed-pilose and black.

**Flowering period:** September-October

#### Distribution and Habitat

*Gonocarpus trichostachyus* is known from collections made at Wagin, Fitzgerald NP, Cheyne Beach, and Mt Lindesay and is also reported from an area north of Bow River where it has not been relocated. The species occurs in gravely loam to sandy-clay soil in areas of relatively open forest and woodland or on shallow soils on granite.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Mt. Lindesay	Frankland	SF	200	5/11/1995	

#### Response to Disturbance

*Gonocarpus trichostachyus* regenerates from soil stored seed following fire after which it has been observed to be a short lived ephemeral (Brenda Hammersley, personal communication).

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### Susceptibility to Phytophthora Dieback

Unknown.

#### Management Requirements

Monitor population every few years.

Search areas of suitable habitat for further populations.

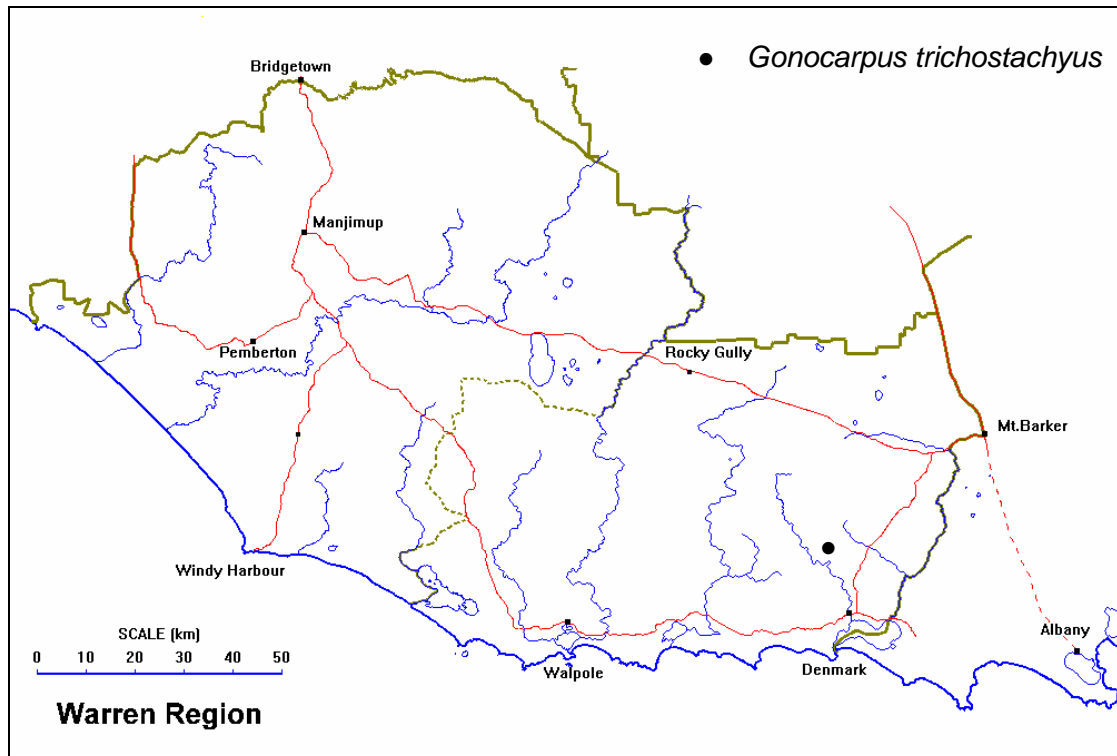
#### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

#### References

Robinson and Coates (1995); Orchard (1990)



## *Grevillea papillosa* (McGillivray) P. Olde & N. Marriott

### PROTEACEAE

WAR F4/85

*Grevillea papillosa* was named as a subspecies of *G. manglesioides* by McGillivray in 1986 and raised to species status by Olde and Marriot in 1995. Its distribution is centred between Augusta and Lake Jasper with reputed outliers near Collie and in Denbarker. Its community type requires monitoring for possible impacts from *Phytophthora* and watertable draw down due to horticulture and mining.

#### Description

*Grevillea papillosa* is a spreading shrub to 1.2 m tall and wide with angular, sparsely silky to glabrous branchlets and linear to narrowly elliptic, entire, pungent, sometimes deeply trifid leaves 20-50 mm long by 1-5 mm wide. The leaf lobes are 0.5-20 mm long by 1-2 mm wide, pungent and glabrous, the surfaces with prominent veins and the margins recurved to revolute. Flowers are both terminal and axillary in short simple or branched racemes with a glabrous to sparsely hairy axis. The perianth is about 3 mm long, white with pinkish markings or pale yellow, papillose inside, glabrous (or almost so) outside. The style is red and the style end 'plate like'.

*Grevillea papillosa* is similar to some forms of *G. manglesioides* but differs in its glabrous leaves and papillose (vs. hairy) inside of the perianth. It differs from *G. diversifolia* in its glabrous or almost glabrous outer perianth surface.

**Flowering period:** September-April

#### Distribution and Habitat

*Grevillea papillosa* is recorded mainly from Scott River National Park where it grows in winter-wet swamps. The species is known from three populations in the Warren Region, all in D'Entrecasteux National Park.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 5	Black Point Rd 1	DON	RR/NP	10 000+	10/8/1995	
CLM 4	Black Point Rd 3	DON	NP	1000+	10/8/1995	
CLM 14	Black Point Rd 4	DON	NP	na	11/3/1997	

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown but given that the major occurrence of this species is in seasonally inundated swamps where it is often the dominant species and it is not found on adjacent higher ground (areas only 0.3-1 m higher in local relief), any dropping the water table could result in plant deaths.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown, but should be treated as if moderately susceptible.

#### Management Requirements

Monitor populations every two to three years.

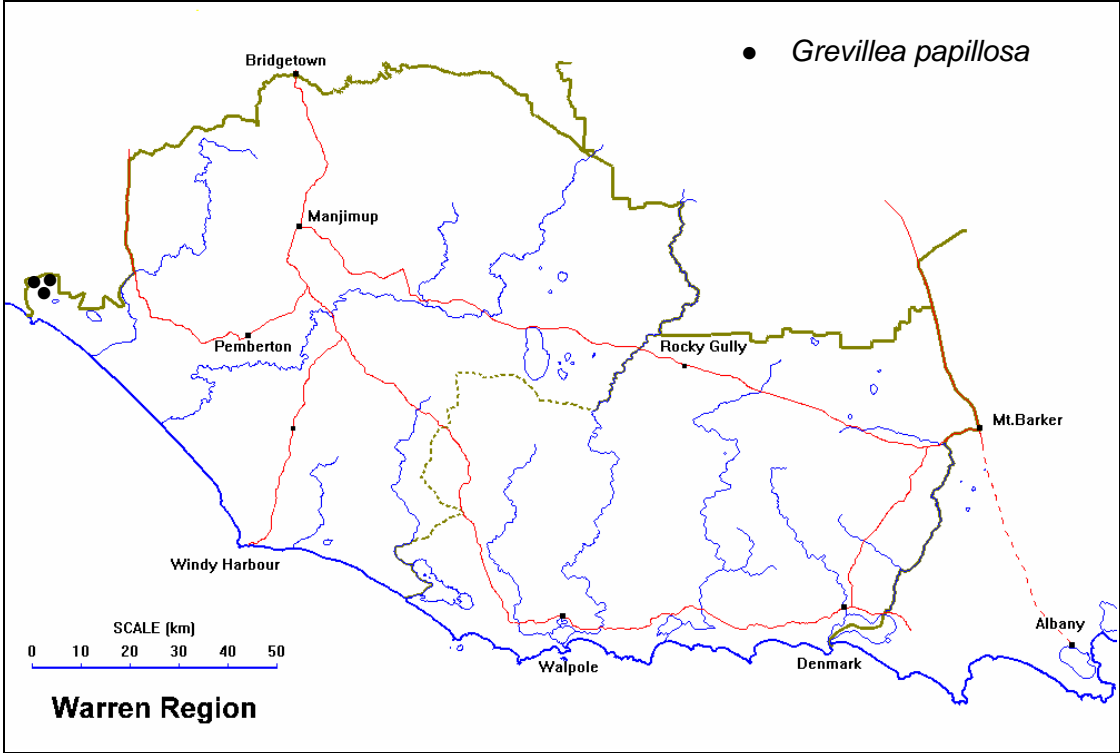
#### Research Requirements



- Determine response to disturbance.
- Determine susceptibility to *Phytophthora* spp.
- Collect seed for seed store

**References**

McGillivray and Makinson (1993); Olde and Marriott (1995)



## *Lambertia rariflora* Meisn. in Lelm. subsp. *lutea* Hnatiuk

### PROTEACEAE

WAR F4/196

*Lambertia rariflora* was described by Meissner in 1848 from a Drummond collection, presumably from the Blackwood Plateaux. The subspecies *lutea* was described in "Flora of Australia (Vol. 16)" by Hnatiuk, in 1995 from limited collection material. At that time, specimens contained in the WA Herbarium had not been seen by him and questions of rank were raised when the 1990 Tony Annels and 1994 Brenda Hammersley collections were viewed as they appeared to be a distinct species. Current molecular studies are being conducted on the genus and may assist in resolving the placement of this taxon.

#### Description

*Lambertia rariflora* is a shrub or small tree to 7 m high with densely pubescent young branches and narrow obovate to narrowly oblanceolate, acute, often shortly mucronate leaves 10-26 mm long by 2.5-6 mm wide, each tapering into a petiole 2-4 mm long. Leaves are pubescent when young, the margins entire to slightly irregular. Conflorescences are axillary with the inner bracts 2-4 mm long. The perianth is sparsely pubescent, zygomorphic and 18-35 mm long, yellow in colour and dilated about the middle. The fruit is slender, cuneate, erect, beaked and 10-15 mm long (including the 3-5 mm beak) by 4-5 mm wide. There are two seeds that are asymmetrically cuneate and about 6 mm long by 2 mm wide.

**Flowering period:** December-April

#### Distribution and Habitat

*Lambertia rariflora* subsp. *lutea* is endemic to the Warren Region where it has a restricted distribution between the Kent River and Deep River, usually growing on grey or yellow sands over laterite in moisture gaining sites above areas of periodic saturation and inundation.

#### Conservation Status

This subspecies is vulnerable to local extinction from the combined effects of frequent fire and *Phytophthora*.

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 2	Nicol Rd 1	FRA	NP/SF	140	24/1/1996	
CLM 3	Mt Frankland	FRA	NP	na	10/1/1990	
CLM 4	Peak Block	FRA	SF	7	22/2/1996	
CLM 5	Renzo Rd	FRA	SF (5g)	<200	5/12/1995	
CLM 6	Nornalup Rd 1	FRA	SF (5g)	<100	1/2/1995	
CLM 7	Nornalup Rd 2	FRA	SF (5g)	107	31/1/1997	
CLM 8	Nicol Rd 2	FRA	NP/SF	<20	20/3/1997	
WAR 100 a	Thompson Rd 1	FRA	NP/SF	<20	5/12/1995	Plants unhealthy dieback affected
WAR 100 b	Thompson Rd 2	FRA	NP/SF	<20	5/12/1995	Plants unhealthy and dieback affected
WAR 101	Bidwell Rd	FRA	RR/PPI	na	27/2/2001	Misidentified = <i>Lambertia uniflora</i>
WAR 102	Middle Rd	FRA	SF	na	1/12/1999	Herbarium record
WAR 103	Boronia Rd	FRA	SF	na	18/12/1997	Herbarium record

#### Response to Disturbance

Observations of the Renzo Road population indicate that the subspecies is highly fire sensitive with even large plants killed by mild fire. It appears to be a seed obligate regenerator rather than a resprouter and would be susceptible to local extinction if fire occurs before there has been sufficient seed production.

Occurrence on track verges may indicate the subspecies is able to utilise soil disturbance.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

### **Susceptibility to *Phytophthora* Dieback**

Susceptible. Most populations of this taxon are affected by *Phytophthora* and are under threat.

### **Management Requirements**

Search areas of suitable habitat for further populations.

Manage populations to minimise impacts of *Phytophthora* spp.

Monitor populations every two years and following disturbance events.

Spray populations affected by *Phytophthora* with phosphite.

### **Research Requirements**

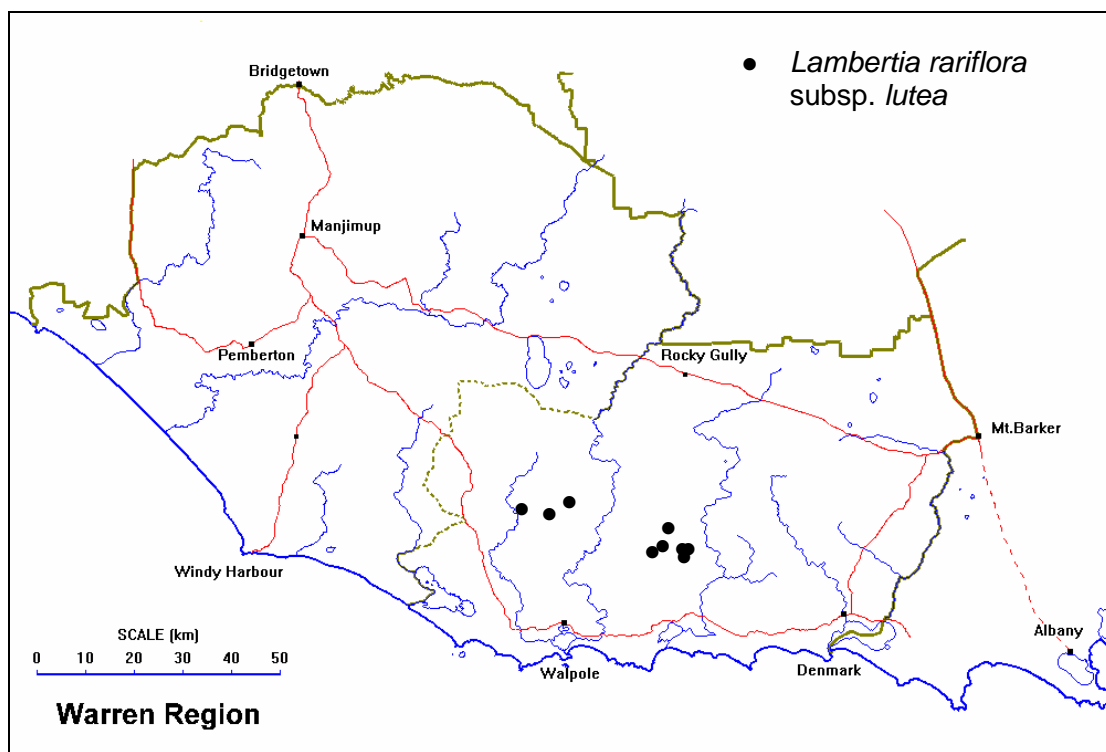
Determine response to disturbance.

Determine susceptibility to *Phytophthora* spp.

Clarify taxonomic rank.

### **References**

Hnatiuk (1995); Macfarlane *et al.* (1996)



*Lasiopetalum cordifolium* Endl. subsp. *acuminatum* E. Bennett. & K.  
Shepherd ms

STERCULIACEAE

WAR F4/189

*Lasiopetalum cordifolium* subsp. *acuminatum* was discovered on Mt. Lindesay by Eileen Croxford in 1982 and then collected several more times through the 1980's by various other people. It is a distinctive taxon that was first recognised during an ongoing revision of the Sterculiaceae. Its restricted distribution makes it particularly vulnerable to climate change.

**Description**

*Lasiopetalum cordifolium* subsp. *acuminatum* is an open, slender, often multi-stemmed shrub to 1.5 m tall with petiolate, broadly cordate leaves to 5 cm long. These are tomentose underneath and each has an extended apex that tapers to a long point. The inflorescence is a cyme with about ten densely crowded, shortly pedunculate flowers. The calyx is tomentose on the outside and five lobed, with each lobe to 7 mm long. Petals are absent.

The subspecies has an overlapping range with *Lasiopetalum cordifolium* subsp. *cordifolium* but differs in its long tapering leaf apex (total leaf length being over two times its width versus about the same width and length in subsp. *cordifolium*), and its lack of a tuft of white hairs in the join between the calyx lobes.

**Flowering period:** September-December

**Distribution and Habitat**

*Lasiopetalum cordifolium* subsp. *acuminatum* is known from populations between the Frankland and Mitchell Rivers, with the largest found in the Western Road and Mt. Lindesay/Mitchell River area. The subspecies is found growing on gravely soils in Jarrah-Marri forest or in open heath.

**Conservation Status**

Current: Priority 3

**Known Populations in the Warren Region**

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Mt. Lindesay 1	FRA	NP	na	25/9/1991	
CLM 2	Mitchell Rd	FRA	NP	na	5/12/1989	
CLM 3	Nutcracker Rd	FRA	NP	na	3/1/1991	
WAR 100	Parker Rd	FRA	5g	500+	13/11/1999	= <i>L. floribundum</i>
WAR 101	Kent River	FRA	5g	na	13/11/1999	As above
WAR 102	Watson Rd	FRA	5g	100	9/11/1999	As above
WAR 103	Hay FB 1	FRA	SF	500	9/7/2002	Probably <i>L. floribundum</i>
WAR 104	Tindale Rd	FRA	SF	500+	20/11/1999	As above
WAR 105	Break Rd	FRA	SF	1000+	20/11/1999	As above
WAR 106	Ficifolia Rd	FRA	NP	100+	13/12/1999	As above
WAR 107	Kenton Drive	FRA	NP	1000+	17/12/1999	As above
WAR 108	Hay FB 2	FRA	SF	1000+	15/10/1998	
WAR 109	Stan Rd	FRA	SF	2	26/10/1998	
WAR 110	Sandy Track Rd 1	FRA	SF	100	26/10/1998	
WAR 111	Sunny Glen Rd	FRA	SF	500+	9/9/1998	Doubtful ID. Recollect
WAR 112	Sandy Track Rd 2	FRA	SF	200	19/9/1998	
WAR 113	Mitchell River Rd 1	FRA	SF	1000+	19/9/1998	
WAR 114	Mitchell River Rd 2	FRA	SF	1000+	19/9/1998	
WAR 115	Kernutt's Rd	FRA	SF	100+	19/9/1998	
WAR 116	Mt. Lindesay 2	FRA	SF	1000+	1/9/1997	
WAR 117	Denmark-Mt Barker Rd	FRA	SF	200+	26/10/1996	

### Response to Disturbance

Vulnerable to frequent fire regimes as it is a seed obligate (i.e. regenerates only through seed dispersal).

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora Dieback*

Unknown.

### Management Requirements

Locate and document all populations.

Search areas of suitable habitat for further populations.

Monitor at least every three years

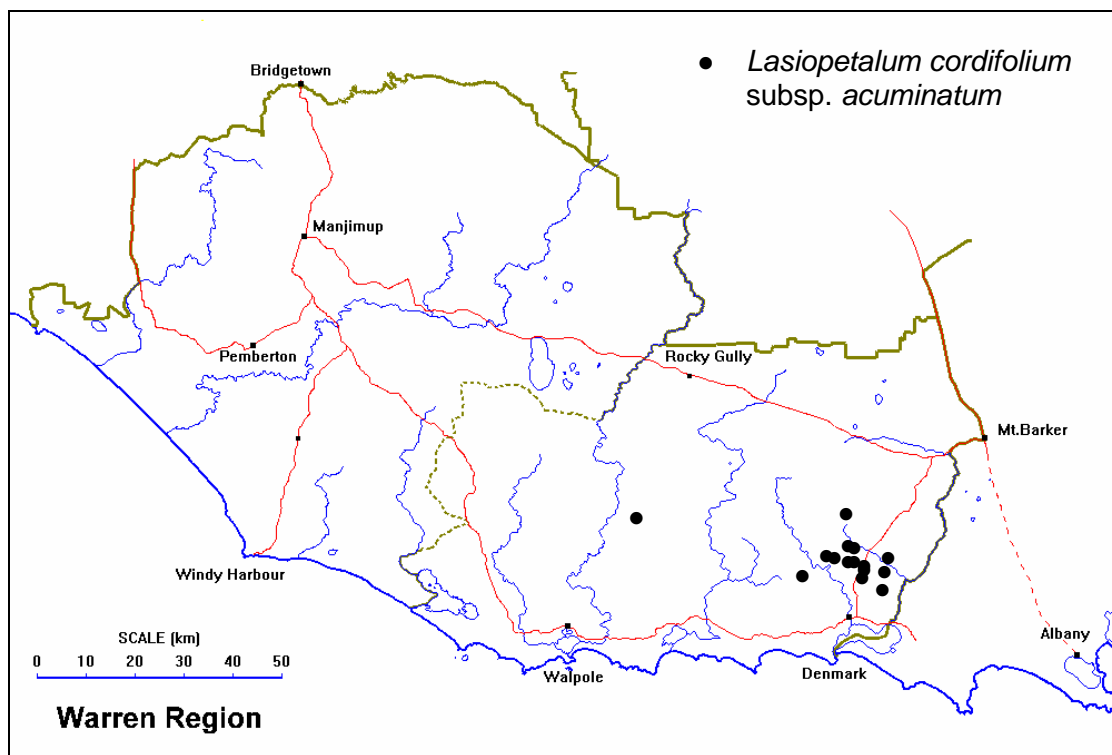
### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Bentham (1863); Kelly Shepherd (personal communication)



## *Lomandra ordii* (F. Muell.) Schltr.

### DASYPOGONACEAE

WAR F4/48

*Lomandra ordii* was described by Mueller as a species of *Xerotes* in 1878 from material he collected along the Shannon River during his 1877 trip through the Region. The species was placed in *Lomandra* by Schlechter in 1908. It is a regional endemic with a range of about 50 km over the lower parts of the Gardner, Shannon and Inlet Rivers and their associated lower terraces and swamps. In these areas it is not uncommon.

#### Description

*Lomandra ordii* is a large tufted plant to 2 m with erect or reclining stems to 1.5 m long and flat, glabrous, leaves 60-150 cm long by 10-20 mm wide, each with a rounded apex. The sheath margins are reddish-brown in colour and intact. Male and female inflorescences, which are similar and extend beyond the leaves, are branched and end in whorled flower clusters. Cluster bracts are inconspicuous and shorter than the flowers. Flowers are white, campanulate 4-6 mm long and shortly pedicellate, with pedicels to 3.5 mm long in males and 0.5 mm long in females. Sepals and petals are white or cream and similar in shape. The seed, which is about 1.5 mm long and coated with fleshy yellow matrix, is initially retained on the plant as carpels open.

**Flowering period:** September-March

#### Distribution and Habitat

*Lomandra ordii* is found growing in sandy soils on creek and river banks between Walpole and Northcliffe, often in association with karri/marri or jarrah and/or *Agonis/Taxandria* species, sedges and rushes.

#### Conservation Status

Current: Priority 3

Recommended: Priority 4

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Inlet River	FRA	NP	25	14/1/2004	
CLM 2	Wheatley Coast Rd	DON	SF	1000	26/10/1994	
CLM 3 & 4	Shannon River	DON/ FRA	NP	1000+	26/10/1994	
CLM 5	Gardner River 1	DON	NP	na	22/2/1990	
CLM 6	Gardner River 2	DON	NP	na	22/2/1990	
CLM 7	Inlet River mouth	FRA	NP	200	19/12/1994	
CLM 8	Chesapeake Rd	DON	NP	na	25/2/1997	
WAR 100	Gardner River 3	DON	NP	20	3/3/2004	
WAR 102	Cantebury Brook	DON	SF	20	1/10/1998	
WAR 103	Clarke Island	FRA	NP	na	5/12/2000	Herbarium record

#### Response to Disturbance

The species has a variable response to fire with the Inlet River population regenerating from rootstock and seed following fire, while plants at the Gardner River population were killed.

Plants have been observed to establish from seed on road verges and other disturbed areas.

The species is restricted to sites that are close to water and may be adversely affected by changes in the water table.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements

Liaise with the MRWA and Shires to protect road reserve populations.

Monitor populations every five years.

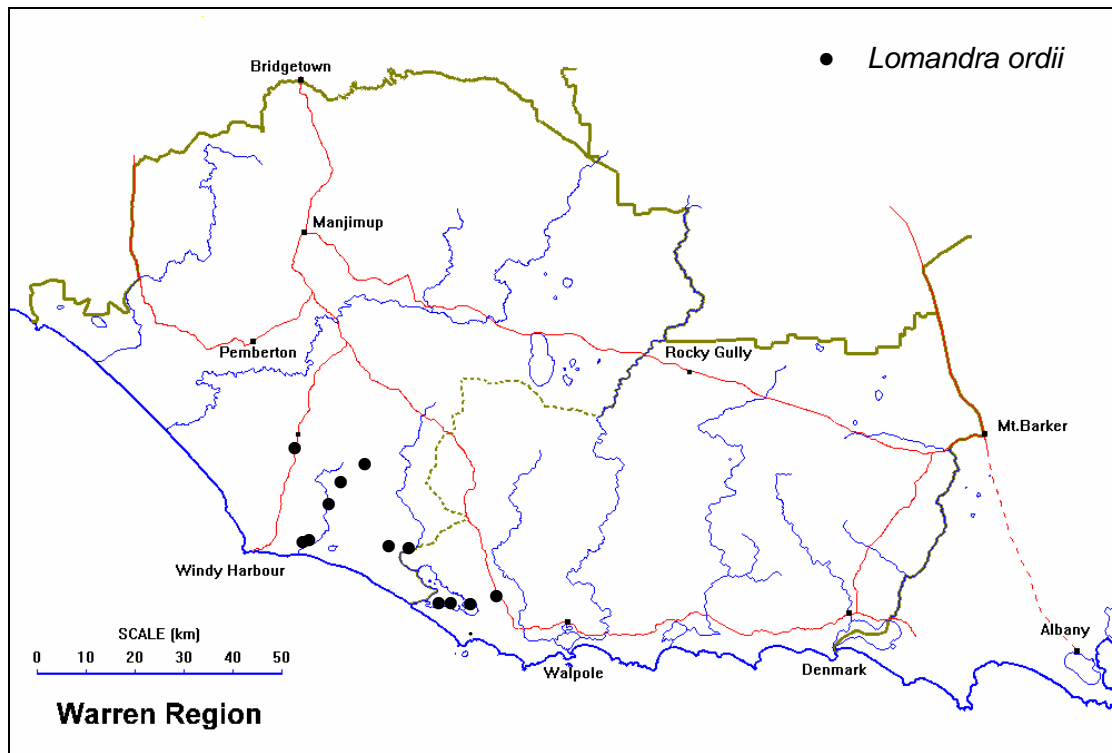
Opportunistically search for further populations in areas of suitable habitat.

### Research Requirements

Determine susceptibility to *Phytophthora* spp.

### References

Lee and Macfarlane (1986)



## *Marianthus sylvaticus* L. Cayzer & Crisp

### PITTOSPORACEAE

WAR F4/148

*Marianthus sylvaticus* was collected near William Bay by C.V. Malcolm in 1984 and again by T. Annels in 1988 during surveys of the Walpole National Park. Although initially placed in *Billardiera coeruleopunctata* the species was later considered by Judy Wheeler to be sufficiently different to represent a new taxon. It was initially given the name *Marianthus* sp. Walpole but has since been described as *Marianthus sylvaticus* (Cayzer and Crisp, 2004). Further collections have extended its known range.

#### Description

*Marianthus sylvaticus* is a twining, climbing shrub to 1.5 m high with alternate, more or less sessile, linear to very narrowly elliptic, entire leaves 20-85 mm long by 3-5 mm wide, the upper surface glabrous and lower surface with a few silky hairs. Flowers, which are in axillary and terminal multi-flowered corymbs, are blue, 12-15 mm across on pedicels 10-15 mm long. Each flower has five free, ciliate, narrowly ovate, acute sepals 2-3 mm long and five free, oblong to spatulate, blue, usually spotted dark blue petals 10-15 mm long that cohere about the middle and spread towards the apex. There are five free stamens. The ovary is superior and glabrous. The single style is about 1 mm long with a small stigma.

The genus *Marianthus* differs from *Billardiera* in having dry fruits rather than succulent black berries. *Marianthus sylvaticus* differs from *M. tenuis* in its glabrous ovary.

Flowering period: April-May

#### Distribution and Habitat

*Marianthus sylvaticus* is found between Walpole and Albany, and north to the Denbarker area, growing in forest and heathland on coarse sandy loams, often over granite or laterite.

#### Conservation Status

Current: Priority 3

Recommended: Priority 4

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	William Bay NP	FRA	NP	na	15/1/1984	
CLM 2	Creek Rd	FRA	NP	<20	12/4/1989	
CLM 3	Mt. Lindesay	FRA	NP	200	16/9/1994	
CLM 4	Mt. Pingerup	FRA	VCL	na	24/4/1989	
CLM 5	Powley Rd	FRA	NP	500	16/9/1994	
CLM 6	Denmark Golf Course	FRA	SHRes	50+	14/4/1996	
CLM 7	Mitchell River	FRA	NP	50	22/5/1996	
CLM 8	Kinkin Rd	DON	SF	na	10/3/1997	
WAR 100	London FB	FRA	NP	70+	2/4/2004	
WAR 101	Happy Valley Rd	FRA	NP	10	27/2/2001	Herbarium record
WAR 102	Talbot Rd	FRA	SF	na	17/4/2000	As above
WAR 104	Collis FB	FRA	PP	na	13/4/2000	As above
WAR 103	Pingerup Rd	FRA	NP	na	13/4/2000	
WAR 105	Trent Rd 1	FRA	SF	na	13/4/2000	
WAR 106	Trent Rd 2	FRA	SF	na	13/4/2000	
WAR 107	Sandy track Rd	FRA	NP	na	13/4/2000	
WAR 108	Collis Rd	FRA	SF	na	13/4/2000	
WAR 109	Granite Rd	FRA	NP	na	13/4/2000	
WAR 110	Board Rd	FRA	RR	na	4/4/2000	
WAR 111	Northumberland FB	FRA	SF	na	4/4/1999	
WAR 112	Claudes Rd	FRA	SF	na	29/5/1998	
WAR 113	Easter Rd	FRA	SF	3	30/4/1998	
WAR 114	Sheepwash SF	FRA	SF	na	27/4/1998	
WAR 115	Bandicoot Rd	FRA	SF	50	20/4/1998	
WAR 116	Sharpe FB	FRA	SF	25	14/4/1998	



WAR 117	Ordnance FB	FRA	SF	15	12/3/1998
WAR 118	Mount Johnston	FRA	NP	na	18/3/1997
WAR 119	Wimballup Swamp	DON	NR	na	18/3/1997

### Response to Disturbance

*Marianthus sylvaticus* is killed by fire and regenerates from soil stored seed.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown but as the species is likely to depend on a seasonally moist environment, it may be vulnerable to climate change.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

### Susceptibility to *Phytophthora Dieback*

Unknown.

### Management Requirements

Resurvey and assess all populations every ten years.

*Marianthus sylvaticus* has been recorded to flower in its second year following fire, indicating a minimum fire cycle of 5-6 years to build up seed reserves.

Monitor populations to determine response to disturbance.

Search areas of suitable habitat for further populations.

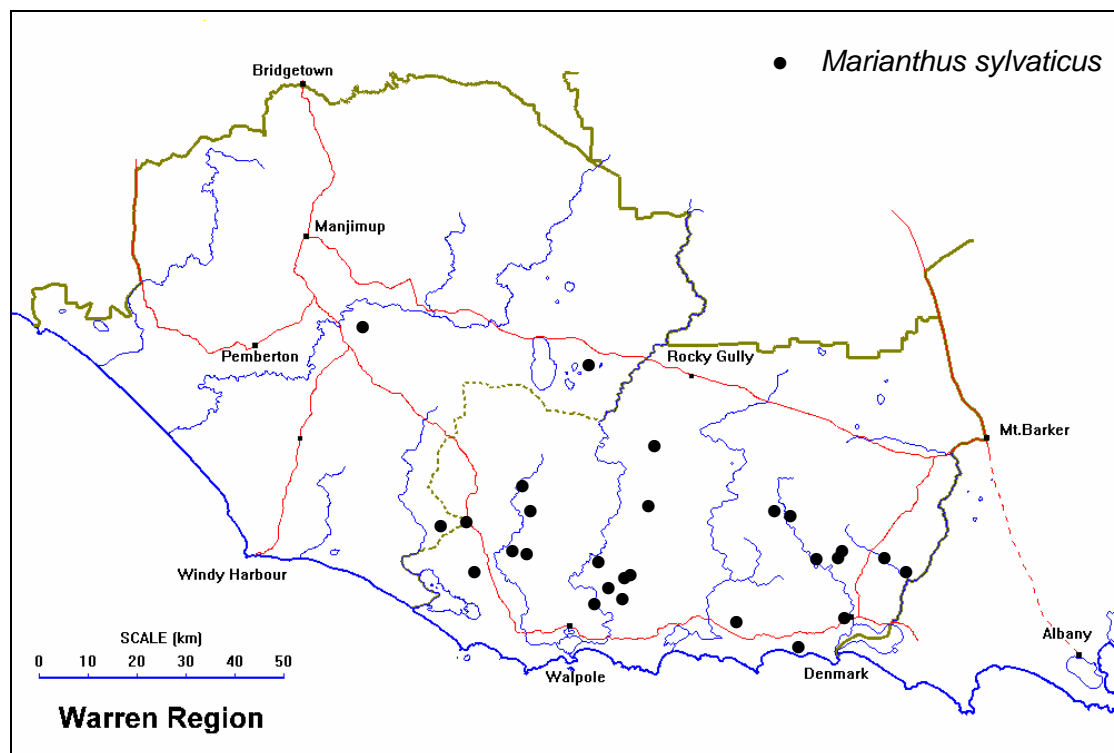
### Research Requirements

Formally describe the species.

Determine susceptibility to *Phytophthora* spp.

### References

Wheeler *et al.* (2002)



## *Meeboldina crassipes* (Pate & Meney) B.G. Briggs & L.A.S. Johnson

### RESTIONACEAE

WAR F4/149

*Meeboldina crassipes* was described by Pate and Meney in 1996 and at that time was placed in the genus *Leptocarpus*. However, as part of a revision of non African restiads, Briggs and Johnson moved the species to *Meeboldina* in 1998. The species was probably previously overlooked as a result of its superficial similarity, similar habit, time of flowering and range to *M. scariosa*. One collection placed in *M. crassipes* appears to be intermediate between the two and may represent a hybrid.

#### Description

*Meeboldina crassipes* is a perennial, dioecious, tufted plant to 1.5 m high with green, ribbed, unbranched stems 1.5-2.5 mm wide and 4-7 mm long and bulbous stem bases covered in brown hairs. The leaves taper to a very fine needle-like point. Male spikelets consist of an open, drooping, brown, multi-flowered inflorescence. The male flowers, which are between 3-6 mm long, have five or six floral segments, enclosed anthers and two to three stamens. The bracts are brown and 1.5-3 mm long. Female spikelets are grey-brown, 4-8 mm long and usually stalkless. Each spikelet is single-flowered and subtended by two bracts. Flowers have white margins and are pointed to shortly awned. The style is three-branched. The fruit is a nut.

*Meeboldina crassipes* is readily separated from the similar *Meeboldina scariosa* by its brown haired, swollen stem bases.

**Flowering period:** Usually summer.

#### Distribution and Habitat

*Meeboldina crassipes* is apparently endemic to the Warren region where it is found growing in association with myrtaceous species, sedges and rushes in sandy and peaty soils in swamps between Kent River and Northcliffe.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Windy Harbour Rd 1	FRA	NP	na	3/5/1991	
CLM 2	Windy Harbour Rd 2	FRA	NP	na	19/1/1992	
CLM 3	Middle Rd	FRA	NP/SF	na	22/2/1996	
CLM 4	Kent River	FRA	RR	na	22/2/1996	
CLM 5	South Coast Hwy	FRA	RR	na	22/2/1996	
CLM 6	Pingerup Rd	FRA/DON	NP	na	24/2/1997	

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#### Response to Disturbance

Populations in peat habitats are at risk from fire during dry or drought periods.

The species re-establishes in disturbed areas if seed or rhizomes are present.

*Meeboldina crassipes* is restricted to sites that contain seasonally shallow water and could be adversely affected by changes in the water table.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements

Liaise with MRWA and the Shire to protect road reserve populations.

Monitor populations every five years.

Opportunistically search areas of suitable habitat for further populations.

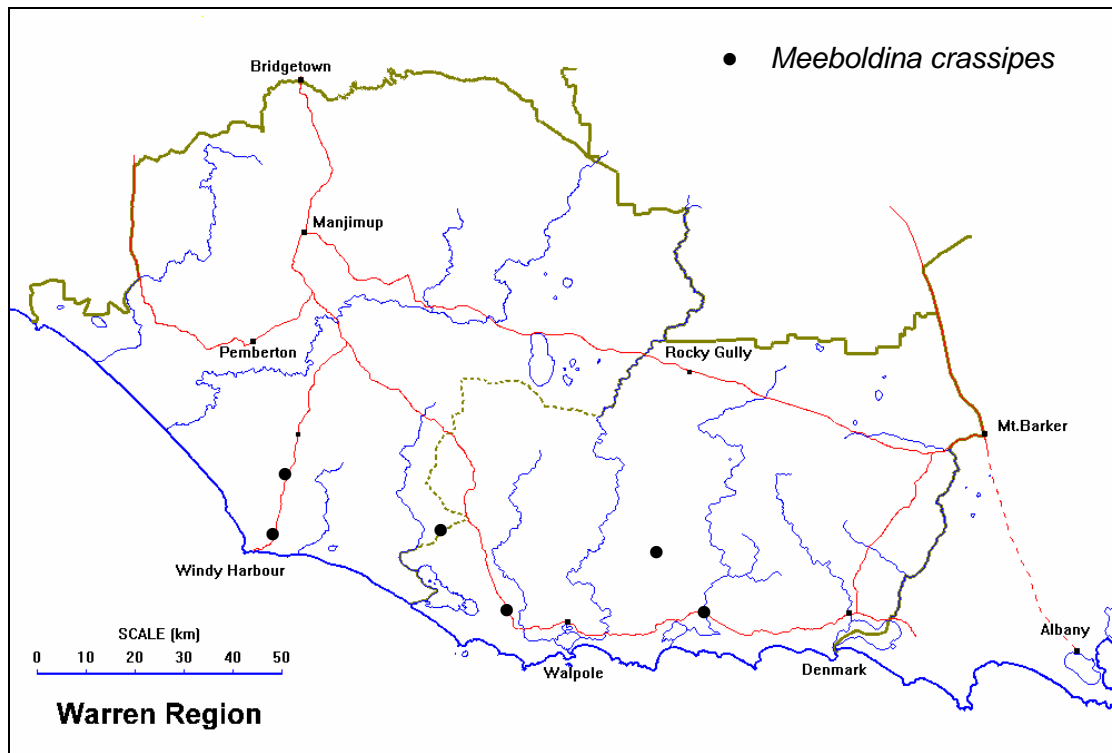
### Research Requirements

Determine response to disturbance.

Determine susceptibility to *Phytophthora* spp.

### References

Wheeler *et al.* (2002); Meney and Pate (1999); Briggs and Johnson (1998); Pate *et al.* (1996)



*Meeboldina thysanantha* L.A.S. Johnson & B. G. Briggs ms

RESTIONACEAE

WAR F4/209

The first recorded collections of *Meeboldina thysanantha* ms were apparently made at Bow River by S.W. Jackson in the summer of 1912/13. It appears the species was then not collected again until 1965 when found near Rocky Gully.

**Description**

*Meeboldina thysanantha* ms is a dioecious perennial herb to 1 m high with a long, thick, creeping rhizome, a sparsely branched, ribbed stem 1-3 mm wide and leaves 5-7 mm long. The leaf sheath is greyish-brown and 7-15 mm long. Plants contain both male and female flowers with the multi-flowered, golden to dark brown male inflorescence drooping, open branched and 3-3.5 mm long. Male flowers have five or six segments, two or three stamens and enclosed anthers. Bracts are ovate, 2-3.5 mm long with a very small point. The female inflorescence is brown in colour and usually sessile with each spikelet single-flowered and subtended by two ovate, white margined bracts 1.5-2 mm long. Female flowers have six fringed floral segments. The style is three-branched. The fruit is a nut.

*Meeboldina thysanantha* ms is distinguished by its creeping rhizome, well-developed leaf blades and brownish female inflorescence.

Flowering period: Spring.

**Distribution and Habitat**

*Meeboldina thysanantha* ms is found between Busselton, the Kent River and Collie, growing in Karri and Jarrah forest along watercourses.

**Conservation Status**

Current: Priority 3

**Known Populations in the Warren Region**

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 4	Kent River	FRA	TR	na	7/10/1984	Unable to relocate
WAR 100	Gardner River	DON	?	na	19/10/1976	As above
WAR 101	Rocky Gully	FRA	RR	na	26/8/1995	As above
WAR 102	Bow River	FRA	?	na	1912	As above
WAR 103	Donnelly River	DON	SF	na	10/11/1998	Not relocated

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**Response to Disturbance**

*Meeboldina thysanantha* ms is probably resilient to fire as it resprouts from the rhizome and is not dependant on seed.

Response to soil disturbance is unknown

The species is restricted to sites containing shallow water and may be adversely affected by changes in the water table.

Response to weed invasion is unknown.

**Susceptibility to Phytophthora Dieback**

Unknown.

**Management Requirements**

Relocate population at Donnelly River

Liaise with MRWA and Shires to protect road reserve populations.

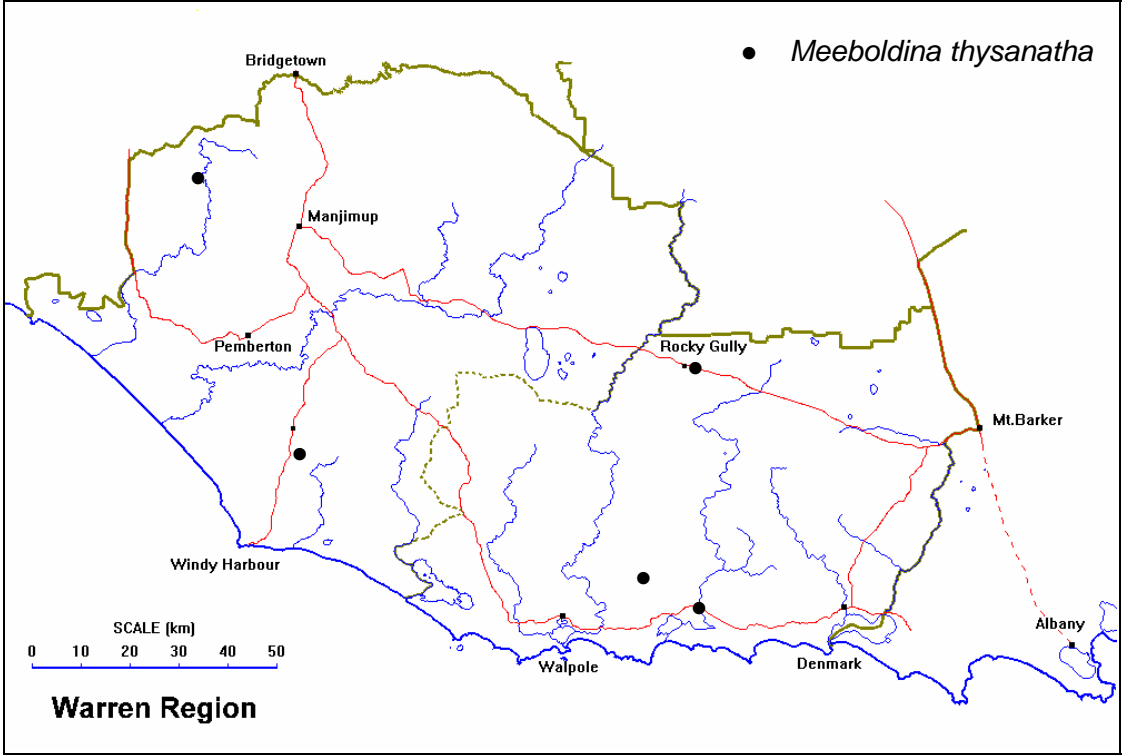
Search areas of suitable habitat for further populations.

**Research Requirements**

Determine response to disturbance.  
Determine susceptibility to *Phytophthora* spp.

**References**

Wheeler *et al.* (2002)



## *Melaleuca diosmifolia* Andrews

### MYRTACEAE

WAR F4/49

*Melaleuca diosmifolia* was described by Andrews in 1807 from material "...sent to us by Mr J. Milne, botanic gardener at Fonthill..." However, there is no reference to the original source of the material or its collector. The single known population in the Warren Region is an outlier well west of the species' main distribution.

#### Description

*Melaleuca diosmifolia* is a small, compact or tall 3 m straggly shrub with grey bark and alternate, crowded, dark green, broadly lanceolate, spreading to patent, densely arranged leaves 7-12 mm long by 2-5 mm wide that are arranged in a compact series of alternate spirals. The inflorescence is subterminal in an elongated cylindric spike 30-120 mm long by 25-40 mm wide. Flowers are sessile, greenish yellow with five sepals 1.5-2 mm long and five petals 3.5-5 mm long that are free above the floral tube. Stamens are indefinite in number and fused into five bundles (one opposite each petal). Staminal bundles are 13-20 mm long, including a claw 3-4.5 mm long. The fruiting spike is cylindric and consists of densely packed individual fruits 8-12 mm wide. Fruit is a three-celled capsule.

Where *Melaleuca diosmifolia* occurs close to *M. ringens* at Deeside but is readily distinguished by its longer inflorescence and leaves and larger fruits.

**Flowering period:** September-November

#### Distribution and Habitat

*Melaleuca diosmifolia* is recorded from scattered populations in the Stirling Range, and coastal areas from the east of Albany to the east of Windy Harbour, growing in shallow loam over coastal granite.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Pt D'Entrecasteaux	DON	NP	na	14/10/1986	Misidentified = <i>M. ringens</i>
CLM 4	West Cliff Pt	DON	NP	100+	20/1/1992	

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#### Response to Disturbance

Resprouts following fire and also regenerates from seed.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements

Relocate and assess threats to the Deeside population.

Monitor every three years.

Search areas of suitable habitat for further populations.

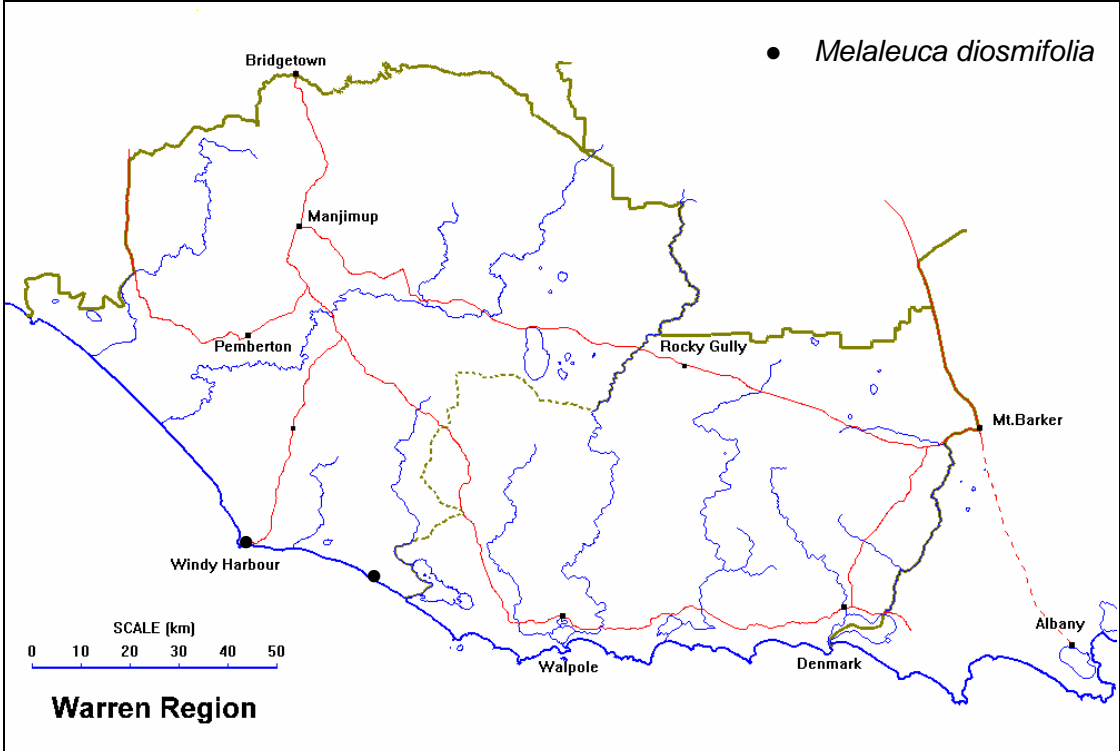
#### Research Requirements

Determine response to disturbance.

Determine susceptibility to *Phytophthora* spp.

**References**

Robinson and Coates (1995); Wheeler *et al.* (2002)



## *Melaleuca micromera* Schau.

### MYRTACEAE

WAR F4/162

*Melaleuca micromera* was described by Schauer in 1844 from material collected from Warriup Hill by Preiss in 1840. The species was subsequently recollected in the same area by Drummond in 1845. Few other collections were made until the 1960's when populations were located in and near the Stirling Ranges and at Mt. Barker. The species was first collected in the Warren Region during field work for this report.

#### Description

*Melaleuca micromera* is a tall shrub to 4 metres high with numerous short slender branches covered in a short close white tomentum that is often concealed by the minute leaves. The leaves, which are ovate, scale like but thick and about 1 mm long, are usually in whorls of three that closely appress the stem. Flowers are creamy yellow in semi globular terminal heads to about 1 cm, the stem growing through into a leafy shoot. *Melaleuca micromera* suckers from its root system forming clumps of several plants together.

**Flowering period:** September-October

#### Distribution and Habitat

*Melaleuca micromera* is found mainly outside of the Warren Region in the Stirling Ranges-Mt. Barker area and Warriup Hill near Albany. In the Warren Region it occurs only in Perup Nature Reserve, growing on a sandy gravel road in open Jarrah forest.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 3	Perup	DON	NR	1	8/10/1998	Root suckering species

#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

#### Susceptibility to Phytophthora Dieback

Unknown.

#### Management Requirements

Monitor population every two years.

In conjunction with South Coast Region, assess all populations and conduct further surveys of suitable habitat to determine its conservation status.

#### Research Requirements

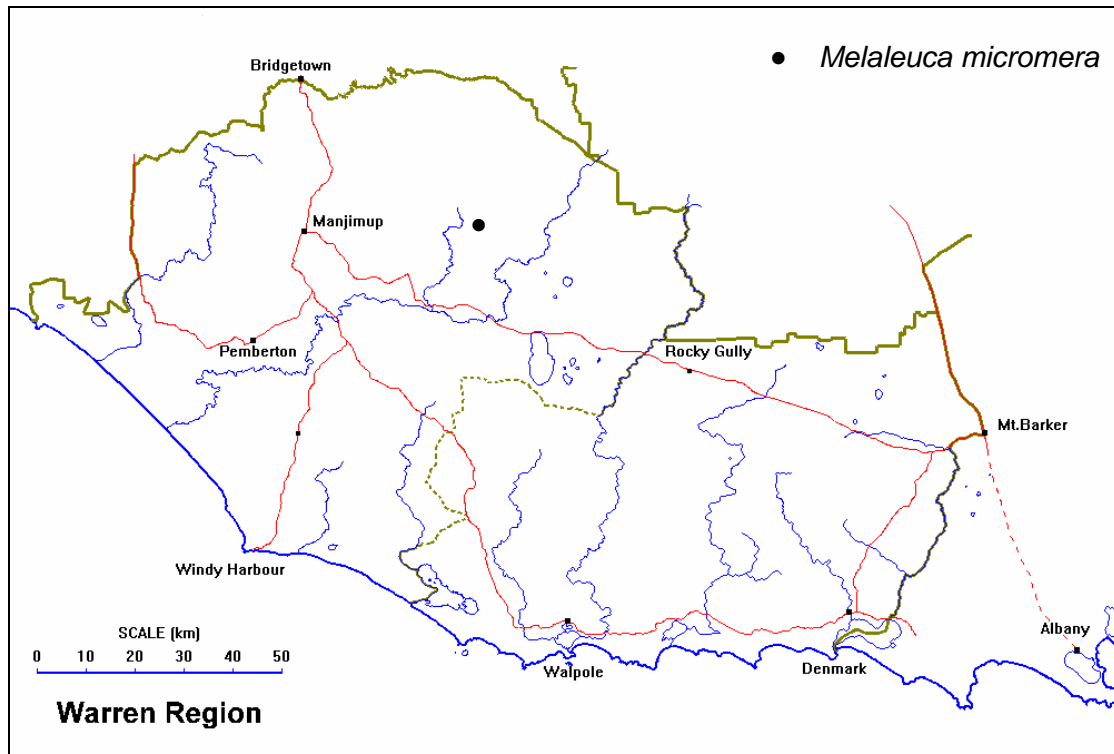
Monitor response to mechanical and fire disturbance in the Perup population. (Population disturbed by grading and fire prior to species identification).

Determine susceptibility to *Phytophthora* spp.

#### References

Bentham (1866); Robinson and Coates (1995)





## *Melaleuca ringens* Barlow

### MYRTACEAE

WAR F4/50

*Melaleuca ringens* was first collected by Ken Newbey in 1968, at which time it was considered to be a form of *M. diosmifolia*. The species was described as distinct by Barlow in 1992. In 1991, two new populations were located between Windy Harbour and Walpole, one by Neil Gibson and Mike Lyons, the other by Tony Annels. A further large population has recently been located just outside Walpole. A collection housed at the Albany Herbarium from south of Albany, has tentatively been placed in *M. ringens*.

#### Description

*Melaleuca ringens* is a tall shrub to 3 m with spirally arranged, densely crowded, spreading, elliptic to ovate leaves 4.5-8.5 mm long by 1.8-3 mm wide, the leaf petiole about 1 mm long. Between ten and sixty flowers are densely arranged in cream, cylindrical terminal spikes 9-30 mm long by about 15 mm wide. Sepals are 0.8-1 mm long and petals are 1.5-2 mm long. Sepals and petals are free above the floral tube. Stamens are joined in the lower part into five bundles, one opposite each petal. Staminal bundles are 5-7 mm long including a basal claw about 1 mm long, each with 7-11 stamens. Fruiting spikes consist of individual fruits 4-7 mm wide with thickened persistent sepals. Fruit is a three-celled capsule.

The Deeside population of *Melaleuca ringens* grows close to *M. diosmifolia* but is distinct from it in its shorter leaves, smaller fruits and shorter inflorescence. It differs from *M. viminea* in its broader leaves and shorter staminal claw and from *M. densa* in its spirally arranged leaves, more numerous stamens and strictly terminal inflorescences.

**Flowering period:** September-October

#### Distribution and Habitat

*Melaleuca ringens* occurs between Walpole and Windy Harbour, growing in shallow sands on exposed coastal limestone formations in heath communities.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 2, 5	Windy Harbour	DON	NP	1000+	16/6/1996	Single population. May be the same population as above.
CLM 3	Coastal Track	DON	NP	na	6/5/1991	
CLM 4	Mandalay	FRA	NP	na	9/10/1991	
CLM 5	Pt. D'Entrecasteaux	DON	NP	na	6/10/1995	
CLM 6	Quarram NR 1	FRA	NR	300	1/6/2002	
CLM 7	Quarram NR 2	FRA	NR	40	7/11/1997	
CLM 8	Quarram NR 3	FRA	NR	100	7/11/1997	
CLM 9	Parry's Beach 1	FRA	NR	40	16/11/1996	
CLM 10	Aldridge Cove	FRA	NR	15	19/11/1996	
WAR 100	Cliffy Head	FRA	NP	1000+	9/11/1999	
WAR 101	Parry Rd	FRA	NP	200	25/9/1999	

#### Response to Disturbance

Regenerates from seed and rootstock following fire.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

## Susceptibility to *Phytophthora Dieback*

Unknown.

## Management Requirements

Search for further populations in areas of suitable coastal habitat between Windy Harbour and Albany.

Monitor known populations every four years and also pre and post disturbance events.

Minimise impact of road construction on the Windy Harbour population.

## Research Requirements

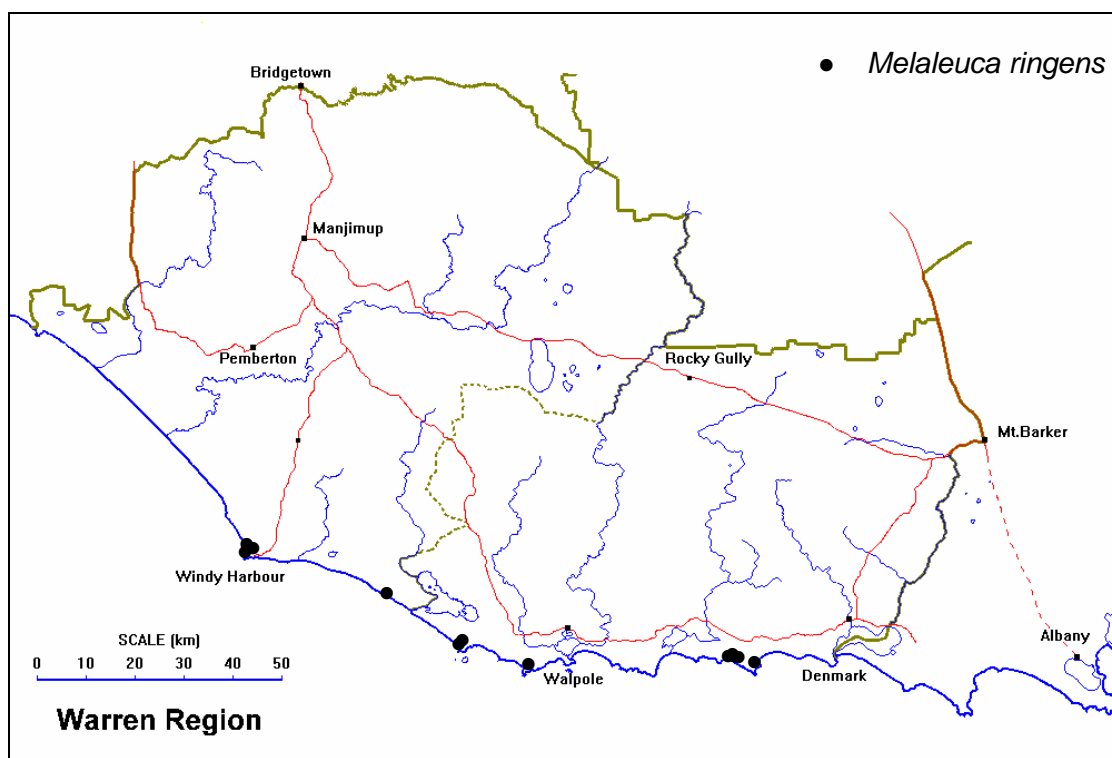
Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

Investigate genetic variability.

## References

Quinn *et al.* (1992); Wheeler *et al.* (2002)



## *Pultenaea pinifolia* Meissner

### PAPILIONACEAE

WAR F4/90

*Pultenaea pinifolia* was described by Meissner in 1848 from a Drummond collection. The two populations found in the Warren Region are quite disjunct from those found in the main distribution of this species in the Busselton-Karridale area.

#### Description

*Pultenaea pinifolia* is a shrub to 3 m high with virgate loosely pubescent or villous branches and alternate, spreading, narrow linear, revolute leaves 12-45 mm long by 1-2 mm wide. Flowers are pedicellate, yellow/orange in loose terminal umbel-like heads. Bracts are acutely lobed and shed early. Bracteoles are narrowly elliptic, entire and midway on pedicels. The calyx is silky pubescent, slightly two-lipped, 5-6 mm long, with acute triangular lobes 1.5-2.5 mm long. The standard is 9-12 mm long.

**Flowering period:** October-November

#### Distribution and Habitat

*Pultenaea pinifolia* is mainly found between Busselton and Karridale with several outliers west of Pemberton. Habitat is marri or bullich woodland on heavy soils in the Busselton area, and sandy heath/scrub on the margins of jarrah forest in the Warren Region.

#### Conservation Status

The species may be at risk from localised extinction due to its susceptibility to *Phytophthora* and the effects of frequent fire regimes, particularly as it occurs in a small area within the region.

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 4	Ritter Rd 1	DON	SF	200	20/10/1994	Phytophthora affected
WAR 100	Charley Rd	DON	SF	400+	9/2/2004	Population along road. Seed probably spread by grader
WAR 101	Ritter Rd 2	DON	SF	100+	9/2/2004	
WAR 102	Charley Lake	DON	SF	300+	23/10/2000	
WAR 103	Charley Rd 2	DON	SF	40+	9/2/2004	
WAR 104	Fly Brook Rd	DON	SF	na	23/10/2000	

#### Response to Disturbance

Species germinates from soil stored seed post fire.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Appears highly susceptible, based on field observations.

#### Management Requirements

Make further collections from Warren populations.

Monitor every three years and also prior to and following disturbance events.

Search areas of suitable habitat for further populations.

Collect seed for storage.

Fire regimes need to take into account a minimum time for the species to set seed and develop a soil seed bank.

### Research Requirements

Determine response to disturbance.

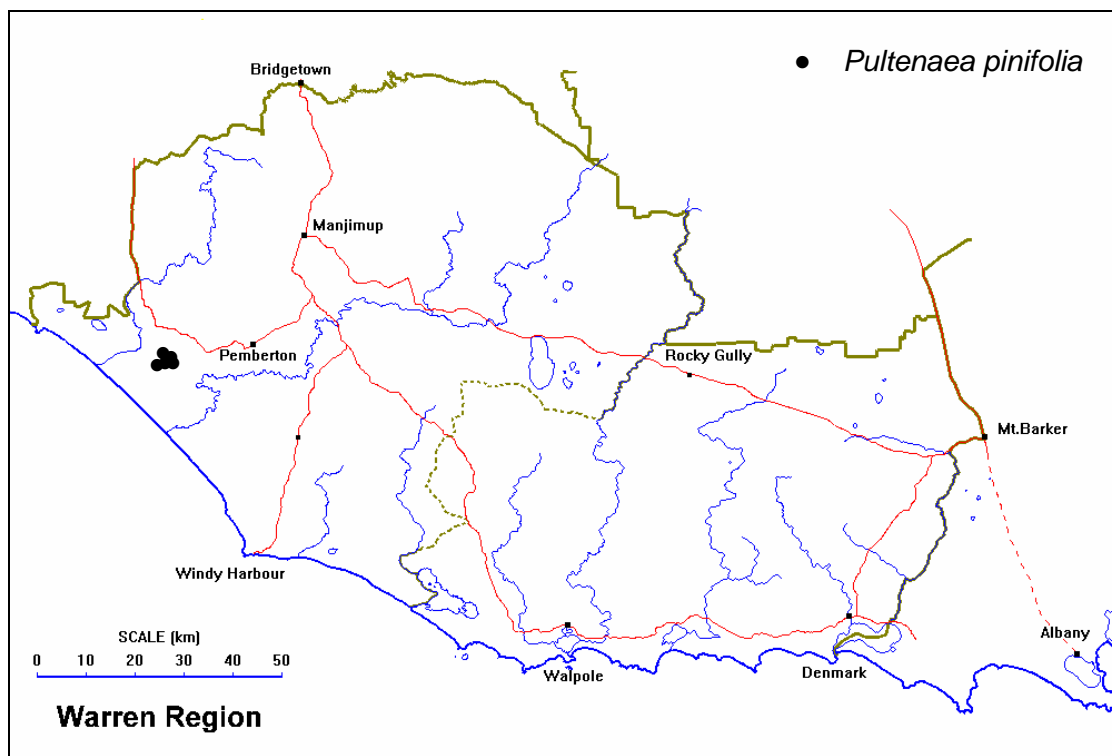
Determine susceptibility to *Phytophthora* spp.

Determine the size of the soil seed bank.

Investigate the interaction between fire frequency, *Phytophthora* and recruitment.

### References

Bentham (1864); Wheeler *et al.* (2002)



## *Sphenotoma parviflorum* (Benth.) F. Muell.

### EPACRIDACEAE

WAR F4/135

*Sphenotoma parviflorum* was described as a species of *Dracophyllum* by Bentham in 1868 from collections made at Thomas River and Cape Le Grand by Maxwell and moved to *Sphenotoma* by Mueller in 1883. It is a poorly collected species that, until recently, appeared uncommon.

#### Description

*Sphenotoma parviflorum* is a slender erect, usually single stemmed shrub to 0.5 m high with spreading, subulate, ciliate, acute, spreading leaves 7-15 mm long by about 1 mm wide. The leaves are clustered and confined to the lower part of stem with the upper leaves of flowering shoots erect and appressed to the stem. The inflorescence is comprised of a few small white flowers. The bract is ovate and 5-7 mm long. Sepals are narrowly ovate to ovate and about 5 mm long. The corolla is 6-8 mm long with lobes 2-3 mm long.

*Sphenotoma parviflorum* differs from other local *Sphenotoma* species in its corolla lobes being shorter than the tube.

**Flowering period:** October-November

#### Distribution and Habitat

*Sphenotoma parviflorum* is found in scattered localities between Busselton/Augusta, Albany and Esperance. In the Warren Region it is found in the Denmark and Northcliffe areas, growing on seasonally damp sandy soils in woodland, shrubland and heath.

#### Conservation Status

Current: Priority 3

Recommended: Priority 4

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Mt. Lindesay 1	FRA	NP	200	2/9/1997	
CLM 2	McIntosh NR	FRA	NR	1000	24/9/1994	
CLM 3	McIntosh Rd	FRA	RR	500	24/9/1994	
CLM 4	Mt. Lindesay 2	FRA	SF	20	20/11/1995	
CLM 5	Saw Rd	FRA	SF	100	4/10/1996	
CLM 7	Granite Rd	FRA	SF	0	1/2/1980	Not relocated
CLM 8	Stan Rd	FRA	SF	na	13/11/1985	
CLM 9	Northumberland Rd	FRA	SF	na	2/11/1980	
CLM 10	One Rd	FRA	SF	na	15/10/1991	
WAR 100	Zamia St Park	DON	SHRes	5	1/11/2003	Herbarium record only
WAR 101	Ficifolia Rd	FRA	NP	na	5/11/2001	
WAR 102	Romance Rd	FRA	SF	<100	23/10/2000	
WAR 103	Stan Rd/Sandy Track	FRA	SF	100+	24/11/1999	
WAR 104	Break Rd	FRA	SF	500+	18/11/1999	
WAR 105	Centre Break Rd	FRA	SF	500+	16/11/1999	
WAR 106	Parker Rd	FRA	TR	500+	13/11/1999	
WAR 107	Break Rd	FRA	SF	200+	9/11/1999	
WAR 108	Tindale Rd	FRA	RR	na	29/10/1999	
WAR 109	William Bay NP	FRA	NP	<50	18/10/1999	
WAR 110	Old Railway Reserve	FRA		50	13/10/1999	
WAR 111	South West Hwy	FRA	SF	12	5/10/1999	
WAR 112	Inlet FB	FRA	SF	1	4/10/1999	
WAR 113	Pingerup FB	FRA	SF	10	4/10/1999	
WAR 114	Basin Rd	FRA	River R	100+	22/10/1998	
WAR 115	Ritter Rd	DON	SF	na	25/11/1997	
WAR 116	Northumberland Rd 2	FRA	SF	50+	17/10/1997	
WAR 117	Bell Brook Swamp	FRA	NP	na	6/10/1997	
WAR 118	Nutcracker Rd	FRA	SF	30	16/12/1998	

### Response to Disturbance

Plants are killed by fire and are dependent on the soil seed bank for regeneration.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

### Susceptibility to *Phytophthora Dieback*

Unknown, but given the susceptibility of other taxa in the family, should be managed as if susceptible.

### Management Requirements

Locate and assess all populations.

Monitor populations every two years.

Search areas of suitable habitat for further populations.

### Research Requirements

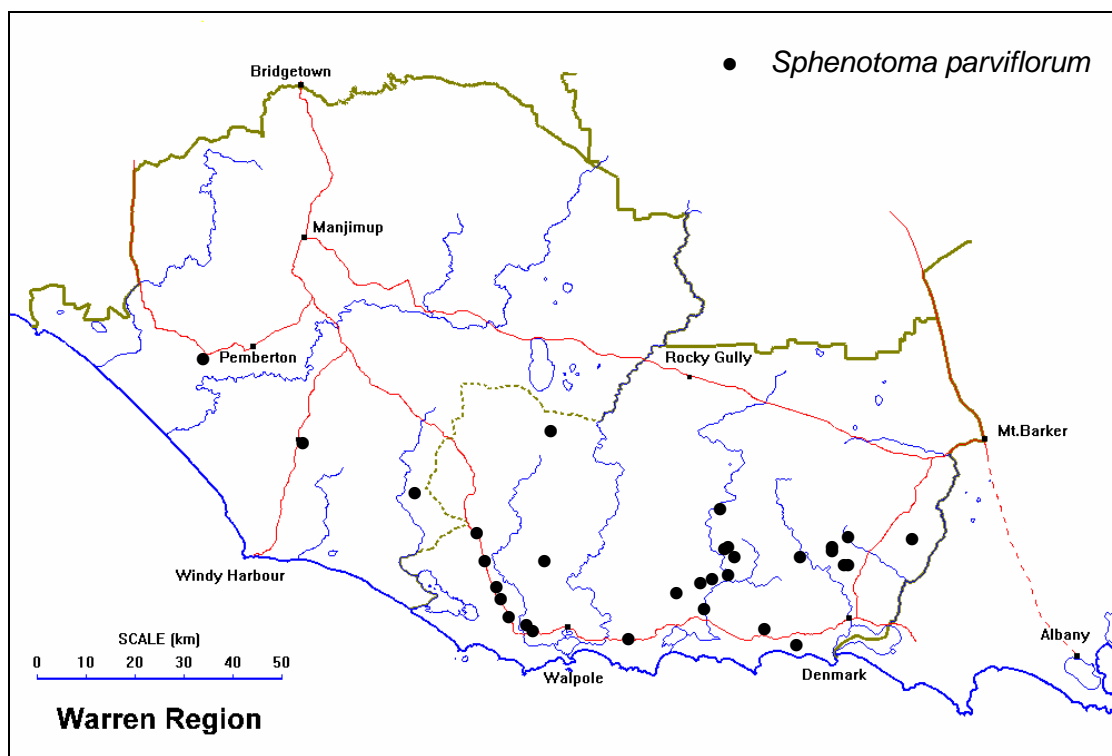
Determine response to disturbance.

Determine susceptibility to *Phytophthora* spp.

Determine seed bank longevity.

### References

Bentham (1869); Robinson and Coates (1995)



## *Stirlingia divaricatissima* A.S. George

### PROTEACEAE

WAR F4/156

*Stirlingia divaricatissima* is a Regional endemic that was described by Alex George in 1995 from an old collection made "20 miles N of Bow Bridge, N of Peaceful Bay". However, recent searches in habitat that fits the locality description have only revealed populations of *S. tenuifolia*. A second collection has since been made from north of Walpole where the majority of populations are known.

#### Description

*Stirlingia divaricatissima* is a single or multi-stemmed shrub to 2 m tall with soft 12-14 cm long leaves on the lower part of the stem, the lamina divaricately divided up to ten times with ultimate, very slender segments 2-4 mm long. Flowers are in heads about 9 mm in diameter on a sparsely branched scape to 1 m high with each flower subtended by an ovate bract to 1.5 mm long. The perianth is 4.5-5 mm long, the limb broader than the tube.

*Stirlingia divaricatissima* differs from *S. tenuifolia* in its longer petiole, smaller heads and longer bracts.

**Flowering period:** October-November

#### Distribution and Habitat

The species is currently known from northwest and east of Mt. Frankland, growing in sandy soils on moist sites under jarrah. A cluster of populations along Nicol Rd may be the result of seed being spread during road works.

#### Conservation Status

Extensive road and foot traverses have been conducted through and adjacent to the known distribution area by several of the authors of this Program and members of the Warren Region Threatened Flora Recovery Team in an attempt to find further populations. However, no further populations have been located.

Current: Priority 3

#### Known Populations in the Warren Region

Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Nicol Rd 1	FRA	NP	na	29/11/1995	
CLM 2	Nicol Rd 2	FRA	SF	na	29/11/1995	
CLM 3	Nicol Rd 3	FRA	SF	na	22/8/2002	Possible sub-population that requires resurvey
CLM 4	Johnston Rd 1	FRA	NP	1000+	17/4/1997	
CLM 5	Johnston Rd 1	FRA	NP	1000+	17/4/1997	
WAR 100	Nicol Rd 4	FRA	NP	1000+	13/10/1999	
WAR 101	Bandicoot Rd	FRA	SF	500+	25/9/2002	
WAR 102	Styx FB 1	FRA	SF	1000+	13/10/2001	Misidentified (possibly <i>S. tenuifolia</i> ). Requires checking by A. George
WAR 103	Nutcracker Rd	FRA	SF	100+	12/2/1997	As above
WAR 104	Nornalup Rd	FRA	SF	52	18/11/1997	As above
WAR 105	Timberjack Rd	FRA	SF	148	17/12/1996	As above
WAR 106	Break Rd	FRA	SF	19	28/10/1997	As above
WAR 107	Styx FB 2	FRA	SF	500+	28/10/1997	As above
WAR 108	Nornalup Rd 2	FRA	SF	0	29/11/1995	1970 collection made by Boyd but not relocated

#### Response to Disturbance

Plants are killed by fire and are probably dependant upon soil stored seed for regeneration.



The presence of the species on the disturbed road verge indicates that it is likely to germinate following disturbance.

The response to changes in soil moisture is unknown but as the species is associated with wet sites significant changes are likely to have a detrimental effect.

Response to weed invasion is unknown.

Response to change in canopy cover is unknown.

### **Susceptibility to *Phytophthora* Dieback**

Appears to be susceptible to *Phytophthora*.

### **Management Requirements**

Monitor populations every two years and both before and following disturbance.

Conduct searches in areas of suitable habitat for new populations.

Confirm identification of populations WAR 102 to 107.

### **Research Requirements**

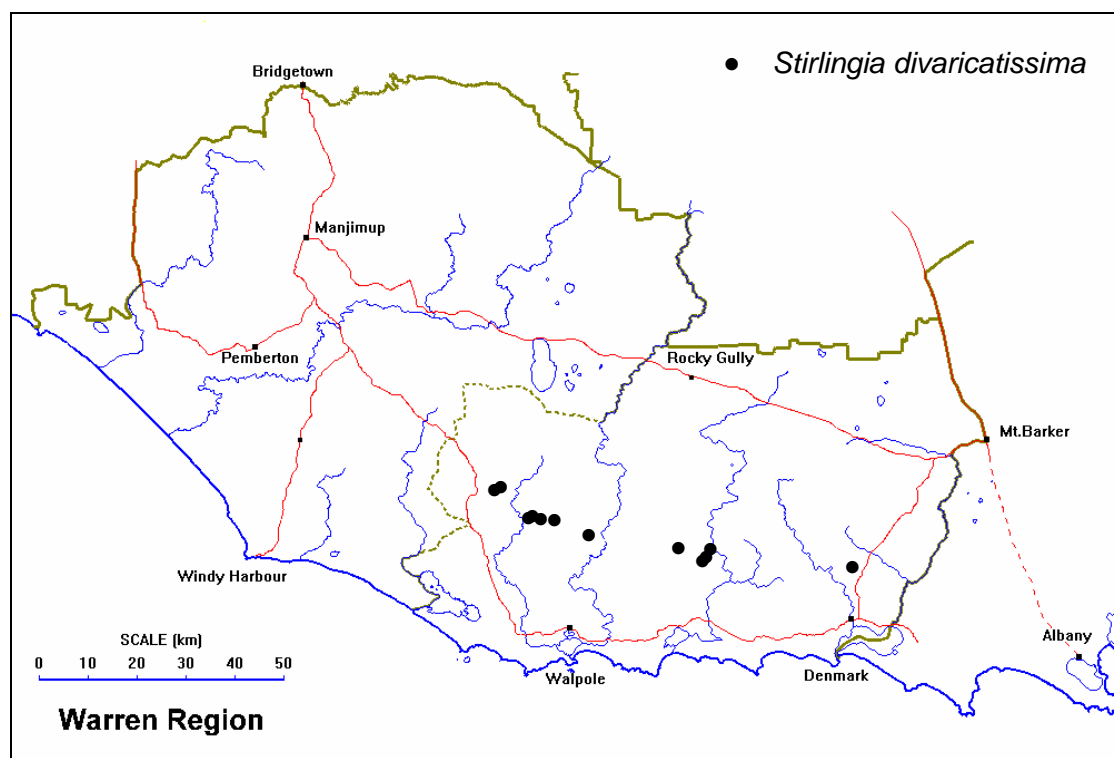
Determine response to disturbance.

Determine susceptibility to *Phytophthora* spp.

Investigate the soil seed bank longevity.

### **References**

George (1995a)



## *Stylidium rhipidium* F.L. Erickson & J.H. Willis

### STYLIDIACEAE

Fan Trigger plant

WAR F4/33

*Stylidium rhipidium* was collected by Rica Erickson from south of Williams in 1952 and described by F.L. Erickson and J.H. Willis in 1956. It has since been found over a wide range, mostly through the wheatbelt, but is very poorly collected. Despite extensive searches of suitable habitat in the Warren Region over a two year period, only one previously recorded population was relocated and no further populations found. The taxon is in need of urgent coordinated survey work across its range to clarify its conservation status.

#### Description

*Stylidium rhipidium* is a small slender, slightly glandular-hairy annual about 50 mm tall with few smooth, slightly thickened, reddish, oblong leaves in a basal rosette and a dark coloured, very slender scape with two or more bracts. Plants have 1-2 flowers with a greenish red oblong, twisted calyx, the lobes slightly shorter than the tube and the total length under 5 mm. The corolla is white and fan shaped, the longest petals 5-6 mm long and the lesser petals about 2 mm long. There are six clearly visible throat appendages.

**Flowering period:** August-November

#### Distribution and Habitat

*Stylidium rhipidium* is recorded over a wide range between Collie, Williams, Arthur River, Merredin, Hyden, Cranbrook, Rocky Gully and Lake Muir. Habitat is reedy creek flats, run-off areas around granite outcrops and low swamps, in soils that are subject to saturation and shallow inundation. Flowering occurs as water levels drop.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 4 a	Lake Muir 1	DON	RR	25	18/10/1994	
CLM 4 b	Lake Muir 2	DON	RR	50+	24/11/1994	
WAR 100	Frankland River?	FRA/DON	?	0	24/11/1994	No plants found

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#### Response to Disturbance

Response to fire is unknown.

Records indicate that most collections have been from severely disturbed sites.

Response to change in soil moisture is unknown, but the species appears to germinate, develop and flower as local inundation recedes. It is probably therefore susceptible to changes in hydrology and rainfall.

Response to weed invasion is unknown.

#### Susceptibility to *Phytophthora Dieback*

Unknown.

#### Management Requirements

Monitor population annually.

Search for Frankland River population.

Search areas of suitable habitat for further populations.

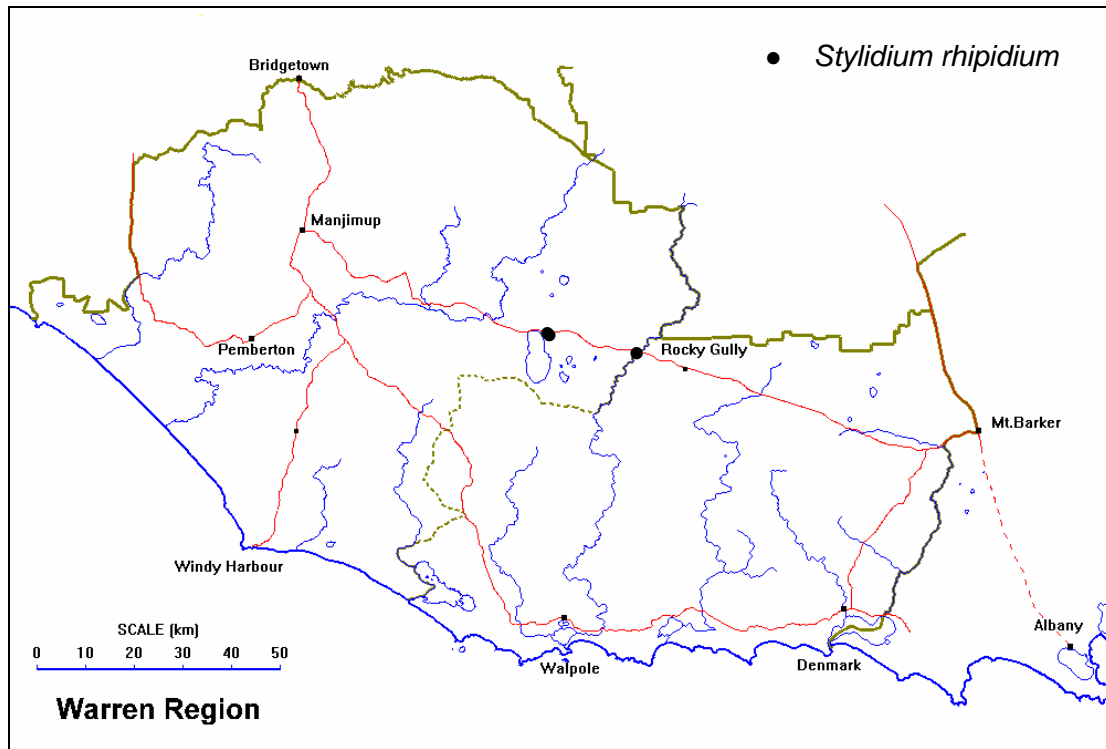
#### Research Requirements

Determine susceptibility to *Phytophthora* spp.

Determine response to disturbance.

### References

Erickson (1958)



## *Synaphea intricata* A.S. George

### PROTEACEAE

WAR F4/199

*Synaphea intricata* is a recently described species that in the past has been treated as a form of *S. polymorpha*. The species occupies an ecotone that is linear in nature (i.e. wetland/riverine habitat) that is intersected by roads. What are currently mapped as populations may in practice represent fewer real populations on the ground

#### Description

*Synaphea intricata* is a small shrub with stems to 50 cm long and appressed-pubescent, glabrescent, tripinnate, divaricate, multiplanar leaves 2-4 cm long by 4-7 cm wide, the linear ultimate lobes 0.5-1.5 mm wide and dentate, pungent. The leaf petiole is 0.5-1.5 cm long, puberulous and glabrescent. Inflorescences grow to 7 cm long with the flowers crowded and on a peduncle to 1 cm long. Bracts are ovate, obtuse and 1.5-2 mm long. The glabrous perianth opens narrowly with an adaxial tepal about 5 mm long by 2 mm wide and the abaxial tepal 4-4.5 mm long. The stigma to 0.9 mm long by 0.4 mm wide is oblong, emarginate, thick and slightly constricted in the middle. The ovary is pubescent.

*Synaphea intricata* differs from *S. polymorpha* in its smaller dimensions and more slender appearance. It also has less divided leaves with broader lobes, larger flowers and a more rounded, larger stigma.

**Flowering Period:** September-November

#### Distribution and Habitat

*Synaphea intricata* is endemic to a range of twenty to thirty kilometres between the Frankland and Kent Rivers, growing in moist sandy soil in Jarrah forest and heath, usually on the lower slopes of hills. The species has an area of overlap with *S. polymorpha* at the confluence of the Styx and Kent River.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	Northumberland Rd	FRA	SF	na	22/11/1980	
CLM 2	Nornalup Rd 1	FRA	SF	na	22/10/1993	
CLM 3	Nornalup Rd 2	FRA	SF	na	22/10/1993	
CLM 4	Boronia Rd 1	FRA	SF	na	22/10/1993	
CLM 5	Nornalup Rd 3	FRA	NP	na	8/10/1996	
CLM 6	Nornalup Rd 4	FRA	NP	na	6/11/1963	
CLM 7	Fernley Rd	FRA	SF	na	6/11/1996	
CLM 8	Nornalup Rd 5	FRA	SF	na	6/11/1996	
CLM 9	Nornalup Rd 6	FRA	SF	na	9/11/1996	
WAR 100	Break Rd 1	FRA	SF	950	30/11/1998	
WAR 101	Romance Rd	FRA	SF	50	12/8/1998	
WAR 102	Basin Rd	FRA	SF	1000+	17/10/2001	
WAR 103	Mountain Rd	FRA	NP	200+	18/10/2001	
WAR 104	Roe Rd	FRA	SF	50+	8/12/1997	
WAR 105	Bevan Rd	FRA	SF	50	9/12/1997	
WAR 106	Break Rd 2	FRA	SF	20	12/8/1998	
WAR 107	London FB	FRA	SF	1	1/10/1998	
WAR 108	Nornalup Rd 7	FRA	SF	1000+	18/11/1997	
WAR 109	Nornalup Rd 8	FRA	NP	100+	18/11/1997	
WAR 110	Boronia Rd 2	FRA	SF	15	17/12/1997	
WAR 111	Boronia Rd 3	FRA	SF	12	17/12/1997	

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#### Response to Disturbance

Plants are killed by fire and are dependant upon soil stored seed for regeneration.

Scattered populations along Nornalup Rd (between Roe Rd and Bevan Rd) and in the Boronia/Nornalup Rd area, indicate possible spread due to road works (i.e. graders).

The species is vulnerable to changes in hydrology and climate.

Response to weed invasion is unknown.

### **Susceptibility to *Phytophthora Dieback***

The species is susceptible and vulnerable to local population extinctions.

### **Management Requirements**

Relocate all populations vouchered at the Western Australian Herbarium and assess their conservation status.

Search areas of suitable habitat for further populations.

Collect seed for long term conservation storage.

Remap all known populations.

Monitor populations for negative effects to changes in rainfall and drainage.

Monitor populations for *Phytophthora* and treat with phosphite.

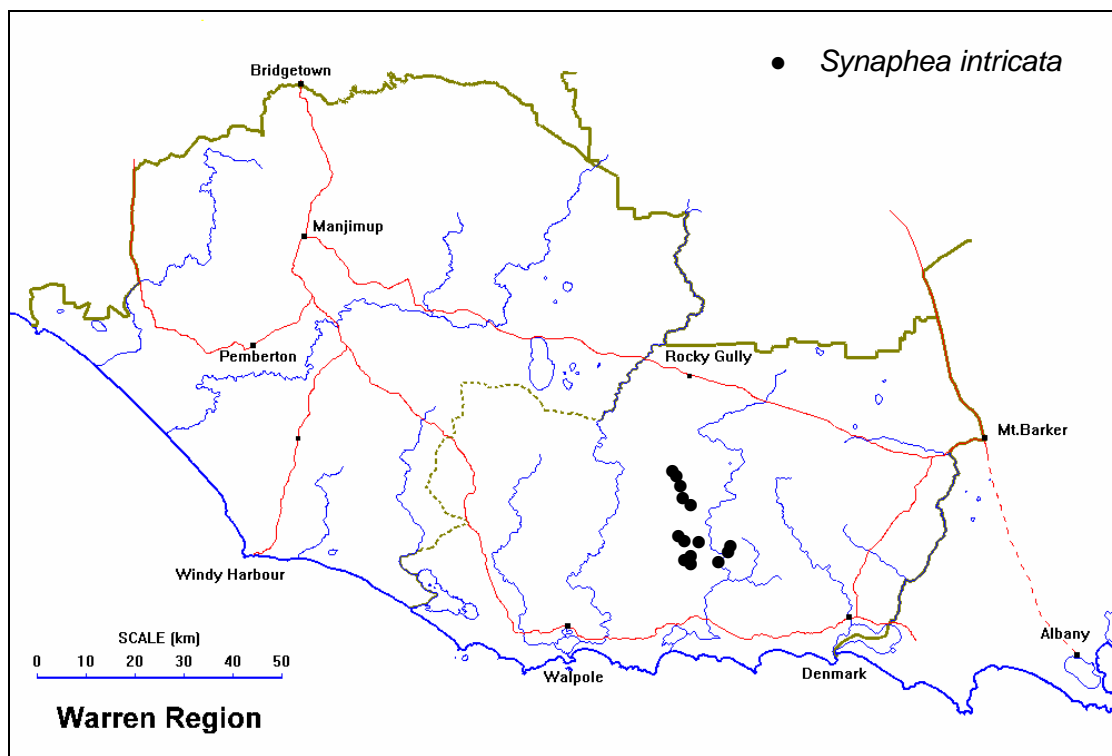
### **Research Requirements**

Determine response to disturbance.

Determine soil seed bank longevity.

### **References**

George (1995b)



## *Synaphea preissii* Meissner

### PROTEACEAE

WAR F4/200

*Synaphea preissii* was described by Meissner in 1845 from a collection made at Princess Royal Harbour by Preiss in 1840, with few further collections then made before the 1980's. Distribution appears to be centred on the Redmond-Narrakup area with a few records in the Warren.

#### Description

*Synaphea preissii* is an erect shrub 15-50 cm high with stout appressed, tomentose stems to 13 cm long and tripartite, multiplanar leaves 3-8 cm long, the leaf lobes usually tripartite. The petiole is 2-7 cm long and glabrous. Inflorescences are 2-6 cm long with widely spaced pubescent to puberulous flowers that open widely. The adaxial tepal is 6-6.5 mm long by about 2-2.5 mm wide and the abaxial tepal is about 6 mm long. The rachis is pubescent with pubescent, spreading bracts 2 mm long. The stigma is thick, emarginate, oblong to narrowly obcordate, slightly constricted in middle and about 1.5 mm long by 1 mm wide. The ovary is pubescent.

Flowering period: July-November

#### Distribution and Habitat

*Synaphea preissii* is found in an area encompassed by Denmark, Albany, Mount Barker and the Stirling Ranges with outliers in the Wickepin and Rocky Gully-Frankland areas, growing in sandy soils (occasionally gravels) in forest and heath communities.

#### Conservation Status

Current: Priority 3

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
WAR 100	Perillup	FRA	SHRes	na		1980 collection. Not relocated
WAR 101	Tonebridge	DON	NR?	na		1993 collection. Not relocated

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#### Response to Disturbance

Response to fire is unknown.

Response to soil disturbance is unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown, but given the susceptibility of most proteaceous species to *Phytophthora*, should be treated as susceptible.

#### Management Requirements

Relocate Perillup and Tonebridge population and assess their conservation status.

Search areas of suitable habitat for further populations.

Monitor populations every three years and also before and following disturbance.

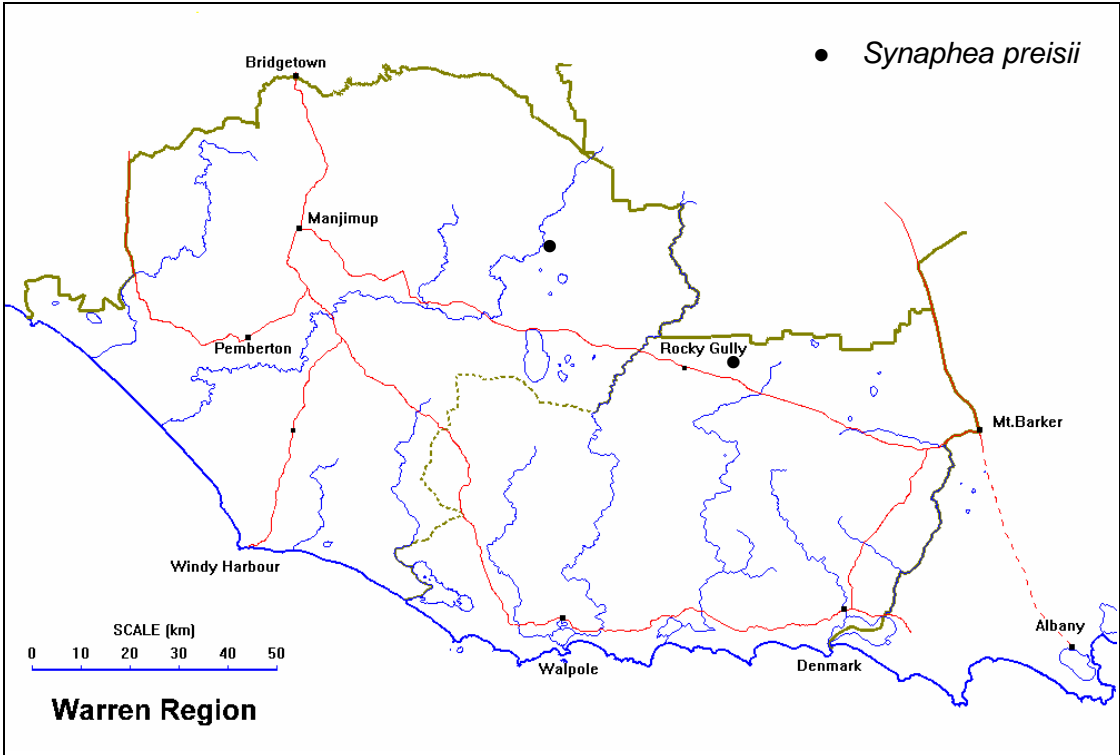
#### Research Requirements

Determine response to disturbance.

Determine susceptibility to *Phytophthora* spp.

#### References

George (1995b)



## *Thelymitra jacksonii* Hopper et A.P. Br. ex Jeanes ms

### ORCHIDACEAE

Jackson's Sun Orchid

WAR F4/17

*Thelymitra jacksonii* ms was originally considered a form of *Thelymitra stellata* but is now recognised as a distinct species. It is named after the late Bill Jackson of Walpole who made the first collections in 1988 and acknowledges his enormous contribution to the knowledge of Western Australian orchids.

#### Description

*Thelymitra jacksonii* ms is a sun orchid 15-45 cm tall with a single broad, ovate leaf and two to twelve golden brown flowers. Sepals are 23-27 mm long by 8-10 mm wide with a central longitudinal pale stripe or band. Petals are similar in size and shape but have dark brown margins and are often spotted and blotched. The column is adorned with a thick apical projection and has fringed wings.

*Thelymitra jacksonii* ms is related to *T. benthamiana* and *T. fuscolutea* but flowers a month later than the former and can be readily separated from both by its larger darker-coloured flowers with orange column lobes and its noticeably spicy odoured flowers.

**Flowering period:** December-January (early)

#### Distribution and Habitat

*Thelymitra jacksonii* ms has a very restricted distribution, known from a few sites north of Walpole, growing in sandy-clay soils over clay, under low Jarrah woodland upslope and fringing winter wet swamps and depressions.

#### Conservation Status

Several populations have not been found for several years and further loss may prompt referral for listing as DRF.

Current: Priority 3

#### Known Populations in the Warren Region

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Pop. No.	Location	District	Land status	No. of plants	Last survey	Comments/condition
CLM 1	South West Hwy 1	FRA	NP	0	14/1/2004	
CLM 2	South West Hwy 2	FRA	SF	0	15/12/1995	
CLM 3	South West Hwy 3	FRA	NP	0	14/1/2004	
CLM 4	Aircraft Rd	FRA	NP/SF	7	15/12/1995	
CLM 5	Mt. Pingerup Track 1	FRA	NP	na	23/12/1989	
CLM 6	South West Hwy 4	FRA	SF	1	28/12/1993	
CLM 7	South West Hwy 5	FRA	SF	na	27/12/1995	
CLM 8	South West Hwy 6	FRA	NP	na	27/12/1995	
WAR 101	Aircraft Rd	FRA	NP	na	15/12/1995	

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#### Response to Disturbance

Flowering appears to be enhanced in the season following summer fire with plants not recorded in subsequent years.

Unknown.

Response to change in soil moisture is unknown.

Response to weed invasion is unknown.

Response to change in canopy is unknown.

#### Susceptibility to *Phytophthora* Dieback

Unknown.

#### Management Requirements



Monitor populations annually.

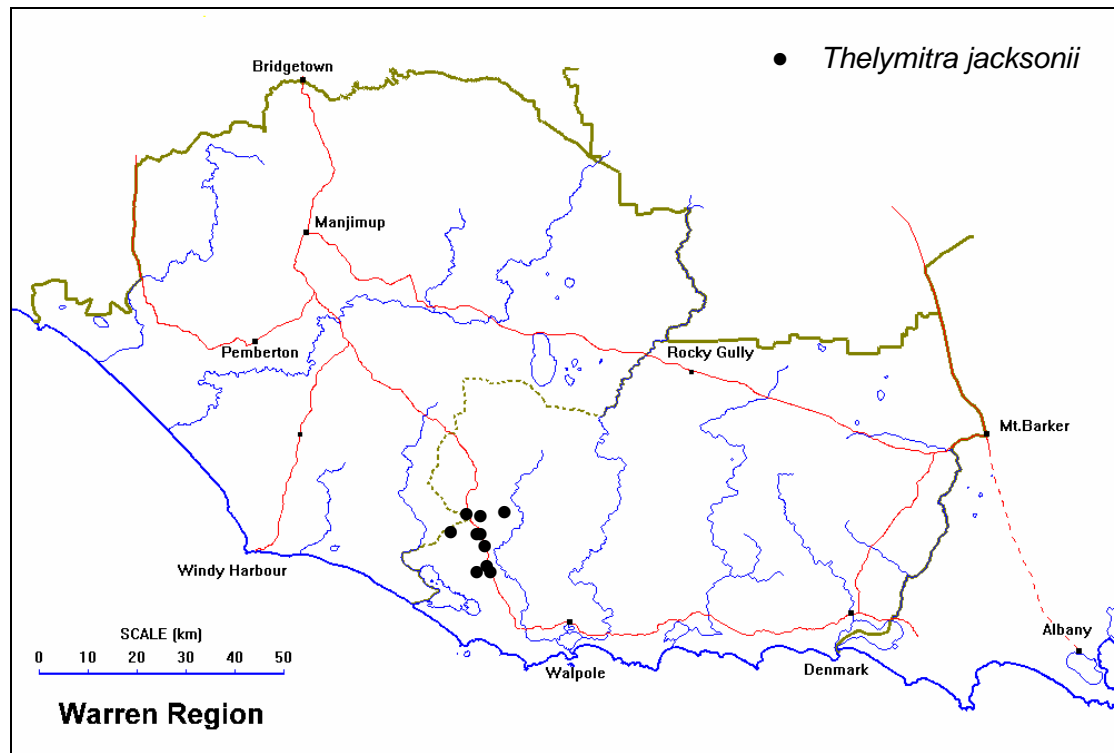
Search areas of suitable habitat for further populations.

### Research Requirements

Determine susceptibility to *Phytophthora* spp.

### References

Hoffman and Brown (1992); Jeanes (in press)



#### 4. PRIORITY FOUR SPECIES

##### Priority Four: Rare Species

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.

This Management Program does not consider these species in any detail, but it is expected that priority four species should be monitored every 5–10 years.

<i>Asplenium aethiopicum</i>	<i>Lysinema lasianthum</i>
<i>Astartea</i> sp. Scott River (D Backshall 88233)	<i>Melaleuca basicephala</i>
<i>Astroloma</i> sp. Nannup (RD Royce 3978)	<i>Microtis media</i> subsp. <i>quadrata</i>
<i>Caladenia interjacens</i>	<i>Microtis pulchella</i>
<i>Caladenia plicata</i>	<i>Pleurophascum occidentale</i>
<i>Corybas limpidus</i>	<i>Reedia spathacea</i>
<i>Drosera fimbriata</i>	<i>Schoenus natans</i>
<i>Dryandra serra</i>	<i>Sollya drummondii</i>
<i>Grevillea ripicola</i>	<i>Tripterooccus brachylobus</i> ms
<i>Hypocalymma cordifolium</i> subsp. <i>minus</i> ms	<i>Tyrbastes glaucescens</i>
<i>Leucopogon tamariscinus</i>	<i>Villarsia submersa</i>

##### Priority Five: Conservation Dependent Species

Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

There are currently no Priority five species known from the Region.

## **PART FOUR - THE PLAN FOR MANAGEMENT**

### **1. DETERMINING PRIORITIES**

#### **Declared Rare Flora**

Based on assessment of DRF against IUCN Criteria and CALM's Ranking Policy 50 (now incorporated in Policy 9), taxa that receive the highest priority for recovery are those that are ranked as Critically Endangered (CR) followed by Endangered (EN) and Vulnerable (VU). Within each of these categories Table 1 can be used as a guide to priorities for research and management.

Part Two of the Management Program assesses the abundance and conservation status of each DRF taxon within the Warren Region and makes recommendations for research and management. On the basis of these recommendations, each taxon, under the headings Critically Endangered, Endangered and Vulnerable, is ranked on a scale of 0 to 3 in nineteen categories based on potential threats or management and research requirements within the region (Table 1). Taxa with no threat or urgency for a particular management and research action were given a score of 0. Those with a high degree of threat or urgency for management and research were allocated a score of 3. Those where the threat or urgency is unknown were represented by a dash (-). Where ranking differs slightly, it is further described under each category. The scores were summed across all threat/management categories for each of the eighteen Declared Rare Flora.

Table 2 lists the eighteen Declared Rare Flora according to the priority and number of protection and management actions, within each IUCN category (Critically Endangered, Endangered and Vulnerable). Taxa with a higher score have higher priority and/or a larger number of required actions. It is intended that all requirements for each taxon will be implemented, as outlined in the previous species treatments. Work will be conducted, programmed or deferred according to IUCN Rank, with priority based on the scoring of Table 1, available funds and existing resources and workloads. This will enable resources and staff within the Warren Region to be allocated where most urgently required. Table 3 displays the same process for Priority 1, 2 and 3 taxa without ranking under IUCN criteria.

#### **Priority Flora**

Where Priority flora is being considered for nomination as DRF and is thought to be Critically Endangered and in need of urgent recovery action due to major threatening processes, low population size or other limiting factor, recovery actions may be given higher priority for action.

During the development of this Program, thirty seven taxa (i.e. three Priority 1, twelve Priority 2 and twenty two Priority 3) were not included as they are new additions to the priority flora list based on current population data and little is known about them. These taxa urgently require assessment and, if found to be threatened, written into the Management Program for the Region (see Table 4).

Note: the system used is not meant to be absolute or determinant. Many of the categories rated are closely correlated and may bias the overall picture if considered in isolation. A lack of knowledge of threats to some taxa meant that rating was not possible. Field work is urgently needed to find populations of these taxa and assess their conservation status.

### **2. DRF - MANAGEMENT AND RESEARCH ACTIONS**

Overall scores for threatened taxa based on the nineteen categories of threat, management and research requirements are shown in Table 1 with taxa in alphabetical order under the CR, EN and VU categories. The scoring suggests that the following taxa warrant immediate management and research action:

*Verticordia apecta*

*Verticordia fimbriolepis* subsp. *australis*

Both species had extremely high ranking scores (34 and 41 respectively).

Specific requirements for each of the nineteen threat, management or research categories are outlined below.

## 2.1 Phytophthora dieback

*Phytophthora cinnamomi* is a major fungal pathogen of the soils of the south-west forests and allied communities. There are a number of other *Phytophthora* species also active, and a couple of airborne canker fungi that are proving significant with some groups, particularly the Proteaceae.

The ranking of risk to *Phytophthora* species was based on a number of premises: rating of 3 assumed proven susceptibility or member of a genus usually found to be at risk; rating of 2 was based on other members of the genus having proved susceptible but not universally so, and rating of 1 was based on other members of the family known to be susceptible but no record for the genus. Other taxa were rated as not susceptible (-), but cannot be ruled out. Taxa occurring in low numbers and in few populations should be tested for susceptibility.

Also included as susceptible to the impacts of *Phytophthora* were taxa not directly killed but whose communities are subject to change through the actions of *Phytophthora* on other members, placing the taxon at risk (e.g. *Caladenia winfieldii*).

Declared rare taxa which may be at risk from *Phytophthora* are:

<i>Banksia verticillata</i>	<i>Sphenotoma drummondii</i>
<i>Caladenia winfieldii</i>	<i>Verticordia apecta</i>
<i>Conostylis misera</i>	<i>Verticordia densiflora</i> var. <i>pedunculata</i>
<i>Kennedia glabrata</i>	<i>Verticordia fimbrialepis</i> subsp. <i>australis</i>

## 2.2 Need for Survey

The need for survey is assessed in relation to several matters: the need to assess populations not relocated despite search effort; new species added to the threatened flora list subsequent to completion of most field work for the review; and species with few known populations (mainly those DRF, P1 and P2 with few populations known post review and with revised individual classification). Ranking was also weighted to reflect perceived threats to the individual taxon and the need to find additional populations to be confident that the taxon is secure.

Additional and up to date survey work needs to be conducted on most threatened species within the Warren Region, mainly priority species. The last major survey of the Region was conducted as part of the RFA (Regional Forest Agreement) process in the 1990s with few species re-surveyed since. Additionally, although most DRF populations are regularly monitored, some of this information may not be recorded on rare flora report forms.

Those DRF that need survey work are:

<i>Asplenium obtusatum</i> subsp. <i>northlandicum</i>	<i>Banksia verticillata</i>	<i>Laxmannia jamesii</i>
<i>Caladenia dorrienii</i>	<i>Caladenia harringtoniae</i>	<i>Meziella trifida</i>
<i>Caladenia winfieldii</i>	<i>Conostylis misera</i>	<i>Microtis globula</i>
<i>Diuris drummondii</i>	<i>Drakaea micrantha</i>	<i>Sphenotoma drummondii</i>
<i>Kennedia glabrata</i>		<i>Verticordia apecta</i>
		<i>Verticordia densiflora</i> var. <i>pedunculata</i>
		<i>Verticordia fimbrialepis</i> subsp. <i>australis</i>

## 2.3 Population Size and Few Populations

A number of DRF are known from few populations or have very small population sizes, making them particularly vulnerable to localised disturbance. This ranking does not address breeding systems

and/or if the taxon has undergone a period of genetic isolation. It is used in assisting decisions on the allocation of resources for survey and recovery action.

Taxa at risk through low numbers and/ or known from only a few populations are:

<i>Asplenium obtusatum</i> subsp.	<i>Microtis globula</i>
<i>northlandicum</i>	<i>Rhacocarpus rehmannianus</i> var. <i>webbianus</i>
<i>Banksia verticillata</i>	<i>Sphenotoma drummondii</i>
<i>Caladenia winfieldii</i>	<i>Verticordia apecta</i>
<i>Conostylis misera</i>	<i>Verticordia densiflora</i> var. <i>pedunculata</i>
<i>Drakaea micrantha</i> ms	<i>Verticordia fimbriolepis</i> subsp. <i>australis</i>
<i>Kennedia glabrata</i>	
<i>Meziella trifida</i>	

## **2.4 Roadside**

Populations located near roads, firebreaks and railways are vulnerable to damage or destruction through maintenance operations. This category principally targets populations restricted to road verges in a cleared landscape on land not under direct management of CALM. It also includes populations on CALM management tracks.

The majority of road reserves are under the management of either Main Roads WA, or a local government authority. Managers and field personnel need to know where the populations of DRF occur to avoid accidental destruction or damage. Liaison with these authorities is essential.

Those species at threat are:

<i>Caladenia christineae</i>	<i>Drakaea micrantha</i> ms
<i>Caladenia dorrienii</i>	<i>Laxmannia jamesii</i>
<i>Caladenia harringtoniae</i>	<i>Meziella trifida</i>
<i>Diuris drummondii</i>	<i>Verticordia fimbriolepis</i> subsp. <i>australis</i>

## **2.5 Private Land Negotiations**

Many DRF and priority taxa occur on or adjacent to private land. This section is weighted on the location of the populations, i.e. how many of the total number of populations occur on private property, or if access needs to be negotiated with private property owners.

Those DRF that require negotiations with private individuals are:

*Caladenia christineae*  
*Drakaea micrantha* ms  
*Diuris drummondii*

## **2.6 Land Acquisition**

Acquisition of land by the Department, either by donation, exchange or purchase, is required for those taxa not well represented on conservation reserves. This would enable as much as possible, appropriate management and protection practices to be implemented on land maintained in a natural state. Plants occurring on land reserved for nature conservation are generally considered to be less threatened than those on land designated for other purposes. It should be noted, however, that presence on a reserve contributes to, but does not guarantee, population survival. Reserves are subject to threats such as weed invasion, disease infection, drought, altered drainage and water tables, uncontrolled fires, maintenance of management access tracks and where approved, mining activities. In addition, several populations of DRF are under threat from the excision of CALM land earmarked for a water dam and negotiations over this are continuing.

The following taxa are priority for land acquisition:

*Diuris drummondii*  
*Laxmannia jamesii*

*Verticordia fimbrialepis* subsp. *australis*

## **2.7 Fencing**

Fencing is needed to protect Declared Rare Flora from damage caused by feral animals, such as pigs, and damage caused by recreational users such as rock climbers and walkers. In addition, Declared Rare Flora that occur on private land may require protection from grazing by domestic stock.

The following taxa either require fencing or are in need of additional fencing:

*Caladenia winfieldii* (majority of CLM 1 population already fenced)

*Rhacocarpus rehmannianus* var. *webbianus*

*Verticordia apecta*

## **2.8 Mining**

Mining is a minor threat to populations within the Warren Region, mainly through indirect effects, such as road construction and infrastructure that are associated with mining. Mines within the region include limestone quarries, gravel mines for road construction and peat mines. It is recommended that several Priority 4 and other ex Priority taxa that are likely to be affected by current and future mining are reviewed. Close liaison between companies, CALM, the Department of Minerals and Energy and the Department of Environmental Protection is essential.

Taxa at risk from mining are:

*Caladenia christineae*

## **2.9 Recreation**

A number of taxa in the region are located at sites where they are currently or potentially at risk from recreational activities. Activities may include camping, bushwalking and off-road vehicle use. There are also issues with track and site construction and maintenance. Risk may be from trampling, rock climbing, picking or the spread of *Phytophthora*. Recreation should be controlled or excluded from sensitive sites depending on the degree of threat. Provision of fencing may also be necessary.

Taxa at threat from recreational activities are:

*Asplenium obtusatum* subsp.

*northlandicum*

*Banksia verticillata*

*Kennedia glabrata*

*Rhacocarpus rehmannianus* var. *webbianus*

*Sphenotoma drummondii*

*Verticordia fimbrialepis* subsp. *australis*

## **2.10 Drought, Flooding, Groundwater Salinity Increase and Changing Weather Patterns**

Many Declared Rare Flora taxa within the Warren region are restricted to winter-wet habitats, swamps, edges of lakes and rivers. As a consequence of their habitat requirement and the recent recognition of climate change within the region, this category has the greatest weighting in terms of priority for management.

Decreased annual rainfall and the increase in land clearing may affect hydrology at the regional and local scale. This can lead to drying out of "wet" habitats for some taxa. Conversely, some communities and associated taxa are at risk of flooding and/or salinisation.

Drought, or even a relatively small reduction of rainfall, is most significant for granite species and relictual Gondwanan taxa that are reliant on high annual rainfall. Research on the reproductive and conservation biology of these taxa is recommended. In addition, a drying regime through the Denbarker/Rocky Gully area may add a significant fire risk to peat and swamp communities.

Taxa at threat from drought, climate change and/or salinity are:

*Caladenia christineae*  
*Caladenia dorrienii*  
*Caladenia harringtoniae*  
*Caladenia winfieldii*  
*Conostylis misera*  
*Diuris drummondii*  
*Kennedia glabrata*

*Laxmannia jamesii*  
*Meziella trifida*  
*Microtis globula*  
*Rhacocarpus rehmannianus* var. *webbianus*  
*Verticordia apecta*  
*Verticordia fimbriolepis* subsp. *australis*

### **2.11 Ex situ Germ Plasm Conservation**

Collection and long term storage of germ plasm (seed or tissues) from wild populations of Declared Rare Flora provides a source of propagation material for future translocations, in addition to ensuring the long-term protection of populations from extinction.

The rating is based on:

- few known or small populations and plant numbers;
- disease risks; fire ecology and possible threats;
- salinity issues; and,
- physical threats such as recreational walkers, four wheel drivers, feral animals and weeds.

Collections should be carried out according to protocols provided by CALM's Threatened Flora Seed Centre. Priority for collection of this material will depend upon the degree of threat to the taxon. Note: Currently, the majority of species in the District are not represented in *ex situ* germ plasm collections.

Seed or tissue material collection should be made for the following taxa:

*Banksia verticillata*  
*Caladenia christineae*  
*Caladenia dorrienii*  
*Caladenia harringtoniae*  
*Caladenia winfieldii*  
*Conostylis misera*  
*Diuris drummondii*  
*Drakaea micrantha* ms

*Kennedia glabrata*  
*Meziella trifida*  
*Microtis globula*  
*Sphenotoma drummondii*  
*Verticordia apecta*  
*Verticordia densiflora* var. *pedunculata*  
*Verticordia fimbriolepis* subsp. *australis*

### **2.12 Re-establishment**

Taxa poorly represented on conservation reserves may need to be considered for translocation into suitable, less vulnerable habitats on land designated for nature conservation.

Taxa that require translocation by CALM staff under an approved Recovery Plan or Interim Recovery Plan are:

*Caladenia winfieldii*

*Verticordia apecta*

### **2.13 Road and Track Management, Relocation, Closure**

Many Declared Rare Flora that occur near recreational pathways, firebreaks, off-road vehicle tracks and other service and utility tracks (such as service tracks associated with Telstra lines, power lines etc.) may benefit from the closing or removal of these roads.

These taxa are:

*Caladenia christineae*  
*Caladenia harringtoniae*  
*Diuris drummondii*

*Drakaea micrantha* ms  
*Laxmannia jamesii*  
*Meziella trifida*

*Verticordia apecta*

*Verticordia densiflora* var. *pedunculata* *Verticordia*  
*fimbrilepis* subsp. *australis*

#### **2.14 Liaison**

Many Declared Rare Flora populations occur on or adjacent to land that is not managed by CALM. This requires close association and cooperation with private landowners, local authorities, land managers and government agencies (e.g. Western Power, Westrail and Main Roads W.A.) to ensure that these populations are not damaged or inadvertently destroyed. Departmental staff provides advice and assistance on conservation and management issues to landholders and other agencies with Declared Rare Flora populations on land under their control. Landowners are requested to arrange their operations so that areas containing populations of DRF are not destroyed or damaged in any way.

Liaison is necessary with neighbours, other management agencies and landowners for the continued survival of populations. Liaison is required for the following species:

*Caladenia christineae*  
*Caladenia harringtoniae*  
*Diuris drummondii*  
*Drakaea micrantha* ms  
*Laxmannia jamesii*

*Meziella trifida*  
*Microtis globula*  
*Verticordia apecta*  
*Verticordia densiflora* var. *pedunculata* *Verticordia*  
*fimbrilepis* subsp. *australis*

#### **2.15 Monitoring**

Within the limit of available resources, all populations of Declared Rare Flora in the Warren Region should be inspected annually to observe any decline in population numbers and to monitor threatening processes. Where detrimental changes are seen, this should be followed by appropriate management actions. Species that require most frequent monitoring are those likely to be affected by factors such as fungal disease, drought, weed invasion and accidental damage, and those disturbance opportunists that decline rapidly two or three years after an initial disturbance event has triggered a mass germination of plants.

A network of permanent monitoring quadrats should be established on populations of threatened flora within the Region. Through detailed mapping of individual plants in small populations, and permanent monitoring plots in larger populations, subsequent visits can provide information on population dynamics, plant longevity and regeneration. Monitoring quadrats require annual inspection.

The majority of the DRF within the Warren Region need ongoing monitoring. They are:

*Asplenium obtusatum* subsp.  
*northlandicum* *Banksia verticillata*  
*Caladenia christineae*  
*Caladenia dorrienii*  
*Caladenia harringtoniae*  
*Caladenia winfieldii*  
*Conostylis misera*  
*Diuris drummondii*  
*Drakaea micrantha* ms

*Kennedia glabrata*  
*Laxmannia jamesii*  
*Meziella trifida*  
*Microtis globula*  
*Rhacocarpus rehmannianus* var. *webbianus*  
*Sphenotoma drummondii*  
*Verticordia apecta*  
*Verticordia densiflora* var. *pedunculata*  
*Verticordia fimbrilepis* subsp. *australis*

#### **2.16 Research**

Very few DRF within the Warren Region have been subject to detailed studies. Research into the taxonomy, genetic systems, population biology and ecology of most taxa is needed to determine the best means of protecting and managing populations, particularly if translocation is considered necessary.

Response to fire, susceptibility to *Phytophthora* spp. and other introduced pathogens, climate change and salinisation require special attention.



Those DRF in need of research are:

<i>Banksia verticillata</i>	<i>Laxmannia jamesii</i>
<i>Caladenia christineae</i>	<i>Meziella trifida</i>
<i>Caladenia dorrienii</i>	<i>Microtis globula</i>
<i>Caladenia winfieldii</i>	<i>Rhacocarpus rehmannianus</i> var. <i>webbianus</i>
<i>Conostylis misera</i>	<i>Verticordia apecta</i>
<i>Diuris drummondii</i>	<i>Verticordia densiflora</i> var. <i>pedunculata</i>
<i>Drakaea micrantha</i> ms	<i>Verticordia fimbrialepis</i> subsp. <i>australis</i>
<i>Kennedia glabrata</i>	

### 2.17 Linear Marking

Populations located along linear reserves (road and rail) and firebreaks that are often associated with utilities such as powerlines, water pipelines and Telstra lines are vulnerable to damage or destruction by maintenance operations. Main Roads WA has developed a field marking system for demarcating environmentally significant areas on road reserves and CALM uses this system to mark DRF and Priority Flora populations along linear routes both on CALM land and on other areas. Local Shires have been encouraged to adopt such a system.

Linear marking is required for the following taxa:

<i>Caladenia christineae</i>	<i>Meziella trifida</i>
<i>Caladenia harringtoniae</i>	<i>Verticordia apecta</i>
<i>Diuris drummondii</i>	<i>Verticordia densiflora</i> var. <i>pedunculata</i>
<i>Drakaea micrantha</i> ms	<i>Verticordia fimbrialepis</i> subsp. <i>australis</i>
<i>Laxmannia jamesii</i>	

### 2.18 Environmental Weeds and Feral Animals

Environmental weeds and feral animals have been combined within a single category. Feral pigs in particular are a major problem to orchids, as they dig up and destroy tubers. Other taxa are affected more by competition with introduced weeds. The response to weeds and feral animals, and to a range of herbicides for most taxa are unknown.

Control of weeds in and near Rare Flora populations on CALM land should be conducted by District staff. The following taxa require weed control or eradication, or require fencing to protect them from feral animals:

<i>Caladenia christineae</i>	<i>Conostylis misera</i>
<i>Caladenia dorrienii</i>	<i>Drakaea micrantha</i> ms
<i>Caladenia harringtoniae</i>	<i>Meziella trifida</i>
<i>Caladenia winfieldii</i>	<i>Rhacocarpus rehmannianus</i> var. <i>webbianus</i>

### 2.19 Fire Management Issues

The response of threatened taxa to fire, when known, is variable. Many are seed obligates that are killed outright by fire but regenerate from soil-stored seed, others are vulnerable to plant and seed store removal if fire occurs under inappropriate circumstances (too frequently or at the wrong time of the year), others are fire ephemerals that are dependant on occasional fire to produce a new generation of seed and some have poor seed production and are possibly fire sensitive. Fire regimes need to accommodate all of these.

Populations of Declared Rare Flora, where fire response is unknown, should be excluded from prescribed burns on CALM and other lands until appropriate research has been carried out and then only be burnt in accordance with specific fire regimes developed by research and regional staff. Where possible, these taxa will need to be protected (by construction of protective breaks or by

reduction of fuels in surrounding areas) from uncontrolled fires unless such fires fit the conditions that have been determined for that taxon.

Those taxa that are obligate seeders should not be burnt on a frequency greater than required for plants to produce adequate post-fire seed for successful recruitment and regeneration of the population. Species that are lignotuberous and resprout after fire may be reduced in their capacity for regeneration after frequent fires.

Fire management is required for the following DRF species:

*Banksia verticillata*  
*Caladenia christineae*  
*Caladenia dorrienii*  
*Caladenia harringtoniae*  
*Caladenia winfieldii*  
*Conostylis misera*  
*Diuris drummondii*  
*Drakaea micrantha* ms

*Kennedia glabrata*  
*Laxmannia jamesii*  
*Meziella trifida*  
*Microtis globula*  
*Sphenotoma drummondii*  
*Verticordia apecta*  
*Verticordia densiflora* var. *pedunculata*  
*Verticordia fimbriolepis* subsp. *australis*

**Table 1.** Warren Region Declared Rare Flora scored (0-3) according to the degree of threat or urgency for management and research actions.

	Total	Phytophthora dieback	Survey Populations	Small/ few populations	Roadside	Private land	Land acquisition	Fencing	Mining	Recreation	Drought/ Flood/ Salt	Germ plasm collection	Re-establishment	Road/ utility maintenance	Liaison	Monitoring	Research	Linear marking	Weeds/ Ferals	Fire management issues	
<b>Critically Endangered</b>																					
<i>Rhacocarpus rehmannianus</i> var. <i>webbianus</i>	18	-	2	3	0	0	0	2	0	3	3	0	0	0	0	3	1	0	1	-	
<i>Verticordia apecta</i>	34	3	3	3	0	0	0	1	0	0	3	3	3	2	2	3	3	3	0	2	
<b>Endangered</b>																					
<i>Caladenia christineae</i>	19	-	0	0	1	1	0	0	1	0	3	2	0	2	2	2	1	1	1	2	
<i>Caladenia dorrienii</i>	13	-	1	0	1	0	0	0	0	0	2	1	0	0	0	2	1	0	3	2	
<i>Caladenia winfieldii</i>	29	3	2	3	0	0	0	1	0	0	3	3	2	0	0	3	3	0	3	3	
<i>Drakaea micrantha</i> ms	15	-	1	2	2	1	0	0	0	0	-	1	0	1	1	2	1	1	1	1	
<i>Sphenotoma drummondii</i>	21	3	3	3	0	0	0	0	0	3	0	3	0	0	0	3	0	0	0	3	
<i>Verticordia densiflora</i> var. <i>pedunculata</i>	26	3	3	3	0	0	0	0	0	0	0	3	0	1	1	3	3	3	0	3	
<i>Verticordia fimbrialepis</i> subsp. <i>australis</i>	41	3	2	3	3	0	3	0	0	3	3	3	0	3	3	3	3	3	0	3	
<b>Vulnerable</b>																					
<i>Asplenium obtusatum</i> subsp. <i>northlandicum</i>	7	-	1	3	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	
<i>Banksia verticillata</i>	18	3	2	1	0	0	0	0	0	3	0	2	0	0	0	3	1	0	0	3	
<i>Caladenia harringtoniae</i>	16	-	1	0	2	0	0	0	0	0	1	1	0	3	1	2	0	2	1	2	
<i>Conostylis misera</i>	18	1	3	2	0	0	0	0	0	0	1	2	0	0	0	3	2	0	3	1	
<i>Diuris drummondii</i>	19	-	1	0	1	1	1	0	0	0	3	1	0	2	2	2	1	2	-	2	
<i>Kennedia glabrata</i>	21	1	3	2	0	0	0	0	0	3	3	2	0	0	0	3	3	0	0	1	
<i>Laxmannia jamesii</i>	15	-	3	0	2	0	2	0	0	0	1	0	0	1	1	2	1	1	0	1	
<i>Meziella trifida</i>	25	-	1	1	2	0	0	0	0	0	2	3	0	3	3	3	1	3	2	1	
<i>Microtis globula</i>	20	-	3	3	0	0	0	0	0	0	1	3	0	0	3	3	3	0	0	1	
<b>Total</b>		<b>20</b>	<b>35</b>	<b>32</b>	<b>14</b>	<b>3</b>	<b>6</b>	<b>4</b>	<b>1</b>	<b>17</b>	<b>29</b>	<b>33</b>	<b>5</b>	<b>18</b>	<b>19</b>	<b>46</b>	<b>28</b>	<b>19</b>	<b>15</b>	<b>31</b>	

**Table 2.** The 18 Declared Rare Flora within the Warren region, ordered according to the urgency of their requirement for protection and management (derived from Table 1). Species with a higher ranking score are the most threatened and/ or in most need of action. The current IUCN ranking of each species is also shown (where CR = Critically Endangered, EN = Endangered & VU = Vulnerable).

Species	Total	IUCN Ranking
<i>Verticordia apecta</i>	37	CR
<i>Rhacocarpus rehmannianus</i> var. <i>webbianus</i>	17	CR
<i>Verticordia fimbriolepis</i> subsp. <i>australis</i>	41	EN
<i>Caladenia winfieldii</i>	28	EN
<i>Verticordia densiflora</i> var. <i>pedunculata</i>	26	EN
<i>Sphenotoma drummondii</i>	21	EN
<i>Caladenia christineae</i>	20	EN
<i>Drakaea micrantha</i> ms	15	EN
<i>Caladenia dorrienii</i>	13	EN
<i>Kennedia glabrata</i>	21	VU
<i>Diuris drummondii</i>	21	VU
<i>Microtis globula</i>	20	VU
<i>Conostylis misera</i>	18	VU
<i>Asplenium obtusatum</i> subsp. <i>northlandicum</i>	17	VU
<i>Banksia verticillata</i>	17	VU
<i>Meziella trifida</i>	26	VU
<i>Caladenia harringtoniae</i>	16	VU
<i>Laxmannia jamesii</i>	15	VU

### 3. PRIORITY FLORA - MANAGEMENT AND RESEARCH ACTIONS

Overall rankings of priority taxa based on the 19 categories of threat, management requirements and research requirements are shown in Table 3. The need for more surveys is the area for highest management priority and is required in order to be able to reassess the conservation status of those taxa for which the existing but limited information suggests they might be highly threatened. Until the conservation status of priority flora is established through further survey work monitoring and research should be given a lower priority in terms of management action.

Seven Priority flora are considered as having the highest priority for further survey and consideration for gazettal as DRF (Table 5). These taxa are:

<i>Andersonia annelsii</i> ms	<i>Grevillea fuscolutea</i>
<i>Andersonia hammersleyana</i>	<i>Laxmannia grandiflora</i> subsp. <i>brendae</i>
<i>Cryptandra congesta</i>	<i>Astartea</i> sp. Mt. Johnson
<i>Eucalyptus virginiae</i> ms	

The data suggest that the following taxa warrant immediate management and research action:

<i>Andersonia hammersleyana</i>	<i>Lambertia rariflora</i> subsp. <i>lutea</i>
<i>Eucalyptus virginiae</i> ms	<i>Stylidium rhipidium</i>

The taxa listed under each category, unlike those outlined in Section 2 for Declared Rare Flora which lists all taxa that receive a score (1, 2 or 3), are only those that receive a score of 3. These have the highest priority for management or assessment under each category.

### 3.1 Phytophthora dieback

Priority species that need management for *Phytophthora* are:

#### Priority One

*Andersonia redolens*

*Andersonia* sp. Mitchell River

#### Priority Two

*Andersonia annelsii* ms

*Andersonia auriculata*

*Andersonia hammersleyana*

*Chamelaucium floriferum* ms  
subsp.

*diffusum* ms

*Chamelaucium forrestii* subsp.  
*forrestii* ms

*Dryandra sessilis* var. *cordata*

*Grevillea fuscolutea*

*Verticordia endlicheriana* var. *angustifolia*

#### Priority Three

*Andersonia amabile* ms

*Astartea* sp. Mt. Johnson

*Calytrix pulchella*

*Chamelaucium floriferum* subsp.  
*floriferum* ms

*Lambertia rariflora* subsp. *lutea*

*Pultenaea pinifolia*

*Sphenotoma parviflorum*

*Stirlingia divaricatissima*

*Synaphea preissii*

### 3.2 Further Surveys

#### Priority One

*Andersonia redolens*

*Andersonia* sp. Mitchell River

*Austrofestuca littoralis*

*Caladenia evanescens*

*Carex tereticaulis*

*Cryptandra arbutiflora* var.  
*pygmaea*

*Deyeuxia inaequalis*

*Eriochilus scaber* subsp. *orbifolia*  
ms

*Eryngium* sp. Lake Muir

*Hydatella australis*

*Pentapogon quadrifidus*

*Sphaerolobium benetectum*

#### Priority Two

*Amperea protensa*

*Andersonia annelsii* ms

*Andersonia auriculata*

*Andersonia hammersleyana*

*Andersonia violens*

*Anthocercis sylvicola*

*Apodasmia ceramophila*

*Borya longiscapa*

*Caladenia abbreviata*

*Caladenia erythrochila*

*Caladenia luteola*

*Caladenia starteorum*

*Calothamnus* sp. Mt. Lindesay

*Chamaexeros longicaulis*

*Cryptandra congesta*

*Dampiera orchardii*

*Diuris heberlei*

*Drepanocladus aduncus*

*Drosera binata*

*Dryandra sessilis* var. *cordata*

*Euphrasia scabra*

*Fabriona hampeana*

*Hemiandra australis* ms

*Hybanthus volubilis*

*Juncus meianthus* ms

*Laxmannia grandiflora* subsp. *brendae*

*Leptinella drummondii*

*Lilaeopsis polyantha*

*Melaleuca pritzelii*

*Mitreola minima*

*Rorippa dictyosperma*

*Schizaea rupestris*

*Schoenus fluitans*

*Selliera radicans*

*Sphagnum nova-zelandicum*

*Spyridium riparium*

*Thomasia quercifolia*

*Verticordia endlicheriana* var. *angustifolia*

#### Priority Three

*Actinotus* sp. Walpole

*Alexgeorgea ganopoda*

*Andersonia amabile* ms

*Astartea* sp. Mt. Johnson

*Boronia anceps*

*Calytrix pulchella*

*Chamelaucium floriferum* ms subsp. *floriferum* ms

*Chorizema reticulatum*

*Cyathochaeta teretifolia*

*Dicrastylis glauca*

*Eucalyptus brevistylis*

*Gonocarpus pusillus*

*Gonocarpus simplex*

*Gonocarpus trichostachyus*

*Grevillea papillosa*

*Jansonia formosa*

*Lambertia rariflora* subsp. *lutea*

*Lasiopetalum cordifolium* subsp. *acuminatum*

*Lomandra ordii*

*Marianthus sylvaticus*

*Meeboldina crassipes*

*Meeboldina thysanantha*

*Melaleuca diosmifolia*

*Melaleuca micromera*  
*Melaleuca ringens*  
*Pultenaea pinifolia*  
*Sphenotoma parviflorum*

*Stylidium rhipidium*  
*Synaphea intricata*  
*Synaphea preissii*

### **3.3 Population Size and Few Populations**

#### **Priority One**

*Austrofestuca littoralis*  
*Caladenia evanescens*  
*Carex tereticaulis*  
*Cryptandra arbutiflora* var. *pygmaea*  
*Deyeuxia inaequalis*  
*Eriochilus scaber* subsp. *orbifolia* ms  
*Eryngium* sp. Lake Muir  
*Hydatella australis*  
*Pentapogon quadrifidus*  
*Sphaerolobium benetectum*  
*Synaphea decumbens*  
*Tetratheca* sp. Kent River

#### **Priority Two**

*Andersonia annelsii* ms  
*Andersonia hammersleyana*  
*Anthocercis sylvicola*  
*Caladenia abbreviata*  
*Caladenia erythrochila*  
*Caladenia luteola*  
*Caladenia starteorum*  
*Calothamnus* sp. Mt. Lindesay  
*Chamelaucium floriferum* subsp.  
*diffusum* ms  
*Cryptandra congesta*  
*Dampiera orchardii*  
*Diuris heberlei*  
*Drepanocladus aduncus*  
*Drosera binata*  
*Eucalyptus virginiae* ms

*Euphrasia scabra*  
*Fabriona hampeana*  
*Grevillea acropogon*  
*Grevillea fuscolutea*  
*Hybanthus volubilis*  
*Juncus meianthus* ms  
*Laxmannia grandiflora* subsp. *brendae*  
*Leptinella drummondii*  
*Lilaeopsis polyantha*  
*Melaleuca pritzelii*  
*Rorippa dictyosperma*  
*Schizaea rupestris*  
*Schoenus fluitans*  
*Selliera radicans*  
*Sphagnum nova-zelandicum*  
*Spyridium riparium*  
*Thomasia quercifolia*  
*Verticordia endlicheriana* var. *angustifolia*

#### **Priority Three**

*Boronia anceps*  
*Calytrix pulchella*  
*Cyathochaeta teretifolia*  
*Dicrastyli glauca*  
*Gonocarpus trichostachyus*  
*Melaleuca diosmifolia*  
*Melaleuca micromera*  
*Pultenaea pinifolia*  
*Stylidium rhipidium*  
*Synaphea preissii*

### **3.4 Roadside**

#### **Priority One**

*Andersonia redolens*

#### **Priority Two**

*Andersonia hammersleyana*  
*Drosera binata*  
*Spyridium riparium*

#### **Priority Three**

*Lambertia rariflora* subsp. *lutea*  
*Melaleuca ringens*  
*Stylidium rhipidium*  
*Synaphea preissii*

### **3.5 Private Land Negotiations**

#### **Priority One**

*Pentapogon quadrifidus*

#### **Priority Two**

*Drepanocladus aduncus*  
*Eucalyptus virginiae* ms  
*Grevillea acropogon*

### **3.6 Land Acquisition**

#### **Priority One**

*Pentapogon quadrifidus*

#### **Priority Two**

*Drepanocladus aduncus*

*Eucalyptus virginiae* ms

*Grevillea acropogon*

### 3.7 Fencing

#### Priority Two

*Eucalyptus virginiae* ms

### 3.8 Mining

#### Priority Two

*Caladenia abbreviata*

*Jansonia formosa*

*Grevillea papillosa*

#### Priority Three

*Melaleuca ringens*

### 3.9 Recreation

#### Priority Two

*Drepanocladus aduncus*

*Schizaea rupestris*

*Thomasia quercifolia*

#### Priority Three

*Melaleuca ringens*

### 3.10 Drought, Flooding, Groundwater Salinity Increase and Changing Weather Patterns

#### Priority One

*Carex tereticaulis*

*Hydatella australis*

*Tetratheca* sp. Kent River

#### Priority Two

*Drepanocladus aduncus*

*Leptinella drummondii*

*Selliera radicans*

*Wurmbea* sp. Cranbrook

#### Priority Three

*Meeboldina crassipes*

*Meeboldina thysanantha*

*Stylidium rhipidium*

*Synaphea intricata*

### 3.11 Ex situ Germ Plasm Conservation

#### Priority One

*Andersonia redolens*

*Andersonia* sp. Mitchell River

*Austrofestuca littoralis*

*Caladenia evanescens*

*Cryptandra arbutiflora* var. *pygmaea*

*Eriochilus scaber* subsp. *orbifolia* ms

*Hydatella australis*

*Synaphea decumbens*

#### Priority Two

*Andersonia annelsii* ms

*Andersonia hammersleyana*

*Anthocercis sylvicola*

*Caladenia erythrochila*

*Caladenia luteola*

*Caladenia starteorum*

*Chamaexeros longicaulis*

*Cryptandra congesta*

*Dampiera orchardii*

*Eucalyptus virginiae* ms

*Euphrasia scabra*

*Laxmannia grandiflora* subsp. *brendae*

*Selliera radicans*

*Thomasia quercifolia*

*Verticordia endlicheriana* var. *angustifolia*

*Wurmbea* sp. Cranbrook

#### Priority Three

*Pultenaea pinifolia*

*Stylidium rhipidium*

*Thelymitra jacksonii*

### 3.12 Re-establishment

#### Priority One

*Austrofestuca littoralis*

#### Priority Two

*Andersonia annelsii* ms

*Dampiera orchardii*

*Eucalyptus virginiae* ms

*Euphrasia* aff. *scabra*

### 3.13 Road and Track Management, Relocation, Closure

#### Priority One

*Andersonia redolens*

#### Priority Two

*Andersonia hammersleyana*  
*Chamelaucium floriferum* subsp.  
*diffusum* ms  
*Drepanocladus aduncus*

*Wurmbea* sp. Cranbrook

#### Priority Three

*Lambertia rariflora* subsp. *lutea*  
*Stirlingia divaricatissima*  
*Stylidium rhipidium*  
*Thelymitra jacksonii*

### 3.14 Liaison

#### Priority One

*Andersonia* sp. Mitchell River  
*Carex tereticaulis*  
*Pentapogon quadrifidus*

#### Priority Two

*Drepanocladus aduncus*  
*Drosera binata*

*Eucalyptus virginiae* ms

*Grevillea acropogon*

*Leptinella drummondii*

*Wurmbea* sp. Cranbrook

#### Priority Three

*Stylidium rhipidium*

### 3.15 Monitoring

#### Priority One

*Andersonia redolens*  
*Andersonia* sp. Mitchell River  
*Austrofestuca littoralis*  
*Caladenia evanescens*  
*Cryptandra arbutiflora* var. *pygmaea*  
*Eriochilus scaber* subsp. *orbifolia* ms  
*Hydatella australis*  
*Synaphea decumbens*

#### Priority Two

*Andersonia annelsii* ms  
*Andersonia auriculata*  
*Andersonia hammersleyana*  
*Andersonia virolens*  
*Borya longiscapa*  
*Caladenia erythrochila*  
*Caladenia luteola*  
*Drepanocladus aduncus*  
*Laxmannia grandiflora* subsp. *brendae*

*Leptinella drummondii*

*Mitreola minima*

*Rorippa dictyosperma*

*Selliera radicans*

*Sphagnum nova-zelandicum*

*Spyridium riparium*

*Thomasia quercifolia*

#### Priority Three

*Astartea* sp. Mt. Johnson  
*Calytrix pulchella*  
*Chamelaucium floriferum* subsp. *floriferum* ms  
*Chorizema reticulatum*  
*Cyathochaeta teretifolia*  
*Jansonia formosa*  
*Lambertia rariflora* subsp. *lutea*  
*Stirlingia divaricatissima*  
*Stylidium rhipidium*  
*Thelymitra jacksonii*

### 3.16 Research

#### Priority One

*Austrofestuca littoralis*  
*Hydatella australis*

#### Priority Two

*Andersonia annelsii* ms  
*Andersonia auriculata*  
*Andersonia hammersleyana*  
*Anthocercis sylvicola*  
*Caladenia abbreviata*  
*Caladenia erythrochila*  
*Caladenia luteola*  
*Calothamnus* sp. Mt. Lindesay

*Chamelaucium floriferum* ms subsp. *diffusum* ms

*Chamelaucium forrestii* subsp. *forrestii* ms

*Hemiandra australis* ms

*Laxmannia grandiflora* subsp. *brendae*

*Melaleuca pritzelii*

*Schoenus fluitans*

*Selliera radicans*

#### Priority Three

*Astartea* sp. Mt. Johnson  
*Chamelaucium floriferum* subsp. *floriferum* ms  
*Cyathochaeta teretifolia*  
*Melaleuca micromera*  
*Stirlingia divaricatissima*



*Stylidium rhipidium*

*Thelymitra jacksonii*

### 3.17 Linear Marking

#### Priority One

*Andersonia redolens*

*Andersonia* sp. Mitchell River

*Cryptandra arbutiflora* var. *pygmaea*

*Synaphea decumbens*

#### Priority Two

*Andersonia auriculata*

*Drosera binata*

*Spyridium riparium*

*Wurmbea* sp. Cranbrook

#### Priority Three

*Andersonia amabile* ms

*Lambertia rariflora* subsp. *lutea*

*Pultenaea pinifolia*

*Stirlingia divaricatissima*

*Stylidium rhipidium*

### 3.18 Environmental Weeds and Feral Animals

#### Priority One

*Austrofestuca littoralis*

*Carex tereticaulis*

*Hydatella australis*

#### Priority Two

*Borya longiscapa*

*Eucalyptus virginea*

*Leptinella drummondii*

*Wurmbea* sp. Cranbrook

#### Priority Three

*Stylidium rhipidium*

### 3.19 Fire Management Issues

#### Priority One

*Caladenia evanescens*

*Sphaerolobium benetectum*

#### Priority Two

*Andersonia annelsii* ms

*Caladenia erythrochila*

*Caladenia luteola*

*Calothamnus* sp. Mt. Lindesay

*Chamaexeros longicaulis*

*Cryptandra congesta*

*Diuris heberlei*

*Drosera binata*

*Eucalyptus virginea*

*Grevillea fuscolutea*

*Laxmannia grandiflora* subsp. *brendae*

*Mitreola minima*

*Sphagnum nova-zelandicum*

*Verticordia endlicheriana* var. *angustifolia*

#### Priority Three

*Astartea* sp. Mt. Johnson

*Chamelaucium floriferum* ms subsp. *floriferum* ms

*Gonocarpus trichostachyus*

*Lambertia rariflora* subsp. *lutea*

*Pultenaea pinifolia*

*Sphenotoma parviflorum*

*Stirlingia divaricatissima*

*Thelymitra jacksonii*

**Table 3.** Warren Region priority flora scored within priority categories 0-3 according to the degree of threat or urgency for management and research action.

<b>Taxon</b>	<b>Total</b>	<b>Phytophthora dieback</b>	<b>Survey population</b>	<b>Small/Few Populations</b>	<b>Roadside</b>	<b>Private Land</b>	<b>Land Acquisition</b>	<b>Fencing</b>	<b>Mining</b>	<b>Recreation</b>	<b>Drought/Flood/Salt</b>	<b>Germ plasm collection</b>	<b>Re-establishment</b>	<b>Road/utility maintenance</b>	<b>Liaison</b>	<b>Monitoring</b>	<b>Research</b>	<b>Line marking</b>	<b>Weeds/Ferals</b>	<b>Fire management issues</b>
<b>Priority One</b>																				
<i>Andersonia redolens</i> ms	25	3	3	2	3	0	0	0	0	0	0	3	0	3	0	3	2	3	0	0
<i>Andersonia</i> sp. Mitchell River	26	3	3	1	1	0	0	0	0	0	0	3	0	2	3	3	2	3	0	2
<i>Austrofestuca littoralis</i>	20	-	3	3	0	0	0	0	0	0	0	3	2	0	0	3	3	0	3	0
<i>Caladenia evanescens</i>	16	-	3	3	0	0	0	0	0	0	0	3	0	0	0	3	1	0	0	3
<i>Carex tereticaulis</i>	16	-	3	3	0	0	0	0	0	0	3	2	0	0	3	2	0	0	-	-
<i>Cryptandra arbutiflora</i> var. <i>pygmaea</i>	20	1	3	3	0	0	0	0	0	0	0	3	0	0	2	3	1	3	0	1
<i>Deyeuxia inaequalis</i>	17	-	3	3	1	0	0	0	0	0	1	0	0	2	2	2	1	2	0	-
<i>Eriochilus scaber</i> subsp. <i>orbifolia</i> ms	14	-	3	3	0	0	0	0	0	0	0	3	0	0	0	3	0	0	0	2
<i>Eryngium</i> sp. Lake Muir	15	1	3	3	1	0	0	0	0	0	1	0	0	1	0	2	1	0	1	1
<i>Hydatella australis</i>	22	-	3	3	0	0	0	0	0	0	3	3	0	0	0	3	3	0	3	1
<i>Pentapogon quadrifidus</i>	18	-	3	3	-	3	3	0	0	0	1	0	0	0	3	2	0	0	0	-
<i>Sphaerolobium benetectum</i>	19	-	3	3	1	0	0	0	0	0	1	0	0	2	2	2	0	2	0	3
<i>Synaphea decumbens</i>	20	2	2	3	1	0	0	0	0	0	1	3	0	0	0	3	1	3	0	1
<i>Tetradlea</i> sp. Kent River	10	-	1	3	0	0	0	0	0	0	3	0	0	0	0	2	1	0	0	-
<b>Priority Two</b>																				
<i>Andersonia annelsii</i> ms	28	3	3	3	1	0	0	0	0	0	1	3	3	1	0	3	3	1	0	3
<i>Andersonia auriculata</i>	25	3	3	1	2	0	0	0	0	0	0	1	0	2	2	3	3	3	0	2
<i>Andersonia hammersleyana</i> ms	30	3	3	3	3	0	0	0	0	2	1	3	0	3	1	3	3	0	0	2

<b>Taxon</b>	<b>Total</b>	<b>Phytophthora dieback</b>	<b>Survey population</b>	<b>Small/Few Populations</b>	<b>Roadside</b>	<b>Private Land</b>	<b>Land Acquisition</b>	<b>Fencing</b>	<b>Mining</b>	<b>Recreation</b>	<b>Drought/Flood/Salt</b>	<b>Germ plasm collection</b>	<b>Re-establishment</b>	<b>Road/utility maintenance</b>	<b>Liaison</b>	<b>Monitoring</b>	<b>Research</b>	<b>Line marking</b>	<b>Weeds/Ferals</b>	<b>Fire management issues</b>
<i>Andersonia virolens</i> ms	14	2	3	2	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	2
<i>Anthocercis sylvicola</i>	18	-	3	3	0	0	0	0	0	1	2	3	0	0	0	1	3	0	0	2
<i>Apodasmia ceramophila</i> ms	13	-	3	1	1	0	0	0	0	0	2	0	0	1	1	2	1	1	0	0
<i>Borya longiscapa</i>	13	-	3	1	0	0	0	0	0	1	0	0	0	0	1	3	0	0	3	1
<i>Caladenia abbreviata</i>	16	-	3	3	0	0	0	0	1	0	0	2	0	0	0	2	3	0	0	2
<i>Caladenia erythrochila</i>	19	-	3	3	0	0	0	0	0	0	0	3	0	0	1	3	3	0	0	3
<i>Caladenia luteola</i>	18	-	3	3	0	0	0	0	0	0	0	3	0	0	0	3	3	0	0	3
<i>Caladenia starteorum</i>	16	-	3	3	0	0	0	0	0	0	2	3	0	0	1	1	1	0	0	2
<i>Calothamnus</i> sp. Mt. Lindesay	20	2	3	3	0	0	0	0	0	2	0	2	0	0	0	2	3	0	0	3
<i>Chamaexeros longicaulis</i>	25	1	3	2	2	1	0	0	0	1	0	3	0	2	2	1	1	1	2	3
<i>Chamelaucium floriferum</i> subsp. <i>diffusum</i> ms	21	3	2	3	0	0	0	0	0	2	0	1	0	3	0	2	3	0	0	2
<i>Chamelaucium forrestii</i> subsp. <i>forrestii</i> ms	15	3	2	2	0	0	0	0	0	1	0	1	0	0	0	1	3	0	0	2
<i>Chordifex jacksonii</i>	12	-	2	1	1	0	0	0	0	0	2	0	0	1	1	1	1	0	0	2
<i>Cryptandra congesta</i>	20	2	3	3	0	0	0	0	0	2	1	3	0	0	0	1	2	0	0	3
<i>Dampiera orchardii</i>	10	-	3	3	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0
<i>Diuris heberlei</i>	15	-	3	3	0	0	0	0	0	0	2	1	0	0	0	2	0	0	1	3
<i>Drepanocladus aduncus</i>	27	-	3	3	0	3	3	0	0	3	3	0	0	3	3	3	0	0	0	0
<i>Drosera binata</i>	26	-	3	3	3	1	0	0	0	0	1	0	0	2	3	2	1	3	1	3
<i>Dryandra sessilis</i> var. <i>cordata</i>	9	3	3	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1

<b>Taxon</b>	<b>Total</b>	<b>Phytophthora dieback</b>	<b>Survey population</b>	<b>Small/Few Populations</b>	<b>Roadside</b>	<b>Private Land</b>	<b>Land Acquisition</b>	<b>Fencing</b>	<b>Mining</b>	<b>Recreation</b>	<b>Drought/Flood/Salt</b>	<b>Germ plasm collection</b>	<b>Re-establishment</b>	<b>Road/utility maintenance</b>	<b>Liaison</b>	<b>Monitoring</b>	<b>Research</b>	<b>Line marking</b>	<b>Weeds/Ferals</b>	<b>Fire management issues</b>
<i>Eucalyptus virginea</i>	34	2	2	3	0	3	3	3	0	0	0	3	2	0	3	2	2	0	3	3
<i>Euphrasia scabra</i>	10	-	3	3	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0
<i>Fabriona hampeana</i>	10	2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
<i>Grevillea acropogon</i>	20	-	1	3	0	3	3	0	0	0	2	2	0	0	3	2	1	0	0	-
<i>Grevillea fuscolutea</i>	18	3	2	3	0	0	0	0	0	2	0	1	0	0	1	2	1	0	0	3
<i>Hemiandra australis</i> ms	14	-	3	2	0	0	0	0	0	1	0	1	0	0	0	2	3	0	0	2
<i>Hybanthus volubilis</i>	10	-	3	3	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2
<i>Juncus meianthus</i> ms	10	-	3	3	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	-
<i>Laxmannia grandiflora</i> subsp. <i>brendae</i>	20	-	3	3	0	0	0	0	0	2	0	3	0	0	0	3	3	0	0	3
<i>Leptinella drummondii</i>	22	-	3	3	0	0	0	0	0	0	3	2	0	0	3	3	2	0	3	0
<i>Lilaeopsis polyantha</i>	10	-	3	3	0	0	0	0	0	0	2	0	0	0	0	1	1	0	0	-
<i>Melaleuca pritzelii</i>	12	-	3	3	0	0	0	0	0	0	1	0	0	0	1	1	3	0	0	-
<i>Mitreola minima</i>	13	-	3	1	0	0	0	0	0	0	2	0	0	0	0	3	1	0	0	3
<i>Rorippa dictyosperma</i>	15	-	3	3	0	0	0	0	0	2	0	1	0	0	0	3	2	0	1	-
<i>Schizaea rupestris</i>	12	1	3	3	0	0	0	0	0	3	0	0	0	0	0	1	0	0	1	-
<i>Schoenus fluitans</i>	12	-	3	3	0	0	0	0	0	0	0	2	0	0	0	1	3	0	0	0
<i>Selliera radicans</i>	23	-	3	3	0	0	3	0	0	0	3	3	0	0	2	3	3	0	0	-
<i>Sphagnum nova-zelandicum</i>	17	-	3	3	1	0	0	0	0	0	2	0	0	2	0	3	0	0	0	3
<i>Spyridium riparium</i>	27	1	3	3	3	0	0	0	0	0	2	2	0	2	2	3	1	3	0	2
<i>Thomasia quercifolia</i>	20	1	3	3	0	0	0	0	0	3	0	3	0	2	0	3	0	0	0	2

<b>Taxon</b>	<b>Total</b>	<b>Phytophthora dieback</b>	<b>Survey population</b>	<b>Small/Few Populations</b>	<b>Roadside</b>	<b>Private Land</b>	<b>Land Acquisition</b>	<b>Fencing</b>	<b>Mining</b>	<b>Recreation</b>	<b>Drought/Flood/Salt</b>	<b>Germ plasm collection</b>	<b>Re-establishment</b>	<b>Road/utility maintenance</b>	<b>Liaison</b>	<b>Monitoring</b>	<b>Research</b>	<b>Line marking</b>	<b>Weeds/Ferals</b>	<b>Fire management issues</b>
<i>Verticordia endlicheriana</i> var. <i>angustifolia</i>	21	3	3	3	0	0	0	0	0	2	1	3	0	0	0	2	1	0	0	3
<i>Wurmbea</i> sp. Cranbrook	29	-	1	1	2	0	0	0	0	2	3	3	0	3	3	2	2	3	3	1
<b>Priority Three</b>																				
<i>Actinotus</i> sp. Walpole	12	1	3	2	0	0	0	0	0	0	1	0	0	0	0	2	0	0	1	2
<i>Alexgeorgea ganopoda</i>	10	-	3	0	2	0	0	0	0	0	1	0	0	0	0	1	0	0	1	2
<i>Amperea protensa</i>	6	-	3	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
<i>Andersonia amabile</i> ms	22	3	3	2	2	0	0	0	0	1	1	1	0	0	0	2	2	3	0	2
<i>Astartea</i> sp. Mt. Johnson	19	3	3	2	0	0	0	0	0	0	1	1	0	0	0	3	3	0	0	3
<i>Boronia anceps</i>	9	-	3	3	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	-
<i>Boronia virgata</i>	10	1	1	0	2	0	1	0	0	0	1	0	0	0	0	1	1	0	0	2
<i>Calytrix pulchella</i>	19	3	3	3	1	0	0	0	0	0	0	2	0	0	0	3	1	0	2	1
<i>Chamelaucium floriferum</i> subsp. <i>floriferum</i> ms	22	3	3	1	0	0	0	0	0	2	0	2	0	2	0	3	3	0	0	3
<i>Chorizema reticulatum</i>	19	-	3	1	2	0	0	0	0	1	0	1	0	0	2	3	2	2	2	-
<i>Cyathochaeta stipoides</i>	6	-	2	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	-
<i>Cyathochaeta teretifolia</i>	14	-	3	3	0	0	0	0	0	0	2	0	0	0	0	3	3	0	0	-
<i>Dicrastylis glauca</i>	6	-	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
<i>Eucalyptus brevistylis</i>	9	2	3	2	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
<i>Gonocarpus pusillus</i>	11	-	3	1	2	0	0	0	0	0	1	0	0	0	0	2	0	0	0	2
<i>Gonocarpus simplex</i>	6	-	3	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0

<b>Taxon</b>	<b>Total</b>	<b>Phytophthora dieback</b>	<b>Survey population</b>	<b>Small/Few Populations</b>	<b>Roadside</b>	<b>Private Land</b>	<b>Land Acquisition</b>	<b>Fencing</b>	<b>Mining</b>	<b>Recreation</b>	<b>Drought/Flood/Salt</b>	<b>Germ plasm collection</b>	<b>Re-establishment</b>	<b>Road/utility maintenance</b>	<b>Liaison</b>	<b>Monitoring</b>	<b>Research</b>	<b>Line marking</b>	<b>Weeds/Ferals</b>	<b>Fire management issues</b>
<i>Gonocarpus trichostachyus</i>	12	-	3	3	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	3
<i>Grevillea papillosa</i>	19	2	3	2	1	0	0	0	2	1	2	1	0	1	1	1	1	1	0	0
<i>Jansonia formosa</i>	23	-	3	2	2	0	2	0	2	2	2	0	0	1	1	3	1	2	0	-
<i>Lambertia rariflora</i> subsp. <i>lutea</i>	30	3	3	2	3	1	0	0	0	0	0	2	0	3	2	3	2	3	0	3
<i>Lasiopetalum cordifolium</i> subsp. <i>acuminatum</i>	14	2	3	1	0	0	0	0	0	1	0	2	0	0	0	2	1	0	0	2
<i>Lomandra ordii</i>	8	1*	3	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1
<i>Marianthus sylvaticus</i>	11	-	3	1	0	0	0	0	0	1	0	0	0	0	1	1	2	0	0	2
<i>Meeboldina crassipes</i>	11	-	3	2	2	0	0	0	0	0	3	0	0	2	2	1	1	2	0	1
<i>Meeboldina thysanantha</i> ms	17	-	3	2	1	0	1	0	0	0	3	0	0	2	1	1	1	2	0	0
<i>Melaleuca diosmifolia</i>	10	-	3	3	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	1
<i>Melaleuca micromera</i>	14	-	3	3	2	0	0	0	0	0	0	0	0	2	0	1	3	0	0	-
<i>Melaleuca ringens</i>	18	2	3	1	3	0	0	0	1	3	0	0	0	2	0	1	1	0	0	1
<i>Pultenaea pinifolia</i>	24	3	3	3	2	0	0	0	0	0	0	3	0	1	0	2	1	3	0	3
<i>Sphenotoma parviflorum</i>	21	3	3	1	1	0	0	0	0	0	0	0	0	1	2	2	2	2	1	3
<i>Stirlingia divaricatissima</i>	24	3	2	1	1	0	0	0	0	0	0	2	0	3	0	3	3	3	0	3
<i>Stylidium rhipidium</i>	33	-	3	3	3	0	0	0	0	0	3	3	0	3	3	3	3	3	3	0
<i>Synaphea intricata</i>	20	1	3	1	2	0	0	0	0	0	3	0	0	2	2	1	1	2	0	2
<i>Synaphea preissii</i>	15	3	3	3	3	0	0	0	0	0	0	0	0	0	1	1	1	0	0	-
<i>Thelymitra jacksonii</i> ms	22	-	2	1	1	0	0	0	0	0	0	3	0	3	2	3	3	1	0	3

**Table 4.** Priority flora that are known to occur in the Warren Region but are not included in the current management plan due to a lack of location and threat information. These taxa urgently require study and inclusion into the regional strategy.

<b>Taxon</b>	<b>Conservation Code</b>
<i>Andersonia jamesii</i>	P1
<i>Rulingia affinis</i> Wilkins ms	P1
<i>Scaevola ballajupensis</i>	P1
<i>Aotus</i> sp. Mt. Frankland	P2
<i>Cardamine paucijuga</i>	P2
<i>Daviesia mesophylla</i>	P2
<i>Degelia flabellata</i>	P2
<i>Gastrolobium ferrugineum</i>	P2
<i>Gastrolobium</i> sp. East Peak	P2
<i>Graticola pedunculata</i>	P2
<i>Kunzea micrantha</i> subsp. <i>hirtiflora</i>	P2
<i>Leucopogon lasiophyllus</i>	P2
<i>Phyllangium palustre</i>	P2
<i>Pimelea cracens</i> subsp. <i>glabra</i>	P2
<i>Schoenus loliaceus</i>	P2
<i>Chamaescilla gibsonii</i>	P3
<i>Calothamnus affinis</i>	P3
<i>Chordifex gracilior</i>	P3
<i>Eryngium ferox</i>	P3
<i>Gahnia scleroides</i>	P3
<i>Goodenia</i> sp. South Coast	P3
<i>Harperia confertospicata</i>	P3
<i>Hemigenia microphylla</i>	P3
<i>Hibbertia helianthemoides</i>	P3
<i>Pimelea rosea</i> subsp. <i>annelsii</i>	P3
<i>Rhodanthe pyrethrum</i>	P3
<i>Schoenus benthamii</i>	P3
<i>Sphaerolobium pubescens</i>	P3
<i>Sphaerolobium rostratum</i>	P3
<i>Sphenotoma</i> sp. Stirling Range	P3
<i>Stylidium gloephyllum</i> ms	P3
<i>Stylidium leeuwinense</i>	P3
<i>Stylidium lepidum</i>	P3
<i>Synaphea hians</i>	P3
<i>Thomasia triloba</i>	P3
<i>Tribonanthes</i> sp. Lake Muir	P3
<i>Xanthosia eichleri</i>	P3

**Table 5.** The recommended conservation status of Priority Flora (Priority 1, 2 & 3) in the Warren Region based upon surveys, number of populations and health of the populations.

<b>Taxon</b>	<b>Current Conservation Code</b>	<b>Recommended Conservation Code</b>
<i>Andersonia redolens</i>	P1	P2
<i>Andersonia</i> sp. Mitchell River	P1	P2
<i>Austrofestuca littoralis</i>	P1	P2
<i>Caladenia evanescens</i>	P1	P2
<i>Carex tereticaulis</i>	P1	-
<i>Cryptandra arbutiflora</i> var. <i>pygmaea</i>	P1	P2
<i>Deyeuxia inaequalis</i>	P1	-
<i>Eriochilus scaber</i> subsp. <i>orbifolia</i> ms	P1	P2
<i>Eryngium</i> sp. Lake Muir	P1	P2
<i>Hydatella australis</i>	P1	P2
<i>Pentapogon quadrifidus</i>	P1	-
<i>Sphaerolobium benetectum</i>	P1	P2
<i>Synaphea decumbens</i>	P1	P2
<i>Tetralochea</i> sp. Kent River	P1	-
<i>Amperea protensa</i>	P2	P3
<i>Andersonia annelsii</i> ms	P2	P2*
<i>Andersonia auriculata</i>	P2	P3
<i>Andersonia hammersleyana</i>	P2	P2*
<i>Andersonia virolens</i>	P2	-
<i>Anthocercis sylvicola</i>	P2	-
<i>Apodasmia ceramophila</i>	P2	P3
<i>Borya longiscapa</i>	P2	P3
<i>Caladenia abbreviata</i>	P2	-
<i>Caladenia erythrochila</i>	P2	-
<i>Caladenia luteola</i>	P2	-
<i>Caladenia starteorum</i>	P2	-
<i>Calothamnus</i> sp. Mt.Lindesay	P2	-
<i>Chamaexeros longicaulis</i>	P2	-
<i>Chamelaucium floriferum</i> ms subsp. <i>diffusum</i> ms	P2	-
<i>Chamelaucium forrestii</i> subsp. <i>forrestii</i> ms	P2	P3
<i>Chordifex jacksonii</i>	P2	P4
<i>Cryptandra congesta</i>	P2	P2*
<i>Dampiera orchardii</i>	P2	-
<i>Diuris heberlei</i>	P2	-
<i>Drepanocladus aduncus</i>	P2	-
<i>Drosera binata</i>	P2	-
<i>Dryandra sessilis</i> var. <i>cordata</i>	P2	P4
<i>Eucalyptus virginiae</i> ms	P2	P2*
<i>Euphrasia scabra</i>	P2	-
<i>Fabriona hampeana</i>	P2	-
<i>Grevillea acropogon</i>	P2	P1
<i>Grevillea fuscolutea</i>	P2	P2*
<i>Hemiandra australis</i> ms	P2	P3
<i>Hybanthus volubilis</i>	P2	-
<i>Juncus meianthus</i> ms	P2	-
<i>Laxmannia grandiflora</i> subsp. <i>brendae</i>	P2	P2*
<i>Leptinella drummondii</i>	P2	-
<i>Lilaeopsis polyantha</i>	P2	-
<i>Melaleuca pritzelii</i>	P2	-
<i>Mitreola minima</i>	P2	P3
<i>Rorippa dictyosperma</i>	P2	-
<i>Schizaea rupestris</i>	P2	-
<i>Schoenus fluitans</i>	P2	-
<i>Selliera radicans</i>	P2	P1



<b>Taxon</b>	<b>Current Conservation Code</b>	<b>Recommended Conservation Code</b>
<i>Sphagnum nova-zelandicum</i>	P2	-
<i>Spyridium riparium</i>	P2	-
<i>Thomasia quercifolia</i>	P2	P3
<i>Verticordia endlicheriana</i> var. <i>angustifolia</i>	P2	-
<i>Wurmbea</i> sp. Cranbrook	P2	P3
<i>Actinotus</i> sp. Walpole	P3	-
<i>Alexgeorgea ganopoda</i>	P3	-
<i>Andersonia amabile</i> ms	P3	-
<i>Astartea</i> sp. Mt. Johnson	P3	P3*
<i>Boronia anceps</i>	P3	-
<i>Boronia virgata</i>	P3	P4
<i>Calytrix pulchella</i>	P3	-
<i>Chamelaucium floriferum</i> ms subsp. <i>floriferum</i> ms	P3	-
<i>Chorizema reticulatum</i>	P3	-
<i>Cyathochaeta stipoides</i>	P3	-
<i>Cyathochaeta teretifolia</i>	P3	-
<i>Dicrastylis glauca</i>	P3	-
<i>Eucalyptus brevistylis</i>	P3	P4
<i>Gonocarpus pusillus</i>	P3	P4
<i>Gonocarpus simplex</i>	P3	P4
<i>Gonocarpus trichostachyus</i>	P3	-
<i>Grevillea papillosa</i>	P3	-
<i>Jansonia formosa</i>	P3	-
<i>Lambertia rariflora</i> subsp. <i>lutea</i>	P3	-
<i>Lasiopetalum cordifolium</i> subsp. <i>acuminatum</i>	P3	-
<i>Lomandra ordii</i>	P3	P4
<i>Marianthus sylvaticus</i>	P3	P4
<i>Meeboldina crassipes</i>	P3	-
<i>Meeboldina thysanantha</i>	P3	-
<i>Melaleuca diosmifolia</i>	P3	-
<i>Melaleuca micromera</i>	P3	-
<i>Melaleuca ringens</i>	P3	-
<i>Pultenaea pinifolia</i>	P3	-
<i>Sphenotoma parviflorum</i>	P3	P4
<i>Stirlingia divaricatissima</i>	P3	-
<i>Stylidium rhipidium</i>	P3	-
<i>Synaphea intricata</i>	P3	-
<i>Synaphea preissii</i>	P3	-
<i>Thelymitra jacksonii</i>	P3	-

\* With highest priority for further survey and consideration for gazettal as DRF

- Species status to remain unchanged

#### **4. IMPLEMENTATION AND TERM OF THE MANAGEMENT PROGRAM**

A recovery team (Warren Region Threatened Flora Recovery Team) is in place and has the task of overseeing and reporting annually to CALM's Corporate Executive on the implementation of this Management Program.

This Program shall run for a period of 10 years, unless subsequent research or changes to the Schedule of Declared Rare Flora result in it being superseded earlier. During this period, CALM may institute changes to the provisions outlined in this Program that are found, through further research or operational management, to be necessary for conservation of threatened flora in the Region.

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## GLOSSARY

<b>abaxial</b>	of the side or surface of an organ, facing away from the axis. cf. <b>adaxial</b>
<b>achene</b>	a dry indehiscent 1-seeded fruit, from an either superior or inferior ovary of 1 carpel, with the seed not fused to the fruit wall; eg as in Ranunculaceae (from a superior ovary) and Asteraceae (from an inferior ovary and usually topped by the pappus and sometimes called a cypsela)
<b>acrocarpous</b>	with the sporophyte produced at the end of the stem or main branch.
<b>acuminate</b>	tapering gradually to a protracted point
<b>acute</b>	terminating in a distinct but not protracted point, the converging edges separated by an angle less than 90 degrees
<b>adaxial</b>	of the side or surface of an organ, facing towards the axis. cf. <b>abaxial</b>
<b>adnate</b>	fused to an organ of a different kind, eg. applied to a stamen fused to a petal
<b>alar cells</b>	with reference to mosses, cells at the base angle of a leaf, often distinctive in shape, size and colour
<b>alternate</b>	of leaves or other lateral organs, borne singly at different heights on the axis; of floral parts, on a different radius, eg describing the position of stamens with respect to petals
<b>annual</b>	a plant whose life span ends within one year after germination
<b>anterior</b>	of floral organs, on the side of the flower farthest from the axis or toward the subtending (enclosing) bract. cf. <b>posterior</b> .
<b>anthesis</b>	the time of opening of a flower
<b>appendage</b>	a structure arising from the surface or extending beyond the tip of another structure
<b>appressed</b>	pressed closely against but not united with
<b>ascending</b>	growing erect after an oblique or semi-horizontal beginning
<b>attenuate</b>	tapering gradually
<b>auricle</b>	an ear-shaped appendage at the base of a leaf, leaflet or corolla lobe. adj. auriculate
<b>auriculate</b>	see <b>auricle</b>
<b>awn</b>	a bristle-like appendage, eg on the tip or back of the lemma of a grass floret
<b>axil</b>	the angle between a leaf or bract and the axis bearing it. adj. <b>axillary</b>
<b>axillary</b>	see <b>axil</b>
<b>axis</b>	a stem, commonly used for the main stem of a whole plant or of an inflorescence
<b>basal</b>	at the base; attached or grouped at the base, eg. of leaves in a rosette; of placentation, with the placenta at the base of the ovary

<b>barbate</b>	bearded, having tufts of hairs
<b>beak</b>	a prominent terminal projection, especially of a carpel or fruit
<b>berry</b>	a fleshy or pulpy indehiscent fruit with the seed(s) embedded in the fleshy tissue of the pericarp
<b>bipinnatisect</b>	twice pinnately divided, lobes almost to base or midribs
<b>bisexual</b>	with both stamens and carpels present and functional on a flower. cf. <b>unisexual</b>
<b>bract</b>	a leaf-like structure, different in form from the foliage leaves and without an axillary bud, associated with an inflorescence or flower
<b>bracteole</b>	a small bract-like structure borne singly or in pairs on the pedicel or calyx of a flower
<b>caducous</b>	falling off early. cf. <b>persistent</b>
<b>calli</b>	in <i>Dampiera</i> small outgrowths in the throat of the corolla (acting as tactile guides for pollinators)
<b>callus</b>	a protruding mass of hardened tissue, often formed after an injury but sometimes a regular feature of the plant, eg. on the labellum of some orchids and the axis of the spikelet of some grasses
<b>calyx</b>	the sepals of one flower collectively
<b>calyx-tube</b>	a tube formed by fusion or cohesion of sepals. cf. <b>hypanthium</b>
<b>campanulate</b>	bell-shaped
<b>capitulum</b>	a racemose inflorescence with sessile flowers compacted on a flattened and expanded, or rounded apex of a peduncle. pl <b>capitula</b>
<b>capsule</b>	a dry fruit formed from two or more united carpels and dehiscing at maturity to release the seeds
<b>cheridium</b>	a sleeve like structure in <i>Calytrix</i> made up of persistent bracteoles on an extended peduncle and connate to it
<b>cilia</b>	in unicellular plants, gametes, spores etc, minute hair-like protoplasmic protrusions whose movement confers motility on the cell; in higher plants, hairs more or less confined to the margins of an organ. sing. <b>cilium</b> ; adj. <b>ciliate</b>
<b>ciliate</b>	see <b>cilia</b>
<b>clavate</b>	club-shaped
<b>claw</b>	a narrow, stalk-like basal portion of a petal, sepal or bract
<b>cleistocarpus</b>	without an operculum and therefore not regularly dehiscent
<b>clonal</b>	see <b>clone</b>
<b>clone</b>	a set of organisms produced from one parent by vegetative reproduction. adj. <b>clonal</b>

<b>column</b>	a structure in Orchidaceae, Asclepiadaceae and Stylidiaceae, extending above the ovary of a flower and incorporating stigma, style and stamens
<b>compressed</b>	flattened in one plane, either dorsally (bringing the front and back closer together) or laterally (bringing the sides closer together)
<b>compound</b>	of a leaf, having the blade divided into two or more distinct leaflets; of an inflorescence, made up of an aggregate of smaller inflorescences
<b>cone</b>	(loosely) in Casuarina, a woody multiple fruit incorporating the bracts and bracteoles associated with the flowers
<b>conflorescence</b>	a compound inflorescence consisting of two or more unit inflorescences
<b>connate</b>	fused to another organ (or other organs) of the same kind
<b>connivent</b>	coming into contact; converging
<b>cordate</b>	of a leaf blade, broad and notched at the base; heart-shaped
<b>corolla</b>	the petals of a flower collectively
<b>corona</b>	a ring of tissue arising from the corolla or perianth of a flower and standing between the perianth lobes and the stamens
<b>corymb</b>	a racemose inflorescence in which the pedicels of the lower flowers are longer than those of the flowers above, bringing all flowers to about the same level
<b>costa</b>	with reference to mosses, the rib or nerve of a leaf, single or double
<b>crenate</b>	with small, rounded teeth; scalloped
<b>crenulate</b>	minutely scalloped
<b>crown</b>	the part of a tree or shrub above the level of the lowest branch
<b>culm</b>	an aerial stem, in grasses, sedges, rushes, etc., bearing the inflorescence
<b>cuneate</b>	wedge-shaped
<b>cymbiform</b>	concave and boat shaped
<b>cyme</b>	an inflorescence in which each flower, in turn, is formed at the tip of a growing axis and further flowers are formed on branches arising below it. adj. <b>cymose</b>
<b>cymose</b>	see <b>cyme</b>
<b>deciduous</b>	falling seasonally, eg of the leaves or bark of some trees
<b>decumbent</b>	spreading horizontally but then growing upwards
<b>decussate</b>	in pairs, with successive pairs borne at right angles to each other
<b>dehiscent</b>	breaking open at maturity to release the contents
<b>dentate</b>	toothed
<b>denticulate</b>	finely toothed

<b>deltoid</b>	triangular with the sides of about equal length
<b>digitate</b>	branching from the axis or stalk like the fingers of a hand
<b>dimorphic</b>	of two different forms
<b>dioecious</b>	having the male and female reproductive structures on separate plants. cf. <b>monoecious</b>
<b>disc</b>	a plate or rim of tissue, derived from the receptacle of a flower, occurring between whorls of floral parts
<b>discolourous</b>	having 2 colours, eg. upper and lower surfaces of a leaf being of different colours
<b>divaricate</b>	widely spreading
<b>dorsal</b>	when referring to thallose liverworts, the upper surface, facing away from the substrate
<b>dorsifixed</b>	attached at or by the back
<b>edaphic</b>	pertaining to the soil
<b>elliptic</b>	oval in outline, widest at the centre
<b>emarginate</b>	having a broad, shallow notch at the apex
<b>emergent</b>	rising above the surrounding plants
<b>endemic</b>	having a natural distribution confined to a particular geographical region
<b>endocarp</b>	the innermost layer of a pericarp
<b>entire</b>	having a smooth margin, not dissected or toothed
<b>ephemeral</b>	short-lived
<b>erect</b>	upright, perpendicular
<b>erose</b>	margin irregularly incised, appearing eroded, gnawed or irregularly toothed
<b>exocarp</b>	the outer layer of a pericarp
<b>exserted</b>	protruding, eg of stamens with respect to a corolla tube
<b>falcate</b>	sickle-shaped
<b>family</b>	a group of one to many genera believed to be related phylogenetically, usually clearly separable from other such groups
<b>fascicle</b>	a cluster, adj. <b>fasciculate</b>
<b>filament</b>	the stalk of a stamen; a thread one or more cells thick; in blue-green Algae, a trichome enclosed in a mucilaginous sheath
<b>filiform</b>	thread-like
<b>flabelliform</b>	fan shaped

<b>floral</b>	belonging to or associated with a flower
<b>floret</b>	a grass flower, together with the lemma and palea that enclose it (often applied to flowers in Cyperaceae and Asteraceae)
<b>fimbriate</b>	fringed
<b>follicle</b>	a dry, dehiscent fruit formed from one carpel and dehiscing along the line of fusion of its edges
<b>free</b>	not fused or united (with other organs)
<b>fruit</b>	the seed-bearing structure in angiosperms formed from the ovary after flowering
<b>gemmae</b>	specialised units of vegetative reproduction; morphologically distinct propogules, not casual fragments
<b>genus</b>	a group of species believed to be related phylogenetically and usually clearly separable from other such groups, or a single species without close relatives. pl. <b>genera</b>
<b>glabrescent</b>	becoming glabrous
<b>glabrous</b>	without hairs
<b>gland</b>	a structure, without or on the surface of a plant, with a secretory function
<b>glandular</b>	bearing glands; functioning as a gland
<b>glaucous</b>	blue-green in colour, with a whitish bloom (as in the juvenile leaves of many eucalypts)
<b>globular</b>	3 dimensional shape; spherical or orbicular; approximately circular in cross section
<b>glume</b>	one of the two bracts at the base of the grass spikelet; in sedges and rushes refers to the very small bracts of the spikelet in which each flower is subtended by a floral glume, and in which there are often several empty glumes in a spikelet
<b>habit</b>	the growth form of a plant, comprising its size, shape, texture and orientation
<b>habitat</b>	the environment in which a plant lives
<b>herb</b>	any vascular plant that never produces a woody stem
<b>herbaceous</b>	not woody; soft in texture
<b>hermaphrodite</b>	bisexual
<b>hirsute</b>	bearing coarse, rough, longish hairs
<b>hoary</b>	covered with a greyish layer of very short, closely interwoven hairs
<b>hyaline</b>	translucent, almost like clear glass
<b>hypanthium</b>	the part of the flower enveloping an ovary and formed by the fusion of the calyx tube, corolla tube and sometimes stamen filaments and receptacle; also referred to as calyx tube, floral tube or perigynium

<b>hypogenous</b>	borne below the ovary; used to describe the flower structure when the ovary is superior and as such the floral whorls and stamens are inserted below the ovary
<b>hypogenous bristle</b>	in Cyperaceae, petals and sepals often when present have been reduced to bristle like appendages
<b>imbricate</b>	of perianth parts, having the edges overlapping in the bud
<b>included</b>	enclosed, not protruding, cf. <b>exserted</b>
<b>incurved</b>	bent or curved inwards or upwards; of leaf margins, curved towards the adaxial surface
<b>indehiscent</b>	not breaking open at maturity to release the contents
<b>indusium</b>	the pollen-cup of Goodeniaceae; tissue covering the sorus of a fern
<b>inferior</b>	of an ovary, at least partly below the level of attachment of the other floral parts. cf. <b>superior</b>
<b>inflexed</b>	bent sharply upwards or forwards
<b>inflorescence</b>	the group or arrangement in which flowers are borne on a plant
<b>intercalary</b>	not involving the stem apex; intercalary branches of liverworts are secondary laterals, not terminal, revealed by a tiny collar of cells where they have pushed through the cortex
<b>internode</b>	the portion of a stem between the level of insertion of two successive leaves or leaf pairs (or branches of an inflorescence)
<b>involucral</b>	see <b>involucre</b>
<b>involucre</b>	large bract or whorl (or several whorls) of bracts surrounding a flower or an inflorescence. adj. <b>involucral</b>
<b>juvenile</b>	of leaves, formed on a young plant and different in form from the adult leaves
<b>keel</b>	a ridge like the keel of a boat; in particular, a boat-shaped structure formed by fusion of the two anterior petals of a flower in Fabaceae
<b>keeled</b>	of leaves or bracts, folded and ridged along the midrib
<b>labellum</b>	a lip; in Orchidaceae, the distinctive median petal that serves as an alighting platform for pollinating insects
<b>lamina</b>	the blade of a leaf
<b>lanceolate</b>	of a leaf, about four times as long as it is broad, broadest in the lower half and tapering towards the tip
<b>leaflet</b>	one of the ultimate segments of a compound leaf
<b>lemma</b>	the lower of two bracts enclosing a grass floret; male lemma - lemma enclosing a male flower; sterile lemma - an empty lemma. cf. <b>palea</b>
<b>lignotuber</b>	a woody swelling below or just above the ground, containing adventitious buds from which new shoots develop if the top of the plant is cut or burnt (common in the shrubby eucalypts and in many other fire-tolerant Australian shrubs)

<b>ligulate</b>	bearing a ligule; strap-shaped
<b>limb</b>	the upper free, spreading portion of a corolla or perianth that is connate at the base
<b>linear</b>	very narrow in relation to the length, and with the sides parallel
<b>lobe</b>	a usually rounded or pointed projecting part, usually one of two or more, each separated by a fissure or a sinus
<b>mallee</b>	a growth habit in which several woody stems arise separately from a lignotuber (usually applied to shrubby eucalypts); a plant having the above growth habit
<b>marginal</b>	occurring at or very close to the margin
<b>mericarp</b>	a one seeded portion of an initially syncarpous fruit which splits apart at maturity
<b>- merous</b>	used with a number prefix to denote the basic number of the 3 outer floral whorls
<b>membranous</b>	thin and translucent
<b>midrib</b>	the central, and usually the most prominent, vein of a leaf or leaf-like organ
<b>monocarpic</b>	flowering and fruiting only once during its life span
<b>monoecious</b>	having the male and female reproductive structures in separate flowers but on the same plant. cf. <b>dioecious</b>
<b>mucro</b>	a sharp, abrupt terminal point. adj. <b>mucronate</b>
<b>mucronate</b>	see <b>mucro</b>
<b>mucronulate</b>	with very small mucro
<b>nectary</b>	a gland that secretes nectar
<b>nerve</b>	a vein
<b>node</b>	the level (transverse plane) of a stem at which one or more leaves arise
<b>obcordate</b>	of a leaf blade, broad and notched at the tip; heart-shaped but attached at the pointed end
<b>oblanceolate</b>	similar in shape to lanceolate but attached at the narrower end
<b>oblong</b>	having the length greater than the width but no many times greater, and the sides parallel
<b>obovate</b>	similar in shape to ovate but attached at the narrower end
<b>obtuse</b>	blunt or rounded at the apex, the converging edges separated by an angle greater than 90 degrees
<b>operculum</b>	a lid or cover becoming detached at maturity by abscission; in <i>Eucalyptus</i> (for example), a cap covering the bud and formed by fusion or cohesion of perianth parts
<b>opposite</b>	of leaves, borne at the same level but on opposite sides of the stem; of floral parts, on the same radius. cf. <b>alternate</b>



<b>orbicular</b>	circular or nearly so
<b>ovate</b>	shaped like a section through the long axis of an egg, and attached by the wider end
<b>ovoid</b>	3 dimensional shape ovate in cross section
<b>palea</b>	the upper of the two bracts of a grass floret. cf. <b>lemma</b>
<b>panicle</b>	a compound raceme; an indeterminate inflorescence in which the flowers are borne on branches of the main axis or on further branches of these
<b>paniculate</b>	indeterminate and much branched
<b>papilla</b>	a small, elongated protuberance on the surface of an organ, usually an extension of one epidermal cell. adj. <b>papillose</b>
<b>papillose</b>	see <b>papilla</b>
<b>pappus</b>	a tuft (or ring) of hairs or scales borne above the ovary and outside the corolla in Asteraceae and possibly representing the calyx; a tuft of hairs on a fruit
<b>-partite</b>	divided, almost to the base, into segments (commonly applied to a style)
<b>patent</b>	spreading, diverging from the axis at almost right angles
<b>pedicel</b>	the stalk of a flower. adj. <b>pedicellate</b>
<b>pedicellate</b>	see <b>pedicel</b>
<b>peduncle</b>	the stalk of an inflorescence; in ferns, the stalk of a sporocarp. adj. <b>pedunculate</b>
<b>pedunculate</b>	see <b>peduncle</b>
<b>pendulous</b>	drooping, hanging downwards
<b>perennial</b>	a plant whose life span extends over more than two growing seasons
<b>perianth</b>	the calyx and corolla of a flower, especially where the two are similar
<b>pericarp</b>	wall of a fruit developed from the ovary wall
<b>persistent</b>	remaining attached, not falling off. cf. <b>caducous</b>
<b>petal</b>	a member of the inner whorl of non-fertile parts surrounding the fertile organs of a flower, usually soft and coloured conspicuously
<b>petiole</b>	the stalk portion of a leaf
<b>petiolate</b>	having a petiole
<b>pilose</b>	hairy, the hairs soft and clearly separated but not sparse
<b>pinnate</b>	divided into pinnae; once-compound. cf. <b>bipinnate</b>
<b>pinnatifid</b>	cut deeply into lobes that are spaced out along the axis (of the leaf). cf. <b>palmatifid</b>
<b>pinnatisect</b>	dissected down to the midrib but having the segments confluent with it

<b>pistil</b>	a free carpel or a group of fused carpels
<b>plicate</b>	having a longitudinal fold or ridge; or folded back and forth longitudinally like a fan
<b>plumose</b>	like a feather; with fine hairs branching from a central axis
<b>pod</b>	a leguminous fruit
<b>pollination</b>	the transfer of pollen from the male organ, where it is formed, to the receptive region of a female organ, eg from anther to stigma
<b>posterior</b>	toward the axis, away from the subtending bract. cf. <b>anterior</b>
<b>procumbent</b>	trailing or spreading along the ground but not rooting at the nodes
<b>prostrate</b>	lying flat on the ground
<b>puberulous</b>	covered with minute, soft, erect hairs
<b>pubescent</b>	covered with short, soft, erect hairs
<b>pungent</b>	ending in a stiff, sharp point; having an acrid taste or smell
<b>pyrene</b>	the stone or pit of a drupe consisting of the hardened endocarp and seed
<b>raceme</b>	an indeterminate inflorescence in which a main axis produced a series of flowers on lateral stalks, the oldest at the base and the youngest at the top. adj. <b>racemose</b>
<b>rachis</b>	the axis of an inflorescence or a pinnate leaf; pl. <b>rachises</b> . <b>Secondary rachis</b> : the axis of a pinna in a bipinnate leaf
<b>ray</b>	of a compound umbel, one of the first (lower) series of branches of the inflorescence axis
<b>receptacle</b>	the axis of a flower (= torus); in ferns, an axis on which sporangia arise
<b>recurved</b>	curved or curled downwards or backwards
<b>reflexed</b>	bent sharply downwards or backwards
<b>reticulate</b>	forming a network
<b>retorse</b>	directed backwards or downwards. cf. <b>antrorse</b>
<b>revolute</b>	rolled downwards or backwards
<b>rhizomatous</b>	see <b>rhizome</b>
<b>rhizome</b>	a creeping stem, usually below ground, consisting of a series of nodes and internodes with adventitious roots. adj. <b>rhizomatous</b>
<b>rhomboid</b>	quadrangular, with the lateral angles obtuse. adj. <b>rhomboidal</b>
<b>rib</b>	a distinct vein or linear marking often raised as a linear ridge
<b>rosette</b>	tuft of leaves or other organs resembling the arrangement of the petals in a rose
<b>rugose</b>	deeply wrinkled

<b>saccate</b>	pouched
<b>scabrous</b>	rough to the touch
<b>scale</b>	a reduced or rudimentary leaf
<b>scape</b>	the stem-like, flowering stalk of a plant with radical leaves
<b>scarious</b>	dry and membranous
<b>secund</b>	with all the parts grouped on one side or turned to one side
<b>sepal</b>	a member of the (usually green) outer whorl of non-fertile parts surrounding the fertile organs of a flower
<b>serrate</b>	toothed, with asymmetrically teeth pointing forward
<b>serrulate</b>	finely serrate
<b>sessile</b>	without a stalk (when applied to a stigma, indicates that the style is absent, the stigma being 'sessile' on the ovary)
<b>seta</b>	a bristle or stiff hair
<b>sheath</b>	see <b>sheathing</b>
<b>sheathing</b>	clasping or enveloping the stem
<b>shrub</b>	a woody plant less than 5 metres high, either without a distinct main axis, or with branches persisting on the main axis almost to its base
<b>silicula</b>	a short siliqua, not more than twice as long as its width
<b>siliqua</b>	a broad, dry, dehiscent fruit derived from 2 or more carpels which dehisce along 2 sutures and which has a persistent partition after dehiscence which is at least twice as long as broad
<b>simple</b>	undivided; of a leaf, not divided into leaflets; of a hair or an inflorescence, not branched
<b>sinuate</b>	with deep, wave-like depressions along the margin. cf. <b>undulate</b>
<b>solitary</b>	of flowers, borne singly, not grouped in an inflorescence
<b>spathulate</b>	spoon-shaped; broad at the tip and narrowed towards the base
<b>species</b>	a taxon comprising individuals, or populations of individuals, capable of interbreeding to produce fertile offspring; the largest group of individuals between which there are no distinguishable, consistent differences in form or reproductive mechanisms
<b>spike</b>	an unbranched, indeterminate inflorescence in which the flowers are without stalks. adj. <b>spicate</b>
<b>spikelet</b>	a unit of the inflorescence in grasses, sedges and some other monocotyledons, consisting of one to many flowers and associated glumes
<b>spine</b>	a stiff, sharp-pointed structure, formed by modification of a plant organ, eg a lateral branch or a stipule

<b>spinescent</b>	ending in a spine; modified to form a spine
<b>spinose</b>	bearing spines
<b>spiral</b>	of leaves or floral organs, borne at different levels on the axis, in an ascending spiral. cf. <b>cyclic</b>
<b>sporangia</b>	see sporangium
<b>sporangium</b>	a case or body that contains the spores. pl. <b>sporangia</b>
<b>sporophore</b>	specialised sporangia-bearing lobes of the leaf margin in species of Schizaeaceae
<b>staminode</b>	a sterile stamen, often rudimentary
<b>standard</b>	the posterior petal in the flower in Papilionaceae
<b>stellate</b>	star-shaped; consisting of star-shaped cells
<b>stem</b>	the main axis or a branch of the main axial system of a plant, developed from the plumule of the embryo and typically bearing leaves
<b>stilt plant</b>	a plant with stilt roots (oblique aerial adventitious roots from the stem)
<b>stipule</b>	one of a pair of appendages at the bases of leaves in many dicotyledons
<b>stolon</b>	a prostrate or trailing stem that produces roots at the nodes
<b>stomate</b>	a pore bounded by two guard cells in the epidermis, especially in leaves, through which gases diffuse pl. <b>stomata</b>
<b>striate</b>	striped with parallel longitudinal lines or ridges
<b>strigose</b>	with sharp, stiff hairs which are slanting rather than erect
<b>subtending</b>	term describing a leaf or bract whose axil gives rise to a bud (the axillary bud) which may develop into a branch or inflorescence; less commonly more than one bud is subtended in each axil
<b>subulate</b>	narrow and tapering gradually to a fine point
<b>superior</b>	inserted above another organ or part; a superior ovary is free from the receptacle, with the perianth and stamens inserted below it or on a perigynous hypanthium
<b>taxon</b>	a group or category, at any level, in a system for classifying plants or animals
<b>tepal</b>	a perianth segment in a flower in which all the perianth segments are similar in appearance, that is not differentiated into a calyx and corolla.
<b>terete</b>	cylindrical or nearly so; circular in cross-section
<b>terminal</b>	at the apex or distal end
<b>terrestrial</b>	of or on the ground; of the habitat of a plant, on land as opposed to in water, or on the ground as opposed to on another plant
<b>thallus</b>	the vegetative body of a plant that is not differentiated into organs such as stems and leaves, eg algae, the gametophytes of many liverworts, and Lemnaceae. adj <b>thallos</b>

<b>thallous</b>	see <b>thallus</b>
<b>throat</b>	of a corolla tube, the top, where the tube joins the lobes
<b>tomentum</b>	a covering of dense, matted, woolly hairs. adj. <b>tomentose</b>
<b>tomentose</b>	see <b>tomentum</b>
<b>trifid</b>	deeply divided into three parts
<b>trifoliate</b>	having three leaves
<b>trigonus</b>	triangular in cross-section and obtusely-angled
<b>triquetrous</b>	trigonus
<b>truncate</b>	with an abruptly transverse end, as if cut off
<b>tuber</b>	a storage organ formed by swelling of an underground stem or the distal end of a root
<b>tuberous</b>	swollen; of roots, tuber-like
<b>umbel</b>	a racemose inflorescence in which all the individual flower stalks arise in a cluster at the top of the peduncle and are of about equal length
<b>umbellule</b>	a partial umbel, part of a compound umbel
<b>undulate</b>	wavy, ie not flat. cf. <b>sinuate</b>
<b>unisexual</b>	bearing only male or only female reproductive organs
<b>united</b>	fused together
<b>utricle</b>	a small bladder; a membranous bladder-like sac enclosing an ovary or fruit
<b>vein</b>	a strand of vascular tissue
<b>venation</b>	the arrangement of veins in a leaf
<b>ventral</b>	when referring to thallose liverworts, the lower surface, that facing towards the substrate
<b>verticillate</b>	arranged in one or more whorls
<b>villous</b>	shaggy with long, weak hairs
<b>virgate</b>	with a broom like habit, more or less densely branched with stiff, more or less erect branches
<b>whorl</b>	a ring of leaves, bracts or floral parts borne at the same level on an axis
<b>wing</b>	a membranous expansion of a fruit or seed, which aids dispersal; a thin flange of tissue extended beyond the normal outline of a stem or petiole; a lateral petal of a flower in Papilionaceae
<b>xeromorphic</b>	able to withstand drought

**zygomorphic** of a flower with the parts such as sepals and petals differing in shape, size, position and/or number so that the flower can be bisected in one plane only; bilaterally symmetrical

## APPENDIX I

### Wildlife Conservation Act 1950

#### Section 23F. Rare or endangered species of flora

- (1) In this section “**rare flora**” means flora for the time being declared to be rare flora for the purposes of this section.
- (2) Where the Minister is of opinion that any class or description of protected flora is likely to become extinct or is rare or otherwise in need of special protection, he may, by notice published in the *Government Gazette*, declare that class or description of flora to be rare flora for the purposes of this section throughout the State.
- (3) The Minister may vary or revoke a notice published under subsection (2) by subsequent notice or notices published in the *Government Gazette*.
- (4) A person shall not, whether or not he is —
  - (a) the holder of a licence issued under this Act to take protected flora;
  - (b) the owner or occupier of private land on which rare flora exists; or
  - (c) authorized by the owner or occupier of land on which rare flora exists,  
take any rare flora unless —
  - (d) where he is not the holder of a licence issued under this Act, he first obtains the consent thereto in writing of the Minister;
  - (e) where he is the holder of a licence issued under this Act, he first obtains the further consent thereto in writing of the Minister.

*[(5) repealed]*

- (6) A person who takes any rare flora contrary to the provisions of this section is liable on conviction to a penalty not exceeding \$10 000.
- (7) Where an owner or occupier of private land who has been refused consent to take rare flora on that land satisfies the Minister that he will suffer loss of use or enjoyment of the land by reason of that refusal, the Minister shall inform the Treasurer in writing accordingly and the owner or occupier shall be paid compensation for that loss at such rate or rates per annum as —
  - (a) is agreed between the owner or occupier and the Treasurer;  
or
  - (b) in default of agreement, is determined by a valuer appointed by agreement between the Treasurer and the owner or occupier, or in default of agreement on such an appointment, by a valuer appointed by the Minister, for such period, not exceeding 5 years, as the loss continues.
- (8) Where compensation has been paid under subsection (7) for a period of 5 years in respect of any particular land, the Minister shall not refuse an application by the owner or occupier of that land to take rare

flora on that part of the land for the loss of use or enjoyment of which compensation has been so paid.

- (9) Notwithstanding that compensation has been paid under subsection (7), whether for a period of 5 years or for a lesser period, for the loss of use or enjoyment of any land, that land may at any time be taken by the Minister administering the *Land Administration Act 1997* under and subject to Part 9 of the *Land Administration Act 1997* for any of the purposes of this Act.

*[Section 23F inserted by No. 86 of 1976 s.17 (as amended by No. 28 of 1979 s.7.); amended by No. 58 of 1985 s.7; No. 31 of 1997 ss.142 and 143; No. 57 of 1997 s.132(23).]*



## APPENDIX II

### Wildlife Conservation (Rare Flora) Notice 2005

Made by the Minister for the Environment under section 23F(2) of the Act.

#### 1. Citation

This notice is the *Wildlife Conservation (Rare Flora) Notice 2005*.

#### 2. Interpretation

In this notice —

“**extant**” means known to be living in a wild state;

“**protected flora**” means any flora belonging to the classes of flora declared by the Minister under section 6 of the Act to be protected flora by notice published in the *Gazette* 9 October 1987, at p. 3855;

“**taxon**” includes any taxon that is described by a genus name and any other name or description.

Note: The plural form of “taxon” is “taxa”.

#### 3. Rare flora

Subject to clause 4, protected flora —

(a) specified in Schedule 1, being taxa that are extant and considered likely to become extinct or rare and therefore in need of special protection; and

(b) specified in Schedule 2, being taxa that are presumed to be extinct in the wild and therefore in need of special protection, are declared to be rare flora for the purposes of section 23F of the Act throughout the State.

#### 4. Application

Clause 3 does not apply to those plants of a taxon of protected flora specified in Schedule 1 or 2 that have been planted for any purpose other than such plants that have been planted for the purpose of conservation of that taxon and in accordance with approval given by the Executive Director.

#### 5. Revocation

The *Wildlife Conservation (Rare Flora) Notice 2004* is revoked.

### Schedule 1 — Extant taxa

#### Division 1 — Spermatophyta (flowering plants, conifers and cycads)

- |   |   |
|---|---|
| 1. <i>Acacia anomala</i>                                | 11. <i>Acacia cochlocarpa</i> subsp. <i>velutinos</i> |
| 2. <i>Acacia aphylla</i>                                | 12. <i>Acacia denticulosa</i>                         |
| 3. <i>Acacia aprica</i>                                 | 13. <i>Acacia depressa</i>                            |
| 4. <i>Acacia aristulata</i> ms                          | 14. <i>Acacia forrestiana</i>                         |
| 5. <i>Acacia ataxiphylla</i> subsp. <i>magna</i>        | 15. <i>Acacia imitans</i>                             |
| 6. <i>Acacia auratiflora</i>                            | 16. <i>Acacia insolita</i> subsp. <i>recurva</i>      |
| 7. <i>Acacia awestoniana</i>                            | 17. <i>Acacia lanuginophylla</i>                      |
| 8. <i>Acacia brachypoda</i>                             | 18. <i>Acacia leptalea</i>                            |
| 9. <i>Acacia chapmanii</i> subsp. <i>australis</i>      | 19. <i>Acacia lobulata</i>                            |
| 10. <i>Acacia cochlocarpa</i> subsp. <i>cochlocarpa</i> | 20. <i>Acacia pharangites</i>                         |
|   | 21. <i>Acacia pygmaea</i>                             |
|   | 22. <i>Acacia recurvata</i>                           |
|   | 23. <i>Acacia rhamphophylla</i>                       |

24. *Acacia sciophanes*
25. *Acacia subflexuosa* subsp. *capillata*
26. *Acacia trulliformis*
27. *Acacia unguicula*
28. *Acacia vassalii*
29. *Acacia volubilis*
30. *Acacia wilsonii*
31. *Acacia splendens*
32. *Adenanthos dobagii*
33. *Adenanthos ellipticus*
34. *Adenanthos eyrei*
35. *Adenanthos pungens* subsp. *effusus*
36. *Adenanthos pungens* subsp. *pungens*
37. *Adenanthos velutinus*
38. *Allocasuarina fibrosa*
39. *Allocasuarina tortiramula*
40. *Andersonia axilliflora*
41. *Andersonia gracilis*
42. *Andersonia pinaster* ms
43. *Anigozanthos bicolor* subsp. *minor*
44. *Anigozanthos viridis* subsp. *terraspectans*
45. *Anthocercis gracilis*
46. *Apium prostratum* subsp. *phillipii* ms
47. *Asterolasia nivea*
48. *Banksia brownii*
49. *Banksia cuneata*
50. *Banksia goodii*
51. *Banksia oligantha*
52. *Banksia sphaerocarpa* var. *dolichostyla*
53. *Banksia verticillata*
54. *Beyeria lepidopetala*
55. *Boronia adamsiana*
56. *Boronia capitata* subsp. *capitata*
57. *Boronia clavata*
58. *Boronia exilis*
59. *Boronia revoluta*
60. *Brachyscias verecundus*
61. *Caladenia barbarella*
62. *Caladenia bryceana* subsp. *bryceana*
63. *Caladenia bryceana* subsp. *cracens*
64. *Caladenia busselliana*
65. *Caladenia caesarea* subsp. *maritima*
66. *Caladenia christineae*
67. *Caladenia dorrieni*
68. *Caladenia drakeoides*
69. *Caladenia elegans*
70. *Caladenia excelsa*
71. *Caladenia harringtoniae*
72. *Caladenia graniticola*
73. *Caladenia hoffmanii*
74. *Caladenia huegelii*
75. *Caladenia melanema*
76. *Caladenia procera*
77. *Caladenia viridescens*
78. *Caladenia wanosa*
79. *Caladenia williamsiae*
80. *Caladenia winfieldii*
81. *Calectasia cyanea*
82. *Calectasia pignattiana*
83. *Calothamnus accedens*
84. *Calytrix breviseta* subsp. *breviseta*
85. *Centrolepis caespitosa*
86. *Chamelaucium griffinii* ms
87. *Chamelaucium roycei* ms
88. *Chamelaucium lullfitzii* ms
89. *Chamelaucium* sp. Hamersley (N. McQuoid 379)
90. *Chordifex abortivus*
91. *Chorizema humile*
92. *Chorizema varium*
93. *Conospermum densiflorum* subsp. *unicephalatum*
94. *Conospermum toddii*
95. *Conospermum undulatum*
96. *Conostylis dielsii* subsp. *teres*
97. *Conostylis drummondii*
98. *Conostylis lepidospermoides*
99. *Conostylis micrantha*
100. *Conostylis misera*
101. *Conostylis rogeri*
102. *Conostylis seorsiflora* subsp. *trichophylla*
103. *Conostylis setigera* subsp. *dasy*
104. *Conostylis wonganensis*
105. *Cooperhooia georgei*
106. *Cyphanthera odgersii* subsp. *occidentalis*
107. *Darwinia acerosa*
108. *Darwinia apiculata*
109. *Darwinia carnea*
110. *Darwinia chapmaniana* ms
111. *Darwinia collina*
112. *Darwinia ferricola* ms
113. *Darwinia foetida* ms
114. *Darwinia masonii*
115. *Darwinia meeboldii*
116. *Darwinia oxylepis*
117. *Darwinia squarrosa*
118. *Darwinia wittwerorum*
119. *Darwinia* sp. Carnamah (J. Coleby-Williams 148)
120. *Darwinia* sp. Stirling Range (G.J. Keighery 5732)
121. *Darwinia* sp. Williamson (G.J. Keighery 12717)
122. *Daviesia bursarioides*
123. *Daviesia cunderdin*
124. *Daviesia dielsii*
125. *Daviesia elongata* subsp. *elongata*
126. *Daviesia euphorbioides*
127. *Daviesia glossosema*
128. *Daviesia megacalyx*
129. *Daviesia microcarpa*
130. *Daviesia obovata*
131. *Daviesia pseudaphylla*
132. *Daviesia speciosa*

133. *Deyeuxia drummondii*  
 134. *Diuris drummondii*  
 135. *Diuris micrantha*  
 136. *Diuris purdiei*  
 137. *Drakaea concolor* ms  
 138. *Drakaea confluens* ms  
 139. *Drakaea elastica*  
 140. *Drakaea isolata* ms  
 141. *Drakaea micrantha* ms  
 142. *Drummondita ericoides*  
 143. *Drummondita longifolia*  
 144. *Dryandra anatona*  
 145. *Dryandra aurantia*  
 146. *Dryandra fuscobractea*  
 147. *Dryandra ionthocarpa* subsp. *chrysophoenix* ms  
 148. *Dryandra ionthocarpa* subsp. *ionthocarpa* ms  
 149. *Dryandra mimica*  
 150. *Dryandra montana*  
 151. *Dryandra mucronulata* subsp. *retrorsa*  
 152. *Dryandra nivea* subsp. *uliginosa*  
 153. *Dryandra pseudoplumosa*  
 154. *Dryandra serratuloides* subsp. *perissa*  
 155. *Dryandra serratuloides* subsp. *serratuloides*  
 156. *Dryandra squarrosa* subsp. *argillacea*  
 157. *Eleocharis keigheryi*  
 158. *Epiblema grandiflorum* var. *cyaneum* ms  
 159. *Eremophila denticulata* subsp. *denticulata*  
 160. *Eremophila koobabbiensis* ms  
 161. *Eremophila lactea*  
 162. *Eremophila nivea*  
 163. *Eremophila pinnatifida* ms  
 164. *Eremophila resinosa*  
 165. *Eremophila rostrata* ms  
 166. *Eremophila scaberula*  
 167. *Eremophila subteretifolia* ms  
 168. *Eremophila ternifolia*  
 169. *Eremophila vernicosa* ms  
 170. *Eremophila verticillata*  
 171. *Eremophila virens*  
 172. *Eremophila viscida*  
 173. *Eucalyptus absita*  
 174. *Eucalyptus argutifolia*  
 175. *Eucalyptus articulata*  
 176. *Eucalyptus balanites*  
 177. *Eucalyptus beardiana*  
 178. *Eucalyptus blaxellii*  
 179. *Eucalyptus brevipes*  
 180. *Eucalyptus burdettiana*  
 181. *Eucalyptus ceracea*  
 182. *Eucalyptus coronata*  
 183. *Eucalyptus crispata*  
 184. *Eucalyptus crucis* subsp. *crucis*  
 185. *Eucalyptus crucis* subsp. *praecipua*  
 186. *Eucalyptus cuprea*  
 187. *Eucalyptus dolorosa*  
 188. *Eucalyptus impensa*  
 189. *Eucalyptus insularis*  
 190. *Eucalyptus johnsoniana*  
 191. *Eucalyptus lateritica*  
 192. *Eucalyptus leprophloia*  
 193. *Eucalyptus merrickiae*  
 194. *Eucalyptus mooreana*  
 195. *Eucalyptus phylacis*  
 196. *Eucalyptus platydisca* ms  
 197. *Eucalyptus pruiniramis*  
 198. *Eucalyptus recta*  
 199. *Eucalyptus rhodantha* var. *rhodantha*  
 200. *Eucalyptus steedmanii*  
 201. *Eucalyptus suberea*  
 202. *Eucalyptus synandra*  
 203. *Frankenia conferta*  
 204. *Frankenia parvula*  
 205. *Gastrolobium appressum*  
 206. *Gastrolobium diabolophyllum*  
 207. *Gastrolobium glaucum*  
 208. *Gastrolobium graniticum*  
 209. *Gastrolobium hamulosum*  
 210. *Gastrolobium lehmannii*  
 211. *Gastrolobium luteifolium*  
 212. *Gastrolobium modestum*  
 213. *Gastrolobium papilio*  
 214. *Glyceria drummondii*  
 215. *Goodenia integerrima*  
 216. *Grevillea althoferorum*  
 217. *Grevillea batrachioides*  
 218. *Grevillea brachystylis* subsp. *australis*  
 219. *Grevillea brachystylis* subsp. *grandis*  
 220. *Grevillea bracteosa*  
 221. *Grevillea calliantha*  
 222. *Grevillea christineae*  
 223. *Grevillea curviloba* subsp. *curviloba*  
 224. *Grevillea curviloba* subsp. *incurva*  
 225. *Grevillea dryandroides* subsp. *dryandroides*  
 226. *Grevillea dryandroides* subsp. *hirsuta*  
 227. *Grevillea elongata*  
 228. *Grevillea flexuosa*  
 229. *Grevillea humifusa*  
 230. *Grevillea infundibularis*  
 231. *Grevillea involucrata*  
 232. *Grevillea maccutcheonii*  
 233. *Grevillea maxwellii*  
 234. *Grevillea murex*  
 235. *Grevillea phanerophlebia*  
 236. *Grevillea pythara*  
 237. *Grevillea rara*  
 238. *Grevillea scapigera*  
 239. *Guichenotia seorsiflora* ms  
 240. *Gyrostemon reticulatus*  
 241. *Hakea aculeata*  
 242. *Hakea megalosperma*  
 243. *Haloragis platycarpa*

244. *Halosarcia bulbosa*  
245. *Hemiandra gardneri*  
246. *Hemiandra rutilans*  
247. *Hemigenia ramosissima*  
248. *Hensmania chapmanii*  
249. *Hibbertia priceana* ms  
250. *Hybanthus cymulosus*  
251. *Hydatella dioica*  
252. *Hydatella leptogyne*  
253. *Hypocalymma angustifolium*  
subsp. *longifolium*  
254. *Isopogon robusta* ms  
255. *Isopogon uncinatus*  
256. *Jacksonia pungens* ms  
257. *Jacksonia quairading* ms  
258. *Jacksonia velveta*  
259. *Kennedia glabrata*  
260. *Kennedia macrophylla*  
261. *Keraudrenia exastia*  
262. *Lambertia echinata* subsp.  
*echinata*  
263. *Lambertia echinata* subsp.  
*occidentalis*  
264. *Lambertia fairallii*  
265. *Lambertia orbifolia* subsp.  
*orbifolia* ms  
266. *Lambertia orbifolia* subsp.  
Scott River Plains (L.W. Sage 684)  
267. *Lasiopetalum pterocarpum* ms  
268. *Lasiopetalum rotundifolium*  
269. *Lechenaultia chlorantha*  
270. *Lechenaultia laricina*  
271. *Lepidium aschersonii*  
272. *Lepidium catapycnon*  
273. *Lepidosperma rostratum*  
274. *Leucopogon gnaphalioides*  
275. *Leucopogon marginatus*  
276. *Leucopogon obtectus*  
277. *Leucopogon* sp. Helena and  
Aurora Range (B.J. Lepschi 2077)  
278. *Lysiosepalum abollatum*  
279. *Macarthuria keigheryi*  
280. *Marianthus villosus*  
281. *Marianthus* sp. Bremer (N.  
Gibson and M. Lyons 1776)  
282. *Melaleuca sciotostyla*  
283. *Meziella trifida*  
284. *Microcorys eremophiloides*  
285. *Microtis globula*  
286. *Muehlenbeckia horrida* subsp.  
*abdita*  
287. *Muelleranthus crenulatus*  
288. *Myoporum cordifolium*  
289. *Myoporum turbinatum*  
290. *Myriophyllum lapidicola*  
291. *Orthrosanthus muelleri*  
292. *Pandanus spiralis* var.  
*flammeus*  
293. *Paracaleana dixonii* ms  
294. *Patersonia spirifolia*  
295. *Persoonia micranthera*  
296. *Petrophile latericola* ms  
297. *Philotheca basistyla*  
298. *Philotheca wonganensis*  
299. *Pityrodia augustensis*  
300. *Pityrodia axillaris*  
301. *Pityrodia scabra*  
302. *Pterostylis* sp. Northampton (S.D. Hopper 3349)  
303. *Ptilotus fasciculatus*  
304. *Ptychosema pusillum*  
305. *Pultenaea pauciflora*  
306. *Rhagodia acicularis*  
307. *Rhizanthella gardneri*  
308. *Ricinocarpus brevis* ms  
309. *Ricinocarpos trichophorus*  
310. *Roycea pycnophylloides*  
311. *Rulingia* sp. Trigwell Bridge (R. Smith s.n. 20.6.89)  
312. *Scaevola macrophylla*  
313. *Schoenia filifolia* subsp. *subulifolia*  
314. *Sphenotoma drummondii*  
315. *Spirogardnera rubescens*  
316. *Stachystemon nematophorus*  
317. *Stawellia dimorphantha*  
318. *Stylidium coroniforme*  
319. *Stylidium galioides*  
320. *Stylidium merrallii*  
321. *Symonanthus bancroftii*  
322. *Synaphea quartzitica*  
323. *Synaphea selenae* ms  
324. *Synaphea stenoloba*  
325. *Synaphea* sp. Pinjarra (R. Davis 6578)  
326. *Tetradia australiensis*  
327. *Tetradthea aphylla*  
328. *Tetradthea deltoidea*  
329. *Tetradthea harperi*  
330. *Tetradthea nephelioides* ms  
331. *Tetradthea paynterae*  
332. *Thelymitra manginiorum* ms  
333. *Thelymitra psammophila*  
334. *Thelymitra stellata*  
335. *Thomasia glabripetala*  
336. *Thomasia montana*  
337. *Thomasia* sp. Green Hill (S. Paust 1322)  
338. *Thryptomene wittweri*  
339. *Tribonanthes purpurea*  
340. *Verticordia albida*  
341. *Verticordia apecta*  
342. *Verticordia carinata*  
343. *Verticordia crebra*  
344. *Verticordia densiflora* var. *pedunculata*  
345. *Verticordia fimbrialepis* subsp. *australis*  
346. *Verticordia fimbrialepis* subsp. *fimbrialepis*  
347. *Verticordia helichrysantha*  
348. *Verticordia hughanii*  
349. *Verticordia pityrhops*  
350. *Verticordia plumosa* var. *ananeotes*  
351. *Verticordia plumosa* var. *pleiobotrya*  
352. *Verticordia plumosa* var. *vassensis*  
353. *Verticordia spicata* subsp. *squamosa*

354. *Verticordia staminosa* subsp.  
*cylindracea* var. *cylindracea*  
355. *Verticordia staminosa* subsp.  
*cylindracea* var. *erecta*

356. *Verticordia staminosa* subsp. *staminosa*  
357. *Villarsia calthifolia*  
358. *Wurmbea calcicola*  
359. *Wurmbea tubulosa*  
360. *Xyris exilis*

**Division 2 — Pteridophyta (ferns and fern allies)**

361. *Asplenium obtusatum* subsp. *northlandicum*

**Division 3 — Bryophyta (mosses and liverworts)**

362. *Rhacocarpus webbianus*

**Schedule 2 — Taxa presumed to be extinct**

**Spermatophyta (flowering plants, conifers and cycads)**

- 1 *Acacia kingiana*
- 2 *Acacia prismifolia*
- 3 *Coleanthera virgata*
- 4 *Frankenia decurrens*
- 5 *Lepidium drummondii*
- 6 *Leptomeria dielsiana*
- 7 *Leucopogon cryptanthus*
- 8 *Opercularia acolytantha*
- 9 *Philotheca falcata*
- 10 *Ptilotus caespitosus*
- 11 *Ptilotus pyramidatus*
- 12 *Taraxacum cygnorum*
- 13 *Tetratheca fasciculata*
- 14 *Thomasia gardneri*

JUDY EDWARDS, Minister for the  
Environment.

## APPENDIX III

### CONSERVATION OF THREATENED FLORA IN THE WILD - DECEMBER 1992

Department of Conservation and Land Management Policy Statement No. 9

#### 1. OPERATIONAL OBJECTIVE

To conserve threatened flora in the wild in Western Australia and to comply with Section 23F of the Wildlife Conservation Act.

#### 2. DEFINITIONS

The term "threatened flora" is used to mean any plant taxon which is threatened with extinction and declared under Section 23F of the Wildlife Conservation Act as "rare flora" (i.e. "is likely to become extinct or is rare or otherwise in need of special protection").

"Interim Wildlife Management Guidelines" means guidelines approved by the Director of Nature Conservation for the management and protection of threatened or harvested taxa where no full Wildlife Management Program has been prepared.

"Wildlife Management Program" means a publication produced by CALM providing detailed information and guidance for the management and protection of threatened or harvested species or groups of those species. Programs for threatened taxa are sometimes referred to as "Species Recovery Plans".

#### 3. BACKGROUND

The Department of Conservation and Land Management has statutory responsibilities for endangered flora conservation. This is a major concern because:

- (i) Western Australia has a flora that is exceptionally rich in localised and rare endemic plant species. Moreover, areas where rare species are concentrated coincide predominantly with the wheatbelt and other areas where there has been extensive clearing or modification of the native flora.
- (ii) Section 23F of the Wildlife Conservation Act prohibits the taking (injury or destruction) of declared threatened (rare) flora by any person on any land throughout the State without the consent in writing of the Minister. A breach of this provision may lead to a fine of up to \$10 000. The flora provisions of the Act are binding on the Crown.

Officers of the Department need to know how to identify declared threatened flora, to know where it occurs, and to know how best to manage it. Moreover, the Act prescribes that threatened flora be protected on all categories of land throughout the State. Hence, the legislation requires officers of the Department to advise and otherwise deal with a broad spectrum of land owners and users. Threatened flora conservation is thus an issue of high public profile, and one where the Department's activities are subject to intense public scrutiny.

#### The Schedule of Declared Rare Flora

The Schedule of Declared Rare (Threatened Flora) is reviewed annually.

Plants which are protected flora declared under the Wildlife Conservation Act **may be recommended** for gazettal as declared rare (threatened) flora if they satisfy the following criteria

- (i) The taxon (species, subspecies, variety) is well-defined, readily identified and represented by a voucher specimen in a State or National Herbarium. It need not necessarily be formally described under conventions in the International Code of Botanical Nomenclature, but such a description is preferred and should be undertaken as soon as possible after listing on the schedule.
- (ii) Have been searched for thoroughly in the wild by competent botanists during the past five years in most likely habitats, according to guidelines approved by the Executive Director (see Appendix).
- (iii) Searches have established that the plant in the wild is either:
  - (a) rare;
  - or**
  - (b) in danger of extinction; **or**
  - (c) deemed to be threatened and in need of special protection;
  - or**
  - (d) presumed extinct (i.e. the taxon has not been collected from the wild, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently).
- (iv) In the case of hybrids, or suspected hybrids, the following criteria must also be satisfied:
  - (a) they must be a distinct entity, that is, the progeny are consistent within the agreed taxonomic limits for that taxon group;
  - (b) they must be self perpetuating, that is, not reliant on the parent stock for replacement; and
  - (c) they are the product of a natural event, that is, both parents are naturally occurring and cross fertilisation was by natural means.

(Plants which occur on land reserved for nature conservation may be considered less in need of special protection than those on land designated for other purposes).

The status of a threatened plant in cultivation has no bearing on this matter. The legislation refers only to the status of plants in the wild.

Plants **may be deleted** from the schedule of declared rare (threatened) flora where:

- (a) recent botanical survey as defined in (ii) above has shown that the taxon is not rare, in danger of extinction or otherwise in need of special protection;
- (b) the taxon is shown to be a hybrid that does not comply with the inclusion criteria; and
- (c) the taxon is no longer threatened because it has been adequately protected by reservation of land where it occurs, or because its population numbers have increased beyond the danger point.

### **"Taking" Threatened Flora**

In the Wildlife Conservation Act (subsection 6 (1)) the following definition is given:

"to take" in relation to any flora includes to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means;"

Thus, taking declared threatened flora would include not only direct injury or destruction by human hand or machine but such activities as allowing stock to graze on the flora, introducing pathogens that attack it, altering water tables such that the flora is deprived of adequate soil moisture or is inundated, allowing air pollutants to harm foliage etc.

In the case of threatened plants which need fire for regeneration, burning at an appropriate time may not adversely affect the survival of the population. However, burning would injure existing plants and constitutes "taking" under the Act. Therefore, Ministerial approval is required prior to conducting a burn which involves any species of endangered flora.



#### **4. POLICY**

The Department will:

- 4.1 Identify, locate and seek to conserve threatened flora.
- 4.2 Undertake research into the taxonomy, population biology, ecology, protection and propagation of threatened flora.
- 4.3 Implement management practices to conserve threatened flora and its habitat.
- 4.4 Publicise the need for conservation of threatened flora, and encourage involvement in conservation from all sectors of the community.
- 4.5 Liaise with other land management and research agencies and private land owners to enhance the study and conservation of threatened flora.
- 4.6 Develop and manage a geographic data base for threatened flora at its headquarters and at regional and district offices.

#### **5. STRATEGIES**

To accomplish the Department objective and policies, staff will:

- 5.1 Establish a consultative committee with the Western Australian Herbarium, Kings Park Board, tertiary institutions and other relevant organisations to ensure that research and management of declared threatened flora are coordinated.
- 5.2 Develop Wildlife Management Programs and Interim Wildlife Management Guidelines, for threatened plant taxa, and appoint fixed term "recovery teams" for their implementation.
- 5.3 Undertake training in Departmental obligations to conserve and manage threatened flora.
- 5.4 Nominate Threatened Flora Officers (additional to District Wildlife Officers) in each region and district who shall be responsible for identifying, locating, mapping, training staff, overseeing management programs and providing liaison and advice on threatened flora.
- 5.5 Establish and maintain field herbaria, photographic collections, map records and other aids concerning threatened flora at each ranger station and district and regional office.
- 5.6 Arrange an inspection to establish whether declared threatened flora are present before undertaking any activity on CALM land that involves permanent destruction (i.e. clearing for road-making, building, mining or other purposes) of native flora.
- 5.7 Ensure that no known declared threatened flora is destroyed, damaged, or otherwise injured by Departmental staff or their contractors without first obtaining a ministerial permit so to do.
- 5.8 Ensure that any burning program (for fire protection purposes) will not cause irreparable damage to species of threatened flora known to be susceptible to fire.
- 5.9 Observe other operational guidelines for protection of endangered flora on CALM lands as detailed in Administrative Instruction No. 24 "Protection Endangered (Threatened) Flora in Departmental Operations".
- 5.10 Monitor known populations of threatened flora.
- 5.11 Maintain a geographic and biological data base on threatened flora
- 5.12 Develop management programs for species of threatened flora.

- 5.13 Collect seed and propagate threatened flora in Departmental nurseries. Replant propagated material in the wild under an approved management programs or approved Interim Wildlife Management Guidelines.
- 5.14 Undertake research on the distribution, taxonomy, genetic systems, population biology, ecology, protection and propagation of threatened flora.
- 5.15 Assist private property owners and other land management agencies in the protection and conservation of threatened flora.
- 5.16 Acquire land through donation, exchange or purchase to protect threatened flora where land and/or funds are available.
- 5.17 Maintain a system for listing and delisting flora on the declared threatened schedule.
- 5.18 Publicise information on threatened flora (without disclosing precise locations) and encourage community involvement in the conservation of threatened flora.
- 5.19 Maintain, through the Wildlife Branch, central records of all correspondence, discoveries of threatened flora populations, basic information on susceptibility to fire or dependence on fire for regeneration, applications for ministerial permits and other matters to do with declared threatened flora.
- 5.20 Refer enforcement matters regarding the taking of declared threatened flora to the appropriate District Wildlife Officer.

## APPENDIX IV

### GUIDELINES FOR SURVEYS OF PLANTS PROPOSED FOR ADDITION OR DELETION TO THE SCHEDULE OF DECLARED THREATENED FLORA

These guidelines were developed in conjunction with new criteria for additions and deletions to the Schedule of declared flora.

Criterion (ii) for additions states:

The taxon "has been searched for thoroughly in the wild by competent botanists during the past five years in most likely habitats, according to guidelines approved by the Executive Director."

The intensity of survey necessary to understand the conservation status of a plant varies according to a number of factors. Important considerations are:

1. Geographic range

A taxon extending over 10 km of terrain will take less time to survey than one that occurs over 100 km.

2. Area of available habitat

Taxa confined to specific localised habitats (eg. granite outcrops) will require less time to survey than those more catholic in habitat preference.

3. Plant size

Large conspicuous perennial plants (eg. eucalypts) can be identified and counted more quickly than small inconspicuous annuals.

4. Seasonality and identification

Some plants are identifiable and conspicuous on vegetative features at any time of year. Others only stand out during flowering or fruiting, which may be confined to just a few weeks in the year, and may also be dependent on good seasonal conditions.

5. Disturbance opportunism

Some plants only germinate and/or flower following disturbance events such as bushfire or earthworks, and hence can only be surveyed after such events.

Based on these considerations, and the accumulated survey experience of many botanists and other CALM officers who have searched for hundreds of Western Australian plants over the past decade, the following matrix provides guidelines as to the duration of search necessary for plants to be considered for addition or deletion to the schedule of declared threatened flora.

Extremes of plant taxa in terms of ease and seasonality of identification are given.

Recommended period of full time field survey

Geographical Range	Area of available habitat	*Taxon easily identifiable any time	#Taxon identifiable with difficulty over short flowering period in certain years
<50 km	small	0.5-1 month	1.2 months over several years
	large	1-2 months	3-6 months over a decade
>50 km	small	3-6 months	6-12 months over a decade
	large	6-12 months	not possible

\*e.g. large perennial plants identifiable any time on vegetative characteristics - *Eucalyptus crucis*, *Banksia tricuspis*.

# eg. short-lived small annuals with inconspicuous flowers - *Hydrocotyle* spp., annual sedges etc.

Having completed surveys according to the above guidelines, the next phase in considering listing on the schedule is described under Criterion for additions (iii).

"Such recent botanical survey has shown that the taxon in the wild is either rare, or in danger of extinction or in need of special protection".

These three categories of endangered flora are defined below.

Rare

Less than a few thousand plants of the taxon exist in the wild.

In danger of extinction

The taxon is in serious risk of disappearing from the wild state within one or two decades if present land use and other causal factors continue to operate.

In need of special protection

The taxon is not presently in danger of extinction but is at risk over a longer period through continued depletion, or largely occurs on sites likely to experience changes in land use which would threaten its survival in the wild.

Presumed extinct

The taxon has not been collected in the wild, or otherwise verified, over the past 50 years (from the date of listing) despite thorough searching, or of which all of the known wild populations have been destroyed more recently, and is presumed to be extinct.