Declared Rare and Poorly Known Flora in the Warren Region

Roger W. Hearn, Rachel Meissner, Andrew P. Brown, Terry D. Macfarlane and Tony R. Annels

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WESTERN AUSTRALIAN WILDLIFE MANAGEMENT PROGRAM NO. 40
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.
Non standard abbreviations used through the document:

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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>5g</td>
<td>CALM Act Section 5 g Reserve</td>
</tr>
<tr>
<td>CLM</td>
<td>CALM</td>
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<tr>
<td>DoE</td>
<td>Department of Environment</td>
</tr>
<tr>
<td>DON</td>
<td>Donnelly District</td>
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<tr>
<td>FRA</td>
<td>Frankland District</td>
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<tr>
<td>MRWA</td>
<td>Main Roads Western Australia</td>
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<td>ms</td>
<td>manuscript (unpublished name)</td>
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<tr>
<td>na</td>
<td>not assessed</td>
</tr>
<tr>
<td>NP</td>
<td>National Park</td>
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<tr>
<td>NR</td>
<td>Nature Reserve</td>
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<tr>
<td>PP</td>
<td>Private Property</td>
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<tr>
<td>River R</td>
<td>River Reserve</td>
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<tr>
<td>RR</td>
<td>Road Reserve</td>
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<tr>
<td>SHRes</td>
<td>Shire Reserve</td>
</tr>
<tr>
<td>SCR</td>
<td>South Coast Region</td>
</tr>
<tr>
<td>SF</td>
<td>State Forest</td>
</tr>
<tr>
<td>TR</td>
<td>Timber Reserve</td>
</tr>
<tr>
<td>UCL</td>
<td>Unallocated Crown Land</td>
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<tr>
<td>WR</td>
<td>Water Reserve</td>
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<tr>
<td>VCL</td>
<td>Vacant Crown Land</td>
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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 30th 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$^2$ 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 pollunants to harm foliage, and burning.
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, Normalup and Rocky Gully making up the other significant population centres in or surrounding the Region.

The Region covers an area of about 14,230 km² (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 relicual 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 fluviatile 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 interfluves 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 gilfoylei, 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. cormata) 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. Sedgelands 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*.  

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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 Lamiaeae; *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.

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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM2</td>
<td>Chatham Island</td>
<td>Frankland</td>
<td>NR</td>
<td>78</td>
<td>26/03/1997</td>
<td>Healthy in accessible areas</td>
</tr>
<tr>
<td>Na</td>
<td>D’Entrecasteaux NP</td>
<td>Frankland</td>
<td>NP</td>
<td>2</td>
<td>9/10/2001</td>
<td>Relocate &amp; survey</td>
</tr>
</tbody>
</table>

**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)
Apselium obtusatum subsp. northlandicum
**Banksia verticillata** R. Br.

Granite Banksia

*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**

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

**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.**

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

Christine’s Spider Orchid

*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**

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

Cossack Spider Orchid

ORCHIDACEAE

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, Kojonup, 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, Kojonup, Boyup Brook area with an outlier at West Dale, growing in open Wandoo/Jarrah woodland over low heath on Wandoo sandy clays, usually in moist valley sites.

Conservation Status

Current: DRF-Endangered

Known Populations in the Warren Region

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

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

**Pink Spider Orchid**

*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 Habitats**

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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Thompson Rd 1</td>
<td>DON</td>
<td>RR</td>
<td>0</td>
<td>Spring 2003</td>
<td>Burnt Autumn 2004</td>
</tr>
<tr>
<td>CLM 2</td>
<td>Thompson Rd 2</td>
<td>FRA</td>
<td>SF</td>
<td>67</td>
<td>14/10/1998</td>
<td></td>
</tr>
<tr>
<td>CLM 3 &amp; 26</td>
<td>Lake Muir</td>
<td>FRA</td>
<td>NR</td>
<td>43</td>
<td>24/9/1998</td>
<td>Single population</td>
</tr>
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<td>CLM 4</td>
<td>Stuchan</td>
<td>DON</td>
<td>SF</td>
<td>1</td>
<td>1/11/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>Palgarup Rd</td>
<td>DON</td>
<td>SF</td>
<td>3</td>
<td>Spring 2003</td>
<td></td>
</tr>
<tr>
<td>CLM 8</td>
<td>Karri Valley</td>
<td>DON</td>
<td>SF</td>
<td>0</td>
<td>17/10/1990</td>
<td></td>
</tr>
<tr>
<td>CLM 9</td>
<td>Iffley FB</td>
<td>DON</td>
<td>SF</td>
<td>0</td>
<td>Spring 2003</td>
<td></td>
</tr>
<tr>
<td>CLM 11</td>
<td>SW Hwy</td>
<td>FRA</td>
<td>RR</td>
<td>5</td>
<td>29/10/1990</td>
<td></td>
</tr>
<tr>
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<td>Hill Rd. West</td>
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<td>0</td>
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<tr>
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<td>SF</td>
<td>12</td>
<td>12/10/1998</td>
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</tr>
<tr>
<td>CLM 16</td>
<td>Poorginup Rd</td>
<td>FRA</td>
<td>SF</td>
<td>20+</td>
<td>Spring 2002</td>
<td></td>
</tr>
<tr>
<td>CLM 17</td>
<td>Long 2 Rd</td>
<td>FRA</td>
<td>SF</td>
<td>7</td>
<td>14/10/1997</td>
<td></td>
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<td>SF</td>
<td>20+</td>
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</table>

**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**

Caladenia winfieldii Hopper & A.P. Br.

Majestic Spider Orchid

**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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
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<td>DON</td>
<td>SF</td>
<td>133</td>
<td>1/1/1998</td>
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</table>

**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.

Grass Conostylis

**HAEMODORACEAE**

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 Kwornicup, 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, ± 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 Kwornicup Lake.

**Conservation Status**

Current: DRF-Vulnerable

**Known populations in the Warren Region**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
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<td>Kwornicup Lake</td>
<td>FRA</td>
<td>NR</td>
<td>na</td>
<td>9/10/1986</td>
<td>Relocate</td>
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</table>

**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**

Conostylis misera
**Diuris drummondii** Lindley

Tall Donkey Orchid

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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
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**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**

Drakaea micrantha Hopper & A.P. Br. ms

Dwarf Hammer Orchid

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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<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
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<th>Comments/condition</th>
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<td>13/10/1998</td>
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<td>FRA</td>
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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**

Kennedia glabrata Lindley

Northcliffe Kennedia  WAR F4/12

Kennedia glabrata is a rarely seen species that was described by Lindley in 1836 as Kennedya 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, trifoliate, 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 umble 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 cylindric.

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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments /condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Chudalup</td>
<td>DON</td>
<td>NP</td>
<td>10</td>
<td>14/9/1994</td>
<td></td>
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<tr>
<td>CLM 2</td>
<td>Muirillup</td>
<td>DON</td>
<td>SF</td>
<td>250</td>
<td>12/10/1998</td>
<td></td>
</tr>
<tr>
<td>CLM 3</td>
<td>Weld 1</td>
<td>FRA</td>
<td>SF</td>
<td>0</td>
<td>29/8/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 4a</td>
<td>Woolbale Hills 1</td>
<td>FRA</td>
<td>NP</td>
<td>150+</td>
<td>14/3/1989</td>
<td></td>
</tr>
<tr>
<td>CLM 4b</td>
<td>Woolbales Hills 2</td>
<td>FRA</td>
<td>NP</td>
<td>5</td>
<td>26/8/1997</td>
<td>Area not usually accessible in spring.</td>
</tr>
<tr>
<td>CLM 5</td>
<td>Broke Inlet 1</td>
<td>FRA</td>
<td>VCL</td>
<td>12</td>
<td>29/11/1991</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>Broke Inlet 2</td>
<td>FRA</td>
<td>VCL</td>
<td>2</td>
<td>29/11/1991</td>
<td></td>
</tr>
<tr>
<td>CLM 7a</td>
<td>William Bay</td>
<td>FRA</td>
<td>NP</td>
<td>10</td>
<td>11/11/2000</td>
<td></td>
</tr>
<tr>
<td>CLM 7b</td>
<td>William Bay</td>
<td>FRA</td>
<td>NP</td>
<td>1</td>
<td>13/11/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 8</td>
<td>Maringup</td>
<td>DON</td>
<td>NP</td>
<td>30</td>
<td>29/8/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 9</td>
<td>Burnett SF</td>
<td>FRA</td>
<td>SF</td>
<td>12</td>
<td>21/9/1997</td>
<td></td>
</tr>
<tr>
<td>Pop. No.</td>
<td>Location</td>
<td>District</td>
<td>Land status</td>
<td>No. of plants</td>
<td>Last survey</td>
<td>Comments /condition</td>
</tr>
<tr>
<td>---------</td>
<td>----------------</td>
<td>----------</td>
<td>-------------</td>
<td>---------------</td>
<td>--------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>CLM 10</td>
<td>Pingerup Rd</td>
<td>FRA</td>
<td>NP</td>
<td>1</td>
<td>12/12/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 11</td>
<td>Moores Track</td>
<td>DON</td>
<td>NP</td>
<td>4</td>
<td>21/9/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 12</td>
<td>Break Rd</td>
<td>FRA</td>
<td>SF</td>
<td>7</td>
<td>22/10/1998</td>
<td></td>
</tr>
<tr>
<td>CLM 13</td>
<td>Railway Parade</td>
<td>FRA</td>
<td>SF</td>
<td>7</td>
<td>10/10/1998</td>
<td></td>
</tr>
</tbody>
</table>

**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

*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**

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

**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
Meziella trifida (Nees) Schindl.

Meziella trifida was collected by Preiss in 1840 and described by Nees in 1844 under the name Gonocarpus trifidus (as ‘Gonioecarpus’). 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**

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

**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 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**

Microtis globula R. Bates

Globular Mignonette Orchid

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

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

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**

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**

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

**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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
</table>

**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

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

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

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

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

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 assess their conservation status.
Monitor populations and assess 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 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, murcromulate, 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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kent River</td>
<td>Frankland</td>
<td>VCL*</td>
<td>2 000+</td>
<td>31/10/1998</td>
<td>* 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</td>
</tr>
</tbody>
</table>

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**

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

**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. Stamen 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Hell River Rd</td>
<td>FRA</td>
<td>SF</td>
<td>100</td>
<td>7/8/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 2</td>
<td>Mitchell River</td>
<td>FRA</td>
<td>SF</td>
<td>20</td>
<td>7/8/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 3</td>
<td>Mitchell River Rd</td>
<td>FRA</td>
<td>SF</td>
<td>300</td>
<td>15/10/1998</td>
<td>Two sub-populations</td>
</tr>
<tr>
<td>CLM 4</td>
<td>Mt. Lindesay 1</td>
<td>FRA</td>
<td>SF (NP)</td>
<td>2</td>
<td>19/8/2001</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>Sunny Glenn Rd</td>
<td>FRA</td>
<td>SF</td>
<td>30</td>
<td>29/8/1996</td>
<td></td>
</tr>
<tr>
<td>CLM 7</td>
<td>Shepwash SF</td>
<td>FRA</td>
<td>SF</td>
<td>200</td>
<td>31/7/1998</td>
<td></td>
</tr>
<tr>
<td>CLM 8</td>
<td>Centre Break Rd</td>
<td>FRA</td>
<td>SF</td>
<td>500</td>
<td>25/4/1998</td>
<td></td>
</tr>
</tbody>
</table>
| CLM 9    | Romance R         | FRA      | SF          | 1000+         | 23/10/2000    | Possibly misidentified=
|          |                   |          |             |               |               | Andersonia 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 sunk F. 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. Marrum 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

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

Semaphore Spider Orchid

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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 100</td>
<td>Peaceful Bay</td>
<td>Frankland</td>
<td>NP</td>
<td>0</td>
<td>10/1995</td>
<td>Relocate population</td>
</tr>
</tbody>
</table>

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.

*C. 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**

*C. 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM2</td>
<td>Bridgetown</td>
<td>Donnelly</td>
<td>PP</td>
<td>na</td>
<td>20/2/1996</td>
<td>Relocate population</td>
</tr>
<tr>
<td>CLM3</td>
<td>Winnejup Reserve</td>
<td>Donnelly</td>
<td>SHRes</td>
<td>na</td>
<td>25/11/1996</td>
<td></td>
</tr>
</tbody>
</table>

**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)
Carex tereticaulis

Warren Region
**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**

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

**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

*Deyeuxia inaequalis* was described in 1940 by Joyce Vickery, from a specimen collected near the Warren River (Arnott’s near Manjimup) 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**

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

**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

**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 concolourus, 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**

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

**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)

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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
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</thead>
<tbody>
<tr>
<td>WAR 100</td>
<td>Neeranup Rd.</td>
<td>DON</td>
<td>NP</td>
<td>1000</td>
<td>15/12/2003</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Swamp Rd. 1</td>
<td>DON</td>
<td>NP</td>
<td>50</td>
<td>15/12/2003</td>
<td></td>
</tr>
<tr>
<td>WAR 102</td>
<td>Swamp Rd. 2</td>
<td>DON</td>
<td>NP</td>
<td>1000</td>
<td>15/12/2003</td>
<td></td>
</tr>
</tbody>
</table>

**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.
Eryngium sp. Lake Muir
**Hydatella australis** Diels

**HYDATELLACEAE**

*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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 100</td>
<td>Perup NR</td>
<td>DON</td>
<td>NR</td>
<td>10,000+</td>
<td>11/10/1994</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Yarnup NR</td>
<td>DON</td>
<td>NR</td>
<td>&lt;100</td>
<td>10/1999</td>
<td></td>
</tr>
<tr>
<td>WAR 102</td>
<td>Kodjinup NR</td>
<td>DON</td>
<td>NR</td>
<td>&lt;500</td>
<td>10/1999</td>
<td></td>
</tr>
</tbody>
</table>

**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 Labillaridiere 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 *Sipr* 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, exserted 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments / condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM1</td>
<td>Rocky Gully</td>
<td>FRA</td>
<td>WR</td>
<td>1000</td>
<td>23/11/1995</td>
<td></td>
</tr>
</tbody>
</table>

**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**

**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**

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

**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**
Butcher (2001)

Sphaerolobium benetectum

Warren Region
**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. otiostigma*, having a large broadly lunate stigma. (This collection differs from *S. otiostigma* 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**

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

**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**

80
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)

*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 nevertheless 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**

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

**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

*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**

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

**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

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, Normalup, 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**

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

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 exserted. 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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 101</td>
<td>Mt. Lindesay</td>
<td>FRA</td>
<td>SF (WR)</td>
<td>&lt;100</td>
<td>16/9/1994</td>
<td></td>
</tr>
<tr>
<td>WAR 102</td>
<td>Granite Rd.</td>
<td>FRA</td>
<td>SF (WR)</td>
<td>500</td>
<td>19/8/1996</td>
<td></td>
</tr>
</tbody>
</table>

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.

Liaise with Kristina Lemson regarding taxonomy and conservation.

**References**

Kristina Lemson (personal communication); Wheeler *et al.* (2002)
Andersonia virolens  K. Lemson ms

EPACRIDACEAE

This species was illegitimately named *Sprengelia macronema* by Mueller from material he collected from Mt. Roe (Burrobunup) 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 sepal 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 (Burrobunup), growing in sandy soil.

**Conservation Status**

Current: Priority 2

**Known Populations in the Warren Region**

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

**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 Normalup 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**

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

**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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants*</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Lake Muir 1</td>
<td>DON</td>
<td>NR</td>
<td>1 ha</td>
<td>9/12/1994</td>
<td>Drainage problem</td>
</tr>
<tr>
<td>CLM 2</td>
<td>Wamballing</td>
<td>FRA</td>
<td>NR</td>
<td>0.5 ha</td>
<td>11/10/1994</td>
<td>As above</td>
</tr>
<tr>
<td>CLM 3</td>
<td>Rocky Gully 2</td>
<td>FRA</td>
<td>PP</td>
<td>0.25 ha</td>
<td>3/11/1994</td>
<td>As above</td>
</tr>
<tr>
<td>CLM 4</td>
<td>Lake Muir 2</td>
<td>DON</td>
<td>NR</td>
<td>1 ha</td>
<td>9/12/1994</td>
<td>As above</td>
</tr>
<tr>
<td>CLM 5</td>
<td>Lake Muir 3</td>
<td>DON</td>
<td>NR</td>
<td>1 ha</td>
<td>9/12/1994</td>
<td>As above</td>
</tr>
<tr>
<td>CLM 6</td>
<td>Kent River</td>
<td>FRA</td>
<td>RR</td>
<td>&lt; 0.25 ha</td>
<td>23/11/1995</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 101</td>
<td>Pinticup NR</td>
<td>DON</td>
<td>NR</td>
<td>na</td>
<td>27/3/1997</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 102</td>
<td>Cobertup NR</td>
<td>DON</td>
<td>NR</td>
<td>na</td>
<td>10/12/1997</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 103</td>
<td>Kululinup NR 1</td>
<td>DON</td>
<td>NR</td>
<td>1 ha</td>
<td>22/10/1997</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 104</td>
<td>Kodjinup NR</td>
<td>DON</td>
<td>NR</td>
<td>1 ha</td>
<td>15/12/1999</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 105</td>
<td>Kululinup NR 2</td>
<td>DON</td>
<td>NR</td>
<td>0.5 ha</td>
<td>15/12/1999</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 100</td>
<td>Frankland River</td>
<td>FRA</td>
<td>NR</td>
<td>na</td>
<td></td>
<td>Not relocated</td>
</tr>
</tbody>
</table>

* 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 involucral 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 involucral 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**

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

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

**ORCHIDACEAE**

Coastal Spider Orchid

*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 an 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 101</td>
<td>Crystal Springs 1</td>
<td>FRA</td>
<td>NP</td>
<td>50</td>
<td>28/11/1989</td>
<td></td>
</tr>
<tr>
<td>WAR 102</td>
<td>Crystal Springs 2</td>
<td>FRA</td>
<td>NP</td>
<td>50</td>
<td>16/11/1995</td>
<td></td>
</tr>
</tbody>
</table>

**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**

Liaise 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**

*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**

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

**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.

Lemon Spider Orchid

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 gravelly 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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 1</td>
<td>Tonebridge</td>
<td>DON</td>
<td>NR</td>
<td>50</td>
<td>10/10/1995</td>
<td></td>
</tr>
</tbody>
</table>

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.

**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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 101</td>
<td>Sheepwash SF</td>
<td>FRA</td>
<td>SF</td>
<td>208</td>
<td>7/10/2004</td>
<td></td>
</tr>
</tbody>
</table>

**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**

Liaise 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)

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

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

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, uncinate – 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 wooly 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**

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

**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**

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

**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

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 staminodes alternate with the ten stamens 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

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

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

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 pedicles 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

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

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

**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 applanata* 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**

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

**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

Meney and Pate (1999); Wheeler et al. (2002); Briggs and Johnson (2004)
Cryptandra congesta Rye

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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Mt. Lindesay</td>
<td>FRA</td>
<td>SF (NP)</td>
<td>1 000+</td>
<td>17/8/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 2</td>
<td>Little Lindesay</td>
<td>FRA</td>
<td>SF (NP)</td>
<td>&gt;500</td>
<td>1/5/2003</td>
<td>CLM 3 is the same</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Towards the Tone River</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown</td>
<td></td>
<td>Further surveys needed</td>
</tr>
</tbody>
</table>

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

Heberle’s Donkey Orchid

*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 resionaceous/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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>“Fish Creek”</td>
<td>DON</td>
<td>NP</td>
<td>500+</td>
<td>5/1/1996</td>
<td></td>
</tr>
<tr>
<td>WAR 100</td>
<td>Fisherman’s track</td>
<td>DON</td>
<td>NP</td>
<td>500+</td>
<td>5/12/2003</td>
<td>Confirm identification</td>
</tr>
</tbody>
</table>

**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**

**Drepanoclados aduncus** (Hedw.) Warnst.

**AMBLYSTEGIACEAE**

**WAR F4/184**

*Drepanoclados 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*, *Drepanoclados senieri* and *D. aduncus*, the latter name adopted here based on a determination by Robert Wyatt.

**Description**

*Drepanoclados 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**

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

**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)

Warren Region

- **Drepanocladius aduncas**
Drosera binata Labill.

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

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

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.

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

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 exserted.

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

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

**Response to Disturbance**

Plants have shown lignotuber growth and reshooting 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.

Yellow Eye-bright

SCROPHULARIACEAE

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. Lindsey (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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last Survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Lake Muir NR 1</td>
<td>DON</td>
<td>NR</td>
<td>1000+-</td>
<td>11/2001</td>
<td>Over area of three ha</td>
</tr>
<tr>
<td>WAR 100</td>
<td>Lake Muir NR 2</td>
<td>DON</td>
<td>NR</td>
<td>100</td>
<td>11/2001</td>
<td>20 sq m</td>
</tr>
</tbody>
</table>

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.

*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. Setae 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*, though the Stirling Range collection is recorded as growing on *Xanthorrhoea* stems.

**Conservation Status**

Current: Priority 2

**Known Populations in the Warren Region**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chudalup – Windy Harbour</td>
<td>DON</td>
<td>NP</td>
<td>0</td>
<td>2/9/2004</td>
<td>Not relocated</td>
<td></td>
</tr>
</tbody>
</table>

**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 inflorescence 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 100</td>
<td>Lake Unicup area</td>
<td>DON</td>
<td>PP</td>
<td>51</td>
<td>1/9/2004</td>
<td></td>
</tr>
</tbody>
</table>

**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

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. Pedicles 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

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

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 lop 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**

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

**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

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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 100</td>
<td>Deep River</td>
<td>FRA</td>
<td>SF</td>
<td>100+</td>
<td>11/10/1995</td>
<td>Full survey required</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 100</td>
<td>Nornalup</td>
<td>FRA</td>
<td>NP</td>
<td>0</td>
<td></td>
<td>Not relocated</td>
</tr>
<tr>
<td>WAR 101</td>
<td>Granite Peak</td>
<td>FRA</td>
<td>NP</td>
<td>Isolated</td>
<td>19/3/2004</td>
<td>Confirm identification of specimen</td>
</tr>
</tbody>
</table>

**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)
Juncus meianthus
Laxmannia grandiflora subsp. brenda Keighery

**ANTHERICACEAE**

Laxmannia grandiflora subsp. brenda was independently collected by Brenda Hammersley and Sarah Barrett in 1995 from different parts of Mt. Lindesay.

**Description**

Laxmannia grandiflora subsp. brenda 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. brenda 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. brenda 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land Status</th>
<th>No. of Plants</th>
<th>Last Survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Mt. Lindesay</td>
<td>FRA</td>
<td>NP</td>
<td>-</td>
<td>8/1995</td>
<td>Plants have not been relocated since a fire in 1998</td>
</tr>
<tr>
<td>CLM 2 a</td>
<td>Little Lindesay 1</td>
<td>FRA</td>
<td>NP</td>
<td>50</td>
<td>Oct/2003</td>
<td></td>
</tr>
<tr>
<td>CLM 2 b</td>
<td>Little Lindesay 2</td>
<td>FRA</td>
<td>NP</td>
<td>30</td>
<td>Oct/2003</td>
<td></td>
</tr>
</tbody>
</table>

**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 involucral 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 Nullup 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 3</td>
<td>Roe Rd-Frankland River</td>
<td>FRA</td>
<td>SF (5g)</td>
<td>na</td>
<td>14/12/1990</td>
<td>1990 collection</td>
</tr>
<tr>
<td>CLM 4</td>
<td>Muir Hwy-Tone River</td>
<td>DON</td>
<td>SF / NR</td>
<td>50+</td>
<td>24/11/1994</td>
<td>Recorded as two subpopulations</td>
</tr>
<tr>
<td>CLM 5</td>
<td>Tick Rd-Wilgarup River</td>
<td>DON</td>
<td>SF</td>
<td>na</td>
<td>13/3/1997</td>
<td></td>
</tr>
<tr>
<td>WAR 100</td>
<td>Mordalup Rd-Tone River</td>
<td>DON</td>
<td>NR/WR</td>
<td>500+</td>
<td>12/1996</td>
<td>Collect in flowe for WA Herbarium</td>
</tr>
<tr>
<td>WAR 101</td>
<td>Randall Rd-Wilgarup River</td>
<td>DON</td>
<td>SF</td>
<td>100+</td>
<td>12/1996</td>
<td>Collect in flowe for WA Herbarium</td>
</tr>
</tbody>
</table>

**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**

150
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*

**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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 100</td>
<td>Lake Muir</td>
<td>DON</td>
<td>NR</td>
<td>na</td>
<td>11/12/1997</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Lake Muir</td>
<td>DON</td>
<td>NR</td>
<td>na</td>
<td>27/10/1997</td>
<td></td>
</tr>
</tbody>
</table>

**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 Entwhistle (1999)
**Melaleuca pritzelii** Domin (Barlow)

*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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 13</td>
<td>Lake Muir</td>
<td>FRA</td>
<td>NR</td>
<td>na</td>
<td>24/3/1997</td>
<td></td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Mountain Rd /Boronia Rd</td>
<td>FRA</td>
<td>SF (5g)</td>
<td>200+</td>
<td>5/12/1995</td>
<td></td>
</tr>
<tr>
<td>CLM 4</td>
<td>Middle Rd 1</td>
<td>FRA</td>
<td>SF (5g)</td>
<td>0</td>
<td>20/11/1995</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>Kangaroo Rd</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>30/11/1994</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Cemetery Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>?</td>
<td>Recollect and confirm location</td>
</tr>
<tr>
<td>WAR 102</td>
<td>Mountain Rd 1</td>
<td>FRA</td>
<td>SF (5g)</td>
<td>500+</td>
<td>5/12/1995</td>
<td></td>
</tr>
</tbody>
</table>

**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**

*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 pairs 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 3</td>
<td>The Knoll</td>
<td>FRA</td>
<td>?NP</td>
<td>&lt;20</td>
<td>30/11/1994</td>
<td>Unable to relocate</td>
</tr>
<tr>
<td>CLM 6</td>
<td>Soho</td>
<td>FRA</td>
<td>NP</td>
<td>&lt;20</td>
<td>14/01/1989</td>
<td></td>
</tr>
</tbody>
</table>

**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**
Schizaea rupes 

Schizaea rupes 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. rupes. 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 rupes 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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 3</td>
<td>Romance block</td>
<td>FRA</td>
<td>WR</td>
<td>na</td>
<td>30/1/1992</td>
<td>Unable to relocate</td>
</tr>
<tr>
<td>CLM 2</td>
<td>Walpole</td>
<td>FRA</td>
<td>NP</td>
<td>&lt;100</td>
<td>19/12/1994</td>
<td></td>
</tr>
</tbody>
</table>

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)
Schizaea rupestris
**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, subobtuse, 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 100</td>
<td>Warren</td>
<td>DON</td>
<td>NP</td>
<td>na</td>
<td>9/1996</td>
<td>Unable to relocate</td>
</tr>
</tbody>
</table>

**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.

*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 subglobose, 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1a</td>
<td>Crusoe Beach 1</td>
<td>FRA</td>
<td>UCL</td>
<td>500</td>
<td>6/5/2001</td>
<td></td>
</tr>
<tr>
<td>CLM 1b</td>
<td>Crusoe Beach 2</td>
<td>FRA</td>
<td>UCL</td>
<td>na</td>
<td>1/2/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 2</td>
<td>Hay River mouth</td>
<td>FRA</td>
<td>SHRes</td>
<td>1000</td>
<td>6/5/2002</td>
<td></td>
</tr>
<tr>
<td>CLM 3</td>
<td>Honeymoon Island</td>
<td>FRA</td>
<td>SHRes</td>
<td>na</td>
<td>21/1/1991</td>
<td>Herbarium record</td>
</tr>
<tr>
<td>CLM 4</td>
<td>Opposite Honeymoon Island</td>
<td>FRA</td>
<td>SHRes</td>
<td>na</td>
<td>27/3/1997</td>
<td>As above</td>
</tr>
</tbody>
</table>

**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.

*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 Normalup 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 zealandicum*.

**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 fairy 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 chloropasts (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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 1</td>
<td>Quinn Rd 1</td>
<td>FRA</td>
<td>SF</td>
<td>1 sq m</td>
<td>8/2001</td>
<td>Relocated</td>
</tr>
<tr>
<td>WAR 2</td>
<td>Angrove Rd</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>9/1996</td>
<td>Not relocated</td>
</tr>
<tr>
<td>WAR 3</td>
<td>Isle Rd/Delta Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>9/1996</td>
<td>Not relocated</td>
</tr>
<tr>
<td>WAR 4</td>
<td>Weld River</td>
<td>FRA</td>
<td></td>
<td></td>
<td>2001</td>
<td>Not relocated</td>
</tr>
<tr>
<td>WAR 5</td>
<td>Quinn Rd 2</td>
<td>FRA</td>
<td>SF</td>
<td>10 sq m</td>
<td>11/2003</td>
<td>New population</td>
</tr>
</tbody>
</table>

**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)

![Map of Warren Region with Sphagnum nova zealandicum indicated](image-url)
Spyridium riparium Rye

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.

Trymalium 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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1, 2 &amp; 6</td>
<td>Mitchell River 1</td>
<td>FRA</td>
<td>SF/RR</td>
<td>200+</td>
<td>19/2/1999</td>
<td>Single population</td>
</tr>
<tr>
<td>CLM 3 &amp; 4</td>
<td>Kent River /Styx River</td>
<td>FRA</td>
<td>SF</td>
<td>900+</td>
<td>22/10/1994</td>
<td>Healthy, however Watsonia present</td>
</tr>
<tr>
<td>CLM 5</td>
<td>Normalup Rd</td>
<td>FRA</td>
<td>RR/SF</td>
<td>500+</td>
<td>8/10/1996</td>
<td>Herbarium record only. Needs to be relocated</td>
</tr>
<tr>
<td>CLM 7</td>
<td>Tindale Rd</td>
<td>FRA</td>
<td>PP</td>
<td>na</td>
<td>29/2/1999</td>
<td></td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 2 b</td>
<td>Denmark</td>
<td>FRA</td>
<td>SHRes</td>
<td>100</td>
<td>28/10/1999</td>
<td>Subpopulation</td>
</tr>
<tr>
<td>CLM 2 a</td>
<td>Denmark</td>
<td>FRA</td>
<td>SHRes</td>
<td>500</td>
<td>5/5/1999</td>
<td>As above</td>
</tr>
<tr>
<td>CLM 3</td>
<td>Conspicuous</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>29/12/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>William Bay</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>2/11/1993</td>
<td></td>
</tr>
<tr>
<td>WAR 100</td>
<td>Pt. D'Entrecasteaux</td>
<td>DON</td>
<td>NP</td>
<td>na</td>
<td></td>
<td>Not relocated</td>
</tr>
</tbody>
</table>

**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

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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 2</td>
<td>Little Lindesay</td>
<td>FRA</td>
<td>SF (NP)</td>
<td>1500+</td>
<td>21/11/1998</td>
<td>Two subpopulations</td>
</tr>
<tr>
<td>CLM 3</td>
<td>The Pass</td>
<td>FRA</td>
<td>SF (NP)</td>
<td>1100</td>
<td>22/10/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 4</td>
<td>Granite Rd</td>
<td>FRA</td>
<td>SF</td>
<td>1000+</td>
<td>17/10/1996</td>
<td>Planned for excision as a dam site</td>
</tr>
<tr>
<td>CLM 5</td>
<td>Mt. Roe</td>
<td>FRA</td>
<td>5g</td>
<td>10000+</td>
<td>7/11/1995</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Roe FB</td>
<td>FRA</td>
<td>SF</td>
<td>500</td>
<td>13/11/1999</td>
<td></td>
</tr>
</tbody>
</table>

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 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 2</td>
<td>Wamballup NR</td>
<td>FRA</td>
<td>NR</td>
<td>500+</td>
<td>11/10/1994</td>
<td></td>
</tr>
<tr>
<td>WAR 100</td>
<td>Perup NR</td>
<td>DON</td>
<td>NR</td>
<td>10000+</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Byenup Lagoon</td>
<td>DON</td>
<td>NR</td>
<td>10000+</td>
<td>10/2004</td>
<td></td>
</tr>
<tr>
<td>WAR 102</td>
<td>Kululinup NR</td>
<td>DON</td>
<td>NR</td>
<td>10000+</td>
<td>11/2003</td>
<td></td>
</tr>
<tr>
<td>WAR 103</td>
<td>Kululinup NR</td>
<td>DON</td>
<td>NR</td>
<td>10000+</td>
<td>11/2003</td>
<td></td>
</tr>
<tr>
<td>WAR 104</td>
<td>Muir Hwy</td>
<td>DON</td>
<td>NR</td>
<td>10000+</td>
<td>11/2003</td>
<td></td>
</tr>
</tbody>
</table>

**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](image)
**Actinotus** sp. Walpole (J.R. Wheeler 3786)

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 an 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 6</td>
<td>Delta Rd 1</td>
<td>FRA</td>
<td>NP</td>
<td>Unknown</td>
<td>26/2/1997</td>
<td>Not relocated</td>
</tr>
<tr>
<td>CLM 7</td>
<td>Delta Rd 2</td>
<td>FRA</td>
<td>NP</td>
<td>Unknown</td>
<td>26/2/1997</td>
<td>Not relocated</td>
</tr>
<tr>
<td>CLM 8</td>
<td>Northcliffe</td>
<td>DON</td>
<td>SF</td>
<td>500+</td>
<td>12/3/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 2</td>
<td>South West Hwy</td>
<td>FRA</td>
<td>NP/RR</td>
<td>Unknown</td>
<td>26/2/1997</td>
<td>Not relocated</td>
</tr>
<tr>
<td>CLM 1</td>
<td>Granite Peak</td>
<td>FRA</td>
<td>NP</td>
<td>Unknown</td>
<td>27/2/1997</td>
<td></td>
</tr>
<tr>
<td>WAR 100</td>
<td>Cederman Rd</td>
<td>DON</td>
<td>SF</td>
<td>na</td>
<td>28/4/2004</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Dog Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>26/2/1997</td>
<td></td>
</tr>
</tbody>
</table>

**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)
Alexgeorgea ganopoda B. Briggs & L. Johnson

RESTIONACEAE
WAR F4/21

Alexgeorgea 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

Alexgeorgea 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

Alexgeorgea 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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Thomson Rd</td>
<td>FRA</td>
<td>NP/SF</td>
<td>10 000+</td>
<td>5/12/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 2</td>
<td>Bow Bridge</td>
<td>FRA</td>
<td>RR</td>
<td>100+</td>
<td>5/12/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 3</td>
<td>Mountain Rd.</td>
<td>FRA</td>
<td>NP/(5g)</td>
<td>500+</td>
<td>30/11/1994</td>
<td>Unlikely to persist due to weed invasion</td>
</tr>
<tr>
<td>CLM 4</td>
<td>Break Rd 1</td>
<td>FRA</td>
<td>SF (5g)</td>
<td>1 000+</td>
<td>28/11/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 5</td>
<td>Break Rd 2</td>
<td>FRA</td>
<td>SF/(5g)</td>
<td>1 000+</td>
<td>28/11/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>Break Rd 3</td>
<td>FRA</td>
<td>SF/(5g)</td>
<td>10 000+</td>
<td>28/11/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 7</td>
<td>Boronia Rd.</td>
<td>FRA</td>
<td>NP/SF</td>
<td>10 000+</td>
<td>30/11/1994</td>
<td></td>
</tr>
<tr>
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<td>Owingup</td>
<td>FRA</td>
<td>RR</td>
<td>na</td>
<td>14/7/1995</td>
<td></td>
</tr>
<tr>
<td>CLM 9</td>
<td>Timberjack Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>12/2/1997</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Pingerup Plains</td>
<td>FRA</td>
<td>NP</td>
<td>5 000+</td>
<td>16/4/1997</td>
<td></td>
</tr>
</tbody>
</table>

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 sedgelands and in dense tall scrub/low woodland with Banksia littoralis.

Conservation Status

Current: Priority 3

Known Populations in the Warren Region

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Peaceful Bay Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>20/1/1979</td>
<td></td>
</tr>
<tr>
<td>CLM 3</td>
<td>Pingerup Rd 1</td>
<td>DON</td>
<td>NP</td>
<td>10</td>
<td>18/12/1990</td>
<td></td>
</tr>
<tr>
<td>CLM 4</td>
<td>Inlet Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>19/12/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>Beardmore Rd</td>
<td>FRA</td>
<td>SF</td>
<td>3</td>
<td>14/1/2004</td>
<td></td>
</tr>
<tr>
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<td>Angrove Rd</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>1/12/1988</td>
<td></td>
</tr>
<tr>
<td>CLM 8</td>
<td>Conspicuous 1</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>1/12/1988</td>
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</tr>
<tr>
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<td>Conspicuous Beach Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>12/12/1988</td>
<td></td>
</tr>
<tr>
<td>CLM 10</td>
<td>Ficifolia Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
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<td>SF</td>
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<td>13</td>
<td>13/2/2004</td>
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<tr>
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<td>FRA</td>
<td>SF</td>
<td>3</td>
<td>14/1/2004</td>
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<td>WAR 103</td>
<td>Sheepwash FB</td>
<td>FRA</td>
<td>SF</td>
<td>3</td>
<td>16/10/1998</td>
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</tr>
</tbody>
</table>
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

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 exserted 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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
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<td>NP</td>
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<td>CLM 6</td>
<td>Watershed Rd</td>
<td>FRA</td>
<td>SF</td>
<td>&lt;20</td>
<td>16/12/1994</td>
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<tr>
<td>CLM 7</td>
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<td>FRA</td>
<td>NP</td>
<td>&lt;50</td>
<td>19/12/1994</td>
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<tr>
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<td>Broke Inlet 2</td>
<td>FRA</td>
<td>NP</td>
<td>200+</td>
<td>19/12/1994</td>
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<tr>
<td>CLM 2</td>
<td>Kangaroo Rd 1</td>
<td>FRA</td>
<td>SF</td>
<td>&lt;20</td>
<td>30/11/1994</td>
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<td>FRA</td>
<td>SF</td>
<td>200+</td>
<td>30/11/1994</td>
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<tr>
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<td>FRA</td>
<td>SF(5g)</td>
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<tr>
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<td>Collis FB</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>13/4/2000</td>
<td></td>
</tr>
<tr>
<td>WAR 102</td>
<td>Parry Rd</td>
<td>FRA</td>
<td>SHRes</td>
<td>na</td>
<td>26/11/1990</td>
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</tr>
</tbody>
</table>

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)

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 sepal and another long horned, wide membranous 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 gazetted as DRF.

Known Populations in the Warren Region

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
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<tbody>
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<td>SF</td>
<td>3000</td>
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<td>Mount Johnston</td>
<td>FRA</td>
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<td>1000</td>
<td>10/1/1997</td>
<td>Was WAR 100</td>
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<td>WAR 102</td>
<td>Claude Rd</td>
<td>FRA</td>
<td>SF</td>
<td>1000</td>
<td>12/11/1999</td>
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</tr>
<tr>
<td>WAR 103</td>
<td>Roe Block 1</td>
<td>FRA</td>
<td>SF</td>
<td>1000</td>
<td>15/6/1997</td>
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<td>WAR 104</td>
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<td>FRA</td>
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<td>Sharpe FB 2</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>Na</td>
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<td>FRA</td>
<td>SF</td>
<td>1000</td>
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<td>SF</td>
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<td>27/10/1997</td>
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</table>

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 Phospite 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-pediculate 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
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<td>Boggy Lake</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>na</td>
<td>Relocate</td>
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</table>

**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 anceps
**Boronia virgata** Paul G. Wilson

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. Pedicles 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**

<table>
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<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
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<td>South Coast Hwy 2</td>
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<td>SF</td>
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<td>Herbarium record only</td>
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<tr>
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<td>Boronia Rd. 3</td>
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<td>12/10/2002</td>
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<td>Rest Point Rd</td>
<td>FRA</td>
<td>SHR</td>
<td>na</td>
<td>1/11/2001</td>
<td>Herbarium record only</td>
</tr>
</tbody>
</table>

**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 *Calycothrix* by Turczaninow in 1852. The name *Calycothrix* 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 3</td>
<td>Walcott 1 (Kent Rd)</td>
<td>DON</td>
<td>SF</td>
<td>10 000+</td>
<td>10/11/1994</td>
<td>Some evidence of rabbit activity</td>
</tr>
<tr>
<td>WAR 100</td>
<td>Walcott 2 (Fred Rd)</td>
<td>DON</td>
<td>SF</td>
<td>na</td>
<td>na</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Walcott 3</td>
<td>DON</td>
<td>SF</td>
<td>na</td>
<td>na</td>
<td></td>
</tr>
</tbody>
</table>

**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

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 sepalas 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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Aldridge Cove Track</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>22/1/1992</td>
<td></td>
</tr>
<tr>
<td>CLM 2</td>
<td>Meredith Rd/Delta Rd?</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>2/10/1967</td>
<td>Relocate population</td>
</tr>
<tr>
<td>CLM 3</td>
<td>Thompson Cove/Mt Hopkins Track</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>22/9/1992</td>
<td></td>
</tr>
<tr>
<td>CLM 4</td>
<td>Mt. Hopkins</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>22/9/1992</td>
<td></td>
</tr>
<tr>
<td>CLM 5</td>
<td>Little Chudalup</td>
<td>DON</td>
<td>NP</td>
<td>1000+</td>
<td>1/11/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>Poison Hill</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>1/1/1991</td>
<td></td>
</tr>
<tr>
<td>WAR 100</td>
<td>Woolbales 1</td>
<td>FRA</td>
<td>NP</td>
<td>500+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Woolbales 2</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAR 102</td>
<td>Wilderness Track</td>
<td>NP</td>
<td></td>
<td>29/11/1997</td>
<td>Herbarium record only</td>
<td></td>
</tr>
</tbody>
</table>

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

*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. Pedicles 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 5mm 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>South Coast Hwy 2</td>
<td>FRA</td>
<td>RR</td>
<td>&lt;50</td>
<td>24/9/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 2</td>
<td>McIntosh Rd</td>
<td>FRA</td>
<td>RR</td>
<td>&lt;50</td>
<td>24/9/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 3</td>
<td>Sandy Track-Denbarker 2</td>
<td>FRA</td>
<td>SF (NP)</td>
<td>100+</td>
<td>30/8/1996</td>
<td></td>
</tr>
<tr>
<td>CLM 4</td>
<td>Normal Rd</td>
<td>FRA</td>
<td>RR</td>
<td>20</td>
<td>8/9/1996</td>
<td></td>
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<tr>
<td>CLM 10</td>
<td>Scotsdale Rd</td>
<td>FRA</td>
<td>RR</td>
<td>na</td>
<td>12/9/1991</td>
<td>Relocate population</td>
</tr>
<tr>
<td>CLM 12</td>
<td>Mount Lindesay 1</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>26/9/1995</td>
<td></td>
</tr>
<tr>
<td>CLM 14</td>
<td>South Coast Hwy 1</td>
<td>FRA</td>
<td>RR</td>
<td>na</td>
<td>21/8/1989</td>
<td></td>
</tr>
<tr>
<td>WAR 100</td>
<td>Mount Hallowell</td>
<td>FRA</td>
<td>SHRes</td>
<td>na</td>
<td>14/9/2001</td>
<td>Herbarium record only</td>
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<tr>
<td>WAR 101</td>
<td>Skippings Rd</td>
<td>FRA</td>
<td>?</td>
<td>na</td>
<td>4/9/2000</td>
<td>Herbarium record only</td>
</tr>
<tr>
<td>WAR 104</td>
<td>Watershed Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>21/2/1997</td>
<td>Herbarium record only</td>
</tr>
<tr>
<td>WAR 105</td>
<td>Middle Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>15/9/1995</td>
<td>Herbarium record only</td>
</tr>
<tr>
<td>WAR 106</td>
<td>Little Lindesay</td>
<td>FRA</td>
<td>SF (NP)</td>
<td>&lt;20</td>
<td>15/9/1995</td>
<td>Herbarium record only</td>
</tr>
<tr>
<td>WAR 107</td>
<td>Mt. Lindesay 2</td>
<td>FRA</td>
<td>SF (NP)</td>
<td>&lt;20</td>
<td>26/9/1995</td>
<td>Herbarium record only</td>
</tr>
</tbody>
</table>
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

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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 2</td>
<td>Windy Harbour 1</td>
<td>DON</td>
<td>NP</td>
<td>na</td>
<td>3/5/1991</td>
<td></td>
</tr>
<tr>
<td>CLM 4</td>
<td>Maringup Rd</td>
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<td>NP</td>
<td>na</td>
<td>18/1/1992</td>
<td></td>
</tr>
<tr>
<td>CLM 5</td>
<td>Pneumonia Rd</td>
<td>DON</td>
<td>NP</td>
<td>na</td>
<td>18/12/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>South West Hwy</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>19/12/1994</td>
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</tr>
<tr>
<td>CLM 9</td>
<td>Ficifolia Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>11/7/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 10</td>
<td>Jane Formation</td>
<td>DON</td>
<td>NP</td>
<td>na</td>
<td>19/3/1997</td>
<td></td>
</tr>
<tr>
<td>WAR 100</td>
<td>Gardner Rd 1</td>
<td>DON</td>
<td>NP</td>
<td>na</td>
<td>18/2/2004</td>
<td>Covers 0.3 ha</td>
</tr>
<tr>
<td>WAR 101</td>
<td>Gardner Rd 2</td>
<td>DON</td>
<td>NP</td>
<td>na</td>
<td>18/2/2004</td>
<td>Covers approx 1 ha</td>
</tr>
<tr>
<td>WAR 102</td>
<td>Gardner Rd 3</td>
<td>DON</td>
<td>NP</td>
<td>100+</td>
<td>18/2/2004</td>
<td></td>
</tr>
</tbody>
</table>

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**
**Cyathochaeta teretifolia** W. Fitzg.

*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 as 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 hypogynous 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 100</td>
<td>Mountain Rd</td>
<td>FRA</td>
<td>(5g)</td>
<td>na</td>
<td></td>
<td>To be relocated and assessed</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
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<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Not located</td>
</tr>
</tbody>
</table>

**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)

Dicrastylis glauca
**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 discolorous 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1a</td>
<td>Monestary Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>4/11/1992</td>
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</tr>
<tr>
<td>CLM 1b</td>
<td>South Coast Hwy</td>
<td>FRA</td>
<td>NP/RR</td>
<td>&lt;1000</td>
<td>1992</td>
<td>Wardell-Johnson study</td>
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<tr>
<td>CLM 1c</td>
<td>Zig Zag Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>12/8/1991</td>
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<tr>
<td>CLM 2</td>
<td>Boronia Rd</td>
<td>FRA</td>
<td>NP (5g)</td>
<td>&lt;1000</td>
<td>3/11/1992</td>
<td>Wardell-Johnson study</td>
</tr>
<tr>
<td>CLM 3</td>
<td>Spikes Rd/Creek Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>4/11/1992</td>
<td></td>
</tr>
<tr>
<td>CLM 4</td>
<td>Crossing FB</td>
<td>FRA</td>
<td>SF (5g)</td>
<td>&lt;1000</td>
<td>1992</td>
<td></td>
</tr>
<tr>
<td>CLM 5</td>
<td>Mountain Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>15/6/1992</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>Collis FB</td>
<td>FRA</td>
<td>SF/NP</td>
<td>&lt;1000</td>
<td>15/6/1992</td>
<td>Wardell-Johnson study</td>
</tr>
<tr>
<td>CLM 7</td>
<td>Middle Rd</td>
<td>FRA</td>
<td>NP</td>
<td>&lt;1000</td>
<td>4/11/1992</td>
<td>Wardell-Johnson study</td>
</tr>
</tbody>
</table>

**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

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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 100</td>
<td>Boggy Lake</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>27/12/1957</td>
<td>Unable to relocate</td>
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<tr>
<td>CLM 12</td>
<td>Black Point Rd</td>
<td>DON</td>
<td>NP/RR</td>
<td>&lt;100</td>
<td>18/1/1996</td>
<td></td>
</tr>
</tbody>
</table>

**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**

205
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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
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<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
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<tbody>
<tr>
<td>WAR 100</td>
<td>Styx River</td>
<td>FRA</td>
<td>na</td>
<td>?</td>
<td>28/11/1994</td>
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</tr>
<tr>
<td>WAR 101</td>
<td>Romance Rd</td>
<td>FRA</td>
<td>na</td>
<td>28/11/1994</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAR 102</td>
<td>Thompson Rd 1</td>
<td>FRA</td>
<td>na</td>
<td>?</td>
<td>23/02/1998</td>
<td></td>
</tr>
<tr>
<td>WAR 103</td>
<td>Chesapeake Rd</td>
<td>DON</td>
<td>na</td>
<td>23/02/1998</td>
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</tr>
<tr>
<td>WAR 104</td>
<td>Nuyts Wilderness</td>
<td>FRA</td>
<td>na</td>
<td>26/11/1997</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAR 106</td>
<td>Thompson Rd 2</td>
<td>FRA</td>
<td>na</td>
<td>11/12/1974</td>
<td>Orchard collection</td>
<td></td>
</tr>
<tr>
<td>WAR 107</td>
<td>Scott Rd 1</td>
<td>DON</td>
<td>na</td>
<td>5/11/1995</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAR 108</td>
<td>SheepWash</td>
<td>FRA</td>
<td>1000+</td>
<td>5/11/1995</td>
<td></td>
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<tr>
<td>WAR 109</td>
<td>Watershed Rd</td>
<td>FRA</td>
<td>50</td>
<td>6/12/1994</td>
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<tr>
<td>WAR 110</td>
<td>Scott Rd 2</td>
<td>DON</td>
<td>na</td>
<td>?</td>
<td>6/12/1994</td>
<td></td>
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<tr>
<td>WAR 111</td>
<td>Pt D'Entrecasteaux</td>
<td>DON</td>
<td>na</td>
<td>18/11/1999</td>
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<tr>
<td>WAR 112</td>
<td>Roe Rd</td>
<td>FRA</td>
<td>na</td>
<td>30/11/1999</td>
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<tr>
<td>WAR 113</td>
<td>Lake William</td>
<td>FRA</td>
<td>NP</td>
<td>24/11/1988</td>
<td>Keighery collection</td>
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</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
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<tbody>
<tr>
<td>CLM 1</td>
<td>Northcliffe</td>
<td>DON</td>
<td>VCL</td>
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<td>11/12/1987</td>
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<tr>
<td>CLM 2</td>
<td>Collis Rd</td>
<td>FRA</td>
<td>SF</td>
<td>500+</td>
<td>30/11/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 3</td>
<td>Gum Link Rd</td>
<td>FRA</td>
<td>SF (5g)</td>
<td>500+</td>
<td>9/11/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 4</td>
<td>Break Rd</td>
<td>FRA</td>
<td>SF (5g)</td>
<td>10 000+</td>
<td>28/11/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 5</td>
<td>Watershed Rd</td>
<td>FRA</td>
<td>SF (5g)</td>
<td>100+</td>
<td>6/12/1994</td>
<td></td>
</tr>
<tr>
<td>CLM 7</td>
<td>Deeside Coast Rd</td>
<td>DON</td>
<td>NP</td>
<td>500+</td>
<td>15/12/1994</td>
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<tr>
<td>CLM 8</td>
<td>Pingerup Rd</td>
<td>FRA/DON</td>
<td>NP</td>
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<td>15/12/1994</td>
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<tr>
<td>CLM 9</td>
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<td>NP</td>
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<td>19/12/1994</td>
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<tr>
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<tr>
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<td>Crystal Springs</td>
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<td>NP</td>
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<td>19/12/1994</td>
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<tr>
<td>CLM 12</td>
<td>Inlet Rd 2</td>
<td>FRA</td>
<td>NP</td>
<td>1000+</td>
<td>19/12/1995</td>
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<tr>
<td>CLM 13</td>
<td>Boronia Rd</td>
<td>FRA</td>
<td>SF (5g)</td>
<td>1000+</td>
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</tr>
<tr>
<td>CLM 14</td>
<td>Nicol Rd</td>
<td>FRA</td>
<td>NP/SF</td>
<td>100+</td>
<td>9/12/1995</td>
<td></td>
</tr>
</tbody>
</table>

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

209
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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Mt. Lindesay</td>
<td>Frankland</td>
<td>SF</td>
<td>200</td>
<td>5/11/1995</td>
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</tr>
</tbody>
</table>

**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)
Gonocarpus trichostachyus

Warren Region
**Grevillea papillosa** (McGillivray) P. Olde & N. Marriott

PROTEACEAE

Grevillea papillosa was named as a subspecies of *G. manglesioides* by McGillivray in 1986 and raised to species status by Olde and Marriott 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'Entrecasteaux National Park.

**Conservation Status**

Current: Priority 3

**Known Populations in the Warren Region**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
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<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 5</td>
<td>Black Point Rd 1</td>
<td>DON</td>
<td>RR/NP</td>
<td>10 000+</td>
<td>10/8/1995</td>
<td></td>
</tr>
<tr>
<td>CLM 4</td>
<td>Black Point Rd 3</td>
<td>DON</td>
<td>NP</td>
<td>1000+</td>
<td>10/8/1995</td>
<td></td>
</tr>
<tr>
<td>CLM 14</td>
<td>Black Point Rd 4</td>
<td>DON</td>
<td>NP</td>
<td>na</td>
<td>11/3/1997</td>
<td></td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
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<td>NP/SF</td>
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<tr>
<td>CLM 6</td>
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<tr>
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<td>SF (5g)</td>
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<td>Thompson Rd 1</td>
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<td>5/12/1995</td>
<td>Plants unhealthy dieback affected</td>
</tr>
<tr>
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<td>Thompson Rd 2</td>
<td>FRA</td>
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<td>&lt;20</td>
<td>5/12/1995</td>
<td>Plants unhealthy and dieback affected</td>
</tr>
<tr>
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<td>RR/PPI</td>
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<tr>
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<td>Middle Rd</td>
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<td>SF</td>
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<td>1/12/1999</td>
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<td>Boronia Rd</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>18/12/1997</td>
<td>Herbarium record</td>
</tr>
</tbody>
</table>

**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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
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<tbody>
<tr>
<td>CLM 1</td>
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<td>NP</td>
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<td>3/1/1991</td>
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<td>FRA</td>
<td>5g</td>
<td>500+</td>
<td>13/11/1999</td>
<td>= <em>L. floribundum</em></td>
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<tr>
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<td>Kent River</td>
<td>FRA</td>
<td>5g</td>
<td>na</td>
<td>13/11/1999</td>
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</tr>
<tr>
<td>WAR 102</td>
<td>Watson Rd</td>
<td>FRA</td>
<td>5g</td>
<td>100</td>
<td>9/11/1999</td>
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<td>WAR 103</td>
<td>Hay FB 1</td>
<td>FRA</td>
<td>SF</td>
<td>500</td>
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<tr>
<td>WAR 104</td>
<td>Tindale Rd</td>
<td>FRA</td>
<td>SF</td>
<td>500+</td>
<td>20/11/1999</td>
<td>As above</td>
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<tr>
<td>WAR 105</td>
<td>Break Rd</td>
<td>FRA</td>
<td>SF</td>
<td>1000+</td>
<td>20/11/1999</td>
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<tr>
<td>WAR 106</td>
<td>Ficusfolia Rd</td>
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<td>Kenton Drive</td>
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<td>17/12/1999</td>
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<tr>
<td>WAR 108</td>
<td>Hay FB 2</td>
<td>FRA</td>
<td>SF</td>
<td>1000+</td>
<td>15/10/1998</td>
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<tr>
<td>WAR 109</td>
<td>Stan Rd</td>
<td>FRA</td>
<td>SF</td>
<td>2</td>
<td>26/10/1998</td>
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<tr>
<td>WAR 110</td>
<td>Sandy Track Rd 1</td>
<td>FRA</td>
<td>SF</td>
<td>100</td>
<td>26/10/1998</td>
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</tr>
<tr>
<td>WAR 111</td>
<td>Sunny Glen Rd</td>
<td>FRA</td>
<td>SF</td>
<td>500+</td>
<td>9/9/1998</td>
<td>Doubtful ID. Recollect</td>
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<td>WAR 112</td>
<td>Sandy Track Rd 2</td>
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<td>SF</td>
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<tr>
<td>WAR 113</td>
<td>Mitchell River Rd 1</td>
<td>FRA</td>
<td>SF</td>
<td>1000+</td>
<td>19/9/1998</td>
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<tr>
<td>WAR 114</td>
<td>Mitchell River Rd 2</td>
<td>FRA</td>
<td>SF</td>
<td>1000+</td>
<td>19/9/1998</td>
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<tr>
<td>WAR 115</td>
<td>Kernut's Rd</td>
<td>FRA</td>
<td>SF</td>
<td>100</td>
<td>19/9/1998</td>
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<tr>
<td>WAR 116</td>
<td>Mt. Lindesay 2</td>
<td>FRA</td>
<td>SF</td>
<td>1000+</td>
<td>1/9/1997</td>
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<tr>
<td>WAR 117</td>
<td>Denmark-Mt Barker Rd</td>
<td>FRA</td>
<td>SF</td>
<td>200+</td>
<td>26/10/1996</td>
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</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
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<th>Last survey</th>
<th>Comments/condition</th>
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</thead>
<tbody>
<tr>
<td>CLM 1</td>
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<td>1000</td>
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<td></td>
<td>FRA</td>
<td></td>
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<tr>
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<td>na</td>
<td>22/2/1990</td>
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<tr>
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<td>Gardner River 2</td>
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<td>na</td>
<td>22/2/1990</td>
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<td>5/12/2000</td>
<td>Herbarium record</td>
</tr>
</tbody>
</table>

**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 Nornalup National Park. Although initially placed in *Billardiera coerulescens* 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
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<td>NP</td>
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<td>13/4/2000</td>
<td></td>
</tr>
<tr>
<td>WAR 110</td>
<td>Board Rd</td>
<td>FRA</td>
<td>RR</td>
<td>na</td>
<td>4/4/2000</td>
<td></td>
</tr>
<tr>
<td>WAR 111</td>
<td>Northumberland FB</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>4/4/1999</td>
<td></td>
</tr>
<tr>
<td>WAR 112</td>
<td>Clauses Rd</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
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<tr>
<td>WAR 113</td>
<td>Easter Rd</td>
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<td>SF</td>
<td>3</td>
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<tr>
<td>WAR 114</td>
<td>Sheepwash SF</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>27/4/1998</td>
<td></td>
</tr>
<tr>
<td>WAR 115</td>
<td>Bandicoot Rd</td>
<td>FRA</td>
<td>SF</td>
<td>50</td>
<td>20/4/1998</td>
<td></td>
</tr>
</tbody>
</table>
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

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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Windy Harbour Rd 1</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>3/5/1991</td>
<td></td>
</tr>
<tr>
<td>CLM 2</td>
<td>Windy Harbour Rd 2</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>19/1/1992</td>
<td></td>
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<tr>
<td>CLM 3</td>
<td>Middle Rd</td>
<td>FRA</td>
<td>NP/SF</td>
<td>na</td>
<td>22/2/1996</td>
<td></td>
</tr>
<tr>
<td>CLM 4</td>
<td>Kent River</td>
<td>FRA</td>
<td>RR</td>
<td>na</td>
<td>22/2/1996</td>
<td></td>
</tr>
<tr>
<td>CLM 5</td>
<td>South Coast Hwy</td>
<td>FRA</td>
<td>RR</td>
<td>na</td>
<td>22/2/1996</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>Pingerup Rd</td>
<td>FRA/DON</td>
<td>NP</td>
<td>na</td>
<td>24/2/1997</td>
<td></td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 4</td>
<td>Kent River</td>
<td>FRA</td>
<td>TR</td>
<td>na</td>
<td>7/10/1984</td>
<td>Unable to relocate</td>
</tr>
<tr>
<td>WAR 100</td>
<td>Gardner River</td>
<td>DON</td>
<td>?</td>
<td>na</td>
<td>19/10/1976</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 101</td>
<td>Rocky Gully</td>
<td>FRA</td>
<td>RR</td>
<td>na</td>
<td>26/8/1995</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 102</td>
<td>Bow River</td>
<td>FRA</td>
<td>?</td>
<td>na</td>
<td>1912</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 103</td>
<td>Donnelly River</td>
<td>DON</td>
<td>SF</td>
<td>na</td>
<td>10/11/1998</td>
<td>Not relocated</td>
</tr>
</tbody>
</table>

**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**

225
Determine response to disturbance.
Determine susceptibility to Phytophthora spp.

References
Wheeler et al. (2002)
**Melaleuca diosmifolia** Andrews

*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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Pt D'Entrecasteaux</td>
<td>DON</td>
<td>NP</td>
<td>na</td>
<td>14/10/1986</td>
<td>Misidentified = <em>M. ringens</em></td>
</tr>
<tr>
<td>CLM 4</td>
<td>West Cliff Pt</td>
<td>DON</td>
<td>NP</td>
<td>100+</td>
<td>20/1/1992</td>
<td></td>
</tr>
</tbody>
</table>

**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.

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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 3</td>
<td>Perup</td>
<td>DON</td>
<td>NR</td>
<td>1</td>
<td>8/10/1998</td>
<td>Root suckering species</td>
</tr>
</tbody>
</table>

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

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, cylindric 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. Staminial 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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
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<tbody>
<tr>
<td>CLM 2, 5</td>
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<td>DON</td>
<td>NP</td>
<td>1000+</td>
<td>16/6/1996</td>
<td>Single population.</td>
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<tr>
<td>CLM 3</td>
<td>Coastal Track</td>
<td>DON</td>
<td>NP</td>
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<td>6/5/1991</td>
<td>May be the same population as above.</td>
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<tr>
<td>CLM 4</td>
<td>Mandalay</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>9/10/1991</td>
<td></td>
</tr>
<tr>
<td>CLM 5</td>
<td>Pt. D'Entrecasteaux</td>
<td>DON</td>
<td>NP</td>
<td>na</td>
<td>6/10/1995</td>
<td></td>
</tr>
<tr>
<td>CLM 6</td>
<td>Quarram NR 1</td>
<td>FRA</td>
<td>NR</td>
<td>300</td>
<td>1/6/2002</td>
<td></td>
</tr>
<tr>
<td>CLM 7</td>
<td>Quarram NR 2</td>
<td>FRA</td>
<td>NR</td>
<td>40</td>
<td>7/11/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 8</td>
<td>Quarram NR 3</td>
<td>FRA</td>
<td>NR</td>
<td>100</td>
<td>7/11/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 9</td>
<td>Parry's Beach 1</td>
<td>FRA</td>
<td>NR</td>
<td>40</td>
<td>16/11/1996</td>
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</tr>
<tr>
<td>CLM 10</td>
<td>Aldridge Cove</td>
<td>FRA</td>
<td>NR</td>
<td>15</td>
<td>19/11/1996</td>
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<tr>
<td>WAR 100</td>
<td>Cliffy Head</td>
<td>FRA</td>
<td>NP</td>
<td>1000+</td>
<td>9/11/1999</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Parry Rd</td>
<td>FRA</td>
<td>NP</td>
<td>200</td>
<td>25/9/1999</td>
<td></td>
</tr>
</tbody>
</table>

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

*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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 4</td>
<td>Ritter Rd 1</td>
<td>DON</td>
<td>SF</td>
<td>200</td>
<td>20/10/1994</td>
<td>Phytophthora affected</td>
</tr>
<tr>
<td>WAR 100</td>
<td>Charley Rd</td>
<td>DON</td>
<td>SF</td>
<td>400+</td>
<td>9/2/2004</td>
<td>Population along road. Seed</td>
</tr>
<tr>
<td>WAR 101</td>
<td>Ritter Rd 2</td>
<td>DON</td>
<td>SF</td>
<td>100+</td>
<td>9/2/2004</td>
<td></td>
</tr>
<tr>
<td>WAR 102</td>
<td>Charley Lake</td>
<td>DON</td>
<td>SF</td>
<td>300+</td>
<td>23/10/2000</td>
<td></td>
</tr>
<tr>
<td>WAR 103</td>
<td>Charley Rd 2</td>
<td>DON</td>
<td>SF</td>
<td>40+</td>
<td>9/2/2004</td>
<td></td>
</tr>
<tr>
<td>WAR 104</td>
<td>Fly Brook Rd</td>
<td>DON</td>
<td>SF</td>
<td>na</td>
<td>23/10/2000</td>
<td></td>
</tr>
</tbody>
</table>

**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.

**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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Mt. Lindesay 1</td>
<td>FRA</td>
<td>NP</td>
<td>200</td>
<td>2/9/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 2</td>
<td>McIntosh NR</td>
<td>FRA</td>
<td>NR</td>
<td>1000</td>
<td>24/9/1994</td>
<td></td>
</tr>
<tr>
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<td>24/9/1994</td>
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<td>SF</td>
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<td>SF</td>
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<td>WAR 100</td>
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<td>SHRes</td>
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<td>1/11/2003</td>
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<tr>
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<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>5/11/2001</td>
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<tr>
<td>WAR 102</td>
<td>Romance Rd</td>
<td>FRA</td>
<td>SF</td>
<td>&lt;100</td>
<td>23/10/2000</td>
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</tr>
<tr>
<td>WAR 103</td>
<td>Stan Rd/Sandy Track</td>
<td>FRA</td>
<td>SF</td>
<td>100+</td>
<td>24/11/1999</td>
<td></td>
</tr>
<tr>
<td>WAR 104</td>
<td>Break Rd</td>
<td>FRA</td>
<td>SF</td>
<td>500+</td>
<td>18/11/1999</td>
<td></td>
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<tr>
<td>WAR 105</td>
<td>Centre Break Rd</td>
<td>FRA</td>
<td>SF</td>
<td>500+</td>
<td>16/11/1999</td>
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<tr>
<td>WAR 106</td>
<td>Parker Rd</td>
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<td>TR</td>
<td>500+</td>
<td>13/11/1999</td>
<td></td>
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<tr>
<td>WAR 107</td>
<td>Break Rd</td>
<td>FRA</td>
<td>SF</td>
<td>200+</td>
<td>9/11/1999</td>
<td></td>
</tr>
<tr>
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<td>RR</td>
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<tr>
<td>WAR 110</td>
<td>Old Railway Reserve</td>
<td>FRA</td>
<td>SF</td>
<td>50</td>
<td>13/10/1999</td>
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<tr>
<td>WAR 111</td>
<td>South West Hwy</td>
<td>FRA</td>
<td>SF</td>
<td>12</td>
<td>5/10/1999</td>
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<tr>
<td>WAR 112</td>
<td>Inlet FB</td>
<td>FRA</td>
<td>SF</td>
<td>1</td>
<td>4/10/1999</td>
<td></td>
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<tr>
<td>WAR 113</td>
<td>Pingerup FB</td>
<td>FRA</td>
<td>SF</td>
<td>10</td>
<td>4/10/1999</td>
<td></td>
</tr>
<tr>
<td>WAR 114</td>
<td>Basin Rd</td>
<td>FRA</td>
<td>River R</td>
<td>100+</td>
<td>22/10/1998</td>
<td></td>
</tr>
<tr>
<td>WAR 115</td>
<td>Ritter Rd</td>
<td>DON</td>
<td>SF</td>
<td>na</td>
<td>25/11/1997</td>
<td></td>
</tr>
<tr>
<td>WAR 116</td>
<td>Northumberland Rd 2</td>
<td>FRA</td>
<td>SF</td>
<td>50+</td>
<td>17/10/1997</td>
<td></td>
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<tr>
<td>WAR 117</td>
<td>Bell Brook Swamp</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>6/10/1997</td>
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<tr>
<td>WAR 118</td>
<td>Nutcracker Rd</td>
<td>FRA</td>
<td>SF</td>
<td>30</td>
<td>16/12/1998</td>
<td></td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLM 1</td>
<td>Nicol Rd 1</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>29/11/1995</td>
<td>Possible sub-population that requires resurvey</td>
</tr>
<tr>
<td>CLM 2</td>
<td>Nicol Rd 2</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>29/11/1995</td>
<td></td>
</tr>
<tr>
<td>CLM 3</td>
<td>Nicol Rd 3</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>22/8/2002</td>
<td></td>
</tr>
<tr>
<td>CLM 4</td>
<td>Johnston Rd 1</td>
<td>FRA</td>
<td>NP</td>
<td>1000+</td>
<td>17/4/1997</td>
<td></td>
</tr>
<tr>
<td>CLM 5</td>
<td>Johnston Rd 1</td>
<td>FRA</td>
<td>NP</td>
<td>1000+</td>
<td>17/4/1997</td>
<td></td>
</tr>
<tr>
<td>WAR 100</td>
<td>Nicol Rd 4</td>
<td>FRA</td>
<td>NP</td>
<td>1000+</td>
<td>13/10/1999</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Bandicoot Rd</td>
<td>FRA</td>
<td>SF</td>
<td>500+</td>
<td>25/9/2002</td>
<td>Misidentified (possibly <em>S. tenuifolia</em>). Requires checking by A. George</td>
</tr>
<tr>
<td>WAR 102</td>
<td>Styx FB 1</td>
<td>FRA</td>
<td>SF</td>
<td>1000+</td>
<td>13/10/2001</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 103</td>
<td>Nutcracker Rd</td>
<td>FRA</td>
<td>SF</td>
<td>100+</td>
<td>12/2/1997</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 104</td>
<td>Normalup Rd</td>
<td>FRA</td>
<td>SF</td>
<td>52</td>
<td>18/11/1997</td>
<td>As above</td>
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<tr>
<td>WAR 105</td>
<td>Timberjack Rd</td>
<td>FRA</td>
<td>SF</td>
<td>148</td>
<td>17/12/1996</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 106</td>
<td>Break Rd</td>
<td>FRA</td>
<td>SF</td>
<td>19</td>
<td>28/10/1997</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 107</td>
<td>Styx FB 2</td>
<td>FRA</td>
<td>SF</td>
<td>500+</td>
<td>28/10/1997</td>
<td>As above</td>
</tr>
<tr>
<td>WAR 108</td>
<td>Normalup Rd 2</td>
<td>FRA</td>
<td>SF</td>
<td>0</td>
<td>29/11/1995</td>
<td>1970 collection made by Boyd but not relocated</td>
</tr>
</tbody>
</table>

**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

Fan Trigger plant

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

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
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<td>CLM 4 a</td>
<td>Lake Muir 1</td>
<td>DON</td>
<td>RR</td>
<td>25</td>
<td>18/10/1994</td>
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<td>CLM 4 b</td>
<td>Lake Muir 2</td>
<td>DON</td>
<td>RR</td>
<td>50+</td>
<td>24/11/1994</td>
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<tr>
<td>WAR 100</td>
<td>Frankland River?</td>
<td>FRA/DON</td>
<td>?</td>
<td>0</td>
<td>24/11/1994</td>
<td>No plants found</td>
</tr>
</tbody>
</table>

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

239
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, tripinna-pinnatifid, 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
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<td>SF</td>
<td>na</td>
<td>22/10/1993</td>
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<tr>
<td>CLM 3</td>
<td>Nornalup Rd 2</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
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<tr>
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<td>Boronia Rd 1</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
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<tr>
<td>CLM 5</td>
<td>Nornalup Rd 3</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
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<tr>
<td>WAR 100</td>
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<td>SF</td>
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<td>WAR 101</td>
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<td>SF</td>
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<td>12/8/1998</td>
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<tr>
<td>WAR 102</td>
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<td>FRA</td>
<td>SF</td>
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<td>17/10/2001</td>
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<tr>
<td>WAR 103</td>
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<td>18/10/2001</td>
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</tr>
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<td>SF</td>
<td>50+</td>
<td>8/12/1997</td>
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</tr>
<tr>
<td>WAR 105</td>
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<td>FRA</td>
<td>SF</td>
<td>50</td>
<td>9/12/1997</td>
<td></td>
</tr>
<tr>
<td>WAR 107</td>
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<td>FRA</td>
<td>SF</td>
<td>1</td>
<td>1/10/1998</td>
<td></td>
</tr>
<tr>
<td>WAR 108</td>
<td>Nornalup Rd 7</td>
<td>FRA</td>
<td>SF</td>
<td>1000+</td>
<td>18/11/1997</td>
<td></td>
</tr>
<tr>
<td>WAR 109</td>
<td>Nornalup Rd 8</td>
<td>FRA</td>
<td>NP</td>
<td>100+</td>
<td>18/11/1997</td>
<td></td>
</tr>
<tr>
<td>WAR 110</td>
<td>Boronia Rd 2</td>
<td>FRA</td>
<td>SF</td>
<td>15</td>
<td>17/12/1997</td>
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</tr>
<tr>
<td>WAR 111</td>
<td>Boronia Rd 3</td>
<td>FRA</td>
<td>SF</td>
<td>12</td>
<td>17/12/1997</td>
<td></td>
</tr>
</tbody>
</table>

**Response to Disturbance**
Plants are killed by fire and are dependant upon soil stored seed for regeneration.

Scattered populations along Normalup Rd (between Roe Rd and Bevan Rd) and in the Boronia/Normalup 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 vouched 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

*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-Narrikup 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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAR 100</td>
<td>Perillup</td>
<td>FRA</td>
<td>SHRes</td>
<td>na</td>
<td></td>
<td>1980 collection. Not relocated</td>
</tr>
</tbody>
</table>

**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)

![Map of Warren Region with Synaphea preisii marked]

Synaphea preisii
Thelymitra jacksonii

Hopper et A.P. Br. ex Jeanes ms

**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**

<table>
<thead>
<tr>
<th>Pop. No.</th>
<th>Location</th>
<th>District</th>
<th>Land status</th>
<th>No. of plants</th>
<th>Last survey</th>
<th>Comments/condition</th>
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<tbody>
<tr>
<td>CLM 1</td>
<td>South West Hwy 1</td>
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<tr>
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<td>Aircraft Rd</td>
<td>FRA</td>
<td>NP/SF</td>
<td>7</td>
<td>15/12/1995</td>
<td></td>
</tr>
<tr>
<td>CLM 5</td>
<td>Mt. Pingerup Track 1</td>
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<td>FRA</td>
<td>SF</td>
<td>1</td>
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<tr>
<td>CLM 7</td>
<td>South West Hwy 5</td>
<td>FRA</td>
<td>SF</td>
<td>na</td>
<td>27/12/1995</td>
<td></td>
</tr>
<tr>
<td>CLM 8</td>
<td>South West Hwy 6</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>27/12/1995</td>
<td></td>
</tr>
<tr>
<td>WAR 101</td>
<td>Aircraft Rd</td>
<td>FRA</td>
<td>NP</td>
<td>na</td>
<td>15/12/1995</td>
<td></td>
</tr>
</tbody>
</table>

**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**

245
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.

- *Asplenium aethiopicum*  
- *Lysinema lasianthum*

- *Astarea* sp. Scott River (D Backshall 88233)  
- *Melaleuca basicephala*

- *Astroloma* sp. Nannup (RD Royce 3978)  
- *Microtis media subsp. quadrata*

- *Caladenia interjacens*  
- *Microtis pulchella*

- *Caladenia plicata*  
- *Pleurophascum occidentale*

- *Corybas limpidus*  
- *Reedia spathacea*

- *Drosera fimbriata*  
- *Schoenus natans*

- *Dryandra serra*  
- *Sollya drummondii*

- *Grevillea ripicola*  
- *Tripterococcus brachylobus ms*

- *Hypocalymma cordifolium subsp. minus ms*  
- *Tyrbastes glaucescens*

- *Leucopogon tamariscinus*  
- *Villarsia submersa*

**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 fimbrilepis 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:

- *Banksia verticillata*
- *Caladenia winfieldii*
- *Conostylis misera*
- *Kennedia glabrata*
- *Sphenotoma drummondii*
- *Verticordia apecta*
- *Verticordia densiflora var. pedunculata*
- *Verticordia fimbrilepis subsp. australis*

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:

- *Asplenium obtusatum* subsp. *northlandicum*
- *Banksia verticillata*
- *Caladenia dorrienii*
- *Caladenia harringtoniae*
- *Caladenia winfieldii*
- *Conostylis misera*
- *Diuris drummondii*
- *Drakaea micrantha*
- *Kennedia glabrata*
- *Laxmannia jamesii*
- *Meziella trifida*
- *Microtis globula*
- *Sphenotoma drummondii*
- *Verticordia apecta*
- *Verticordia densiflora var. pedunculata*
- *Verticordia fimbrilepis subsp. australis*

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:

- Asplenium obtusatum subsp. northlandicum
- Banksia verticillata
- Caladenia winfieldii
- Conostylis misera
- Drakaea micrantha ms
- Kennedia glabrata
- Meziella trifida
- Microtis globula
- Rhacocarpus rehmannianus var. webbianus
- Sphenotoma drummondii
- Verticordia apecta
- Verticordia densiflora var. pedunculata
- Verticordia fimbrilepis subsp. australis

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:

- Caladenia christineae
- Caladenia dorrienii
- Caladenia harringtoniae
- Diuris drummondii
- Drakaea micrantha ms
- Laxmannia jamesii
- Meziella trifida
- Verticordia fimbrilepis subsp. australis

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
- Laxmannia jamesii

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 fimbrilepis** 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 fimbrilepis* 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:
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*
- *Kennedia glabrata*
- *Laxmannia jamesii*
- *Meziella trifida*
- *Microtis globula*
- *Rhacocarpus rehmannianus var. webbianus*
- *Verticordia apecta*
- *Verticordia fimbrilepis 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*
- *Drakaea micrantha ms*
- *Caladenia harringtoniae*
- *Laxmannia jamesii*
- *Diuris drummondii*
- *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
- Caladenia apecta
- Caladenia 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
- 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:

- Banksia verticillata
- Caladenia christineae
- Caladenia dorrienii
- Caladenia winfieldii
- Conostylis misera
- Diuris drummondii
- Drakaea micrantha
- Kennedia glabrata
- Laxmannia jamesii
- Meziella trifida
- Microtis globula
- Rhacocarpus rehmannianus var. webbianus
- Verticordia apecta
- Verticordia densiflora var. pedunculata
- Verticordia fimbrilepis subsp. australis

### 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:

- Caladenia christineae
- Caladenia harringtoniae
- Diuris drummondii
- Drakaea micrantha
- Laxmannia jamesii
- Meziella trifida
- Verticordia apecta
- Verticordia densiflora var. pedunculata
- Verticordia fimbrilepis subsp. australis

### 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:

- Caladenia christineae
- Caladenia harringtoniae
- Drakaea micrantha
- Laxmannia jamesii
- Conostylis misera
- Drakaea micrantha
- Meziella trifida
- Rhacocarpus rehmannianus var. webbianus

### 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:

<table>
<thead>
<tr>
<th>Species 1</th>
<th>Species 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banksia verticillata</td>
<td>Kennedia glabrata</td>
</tr>
<tr>
<td>Caladenia christineae</td>
<td>Laxmannia jamesii</td>
</tr>
<tr>
<td>Caladenia dorrienii</td>
<td>Meziella trifida</td>
</tr>
<tr>
<td>Caladenia harringtoniae</td>
<td>Microtis globula</td>
</tr>
<tr>
<td>Caladenia winfieldii</td>
<td>Sphenotoma drummondii</td>
</tr>
<tr>
<td>Conostylis misera</td>
<td>Verticordia apecta</td>
</tr>
<tr>
<td>Diuris drummondii</td>
<td>Verticordia densiflora var. pedunculata</td>
</tr>
<tr>
<td>Drakaea micrantha ms</td>
<td>Verticordia fimbrilepis subsp. australis</td>
</tr>
</tbody>
</table>
Table 1. Warren Region Declared Rare Flora scored (0-3) according to the degree of threat or urgency for management and research actions.

<table>
<thead>
<tr>
<th>Critically Endangered</th>
<th>Total</th>
<th>Phytophthora dieback</th>
<th>Survey</th>
<th>Populations</th>
<th>Small/ few populations</th>
<th>Roadside</th>
<th>Private land</th>
<th>Land acquisition</th>
<th>Fencing</th>
<th>Mining</th>
<th>Recreation</th>
<th>Drought/ Flood/ Salt</th>
<th>Germ plasm collection</th>
<th>Re-establishment</th>
<th>Road/ utility maintenance</th>
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**Total** | 20 | 35 | 32 | 14 | 3 | 6 | 4 | 1 | 17 | 29 | 33 | 5 | 18 | 19 | 46 | 28 | 19 | 15 | 31 |
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).

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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:

- *Andersonia annelsii* ms
- *Andersonia hammersleyana*
- *Cryptandra congesta*
- *Eucalyptus virginae* ms
- *Grevillea fuscolutea*
- *Laxmannia grandiflora* subsp. *brendae*
- *Astartea* sp. Mt. Johnson

The data suggest that the following taxa warrant immediate management and research action:

- *Andersonia hammersleyana* Laxmannia grandiflora subsp. *brendae*
- *Eucalyptus virginae* ms
- *Lambertia rariflora* subsp. *lutea*
- *Stylidium rhipidium*

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*  
*Chamelaucium forrestii* subsp. *forrestii*  
*Dryandra sessilis* var. *cordata*

**Priority Three**  
*Grevillea fuscolutea*  
*Verticordia endlicheriana* var. *angustifolia*

3.2 Further Surveys

**Priority One**  
*Andersonia redolens*  
*Andersonia* sp. Mitchell River  
*Austrostipa littoralis*  
*Caladenia evanescens*  
*Carex tereticaulis*  
*Cryptandra arbutiflora* var. *pygmaea*  
*Deyeuxia inaequalis*  
*Eriochilus scaber* subsp. *orbifolia* ms  
*Eryngium* sp. Lake Muir  
*Hydatella australis*  
*Pentapogon quadriditus*  
*Sphaerolobium benectectum*

**Priority Two**  
*Amperea protensa*  
*Andersonia annelsii* ms  
*Andersonia auriculata*  
*Andersonia hammersleyana*  
*Andersonia virolens*  
*Anthocercis sylvicola*  
*Apodasmia ceramophila*  
*Borya longiscapa*  
*Caladenia abbreviata*  
*Caladenia erythrochila*  
*Caladenia luteola*  
*Caladenia starteorum*  
*Calothamnus sp. Mt. Lindesay*  
*Chamaeneros longicaulis*  
*Cryptandra congesta*  
*Dampiera orchardii*  
*Diuris heberlei*  
*Drepanocladus aduncus*  
*Drosera binata*  
*Dryandra sessilis* var. *cordata*  
*Euphrasia scabra*  
*Fabronia hampeana*  
*Hemianthus australis* ms

**Priority Three**  
*Hybanthus volubilis*  
*Juncus meianthus* ms  
*Lazmannia grandiflora* subsp. *brendae*  
*Leptinella drummondii*  
*Lilaeopsis polyantha*  
*Melaleuca pritzeli*  
*Mitreola minima*  
*Rorippa dictyosperma*  
*Schoenus fluitans*  
*Selliera radicans*  
*Sphagnum nova-zelandicum*  
*Spyridium riparium*  
*Thomasia quercifolia*  
*Verticordia endlicheriana* var. *angustifolia*

*Actinotus sp. Walpole*  
*Alexgeorgea ganopoda*  
*Andersonia amabile* ms  
*Andersonia anambole* ms  
*Andersonia annelsii* ms  
*Andersonia auriculata*  
*Andersonia hammersleyana*  
*Andersonia virolens*  
*Anthocercis sylvicola*  
*Apodasmia ceramophila*  
*Borya longiscapa*  
*Caladenia abbreviata*  
*Caladenia erythrochila*  
*Caladenia luteola*  
*Caladenia starteorum*  
*Calothamnus sp. Mt. Lindesay*  
*Chamaeneros longicaulis*  
*Cryptandra congesta*  
*Dampiera orchardii*  
*Diuris heberlei*  
*Drepanocladus aduncus*  
*Drosera binata*  
*Dryandra sessilis* var. *cordata*  
*Euphrasia scabra*  
*Fabronia hampeana*  
*Hemianthus australis* ms  
*Melaleuca diosmifolia*
Melaleuca micromera       Stylidium rhipidium
Melaleuca ringens         Synaphea intricata
Pultenaea pinifolia      Synaphea preissii
Sphenotoma parviflorum

3.3  Population Size and Few Populations

Priority One
Austrofestuca littoralis       Euphrasia scabra
Caladenia evanescens           Fabriona hampeana
Carex tereticaulis             Grevillea acropogon
Cryptandra arbutiflora var. pygmaea       Grevillea fuscolutea
Deyeuxia inaequalis            Hybanthus volubilis
Eriochilus scaber subsp. orbifolia ms       Juncus meianthus ms
Eryngium sp. Lake Muir         Leptinella drummondi
Hydatella australis            Lilaeopsis polyantha
Pentapogon quadrifidus         Melaleuca pritzeli
Sphaerolobium benectum         Rorippa dictyosperma
Synaphea decumbens            Schizaea raepstris
Tetraitheca sp. Kent River     Schoenus fluitans

Priority Two
Andersonia annelsii ms        Sphagnetum nova-zealandicum
Andersonia hammersleyana      Spyridium riparium
Anthocercis sylvicola         Thomasia quercifolia
Caladenia abbreviata          Verticordia endlicheriana var. angustifolia
Caladenia erythrochila        Priority Three
Caladenia luteola             Boronia anceps
Caladenia starteorum          Calytrix pulchella
Calothamnus sp. Mt. Lindesay   Cyathochaeta teretifolia
Chamelaucium floriferum subsp. dicrastylis glauca
diffusum ms                   Gonocarpus trichostachyus
Cryptandra congesta           Melaleuca diosmifolia
Dampiera ochardii             Melaleuca micromera
Diuris heberlei               Pultenaea pinifolia
Drepanooclados aduncus        Stylidium rhipidium
Drosera binata               Synaphea preissii
Eucalyptus virginae ms

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
Drepanooclados aduncus
Eucalyptus virginae ms
Grevillea acropogon

3.6  Land Acquisition

Priority One
Pentapogon quadrifidus

Priority Two
Drepanooclados aduncus

259
3.7 **Fencing**

**Priority Two**

Eucalyptus virginae

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
Tetrapheca sp. Kent River

Drepanocladus aduncus
Leptinella drummondii

**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 evanescent
Cryptandra arbutiflora var. pygmaea
Eriochilus scaber subsp. orbifolia
Hydatella australis
Synaphea decumbens

Caladenia starteorum
Chamaexeros longicaulis
Cryptandra congesta
Dampiera orchardii
Eucalyptus virginae ms
Euphrasia scabra
Lasmannia 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

Dampiera orchardii

Eucalyptus virginae ms

**Priority Two**

Andersonia annelsii ms

Euphrasia aff. scabra
3.13 Road and Track Management, Relocation, Closure

**Priority One**
- *Andersonia redolens*
- Wurmbea sp. Cranbrook

**Priority Two**
- *Andersonia hammersleyana*
- Chamelaucium floriferum subsp. diffusum
- Drepanoclados aduncus

**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**
- Drepanoclados aduncus
- Drosera binata

**Priority Three**
- Eucalyptus virginae ms
- Grevillea acropogon
- Leptinella drummondi
- Wurmbea sp. Cranbrook
- Styliidium rhipidium

3.15 Monitoring

**Priority One**
- *Andersonia redolens*
- *Andersonia* sp. Mitchell River
- *Austrostelca littoralis*
- *Caladenia evanescens*
- *Cryptandra arbutiflora var. pygmaea*
- *Eriochilus scaber* subsp. *orbifolia* ms
- *Hydatella australis*
- *Synaphe decumbens*

**Priority Two**
- *Andersonia annelsii* ms
- *Andersonia auriculata*
- *Andersonia hammersleyana*
- *Andersonia virolens*
- *Borya longiscapa*
- *Caladenia erythrochila*
- *Caladenia luteola*
- Drepanoclados aduncus
- *Laxmannia grandiflora* subsp. *brendae*

**Priority Three**
- *Asartea* sp. Mt. Johnson
- *Calytrix pulchella*
- *Chamelaucium floriferum* subsp. *floriferum* ms
- *Chorizema reticulatum*
- *Cyathochaeta teretifolia*
- *Jansonia formosa*
- *Lambertia rariflora* subsp. *lutea*
- *Stirlingia divaricatissima*
- *Stlyidium rhipidium*
- *Thelymitra jacksonii*

3.16 Research

**Priority One**
- *Austrostelca littoralis*
- *Hydatella australis*

**Priority Two**
- *Andersonia annelsii* ms
- *Andersonia auriculata*
- *Andersonia hammersleyana*
- *Anthocercis sylvicola*
- *Caladenia abbreviata*
- *Caladenia erythrochila*
- *Caladenia luteola*
- *Calothamnus* sp. Mt. Lindesay

**Priority Three**
- *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**
- *Asartea* sp. Mt. Johnson
- *Chamelaucium floriferum* subsp. *floriferum* ms
- *Cyathochaeta teretifolia*
- *Melaleuca micromera*
- *Stirlingia divaricatissima*
### 3.17 Linear Marking

**Priority One**
- Andersonia redolens
- Andersonia sp. Mitchell River
- Cryptandra arbutiflora var. pygmaea
- Synaphea decumbens

**Priority Two**
- Andersonia auriculata
- Drosera binata

**Priority Three**
- Spyridium riparium
- Wurmbea sp. Cranbrook

### 3.18 Environmental Weeds and Feral Animals

**Priority One**
- Austrofestuca littoralis
- Carex tereticaulis
- Hydatella australis

**Priority Two**
- Borya longiscapa

**Priority Three**
- Eucalyptus virginea
- Leptinella drummondii
- Wurmbea sp. Cranbrook

### 3.19 Fire Management Issues

**Priority One**
- Caladenia evanescens
- Sphaerolobium benetectum

**Priority Two**
- Andersonia annelsii ms
- Caladenia erythrobotria
- Caladenia luteola
- Calothamnus sp. Mt. Lindesay
- Chamaexeros longicaulis
- Cryptandra congesta
- Diuris heberlei
- Drosera binata
- Eucalyptus virginea
- Grevillea fuscolutea

**Priority Three**
- Laxmannia grandiflora subsp. brendae
- Mitreola minima
- Sphagnum nova-zelandicum
- Verticordia endlicheriana var. angustifolia
- 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.

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<th>Land Acquisition</th>
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**Taxon**

*Verticordia endlicheriana* var. *angustifolia*

*Wurmbea* sp. Cranbrook

**Priority Three**

*Actinotus* sp. Walpole

*Alexgeorgea ganopoda*

*Amperea protensa*

*Andersonia amabile* ms

*Astartea* sp. Mt. Johnson

*Boronia anceps*

*Boronia virgata*

*Calotrix pulchella*

*Chamelaeonium floriferum* subsp. *floriferum* ms

*Chorisema reticulatum*

*Cyathochaeta stipoides*

*Cyathochaeta teretifolia*

*Dicrastylis glauca*

*Eucalyptus brevistylis*

*Gonocarpus pusillus*

*Gonocarpus simplex*

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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.

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* 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

abaxial  of the side or surface of an organ, facing away from the axis. cf. adaxial

achene  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)

acrocarpous  with the sporophyte produced at the end of the stem or main branch.

acuminate  tapering gradually to a protracted point

acute  terminating in a distinct but not protracted point, the converging edges separated by an angle less than 90 degrees

adaxial  of the side or surface of an organ, facing towards the axis. cf. abaxial

adnate  fused to an organ of a different kind, eg. applied to a stamen fused to a petal

alar cells  with reference to mosses, cells at the base angle of a leaf, often distinctive in shape, size and colour

alternate  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

annual  a plant whose life span ends within one year after germination

anterior  of floral organs, on the side of the flower farthest from the axis or toward the subtending (enclosing) bract. cf. posterior

anthesis  the time of opening of a flower

appendage  a structure arising from the surface or extending beyond the tip of another structure

appressed  pressed closely against but not united with

ascending  growing erect after an oblique or semi-horizontal beginning

attenuate  tapering gradually

auricle  an ear-shaped appendage at the base of a leaf, leaflet or corolla lobe. adj. auriculate

auriculate  see auricle

awn  a bristle-like appendage, eg on the tip or back of the lemma of a grass floret

axil  the angle between a leaf or bract and the axis bearing it. adj. axillary

axillary  see axil

axis  a stem, commonly used for the main stem of a whole plant or of an inflorescence

basal  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
barbate  bearded, having tufts of hairs
beak  a prominent terminal projection, especially of a carpel or fruit
berry  a fleshy or pulpy indehiscent fruit with the seed(s) embedded in the fleshy tissue of the pericarp
bipinnatisect  twice pinnately divided, lobes almost to base or midribs
bisexual  with both stamens and carpels present and functional on a flower. cf. unisexual
bract  a leaf-like structure, different in form from the foliage leaves and without an axillary bud, associated with an inflorescence or flower
bracteole  a small bract-like structure borne singly or in pairs on the pedicel or calyx of a flower
caducous  falling off early. cf. persistent
calli  in Dampiera small outgrowths in the throat of the corolla (acting as tactile guides for pollinators)
callus  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
calyx  the sepals of one flower collectively
calyx-tube  a tube formed by fusion or cohesion of sepals. cf. hypanthium
campanulate  bell-shaped
capitulum  a racemose inflorescence with sessile flowers compacted on a flattened and expanded, or rounded apex of a peduncle. pl capitula
capsule  a dry fruit formed from two or more united carpels and dehiscing at maturity to release the seeds
cheridium  a sleeve like structure in Calytrix made up of persistent bracteoles on an extended peduncle and connate to it
cilia  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. cillum; adj. ciliate
ciliate  see cilia
clavate  club-shaped
claw  a narrow, stalk-like basal portion of a petal, sepal or bract
cleistocarpus  without an operculum and therefore not regularly dehiscent
clonal  see clone
clonal  a set of organisms produced from one parent by vegetative reproduction. adj. clonal
| **column** | a structure in Orchidaceae, Asclepiadaceae and Stylidiaceae, extending above the ovary of a flower and incorporating stigma, style and stamens |
| **compressed** | flattened in one plane, either dorsally (bringing the front and back closer together) or laterally (bringing the sides closer together) |
| **compound** | of a leaf, having the blade divided into two or more distinct leaflets; of an inflorescence, made up of an aggregate of smaller inflorescences |
| **cone** | (loosely) in Casuarina, a woody multiple fruit incorporating the bracts and bracteoles associated with the flowers |
| **conflorescence** | a compound inflorescence consisting of two or more unit inflorescences |
| **connate** | fused to another organ (or other organs) of the same kind |
| **connivent** | coming into contact; converging |
| **cordate** | of a leaf blade, broad and notched at the base; heart-shaped |
| **corolla** | the petals of a flower collectively |
| **corona** | a ring of tissue arising from the corolla or perianth of a flower and standing between the perianth lobes and the stamens |
| **corymb** | 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 |
| **costa** | with reference to mosses, the rib or nerve of a leaf, single or double |
| **crenate** | with small, rounded teeth; scalloped |
| **crenulate** | minutely scalloped |
| **crown** | the part of a tree or shrub above the level of the lowest branch |
| **culm** | an aerial stem, in grasses, sedges, rushes, etc., bearing the inflorescence |
| **cuneate** | wedge-shaped |
| **cymbiform** | concave and boat shaped |
| **cyme** | 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. cymose |
| **cymose** | see cyme |
| **deciduous** | falling seasonally, eg of the leaves or bark of some trees |
| **decumbent** | spreading horizontally but then growing upwards |
| **decussate** | in pairs, with successive pairs borne at right angles to each other |
| **dehiscent** | breaking open at maturity to release the contents |
| **dentate** | toothed |
| **denticulate** | finely toothed |
deltoid  triangular with the sides of about equal length

digitate  branching from the axis or stalk like the fingers of a hand

dimorphic  of two different forms

dioecious  having the male and female reproductive structures on separate plants. cf. monoecious

disc  a plate or rim of tissue, derived from the receptacle of a flower, occurring between whorls of floral parts

discolorous  having 2 colours, eg. upper and lower surfaces of a leaf being of different colours

divaricate  widely spreading

dorsal  when referring to thallous liverworts, the upper surface, facing away from the substrate

dorsifixed  attached at or by the back

dedaphic  pertaining to the soil

dielliptic  oval in outline, widest at the centre

demarginate  having a broad, shallow notch at the apex

demerget  rising above the surrounding plants

demic  having a natural distribution confined to a particular geographical region

decarp  the innermost layer of a pericarp

dentire  having a smooth margin, not dissected or toothed

dephemeral  short-lived

decrect  upright, perpendicular

derose  margin irregularly incised, appearing eroded, gnawed or irregularly toothed

decarx  the outer layer of a pericarp

deserted  protruding, eg of stamens with respect to a corolla tube

decate  sickle-shaped

deonym  a group of one to many genera believed to be related phylogenetically, usually clearly separable from other such groups

decicycle  a cluster, adj. fasciculate

decilament  the stalk of a stamen; a thread one or more cells thick; in blue-green Algae, a trichome enclosed in a mucilaginous sheath

deciform  thread-like

decabelliform  fan shaped
floral  belonging to or associated with a flower
floret  a grass flower, together with the lemma and palea that enclose it (often applied to flowers in Cyperaceae and Asteraceae)
fimbriate  fringed
follicle  a dry, dehiscent fruit formed from one carpel and dehiscing along the line of fusion of its edges
free  not fused or united (with other organs)
fruit  the seed-bearing structure in angiosperms formed from the ovary after flowering
gemmae  specialised units of vegetative reproduction; morphologically distinct propagules, not casual fragments

**genus**  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. **genera**
glabrescent  becoming glabrous
glabrous  without hairs
gland  a structure, without or on the surface of a plant, with a secretory function
glandular  bearing glands; functioning as a gland
glaucous  blue-green in colour, with a whitish bloom (as in the juvenile leaves of many eucalypts)
globular  3-dimensional shape; spherical or orbicular; approximately circular in cross section

glume  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

**habit**  the growth form of a plant, comprising its size, shape, texture and orientation
**habitat**  the environment in which a plant lives
herb  any vascular plant that never produces a woody stem
herbaceous  not woody; soft in texture
hermaphrodite  bisexual
hirsute  bearing coarse, rough, longish hairs
hoary  covered with a greyish layer of very short, closely interwoven hairs
hyaline  translucent, almost like clear glass
hypanthium  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
**hypogenous**  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.

**hypogenous bristle**  in Cyperaceae, petals and sepals often when present have been reduced to bristle-like appendages.

**imbricate**  of perianth parts, having the edges overlapping in the bud.

**included**  enclosed, not protruding, cf. **exserted**.

**incurved**  bent or curved inwards or upwards; of leaf margins, curved towards the adaxial surface.

**indehiscent**  not breaking open at maturity to release the contents.

**indusium**  the pollen-cup of Goodeniaceae; tissue covering the sorus of a fern.

**inferior**  of an ovary, at least partly below the level of attachment of the other floral parts. cf. **superior**.

**inflexed**  bent sharply upwards or forwards.

**inflorescence**  the group or arrangement in which flowers are borne on a plant.

**intercalary**  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.

**internode**  the portion of a stem between the level of insertion of two successive leaves or leaf pairs (or branches of an inflorescence).

**involucral**  see **involucre**.

**involucre**  large bract or whorl (or several whorls) of bracts surrounding a flower or an inflorescence. adj. **involucral**.

**juvenile**  of leaves, formed on a young plant and different in form from the adult leaves.

**keel**  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.

**keeled**  of leaves or bracts, folded and ridged along the midrib.

**labellum**  a lip; in Orchidaceae, the distinctive median petal that serves as an alighting platform for pollinating insects.

**lamina**  the blade of a leaf.

**lanceolate**  of a leaf, about four times as long as it is broad, broadest in the lower half and tapering towards the tip.

**leaflet**  one of the ultimate segments of a compound leaf.

**lemma**  the lower of two bracts enclosing a grass floret; male lemma - lemma enclosing a male flower; sterile lemma - an empty lemma. cf. **palea**.

**lignotuber**  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).
ligulate  bearing a ligule; strap-shaped

limb  the upper free, spreading portion of a corolla or perianth that is connate at the base

linear  very narrow in relation to the length, and with the sides parallel

lobe  a usually rounded or pointed projecting part, usually one of two or more, each separated by a fissure or a sinus

mallee  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

marginal  occurring at or very close to the margin

mericarp  a one seeded portion of an initially syncarpous fruit which splits apart at maturity

-merous  used with a number prefix to denote the basic number of the 3 outer floral whorls

membranous  thin and translucent

midrib  the central, and usually the most prominent, vein of a leaf or leaf-like organ

monocarpic  flowering and fruiting only once during its life span

monoecious  having the male and female reproductive structures in separate flowers but on the same plant. cf. dioecious

mucro  a sharp, abrupt terminal point. adj. mucronate

mucronate  see mucro

mucronulate  with very small mucro

nectary  a gland that secretes nectar

nerve  a vein

node  the level (transverse plane) of a stem at which one or more leaves arise

obcordate  of a leaf blade, broad and notched at the tip; heart-shaped but attached at the pointed end

oblanceolate  similar in shape to lanceolate but attached at the narrower end

oblong  having the length greater than the width but no many times greater, and the sides parallel

obovate  similar in shape to ovate but attached at the narrower end

obtuse  blunt or rounded at the apex, the converging edges separated by an angle greater than 90 degrees

operculum  a lid or cover becoming detached at maturity by abscission; in Eucalyptus (for example), a cap covering the bud and formed by fusion or cohesion of perianth parts

opposite  of leaves, borne at the same level but on opposite sides of the stem; of floral parts, on the same radius. cf. alternate
orbicular  circular or nearly so
ovate    shaped like a section through the long axis of an egg, and attached by the wider end
ovoid    3 dimensional shape ovate in cross section
palea    the upper of the two bracts of a grass floret. cf. lemma
panicle  a compound raceme; an indeterminate inflorescence in which the flowers are borne on branches of the main axis or on further branches of these
paniculate indeterminate and much branched
papilla  a small, elongated protuberance on the surface of an organ, usually an extension of one epidermal cell. adj. papillose
papillose see papilla
pappus   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
-partite divided, almost to the base, into segments (commonly applied to a style)
patent   spreading, diverging from the axis at almost right angles
pedicel  the stalk of a flower. adj. pedicellate
pedicellate see pedicel
peduncle the stalk of an inflorescence; in ferns, the stalk of a sporocarp. adj. pedunculate
pedunculate see peduncle
pendulous drooping, hanging downwards
perennial a plant whose life span extends over more than two growing seasons
perianth  the calyx and corolla of a flower, especially where the two are similar
pericarp  wall of a fruit developed from the ovary wall
persistent remaining attached, not falling off. cf. caducous
petal    a member of the inner whorl of non-fertile parts surrounding the fertile organs of a flower, usually soft and coloured conspicuously
petiole   the stalk portion of a leaf
petiolate having a petiole
pilose    hairy, the hairs soft and clearly separated but not sparse
pinnate   divided into pinnae; once-compound. cf. bipinnate
pinnatifid cut deeply into lobes that are spaced out along the axis (of the leaf). cf. palmatifid
pinnatisect dissected down to the midrib but having the segments confluent with it
pistil | a free carpel or a group of fused carpels
plinate | having a longitudinal fold or ridge; or folded back and forth longitudinally like a fan
plumose | like a feather; with fine hairs branching from a central axis
pod | a leguminous fruit
pollination | 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
posterior | toward the axis, away from the subtending bract. cf. anterior
procumbent | trailing or spreading along the ground but not rooting at the nodes
prostrate | lying flat on the ground
puberulous | covered with minute, soft, erect hairs
pubescent | covered with short, soft, erect hairs
pungent | ending in a stiff, sharp point; having an acrid taste or smell
pyrene | the stone or pit of a drupe consisting of the hardened endocarp and seed
raceme | 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. racemose
rachis | the axis of an inflorescence or a pinnate leaf; pl. rachises. Secondary rachis: the axis of a pinna in a bipinnate leaf
ray | of a compound umbel, one of the first (lower) series of branches of the inflorescence axis
receptacle | the axis of a flower (= torus); in ferns, an axis on which sporangia arise
recurved | curved or curled downwards or backwards
reflexed | bent sharply downwards or backwards
reticulate | forming a network
retrorse | directed backwards or downwards. cf. antorse
revolute | rolled downwards or backwards
rhizomatous | see rhizome
rhizome | a creeping stem, usually below ground, consisting of a series of nodes and internodes with adventitious roots. adj. rhizomatous
rhomboid | quadrangular, with the lateral angles obtuse. adj. rhomboidal
rib | a distinct vein or linear marking often raised as a linear ridge
rosette | tuft of leaves or other organs resembling the arrangement of the petals in a rose
rugose | deeply wrinkled
saccate  

  
pouched

scabrous  

  
rough to the touch

scale  

  
a reduced or rudimentary leaf

scape  

  
the stem-like, flowering stalk of a plant with radical leaves

scarious  

  
dry and membranous

secund  

  
with all the parts grouped on one side or turned to one side

sepal  

  
a member of the (usually green) outer whorl of non-fertile parts surrounding the fertile organs of a flower

serrate  

  
toothed, with asymmetrically teeth pointing forward

serrulate  

  
finely serrate

sessile  

  
without a stalk (when applied to a stigma, indicates that the style is absent, the stigma being 'sessile' on the ovary)

seta  

  
a bristle or stiff hair

sheath  

  
see sheathing

sheathing  

  
claspimg or enveloping the stem

shrub  

  
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

silicula  

  
a short siliqua, not more than twice as long as its width

siliqua  

  
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

simple  

  
undivided; of a leaf, not divided into leaflets; of a hair or an inflorescence, not branched

sinuate  

  
with deep, wave-like depressions along the margin. cf. undulate

solitary  

  
of flowers, borne singly, not grouped in an inflorescence

spathulate  

  
spoon-shaped; broad at the tip and narrowed towards the base

species  

  
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

spike  

  
an unbranched, indeterminate inflorescence in which the flowers are without stalks. adj. spicate

spikelet  

  
a unit of the inflorescence in grasses, sedges and some other monocotyledons, consisting of one to many flowers and associated glumes

spine  

  
a stiff, sharp-pointed structure, formed by modification of a plant organ, eg a lateral branch or a stipule
spinescent ending in a spine; modified to form a spine
spinose bearing spines
spiral of leaves or floral organs, borne at different levels on the axis, in an ascending spiral. cf. cyclic
sporangia see sporangium
sporangium a case or body that contains the spores. pl. **sporangia**
sporophore specialised sporangia-bearing lobes of the leaf margin in species of Schizaeaceae
staminode a sterile stamen, often rudimentary
standard the posterior petal in the flower in Papilionaceae
stellate star-shaped; consisting of star-shaped cells
stem 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
stilt plant a plant with stilt roots (oblique aerial adventitious roots from the stem)
stipule one of a pair of appendages at the bases of leaves in many dicotyledons
stolon a prostrate or trailing stem that produces roots at the nodes
stomate a pore bounded by two guard cells in the epidermis, especially in leaves, through which gases diffuse pl. **stomata**
striate striped with parallel longitudinal lines or ridges
strigose with sharp, stiff hairs which are slanting rather than erect
subtending 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
subulate narrow and tapering gradually to a fine point
superior 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
taxon a group or category, at any level, in a system for classifying plants or animals
tepal 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.
terete cylindrical or nearly so; circular in cross-section
terminal at the apex or distal end
terrestrial 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
thallus 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 **thallous**
thallous  see thallus
throat  of a corolla tube, the top, where the tube joins the lobes
tomentum  a covering of dense, matted, woolly hairs. adj. tomentose
tomentose  see tomentum
trifid  deeply divided into three parts
trifoliate  having three leaves
trigonous  triangular in cross-section and obtusely-angled
triquetrous  trigonous
truncate  with an abruptly transverse end, as if cut off
tuber  a storage organ formed by swelling of an underground stem or the distal end of a root
tuberosous  swollen; of roots, tuber-like
umbel  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
umbellule  a partial umbel, part of a compound umbel
undulate  wavy, ie not flat. cf. sinuate
unisexual  bearing only male or only female reproductive organs
united  fused together
utricle  a small bladder; a membranous bladder-like sac enclosing an ovary or fruit
vein  a strand of vascular tissue
venation  the arrangement of veins in a leaf
ventral  when referring to thallous liverworts, the lower surface, that facing towards the substrate
verticillate  arranged in one or more whorls
villus  shaggy with long, weak hairs
virgate  with a broom like habit, more or less densely branched with stiff, more or less erect branches
whorl  a ring of leaves, bracts or floral parts borne at the same level on an axis
wing  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
xeromorphic  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,

taxe 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.
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. Acacia anomala 11. Acacia cochlocarpa subsp. velutinosa
2. Acacia aphylla 12. Acacia denticulosa
3. Acacia aprica 13. Acacia depressa
4. Acacia aristulata ms 14. Acacia forrestiana
5. Acacia ataxiphylla subsp. magna 15. Acacia imitans
6. Acacia auratiflora 16. Acacia insolita subsp. recurva
7. Acacia awestoniana 17. Acacia lanuginophylla
8. Acacia brachypoda 18. Acacia leptalea
9. Acacia chapmanii subsp. australis 19. Acacia lobulata
10. Acacia cochlocarpa subsp. cochlocarpa 20. Acacia pharangites

23. Acacia rhamphophylla
24. Acacia sciophanes
25. Acacia subflexuosa subsp. capillata
26. Acacia trulliformis
27. Acacia unguicula
28. Acacia vassallii
29. Acacia volubilis
30. Acacia wilsonii
31. Acacia splendens
32. Adenanthos dobagii
33. Adenanthos ellipticus
34. Adenanthos effusus
35. Adenanthos pungens subsp. pungens
36. Adenanthos velutinus
37. Allocasuarina fibrosa
38. Allocasuarina tortiramula
39. Andersonia axilliflora
40. Andersonia gracilis
41. Andersonia pinaster
42. Anigozanthos bicolor subsp. minor
43. Anigozanthos viridis subsp. terraspectans
44. Anigozanthos viridis subsp. terrapectans
45. Anthocercis gracilis
46. Apium prostratum subsp. phillipi
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 dorrienii
68. Caladenia drakeoides
69. Caladenia elegans
70. Caladenia excelsa
71. Caladenia harringtoniae
72. Caladenia graniticola
73. Caladenia hoffmannii
74. Caladenia huegelii
75. Caladenia melanema
76. Caladenia procera
77. Caladenia viridescens
78. Caladenia wanosa
79. Caladenia williamsiae
80. Caladenia winfieldii
81. Calceolus cyanea
82. Calceolus pignattianum
83. Calothamnus accedens
84. Calytrix breviseta subsp. breviseta
85. Centrolepis caespitosa
86. Chamelaucium griffithii
87. Chamelaucium roycei
88. Chamelaucium halfitii
89. Chamelaucium sp. Hamersley (N. McQuoid 379)
90. Chordifex abortivus
91. Chorizema hamile
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. dasys
104. Conostylis wonganensis
105. Cooperookia georgei
106. Cyphanthera odgersii subsp. occidentalis
107. Darwinia acerosa
108. Darwinia apiculata
109. Darwinia carnea
110. Darwinia chapmaniana
111. Darwinia collina
112. Darwinia ferricola
113. Darwinia foetida
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 cunderrin
124. Daviesia dielsii
125. Daviesia elongata subsp. elongata
126. Daviesia ephorbioides
127. Daviesia glossosema
128. Daviesia megacalyx
129. Daviesia microcarpa
130. Daviesia obovata
131. Daviesia pseudophylla
132. Daviesia speciosa
<table>
<thead>
<tr>
<th>133.</th>
<th>Deyeuxia drummondii</th>
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<td>134.</td>
<td>Diuris drummondii</td>
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<td>Diuris micrantha</td>
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<td>137.</td>
<td>Drakaea concolor ms</td>
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<td>Drakaea confluens ms</td>
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<td>Drakaea elastica</td>
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<td>Drakaea isolata ms</td>
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<td>Dryandra anatona</td>
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<td>Dryandra aurantia</td>
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<td>Dryandra fuscobractea</td>
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<td>Dryandra ionthocarpa subsp. chrysophoenix ms</td>
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<td>Dryandra mimica</td>
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<td>147.</td>
<td>Dryandra squarrosa subsp. argillacea</td>
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<td>Dryandra montana</td>
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<td>149.</td>
<td>Dryandra mucronulata subsp. retrorsa</td>
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<td>Eremophila denticulata subsp. denticulata</td>
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<td>Eucalyptus absita</td>
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<td>Grevillea curvuloba subsp. incurva</td>
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<td>Grevillea dryandroides subsp. dryandroides</td>
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<td>226.</td>
<td>Grevillea dryandroides subsp. hirsuta</td>
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<td>Haloragis platycarpa</td>
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<td>Scientific Name</td>
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<td>Halosarcia bulbosa</td>
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<td>Hibbertia priceana (ms)</td>
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<td>Lambertia echinata subsp. occidentalis</td>
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<td>Lambertia orbifolia subsp. orbifolia (ms)</td>
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<td>Lambertia orbifolia subsp. Scott River Plains (L.W. Sage 684)</td>
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<td>Lasiopetalum pterocarpum (ms)</td>
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<td>Leucopogon sp. Helena and Aurora Range (B.J. Lepschi 2077)</td>
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<td>Paracaleana dixonii (ms)</td>
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<td>Pterostylis sp. Northampton (S.D. Hopper 3349)</td>
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<td>Ricinocarpus brevis (ms)</td>
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<td>Synaphea selena (ms)</td>
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<td>Thomasia montana</td>
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<td>Thomasia sp. Green Hill (S. Paust 1322)</td>
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<td>Thryptomene wittleri</td>
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<td>Verticordia densiflora var. pedunculata</td>
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<td>345.</td>
<td>Verticordia fimbrilepis subsp. australis</td>
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<td>352.</td>
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<td>353.</td>
<td>Verticordia spicata subsp. squamosa</td>
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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 caespitulosus
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 gazetted 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**

<table>
<thead>
<tr>
<th>Geographical Range</th>
<th>Area of available habitat</th>
<th><em>Taxon easily identifiable any time</em></th>
<th>#Taxon identifiable with difficulty over short flowering period in certain years</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50 km</td>
<td>small</td>
<td>0.5-1 month</td>
<td>1.2 months over several years</td>
</tr>
<tr>
<td></td>
<td>large</td>
<td>1-2 months</td>
<td>3-6 months over a decade</td>
</tr>
<tr>
<td>&gt;50 km</td>
<td>small</td>
<td>3-6 months</td>
<td>6-12 months over a decade</td>
</tr>
<tr>
<td></td>
<td>large</td>
<td>6-12 months</td>
<td>not possible</td>
</tr>
</tbody>
</table>

*e.g. large perennial plants identifiable any time on vegetative characteristics - Eucalyptus crucis, Banksia tricuspis.

# e.g. 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.